Salida Sanitary District

Salida Recycled Water Planning Study

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Prepared For
State Water Resources Control Board
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State Water Resources Control Board
Salida Sanitary District Recycled Water Planning Study

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I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my knowledge and on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Neal T. Colwell, RCE 59437 5/22/2024

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TABLE OF ABBREVIATIONS

Abbreviation	Definition
ADWF	Average Dry Weather Flow
AF	Acre-feet
AFY	Acre-feet per Year
AFA / afa	Acre-feet per Annum (year)
AWMP	Agricultural Water Management Plan
bgs	below ground surface
BOD	Biochemcical Oxygen Demand
BU	Billable Units
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CVRWQCB	Central Valley Regional Water Quality Control Board
CV SALTS	Central Valley Salinity Alternatives for Long-term Sustainability
CWC	California Water Code
CWSRF	Clean Water State Revolving Fund
DDW	Division of Drinking Water
DHS	Department of Health Services
DO	Dissolved Oxygen
DS2.2	Disinfected secondary-2.2 recycled water
DS23	Disinfected secondary-23 recycled water
DWR	Department of Water Resources
EDU	Equivalent Dwelling Unit
Eto	Evapotranspiration
GO	General Order
GIS	Geographical Information System
gpcd	gallons per capita per day
gpm	gallons per minute
ILRP	Irrigated Land Regulatory Program
KSN	Kjeldsen, Sinnock, and Neudeck Inc
LAFCO	Stanislaus County Local Agency Formation Commission
lbs/cap/d	pounds per capital per day
MCLs	Maximum Contaminant Levels
mg/L	milligrams per liter
Mgal	Million gallon(s)
Mgal/d or MGD	Million gallons per day
MID	Modesto Irrigation District
MPN	Most Probable Number
MRP	Monitoring and Reporting Program
MRWTP	Modesto Regional Water Treatment Plant

Abbreviation	Definition
MSL	Mean Sea Level
OFCA	On-Farm Connection Assembly
PCE	Perchloroethylene
ROW	Right-of-Way
RW	Recycled Water
RWQCB	Regional Water Quality Control Boards
SBR	Sequencing Batch Reactor
SOI	Sphere of Influence
SRWPS	Salida Recycled Water Planning Study
SSD	Salida Sanitary District
SWRCB	State Water Resources Control Board
TCE	Trichloroethylene
TDA	Treatment and Delivery Agreement
TDS	Total Dissolved Solids
TID	Turlock Irrigation District
TKN	Total Kjeldahl Nitrogen
TM	Technical Memorandum
TSS	Total Suspended Solids
UDS	Undisinfected Secondary Recycled Water
USBR	United States Bureau of Reclamation
UV	Ultraviolet
WAS	Waste Activated Sludge
WDRs	Waste Discharge Requirements
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

The Salida Sanitary District (District) has been evaluating the potential feasibility of implementing a recycled water element to their water management portfolio. The Salida Recycled Water Planning Study (Study, SRWPS) is envisioned as a program for the production and use of recycled water within Northern Stanislaus County in the vicinity of the unincorporated community of Salida. The project has the potential to capture and reuse wastewater generated by the Salida Sanitary District's Wastewater Treatment Plant (WWTP) to supplement surface water and groundwater sources. It is envisioned that this water will be used to offset water used for agricultural needs and future park and landscape demands as agricultural lands are developed.

This *Recycled Water Planning Study* (Study) has been developed to present the findings of the feasibility evaluation conducted by the District related to the production of recycled water in the vicinity of Salida. The feasibility analysis includes identifying the regulatory requirements for recycled water production as it relates to specific uses, assessing the current WWTP's ability to meet treatment requirements, establishing preliminary alternatives for treatment upgrades and expansion, recycled water use, and assessing costs associated with these alternatives.

ES – 1 PROJECT PLANNING CRITERIA

The November 2022 Flows and Loads Technical Memorandum (Tech Memo, TM) provided the basis for the recommended planning criteria for the SRWPS. These planning criteria were based on an assessment of current and recent historical WWTP flow and load data, projected land use, and population projections through the 30-year planning horizon. Planning criteria for future flows and loads are proposed to be based on future population growth projected to the year 2052 rather than on the District's projected build-out as it is likely that the full build-out of Salida will occur beyond the 30-year planning horizon. Future wastewater flows were projected to the year 2052 using the current Average Dry Weather Flow (ADWF) as the baseline. Existing land use within the current City limits, Community Plan Area and Sphere of Influence (SOI) consists of a combination of residential and non-residential uses including[1]:

- Industrial;
- Agricultural;
- Commercial;
- Business Park;
- Planned Industrial;
- Planned Development;
- Lower-Density Residential;
- Lower-Density Residential, Special Treatment Area;
- Medium-Density Residential; and
- Medium to High-Density Residential.

[1] Land Use Designation from 2007 Salida Community Plan.

Industrial land use is the largest percentage in the project study area, followed by low density residential, planned development, business park and agricultural, respectively. Figure ES - 1 shows the locations of the exiting and projected land uses within Salida.

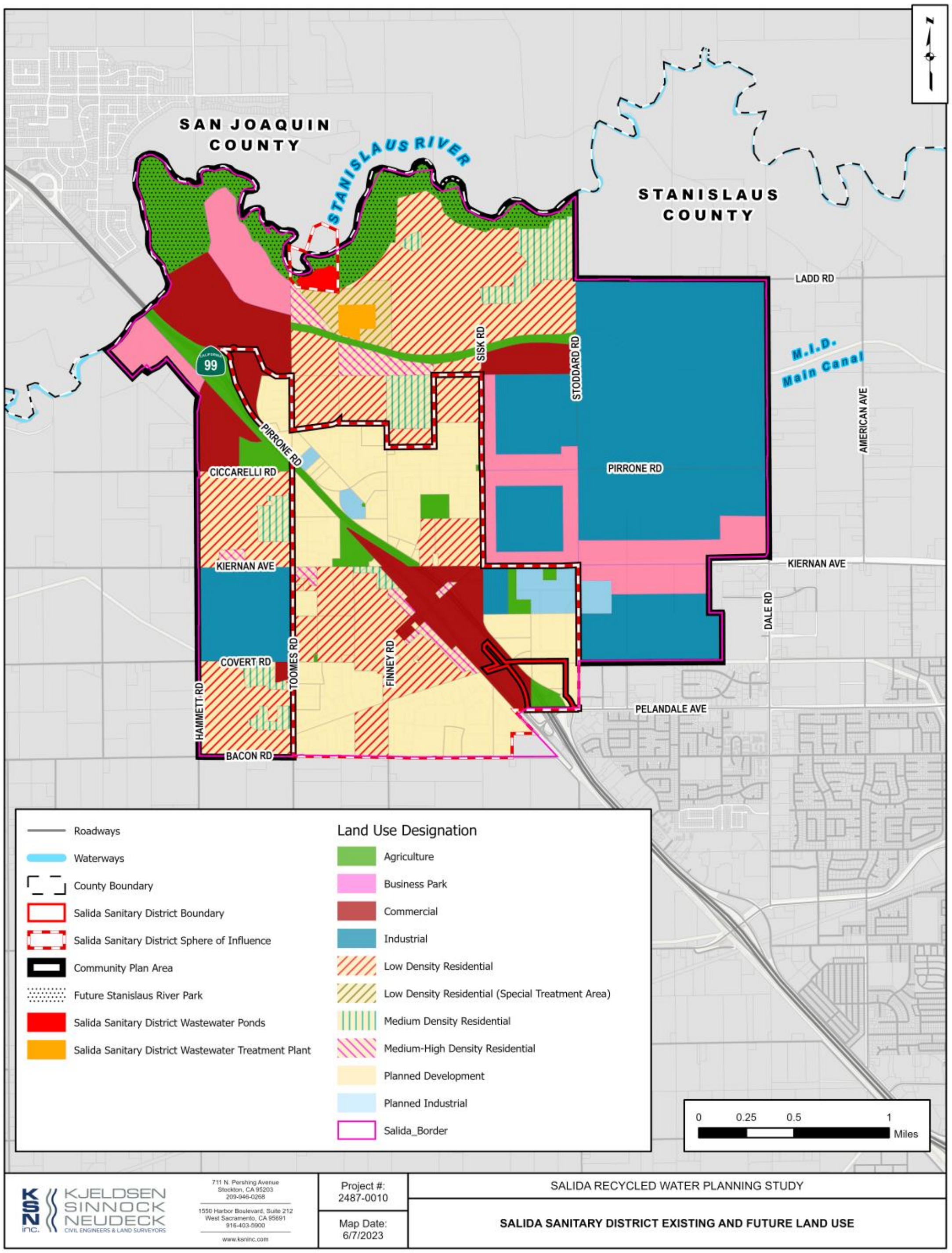

Figure ES - 1
Salida Existing and Future Projected Land Use

Historical flow and water quality data indicate the projected increase in Salida's population of 5,310 residents will result in the projected influent flows and loads to the WWTP in the year 2052 summarized in Table ES - 1.

Table ES - 1
Estimated Salida Flows and Loads

Wastewater Characteristic	Current	Increase	Projected Year 2052
ADWF (Mgal/d)[1]	1.07	0.33	1.40
BOD (lbs/day)[2]	5,671	3,660	9,331
Current TSS (lbs/day)[3]	5,048	3,258	8,306

(1) Existing ADWF based on 2017-2021 average. Future ADWF based on current estimated wastewater generation of 62 gpcd and increase in population of 5,310 residents.

(2) Existing BOD load based on 5,671 lbs/day industrial load from 2017-2021 average plus 3,660 lbs/day for current population. Future BOD load based on current estimated BOD load of 0.18 lbs/cap-d and increase in population of 5,310 residents.

(3) Existing TSS load based on 5,048 lbs/day industrial load from 2017-2021 average plus 3,258 lbs/day for current population. Future TSS load based on current estimated TSS load of 0.16 lbs/cap-d and increase in population of 5,310 residents.

The recommended planning criteria for the Study are summarized in Table ES - 2. These values are based on the 30-year planning horizon and are consistent with infill development that may occur within the existing City limits, Community Plan Area and the SOI. Additional facilities would be needed to accommodate wastewater generated beyond the 30-year projection and build-out development within the Community Plan area. Planning criteria are based on industrial flows and loads continuing similar to average flows and loads in 2017 through 2021.

Table ES - 2
Planning Study Recommended Facilities Criteria

Wastewater Characteristic	Unit	Planning Criteria
Flows		
ADWF	Mgal/d	1.40
Peak Month Peaking Factor	Unitless	1.1
Peak Day Peaking Factor	Unitless	1.8
Loads		
BOD		
Average BOD Daily Load	Lbs/d	3,660
BOD Peak Month Peaking Factor(1)	Unitless	1.3
BOD Peak Day Peaking Factor(1)	Unitless	1.8
TSS		
Average TSS Daily Load	Lbs/day	3,258
TSS Peak Month Peaking Factor(1)	Unitless	1.4
TSS Peak Day Peaking Factor(1)	Unitless	2.8
Nitrogen		
Total N Load(2)	Lbs/day	653
Total N Peak Month Peaking Factor(1)		1.4
Total N Peak Day Peaking Factor(1)		1.5

Peaking factors for BOD, TSS, and Total N based on 2017 through 2021 weekly and monthly influent monitoring data shown in Appendix A.

The District does not currently produce recycled water, however the Study has the potential to provide approximately 1,550 acre-feet (AF) of recycled water annually based on projected ADWF estimates. Assuming current ADWF, the current recycled water production would be approximately 1,200 AF. In order to produce and distribute the recycled water, several key elements would need to be put in place by the District. These key elements include:

- Treatment improvements at the WWTP to produce up to 1.4 Mgal/d recycled water; and
- Recycled water pumping and distribution to end users.

The required upgrades to the WWTP and the distribution elements are discussed in detail in Section 4 of this Study.

ES – 2 TREATMENT AND WATER QUALITY CONSIDERATIONS FOR REUSE

Water quality issues related to agricultural use, both from an end user perspective and a regulatory framework perspective were considered as part of the evaluation for recycled water production. This includes meeting water quality needs for irrigation, as well as regulatory and permitting requirements for use of recycled water.

The California Water Code (CWC) establishes the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB) and grants them the power to permit and approve recycled water programs. The RWQCBs issue permits for water reuse applications. These permits specify the requirements for water recycling including treatment, monitoring, reporting, and effluent water quality. Water quality criteria are enforced using waste discharge requirements, water reclamation requirements, or other appropriate permits issued by the RWQCB. The RWQCB verifies that reuse projects can meet the criteria by requiring projects to receive Division of Drinking Water (DDW) approval of a Title 22 Engineering Report to obtain a discharge permit.

CCR Title 22 establishes the guidelines for permitting and implementing recycled water programs. Title 22 focuses on public health protection and is administered by the SWRCB DDW. A Title 22 Engineering Report must be developed and submitted to DDW for review and approval prior to the implementation of the recycled water project.

In order to meet regulatory requirements as well as provide a level of treatment consistent with agricultural reuse, a combination of filtration and disinfection processes upgrades would be required at the WWTP to meet turbidity and total coliform bacteria reduction criteria. The requirements for the water reuse are stipulated in the CCR Title 22. There are four types of regulated non-potable recycled uses allowed. Note that end uses vary for each of these types of non-potable recycled uses. The number of allowable end uses increases with the increased level of treatment and water quality. The levels of treatment and types of recycled waters considered in Title 22 are:

1. **Undisinfected secondary (UDS) recycled water:** wastewater that has been oxidized but not disinfected (consistent with the existing level of treatment at the WWTP).
2. **Disinfected secondary-23 (DS23) recycled water:** wastewater that has been oxidized and disinfected such that secondary effluent total coliform has a median concentration of 23 (most probable number) MPN/100 mL or less.
3. **Disinfected secondary-2.2 (DS2.2) recycled water:** wastewater that has been oxidized and disinfected such that secondary effluent total coliform has a median concentration of ≤2.2 MPN/100 Ml.
4. **Disinfected tertiary recycled water:** wastewater that has been oxidized, filtered and disinfected such that secondary effluent total coliform has a median concentration of ≤2.2 MPN/100 mL, average turbidity of 2 NTU or less (or 0.2 NTU for MF), and includes either a chlorine disinfection process that provides a CT value of at least 450 milligrams-minutes per liter (mg-min/L) always with a modal contact time of no less than 90 minutes or a disinfection process that is demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F- specific bacteriophage MS2 or polio virus.

To meet the recycled water uses identified in the Use Area and to provide for a high-degree of grower acceptability production of disinfected tertiary recycled water is proposed. The Salida WWTP has the potential to produce approximately 1.4 Mgal/d of disinfected tertiary recycled water, also sometimes referred to as “Title 22 unrestricted recycled water,” for agricultural and landscape irrigation.

ES – 3 RECYCLED WATER MARKET

A market assessment was conducted as part of the Study. This assessment was conducted to identify the demand for recycled water within the Use Area as well as to better understand the local water supply needs and current supply drivers. The market assessment included outreach to individual landowners to discuss their interest in recycled water as well as assessment of potential partnerships with other local agencies.

Face to face meetings were conducted with responsive landowners to provide more detail on the Study, and ask for feedback on their level of interest, their water supply priorities, crop types and irrigation methods, the willingness to pay for recycled water, and any other information to help understand their current water supply needs. A questionnaire was used to capture input and information from interested landowners.

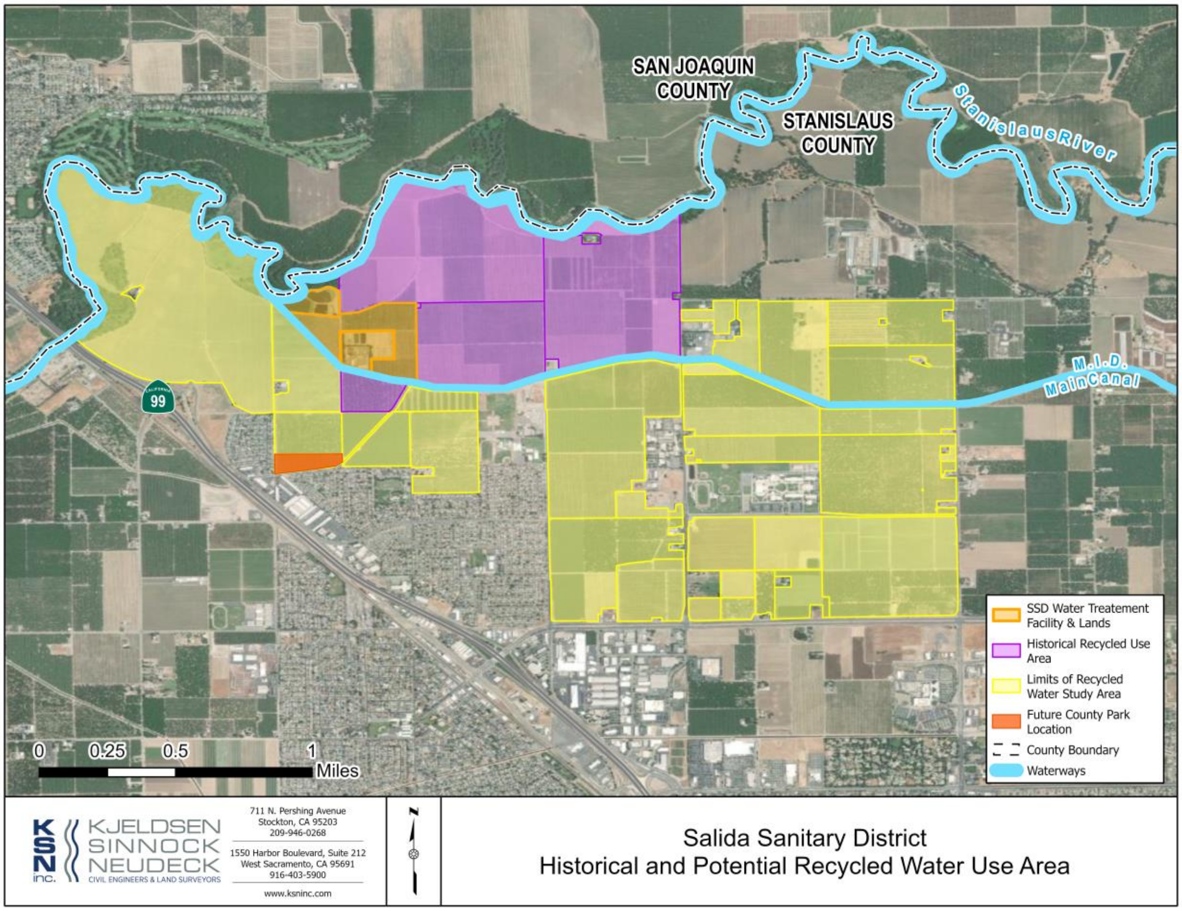

Figure ES - 2
Prospective Recycled Water Use Area

ES – 4 PROJECT ALTERNATIVES ANALYSIS

Several project components and alternatives were evaluated as part of the Salida Recycled Water Planning Study. Alternatives were evaluated on the basis of permitting complexity, suitability for recycled water use, integration into existing facilities, capital cost, and lifecycle costs. Two production alternatives and three storage and distribution approaches were evaluated, consistent with the site requirements and/or delivery of recycled water directly to growers in the Use Area.

An alternatives analysis was conducted using the project planning criteria to evaluate feasible production project alternatives. Additionally, potential alternatives for recycled water storage and distribution were compared on benefit and cost-basis. Each alternative's capital costs, operating costs, and life-cycle costs were compared. The cost estimates are conceptual estimates of the capital costs to construct facilities. The cost estimates should be refined from this conceptual phase as project elements are better defined and progress in design phases. Assumptions made in the estimated costs for the alternatives include:

- Contingency at 25% based on assumption of a Class 5 planning level estimate,
- Engineering, design, administration, and construction management costs at 25%, and
- Environmental and permitting costs at 10%.

ES – 4.1 Recycled Water Production Alternatives

Existing facilities at the WWTP consist of a headworks system, an ICEAS Basin, an effluent pump station, nine evaporation/percolation ponds, four groundwater monitoring wells, and associated piping and mechanical components. Based on data evaluated from January 2017 through December 2021, the WWTP treatment process provides excellent secondary treatment, specifically in terms of TSS and BOD removal, and regularly achieves effluent ammonia less than 2 mg-N/L and low effluent nitrate values.

Water quality constraints related to agricultural use, both from an end user perspective and a regulatory framework perspective were considered as part of the evaluation of treatment options for recycled water production. This includes meeting the water quality needs for crop irrigation, as well as meeting regulatory and permitting requirements for the use of recycled water on food crops. In order to meet regulatory requirements as well as provide a level of treatment consistent with agricultural reuse, a combination of filtration and disinfection processes upgrades would be required at the WWTP to meet turbidity and total coliform bacteria reduction criteria. To provide for a high degree of grower acceptability, production of disinfected tertiary recycled water is proposed.

It is assumed that disinfected tertiary recycled water will be produced to meet recycled water needs as secondary effluent is produced. Secondary effluent in excess of the recycled water demand would be sent to the rapid infiltration basins for disposal. All Production Facilities Alternatives are evaluated with the following general design considerations:

- **Pre-treatment**: Per the Title 22 requirements in 60301.320, disinfected tertiary recycled water requires coagulation upstream. "'Filtered wastewater' means an oxidized wastewater that…[h]as been coagulated and passed through natural undisturbed soils or a bed of filter media." Pre-treatment would consist of chemical injection followed by rapid mixing and flocculation. A new filter feed pumping station would feed flow from the secondary system to the pre-treatment system.
- **Filtration**. Flow from the pre-treatment system would flow by gravity to the filtration system. The filtration system would consist of two cloth disk filters with backwashing equipment or four continuous backwashing sand filters.
- **Disinfection**. Effluent from the filters would be sent through an open-channel UV disinfection system or a chlorine contactor to meet the requirements of disinfected tertiary, for allowable uses identified in Section 4.1.2.

Table ES - 3 summarizes the estimate of probable cost of construction, O&M and NPV for the tertiary treatment alternatives. Treatment capacity to expand from 1.07 to 1.4 Mgal/d is included in these costs.

Table ES - 3
Summary of RW Production Project Costs – Tertiary Filtration and Disinfection

Treatment Alternative	Description	Estimated Cost ($M)	O&M Costs ($)[a]	NPV ($M)
1	Cloth disk filtration plus UV disinfection	$12.1	$115,000	$15.3
2	Continuous backwash media filtration plus UV disinfection	$12.9	$126,000	$16.6

a. *O&M costs include labor, power, chemicals and materials replacement costs.*

ES – 4.2 Recycled Water Use Alternatives

Two alternative pipeline alignment approaches were evaluated for recycled water distribution, consistent with the site requirements and delivery of recycled water directly to growers in the Use Area.

Pipeline alignment 1 includes a backbone system for direct delivery to prospective landowners through a distribution system from the WWTP. An initial length of 27,750 linear feet of distribution piping was assumed to allow for recycled water transmission main construction extending to the main reaches of the use area, allowing a point of connection through On-Farm Connection Assemblies (OFCAs) for landowners identified in the market study discussed in Section 3.

Pipeline alignment 2 includes a phased approach to pipeline alignment 1 by providing recycled water delivery to only near-term potential users identified in Section 3.1.1.1 through a distribution system from the WWTP, with potential for future expansion to landowners in additional phases based upon demand and availability of recycled water. This alignment also considers the future potential for recycled water used for streetscape irrigation as current agricultural areas become developed. An initial length of 14,750 feet of distribution piping was assumed for this initial phase, which can be expanded to reach more landowners over time. Although the system is initially planned to operate under a low head condition, the system should be designed to allow for ease of transition to a pressurized recycled water delivery system in the future.

Because the potentially interested landowners identified as viable candidates for recycled water irrigation are limited and closer to the WWTP, pipeline alignment 2 is the selected alignment as it is planned to serve those potential users. Pipeline alignment 2 is shown below in Figure ES - 3.

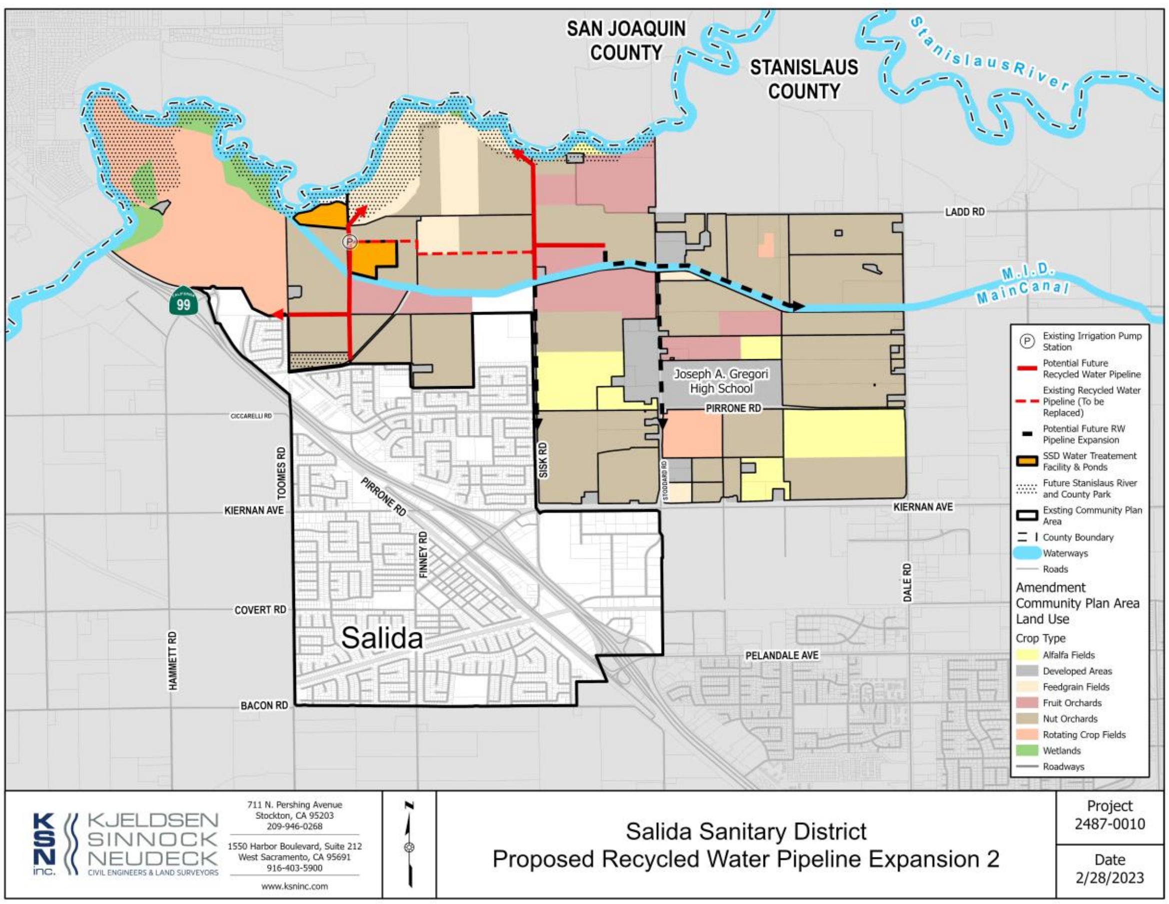

Figure ES - 3
Proposed Pipeline Alignment 2

The following storage and distribution alternatives were considered under the operational conditions of the recommended phased pipeline alignment:

- Alternative D1 - Operational storage for the recycled water delivery system to meet irrigation demand with no on-site storage (No Seasonal Storage);

- Alternative D2 - Maximized use of on-site ponds as seasonal storage at the WWTP to store produced recycled water through the non-irrigation season; and

- Alternative D3 - Remote storage for maximized beneficial use of recycled water for irrigation.

Table ES - 4 summarizes the estimate of probable cost of construction, O&M and NPV for the three storage and distribution alternatives. The storage and distribution alternatives are summarized in the subsections below.

Table ES - 4
Summary of RW Use Project Costs – Storage and Distribution Alternatives

Distribution Alternative	Description	Cost ($M)	O&M Costs [a] ($)	NPV ($M)
D0	No Recycled Water Project Option	$0	$30,000	$0
D1	Operational Recycled Water Storage Only	$8.0	$63,000	$9.8
D2	Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP	$4.1	$57,000	$5.7
D3	Maximized Remote Storage	$47.2	$62,000	$49.0

a. O&M costs include labor, power, chemicals and materials replacement costs.

ES – 4.2.2 Alternative D1 - Operational Recycled Water Storage Only

Alternative D1 includes construction of operational storage for production of 1.4 Mgal/d with no seasonal storage. During the irrigation season, the primary delivery pathway produces recycled water at a constant rate matching the influent flow rate up to 1.4 Mgal/d, with additional flows routed to land disposal through the RIBs and Lower Ponds. During the non-irrigation season, recycled water is not produced and therefore secondary effluent is routed to the RIBs and Lower Ponds for disposal. Under this alternative, a minimum of approximately 180 acres of land would be needed to meet disposal capacity. The 184 Mgal yearly irrigation demand of the 180 acres of adjacent orchards would be fully met through the recycled water irrigation without the need for supplemental surface or groundwater. Based on the irrigation scheduling described in Section 4.4.2, it is estimated that approximately 0.9 Mgal of operational storage is required to meet the peak irrigation demand. Pumping would be required to lift recycled water into the operational storage tank and recycled water distribution pumping to transport recycled water from operational storage into the recycled water distribution system and users OFCAs.

ES – 4.2.3 Alternative D2 – Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP

Alternative D2 involves the usage of on-site storage to both accommodate the additional projected inflow of 1.4 Mgal/d and to allow for operational flexibility for recycled water delivery during the irrigation season. The configuration of the on-site disposal ponds under this alternative would allow for incidental storage of secondary effluent while these ponds serve their primary purpose of effluent disposal during the winter months due to permitting restrictions. Alternative D2 would include the continued use of the existing lower ponds for evaporation and percolation of secondary treated effluent prior to transfer to the tertiary treatment train. Under this alternative, a minimum of approximately 180 acres of land would be needed for irrigation for recycled water production by the WWTP to meet disposal capacity needs. It is estimated that the 161 Mgal yearly irrigation demand of the 180 acres of adjacent orchards could be fully met through the recycled water irrigation. This system arrangement delivers secondary effluent through the existing RIBs, certain degradation of the water quality is likely to occur, including production of algae. This water quality degradation could require additional treatment improvements such as Dissolved Air Flotation (DAF) to remove the algae before filtration. Recycled water treated to a tertiary standard would then be distributed to landowners for irrigation through the recycled water pumping station.

ES – 4.2.4 Alternative D3 – Remote Storage for Maximized Beneficial Use of Recycled Water for Irrigation

Alternative D3 includes the continued usage of the 9 existing RIBs and 3 active lower ponds and the addition of a remote seasonal storage basin to maximize irrigation potential through the continuous production of recycled water at a rate of 1.4 Mgal/d throughout the year, including the winter months when irrigation demand is low and the WWTP will still be producing water treated to tertiary standards. Seasonal storage is considered to maximize the use of recycled water produced throughout the year and allow for storage of recycled water when irrigation cannot occur during the winter months due to permitting restrictions. Under this alternative, the beneficial use of recycled water for irrigation is maximized through the irrigation of an estimated 410 acres of adjacent orchards. It is estimated that of the total 418.3 Mgal yearly irrigation demand of the defined irrigation area, 417 Mgal would be met through recycled water produced by the WWTP and 1.3 Mgal would need to be supplemented by surface or groundwater irrigation. The volume of the remote storage basin was optimized to maximize irrigation potential and reduce evaporative losses at a constant inflow of 1.4 Mgal/day under average precipitation conditions and verified by 1 in 100 year precipitation conditions. The optimal volume of the storage basin was found to be 250 Mgal. As with Alternative D2, there would be some degradation of water quality due to atmospheric exposure in the remote storage, including potential for natural coliform regrowth and growth of algae. While the water would meet tertiary disinfected recycled water criteria, additional treatment by the growers may be needed including filtration before delivery through emitters and sprinklers.

ES – 4.3 No Project Alternative

The no recycled water project option includes the continued use of existing means of effluent disposal without the addition of recycled water production and distribution facilities. The improvements for tertiary treatment are not included because those facilities are related to recycled water production. As flows approach the 30-year projected influent flow of 1.40 Mgal/d by year 2052, the District will need to adjust the approach to storage and percolation cycles to prevent standing water in the RIBs for more than 72 hours to maintain compliance with current and future WDRs.

ES – 5 RECOMMENDED PROJECT

The recommended project is a combination of alternative T1 and alternative D1, which incorporate the key tertiary treatment processes of cloth disk filtration and UV disinfection and the operational recycled water storage, and additional on-site disposal to accommodate future flows of 1.4 Mgal/d. No upgrades to the headworks or secondary treatment processes are included in this project because the existing facilities were deemed to be adequate for producing the influent flow and water quality for the tertiary treatment system.

The recommended recycled water production facility improvements include designing and constructing the following key tertiary treatment facilities:

- Filtration feed pumping station,
- Rapid mixers and flocculation tank,
- Chemical storage and addition systems,
- Cloth disk filtration system,
- UV disinfection system,
- Recycled water pumping station, and
- Ancillary facilities, equipment, and piping.

The recommended recycled water use includes designing and constructing the following key recycled water storage and delivery components:

- Recycled Water Lift Station,
- Operational Storage Tank,
- Recycled Water Delivery Pipelines (Alignment 2, phased approach), and
- On-Farm Connection Assemblies.

The project will include construction of a recycled water distribution pump station at the WWTP, and an initial length of distribution piping of 14,750 feet, which can be expanded to reach additional landowners over time.

Based on the future projected flows to the WWTP of approximately 1.4 Mgal/d and assuming this recycled water production capacity, irrigation scheduling scenarios were evaluated using the method. An irrigation schedule of 10 hours on and 14 hours of storage (at a minimum of 180 acres irrigated) was determined to be the optimal delivery schedule for recycled water under the projected 1.4 Mgal/d production rate. This results in a peak irrigation flow rate of approximately 2,400 gpm. Table ES - 5 provides a summary of the parameter values assumed for direct delivery under projected 1.4 Mgal/d flows for the recommended project.

Table ES - 5
Irrigation Delivery Evaluation Criteria Assuming 1.4 Mgal/d Recycled Water Production

Parameter	Unit	Value ADWF @ 1.4 Mgal/d
Total Irrigated Area	Ac	180
Peak Daily Irrigation Area	Ac	135
Irrigation Efficiency	%	85
Irrigation Duration	hrs	10
Peak Irrigation Flow Rate	gpm	2,400

This recommended project would also include 900,000-gal of on-site operational recycled water storage and utilize the secondary effluent percolation ponds to accommodate additional disposal and meet reliability criteria of Title 22. Tertiary treated recycled water storage would be limited to the operational storage provided in one above ground 900,000-gal steel storage tank.

The recommended layout of the proposed facilities including the new tertiary treatment facilities, recycled water pump station, and location of the operational recycled water storage tank and lift station is shown in Figure ES - 4. An overview of the proposed recycled water distribution facilities under the recommended alternative is shown in Figure ES - 5.

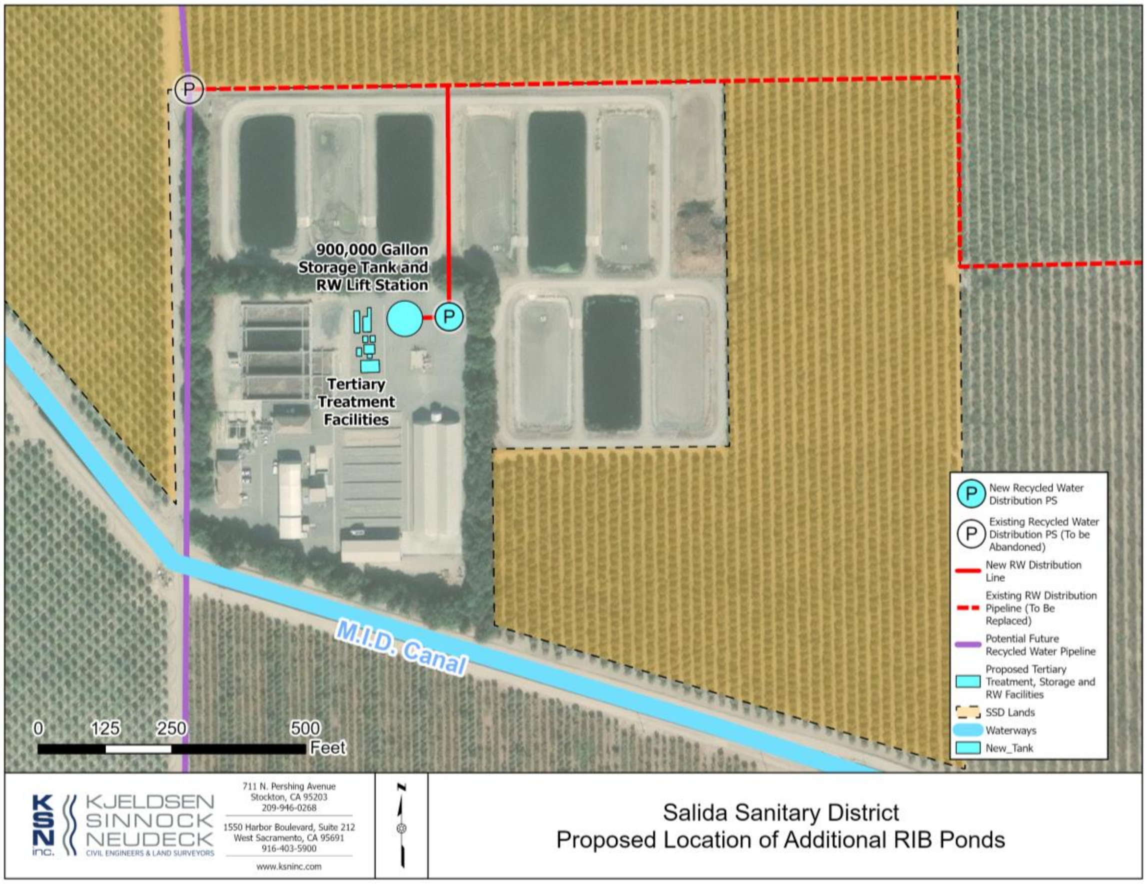

Figure ES - 4
Proposed Recommended Project Facilities

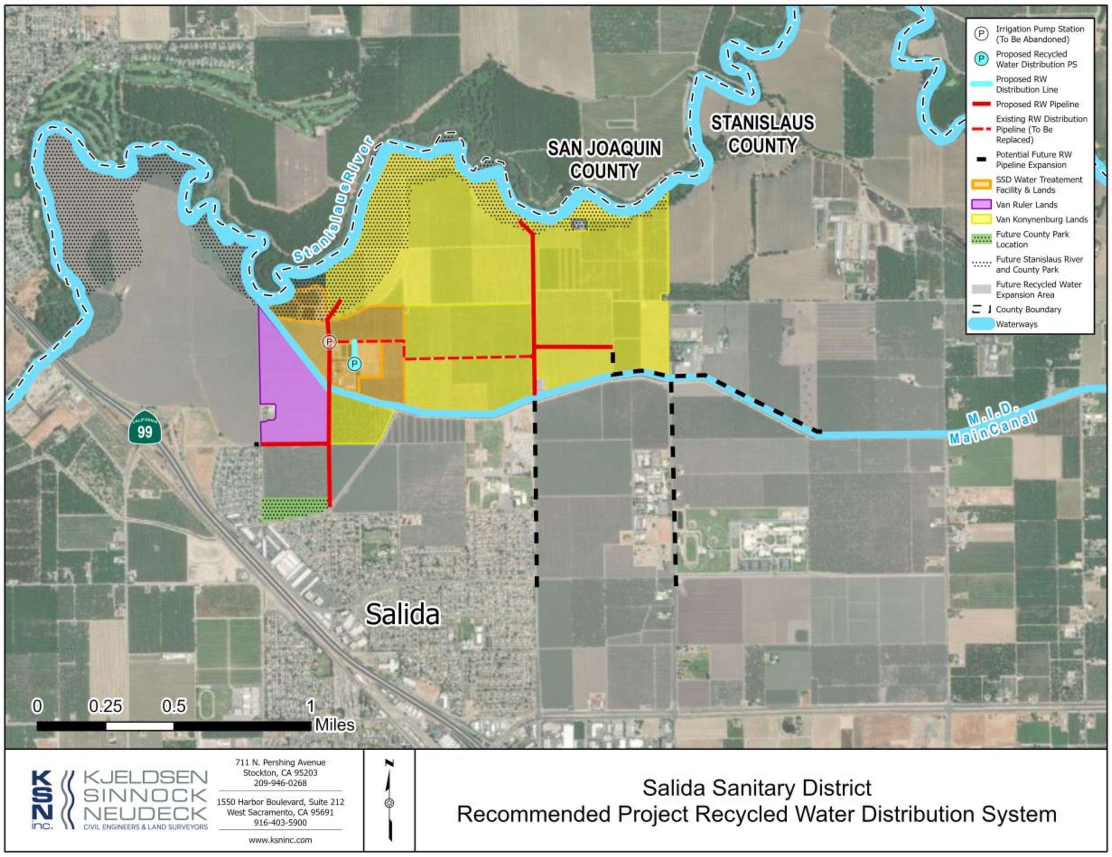

Figure ES - 5
Proposed Recommended Project Recycled Water Distribution Facilities

The estimated probable capital, O&M, and NPV costs for the recommended project are summarized in Table ES - 6. NPV costs are based on an assumed 30-year lifecycle for the project and assume an escalation rate of 2.1 percent and discount rate of 2.5 percent. All costs are in mid-2023 dollars.

Table ES - 6
Summary of Estimated Probable Capital, O&M, and NPV Costs for Recommended Project

Description	Cost Type	Estimated Cost ($)
Tertiary Treatment System Including Cloth Disk Filtration and UV Disinfection	Capital Cost	$12,100,000
	Annual O&M Cost	$133,000
	30-year NPV Cost	$15,500,000
Operational Recycled Water Storage and Additional On-Site Storage for RW Delivery	Capital Cost	$7,998,000
	Annual O&M Cost	$63,000
	30-year NPV Cost	$9,800,000
	Total Recommended Project Capital Cost	**$21,900,000**

ES – 6 CONSTRUCTION FINANCING PLAN AND REVENUE PROGRAM

The following section summarizes the capacity of the District to pay for capital costs and the operations, maintenance, and costs of the WWTP upgrades and recycled water facilities. Additionally, a proposed plan for financing of the construction, operations, maintenance, and replacement costs has been prepared to summarize the expected costs borne by the District and potential funding sources such as grants and/or loans available to reduce these costs. Capacity charge programs and user rates have been estimated based on the capital costs and loan debt servicing.

There are a variety of financing sources available to the District for capital improvements, replacements, and expansion of wastewater treatment and management systems. These options include developing and using cash reserves and operating revenues, state revolving fund grants and loans, and tax-exempt borrowings such as general obligation bonds, special tax bonds, assessment bonds, revenue bonds, bond pools, and certificates of participation. With a District that has existing dedicated wastewater system connections as a source of revenues, the typical financing methods of revenue bonds, bond pools, certificates of participation, or other state-sponsored low-interest loans, would entail repayment of the debt using revenues from user fees.

Table ES - 7
Funding and Financing Sources Available to Salida Sanitary District

Funding/Financing Source	Finance Type	Funding Amount	Typical Financing Term
US Bureau of Reclamation Title XVI WaterSMART	Federal Grants	Lesser of $20M or 25% of project cost	N/A
SWRCB Clean Water State Revolving Fund	State Grant & Loans	Up to 35% of project cost	20-year amortization at 1.85% interest or 30-year amortization at 3% interest
EPA WIFIA Loan Program	Federal Loans	N/A	30-year at 4.24% interest (1)
Traditional Bonds	Municipal Revenue Bonds	N/A	30-year amortization at 5.0% interest, with interest depending on bond market

(1) *Interest rate based on SLGS table 30-year yield as of 9/15/2023: SLGS Tables*

Based on the funding programs available, it is recommended that the District pursue as much funding as possible through the grant and Federal and State low interest loan programs listed in Table ES - 7. However, availability or likelihood of the District to retain grant funding remains uncertain in the future, and there is no guarantee that application to the programs presented in Table ES - 7 will result in the District receiving any grants.

For the purposes of developing preliminary financial calculations, approximately 35% of the project costs are assumed to be reasonably funded through one or more of the state or federal grant programs in Table ES - 7.

ES – 6.1 ESTIMATED INCREASES TO USER RATES

User rates for the Recommended Project are calculated by dividing the scheduled annual loan payment by the total number of equivalent dwelling units (EDU) at 5,485 EDUs based on 2021 conditions as described in the 2021 Capitol PFG Sewer Rate Study. The additional resulting user rates required to service the loan debt in 2023 dollars would be between $212to $273 per billable unit per year, or an increase of approximately $18 to $23 per month, depending on the amount of grant funding awarded, including a debt coverage ratio of 1.2 per SWRCB Policy for Implementing the CWSRF . Theis increase in user rates represents the additional cost to cover capital costs for the recycled water treatment and distribution facilities and the additional O&M and are in addition to the current user rates covering the operation and maintenance of the existing facilities. The total estimated monthly costs including the current monthly user rate and the additional rates for the Recommended Project are shown below in Table ES - 8.

Table ES - 8
User Rates to Service RW Distribution Capital Costs

User Rate Component	Grant Funding Scenario		
	0% Grant Funding	12.5% Grant Funding	25% Grant Funding
Additional O&M Costs ($USD) (1)	$158,282	$158,282	$158,282
Loan Debt Service ($USD)	$1,117,322	$983,243	$837,991
Debt Service Coverage(2) ($USD)	$223,464	$196,649	$167,598
Total Debt Service ($USD)	$1,340,786	$1,179,892	$1,005,590
No. of Equivalent Dwelling Units (EDUs)	5,485	5,485	5,485
Additional Annual Base User Rate ($/BU/yr)	$273	$244	$212
Additional Monthly Base User Rate ($/BU/month)	$23	$20	$18
Current Monthly User Rate per 2023 Projection in Rate Study(3) ($/BU/month)	$19.71	$19.71	$19.71
Total Estimated Monthly User Rate with Recommended Project	$42	$40	$37

(1) Annual O&M costs for RW production and delivery minus revenue from RW sales as discussed in 6.4.
(2) Based on 1.2 debt coverage ratio of SWRCB Policy for Implementing the CWSRF, December 3, 2019.
(3) Rates are based on the 2023/2024 Sewer Rates in the Capitol PFG SSD Sewer Rate Study dated May 2021.
Note: Estimates are based on 2023 USD

ES – 6.2 Capacity Charge Revenues

Capacity charges are established for future connections to the wastewater system that will utilize disposal capacity of the recycled water storage and distribution system. If a recycled water project is implemented, it is expected that the District would prepare an updated capacity charge program for future connections to the system to provide a source of revenue to cover the capital cost of the facilities needed to serve those future connections.

Grant coverage (if received by the District) is applied to benefit both existing and future users for capacity, consistent with the basis of fee setting recommended by both the Water Environment Federation (WEF) Manual 27[2], and the American Water Works Association M1[3]. These include the costs from the recommended project discussed in Section 5. Of the secondary treatment costs, approximately 1.07 of the 1.4 Mgal/d capacity is used by existing users, and the remaining available capacity is attributed to the 0.33 Mgal/d contributed by future users. It should be noted that the expected complete buildout of Salida would require additional future projects to provide capacity beyond the 1.4 Mgal/d total capacity that this project offers.

Tertiary level of treatment would be required for future users because of the recycled water usage requirements within the District's WDRs and flows are projected to increase from the current 1.07 Mgal/d to 1.4 Mgal/d which cannot be disposed of using the existing WWTP's means of on-site disposal. Additional means of disposal are intended to be met by seasonal RW irrigation included in the first phase of the $21.9M recommended project. Because the existing treatment process has available capacity to meet future needs, but additional disposal processes need to be constructed, e.g, tertiary treatment and recycled water use, the costs of these facilities and their associated capacity, would be the responsibility of future users. A demonstration of the methodology used to delineate cost per unit to future users is presented in Table ES - 9.

[2] Water Environment Federation, Financing and Charges for Wastewater Systems, Manual of Practice No. 27: WEF M27
[3] AWWA Manual of Water Supply Practices, Principles of Water Rates, Fees and Charges, 7th Edition: AWWA M1

Table ES - 9
Per Unit Capacity Charge Costs for RW Production and Use

Total Flow: 1.4 Mgal/d Total Additional Flow: 0.33 Mgal/d
Total Capital Costs Tertiary Treatment, Storage, Distribution Costs ($M)
[$12.1M (Tertiary) + $9.8M (Storage and Distribution)] = $21.9
Flow Capacity Contributions (Mgal/d)
0.33
25% Grant Funding ($M)
$5.5
Total Loan Interest (R = 1.85%) ($M)
$8.7
Application of Grant Coverage Costs Covered by Capacity Charges
[$21.9M (Capital) + $8.7M (Interest) - $5.5M (Grants)] = $25.1M Remaining Capital Cost
Overall User Wastewater Generation Costs ($/GPD)
$76.18

Preliminary increase in the capacity charge (also referred to as Facilities Fee) calculations for propertied within the District boundary are summarized in Table ES - 10. Capacity charge calculations were proportioned to future users by the amount of flow contributed by Equivalent Dwelling Unit based on the Salida Sanitary District Facilities Fees determined by the June 2015 Facilities Fee Study by Parsons and Associates.

Considering only the cost of capacity for new connecting properties within the District Boundary, Table ES - 10 presents the estimated increase in capacity charges on a per-unit basis to add the recommended project to the program of wastewater treatment and disposal under a range of potential grant coverage. Since the capacity charge for properties not within the District includes facilities that could be duplicative of the recycled water elements, an additional detailed facilities study for capacity beyond the 2.4 Mgal/d secondary process and 1.4 Mgal/d recycled water program would need to be developed, which is beyond the scope of this study. Considering only properties within the current District Boundary the potential capacity charge could increase to approximately $11,809 to $12,808 per EDU or $537 to $582 per fixture unit for light industrial or commercial.

Table ES - 10
Summary of Existing and Additional Capacity Charges for the Recommended Project

Land Use (Within Boundary) (1)	Existing Collection System Fees for FY 2023/2024(2) (Within Boundary)	0% Grant Coverage	12.5% Grant Coverage	25% Grant Coverage
		Additional Facilities Cost per Unit(1)	Additional Facilities Cost per Unit(1)	Additional Facilities Cost per Unit(1)
Customer Class	**$/Unit**	**$/Unit**	**$/Unit**	**$/Unit**
Residential Dwelling Unit	$8,815	$3,993	$3,494	$2,995
Industrial (Light) per fixture unit	$401	$181	$159	$136
Commercial per fixture unit	$401	$181	$159	$136

(1) Unit cost of capacity for the recycled water facilities of the Recommended Project with a capacity of 1.4 Mgal/d. Light industrial and commercial cost per unit calculated at a factor of 1/22 times the residential dwelling unit per Table 1 of the Parsons & Associates Fee Study Report.

(2) Residential, light industrial, and commercial capacity charges for properties within the District boundary per Ordinance 2023-1.

ES – 6.3 Recycled Water User Fees

Revenues collected from recycled water users are planned to offset a portion of the cost of operation and maintenance of the recycled water storage and distribution system. This funding strategy is based on charging for recycled water use at the same or equivalent cost of alternative water sources available to users, namely groundwater or MID surface water.

Based on the current expected operation and maintenance costs of $63,000 per year for the recycled water storage and distribution system, and the current expected production volume of 595 AF/yr, the cost for recycled water storage and delivery is approximated at $106/AF. Based on a 4% annual escalation of the operations and maintenance costs, the total cost of recycled water by 2053 is estimated to be approximately $344/AF. By comparison, the current cost for existing growers to utilize groundwater and pressurize it for irrigation is estimated at approximately $34/AF at current rates. Recycled water charges (for each decade) between 2023 and 2053 are summarized in Table ES - 11.

Table ES - 11
Proposed Recycled Water User Fees

Year	Comparative Costs for Using Groundwater for Irrigation [1] ($/AF)	Proposed Fees for Recycled Water Users [2] ($/AF)
2023	$34	$34
2033	$47	$47
2043	$64	$64
2053	$88	$88

[1] Cost for groundwater use for irrigation is based on MID agricultural user energy rate schedules, escalated at an annual rate of 3%.

[2] Cost share for recycled water users, commensurate with groundwater pumping

ES – 7 IMPLEMENTATION AND OPERATIONAL PLAN

Since the Phase I recommended project is focused on producing and delivering recycled water to a limited set of interested users, the legal and institutional issues are limited. The following are likely requirements of the Phase I project implementation:

- Institutionally the District is expected to have the authority to produce and deliver recycled water and no changes to the District's authority are likely required.
- The most likely form of legal relationship between the District and a recycled water user is in the form of an individual service agreement, covering the delivery and use of recycled water. This individual service agreement should address the following elements:
    - Responsibility for facilities operation and maintenance including recycled water delivery facilities and on-farm recycled water application and monitoring facilities;
    - Cost of service;
    - Responsibility for operation and monitoring and reporting under the type of permit to be issued for the recycled water program; and
    - Other required matters between the District and an individual grower.
- The Phase I project service area is coordinated with the current MID irrigation service area. Coordination with MID is recommended regarding the potential overlap of meeting grower irrigation water supply needs, however specific jurisdictional and service area requirements are not expected to be challenges, particularly operating under the framework of an individual service agreement between the District and the recycled water user.
- In developing the recycled water program and service area, it is recommended that the District consult with the Stanislaus County Local Agency Formation Commission (LAFCO) regarding the service to be provided by the District's program and LAFCO's coordination of public agency services.

If the District proceeds with the recommended project, an environmental checklist will need to be performed. The checklist will serve as an initial evaluation of the expected environmental impacts associated with the project, based on the projects level of development. The checklist should be based on the requirements for determining the significance of environmental impacts based on California Environmental Quality Act (CEQA).

Permitting of the Recycled Use portion of the Recommended Project is anticipated to be under the General Order Water Reclamation Requirements for Recycled Water Use, Order WQ 2016-0068-DDW, which avoids the need for individual permits issued by the RWQCB for each site under the traditional WDR permit program. This option also provides the most flexibility in where recycled water can be used and would establish the District as the recycled water producer, distributor, and administrator. For new recycled water projects, submittal of a Notice of Intent (NOI) to the RWQCB for coverage under Order WQ 2016-0068-DDW will be required in addition to an Engineering Report (ER) to the SWRCB DDW.

In considering to proceed with development of a recycled water program, particularly for conversion of agricultural uses to irrigation of public landscape areas, road medians and park areas, master planning of the recycled water program as well as development of District design standards and planning standards and conditions of future project approval should be developed.

Details of the Design and Construction Implementation Plan and Operational plan are provided in Sections 7.2 and 7.3.

Section 1

Description of Current and Future Service Area

1.1 BACKGROUND

The Salida Sanitary District (District) has obtained support through grant funding to evaluate the potential feasibility of implementing a recycled water element to their water management portfolio. A planning study has been performed based upon the State Water Resources Control Board (SWRCB) proposed recycled water planning report scope and the District's recycled water plan and objectives. The Salida Recycled Water Planning Study (Study, SRWPS) is envisioned as a program for the production and use of recycled water within Northern Stanislaus County in the vicinity of the unincorporated community of Salida. The project identifies the potential to capture and reuse wastewater generated by the Salida Wastewater Treatment Plant (WWTP) to supplement fresh water sources. It is envisioned that this water will be used to offset a combination of groundwater and surface water used for agricultural needs and future park and landscape demands as agricultural lands are developed.

This Study has been developed to present the findings of the feasibility evaluation conducted by the District related to the use of recycled water in the area of Salida. The feasibility analysis includes identifying potential recycled water use locations, identifying potential project partners, identifying local water use needs (including water quality, quantity, and seasonality), establishing preliminary alternatives for recycled water production and distribution, and assessing permitting needs and costs associated with these alternatives.

1.2 PROJECT DRIVERS

There are several drivers that make recycled water use a potentially viable option in the area. The following policy, regulatory, and facilities capacity conditions have been identified as drivers in support of the Study:

Policy Drivers:

1. The State Water Resources Control Board, through Resolution 77-1, strongly encourages development of local and regional "drought-proof" water supplies, in particular development of recycled water projects.

2. Based on the recent drought, the State of California placed primary interest in pursuing development of recycled water projects.

3. The existing wastewater disposal system does not currently include local resource recovery or reuse. If cost of production could be managed, recycled water could be considered a commodity.

Regulatory Framework Drivers:

Considering Salida site-specific conditions, the following are potential regulatory drivers for the District to consider in implementation of this project:

1. The existing process of effluent disposal may be subject to additional regulatory limitations based on the Central Valley Salinity Alternatives for Long-term Sustainability (CV SALTS) program. The WWTP is located in the Modesto Management Zone, which is a Priority 1 basin, and will be subject to the nitrogen management requirements of this program in the future.

2. The District held a historic agreement with regional landowners permitting the use of recycled water for irrigation. The agreement has been postponed due to the need to upgrade treatment to meet compliance with tertiary treatment standards which will be addressed in the scope of this document, therefore re-implementation of the recycled water agreement with adjacent landowners could be achievable during renewal of the District's wastewater permit. Recycled water for adjacent landowner irrigation ceased in 2002.

Capacity Drivers

Capacity related benefits of the Recycled Water include the following:

1. Influent to the existing wastewater treatment system treatment is approximately 1.07 Million gallons per day (Mgal/d), as Salida grows, with a projected potential of up to approximately 1.4 Mgal/d, expansion of effluent disposal will be necessary triggering facilities improvements and permit renewal.

While capacity in preliminary and secondary treatment processes is adequate to address identified development, capacity of the existing disposal ponds is limited and may be further limited based on water quality requirements, therefore new and/or expanded means of effluent disposal will need to be developed as Salida grows, that disposal capacity increase could be through recycled water use.

1.3 SOURCE AREA DESCRIPTION

Salida is located within Stanislaus County, just south of the border of San Joaquin County and the Stanislaus River, south of the City of Ripon and north of the City of Modesto. The community of Salida is divided by Highway 99 and the Union Pacific Railroad. Salida's estimated 2022 population is approximately 15,416 people. Salida is a mix of predominantly low to medium density residential and industrial land uses with some commercial and agricultural land uses. The Salida WWTP is outside of the Salida community limits and is bordered by the Stanislaus River to the north and the Modesto Irrigation District (MID) canal to the south. Wastewater generated by the WWTP is the proposed source of recycled water under this Study. Recycled water distribution alternatives are discussed in detail in Section 4.4. Improvements to the WWTP required to produce recycled water are discussed in Section 4.3.

Kjeldsen, Sinnock, and Neudeck, Inc. (KSN) evaluated the Salida's land use, population, and wastewater flows in the November 2022 Flows and Loads Technical Memorandum (TM) (included in Appendix A). For the purposes of the evaluation, the study area was defined as the District boundary, the Sphere of Influence (SOI), and the Salida Community Plan Area. The District boundary contains approximately 1,488 acres, and the District's SOI includes another 45 acres, and the Community Plan Area encompasses an additional 3,502 acres for a total area of 5,058 acres. The District boundary, the SOI, and the Community Plan Area are situated north of the City of Modesto and south of the City of Ripon. For the purposes of this Study, this is considered the Source Area, as it is the source of wastewater to potentially be used for production of recycled water. The project study area, community plan area, and land uses are described in detail within Section 2.3.

Land use information from the 2022 Flows and Loads TM is summarized here. Existing land use within the current City limits and SOI consists of a combination of residential and non-residential uses including[4]:

- Industrial;
- Agricultural;

[4] Land Use Designation from 2007 Salida Community Plan.

- Commercial;
- Business Park;
- Planned Industrial;
- Planned Development;
- Lower-Density Residential;
- Lower-Density Residential, Special Treatment Area;
- Medium-Density Residential; and
- Medium to High-Density Residential.

Industrial land use is the largest identified acreage represented in Salida, the Community Plan Area, and SOI, followed by low density residential, planned development, business park and agricultural, respectively. Land use designations areas are shown in Figure 2-4.

1.4 USE AREA DESCRIPTION

For the recycled water distribution portion of the Study, the lands surrounding the District were considered for recycled water use. A market assessment was performed to assess landowner interest for recycled water irrigation, discussed in detail in Section 3. Figure 1-1 shows the limits of the District, the boundaries of landowner properties identified in the historical agreement, the approximate existing recycled water distribution facilities, and surrounding lands considered in this Study.

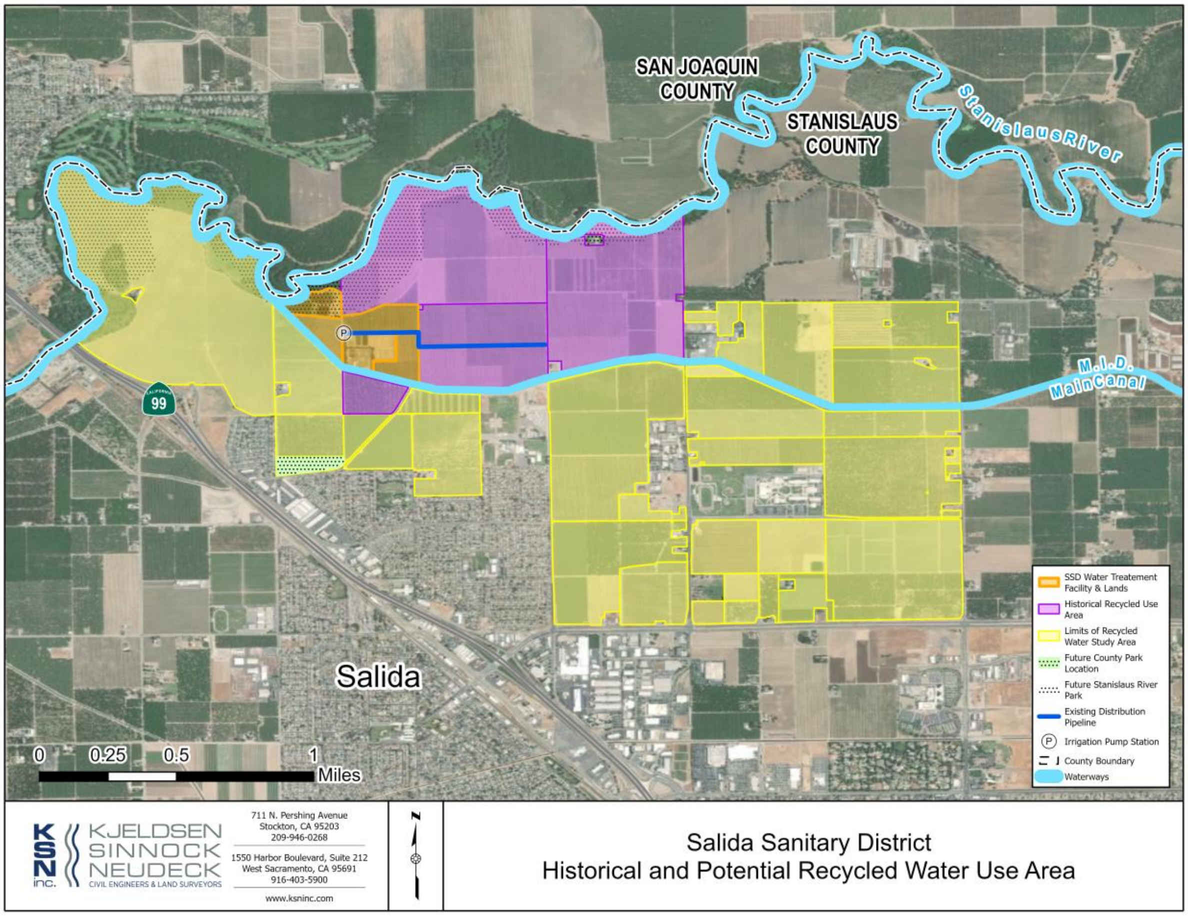

Figure 1-1
Salida Recycled Water Use Area

1.5 RECYCLED WATER PRODUCTION PLANNING CRITERIA

The November 2022 Flows and Loads TM provided in Appendix A establishes the basis for the recommended planning criteria for the recycled water project. These planning criteria were based on an assessment of current and recent historical WWTP flow and load data, projected future land use, and population projections through the 30-year planning horizon. Planning criteria for future flows and loads were proposed to be based on future population growth projected to the year 2052 rather than on the Salida's projected Community Plan build-out as it is likely that the full build-out will occur beyond the 30-year planning horizon.

Future wastewater flows were projected to the year 2052 using current Average Dry Weather Flow (ADWF) as the baseline. During the period of 2017-2021 the average dry weather flow into the WWTP ranged from approximately 1.04 to1.22 Mgal/d. An ADWF of 1.07 Mgal/d was selected as the current conditions baseline used for future flow projections. During the same period, the average wastewater production in gallons per capita per day (gpcd) in Salida ranged from 69 to 77 gpcd. Considering this range of current wastewater production and the identified effects of water conservation a future wastewater generation rate of 62 gpcd was used for planning. The average Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) during this period were between 0.18 to 0.20 and 0.16 to 0.19 pounds per capital per day (lbs/cap-d), respectively. These loadings fall within the expected range for domestic wastewater, therefore baseline conditions used for future projects of loading of BOD and TSS were assumed to be 0.18 and 0.16 lbs/cap-d, respectively.

The historical annual average population growth rate for Salida is 0.96% based on population data for the period of 2015-2020. Assuming this 0.96% annual increase, the year 2052 population of Salida is estimated to be 20,726 people. This is an increase of approximately 5,310 residents.

Based on the review of historical flow and water quality data, and the projected increase in Salida's population of 5,310 residents, the projected influent flows and loads to the WWTP by the year 2052 are summarized in Table 1-1.

Table 1-1
Estimated Future Salida Flows and Loads

Wastewater Characteristic	Current	Increase	Projected Year 2052
ADWF (Mgal/d)[1]	1.07	0.33	1.40
BOD (lbs/day)[2]	5,671	3,660	9,331
Current TSS (lbs/day)[3]	5,048	3,258	8,306

(1) Existing ADWF based on 2017-2021 average. Future ADWF based on current estimated wastewater generation of 62 gpcd and increase in population of 5,310 residents.
(2) Existing BOD load based on 5,671 lbs/day industrial load from 2017-2021 average plus 3,660 lbs/day for current population. Future BOD load based on current estimated BOD load of 0.18 lbs/cap-d and increase in population of 5,310 residents.
(3) Existing TSS load based on 5,048 lbs/day industrial load from 2017-2021 average plus 3,258 lbs/day for current population. Future TSS load based on current estimated TSS load of 0.16 lbs/cap-d and increase in population of 5,310 residents.

The recommended planning criteria for the Salida Recycled Water Planning Study are summarized in Table 1-2. These values are based on the 30-year planning horizon and are consistent with infill development that may occur within the existing Salida community limits and the SOI. Additional facilities would be needed to accommodate wastewater generated beyond the 30-year projection and to accommodate build-out development within the Salida Community Plan area. The below recommended criteria are based on industrial flows and loads continuing at levels similar to average flows and loads experienced in 2017 through 2021.

Table 1-2
Planning Study Recommended Facilities Criteria

Wastewater Characteristic	Unit	Planning Criteria
Flows		
ADWF	Mgal/d	1.40
Peak Month Peaking Factor	Unitless	1.1
Peak Day Peaking Factor	Unitless	1.8
Loads		
BOD		
Average BOD Daily Load	Lbs/d	3,660
BOD Peak Month Peaking Factor(1)	Unitless	1.3
BOD Peak Day Peaking Factor(1)	Unitless	1.8
TSS		
Average TSS Daily Load	Lbs/day	3,258
TSS Peak Month Peaking Factor(1)	Unitless	1.4
TSS Peak Day Peaking Factor(1)	Unitless	2.8
Nitrogen		
Total N Load(2)	Lbs/day	653
Total N Peak Month Peaking Factor(1)		1.4
Total N Peak Day Peaking Factor(1)		1.5

1. Peaking factors for BOD, TSS, and Total N based on 2017 through 2021 weekly and monthly influent monitoring data shown in Appendix A.

Section 2

Wastewater Treatment Plant Characteristics and Facilities

Sanitary sewer, wastewater treatment and disposal service to the community of Salida is provided by the Salida Sanitary District (District). Treatment and disposal is provided at the Salida Sanitary District's Wastewater Treatment Plant (WWTP). Treated wastewater is discharged to Rapid Infiltration Basins and Lower Ponds on the WWTP site and land application disposal occurs through percolation and evaporation. The District's operations are regulated through the Waste Discharge Requirements, which allow for reclaimed water to be used for crop irrigation under specific treatment level requirements. Reclaimed water for crop irrigation was discontinued in 2002. This section describes the District's community characteristics, water sources, WWTP wastewater characteristics, treatment process, and treatment facilities.

2.1 EXISTING WATER SUPPLIES WITHIN STUDY AREAS

Existing water supplies within the potential study area are a mix of surface water and groundwater supplies. This includes surface water supplied by Modesto Irrigation District (MID) as well as groundwater supplied from privately owned groundwater wells for agricultural use and potable water supplied to the residential, commercial, and industrial developed areas of the community. Water supply sources are discussed in further detail below.

2.1.1 MID SURFACE WATER

MID was the second irrigation District established in California, and therefore holds senior water rights on the Tuolumne River dating back to 1903. MID shares water rights with the Turlock Irrigation District (TID) which allows storage of up to 1,046,800 acre-ft per annum (afa) between November 1 and July 31 for irrigation and recreational use in the New Don Pedro Reservoir. Points of diversion are located on the Tuolumne River at the New Don Pedro Dam and the La Grange Dam. Additionally, MID and TID hold water rights licenses and permits authorizing the withdrawal of a total of 951,100 afa from storage at New Don Pedro Dam. In 2004, the State Water Resources Control Board granted the transfer of 67,200 afa to the City of Modesto for municipal and industrial usage, leaving a total of 883,900 afa available to be withdrawn from the reservoir, and to be shared between MID and TID for agricultural irrigation[5].

Agricultural users in the Salida area currently use a mixture of MID Surface water delivered through MID irrigation canals and groundwater. Users must pressurize water from the canal through booster pumps to use MID water in irrigation or sprinkler or drip irrigation systems[6]. Groundwater quality in the Modesto Subbasin is generally sufficient to meet beneficial uses, although several constituents of concern are currently impacting groundwater use or have the potential to impact it in the future, discussed further in section 2.1.2. Water usage has generally decreased as drought had become more persistent in California, and conservation measures have increased[7].

MID supplies surface water to approximately 2,300 agricultural users spanning 60,000 acres within their service boundary, as shown in Figure 2-1. Water originating from the Don Pedro Reservoir, Modesto Reservoir, and the Tuolumne River is delivered to agricultural users through the MID irrigation canals. Irrigation water is provided to

5 Division of Water Rights – WR Order 2005-0022: https://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/2005/wro2005_0022.pdf
6 Modesto Irrigation District Website: https://www.mid.org/water/default.jsp
7 City of Modesto Urban Water Management Plan (UWMP), 2017: Chapter_3_Water_Demands (modestogov.com)

landowners through 208 miles of non-pressurized, gravity flow canals and low-head pipelines. Users must pressurize the water through booster pumps to use the water in sprinkler or drip irrigation systems[8].

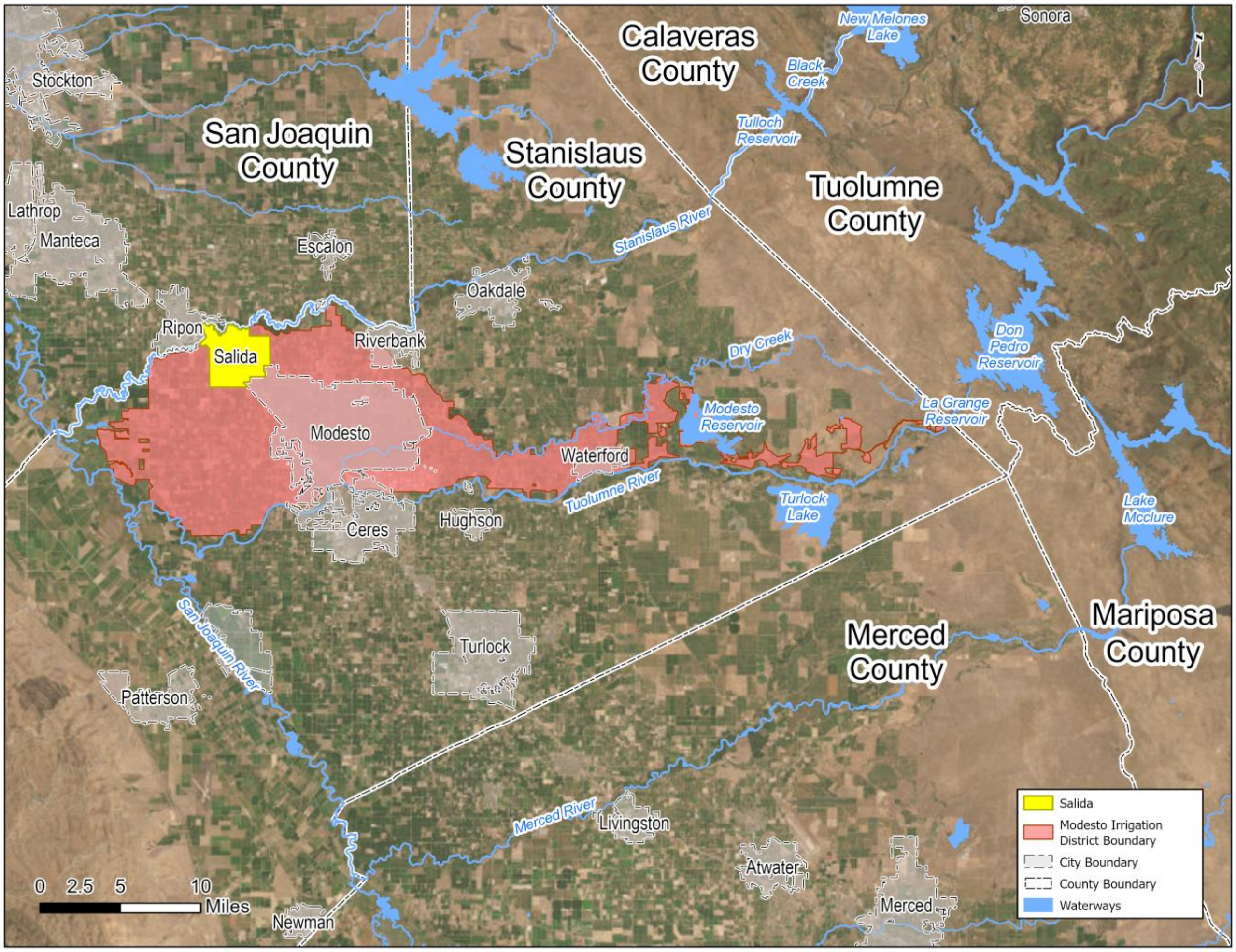

Figure 2-1
MID Service Boundary and Surface Water Sources
Source: KSN Inc., with water district boundaries obtained from DWR.

The MID canal is the main method of agricultural water transport in the area. MID. MID monitors water quality results for Modesto Reservoir to ensure compliance with several water quality monitoring programs. The average water quality results for the water supply within the Modesto Reservoir from 2009 to 2020 are shown below in Table 2-1. MID states that the water quality of the Tuolumne River degrades gradually as runoff from agricultural and developed lands accumulate, but quality remains good[9], as a matter of course we understand that in addition to pressurizing the water for irrigation, landowners also often filter the water to prevent clogging of their irrigation systems.

[8] Modesto Irrigation District Website: https://www.mid.org/water/default.jsp
[9] MID AWMP 2020: https://www.mid.org/water/awmp/awmp_2020_final.pdf

Table 2-1
Modesto Reservoir Average Water Supply Quality

Constituent	Units	2009 - 2020 Average
Al	mg/l	0.23
As	µg/l*	ND
Ba	mg/l	ND
Ca	mg/l	3.00
Cu	µg/l	6.10
Fe	mg/l	0.19
Mg	mg/l	1.27
Se	µg/l	ND
Na	mg/l	1.53
TDS	mg/l	26.53

Source: MID AWMPs: 2012 to 2020

2.1.2 GROUNDWATER

Groundwater is a major source of irrigation supply in the area. For some landowners this may be their main source of irrigation water where MID water may not be available, while for others groundwater may be used to supplement surface water supplies.

MID reports that groundwater quality is generally excellent to good quality with a TDS of less than 500 ppm.

California Department of Water Resources (DWR) California's Groundwater, Bulletin 118 (Bulletin), indicates that the Community of Salida is located in the Modesto Subbasin of the San Joaquin Valley Groundwater Basin. As described in DWR Bulletin 118, the San Joaquin Groundwater Basin comprises the southernmost portion of the Great Valley Geomorphic Province of California. The Modesto Subbasin is oriented between the Stanislaus River to the north, Tuolumne River to the south, San Joaquin River to the east, and crystalline basement rock of the Sierra Nevada foothills to the east. The subbasin comprises land primarily in the Modesto, Turlock, and Oakdale Irrigation Districts[10].

The primary hydrogeologic units of the Modesto subbasin include both consolidated and unconsolidated sedimentary deposits. Three formations make up the consolidated deposits:

- Ione Formation
- Valley Springs Formation, and
- The Mehrten Formation.

The most important and highest yielding aquifer of the consolidated formations is the Mehrten Formation which is comprised of up to 300 feet of sandstone, breccia, conglomerate, tuff siltstone and claystone. The main water bearing units of the unconsolidated deposits consist of continental deposits and older alluvium. Other unconsolidated deposits include Corcoran clay, flood subbasin, and younger alluvium deposits which likely contribute little to moderate amounts of water to wells[4].

[10] Bulletin 118, Subbasin Report 5-022-02: https://data.cnra.ca.gov/dataset/bulletin-118-update-2003-basin-reports/resource/

Groundwater occurs in confined, semi-confined and unconfined conditions within the Modesto Subbasin. Groundwater flow is mostly restricted to the southwest of the aquifer. From 1970 to 2000, groundwater levels within the Modesto Subbasin aquifer have decreased an average of 15 feet. The estimated average specific yield of the Modesto subbasin is 8.8 percent. At this specific yield value, the DWR Bulletin estimates total storage capacity of the aquifer is 6.5M acre-ft to a depth of 300 feet[11], however the Todd groundwater simulations presented in the Modesto Subbasin GSP demonstrate a depth to the base of fresh water is much deeper than 300 feet, approaching 750 feet below msl, which implies that the storage capacity of the aquifer is higher[6].

The project study area is located in the northwestern section of the Modesto Subbasin. Wells within the study area are expected to be set within the Western Upper Principal Aquifer and Eastern Principal Aquifer, which are unconfined in the western portion of Salida and confined to the far eastern edge. Based on review of the agricultural irrigation wells in the vicinity of the Salida WWTP, the completed well depths range between 140 to 540 feet, primarily withdrawing from the Eastern Principal Aquifer formation and recharged by the immediately adjacent Stanislaus River. Typical groundwater elevations in the study area are between 20 to 40 feet above mean sea level (MSL) as shown in Figure 2-2. The groundwater elevation in the region has been observed to be declining at a rate of 0.5 ft/year[12].

Excess groundwater usage due to population expansion and persistent drought caused the development of a cone of depression beneath the City of Modesto. Since the 1980's, reliance on groundwater has reduced prompting an increase in usage of surface water to supplement water demand and allow for groundwater recharge[13]. In recent years, from 2012 to 2015, the District experienced consistent drought, which prompted the need for increases in groundwater pumping to meet water demands. In response, MID initiated several drought management programs including a decrease in water allocation and shortened irrigation season. Drought is a persistent problem in the Modesto region and is anticipated to become more frequent in the future.

Groundwater quality in the Modesto Subbasin is generally sufficient to meet beneficial uses, although seven constituents of concern are either currently impacting groundwater use or have the potential to impact it in the future. The primary naturally occurring water quality constituents of concern above Maximum Contaminant Levels (MCLs) are salinity, uranium and arsenic while primary water quality constituents related to human activity include nitrates, salinity, TCP, PCE, and DBCP[8].

[11] Bulletin 118, Subbasin Report 5-022-02: https://data.cnra.ca.gov/dataset/bulletin-118-update-2003-basin-reports/resource/

[12] Modesto Subbasin Groundwater Sustainability Plan (GSP): https://strgba.org/Content/Documents/Documents/Modesto_Subbasin_GSP_20220130.pdf

[13] MID Agricultural Water Management Plan (AWMP), 2020: https://www.mid.org/water/awmp/awmp_2020_final.pdf

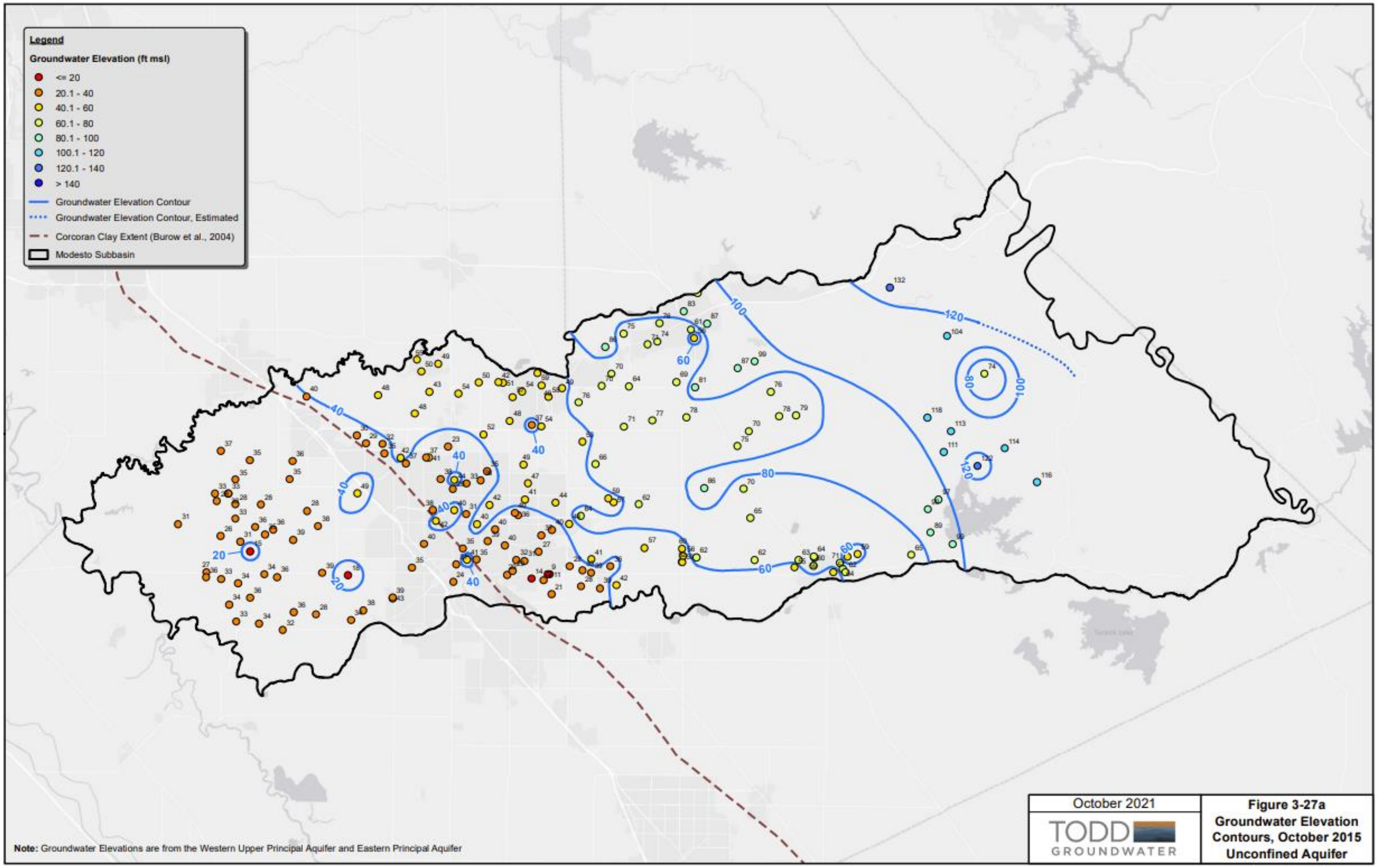

Figure 2-2
Modesto Subbasin Groundwater Contours
Source: Modesto Subbasin Groundwater Sustainability Plan (GSP), Jan 2022

2.1.3 City of Modesto Potable Water Supply

In addition to roughly 3,400 agricultural irrigation accounts, MID owns and operates the Modesto Regional Water Treatment Plant (MRWTP) which provides potable water service to the City of Modesto (the City). Treated water from the MRWTP is sold to the City and distributed to residents of Northern Modesto, Salida and Empire. As of 2021, the MRWTP received an annual average of 26,780 acre-feet of water originating from the Don Pedro Reservoir and the Tuolumne River, accounting for approximately 10% of MID's total annual water diversion from these sources. The recent completion of phase two of the MRWTP plant expansion project in 2016 has increased the plant's processing capacity from 30 Mgal/d to 60 Mgal/d. The original Treatment and Delivery Agreement (TDA) will also increase the quantity of surface water delivered to the City from a maximum of 33,600 AFY to 67,200 AFY in 2050 regulated through the Amended and Restated TDA (ARTDA). The ARTDA includes water supply reductions in drought years and aims to reduce the City's reliance on groundwater sources, however groundwater usage tends to supplement decreases in surface water usage during drought years to meet water demand[14].

2.2 EXISTING WASTEWATER FACILITIES

The District area spans approximately 1,200 acres and provides service for nearly 4,200 individual accounts with one industrial discharge account. The wastewater collection system consists of 42.7 miles of pipeline ranging from 6 inches to 36 inches in diameter and four lift stations which convey wastewater to the wastewater treatment plant[15]. The treatment plant consists of a liquid treatment train and solids treatment facilities. The liquid treatment train includes headworks, an Intermittent Cycle Extended Aeration System (ICEAS) secondary treatment system, followed by nine rapid infiltration basins (RIBs) and three percolation and evaporation ponds. The solids treatment train consists of an aerobic digester for the ICEAS waste activated sludge (WAS), two solar dryers, and one belt filter press (BFP). The District also monitors groundwater quality through four monitoring wells near the WWTP.

The original facility was constructed from 1988 to 1989, with significant plant upgrades performed on an as-needed basis starting in 1991. Treatment plant upgrades include:

- Expansion of ICEAS Basins, in 1997
- Headworks, in 2008
- Expansion of RIBs, post 2010

The facility was originally designed to process an average monthly flow of 2.4 Mgal/d and a maximum monthly flow of 4.8 Mgal/d. This capacity included irrigation of approximately 575 acres as part of the effluent disposal program[16]. Based on District reported average monthly influent flows from 2017 to 2021, the current average wastewater flow into the facility is approximately 1.07 Mgal/d with a maximum monthly flow of 1.22 Mgal/d[17]. Salida WWTP's wastewater characteristics, treatment process, and treatment facilities are described in detail in the following subsections.

2.2.1 Influent Pump Station, Screening, and Grit Removal

The headworks system includes an influent pump station, screening and grit removal. As the influent wastewater enters the influent pump station, it is pretreated through a series of sewage grinders within the pump station wet well through a main duty band screen and a standby bar screen. The influent is pumped through the mechanical

[14] City of Modesto Urban Water Management Plan (UWMP), 2020: https://modestogov.com/DocumentCenter/View/17262/Joint-2020-Urban-Water-Management-Plan-PDF
[15] Salida Sewer Rate Study, May 2021
[16] Waste Discharge Requirements (WDRs) for Salida Sanitary District, Order No. 92-036
[17] KSN Existing and Future Land Use and Flows and Loads Technical Memorandum, November 2022

climbing band screen through a channel where large solid waste screenings are separated from the influent wastewater. The influent sampling is conducted using a composite sampler as flow rate is measured in a 12-inch throat Parshall flume. Influent wastewater samples are analyzed for 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), Total Kjeldahl Nitrogen (TKN), and Ammonia as Nitrogen (NH_3-N). Following the Parshall flume, a vortex type grit removal system removes dense particulate solids prior to transport to the ICEAS basins for treatment. The grit removal system is designed to remove 95% of 50 mesh grit at peak hour flow. The separated grit and screened waste collected from the screening is removed and transported off-site to a landfill for disposal.

2.2.2 Existing Secondary Treatment Facilities

From the headworks, wastewater is directed into the ICEAS secondary treatment system, which is designed to biologically reduce wastewater constituents such as BOD, TSS, and oxidize ammonia to nitrate. There are three active ICEAS basins, each with a rated capacity of 0.6 Mgal/d[18]. The ICEAS basin capacity is the capacity limiting process. The secondary capacity of the existing facility is presented in Table 2-2.

Table 2-2
Flow and Loading Basis of Design

Parameter	Existing ICEAS Capacity, 2010
Flow, Mgal/d	1.8
BOD, lb/d	4,960
TSS, lb/d	3.300

Black & Veatch WWTP Facilities Evaluation Report, June 2010

Producing adequate secondary effluent quality is important for achieving California Title 22 reuse water quality standards in the new tertiary treatment systems. Data was evaluated from January 2017 through December 2021. Samples were taken once per month over this time period and no outliers were removed from the analysis. The treatment process provides excellent TSS and BOD removal, and regularly achieves effluent ammonia less than 2 mg-N/L and low effluent nitrate values. Table 2-3 presents a summary of available secondary effluent monitoring data.

[18] Black and Veatch WWTP Facilities Evaluation Report, June 2010

Table 2-3
Summary of Existing Effluent Water Quality

Parameter	Units	Average	75th Percentile	Max Day
BOD	mg/L	4.2	4.8	16.4
TSS	mg/L	3.3	4.0	11
TDS	mg/L	407	450	510
Specific Conductance	umhos/cm	681	729	898
Ammonia-N	mg-N/L	1.5	1.2	23.0
Nitrate as N	mg-N/L	3.3	4.3	7.1
Nitrite as N	mg-N/L	0.3	0.4	0.6
TN	mg-N/L	5.8	6.2	20.5
TKN	mg-N/L	2.3	2.2	20.3

2.2.3 Effluent Pump Station

Effluent from the ICEAS basins is transported to the effluent pump station where it is then distributed to the land disposal facilities The effluent pump station contains two operational 50 horsepower vertical turbine pumps with rated capacities of 7,400 gpm each. The effluent pump station contains a vacant third pump base with connection option to the underground pump manifold.

2.2.4 Land Disposal Facilities

The WWTP disposal facilities currently consists of nine RIBs located around the northern and eastern perimeter of the facility, referred to as “Upper Ponds”. There are currently three active percolation / evaporation ponds referred to as “Lower Ponds” located to the northwest of the facility bordering the Stanislaus River. An overview of the District’s WWTP facility and pond location is shown in Figure 2-3.

Figure 2-3
Salida Wastewater Treatment Facility Disposal Facilities Map
Source: CVRWQCB SSD WWTF Inspection Report, Apr 2020

The WDRs require wastewater percolation or evaporation within 72 hours after discharge to the RIBs. Currently two RIBs are filled at a time to meet discharge requirements. The District has reported slower RIB percolation rates in ponds 1, 2, and 3 which may be a result of the soil composition of these ponds. Because of the slower rates in RIBs 1,2, and 3, the other ponds are used preferentially to meet disposal needs. The RIBs are maintained by disking or ripping on an annual basis to increase percolation.

In the Additional Information for the 2003 Report of Waste Discharge[19], the District reported an average measured percolation rate of 20 Mgal per month for the 6 RIBs operating at the time and 12.2 Mgal per month for the Lower Ponds. These reported percolation rates equate to roughly 3.33 in/day for the RIBs and 3.05 in/day for the Lower Ponds. A field investigation was performed to refine the characteristics of the RIBs. The investigation involved

[19] Additional Information for Incomplete Report of Waste Discharge, Salida Sanitary District, 2003

permeability testing, a soil analysis and definition of percolation rates using pressure transducer readings, details of the field investigation are presented in the RIB characterization study provided in Appendix C. Through the analysis it was found that the average percolation rates of the RIBs is 15.25 in/day. The average range of percolation rates for successful Rapid Infiltration (RI) systems is reported to be from 50 to 100 ft/yr or 1.64 to 13.15 in/day, indicating that the District facilities percolation rates rank above the high end of a successful RI system.

2.2.5 Historical Recycled Water Facilities

The alternatives evaluated under this Study include potential distribution options involving the expansion of existing recycled water facilities. The District held a historical agreement from 1991 to 2003 with landowners of adjacent properties, the VanKonynenberg family and associations, allowing the use of treated effluent for crop irrigation. A recycled water distribution system was constructed to transport treated water to approximately 575 acres of nearby walnut, peach and almond orchards.

The irrigation distribution system begins within the treatment plant and includes:

- An Irrigation Pump Station; adjacent to RIB 1, and
- Distribution Pipelines to the east to a point of interconnection with the existing irrigation system.

The irrigation pump station contains a wet well with an 800-gpm vertical turbine pump and a series of three sand media filters and backwash system. An open pipe connects the irrigation pump station wet well to RIB 1. A separate pipe connects the irrigation pump station to the pipeline that conveys secondary effluent to the Lower Ponds. From the irrigation pump station, a 6” to 8” pipeline extends eastward into the adjacent fields.

2.3 EXISTING AND PROJECTED FLOWS AND LOADS

An assessment was performed as a part of this study to define the study area of the Salida Recycled Water Planning Study (SRWPS, Study), summarize current District land use, project future District land use, identify population characteristics, and calculate and summarize the future WWTP flows and loads. This section summarizes the findings of the assessment presented in the Salida Flows and Loads Technical Memorandum contained in Appendix A.

2.3.1 Project Study Area, Community Plan, and Land Use Designations

The project study area has been defined based on the best available land-use planning, as contained in the 2007 Stanislaus County Board of Supervisors Salida Community Plan (Community Plan). The Community Plan identified land uses and encompassing acreages planned to be developed and improved over time. The acreages presented in the Community Plan were utilized as the basis for the land use designations and projected flows and loads analysis. A summary of the Community Plan land use designations and their corresponding areas are shown in Table 2-4. The 2018 Stanislaus County Local Agency Formation Commission (LAFCO) District Municipal Service Review and Sphere of Influence (SOI) documents provide an update to the original area reflected in the corresponding Stanislaus County Geographical Information System (GIS) Online data.

Table 2-4
Salida Land Use Designations and Areas

Land Use Designation (1)	Existing District Boundary (2) (acres)	District SOI Area (acres)	Community Plan Area (3) (acres)	Total Area (acres)
Industrial (4)	82	0	1,325	1,407
Business Park	0	0	438	438
Commercial	175	11	255	441
Planned Development	740	21	0	761
Low-Density Residential	293	0	580	873
Low-Density Residential (Special Treatment Area)	72	0	0	72
Medium-Density Residential	8	0	178	186
Medium-High Density Residential	29	0	59	88
Agricultural (5)	90	13	232	335
Totals	**1,488**	**45**	**3,067**	**4,600**

(1) Land use designation per Stanislaus County records, with several designations grouped.
(2) Approximate acreages within the District boundary that generate wastewater.
(3) Includes area within the Community Plan Area, but outside the limits of the current District Boundary and SOI.
(4) Approximately 60 acres identified as Industrial land use has been excluded from the GIS data due to it coinciding with major roadways planned in the Salida Community Plan that would not generate wastewater but overlie Industrial zoned areas.
(5) Approximately 45 acres designated as agricultural land use has been removed from the GIS data as it is associated with the MID Main Canal area that under future development would not generate wastewater.

The Salida land use designations are presented below in Figure 2-4.The most recent GIS and LAFCO documentation defines the study area at 5,058 gross acres including 458 acres of agricultural areas that were not included in the original Community Plan. The additional agricultural areas are shown in the land use designations in Figure 2-4, but are not included in the flows and loads analysis.

Land Use	Zone Code	District Boundary	S.O.I. Acreage	Community Plan Area	Total Acreage
Agriculture	A-2, SCP-A-2	89.98	12.53	419.06	521.57
Business Park	SCP-IBP	0	0	437.54	437.54
Commercial	C-2, SCP-C-1, SCP-C-2	174.66	11.35	266.02	452.02
Industrial	L-M, SCP-PI	21.16	0	1366.21	1387.37
Low Density Residential	R-1, SCP-R-1	293.02	0	779.73	1072.75
Low Density Residential (Special Treatment Area)	SCP-R-1-ST	72.3	0	0	72.3
Medium Density Residential	R-2, SCP-R-2	7.75	0	178.18	185.93
Medium-High Density Residential	R-3, SCP-R-3	29.07	0	58.69	87.77
Planned Development	P-D	739.75	21.13	0	760.88
Planned Industrial	P-I	60.34	0	19.07	79.41
Total Acreage		1488.02	45.01	3524.5	5057.54

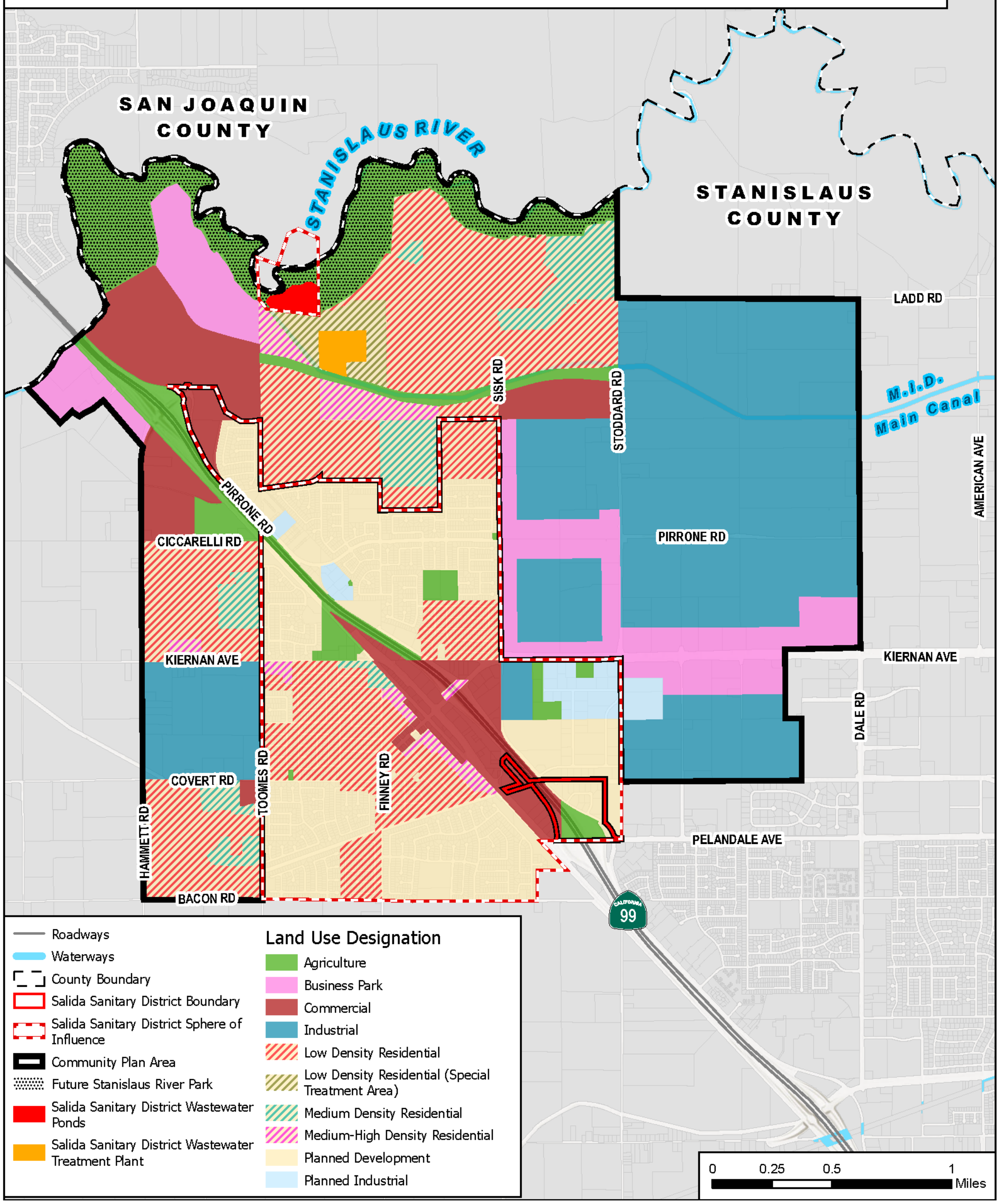

Figure 2-4
Salida Sanitary District Existing and Future Land Uses

2.3.2 POPULATION TRENDS

Historical population data was used to analyze population trends within Salida. From 2010 to 2020, the historical data indicated an overall annual growth rate of 0.52% per year with an average growth rate of 0.96% per year from 2015 to 2020. The more recent average of 0.96% was used to estimate a population prediction of 15,416 for 2021 and a population of 15,564 for 2022 based on its consistency with northern San Joaquin Valley trends. Historical and projected population information is shown in Table 2-5.

Table 2-5
Historical Population Trends for Salida

Year	Housing Units	Salida Population	Persons per Household	Annual Population Growth (%)
2010	4,294	14,625	3.4	
2011	4,477	15,156	3.4	3.63%
2012	4,379	14,357	3.3	-5.27%
2013	4,451	14,672	3.3	2.19%
2014	4,276	14,509	3.4	-1.11%
2015	4,162	13,501	3.2	-6.95%
2016	4,224	13,898	3.3	2.94%
2017	4,341	14,424	3.3	3.78%
2018	4,188	14,658	3.5	1.62%
2019	4,133	14,229	3.4	-2.93%
2020	4,336	15,269	3.5	7.31%
2021 (Estimated)	4,514	15,416	3.4	0.52%
2022 (Estimated)	4,537	15,564	3.4	0.52%
Overall Average				0.52%
Average 2015-2020				0.96%

2.3.3 EXISTING FLOWS AND LOADS

As part of its regular monitoring and reporting program the District monitors the influent wastewater to the WWTP. Data for influent flows and influent BOD, Total Nitrogen as N (Total N), and TSS is collected on a daily, weekly, or monthly basis. Raw influent wastewater data collected from 2017 to 2021 was evaluated to remove outliers and analyzed to determine Average Monthly Influent Flows for each constituent concentration and loading. The results of the District WWTP Influent Characteristic Flows and Concentrations is shown in Figure 2-5.

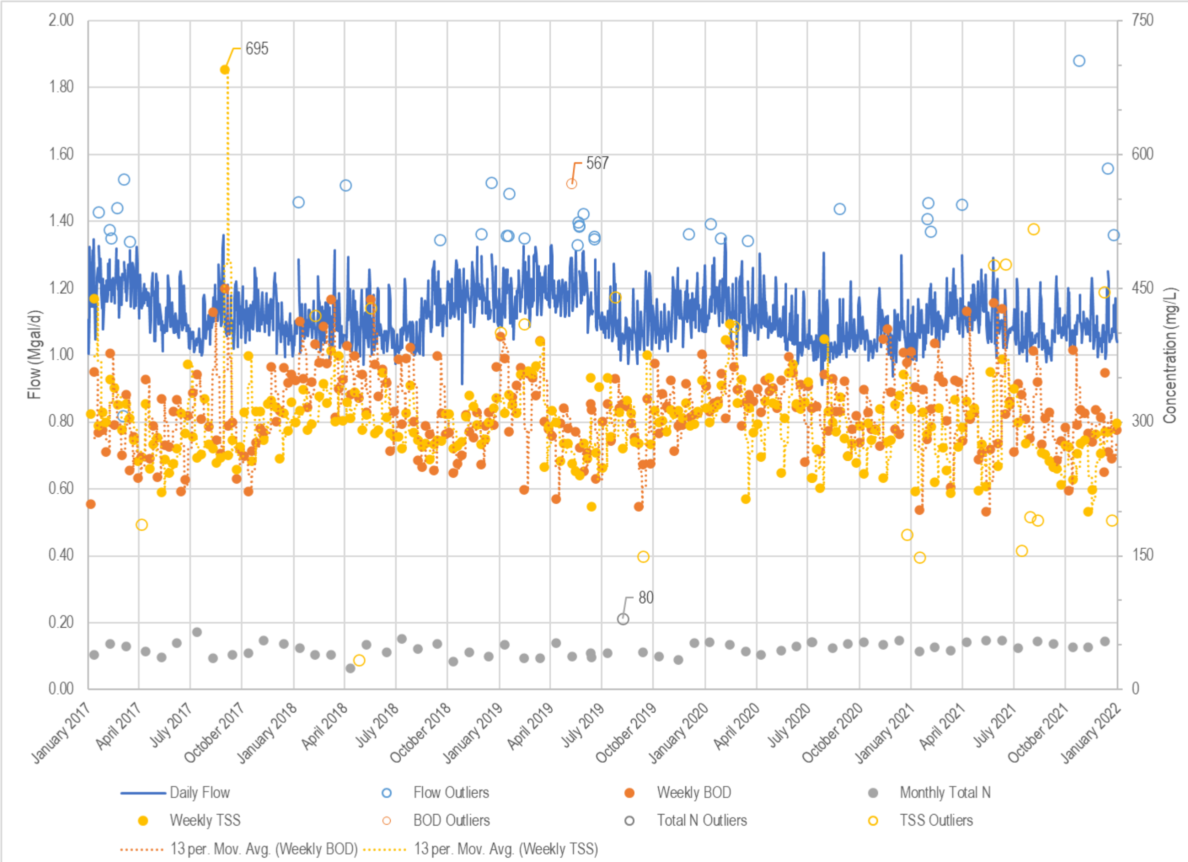

Figure 2-5
District WWTP Influent Flows and Concentrations

The average annual concentrations of BOD and TSS are generally consistent with WW strength associated with primarily residential wastewater including residential, institutional, public facility, and commercial sources. The influent wastewater flows respond to seasonal rainfall and associated infiltration and inflow (I/I), with dry-period flows occurring predominantly in July, August, and September and seasonal I/I increases from December to March resulting from rainfall events with occasional increases as late as May. Annual average flows range from 1.04 million gallons per day (Mgal/d) to 1.22 Mgal/d, and have remained relatively stable since 2017, however with 2020 and 2021 indicating a possible decrease despite estimated increases in population, potentially as a result of drought conditions and water conservation. Seasonal peak flows can reach rates over 1.8 Mgal/day.

Average and peak concentration and loading data was obtained for influent BOD, TSS and Total Nitrogen. The Average concentrations and loading ranges excluding outliers are summarized below.

Annual average concentration:

- BOD: 298 mg/L to 328 mg/L,
- TSS: 277 mg/L to 307 mg/L, and
- Total Nitrogen as N: 42 mg/L to 50 mg/L.

Annual average loading:

- BOD: 2,484 lb-BOD/day to 3,477 lb-BOD/day,

- TSS: 2,241 lb-TSS/day to 3,694 lb-TSS/day, and
- Total Nitrogen as N: 382 lb-N/day to 456 lb-N/day.

The representative peak concentrations for influent BOD, TSS and Total Nitrogen found to be outside of the average annual range from 2017 to 2020 excluding outliers are:

- BOD: 450 mg/L,
- TSS: 695 mg/L, and
- Total Nitrogen as N: 65 mg/L.

The estimated peak loading rates for influent BOD, TSS and Total Nitrogen excluding outliers are:

- BOD: 5,100 lb-BOD/day,
- TSS: 7,877 lb-TSS/day, and
- Total Nitrogen as N: 640 lb-N/day.

Peak loading values occurred during the dry summer season within the same months as the peak concentrations. The peak concentration and peak loading for BOD and TSS occurred in August 2017 after a high flow event and peak concentration and peak loading for Total Nitrogen occurred in July of 2017. Further details of constituent loading rates can be found in Appendix A.

2.3.3.1 Average Dry Weather Flows and Loads and Peaking Factors

The Average Dry Weather Flows (ADWF) were determined based on the influent flows from the months of July, August, and September. The resulting estimated unit flow and load characteristics of the domestic sources were analyzed. The results are presented in Table 2-6 below.

Table 2-6
Summary of Salida WWTP Average Dry Weather Flows and Loads

Water Year	WWTP ADWF (1) (Mgal/d)	Population (Persons)	ADWF per Capita (2) (gal/cap-day)	ADWF BOD Load (3) (lb/d)	ADWF TSS Load (3) (lb/d)	ADWF Total N Load (3) (lb/d)	Per-Capita BOD (lbs/cap-day)	Per-Capita TSS (lbs/cap-day)	Per-Capita Total N (lbs/cap-day)
2017	1.11	14,424	77	2,900	2,786	423	0.20	0.19	0.029
2018	1.10	14,658	75	2,830	2,640	472	0.19	0.18	0.032
2019	1.09	14,229	77	2,704	2,770	383	0.19	0.19	0.027
2020	1.05	15,269	69	2,700	2,510	441	0.18	0.16	0.029
2021	1.07	15,416	69	2,704	2,408	452	0.18	0.16	0.029
Maximum	1.11	15,416	77	2,900	2,786	472	0.20	0.19	0.032
Minimum	1.05	14,229	69	2,700	2,408	383	0.18	0.16	0.027
Average	1.08	14,799	73	2,768	2,623	434	0.19	0.18	0.029

(1) Influent ADWF for water year 2017 through 2021, which includes July, August, and September flows.

(2) Estimated average per capita wastewater flow generation rate for total influent flows on a per capita basis, assuming population as presented in Table 2-4;

(3) Average of July, August and September loading from Table 6 of Appendix A.

The District ADWF has remained relatively constant over the last five years, with a slight decreasing trend likely influenced by water conservation. Both BOD and TSS unit generation factors appear to be reasonably near or within ranges expected for domestic wastewater, as compared with the Ten States Standards recommended values of 0.17 – 0.20 lbs/cap-day for BOD and 0.20 – 0.22 lbs/cap-day for TSS and other northern California communities. Nitrogen in the wastewater typically ranged from 0.027 to 0.032 lbs/cap-day, of which 99% was typically comprised of Total Kjeldahl Nitrogen (TKN) which falls within the typical range of 0.02 to 0.04 lbs/cap-day.

Peak month and peak day peaking factors were determined by comparing the representative data on a 30-day running average and a daily basis with the ADW Flows and Loads. The historical peaking factors are shown in Table 2-7, with recommended peaking factors for facilities planning.

Table 2-7
Summary of the District WWTP Peak Month and Peak Day Peaking Factors

Water Year	Influent Flow		BOD Loading		TSS Loading		Total N Loading	
	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor
2017	1.1	1.4	1.2	1.8	1.3	2.8	1.4	1.5
2018	1.1	1.4	1.3	1.6	1.2	1.4	1.1	1.2
2019	1.1	1.4	1.3	1.5	1.4	1.7	1.4	1.5
2020	1.1	1.4	1.3	1.5	1.5	1.8	1.2	1.3
2021	1.1	1.8	1.2	1.7	1.3	1.4	1.2	1.3
Recommended Peaking Factors	**1.1**	**1.8**	**1.3**	**1.8**	**1.5**	**2.8**	**1.4**	**1.5**

Peaking factors for BOD, TSS and Total N were determined by the ratio of peak day or peak month loading to the ADWF loads from that year. The atypical peak flow of 1.88 Mgal/d was included in the data set to provide additional hydraulic capacity that may be required under heavy rain conditions.

The overall per capita ADWF wastewater generation in Salida was 69 gpcd in 2020 and 2021. This wastewater generation rate is a combined rate which includes residential, commercial, limited industrial, and institutional flows divided by the resident population. Because the wastewater generation rate was assumed to decrease from 2020 to 2022, the overall per capita ADWF wastewater generation rate of 62 gpcd is recommended for projecting future wastewater generation based on community population increases. Details of per capita assumptions and wastewater generation rates can be found in Appendix A.

2.3.4 FUTURE POPULATION, FLOWS, AND LOADS

Projected population data was used in the calculations for the Average Dry Weather Flows and Loads, WWTP peak month and day peaking factors, projection of District, SOI, and Community Plan buildout, and estimated future flows and loads. Future increases in flows and loads are expected to result primarily from new residential and commercial development occurring as infill within the existing District SOI boundary. Potential future flows and loads were characterized based on potential future land use and population projections. For this planning study, the 30-year horizon for population growth was used to estimate near-term flows and loads to the WWTP.

Assuming an annual average population growth rate ranging from 0.52% to 0.96% (historical 10-year average vs. 5-year average), the potential future population for Salida over a 30-year planning horizon is estimated to increase by approximately 2,680 to 5,380 residents. Estimated Salida population trends are shown in Figure 2-6.

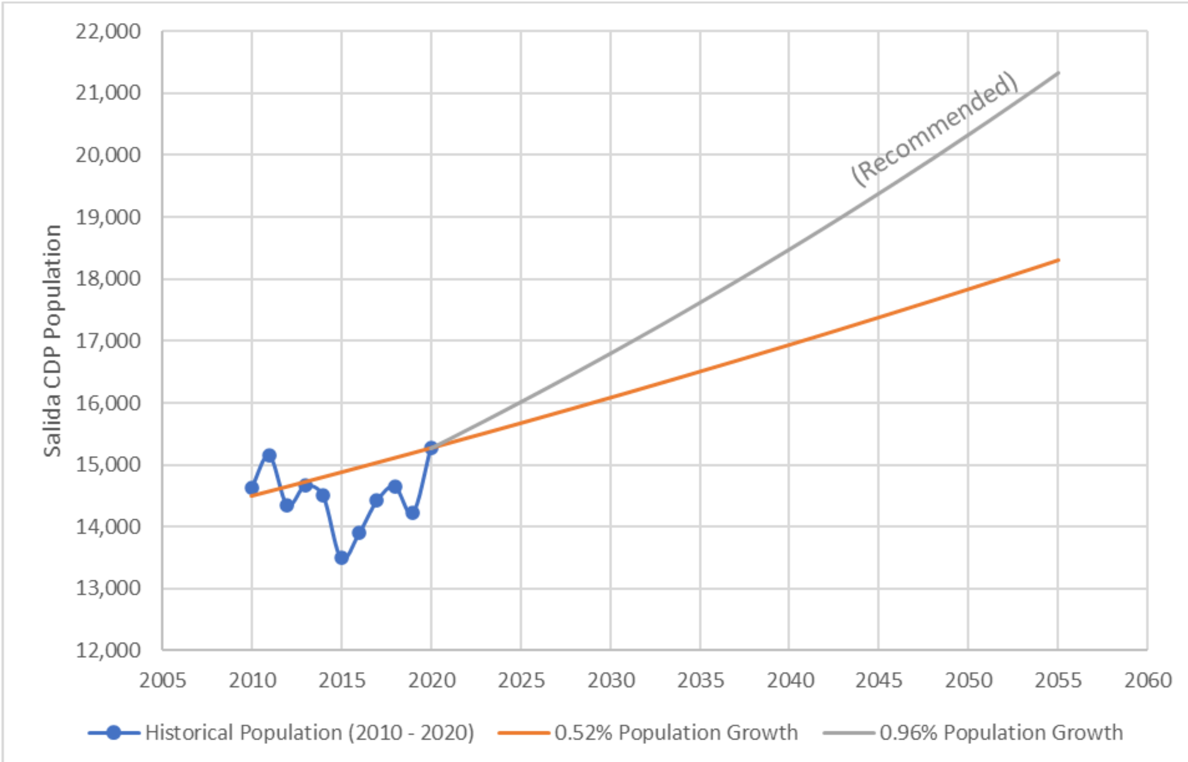

Figure 2-6
Estimated Future Population Trends for Salida

This increase in population would occur because of both infill development and as new development occurs. It is anticipated that population growth for Salida will proceed similar to the more recent annual growth rate of 0.96%, therefore the annual 0.96% annual population growth is recommended to be used to estimate the future Salida population.

2.3.4.1 Future Average Dry Weather Flows

The projection of District SOI buildout was estimated using the land use designation existing areas shown in Figure 2-4 and potential future wastewater generation factors. The total buildout of the overall Salida Community Plan Area would result in approximately 3.57 Mgal/d of ADWF to the WWTP, comprised of the following potential ADWF future contributions:

- Existing District boundary, 1.07 Mgal/day,
- Infill of the existing District boundary, at 0.09 Mgal/d,
- District SOI buildout, at 0.05 Mgal/d, and
- Community Plan Amendment Area, at 2.36 Mgal/day.

Details of the District SOI and Community Plan projections are found in Section 3.0 of Appendix A.

2.3.4.2 Future Flows and Loads and Peaking Factors

Future increases in flows and loads are expected to result primarily from new residential and commercial development occurring as infill and within the District SOI boundary. Estimates for future flows and loads to the District WWTP are based on future population growth over a 30-year planning horizon projected to the year 2052 and are shown below in Table 2-8.

Table 2-8
Estimate Future Flows and Loads for District WWTP

Wastewater Characteristic	Additional Population	Unit Generation Factor	Range of Flow/Load
Flows			
Current ADWF (Mgal/d)			1.07
Flow Increase (Mgal/d)	2,610 – 5,310	62 gpcd	0.16 - 0.33
Projected Year 2052 Flows (Mgal/d)			1.23 – 1.40
Loads			
BOD			
Current BOD (lb/day)			2,704
BOD Increase (lb/day)	2,610 – 5,310	0.18 lbs/cap-day	470 - 956
Projected Year 2052 BOD (lb/day)			3,174 – 3,660
TSS			
Current TSS (lb/day)			2,408
TSS Increase (lb/day)	2,610 – 5,310	0.16 lbs/cap-day	418 – 850
Projected Year 2052 TSS (lb/day)			2,826 – 3,258
Total Nitrogen			
Current Total N (lb-N/day)			494
Total N Increase (lb-N/day)	2,610 – 5,310	0.03 lbs/cap-day	78 – 159
Projected Year 2052 Total N (lb-N/day)			572 – 653

gpcd = gallons per capita per day

Estimated future flows and loads are based on data from 2017 to 2021 and include the following criteria:

1. A future development wastewater generation factor of 62 gallons per capita per day;
2. BOD unit generation of 0.18 lbs per capita per day;
3. TSS unit generation of 0.16 lbs per capita per day; and
4. Nitrogen as N unit generation of 0.03 lbs per capita per day.

The recommended Recycled Water Facilities planning criteria is shown below in Table 2-9. The facilities planning criteria found within the table is based on:

1. Historical District monitoring data,
2. A 30-year projection of population to 20,730,
3. Projection of the recommended annual growth rate of 0.96% per year, and
4. A community-based future wastewater generation rate of 62 gpcd.

The 30-year population projection is consistent with infill development that may occur within the Salida Community Plan Area. Additional facilities would be needed to accommodate wastewater generated beyond the 30-year projection and to accommodate build-out development.

Table 2-9
Future Recycled Water Facilities Planning Criteria

Wastewater Characteristic	Unit	Recommended Planning Study Criteria	Buildout (2)
Flows			
ADWF	Mgal/d	1.40	3.57
Peak Month Peaking Factor	Unitless	1.1	1.1
Peak Day Peaking Factor	Unitless	1.8	1.8
Loads			
BOD			
Average BOD Daily Load	Lbs/day	3,660	9,331
BOD Peak Month Peaking Factor (1)	Unitless	1.3	1.3
BOD Peak Day Peaking Factor (1)	Unitless	1.8	1.8
TSS			
Average TSS Daily Load	Lbs/day	3,258	8,306
TSS Peak Month Peaking Factor (1)	Unitless	1.4	1.4
TSS Peak Day Peaking Factor (1)	Unitless	2.8	2.8
Nitrogen			
Total N Load (1)	Lbs/day	653	1,665
Total N Peak Month Peaking Factor (1)	Unitless	1.4	1.4
Total N Peak Day Peaking Factor (1)	Unitless	1.5	1.5

(1) Peaking factors for BOD, TSS, and Total N based on 2017 through 2021 weekly and monthly influent monitoring data (See Tables 6, 7, and 8, and Figures 2 and 3 of Appendix A).
(2) Buildout loading is linearly projected to the estimated Buildout AWDF in Table 9 of Appendix A.

Further details on future flows, loads, and peaking factors can be found in Appendix A.

2.4 EXISTING POLLUTION CONTROL REQUIREMENTS

The WWTP operations are regulated under Waste Discharge Requirements (WDRs) Order 92-036, which contain discharge prohibitions, specifications, sludge disposal and groundwater limitations. As defined in the WDRs, the WWTP is prohibited from the following actions:

- Discharge of wastes to surface waters or surface water drainage courses,
- Bypass or overflow of untreated or partially treated waste,
- Discharge of waste classified as “hazardous” or “designated”, as defined in Section 2521(a) and 2522(a) of Chapter 15, and,
- Discharge of wastes within 100 feet of surface waters.

Additional discharge specifications listed in the WDRs include the following:

- Nuisance or condition of pollutant as defined by California Water Code, Section 13050 shall not be caused by treatment or discharge,
- The monthly average dry weather discharge flow shall not exceed 2.4 million gallons/day,
- Discharge is to remain within designated disposal area at all times,
- Objectionable odors originating at the facility shall not be perceivable beyond the limits of the property,
- Dissolved oxygen content in the upper one foot of wastewater in ponds shall not be less than 1.0 mg/L, this specification does not apply to the Rapid Infiltration Basins (RIBs),
- Treatment facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency,
- Once wastewater has been discharged into the RIBs, the water shall not stand continuously in any RIB for more than 72 hours after discharge has ceased or the basin will be considered a holding pond,
- Ponds shall be managed to prevent breeding of mosquitos, with specific programs for the following:
    - Erosion control, to prevent the formation of small coves and irregularities around the water surface,
    - Weed control, through control of pond water depth, harvesting, or herbicides,
    - Dead algae, vegetation, and debris control, to prevent accumulation on the pond surface.
- Fences, signs, and other acceptable alternatives shall be used to avoid and prevent public contact with wastewater,
- Ponds shall have sufficient capacity to accommodate allowable wastewater flow and design seasonal precipitation (based on a 100-year return period) and ancillary inflow and infiltration during the non-irrigation season,
- Freeboard requirements for the treatment and disposal ponds shall never be less than 2 feet, with available pond storage capacity equal to the volume necessary to comply with 2 feet of freeboard on or about October 1st of each year.

Although the District is not currently operating reclamation facilities, discharge specifications for reclamation and agricultural irrigation within the WDRs are as follows:

- Reclaimed water may be used for irrigation of peaches, walnuts and almonds; public contact with wastewater is prohibited,
- Uses of reclaimed wastewater must comply with appropriate provisions of Title 22, Division 4, CCR and specifications and requirements within the WDRs,
- Specific requirements for the irrigation of <u>peaches</u> are as follows:

  - Spray irrigation with reclaimed water is not allowed when fruit is on the tree,
  - Spray irrigation with reclaimed water is allowed between the end of harvest and the start of fruit production (about May 1),
  - Surface or drip irrigation with reclaimed water is allowed all year provided that fruit is not harvested if it has come in contact with the ground.

- Specific requirements for the irrigation of walnuts and almonds are as follows:
  - Spray irrigation with reclaimed water in accordance with Section 60307 of Title 22 is permissible provided that irrigation with reclaimed water stops a minimum of four weeks prior to harvest, and,
  - Surface or drip irrigation with reclaimed water in accordance with Section 60307b of Title 22 is permissible provided that irrigation with reclaimed water stops a minimum of four weeks prior to harvest.
- A backflow preventor must be installed and maintained to prevent reclaimed water from entering the MID main canal,
- The Well No. 1 discharge line must be above the high water level of the MID main canal,
- Berms must be constructed and maintained to assure that no irrigation or storm water runoff from orchards will enter surface waters or adjacent properties,
- To meet fertilizer needs of the orchards, nutrient content of the wastewater shall be evaluated and required adjustment to fertilizer application rates will need to be performed,
- The District shall efficiently maintain and properly operate any facility or control system installed by the Discharger to achieve compliance with requirements set forth in the WDRs.

Applicable sludge disposal requirements specified in the WDRs include the following:

- Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner that is consistent with Chapter 15 of the California Code of Regulations and approved by the Executive Officer.
- Use and Disposal of sewage shall comply with existing Federal and State law and regulations, and with Clean Water Act (CWA) Section 405(d) including technical standards when promulgated.

The groundwater limitations contained in the WDRs state that discharge from the WWTP shall not cause underlying groundwater to:

- Be degraded,
- Contain chemicals, heavy metals, or trace elements in concentrations that adversely affect beneficial uses or exceed maximum contaminant levels specified in 22 California Code of Regulations (CCR), Division 4, Chapter 15,

- Exceed a most probable number of total coliform organisms of 2.2/100 mL over any seven-day period,
- Exceed concentrations of radionuclides specified in 22 CCR, Division 4, Chapter 15,
- Contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses, and,
- Contain concentrations of chemical constituents in amounts that adversely affect agricultural use.

2.5 CONFORMANCE WITH DISCHARGE PERMIT REQUIREMENTS

Treated wastewater from the WWTP is not discharged to surface water but is allowed to percolate to groundwater or evaporate to the atmosphere. Available information indicates that the WWTP is operating in compliance with the WDRs, with exceptions listed below:

1) Nitrate as Nitrogen limitation exceedance,
2) Total coliform organism limitation exceedance, and
3) Tertiary level treatment requirements for recycled water irrigation.

In March of 2016, the District received a notice of violation for exceeding groundwater concentrations of Nitrate as Nitrogen and Total Coliform Organisms within the groundwater monitoring wells. In response to the violation, a Background Groundwater Quality Evaluation Report proposed groundwater monitoring limitations of 10 mg/L for Nitrate as Nitrogen and of 2.2 MPN/100 mL total coliform organisms in July of 2016. Concentrations resulting in the violations are reported in the April 2020 CVRWQCB inspection report as follows:

1) Nitrate as Nitrogen: 10.8 mg/L to 23.4 mg/L in groundwater monitoring wells (MWs) 3 and 4,
2) Total coliform organisms: 4.5 MPN to >1,600 MPN per 100 mL in MWs 1 to 4.

The 2021 annual summary report for the District WWTP shows Nitrate as Nitrogen levels varying in MW 3 and MW 4, where MW 3 exceeded limitations only in August at 12 mg/L and well 4 consistently reports concentrations above 14 mg/L from April to December, peaking at 17.0 mg/L in August 2021. The 2022 annual summary report demonstrates the same Nitrate as Nitrogen reporting trends with MW 3 exceeding limitations in August at 12.4 mg/L and MW 4 reporting lower concentrations than in 2021 of 14.2 mg/L in April decreasing to 9.9 mg/L in December of 2022, but still averaging higher than the 10 mg/L requirement threshold at 12.7 mg/L. A summary of the Nitrate as Nitrogen Levels from 2018 to 2022 is shown in Figure 2-7.

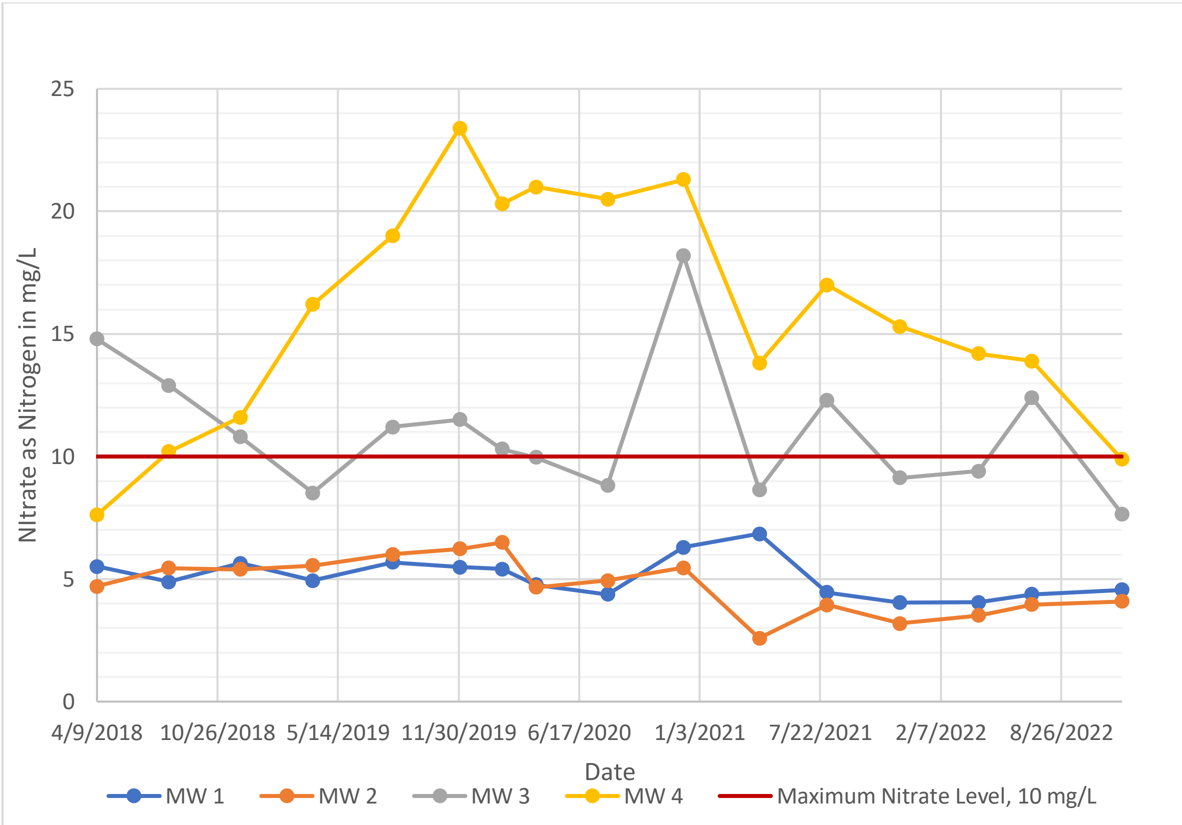

Figure 2-7
District Reported Nitrate as Nitrogen Levels, 2018 to 2022

An analysis of the groundwater elevations of the monitoring wells reported by the District over time shows that MW 4 consistently at the lowest overall groundwater elevation, with the groundwater elevations of MW 2 being the highest, indicating a groundwater gradient from MW 2 to MW 4. A summary of the groundwater elevations is shown in Figure 2-8.

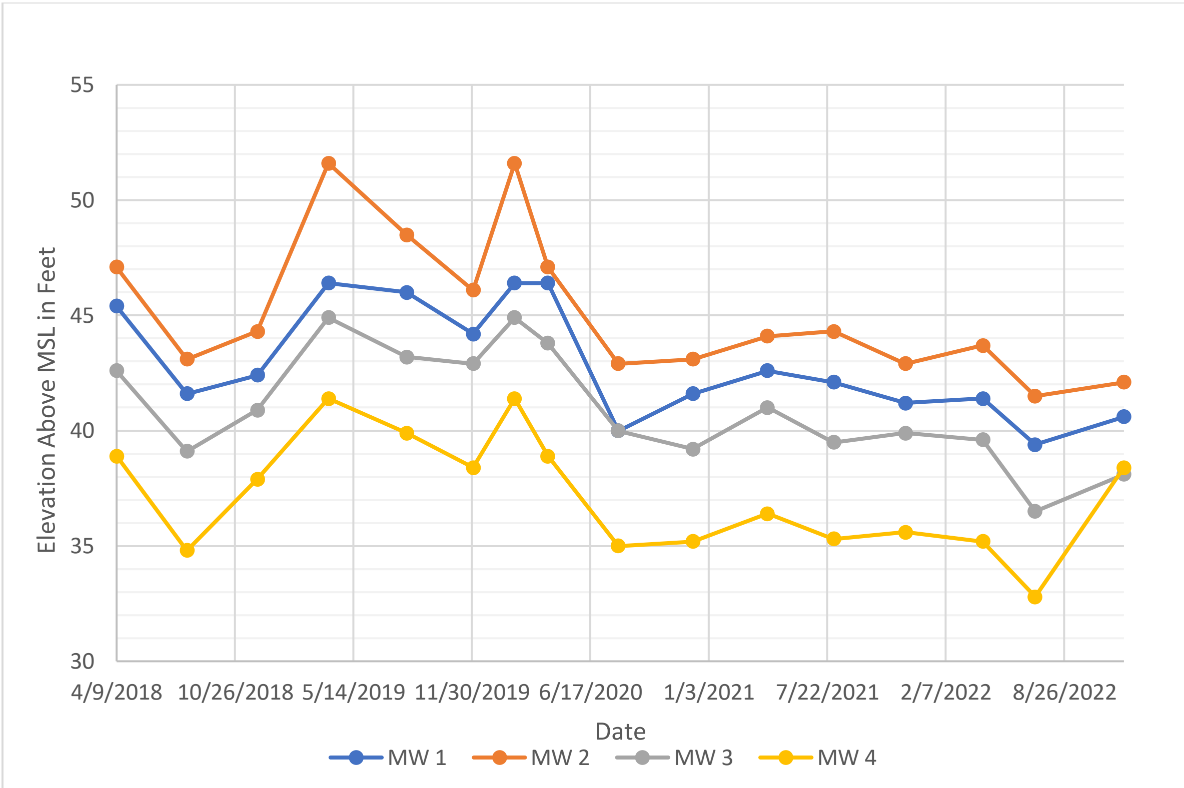

Figure 2-8
District Monitoring Well Groundwater Elevation, 2018 to 2022

The distribution of groundwater elevations from 2018 to 2022 is shown in Figure 2-8. The trends shown in Figure 2-8 and the locations of the wells shown in Figure 2-9 imply that the MW 3 and MW 4 are located down to cross gradient of the WWTP area. Groundwater contours relative to MW locations shown in Figure 2-9 are indicative of the groundwater elevations reported by the District in April of 2022. The concentrations of Total Nitrogen reported in the WWTP effluent from 2017 to 2021 range from 3.1 to 10.2 mg/L, which is lower than the typical Nitrate as Nitrogen concentrations of approximately 10 to 20 mg/L in MW-3 and MW-4 reported in 2021 and 2022. Assuming that the Total Nitrogen levels are the upper limit of potential Nitrogen available for conversion to Nitrate at a given time, the data indicates that Nitrate as Nitrogen concentrations in MW 3 and MW 4 may be influenced by sources external to the WWTP operations. It should be noted that the representative effluent Nitrate as Nitrogen levels reported by the District from 2017 to 2021, which contribute to the Total Nitrogen concentrations, ranged from 0.2 to 7.1 mg/L.

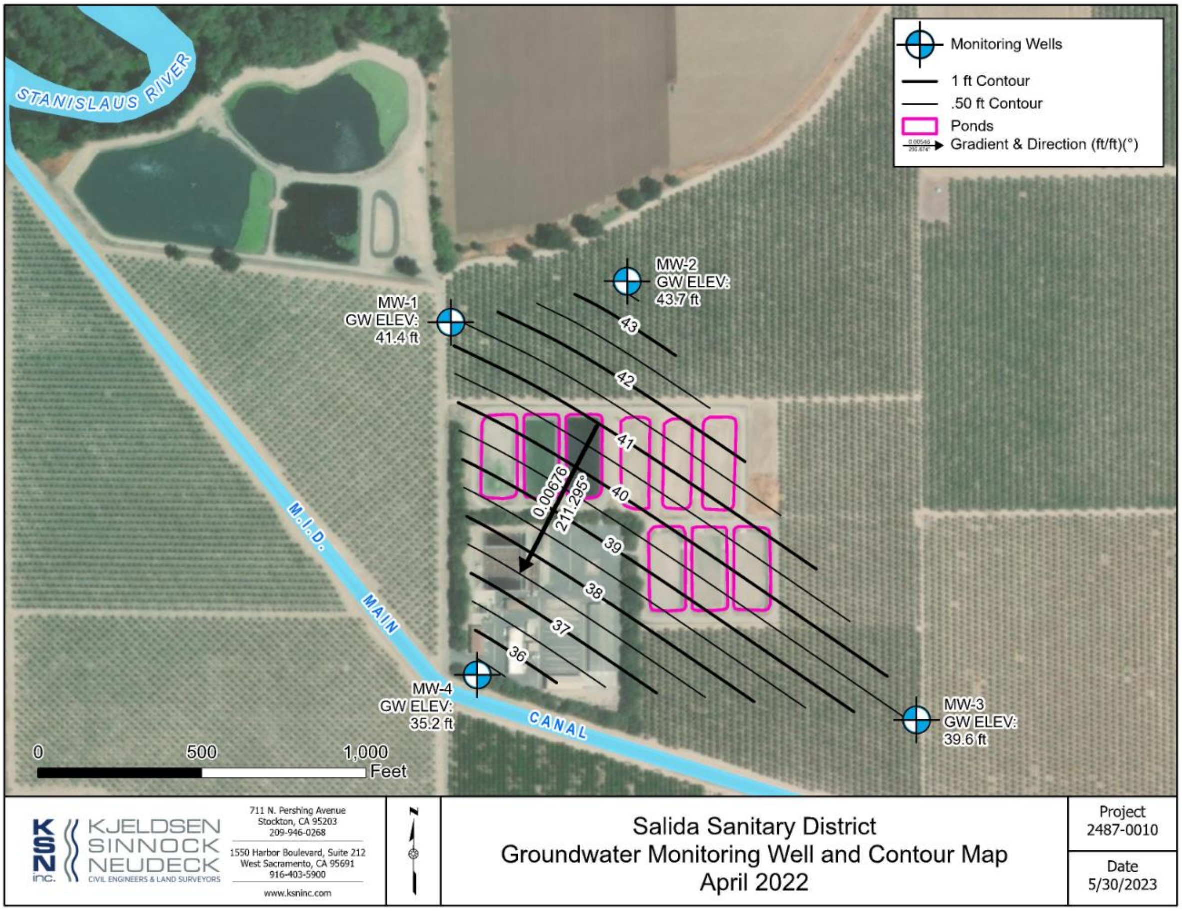

Figure 2-9
Salida Sanitary District Monitoring Well and Contour Map for the Reported Groundwater Elevations in April of 2022

Total coliform organisms were within acceptable range at < 1.8 MPN/100 mL from April to December of 2021 and from April to December of 2022. It appears that there were exceedances of coliform that were indicative of sampling protocol and sample contamination that were addressed and corrected, therefore coliform exceedances do not appear to be of wastewater origin.

The District held a historical agreement which permitted the use of excess reclaimed water on the Van Konynenberg lands for irrigation purposes. The agreement was valid from 1991 to 2003 until its implementation was postponed by the California Department of Public Health due to the need for the District to construct improvements to meet water recycling criteria of disinfected tertiary treatment. At the time, the Department of Health Services (DHS, now the Division of Drinking Water of the State Water Resources Control Board) required coagulation, filtration, and disinfection improvements prior to RWQCB consideration of reinstatement of the recycled water irrigation agreement within the Use Area[20]. The recommended project alternatives in Section 4.1 discuss the incorporation of the upgrades necessary to bring the facilities within compliance with these same requirements.

[20] Additional Information for Incomplete Report of Waste Discharge, Salida Sanitary District, April 2003

2.5.1 ABILITY TO MEET FUTURE REQUIREMENTS

The District's approach to compliance with the Nitrate as Nitrogen requirements of their permit is under the Pathway B: Management Zone Permitting Approach[21] allowed under the Central Valley CV-SALTS Basin Plan Amendments for Salt and Nitrate Control[22]. Under Pathway B, the District will share compliance costs and responsibilities with other permittees and members of the Modesto Management Zone. The District is considering the potential for compliance through Pathway A, which may be supported through implementation of recycled water facilities and effluent management predominantly via recycled water application on crops.

Expansion of Salida's facilities is needed to accommodate planned development within Salida. Production of recycled water for irrigation at the facility has the potential to reduce the use of on-site percolation basins, leading to potential improved conditions for the groundwater underlying the Salida WWTP and to provide for additional disposal capacity to meet future capacity requirements.

[21] Central Valley Water Board CV-SALTS Nitrate Program: https://www.cvsalinity.org//nitrate-program/

[22] CVRWQCB Basin Plan Amendments: https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/resolutions/r5-2018-0034_res.pdf

Section 3

Recycled Water Market

3.1 MARKET ASSESSMENT

A market assessment was conducted as part of the Study. This assessment was conducted to identify the demand for recycled water within the historical and potential Use Area as well as to better understand the local irrigation water supply needs and current drivers for considering recycled water. The market assessment included outreach to individual landowners to discuss their interest in the use of recycled water as well as assessment of potential partnerships that could be formed with local agencies.

3.1.1 POTENTIAL RECYCLED WATER USER OUTREACH

Assessment of interest by individual landowners in the vicinity of the WWTP initially included an outreach letter sent to landowners providing background on the feasibility study and recycled water project concept. Landowners were asked to respond if they were interested in learning more and further discussing their water use/needs. Face to face meetings were conducted with three responsive landowners to provide more detail on the concept of utilizing recycled water for irrigation, and ask for feedback on their level of interest, what their priorities related to water supply are, crop types and irrigation methods, the level or cost that would make recycled water a viable option for them, and to provide any other information what would help to understand their current water supply needs. A questionnaire was used to capture input and information from interested landowners. Figure 1-1 shows the properties where landowners were contacted, and those that expressed interest in receiving recycled water.

3.1.1.1 Individual Landowners

One of the three parties interviewed showed definite interest in the recycled water program the Van Konynenbergs. The District held a historical agreement with the Van Konynenberg family permitting the use of recycled water for agricultural irrigation, discussed further below in Section 3.1.1.2. The interested parties own and operate the following properties:

- The Van Konynenberg family, Van Kay Inc. and Bavak Land Co.
  APNs:
    - 003-020-001,
    - 003-020-010,
    - 003-020-016,
    - 003-020-017,
    - 003-020-018, and
    - 136-032-008.

Mr. Van Konynenberg attended meetings in October 2022 to discuss recycled water usage for irrigation.

3.1.1.2 Historical Recycled Water Recipients

A historical agreement existed between Salida Sanitary District and the Van Konynenberg family, Van Kay Inc., Bavak Land Co., and the Britton parties who own and operate 575 irrigable acres of peaches, almonds, walnut tree orchards adjacent to the WWTP. A secondary transfer irrigation pump station and distribution pipelines were constructed to the Van Konynenberg property from the WWTP circa 1991. In 2002, recycled water delivery services ceased due to non-compliance of disinfection criteria cited by the Department of Health Services. The District is evaluating alternatives which would include required upgrades to the tertiary treatment facilities to bring the recycled water back into compliance and renew and expand upon recycled water irrigation agreements.

3.1.2 POTENTIAL ADDITIONAL PARTNERS

Additional potential partners in the use of recycled water identified in the scoping of this Recycled Water Planning Study were the Stanislaus County Parks & Recreation Department and the Modesto Irrigation District (MID). The results of outreach to these two potential partners are summarized below.

Open recreational space in the area of Salida is managed primarily by the Stanislaus County Parks & Recreation Department (Parks & Recreation). During development of the scope of this study, available information indicated the potential for Parks & Recreation facilities to be a potential current and future user of recycled water. The most significant potential use of recycled water on parks land was indicated by the Community Plan-identified "Future Stanislaus River Park" along the northern border of the study area, as depicted in Figure 2-4. Based on available information from Parks & Recreation, other potential recycled water use locations were initially identified.

As part of this study, outreach to Parks & Recreation staff was conducted to assess the potential for partnering on use of recycled water at existing and future parks and open space in Salida. Contact was made with Parks & Recreation and the following landscape irrigation water uses managed by Parks & Recreation were identified[23], see Figure 3-1:

- Five existing Parks & Recreation maintained parks in Salida; and
- Approximately 26,000 linear feet of streetscape landscaping.

[23] Personal Communication, James Pursley, Manger II, Stanislaus County Parks and Recreation, December 7, 2022.

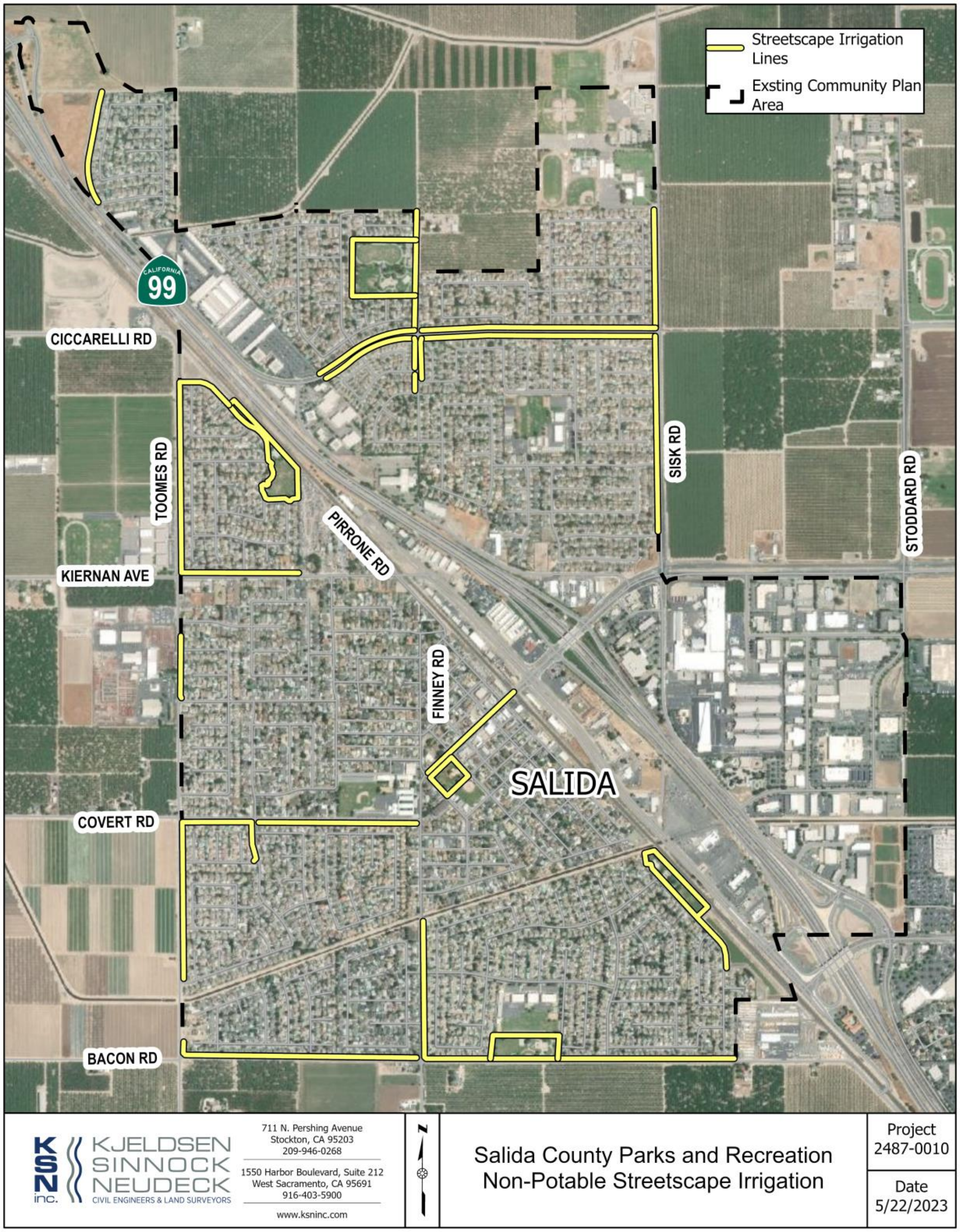

Figure 3-1
Existing Non-Potable Streetscape Irrigation and Potential Future RW Irrigation Lines

In addition to these existing parks and landscaped areas, Parks & Recreation has planned a new park on an approximately 11-acre site (APN 136-043-003) north of the MID canal north of Amaro Way (see Figure 4-5).

The existing Salida parks are currently irrigated with non-potable water from wells owned and operated by the Parks & Recreation Department and the disbursed streetscape landscaping is supplied water from numerous connections to the City of Modesto potable water system. Because of these factors integrating the Parks & Recreation's existing landscape irrigation water into a future recycled water program has limited value and a relatively high cost to implement and therefore is not proposed at this time. Integrating the planned future park to be constructed on APN 136-043-003 is presented in Section 4.4.

The "Future Stanislaus River Park" identified in the Salida Community Plan is not on the Parks & Recreation's long-range park master plan (2018 Parks & Recreation Master Plan) and therefore not identified as an improvement or potential recycled water user within the next twenty years. If, through development of the Salida Community Plan or other future land use planning, a regional park is constructed along the Stanislaus River, recycled water could be a part of that project's development (see Section 3.2 discussing future market approaches for recycled water).

The Modesto Irrigation District has major irrigation delivery facilities traversing the Salida area, serving existing local agricultural water users and downstream users west of Salida. Conceptually, recycled water could supplement the surface water delivered by MID to allow for expanded deliveries or be used to off-set transfers of surface water to other users. In either case, delivery of recycled water to the MID canal system would be necessary and is likely to require permitting under the Federal National Pollution Discharge Elimination System (NPDES) program with potential operational changes and monitoring of the MID system for implementation. District staff conducted initial outreach to MID to gauge the District's interest in exploring recycled water. Based on initial responses to that outreach and limited interest by MID near-term partnering with MID on use or delivery of recycled water is limited. Based on initial coordination with the District, Modesto Irrigation District (MID) is not considered a potential partner for recycled water facilities.

3.1.3 DEMAND FOR RECYCLED WATER

Within the Use Area, irrigation water demands were assessed based on local climatological conditions, local crop types, and local cultural practices for crop irrigation. Average and peak crop irrigation demands were considered under these conditions. The highest demand for irrigation water is in the summer months, when rainfall is lowest and when crops are in peak production. For planned recycled water peak flow rate requirements, the amount of water needed is required to meet the beneficial use requirements of the crop, and irrigation inefficiencies. For planned recycled water peak flow rate requirements, the beneficial use requirement is usually the crop evapotranspiration (ETc) during the hottest period of the year, counted against any precipitation that may meet the ETc demand. Although modern irrigation systems are highly efficient, imperfections exist with drip/micro irrigation uniformity of irrigation and the spray losses. Equation 1 was used to approximate the gross application rate per month of each acre.

$$\boldsymbol{V_{app}} = \frac{\boldsymbol{ETc - Precip}}{\boldsymbol{E_{app}}}$$

Equation **1**
(Gross Irrigation Application Volumes**)**

Where:

V_{app} = Monthly irrigation volume, Mgal
ETc = Crop evapotranspiration volume, Mgal
$Precip$ = Precipitation volume, Mgal
E_{app} = Irrigation application efficiency, %

In order to estimate the evapotranspiration demand during the year, the zone 13 reference crop evapotranspiration (ETc) and precipitation tables were used, as widely available from the California Polytechnic State University Irrigation Training and Research Center (ITRC). Table 3-1 summarizes the required monthly crop irrigation volume per acre for the weighted average of nut and fruit orchards based on evapotranspiration less average monthly precipitation and best available agricultural land use information. Based on the results, July is expected to demand the largest volume of recycled water (0.19 Mgal or 0.6 Ac-ft) per acre.

Table 3-1
Monthly Crop Irrigation Volume per Acre

Irrigation Volume	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Crop Demand (Mgal)	0.07	0.04	0.04	0.00	0.00	0.01	0.05	0.08	0.12	0.19	0.19	0.14
Crop Demand (Ac-ft)	0.22	0.11	0.11	0.00	0.00	0.02	0.14	0.25	0.36	0.60	0.59	0.44

Peak irrigation delivery rates may vary depending on the irrigation schedule demands that each individual grower requires for their crops. Specific analyses and scenarios for irrigation demands that dictate delivery rates are further discussed in Section 4.

3.1.4 Costs

The cost of usage of recycled water for irrigation was one of the largest concerns presented by perspective landowners. Currently groundwater is relatively low cost to use, and those landowners within the MID service area have access to a low cost and reliable surface water supply. In response, a recycled water cost analysis was performed. Results of the cost analysis are discussed in the subsections below.

3.1.4.1 Recycled Water Cost Assessment

For comparative purposes, the grower cost of MID surface water and groundwater irrigation sources were analyzed. When water is supplied to growers via the MID canal system, it arrives unpressurized and unfiltered, whereas recycled water distributed from the WWTP would be treated to tertiary standards and may be pressurized for growers within a certain distance from the WWTP. For these growers, there is an anticipated future benefit to using recycled water where a grower would no longer directly bear the energy costs for pressurizing (pumping) and filtering the non-recycled water. Potential cost offsets from replacement of groundwater irrigation are further detailed in Section 3.1.4.3.

The costs of the City of Modesto potable water landscape irrigation were also analyzed for comparison. Recycled water distribution facilities would be designed for compatibility with future development landscape and traffic median irrigation systems as predominantly agricultural land use transitions to residential, commercial and industrial.

3.1.4.2 MID Surface Water

MID currently employs a uniform fixed charge to all lands on an acreage basis and a volumetric tiered system. Agricultural users are charged $53 per acre plus a volumetric increase in cost per acre according to the following structure[24]:

- $2 per AF up to 2 feet of water depth per acre,
- $5 per AF from 2 feet up to 3 feet of water depth per acre,
- $11.25 per AF from 3 feet up to 3.5 feet of water depth per acre, and
- $40 per AF for everything over 3.5 feet of water depth per acre.

For lands with less than or equal to 5 acres, users are charged a minimum of $265.00. A facilities maintenance charge of $26.50 per acre is applied to all users.

MID also implemented an additional $16 surcharge per irrigated acre, increasing the uniform fixed charge to $60 per acre in 2014[25].

3.1.4.3 Groundwater

This analysis started with an inventory of well completion reports of the irrigation wells in the vicinity of the Salida WWTP to assess typical pumping rates and depth to groundwater.[26] The completion reports indicated that the average well yielded approximately 1,500 gpm at an average static groundwater depth of approximately 40 feet below ground surface (bgs). To estimate the cost of pumping groundwater borne by individual landowners, the following assumptions were made in developing pumping costs:

- Pump operating flow is 80% of the well yield (assumed to be 1,200 gpm);
- Pumps assumed to operate at a discharge pressure of 50 psi (typical pressure required for filtration and delivery to sprinkler or drip system);
- Assumed pump efficiency of 75% and motor efficiency of 95%;
- Pumps assumed to operate 183 days (6 months) out of the year.

Using the current MID Summer Water Well and Agricultural Power Service rate schedule range of $0.13 to $0.14 per kWh[27], the resulting cost per acre foot of groundwater water pumped by a grower would range from $33.67 to $48.72. MID charges an additional monthly fixed rate of $11.00 and a fixed rate per horsepower ranging from $0.60 to $1.00 depending on pump power category (greater or less than 10 hp). Typical growers with pumps ranging from 5 hp to 20 hp would accrue a total additional monthly flat rate cost ranging from $14.00 to $31.00 Table 3-2 contains the results based on these calculations.

[24] 2023 MID Irrigation Rates: https://www.mid.org/water/irrigation/allocation.html
[25] MID Agricultural Water Management Plan (AWMP), 2020: https://www.mid.org/water/awmp/awmp_2020_final.pdf
[26] Department of Water Resources, Well Completion Report Map Application
[27] MID Electric Rate Schedule P-3: https://www.mid.org/tariffs/rates/p3_water_well_pumping.pdf

Table 3-2
Range of Agricultural Well Water Irrigation Costs

Parameter	Units	Value
Avg Well Yield	gpm	1,500
Pump Flow Rate	gpm	1,200
Avg. GW Level	Ft. BGS	40
Operating Pressure	psi	50
Pump Efficiency	%	75
Pump Motor Efficiency	%	95
Energy Cost Range	$USD/kWh	0.13 – 0.14
Annual Operation Period	Days	183
Total Volume Pumped	Ac-Ft	970
Volumetric Cost Range	**$USD/Ac-ft**	**33.67 – 48.72**
Fixed Horsepower Rate (per hp): less than 10 hp	**$USD**	**0.60**
Fixed Horsepower Rate (per hp): more than 10 hp	**$USD**	**1.00**
Fixed Monthly Rate	**$USD**	**11.00**

Increasing drought frequency indicates the possibility of rate increases and suggests the need for alternate irrigation methods as persistent groundwater pumping within the Modesto-subbasin has proven to be unsustainable[28].

3.1.4.4 City of Modesto Potable Water

The City of Modesto utilizes a tiered structure which applies a flat monthly rate for potable water irrigation per lot size. The rates incorporate estimated monthly water usage costs and assume the lot is un-metered. A summary of the City of Modesto Non-Metered Flat Rates[29] is shown in Table 3-3.

Table 3-3
City of Modesto Non-Metered Potable Water Flat Rates

Lot Size, SQ FT	Monthly Rate, $
0 - 5,000	$ 57.23
5,001 - 7,000	$ 65.51
7,001 - 11,000	$ 81.87
11,001 - 17,000	$ 106.30
> 17,000	$ 118.63

The City of Modesto has a separate rate structure for metered services. The metered service rate schedule includes a monthly base charge dependent upon meter size and a volumetric rate charge of $2.02 per 100 cubic feet of water used. The City of Modesto Metered Potable Water Rate schedule[30] is shown in Table 3-4.

[28] Modesto Irrigation District Website: https://www.mid.org/water/default.jsp
[29] City of Modesto Non-Metered Potable Water Rates: Flat Water Rates | Modesto, CA (modestogov.com)
[30] City of Modesto Metered Potable Water Rates: Metered Water Rates | Modesto, CA (modestogov.com)

Table 3-4
City of Modesto Metered Potable Water Rates

Meter Size, Inches	Monthly Rate, $
5/8" - 3/4"	$ 25.44
1"	$ 36.83
1 1/2"	$ 65.32
2"	$ 99.50
3"	$ 207.73
4"	$ 367.24
6"	$ 748.90
8"	$ 1,375.53
10"	$ 2,173.05
12"	$ 2,856.63

3.2 FUTURE MARKET APPROACH

Because the current land use within the areas for potential integration of recycled water is agricultural, the recycled water use alternatives for near-term implementation are focused on delivery of recycled water for crop irrigation (or landscape irrigation in the case of the future Parks & Recreation park on APN 136-043-003). However, if the Salida Community Plan (or other similar land use planning authority) is developed much of this agricultural land use could convert to residential, commercial, business park, and industrial land uses. Since such conversion could occur in the future, which is consistent with how other local communities in the area are growing such as Modesto, Ripon, and Riverbank, it is recommended that any near-term recycled water program developed by the District consider the ability to convert recycled water use consistent with that future land use. Development of residential, commercial, and industrial land uses could result in potential recycled water uses in the following areas:

- Larger commercial/industrial landscaped area irrigation;
- Irrigation of additional future parks and school developed to serve future residential land uses instead of using groundwater, potentially including a future Stanislaus River Park;
- Irrigation of future streetscaping instead of using potable water; and
- Potential industry-specific industrial uses such as cooling or other uses;
- Individual home landscape irrigation.

Per Table 4-1 treatment to the disinfected tertiary level would allow for recycled use in the above means.

For the distribution of recycled water, while initial agricultural use does not require a pressurized system, the system design should consider conversion to a more conventional pressure distribution system to support the landscape irrigation uses that are likely to be the predominant future recycled water use if the Community Plan develops. Likewise, if the District proceeds with development of a recycled water program, it is recommended that certain District policies and conditions be developed and future land-use documents consider the following:

- Recycled Water Master Plans;
- District ordinance and policies on requirements for recycled water use for new development;
- Integrate recycled water use requirements into the District's design and improvement standards;
- Develop recycled water fee program for both capacity charges and user fees; and
- With Stanislaus County, integrate recycled water use into project descriptions, analysis, and approvals under the California Environmental Quality Act (CEQA).

Section 4

Project Alternatives Analysis

Several project components and alternatives have been evaluated as part of the Salida Recycled Water Planning Study. Alternatives were evaluated on the basis of permitting complexity, suitability for recycled water use, integration into existing facilities, capital cost, and lifecycle costs. These various components and alternatives are presented in the following subsections.

4.1 TREATMENT REQUIREMENTS FOR DISCHARGE AND REUSE

Water quality constraints related to agricultural use, both from an end user perspective and a regulatory framework perspective were considered as part of the evaluation of treatment options for recycled water production and are discussed below. This includes meeting the water quality needs for crop irrigation, as well as meeting regulatory and permitting requirements for the use of recycled water on food crops.

4.1.1 Regulatory Framework

The California Water Code (CWC) establishes the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB) and grants them the power to permit and approve recycled water programs. The RWQCBs issue permits for water reuse applications. These permits specify the requirements for water recycling including treatment, monitoring, reporting, and effluent water quality. Water quality criteria are enforced using waste discharge requirements, water reclamation requirements, or other appropriate permits issued by the RWQCB. The RWQCB checks that reuse projects can meet the criteria by requiring projects to receive SRWCB Division of Drinking Water (DDW) approval of a Title 22 Engineering Report to obtain a discharge permit.

CCR Title 22 establishes the guidelines for permitting and implementing recycled water programs. Title 22 focuses on public health protection and is administered by the SWRCB DDW. Prior to approval of the SRWPS, a Title 22 Engineering Report must be developed and submitted to DDW for review and approval.

4.1.2 Reuse Requirements

In order to meet regulatory requirements as well as provide a level of treatment consistent with agricultural reuse, a combination of filtration and disinfection processes upgrades would be required at the WWTP to meet turbidity and total coliform bacteria reduction criteria. The requirements for the water reuse are stipulated in the CCR Title 22. There are four types of regulated non-potable recycled uses allowed. Note that end uses vary for each of these types of non-potable recycled uses. The number of allowable end uses increases with the increased level of treatment and water quality. The levels of treatment and types of recycled waters considered in Title 22 are:

5. **Undisinfected secondary (UDS) recycled water:** wastewater that has been oxidized but not disinfected. (consistent with the existing level of treatment at the WWTP).
6. **Disinfected secondary-23 (DS23) recycled water:** wastewater that has been oxidized and disinfected such that secondary effluent total coliform has a median concentration of 23 (most probable number) MPN/100 mL or less.
7. **Disinfected secondary-2.2 (DS2.2) recycled water:** wastewater that has been oxidized and disinfected such that secondary effluent total coliform has a median concentration of ≤2.2 MPN/100 Ml.

8. **Disinfected tertiary recycled water:** wastewater that has been oxidized, filtered and disinfected such that secondary effluent total coliform has a median concentration of ≤2.2 MPN/100 mL, average turbidity of 2 NTU or less (or 0.2 NTU for MF), and includes either a chlorine disinfection process that provides a CT value of at least 450 milligrams-minutes per liter (mg-min/L) always with a modal contact time of no less than 90 minutes or a disinfection process that is demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F- specific bacteriophage MS2 or polio virus.

The water quality parameters, criteria, and approved end uses of these types of recycled waters are summarized in Table 4-1.

Table 4-1
Recycled Water Types and Approved Uses

Recycled Water Type	Parameter	Quality Criteria	Approved Uses
UDS (wastewater that has been oxidized but not disinfected)	Not applicable	• Not applicable	• Irrigation of non-food-bearing trees • Seed crops not being consumed by humans • Food and pasture for animals not producing milk for human consumption • Flushing of sanitary sewers
DS23 (wastewater that has been oxidized and disinfected)	Total Coliform	• Median concentration must not exceed 23 Most Probable Number (MPN)/100 milliliters (mL) using the last 7 days analyses that were completed • Must not exceed 240 MPN/100 mL in more than one sample in any 30-day period	All end uses of UDS recycled water plus: • Irrigation of landscaping, including freeways, golf courses, and sod farms • Industrial or commercial cooling that does not create a mist • Industrial boilers • Nonstructural firefighting • Cleaning of streets and outdoor work areas
DS2.2 (wastewater that has been oxidized and disinfected)	Total Coliform	• Median concentration must not exceed 2.2 MPN/100 mL using the last 7 days analyses were completed • Must not exceed 23 MPN/100 mL in more than one sample in any 30-day period	• All end uses of UDS and DS23 plus: • Irrigation of food crops, orchards, and vineyards not contacted by the recycled water • Fish hatcheries
Disinfected tertiary (wastewater that has been oxidized, filtered, and disinfected)	Turbidity for Filtration Using Natural Undisturbed Soils or a Filter Bed	• Must not exceed average turbidity of 2 nephelometric turbidity units (NTU) within a 24-hour period • Must not exceed 5 NTU more than 5 percent of the time within a 24-hour period • Must not exceed 10 NTU at any time	• All end uses of UDS, DS23, and DS2.2 plus: • Irrigation of food crops where recycled water contacts the edible portion of the crop, • Parks, and playgrounds, school yards, and residential landscaping, • Industrial or commercial cooling that does create a mist, • Flushing toilets, • Decorative fountains • Structural firefighting
	Turbidity for Filtration Using • MF • Ultrafiltration • Nanofiltration or • Reverse osmosis	• Must not exceed 0.2 NTU more than 5 percent of the time within a 24-hour period • Must not exceed 0.5 NTU at any time	

Recycled Water Type	Parameter	Quality Criteria	Approved Uses
	• Total Coliform	• Median concentration must not exceed 2.2 MPN/100 mL using the last 7 days analyses were completed • Must not exceed 23 MPN/100 mL in more than one sample in any 30-day period • Must not exceed 240 MPN/100 mL at any time	

- *Cloth disk filtration is an alternative treatment technology to filtration using natural undisturbed soils or a filter bed that must be approved on a case-by-case basis.*

To meet the recycled water uses identified in the use area and to provide for a high degree of grower acceptability, production of disinfected tertiary recycled water is proposed. Salida currently has the potential to produce approximately 1.07 Mgal/d of disinfected tertiary recycled water, also sometimes referred to as "Title 22 unrestricted recycled water," for agricultural and landscape irrigation.

4.1.3 Agricultural Water Quality Needs

Water quality for agricultural irrigation is a major consideration in development of the Salida Recycled Water Planning Study. Water produced must be of a suitable quality for irrigation of the crop types it will be used on. Salinity, suspended material, and bacteria are major concerns for agricultural water quality. Salinity can cause issues related to water uptake in plants, as well as create issues for underlying groundwater. Suspended material in the water can clog sprinklers and other irrigation equipment. Bacteria can present health effects for agricultural workers and consumers of the product.

Additionally, the CWC requires that each RWQCB formulate and adopt Water Quality Control Plans for all areas governed by that Board. The plans must contain water quality objectives for surface water and groundwater within the region that provide reasonable protection of the beneficial uses of the waters. Per CWC Section 13240, basin plans must be formed with input from state and local agencies and be reviewed and updated periodically; water reuse projects must file with the appropriate RWQCB (CWC Section 13260). The SWRCB defines agricultural use as a beneficial use of the waters of the state. The SWRCB sets limits for various constituents including aluminum, arsenic, beryllium, boron, cadmium, chloride, chromium, cobalt, copper, fluoride, iron, lead, manganese, molybdenum, nickel, pH, selenium, sodium, specific conductance, total dissolved solids, vanadium, zinc for agricultural purposes[31].

4.2 RECYCLED WATER USE REQUIREMENTS

In addition to the permitting requirements discussed in Section 4.1.1 related to treatment of recycled water, there are also requirements applicable to the recycled water use areas. As mentioned in Section 2.5, The District held a historical agreement with the VanKonynenbergs, which has been postponed since 2002 due to a need to improve the level of treatment to meet tertiary treatment criteria. The following requirements are identified for the Salida Recycled Water Planning Study, assuming District compliance with WDRs after project implementation:

[31] Irrigation with Reclaimed Municipal Wastewater – Guidance Manual: https://www.waterboards.ca.gov/publications_forms/publications/general/docs/irrigation-manual-1984a.pdf

- Tail Water Capture and Control and Return;
- Use Area Monitoring Requirements; and
- Treatment Process and Groundwater Monitoring Program.

These requirements are summarized in the following sections.

4.2.1 Tail Water Capture and Control and Return

The District and end-users of the recycled water would be required to obtain the relevant permissions and approval from regulatory agencies. It would be the landowner's responsibility to ensure that a tailwater recovery system is planned, designed, and constructed to meet all Federal, State, and local laws and regulations. Tail water recovery systems must contain adequate collection, conveyance, and storage features to ensure containment of any tail water or control of recycled water runoff as all recycled water must be maintained within the user area[32].

4.2.2 Use Area Monitoring Requirements

Both the WWTP and the end-users of the recycled water are required to monitor and report on the quality, status and condition of the recycled water used for irrigation of the lands where recycled water would be applied, consistent with the requirements set forth in the WDRs. The WDRs would require management actions on the part of the landowner including:

- Setbacks from rivers, surface water drainage courses, and property boundaries where recycled water would be applied;
- Recycled water application at "agronomic rates", i.e., application dictated by the crop water requirements considering climate, soil, and management practices;
- A tailwater capture, control, and recovery system, as described in Section 4.2.1.
- Groundwater monitoring and reporting; and
- Recycled water application monitoring and reporting consistent with the existing Monitoring and Reporting Program No. 92-036, including:
  - BOD_5,
  - DO,
  - Settleable Solids,
  - Total Coliform,
  - Flow from main transfer station,
  - Flow from secondary transfer station, and
  - An application log documenting crop type, method of application and field conditions such as sludge, standing water or odor.

[32] USDA NRCS Irrigation and Drainage Tailwater Recovery: https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Drainage_Tailwater_Recovery_447_CPS_9_2020.pdf

Each individual use area needs to be permitted with individual WDRs or permitted as part of a recycled water program under Order WQ 2016-0068-DDW. The monitoring and reporting requirement of individual landowners is a commitment and could deter prospective landowners from establishing agreements with the District.

4.2.3 Treatment Process and Groundwater Monitoring Program

Site-specific permits issued to the WWTP determine the treatment and disposal operations at the WWTP site. Secondary effluent produced from the existing WWTP facilities would be sent through coagulation/flocculation, filtration, and disinfection to meet the requirements of disinfected tertiary recycled water for uses onsite and allowable uses off-site as defined in the WDRs. The WWTP is currently required to perform on-site monitoring and reporting methods as set forth in the WDRs. Monitoring and Reporting Program No. 92-036 requires the following monitoring elements:

- Monitoring of Effluent Discharged to Rapid Infiltration Basins
    - BOD_5,
    - Suspended Solids,
    - Settleable Solids,
    - TDS,
    - Specific Conductivity,
    - Standard Minerals,
    - pH,
    - Flow to lower disposal areas,
    - Flow to upper disposal areas,
    - Nitrate as N, and
    - Total Nitrogen as N.

- Monitoring of Lower Ponds
    - DO,
    - Pond Freeboard,

- Monitoring of the Stanislaus River (when using ponds near river)
    - Total Coliform

- Monitoring of Groundwater
    - Depth to Groundwater,
    - Groundwater elevation,
    - pH,
    - Conductivity,
    - Nitrate as N, and
    - Total Coliform

4.2.4 ROW Permitting

In addition to the permitting required for distribution and use of recycled water, it is anticipated that Right-of-Way (ROW) acquisition and permitting will also be required. ROW acquisition would be necessary for pipelines or storage facilities located on Non-District lands and would most likely be obtained through permanent pipeline easements and agreements with affected landowners or acquisition of fee title to lands. Encroachment permits will be required for locations where distribution pipelines cross or run through other entity ROW, such as Stanislaus County or MID corridors in the event of future westward pipeline expansion. Depending on ultimate alignment of the distribution network, this may include easement acquisition, encroachment permitting, and utility coordination for access to land owned of with rights maintained by:

- Stanislaus County;
- Private Landowners;
- Other region utilities with existing right-of-way such as PG&E, MID, and telecommunications.

Because interested parties reside across the MID canal, three potential methods of pipeline crossing of MID canal were analyzed. Pipeline crossing approaches include:

- Tunneling under the canal
- Crossing over the canal independently
- Crossing over the canal with attachment to an existing bridge

These methodologies will require a combination of encroachment permitting obtained from Stanislaus County, MID review of design, and approval from the Stanislaus County Public Works Department, where applicable.

4.3 ALTERNATIVES FOR PRODUCTION OF RECYCLED WATER

This section discusses the planning and design parameters and assumptions to meet the recycled water treatment requirements as discussed in Section 4.1. Additionally, the potential alternatives for tertiary treatment technologies and treatment trains are presented.

4.3.1 TERTIARY TREATMENT DESIGN CONSIDERATIONS

Secondary effluent produced from the existing WWTP facilities would be sent through coagulation/flocculation, filtration, and disinfection to meet the requirements of disinfected tertiary recycled water for uses onsite and allowable uses identified in Section 4.1.2. The design criteria for the alternatives described below are based on the WWTP's estimated future ADWF of 1.4 Mgal/d, and it is assumed that disinfected tertiary recycled water will be produced to meet recycled water demand as secondary effluent is produced. Secondary effluent in excess of the recycled water demand would be sent to the existing rapid infiltration basins for disposal. For simplicity, ancillary facilities are not described.

- **Pre-treatment**: Per the Title 22 requirements in 60301.320, disinfected tertiary recycled water requires coagulation upstream. "'Filtered wastewater' means an oxidized wastewater that…[h]as been coagulated and passed through natural undisturbed soils or a bed of filter media." Pre-treatment would consist of chemical injection followed by rapid mixing and flocculation. A new filter feed pumping station would feed flow from the secondary system to the pre-treatment system.
- **Filtration**. Flow from the pre-treatment system would flow by gravity to the filtration system. The filtration system would consist of two cloth disk filters with backwashing equipment or four continuous backwashing sand filters.
- **Disinfection**. Effluent from the filters would be sent through an open-channel UV disinfection system or a chlorine contactor to meet the requirements of disinfected tertiary, for allowable uses identified in Section 4.1.2.

4.3.2 TERTIARY TREATMENT PROCESS SELECTION

The unit processes that make up the tertiary treatment alternatives are described in the subsections below.

4.3.2.1 Rapid Mixing and Flocculation

Pretreatment with coagulation is required per Title 22. For conservatism, a flocculation tank is provided upstream of the filtration process. It is recommended that this pretreatment requirement be revisited during detailed design to confirm if it is required or if direct filtration (addition of coagulant in a static mixer just upstream of the filter) would be sufficient.

A coagulant chemical addition system will be provided to supplement the filtration process. A jar testing study is recommended to inform final coagulant selection and dosing. A summary of rapid mix and flocculation design criteria is provided in Table 4-2. Table 4-3 presents a design summary for the coagulant addition system.

Table 4-2
Rapid Mixing and Flocculation System Design Criteria

Parameter	Value
Minimum flow (Mgal/d)	0.6
Maximum flow (Mgal/d)	1.4
Turbidity (NTU)	7.5
Rapid Mixing System	
Detention time at max flow (seconds)	20
Number of tanks installed	1 duty + 1 standby
Number of tanks required at max flow	1
Tank dimensions (length x width x depth)	3.5 ft x 3.5 ft x 3.5 ft
Tank freeboard (feet)	2
Number of mixers per tank	1 duty
Velocity gradient G, maximum (s^{-1})	1,000
Mixer horsepower (hp)	2
Motor drive type	VFD
Flocculation System	
Detention time per tank at max flow (minutes)	16
Number of tanks installed	1 duty
Number of tanks required at max flow	1
Tank dimensions (length x width x depth)	17 ft x 11 ft x 11.5 ft
Tank freeboard (feet)	2
Number of flocculant mixers per tank	1 duty
Mixing energy x detention time (G*t) at max flow	40,000
Mixer horsepower (hp)	1
Motor drive type	VFD

NTU = nephelometric turbidity units

Table 4-3
Chemical Addition Systems Design Criteria

Parameter	Value
Coagulant System	
Number of coagulant pumps	1 duty + 1 standby
Coagulant type and bulk concentration	Alum, 48% by volume
Coagulant dose rate, average[a]	25 mg/L
Storage Tank	1 @ 1,100 gallons
Days storage at 972 gpm	15 days

[a] *Should be refined during detailed design.*

In this process, secondary effluent would be pumped to the rapid mixing basin where coagulant would be injected and flash mixed. Flow would leave the rapid mix basin and enter the flocculation tank. The flocculation tank is designed to provide a minimum of 15 minutes of hydraulic retention time (HRT) at 972 gpm. Due to the size of the flocculation basins and their simple mechanical parts, a redundant flash mix/flocculation tank is not proposed; one duty flocculant mixer is provided per tank. Flow would discharge from the flocculation tank into an outflow pipe that distributes flow to the filters. A bypass around the rapid mix and flocculation system would be provided for maintenance purposes.

The coagulant storage tank capacities were determined to provide 15-day supply assuming average dosing. It is important to note that the dose is assumed from typical reclaimed water treatment facilities.

4.3.3 Filtration Methods

Two filtration methods were evaluated: cloth disk filtration and continuous backwashing media filters. The filtration system would be designed to produce reclaimed water in accordance with California Title 22 regulations, requiring an effluent turbidity that does not exceed any of the following:

- An average of 2 NTU within a 24-hour period
- 5 NTU, more than 5 percent of the time within a 24-hour period (e.g., 72 minutes within a 24-hour period)
- 10 NTU at any time

A turbidimeter would be installed downstream of filtration but before disinfection. The turbidity meter must continuously log data and should be capable of retaining a 2-year data history.

4.3.3.1 Filtration Method 1 – Cloth Disk Filters

In this filtration alternative, new cloth disk filters would be constructed downstream of pretreatment. This scenario includes two steel tanks to house the cloth disk filters in a 1 duty + 1 standby configuration. Cloth disk filters use rotating disks covered with a fine nylon fiber material to provide filtration of particulate matter. During filtration, water enters the basin containing the disks, completely submerging the cloth media. Solids are deposited on the cloth media while filtered water is collected internally in each disk and conveyed through a central shaft for discharge. Discharged flow is conveyed over an effluent weir and into a common effluent channel or pipe for further treatment.

The cloth disk filters described herein are contained in above-grade standalone painted steel tanks. These filter tanks are typically uncovered, and access platforms would be provided around the tanks to access the drive unit and drive chain and to allow observation of the process. Backwash pumps, valves, piping, control panels, and other filter appurtenances would be skid mounted near the filter tank.

A backwash cycle is automatically initiated when solids accumulation on the cloth media increases headloss across the filter to a threshold value. Disks rotate slowly as suction provided via the backwash pump removes solids from the cloth media disks. Individual disks are cleaned while remaining disks continue to operate. A periodic waste cycle pumps heavier solids that naturally settle and accumulate on the tank bottom out of the filter basin. All waste and backwash water are assumed to be conveyed to the headworks.

Table 4-4 presents a summary of key design criteria for the filtration system based on the cloth disk filter from Aqua Aerobics.

Table 4-4
Disk Filter Design Criteria Summary

Parameter	Value
Filters	
Type	Cloth disk
Number of filters required	2 (1 duty + 1 standby)
Number of disks per filter	4
Filter chamber dimensions, ft	5.4 x 7.8 (filter chamber) 3.3 x 5.2 (effluent chamber)
Disk type	OptiFiber PES-14
Maximum hydraulic loading rate (gpm/ft^2)	2.3
Filter hydraulic capacity, initial (gpm, each)	972
Backwash rate, maximum	3%
Alarms	• High turbidity (filter influent, filter effluent)

This is an approved filtration technology for filtered disinfected non-potable reuse in California.

4.3.3.2 Filtration Method 2 – Continuous Backwashing Media Filter

In this filtration alternative, a new continuous backwashing sand filter would be constructed downstream of the mixing and flocculation system. Continuous backwashing filtration uses media, like sand, to provide filtration of particulate matter while continuously cleaning the media instead of cycling on and off filters to perform backwashing. During filtration, water is fed to the filter at the bottom of the sand layer and flows upward through the sand. Solids are deposited on the sand as water flows through the filter bed. Simultaneously, an airlift pipe, paired with an air compressor, in the center of the basin lifts sand from the bottom of the basin to the top to be cleaned and redeposited to the top of the filter bed. Filtered water is collected from each filter and conveyed through a central pipe to the disinfection system for further treatment. Reject water from backwashing is collected separately and is assumed to be recycled back to the headworks.

Pumping is assumed to be needed to convey water from the secondary sequencing batch reactor process to the filters. Table 4-5 presents a summary of key design criteria for the filtration system based on a continuous backwash sand filtration system from Parkson. Design criteria may be slightly modified during detailed design if equipment is provided by another vendor.

Table 4-5
Continuous Backwash Sand Filter Design Criteria Summary

Parameter	Value
Filters	
Type	Continuous Backwash Sand
Basis of design, Continuous Backwash Filter	Dynasand
Maximum hydraulic loading rate (gpm/ft^2) with all filters in service	2.4
Maximum hydraulic loading rate (gpm/ft^2) with one filter out of service	3.2
Max day flow (Mgal/d)	1.4
Number of total filter modules	8
Number of cells [a]	4
Number of filter modules per cell	2
Individual filter module width (ft)	7.1
Individual filter module length (ft)	7.1
Individual filter module area (ft^2)	50
Air compressor horsepower (hp)	10
Silica sand (inches)	80
Total sand required per module (tons):	18
Design headloss across filter (inches)	48
Typical headloss across filter (inches)	18 to 24

This is an approved filtration technology for disinfected tertiary reuse in California.

4.3.4 DISINFECTION METHODS

The disinfection system would be designed to produce disinfected tertiary reclaimed water in accordance with California Title 22 regulations as described in Section 4.1.2, either using UV or chlorination.

4.3.4.1 Disinfection Method 1 – UV Disinfection

In this method, the reclaimed water disinfection requirements would be achieved using a UV disinfection system. As specified in CCR section 60301.230, a design UV dose of 100 mJ/cm^2 was selected to provide 5-log inactivation of F-specific bacteriophage MS2.

The design is based on the use of low-pressure high-output (LPHO) lamps with automatic sleeve cleaning, validated for disinfection credit for tertiary disinfected reuse applications. The UV disinfection system would be fed from the filtration system as described in Section 4.3.3. Flow would be routed from the filter unit effluent through a connecting pipe and into a common UV influent channel. Water levels in an open channel UV system would be controlled using a manufacturer-designed level-control structure, which keeps the UV equipment submerged at all flow rates. Flows from the UV channel would be conveyed to a common effluent channel/pipeline and on to the recycled water pump station for distribution or disposal.

A vendor-provided programmable logic controller (PLC) would adjust UV system lamp operation using a third-party validated UV dose equation to maintain UV dose delivery at or above the required dose setpoint. It adjusts the system output by changing lamp power or turning UV banks, or whole trains, “ON” or “OFF” to respond to changes in UVT (UV transmittance at 254 nm), lamp output (i.e., due to aging and/or fouling), and flow. A UVT monitor would be installed post-filtration and a flowmeter would be included. A crane is not required for routine maintenance. Space surrounding the UV channel will be used to house the power distribution centers and for walkways to facilitate maintenance.

Table 4-6 presents a summary of the key design criteria for the UV disinfection system. As no historical UVT data was available, a conservative UVT of 55% was selected for design (NWRI, 2012). Prior to detailed design, long-term monitoring of UVT is recommended to inform system sizing.

Table 4-6
UV Disinfection System Design Criteria

General Design Criteria	
Description	Value
UV dose, minimum [a]	100 mJ/cm^2
UV transmittance, minimum [b]	55% at 254 nm
Basis of design Open-Channel UV technology	TrojanUVSigna
Lamp type	Low-pressure high-output (LPHO), in quartz sleeves
End of lamp life factor	0.86
Lamp fouling factor	0.85
Lamp cleaning system	Automatic chemical/mechanical
Number of channels	1
Flow per channel (Mgal/d)	1.4
Channel dimensions (ft, per channel)	30 ft. (L) x 2.6 ft. (W) x 7.8 ft. (D)
Number of banks per channel	3 duty + 1 standby
Number of lamps per bank	8
Total number of UV lamps	32
Lamp power draw (W), per lamp	1,000
Peak power draw, kW [c]	33.7
Water level control mechanism	Fixed effluent weir
Headloss across UV channel at design flow, inches [d]	3.5
Monitoring	• Continuous measurements for flow rate, UVT, UV intensity, operational UV dose, turbidity • On/off status for each reactor and lamp, lamp age, reactor on/off cycles, power consumption and power set point, liquid level in reactor, GFI • Daily sampling for fecal coliform
Alarms	• Lamp failure, low UV intensity, low UVT, high turbidity, low operational UV dose, high and low water level, GFI

a. *Based on 99.999 percent (5-log) inactivation of F-specific bacteriophage MS2 or poliovirus.*

b. *Limited UVT data was available. Fifty-five percent UVT was assumed as a reasonably conservative value for system design. This assumption may be updated at a later date depending upon further data collection.*

c. *Control center and other small ancillary power draws are not included.*

d. *Assumes headloss through the banks is 0.5 inch and headloss across fixed weir will be 3 inches.*

This is an approved filtration technology for disinfected tertiary reuse in California.

4.3.4.2 Disinfection Method 2 – Chlorination

In this method, the reclaimed water disinfection requirements would be achieved using chlorine. As specified in CCR section 60301.230, a design CT value (the product of total chlorine residual and modal contact time measured at the same point) of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes.

Flow would be routed from the filter unit effluent through a connecting pipe and into a common chlorine influent channel. New chlorine contactors would be built with chemical metering and chlorine dosing equipment. Flow rate and residual chlorine is monitored to verify adequate CT and modal contact time. Tracer testing would be needed as part of commissioning to verify modal contact time.

Based on preliminary estimates, the required chlorine disinfection contact basin footprint to achieve a 90-minute modal contact time and a residual chlorine CT of 450 mg-min/L would be approximately 50 x 60 feet. Due to the size requirements, chlorine disinfection is not considered a feasible or cost-effective alternative, and it is not evaluated further.

4.3.5 Pumping Requirements

Pumping is expected to be required for secondary effluent into the tertiary treatment system and treated tertiary effluent from the treatment system into the recycled water distribution system. Secondary effluent is assumed to flow into the tertiary Filter Feed Pumping Station wet well before being pumped to the filtration processes. An overflow weir in the pumping station wet well would allow secondary effluent in excess of 1.4 Mgal/d to flow by gravity to the existing Effluent Pumping Station. Disinfected effluent from the disinfection system will flow by gravity into the Recycled Water Pumping Station wet well before being pumped to the recycled water distribution system. An overflow weir in the pumping station wet well would allow treated tertiary water in excess of recycled water demand to flow by gravity to the existing Effluent Pumping Station. Table 4-7 presents the design criteria for the Filter Feed Pumping Station, and Table 4-8 presents the design criteria for the Recycled Water Pump Station.

Table 4-7
Filter Feed Pumping Station Design Criteria

Parameter	Value
Minimum pump flow (Mgal/d)	0.6
Maximum pump flow (Mgal/d)	1.4
Total Dynamic Head (ft)	23
Number of pumps	1 duty + 1 standby
Pump Type	Vertical turbine pump
Wet well dimensions (length x width x depth)	25 ft x 15 ft x 16.5 ft
Pump horsepower (hp)	10
Motor drive type	VFD

Table 4-8
Recycled Water Pumping Station Design Criteria

Parameter	Value
Minimum pump flow (Mgal/d)	0.6
Maximum pump flow (Mgal/d)	1.4
Number of pumps	1 duty +1 standby
Total Dynamic Head (feet)	120
Pump Type	Vertical turbine pump
Wet well dimensions (length x width x depth)	30 ft x 20 ft x 10 ft
Pump horsepower (hp)	40
Motor drive type	VFD

4.3.6 Additional Facilities

A new building will be required to house the ancillary electric equipment that supports the various tertiary treatment equipment, such as motor control center and programmable logic controller. This building is assumed to be a prefabricated electrical building located adjacent to the treatment units. Additionally, a canopy would be required for the cloth disk filters and an open-channel UV system for weather protection.

4.3.7 Tertiary Treatment Train Alternatives

The two filtration options with UV disinfection were combined to create two different possible treatment trains:

- Alternative T1 - Pre-treatment + Cloth Disk Filtration + UV Disinfection
- Alternative T2 - Pre-treatment + Continuous Backwash Filtration + UV Disinfection

Most process units include standby redundancy; however, full redundancy is likely not needed considering the limited recycled water demand and ability to divert secondary effluent flow to the rapid infiltration basins. It is assumed there would be provision for off-specification (i.e., undertreatment) diversion to the treatment headworks.

4.3.7.1 Alternative T1 –Cloth Disk Filtration + UV Disinfection

Alternative T1 would use cloth disk filtration followed by UV disinfection. In this scenario, treated secondary effluent would be pumped by the filter feed pumping station to the tertiary treatment area, where it would flow by gravity through mixing, coagulation, cloth disk filters, and UV disinfection. The process flow diagram and site layout are illustrated in Figure 4-1 and Figure 4-2, respectively.

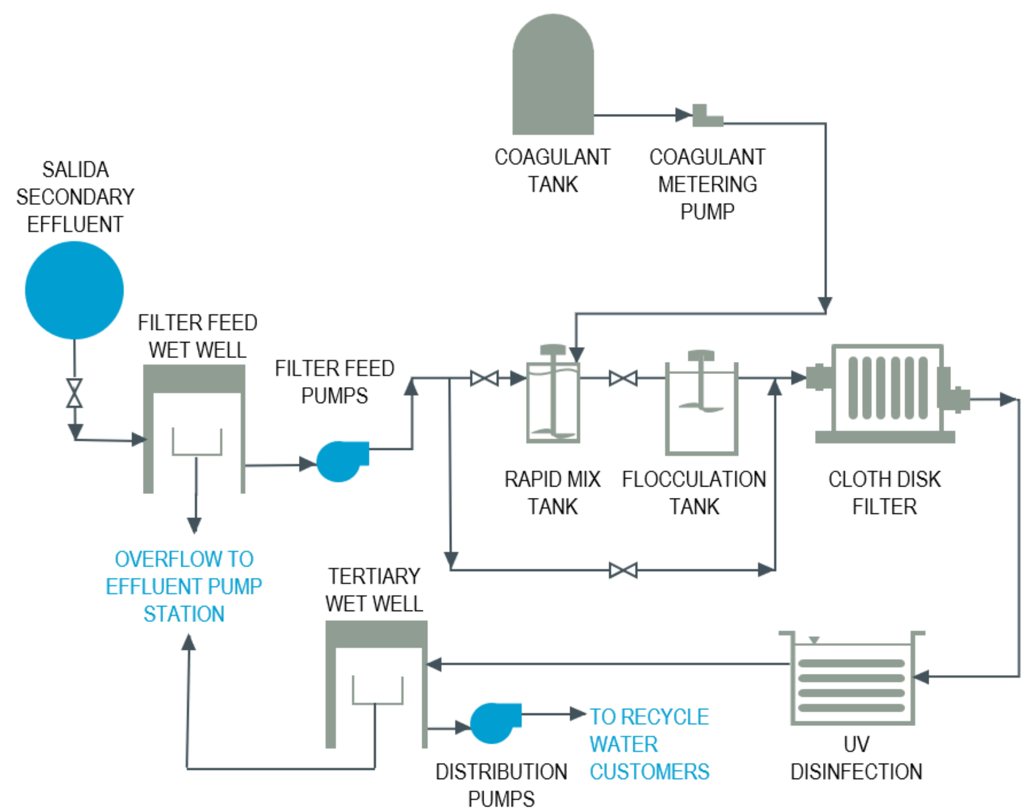

Figure 4-1
Process Flow Diagram for Alternative T1

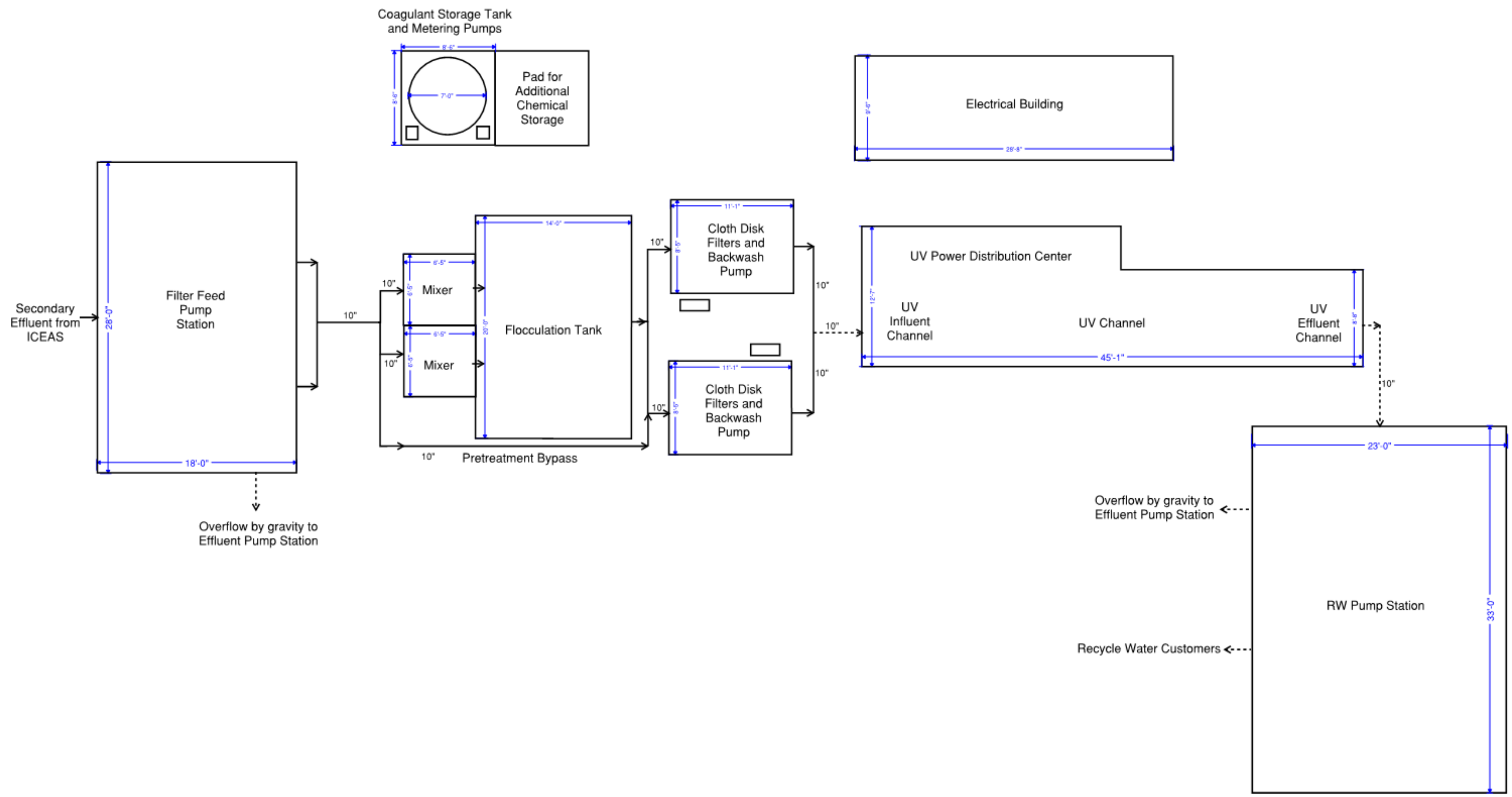

Figure 4-2
Process Layout for Alternative T1

4.3.7.2 Alternative T2 – Continuous Backwash Filtration + UV Disinfection

Alternative T2 would use continuous backwashing sand filtration followed by UV disinfection. In this scenario, treated secondary effluent would be pumped by the Filter Feed Pumping Station to the tertiary treatment area, where it would flow by gravity through mixing, coagulation, sand filters, and UV disinfection. The process flow diagram and site layout are illustrated in Figure 4-3 and Figure 4-4, respectively.

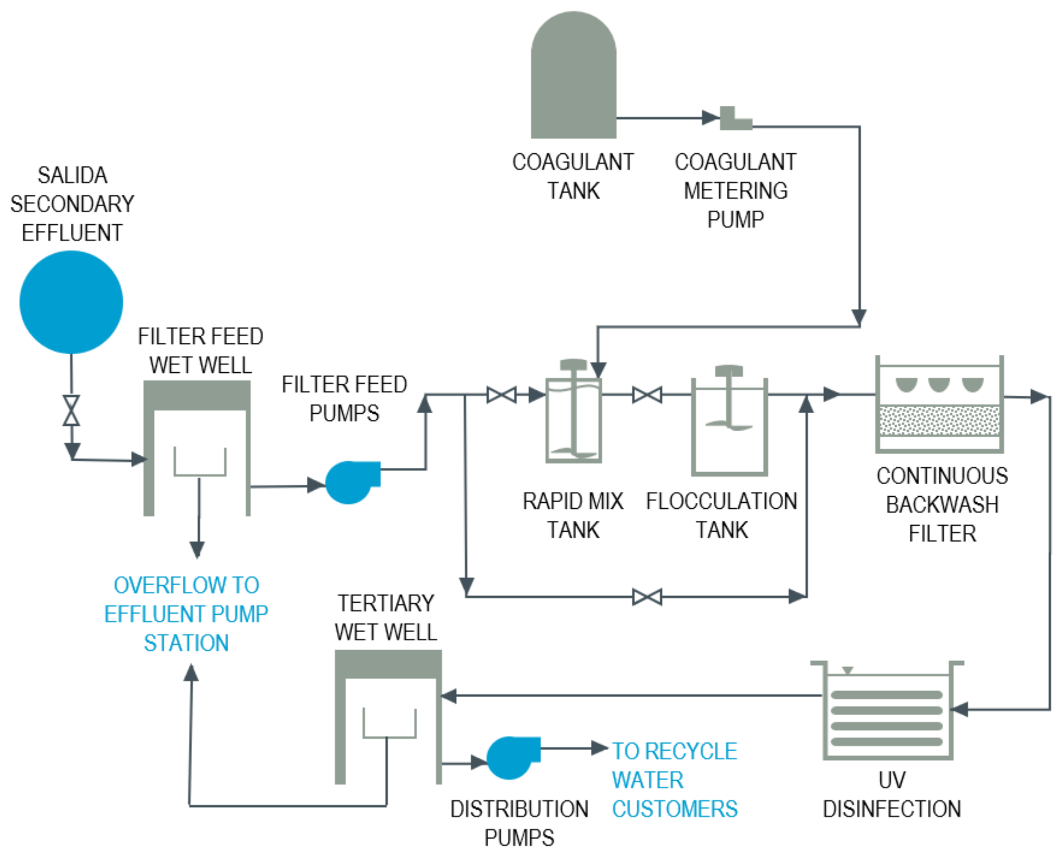

Figure 4-3
Process Flow Diagram for Alternative T2

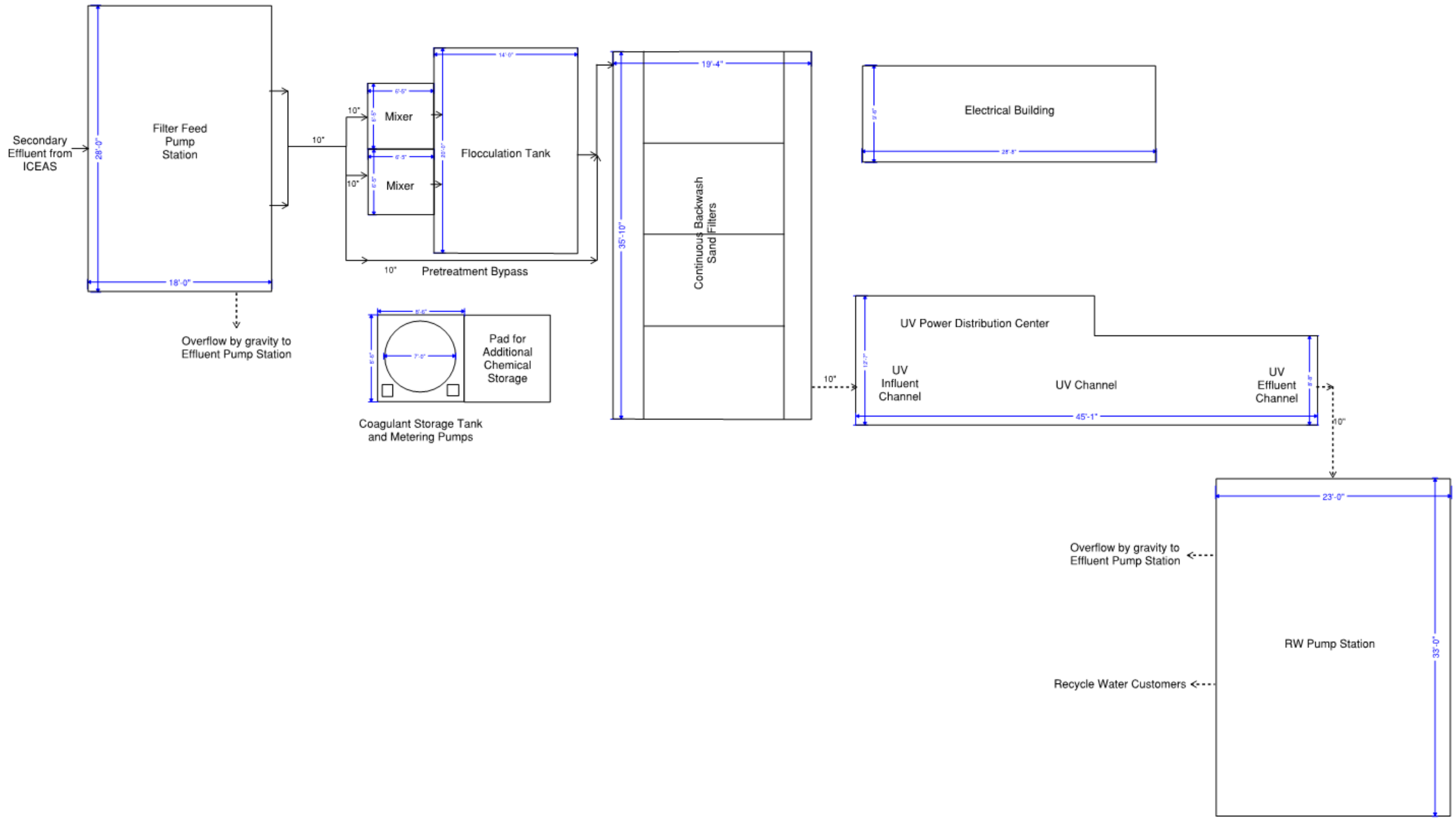

Figure 4-4
Process Layout for Alternative T2

4.4 ALTERNATIVES FOR RECYCLED WATER USE

This section discusses the storage and delivery alternatives evaluated to meet a potential range of recycled water use requirements identified in Section 3.

4.4.1 DIRECT DELIVERY TO LANDOWNERS

As discussed in Section 3, individual landowners were contacted to assess their interest in the use of recycled water for agricultural irrigation. Two of these landowners expressed interest in receiving recycled water for use on their agricultural lands. In the following subsections, recycled water would be delivered directly to points of connection with individual landowner's facilities from the WWTP through a combination of new and existing constructed pipelines and facilities.

Delivery would be at a low head condition to be pumped by recycled water user pumping facilities at designated points-of-connection with the end user's irrigation system. Because the primary source of water from MID is not pressurized, regional growers typically have individual pumping stations installations to provide pressure to deliver water required for irrigation through sprinkler or drip systems. The construction of delivery facilities will be performed as a phased approach, with construction of the initial pipeline and connection assemblies to those landowners who have initially expressed interest and allow for future connection of new users or construction of additional pipelines as the availability of and demand for recycled water increases. This delivery method will require permitting as discussed in Section 4.2.4.

Supplemental water is expected to be required in summer the months under the direct delivery scenario, discussed further in Section 4.4.2, where delivery rates and water balance calculations are presented. Additionally, recycled water storage would benefit meeting peak irrigation demand, but at increased capital and operational costs (discussed more in Section 4.4.3).

4.4.2 DELIVERY RATES

Irrigation scheduling scenarios were evaluated using the method described in Section 3.1.3. An operational storage approach was selected as the best method to optimize recycled water production, storage, and delivery. The operational storage approach would provide a storage tank designed to hold tertiary treated recycled water as it is produced, until recycled water is ready to be delivered for irrigation. A typical irrigation cycle is expected to include recycled water delivery daily over a period of 10 hours, with produced recycled water recycled water stored for 14 hours between irrigation sessions. To meet the recycled water production capacity of the WWTP of 1.4 Mgal/d over a period of 14 hours, 900,000-gallons of operational storage would be used, and irrigation supply would be approximately 2,400 gpm.

4.4.3 RECYCLED WATER DELIVERY PIPELINE ALIGNMENTS

Two alternative distribution approaches were evaluated, consistent with the site requirements and delivery of recycled water directly to growers in the Use Area. The following pipeline alignments assume initial pumping of recycled water from the distribution facilities and transport of the recycled water user at a low head condition. Recycled water is assumed to be pressurized at the point of connection by the participating landowner prior to dispersal throughout the agricultural lands using existing landowner irrigation facilities.

4.4.3.1 Pipeline Alignment 1

Pipeline alignment 1 includes a backbone system for direct delivery to prospective landowners through a distribution system from the WWTP. An initial length of 27,750 linear feet of distribution piping was assumed to allow for recycled water transmission main construction extending to the main reaches of the use area, allowing a point of connection through On-Farm Connection Assemblies (OFCAs) for landowners identified in the market study discussed in Section 3. This alternative would include an initial connection to the user existing irrigation systems to facilitate recycled water delivery to landowners through the Recycled Water Distribution Pump Station at the WWTP detailed in Table 4-8. Over time, the existing 10” irrigation pipeline will be replaced with an 18” recycled water transmission main. Table 4-9 provides a summary of the facilities planning criteria for this alternative. The 18” replacement recycled water pipeline lengths are included within the facilities planning criteria. Figure 4-5 provides a conceptual overview of this alternative.

Table 4-9
Pipeline Alignment 1 Facilities Planning Criteria

Parameter	Value
Distribution Pipeline[1]	
Pipe Size (in)	18
Length of Piping (ft)	27,750
On-Farm Connection Assembly	
18" Modulating Control Valve	6
18" Magnetic Flow Meter	6
18" Double Door Disc Check Valve	6
Pressure Indicating Transmitter	6
18" Dismantling Joint	6

Based on meeting a nominal minimum velocity of 3.0 ft/sec.

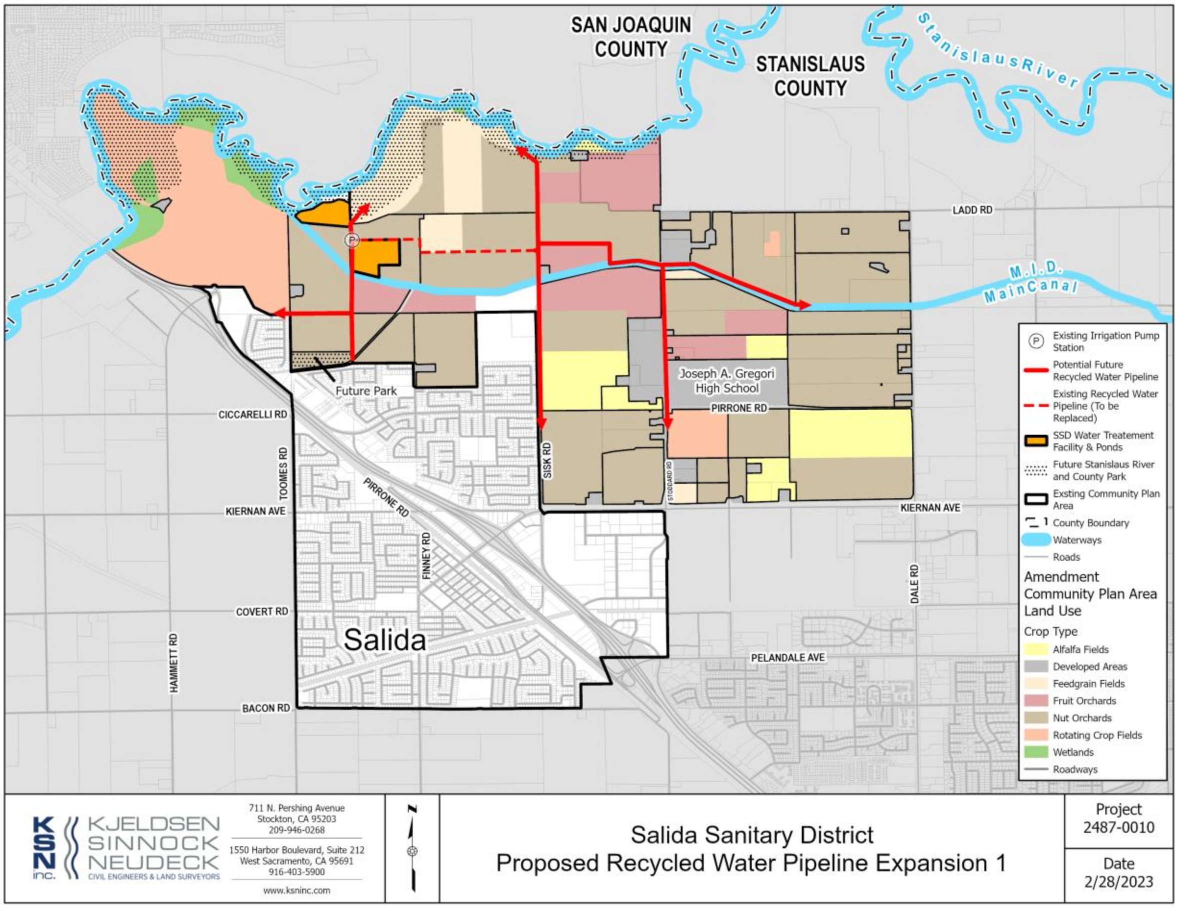

Figure 4-5
Pipeline Alignment 1 - Recycled Water Pipeline Full Expansion Delivery Overview

4.4.3.2 Pipeline Alignment 2

Pipeline Alignment 2 includes a phased approach to alignment 1 by providing recycled water delivery to only near-term potential users identified in Section 3.1.1.1 through a distribution system from the WWTP, with potential for future expansion to landowners in additional phases based upon demand and availability of recycled water. This alignment also considers the future potential for recycled water streetscape irrigation as current agricultural areas become developed. An initial length of 14,750 feet of distribution piping was assumed for this initial phase, which can be expanded to reach more landowners over time. Although the system is initially planned to operate under a low head condition, the system is designed to allow for ease of transition to a pressurized recycled water irrigation in the future. This alternative may include additional recycled water storage based upon the selected alternative presented in Section 4.4.4. This alternative would also include a connection to the user existing irrigation systems through On-Farm Connection Assemblies (OFCAs), with recycled water delivered by the Recycled Water Irrigation Pump Station presented in Table 4-8 and a connection to existing irrigation pipelines extending from the WWTP. Over time, the existing 10" irrigation pipeline will be replaced with an 18" recycled water transmission main.

Table 4-10 provides a summary of the facilities planning criteria for this alternative. The 18" replacement recycled water pipeline lengths are included within the facilities planning criteria. Figure 4-6 provides a conceptual overview of this alternative.

Table 4-10
Pipeline Alignment 2 Facilities Planning Criteria

Parameter	Value
Distribution Pipeline[1]	
Pipe Size (in)	18
Length of Piping (ft)	14,750
On-Farm Connection Assembly	
18" Modulating Control Valve	2
18" Magnetic Flow Meter	2
18" Double Door Disc Check Valve	2
Pressure Indicating Transmitter	2
18" Dismantling Joint	2

Based on meeting a nominal minimum velocity of 3.0 ft/sec.

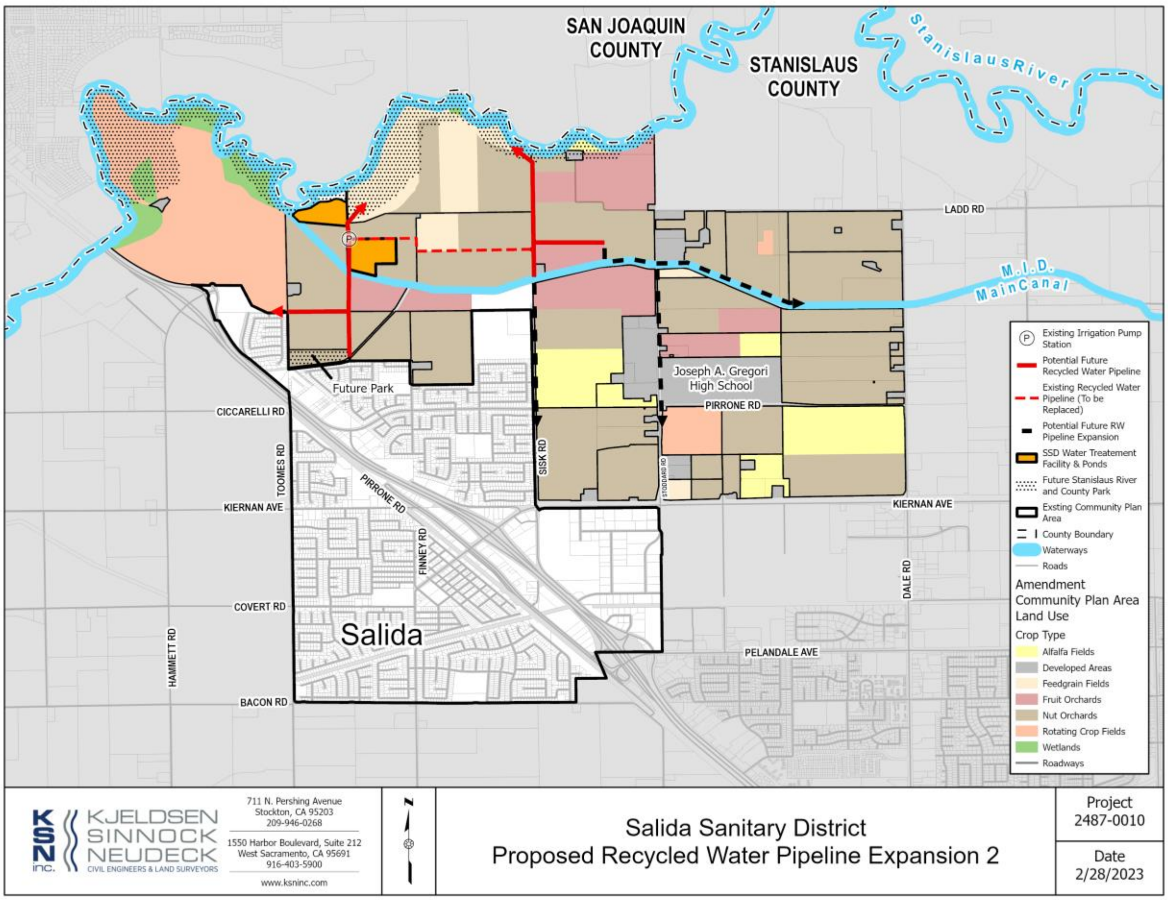

Figure 4-6
Pipeline Alignment 2 Recycled Water Refined Pipeline Expansion Overview

Because the potentially interested landowners identified as viable candidates for recycled water irrigation are limited and closer to the WWTP, pipeline alignment 2 is the selected alignment as it is planned to serve those potential users.

4.4.4 RECYCLED WATER STORAGE AND DISTRIBUTION ALTERNATIVES

The following storage and distribution alternatives were considered under the operational conditions of the recommended phased pipeline alignment:

(1) Alternative D1 - Operational storage for the recycled water delivery system to meet irrigation demand with no on-site storage (No Seasonal Storage);

(2) Alternative D2 - Maximized use of on-site ponds as seasonal storage at the WWTP to store produced recycled water through the non-irrigation season; and

(3) Alternative D3 - Remote storage for maximized beneficial use of recycled water for irrigation.

These alternatives are discussed in the subsections below.

4.4.4.2 Alternative D1 - Operational Recycled Water Storage Only

Alternative D1 includes construction of operational storage for production of 1.4 Mgal/d with no seasonal storage. During the irrigation season, the primary delivery pathway produces recycled water at a constant rate matching the influent flow rate up to 1.4 Mgal/d, with additional flows routed to land disposal through the RIBs and Lower Ponds. During the non-irrigation season, recycled water is not produced and therefore secondary effluent is routed to the RIBs and Lower Ponds for disposal. By utilizing disposal capacity and utilizing disposal methods as a secondary pathway to recycled water delivery for irrigation, Title 22 reliability criteria requirements are met, alleviating the need for redundant treatment trains.

To evaluate the WWTP's ability to process projected annual influent flows, waterbalance calculations were performed. The waterbalance for Alternative D1 is included in Appendix B. The waterbalance for Alternative D1 is included in Appendix B. In December 2023, an RIB characterization study was performed by KSN to evaluate the percolation rates and performance of the RIBs and the potential expansion area east of the facility. Through the evaluation it was determined that the approximate average percolation rate of the RIBs is 15.25 in/day. The RIB characterization study is provided in Appendix C.

Under this alternative, approximately 180 acres of land would be irrigated with tertiary treated recycled water at an ADWF of 1.4 Mgal/d under 1-in-100 year precipitation conditions. In this scenario it is estimated that the 183.65 Mgal yearly irrigation demand of the 180 acres of adjacent walnut, almond and peach orchards could be fully met through the recycled water irrigation without the need for supplemental surface or groundwater. During the non-irrigation season, secondary treated effluent sent to the RIBs is fully percolated throughout the duration of the month without accumulation of storage.

Based on the irrigation scheduling described in Section 4.4.2, it is estimated that approximately 0.9 Mgal of operational storage is required to meet the peak irrigation demand. Pumping would be required to lift recycled water into the operational storage tank and recycled water distribution pumping to transport recycled water from operational storage into the recycled water distribution system and users OFCAs.

A summary of the Alternative D1 planning criteria is presented in Table 4-11. Design criteria for the recycled water pumping station is shown separately in Table 4-8. The process flow diagram for Storage Alternative D1 is depicted in Figure 4-7.

Table 4-11
Alternative D1 Summary Table

Parameter	Value
Plant Piping	
Pipe Size (in)	18
Length of Piping	520
Expanded Secondary Effluent Disposal	
Operational Storage	
Tank Capacity (Mgal)	0.9
Tank Diameter (ft)	80
Tank Height (ft)	24
Tank Material Type	Bolted Steel
Tank Concrete Pad Dimensions (ft) (width x length)	150 ft x150 ft
Recycled Water Lift Station	
Total Dynamic Head (ft)	24
Number of pumps	2 duty + 1 standby
Pump Type	Vertical Turbine Pump
Pump Horsepower (hp)	10
Pump Capacity (gpm)	800

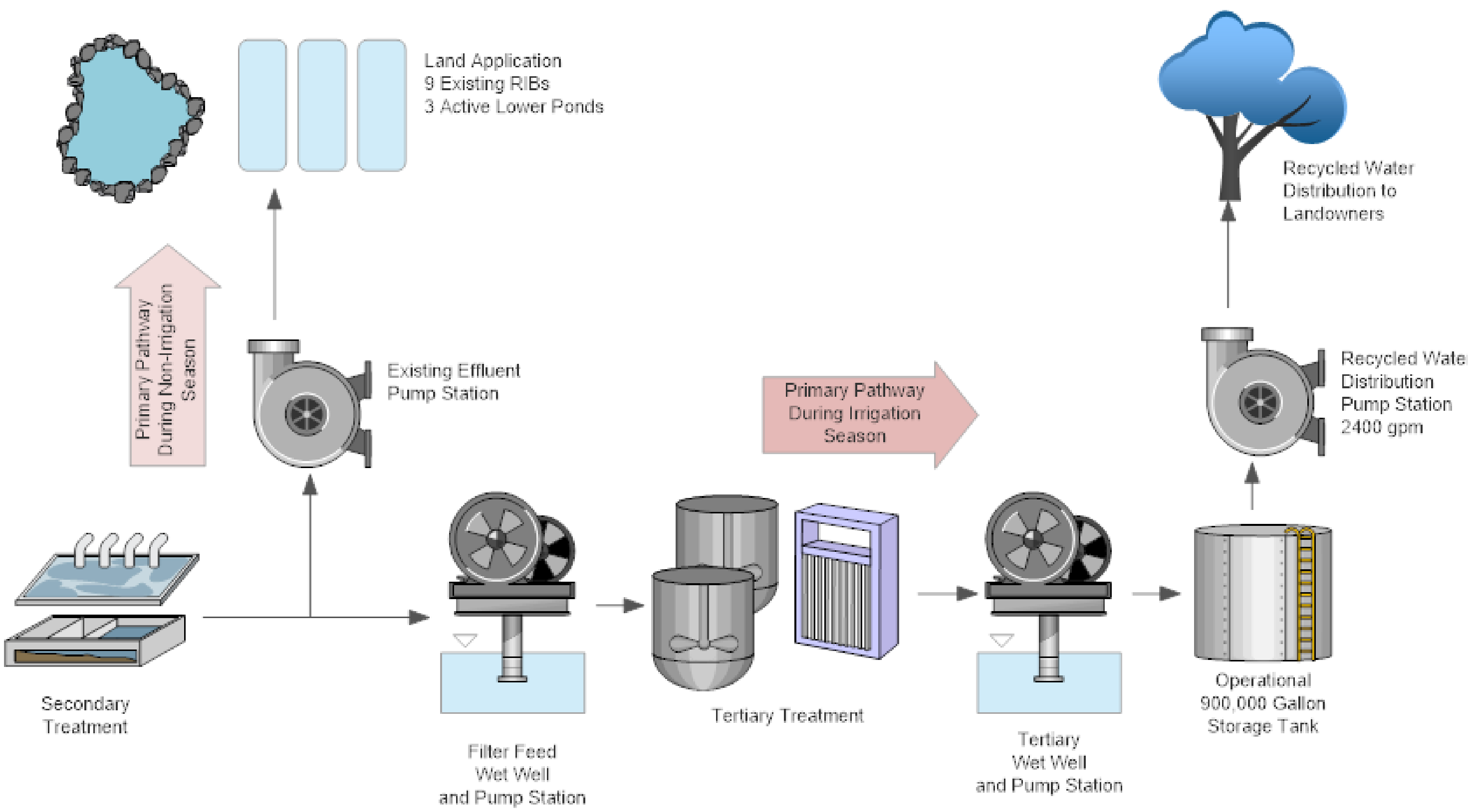

Figure 4-7
Storage Alternative D1 – Operational Storage Only

4.4.4.3 Alternative D2 – Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP

Alternative D2 includes additional on-site storage to both accommodate the additional projected inflow of 1.4 Mgal/d and to allow for operational flexibility for recycled water delivery during the irrigation season. The configuration of the on-site disposal ponds under this alternative would allow for incidental storage of secondary effluent while these ponds serve their primary purpose of effluent disposal during the winter months due to permitting restrictions discussed in Section 2.4. Alternative D2 would include an expansion of the existing RIBs and the continued use of the existing lower ponds for evaporation and percolation of secondary treated effluent prior to transfer to the tertiary treatment train. Under this alternative, a minimum of approximately 180 acres of land would be needed for irrigation for recycled water production by the WWTP to meet disposal capacity needs at a 1.4 Mgal/d ADWF under 1 in 100 year precipitation conditions.

Under this process configuration, waterbalance calculations were prepared to evaluate the interaction between on-site pond disposal and incidental storage with seasonal production of recycled water to meet grower needs. Waterbalance calculations are shown in Appendix B. . An average percolation rate of 15.25 in/day was used to estimate the percolation capacity and change in storage of the RIBs in the waterbalance calculations. The development of this percolation rate is described in the RIB characterization study provided in Appendix C.

The waterbalance calculations demonstrate that the 9 existing RIBs and the active lower ponds provide adequate storage capacity to accommodate seasonal secondary effluent disposal requirements under 1-in-100-year seasonal precipitation conditions. Secondary treated effluent flows are accommodated during the wettest months of the year when irrigation demand is low or non-existent and the WWTP continually produces secondary effluent. During the winter season, waterbalance calculations show a minimal increase in storage to approximately 8% at the wet season peak in January before returning down to 0% storage in April as irrigation season begins. .

During the irrigation season, secondary effluent, including water held within the on-site ponds, would be fed into the tertiary treatment system. In this scenario it is estimated that the 160.6 Mgal yearly irrigation demand of the 180 acres of adjacent walnut, almond and peach orchards could be fully met through the recycled water irrigation without the need for supplemental surface or groundwater. By utilizing land disposal of secondary effluent as a supplemental disposal operation to recycled water delivery for irrigation, Title 22 reliability requirements are met, alleviating the need for redundant treatment trains.

Since this system arrangement delivers secondary effluent through the existing RIBs, certain degradation of the water quality is likely to occur, including production of algae. This water quality degradation could require additional treatment improvements such as Dissolved Air Flotation (DAF) to remove the algae before filtration. Recycled water treated to a tertiary standard would then be distributed to landowners for irrigation through the recycled water pumping station. Planning criteria for the recycled water pumping station is shown in Table 4-8. In addition to the recycled water pump station, Alternative D2 would require an estimated additional 520 feet of 18-inch piping to connect to the expanded recycled water pipeline alignment 2 presented in Figure 4-6 and Table 4-10. This alternative was not considered further due to potential water quality concerns related to algal growth promoted by secondary effluent being stored in the RIBs and the additional cost of supplemental treatment such as DAF treatment with an estimated cost of approximately $1.125M in present day (2024) dollars. The process flow diagram, excluding DAF, outlining Alternative D2 is shown in Figure 4-8.

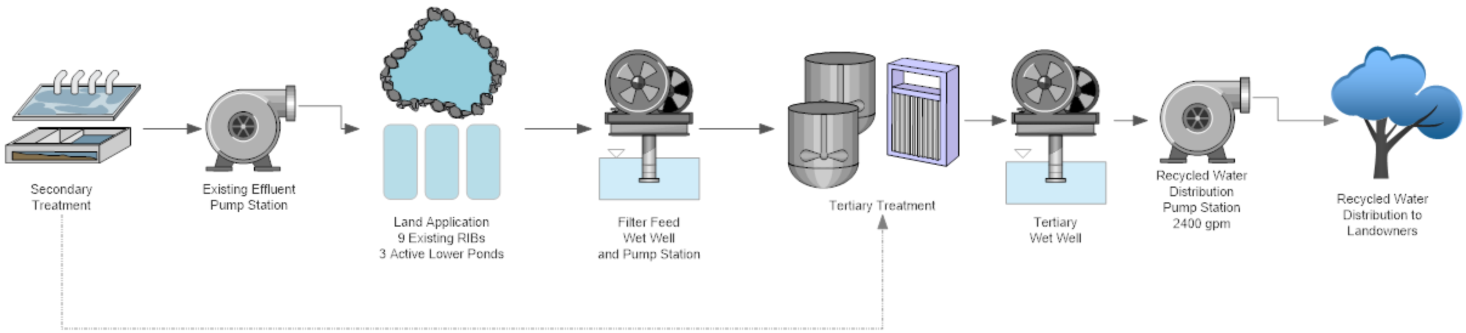

Figure 4-8
Storage Alternative D2 – Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP

4.4.4.4 Alternative D3 – Maximized Remote Storage

Alternative D3 includes the continued usage of the 9 existing RIBs and 3 active lower ponds and the addition of a remote seasonal storage basin to maximize irrigation potential through the continuous production of recycled water at a rate of 1.4 Mgal/d throughout the year. The primary delivery pathway would be the production of recycled water and delivery to a remote storage pond prior to distribution through the recycled water pumping station, described in Table 4-8. The WWTP will produce water treated to tertiary standards to be stored in a remote storage pond during the winter months when irrigation demand is low and irrigation cannot occur due to permitting restrictions discussed in Section 2.4. Excess secondary effluent would be transferred to the 9 existing RIBs and 3 active lower ponds as a secondary pathway when influent flows exceeded the tertiary treatment system capacity and as a secondary disposal method meeting Title 22 requirements.

Waterbalance calculations were prepared to estimate the amount of remote seasonal storage required, assuming continued use of the 9 RIBs and 3 operational lower ponds. The Alternative D3 waterbalance for average and 1 in 100 year precipitation conditions are provided in Appendix B. The approximate average percolation rate of the RIBs of 15.25 in/day was used to evaluate the storage and percolation capacity of the RIBs. The development of this updated percolation rate is described in the RIB characterization study provided in Appendix C.

Under this alternative, the beneficial use of recycled water for irrigation is maximized through the irrigation of an estimated 410 acres of adjacent walnut, almond and peach orchards. In this scenario, the 410 acres area would be irrigated with recycled water produced by the WWTP at an influent ADWF of 1.4 Mgal/d under 1 in 100 year precipitation conditions. It is estimated that of the total 418.3 Mgal yearly irrigation demand of the defined irrigation area, 417 Mgal would be met through recycled water produced by the WWTP and 1.3 Mgal would need to be supplemented by surface or groundwater irrigation. The supplemental irrigation would occur at the end of the water year in September when the accumulated RW storage at the WWTP has been fully utilized.

An analysis was performed to determine the optimal remote storage basin volume based on average year conditions. The amount of recycled water available for irrigation was estimated by quantifying system inflows at a constant influent ADWF of 1.4 Mgal/day with precipitation and subtracting system outflows including evaporative losses from the storage pond and RIB percolation. The results of the remote storage basin volume optimization and recycled water availability analysis are shown in Figure 4-9.

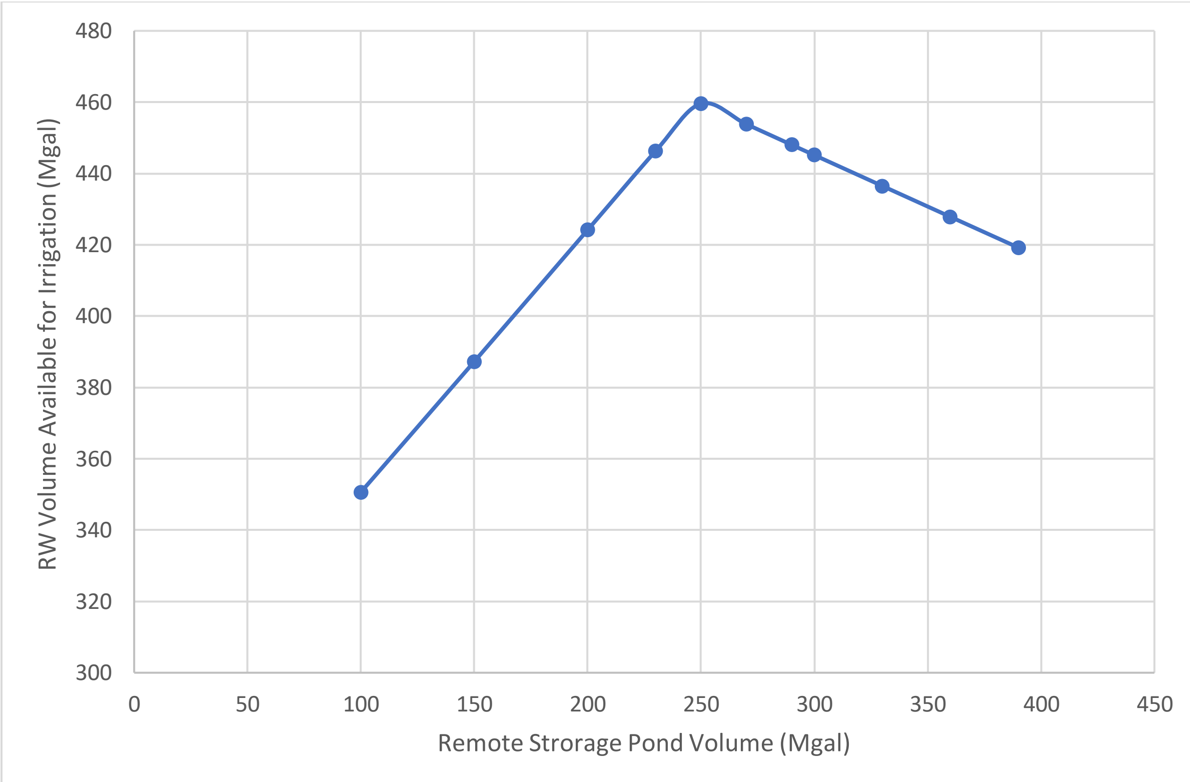

Figure 4-9
Recycled Water Available for Irrigation per Remote Storage Volume, Average Precipitation Conditions

Through the analysis it was found that as the size of the remote storage pond increases, evaporative losses also increase which reduces the availability of recycled water for irrigation at the constant ADWF of 1.4 Mgal/day. The optimal remote storage pond volume of 250 Mgal was selected based upon optimized RW irrigation potential and balance of evaporative losses. The 250 Mgal remote storage pond was then applied to the 1 in 100 year precipitation scenario to ensure yearly disposal requirements were met.

Assuming a remote storage pond volume of 250 Mgal and 1 in 100 year precipitation conditions, the waterbalance for Alternative D3 resulted in an accumulation of RW for irrigation of 85% of full remote storage basin capacity by the end of March. The full utilization of recycled water in remote storage is achieved by the end of the water year in September. Minimal usage of the on-site RIB ponds are observed in this scenario with precipitation contributing the majority of the storage accumulation in the RIBs. The Salida WWTP system storage, including the remote storage basin, reaches 96% of full capacity at the end of the winter season under 1 in 100 year precipitation conditions, indicating the ability of the system to process periods of high flows and high intensity storms under Alternative D3. A summary of the Alternative D3 planning criteria is shown in Table 4-12.

Table 4-12
Alternative D3 Summary Table

Parameter	Value
Remote Seasonal Storage	
Remote Storage Pond Capacity (Mgal)	250
Storage Pond Dimensions (ft) (width x length x depth)	1450 ft x 1925 ft x 14 ft
Freeboard (ft)	2
Side Slopes (ft:ft)	2.5:1
Berm Height (ft)	2
Berm Slope (ft:ft)	3:1
Berm Width (ft)	20
Remote Storage Transfer Station	
Total Dynamic Head (ft)	23
Number of pumps	1 duty + 1 standby
Pump Type	Vertical turbine pump
Pump horsepower (hp)	10
Pump Capacity (gpm)	800

As with Alternative D2, there would be some degradation of water quality due to atmospheric exposure in the remote storage, including potential for natural coliform regrowth and growth of algae. While the water would meet tertiary disinfected recycled water criteria, additional treatment by the growers may be needed including filtration before delivery through emitters and sprinklers. The process flow diagram for Alternative D3 is depicted in Figure 4-10.

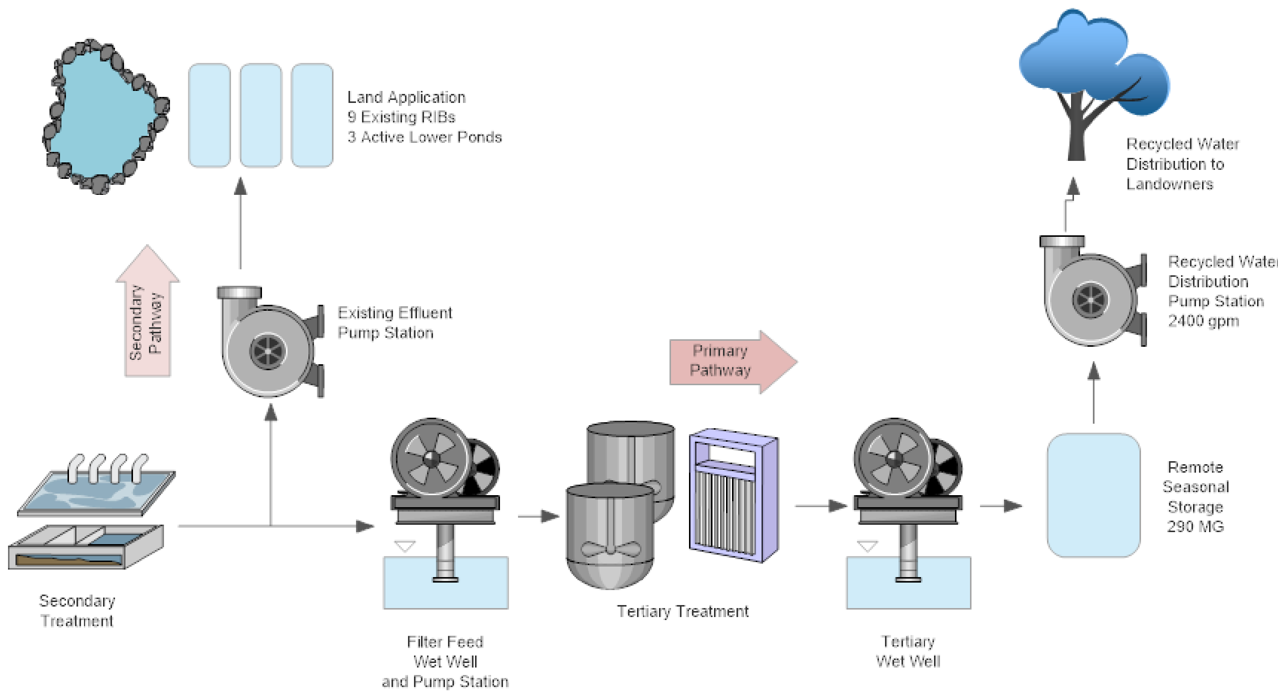

Figure 4-10
Alternative D3 – Remote Seasonal Storage

4.5 NO PROJECT ALTERNATIVE

The no recycled water project option includes the continued use of existing means of effluent disposal without the addition of recycled water production and distribution facilities. The improvements for tertiary treatment are not included because those facilities are related to recycled water production. As flows approach the 30-year projected influent flow of 1.40 Mgal/d by year 2052, the District will need to adjust the approach to storage and percolation cycles to prevent standing water in the RIBs for more than 72 hours to maintain compliance with current and future WDRs.

4.6 ALTERNATIVES COST COMPARISONS

This section presents an estimate of tertiary treatment alternatives capital costs, operating costs, and life-cycle cost of recycled water for each of the reuse alternatives. The cost estimates represent conceptual estimates of the capital costs to construct facilities. The cost estimates should be refined from this conceptual phase as the project elements are better defined and proceed into the pre-design and design phases. The cost estimates represent mid-2023 dollars. The detailed cost estimates of the alternatives are presented in Appendix D.

Capital costs represent the construction and other costs necessary for project completion including constructing appurtenances to meet regulations. Construction costs cover the material, labor, and services necessary to build the identified project. Changes during the design of the project, in the cost of materials, labor, and equipment, and in the bidding environment will cause changes in the estimated cost. It may be possible to optimize some design details to reduce the total cost; it is recommended this be explored during preliminary design.

The contingency cost item addresses the uncertainties that are associated with the preliminary sizing of projects. Factors such as unexpected construction conditions, the need for unforeseen construction items, and variations in quantities are some of the items that can increase project cost. The engineering, administrative, and legal cost item covers engineering and construction management services and items such as legal fees and administrative costs that are typically associated with a project. Environmental and permitting is included to cover the cost of acquiring the necessary permits and environmental documents for the project.

4.6.1 Capital Cost Comparisons

Capital costs for the treatment, distribution and the no project alternatives are presented in the tables below. Detailed Class 5 construction cost-estimates are provided in Appendix D. The following markup assumptions were made in the development of the estimated costs:

- Contingency at 25% based on assumption of a Class 5 planning level estimate;
- Engineering, design, administration, and construction management costs at 25%;
- Environmental and permitting costs at 10%;

Table 4-13 summarizes the estimate of probable capital cost of construction for the tertiary treatment alternatives.

Table 4-13
Estimate of Probable Capital Costs – Tertiary Filtration and Disinfection

Treatment Alternative	Description	Estimated Cost ($M)
T1	Cloth disk filtration plus UV disinfection	$12.1
T2	Continuous backwash media filtration plus UV disinfection	$13.0

Table 4-14 provides a summary of the estimated capital costs of the three distribution and storage alternatives.

Table 4-14
Estimate of Probable Capital Costs – Distribution and Storage

Distribution Alternative	Description	Estimated Cost ($M)[a]
D1	Operational Recycled Water Storage Only	$8.0
D2	Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP	$4.1
D3	Maximized Remote Storage	$47.2

Table 4-16 provides a summary of the estimated capital costs of the no-project alternative.

Table 4-15
Estimate of Probable Capital Costs – No Project Alternative

Project Alternative	Description	Estimated Cost ($M)
D0	No Project Alternative	$0

4.6.2 OPERATION AND MAINTENANCE COST COMPARISONS

Annual operating costs for the treatment and distribution alternatives are presented in the tables below. Operations costs were estimated assuming an electrical cost of $0.127/kWh, PACl at $0.34/lb, and labor at $80/hour fully burdened. Power consumption estimated were either provided directly from the vendor or estimated based on the horsepower of the equipment. Labor hours were either provided directly from the vendor or estimated based on professional judgement and vendor provided replacement intervals.

Table 4-16 summarizes the estimated annual operating costs of the tertiary treatment alternatives in 2023 dollars. Replacement costs were provided by the equipment vendors, and general equipment maintenance was estimated for the cloth disk filters, continuous backwash filters, and UV system based on 2-percent of the vendor provided total equipment cost.

Table 4-16
Estimate of Annual Operating Costs – Tertiary Filtration and Disinfection

Treatment Alternative	Description	Cost ($)[a]
T1	Cloth disk filtration plus UV disinfection	$115,000
T2	Continuous backwash media filtration plus UV disinfection	$126,000

a. O&M costs include labor, power, chemicals and materials replacement costs.

Table 4-17 summarizes the estimated annual operating costs of the recycled water distribution and storage alternatives in 2023 dollars.

Table 4-17
Estimate of Annual Operating Costs – Distribution and Storage

Distribution Alternative	Description	Estimated Cost ($)[a]
D1	Operational Recycled Water Storage Only	$63,000
D2	Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP	$57,000
D3	Maximized Remote Storage	$62,000

Table 4-18 summarizes the estimated annual operating costs of the no project alternative in 2023 dollars.

Table 4-18
Estimate of Annual Operating Costs – No Project Alternative

Distribution Alternative	Description	Estimated Cost ($)[a]
D0	No Recycled Water Project Option	$0

4.6.3 COST COMPARISONS

The estimated 30-year net present value (NPV) of the tertiary treatment, distribution and storage, and no project alternatives in 2023 dollars. The escalation rate used was 2.1 percent, the discount rate was 2.5 percent.

Table 4-19 summarizes the estimated 30-year net present value of the tertiary treatment alternatives.

Table 4-19
Estimate of Net Present Value – Tertiary Filtration and Disinfection

Treatment Alternative	Description	Estimated Cost ($M)
1	Cloth disk filtration plus UV disinfection	$15.3
2	Continuous backwash media filtration plus UV disinfection	$16.6

Table 4-20 summarizes the estimated 30-year net present value of the distribution and storage alternatives. In addition to the recurring annual costs summarized in Table 4-17, the NPV costs include non-annual maintenance costs for pump overhaul assumed to be $80,000 at year 20 for the recycled water pump station, which is included in all alternatives. An additional $80,000 for pump overhaul costs is included in alternative D1 for the recycled water lift station and in alternative D3 for the recycled water transfer station. Tank recoating costs of $20,000 for the operational storage tank in alternative D1 are also included at year 20.

Table 4-20
Estimate of Net Present Value – Distribution and Storage

Distribution Alternative	Description	Cost ($M)
D1	Operational Recycled Water Storage Only	$9.8
D2	Maximized Use of On-Site Ponds as Seasonal Storage at Salida WWTP	$5.7
D3	Maximized Remote Storage	$49.0

Table 4-21 summarizes the estimated 30-year net present value of the no project alternative. The NPV costs for this alternative include maintenance costs for daily equipment functionality checks.

Table 4-21
Estimate of Net Present Value – Distribution and Storage

Distribution Alternative	Description	Cost ($M)
D0	No Recycled Water Project Option	$0

4.6.4 CURRENT WATER COSTS

It is estimated that the cost per acre-foot cost for production of recycled water is approximately $36 to $48 per AF, which is based on annual operating costs of the proposed system and projected recycled water production. This cost does not include capital costs incurred for construction of related facilities.

It is estimated that the cost for a landowner to pump groundwater from a private well is approximately $35 to $50 per AF. The cost for MID surface water is approximately $30 to $38 per AF additional to the MID flat rate of $53 per acre, while the cost of groundwater is estimated at $33 to $48 per AF.

4.7 ENERGY USAGE AND ANALYSIS

Energy usage for the recycled water distribution system will primarily be the energy required by the pump stations used to convey the recycled water. This includes the following pump stations:

- The Recycled Water Pump Station, used for recycled water delivery for irrigation in all distribution alternatives;

- The Recycled Water Lift Station included, which would convey recycled water to the operational storage tank prior to irrigation in alternative D1; and
- The Recycled Water Transfer Pump Station which would deliver tertiary treated water to the remote storage pond prior to delivery to landowners in alternative D3.

The energy costs associated with these pump stations will be incorporated as part of the detailed design of the facilities.

4.8 WATER QUALITY IMPACT COMPARISONS

Implementation of the recycled water planning study would result in the addition of another source of high-quality irrigation water within Stanislaus County. By providing additional recycled water for irrigation, it is expected that recycled water will facilitate the overall basin water balance by replacing a portion of the local groundwater that would have otherwise been used for irrigation purposes as well as improve local groundwater nitrogen conditions through crop uptake of nitrogen in the recycled water.

Section 5

Recommended Project

Based on the potential benefits to end users, the permitting requirements, and the cost as presented in the previous sections, the recommended project is described below.

5.1 SUMMARY OF RECOMMENDED ALTERNATIVES

The recommended project is a combination of alternative T1 and alternative D1, which incorporate the key tertiary treatment processes of cloth disk filtration and UV disinfection, the operational recycled water storage, and additional on-site disposal to accommodate future flows of 1.4 Mgal/d. No upgrades to the headworks or secondary treatment processes are included in this project because the existing facilities were deemed to be adequate for producing the influent flow and water quality for the tertiary treatment system.

5.1.1 SUMMARY OF RECYCLED WATER PRODUCTION FACILITIES IMPROVEMENTS

The recommended recycled water production facility improvements include designing and constructing the following key tertiary treatment facilities:

- Filtration feed pumping station
- Rapid mixers and flocculation tank
- Chemical storage and addition systems
- Cloth disk filtration system
- UV disinfection system
- Recycled water pumping station
- Ancillary facilities, equipment, and piping

The existing headworks and secondary treatment facilities would be retained without any significant modifications. A site map depicting a preliminary footprint of the recommended project facilities is presented in Figure 5-1.

Figure 5-1
Site Map of Recommended Project

The planning criteria for the recommended project described below are based on the WWTP's estimated future ADWF of 1.4 Mgal/d, and it is assumed that disinfected tertiary recycled water will be produced to meet recycled water demand as secondary effluent is produced. Secondary effluent in excess of the recycled water demand would be sent to the rapid infiltration basins for disposal. Tertiary treated recycled water bound for irrigation will be sent to the 900,000 gallon operational storage tank to facilitate irrigation delivery cycles. Operational storage will not be utilized during the non-irrigation season. Table 5-1 provides a summary of the facilities planning criteria for the recycled water production facilities of the recommended project.

Table 5-1
Compiled Preliminary Production Facilities Planning Criteria of Recommended Project

Parameter	Units	Value
Headworks Facility Components (Existing, No Change)		
Inlet Structure		
Number of Channels	–	3
Channel Dimensions (width x height)	ft, each	2.5 x 5
Flow capacity	Mgal/d	12.75
Raw Wastewater Pump Station		
Pump type	–	Submersible centrifugal pump
Number of pumps	–	3 duty + 1 standby
Motor drive type	–	2 VFDs + 2 constant speed

Parameter	Units	Value
Maximum pump flow	Mgal/d, each	3
Total flow capacity	Mgal/d	8
Screening Equipment		
Type of screen	–	Perforated mechanical screen
Number of screens	–	1
Flow capacity	Mgal/d	6
Grit Removal Equipment		
Type of grit removal system	–	Vortex
Number of grit removal systems	–	1
Flow capacity	Mgal/d	8
Flow Measuring Equipment		
Type of flow measurement	–	Parshall flume
Number of flumes	–	1
Size of flume	inch	12
Flow capacity	Mgal/d	10
Secondary Treatment Components (Existing, No Change)		
Sequencing Batch Reactors		
Type of SBR	–	Intermittent Cycle Extended Aeration System (ICEAS)
Number of basins	–	3 duty
Basin capacity	Mgal/d, each	0.6
Effluent Pumps		
Pump type	–	Vertical turbine pump
Number of pumps	–	1 duty + 1 standby
Maximum pump flow	Mgal/d, each	10.6
Total flow capacity	Mgal/d	10.6
Rapid Infiltration Basins		
Total flow capacity, maximum monthly ADWF	Mgal/d	2.4
Tertiary Treatment Components		
Filtration Feed Pumps		
Minimum pump flow	Mgal/d	0.6
Maximum pump flow	Mgal/d	1.4
Total Dynamic Head	ft	23
Number of pumps	–	1 duty + 1 standby
Pump Type	–	Vertical turbine pump
Wet well dimensions (length x width x depth)	ft	25 x 15 x 16.5
Pump horsepower	hp	10
Motor drive type	–	VFD
Secondary Effluent Turbidity	NTU	7.5
Rapid Mixing System		
Detention time at max flow	seconds	20
Number of tanks installed	–	1 duty + 1 standby
Number of tanks required at max flow	–	1
Tank dimensions (length x width x depth)	ft	3.5 x 3.5 x 3.5
Tank freeboard	ft	2
Number of mixers per tank	–	1 duty
Velocity gradient G, maximum	s^{-1}	1,000
Mixer horsepower	hp	2
Motor drive type	–	VFD
Flocculation System		
Detention time per tank at max flow	minutes	16
Number of tanks installed	–	1 duty
Number of tanks required at max flow	–	1
Tank dimensions (length x width x depth)	ft	17 x 11 x 11.5
Tank freeboard	ft	2
Number of flocculant mixers per tank	–	1 duty
Mixing energy x detention time (G*t) at max flow	–	40,000

Parameter	Units	Value
Mixer horsepower	hp	1
Motor drive type	–	VFD
Coagulant Addition System		
Number of coagulant pumps	–	1 duty + 1 standby
Coagulant type and bulk concentration	% by volume	Alum, 48%
Coagulant dose rate, average[a]	mg/L	25
Storage Tank	gallons	1 @ 1,100
Days storage at 972 gpm	days	15
Cloth Disk Filtration System		
Number of filters required	–	2 (1 duty + 1 standby)
Number of disks per filter	–	4
Filter chamber dimensions	ft	5.4 x 7.8 (filter chamber) 3.3 x 5.2 (effluent chamber)
Disk type	–	OptiFiber PES-14
Maximum hydraulic loading rate	gpm/ft^2	2.3
Filter hydraulic capacity, initial	gpm, each	972
Backwash rate, maximum	%	3
Alarms		High turbidity (filter influent, filter effluent)
UV Disinfection System		
UV dose, minimum [b]	mJ/cm^2	100
UV transmittance, minimum [c]	% at 254 nm	55
Basis of design Open-Channel UV technology	–	TrojanUVSigna
Lamp type	–	Low-pressure high-output (LPHO), in quartz sleeves
End of lamp life factor	–	0.86
Lamp fouling factor	–	0.85
Lamp cleaning system	–	Automatic chemical/mechanical
Number of channels	–	1
Flow per channel	Mgal/d	1.4
Channel dimensions (ft, per channel)	ft, per channel	30 (L) x 2.6 (W) x 7.8 (D)
Number of banks per channel	–	3 duty + 1 standby
Number of lamps per bank	–	8
Total number of UV lamps	–	32
Lamp power draw	W, per lamp	1,000
Peak power draw [d]	kW	33.7
Water level control mechanism	–	Fixed effluent weir
Headloss across UV channel at design flow [e]	inches	3.5
Monitoring	–	• Continuous measurements for flow rate, UVT, UV intensity, operational UV dose, turbidity • On/off status for each reactor and lamp, lamp age, reactor on/off cycles, power consumption and power set point, liquid level in reactor, GFI • Daily sampling for fecal coliform
Alarms	–	Lamp failure, low UV intensity, low UVT, high turbidity, low operational UV dose, high and low water level, GFI
Recycled Water Pumping		
Minimum pump flow	Mgal/d	0.6
Maximum pump flow	Mgal/d	1.4
Number of pumps	–	1 duty +1 standby
Total Dynamic Head	ft	120
Pump Type	–	Vertical turbine pump
Wet well dimensions (length x width x depth)	ft	30 x 20 x 10
Pump horsepower	hp	40
Motor drive type	–	VFD

[a] *Should be refined during detailed design.*
[b] *Based on 99.999 percent (5-log) inactivation of F-specific bacteriophage MS2 or poliovirus.*

[c] Limited UVT data was available. Fifty-five percent UVT was assumed as a reasonably conservative value for system design. This assumption may be updated at a later date depending upon further data collection.
[d] Control center and other small ancillary power draws are not included.
[e] Assumes headloss through the banks is 0.5 inch and headloss across fixed weir will be 3 inches.

5.1.2 Summary of Recycled Water Use Project

The recommended recycled water use includes designing and constructing the following key recycled water storage and delivery components:

- Recycled Water Lift Station
- Operational Storage Tank
- Recycled Water Delivery Pipelines (Alignment 2, phased approach)
- On-Farm Connection Assemblies

The project will include construction of a recycled water distribution pump station at the WWTP, and an initial length of distribution piping of 14,750, which can be expanded to reach additional landowners over time.

Based on the future projected flows to the WWTP of approximately 1.4 Mgal/d and assuming this recycled water production capacity, irrigation scheduling scenarios were evaluated using the method described in Section 4.4.2. An irrigation schedule of 10 hours on and 14 hours of storage (at a minimum of 180 acres irrigated) was determined to be the optimal delivery schedule for recycled water under the projected 1.4 Mgal/d production rate. This results in a peak irrigation flow rate of approximately 2,400 gpm. Table 5-2 provides a summary of the parameter values assumed for direct delivery under projected 1.4 Mgal/d flows for the recommended project.

Table 5-2
Irrigation Delivery Evaluation Criteria Assuming 1.4 Mgal/d Recycled Water Production

Parameter	Unit	Value ADWF @ 1.4 Mgal/d
Total Irrigated Area	Ac	180
Peak Daily Irrigation Area	Ac	135
Irrigation Efficiency	%	85
Irrigation Duration	hrs	10
Peak Irrigation Flow Rate	gpm	2,400

This recommended project would also include 900,000-gal of on-site operational recycled water storage and utilize the secondary effluent percolation ponds as a means to accommodate additional disposal and meet reliability criteria of Title 22. Tertiary treated recycled water storage would be limited to the operational storage provided in one above ground 900,000-gal steel storage tank. A summary of the facilities planning criteria for the recommended project is shown in Table 5-3.

Table 5-3
A Summary of the Facilities Planning Criteria for the Recommended Project

Parameter	Value
Plant Piping	
Pipe Size (in)	18
Length of Piping	520
Operational Storage	
Tank Capacity (Mgal)	0.9
Tank Diameter (ft)	80
Tank Height (ft)	24
Tank Material Type	Bolted Steel
Tank Concrete Pad Dimensions (ft) (width x length)	150 ft x150 ft
Recycled Water Lift Station	
Total Dynamic Head (ft)	24
Number of pumps	2 duty + 1 standby
Pump Type	Vertical Turbine Pump
Pump horsepower (hp)	10
Recycled Water Distribution Pipeline	
Pipe Size (in)	18
Length of Piping (ft)	14,750
On-Farm Connection Assembly	
18" Modulating Control Valve	2
18" Magnetic Flow Meter	2
18" Double Door Disc Check Valve	2
Pressure Indicating Transmitter	2
18" Dismantling Joint	2

The recommended layout of the proposed facilities including the new tertiary treatment facilities, recycled water pump station, and location of the operational recycled water storage tank and lift station is shown in Figure 5-2. An overview of the proposed recycled water distribution facilities under the recommended alternative is shown in Figure 5-3.

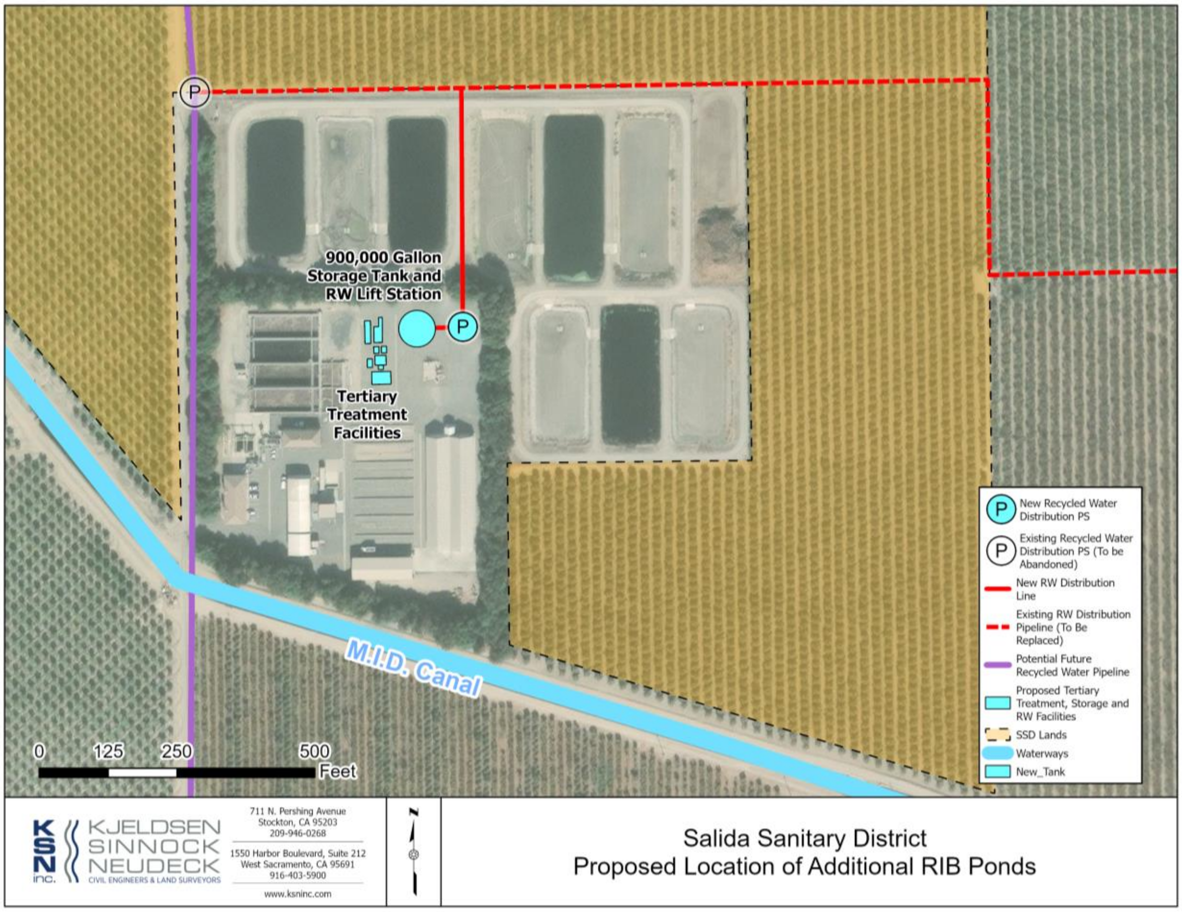

Figure 5-2
Location of Proposed Facilities Under the Recommended Project

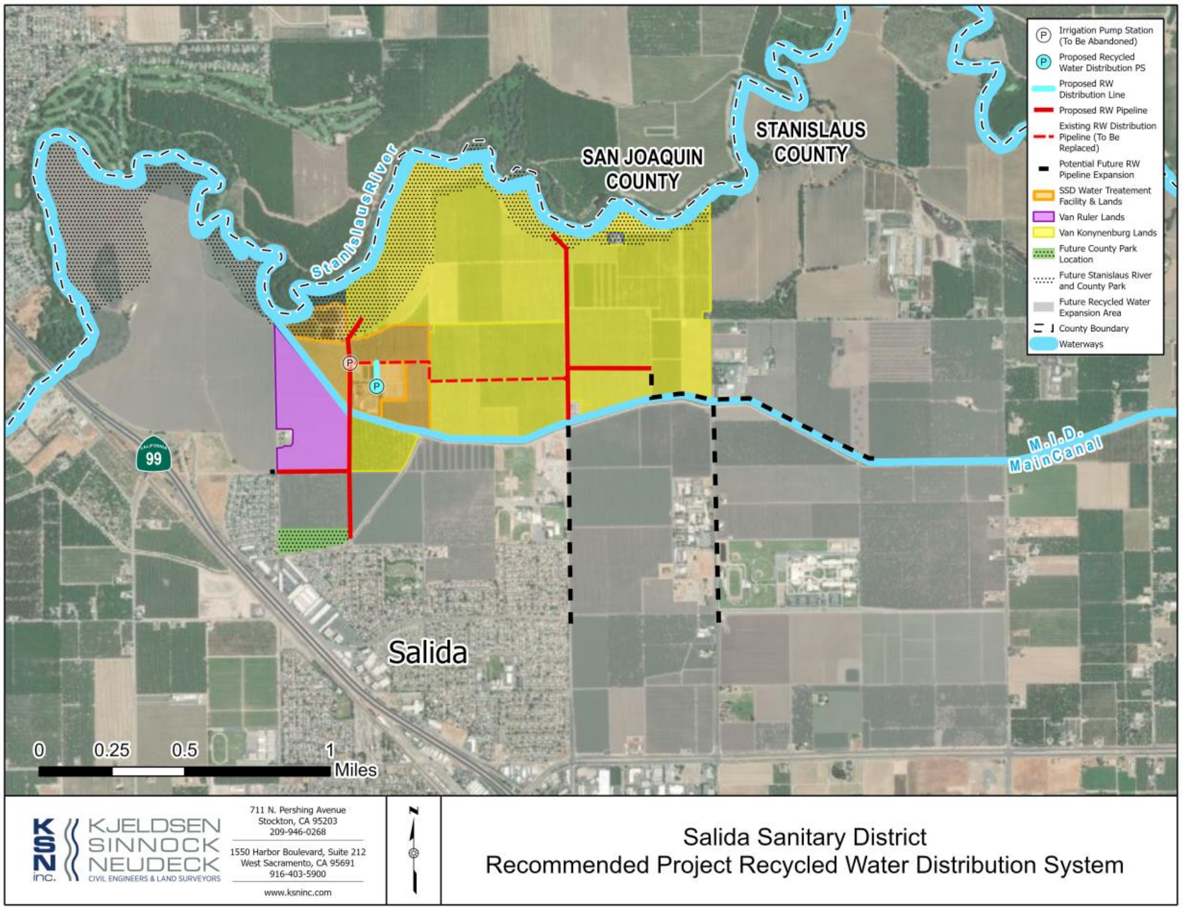

Figure 5-3
Proposed Recycled Water Distribution System

5.1.3 RECOMMENDED PROJECT COST SUMMARY

The estimated probable capital, O&M, and NPV costs for the recommended project are summarized in Table 5-4 . NPV costs are based on an assumed 30-year lifecycle for the project and assume an escalation rate of 2.1 percent and discount rate of 2.5 percent. All costs are in 2024 dollars.

Table 5-4
Summary of Estimated Probable Capital, O&M, and NPV Costs for Recommended Project

Description	Cost Type	Estimated Cost ($)
Tertiary Treatment System Including Cloth Disk Filtration and UV Disinfection	Capital Cost	$12,100,000
	Annual O&M Cost	$115,000
	30-year NPV Cost	$15,300,000
Operational Recycled Water Storage and Additional On-Site Storage for RW Delivery	Capital Cost	$7,998,000
	Annual O&M Cost	$63,000
	30-year NPV Cost	$9,800,000
Total Recommended Project Capital Cost		**$21,900,000**

5.2 RELIABILITY FEATURES AND TITLE 22 REQUIREMENTS

Reliability of the recycled water system is provided by the redundancy of the various components of the system. The recycled water pump station will be provided with a standby pump to provide redundancy in the delivery system. Additionally, the continued use of existing RIBs provide a means for storage and disposal of secondary treated water to be used to meet demand under peak periods and provide for an alternative disposal means to recycled water, satisfying Title 22 reliability requirements.

Section 6

Construction Financing Plan and Revenue Program

The following section discusses conceptual plan for financing capital costs and alternative approaches to pay for the costs of operations, maintenance, and replacement of the recommended production and distribution alternatives discussed in Section 5. This includes a plan for financing of the construction, operations, maintenance, and replacement costs and summarizes the expected costs to be borne by the District, with potential funding sources such as grants and/or loans available to reduce the costs to be covered by the District. Preliminary capacity charge calculations and user rates for sewer service and recycled water deliveries have been estimated based on the capital costs and loan debt servicing as well as covering the additional facilities operation and maintenance, as discussed in the following sub-sections. The proposed financing plan encapsulates the financing elements of the first phase of recycled water distribution facilities, referred to as Pipeline Alignment 2, discussed in Section 4.4.3. The recycled water delivery system is expected to expand into Pipeline Alignment 1 over time as new recycled water users are identified and incorporated into the system and likely as development occurs within the study area.

6.1 METHODS OF PROJECT FINANCING

There are a variety of financing sources available to the District for capital improvements, replacements, and expansion of wastewater treatment and management systems. These options include developing and using cash reserves and operating revenues, state revolving fund grants and loans, and tax-exempt borrowings such as general obligation bonds, special tax bonds, assessment bonds, revenue bonds, bond pools, and certificates of participation. With a District that has existing dedicated wastewater system connections as a source of revenues, the typical financing methods of revenue bonds, bond pools, certificates of participation, or other state-sponsored low-interest loans, would entail repayment of the debt using revenues from user fees.

All revenue-supported, tax-exempt borrowing methods have similar structures where revenues of the borrower are pledged to pay the annual debt service (principal and interest) and the borrower pledges that net revenues (gross revenues less O&M expenses) are maintained above a minimum level. The utility revenue is identified and can be forecasted reasonably. A set of reasonably available funding and financing sources to provide the District with the capital costs needed to construct the recycled water production, storage and distribution system as described in Section 5.1 are summarized in Table 6-1.

Table 6-1
Funding and Financing Sources Available to Salida Sanitary District

Funding/Financing Source	Finance Type	Funding Amount	Typical Financing Term
US Bureau of Reclamation Title XVI WaterSMART	Federal Grants	Lesser of $20M or 25% of project cost	N/A
SWRCB Clean Water State Revolving Fund	State Grant & Loans	Up to 35% of project cost	20-year amortization at 1.85% interest or 30-year amortization at 3% interest
EPA WIFIA Loan Program	Federal Loans	N/A	30-year at 4.24% interest (1)
Traditional Bonds	Municipal Revenue Bonds	N/A	30-year amortization at 5.0% interest, with interest depending on bond market

(1) Interest rate based on SLGS table 30-year yield as of 9/15/2023: SLGS Tables

The US Bureau of Reclamation (USBR) Title XVI WaterSMART program provides funding grants of up to 25% of the project costs, or $20 million, whichever is less, for projects that promote energy efficiency and drought resiliency.[33] The District may choose to apply for the maximum available funding from the program for the Recommended Project.

The SWRCB administers the Water Recycling Funding Program (WRFP) to provide project funding for construction costs of recycled water facilities through the Clean Water State Revolving Fund (CWSRF).[34] Water recycling projects may receive any combination of grant and loan financing when funds are available. Grant funds, if awarded, may be up to 35% of the construction cost for the project up to a total of $15M. Interest for the loans is typically 50% of the most recent state general obligation bond rate (approximately 5%), and a 0.25% rate reduction is applied if the District were to apply for the 20-year amortization instead of the 30-year period. Therefore, the District could obtain this fund at a rate of 1.85-3% interest, with the current rate as of October 11, 2023 being 3.00% for the CWSRF.

The Environmental Protection Agency (EPA) Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established a federal credit program administered by the EPA that offers loans or loan guarantees to water and wastewater projects of regional and national significance for up to 49% of eligible project costs.[35] Wastewater projects that are eligible for the CWSRF are also eligible for this program. The cost threshold for the WIFIA loan program are project costs that are anticipated to be at least $20 million. The WIFIA program offers fixed-rate credit instruments that are at interest rates no less than the yield on U.S. Treasury securities of a similar maturity. To establish the interest rate on the date of the loan closing, the WIFIA program will identify the Treasury rates through use of the daily rate tables published by the Bureau of the Public Debt for State and Local Government Series (SLGS) investments. The WIFIA program will then add one basis point to the SLGS rate as this is equal to the Treasury rate. To estimate the yield on comparable Treasury securities, the WIFIA program will use a maturity that is closest to the weighted average loan life of the WIFIA credit assistance, measured from first disbursement.

Traditional bonds, or municipal bonds, are a potential debt instrument that the District could take advantage of with bond repayment being based on pledging user fees or a specific source of regular revenue or through development of an assessment district with a land-based assessment. For bonds to be a viable means of financing, the high cost of bond issuance has to be a relatively small fraction of the total debt, therefore only the largest project costs are considered viable for bond financing.

Based on the funding programs available, it is recommended that the District pursue as much funding as possible through the grant and Federal and State low interest loan programs listed in Table 6-1. However, availability or

[33] US Bureau of Reclamation WaterSMART Title XVI Program: https://www.usbr.gov/watersmart/title/index.html

[34] SWRCB CWSRF WRFP: https://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/.

[35] EPA WIFIA Program: https://www.epa.gov/wifia/wifia-program-handbook

likelihood of the District to retain grant funding remains uncertain in the future, and there is no guarantee that application to the programs presented in Table 6-1 will result in the District receiving any grants.

For the purposes of developing preliminary financial calculations in Sections 6.2, 6.3, and 0, approximately 35% of the project costs are assumed to be reasonably funded through one or more of the state or federal grant programs in Table 6-1. Financing for the remainder of the project may be pursued through low-interest federal and/or state loan programs. It is assumed that the District secures a SWRCB WRFP loan at the rate of 3.0% interest amortized for a 30-year period for calculation purposes.

The potential for a portion of the recycled water delivery project costs to be borne by perspective future developments is considered as a source of project funding, however the timing of such revenue is uncertain. Current regional planned land uses identified in the 2022 Flows and Loads Tech Memo show the level of planned development within the project area within the SSD SOI in Figure 2-4. Because timing of development is uncertain in the vicinity of the planned project area within the timeframe of project implementation, developer contributions are not considered a reliable source of initial funding for the initial phase project. If the pace of development does increase, there is the potential for the District to request up-front funding from large developments as conditions of development to facilitate developing the wastewater treatment and disposal capacity needed to serve those developments.

The District does not currently have outstanding debt obligations or sunken project costs that could be considered in financial planning.

6.2 USER RATES

User rates related to the recycled water storage and distribution system would be based on the debt service of the financing obtained by the District for project implementation from financing sources discussed in Section 6.1 as well as to cover the additional O&M of the recycled water program. Table 6-2 summarizes the loan debt service based on a 30-year amortized state loan at 3% interest. Grant funding amounts of the total capital cost for construction of facilities are presented for three scenarios from 0%, 12.5%, up to 25%, with remaining costs being the loan amount required by the District.

Table 6-2
Construction Loan Summary

Loan Summary	Grant Funding Scenario		
	0% Grant Funding	12.5% Grant Funding	25% Grant Funding
Total Project Cost	$21,900,000	$21,900,000	$21,900,000
Total Grant Amount	$0	$2,628,000	$5,475,000
Loan Amount	$21,900,000	$19,272,000	$16,425,000
Annual Interest Rate	3%	3%	3%
Loan Period	30-Year	30-Year	30-Year
Scheduled Annual Loan Payment	$1,117,322	$983,243	$837,991
Annual O&M (1)	$158,282	$158,282	$158,282
Total Interest	$11,619,653	$10,225,295	$8,714,740

(1) Annual O&M costs for RW production and delivery are borne by recycled water users and sewer service users as discussed in Section 6.4.

The number of current equivalent dwelling units were estimated based on the flow per dwelling unit as calculated in the 2021 Sewer Rate Study prepared for SSD by Capitol PFG. Industrial flows were assumed to be constant based on those estimated in the 2022 Flows and Loads Tech Memo.

Table 6-3
Salida Sanitary District Equivalent Dwelling Units in 2021

Billable Unit Type	2021 (1.07 Mgal/d ADWF) No. Equivalent Dwelling Units (EDUs)
Commercial	807
Industrial	409
Residential	4,269
Total	5,485

Additional user rates for the Recommended Project are calculated by dividing the scheduled annual loan payment in Table 6-2, plus a 1.2 debt service coverage ratio, by the total number of EDUs at 5,485 dwelling units based on 2021 conditions shown in Table 6-3 and adding the net additional O&M cost for the recycled water program minus revenues from recycled water sales. The additional resulting user rates required to service the loan debt in 2023 dollars would be between $212 to $273 per billable unit per year, or approximately $18 to $23 per month, depending on the amount of grant funding awarded. These user rates represent the cost to cover capital costs for the recycled water treatment and distribution facilities and the net additional O&M costs and are in addition to the current user rates covering the operation and maintenance of the existing facilities. The total estimated monthly costs including the current monthly user rate and the additional rates for the Recommended Project are shown below in Table 6-4.

Table 6-4
Component of User Rates to Service RW Distribution Capital Costs

User Rate Component	Grant Funding Scenario		
	0% Grant Funding	12.5% Grant Funding	25% Grant Funding
Additional O&M Costs ($USD) (1)	$158,282	$158,282	$158,282
Loan Debt Service ($USD)	$1,117,322	$983,243	$837,991
Debt Service Coverage(2) ($USD)	$223,464	$196,649	$167,598
Total Debt Service ($USD)	$1,340,786	$1,179,892	$1,005,590
No. of Equivalent Dwelling Units (EDUs)	5,485	5,485	5,485
Additional Annual Base User Rate ($/BU/yr)	$273	$244	$212
Additional Monthly Base User Rate ($/BU/month)	$23	$20	$18
Current Monthly User Rate per 2023 Projection in Rate Study(3) ($/BU/month)	$19.71	$19.71	$19.71
Total Estimated Monthly User Rate with Recommended Project	$42	$40	$37

(4) Annual O&M costs for RW production and delivery minus revenue from RW sales as discussed in 6.4.
(5) Based on 1.2 debt coverage ratio of SWRCB Policy for Implementing the CWSRF, December 3, 2019.
(6) Rates are based on the 2023/2024 Sewer Rates in the Capitol PFG SSD Sewer Rate Study dated May 2021.
Note: Estimates are based on 2024 USD

6.3 CAPACITY CHARGE REVENUES

Capacity charges are established for future connections to the wastewater system that will utilize disposal capacity of the recycled water storage and distribution system. If the recommended project is implemented, it is expected that the District would update its capacity charge program for future connections to the system in order to provide a source of revenue to cover the capital cost of the facilities needed to serve those future connections. The capacity charge revenue requirements have been estimated by taking the sum of the capital costs for the Tertiary Treatment System upgrades Including Cloth Disk Filtration and UV Disinfection ($12.1M), the initial phase of the RW storage and distribution project ($9.8M), and loan interest ($8.7M), subtracting grant funding from the capital costs (preliminarily assumed at 25% funding, $5.5M), and then dividing by the disposal capacity required for future users (approx. 0.33 Mgal/d) to estimate the cost per unit capacity.

Grant coverage (if received by the District) is applied to benefit both existing and future users for capacity, consistent with the basis of fee setting recommended by both the Water Environment Federation (WEF) Manual 27[36], and the American Water Works Association M1[37]. These include the costs from the recommended project discussed in Section 5. Of the secondary treatment costs, approximately 1.07 of the 1.4 Mgal/d capacity is used by existing users, and the remaining available capacity is attributed to the 0.33 Mgal/d contributed by future users. It should be noted that the expected complete buildout of Salida would require additional future projects to provide capacity beyond the 1.4 Mgal/d total capacity that this project offers.

Tertiary level of treatment would be required for future users because of the recycled water usage requirements within the District's WDRs and flows are projected to increase from the current 1.07 Mgal/d to 1.4 Mgal/d which cannot be disposed of using the existing WWTP's means of on-site disposal. Additional means of disposal are intended to be met by seasonal RW irrigation included in the first phase of the $21.9M recommended project discussed in Section 5. Since the existing treatment process has available capacity to meet future needs, but additional disposal processes need to be constructed, e.g., tertiary treatment and recycled water use, the costs of these facilities and their associated capacity, would be the responsibility of future users. A demonstration of the methodology used to delineate cost per unit to future users is presented in Table 6-5.

Preliminary capacity charge (also referred to as Facilities Fee) calculations for the recommended project have been proportioned to future users based on a flow-based Equivalent Dwelling Unit (EDU) basis. This preliminary capacity charge for the recommended project has been compared with the Salida Sanitary District Facilities Fees determined by the June 2015 Facilities Fee Study by Parsons and Associates. The additional charges are summarized in Table 6-6. The capacity charges additional to the existing facilities fees required to recover the capital cost of the recommended project facilities for new users are approximately $2,995 to $3,993 per EDU connection. The range of capacity charges would vary depending on the amount of grant funding the District is able to secure. These estimates should be revisited in the future for update during detailed design.

[36] Water Environment Federation, Financing and Charges for Wastewater Systems, Manual of Practice No. 27: WEF M27
[37] AWWA Manual of Water Supply Practices, Principles of Water Rates, Fees and Charges, 7th Edition: AWWA M1

Table 6-5
Unit Cost of Capacity for Recommended Recycled Water Project

Total Flow: 1.4 Mgal/d Total Additional Flow: 0.33 Mgal/d
Total Capital Costs Tertiary Treatment, Storage, Distribution Costs ($M)
[$12.1M (Tertiary) + $9.8M (Storage and Distribution)] = $21.9
Flow Capacity Contributions (Mgal/d)
0.33
25% Grant Funding ($M)
$5.5
Total Loan Interest (R = 3%) ($M)
$8.7
Application of Grant Coverage Costs Covered by Capacity Charges
[$21.9M (Capital) + $8.7M (Interest) - $5.5M (Grants)] = $25.1M Remaining Capital Cost
Overall User Wastewater Generation Costs ($/GPD)
$76.18

The District's current Facilities Fees, based on the 2023 Facilities Fee calculation effective November 11, 2023 pursuant to Ordinance No. 2023-1, are as follows for residential unit[38]:

- Facilities fees for properties within the District Boundary = $8,814.80 per residential dwelling unit.
- Facilities fees for properties not within the District Boundary = $28,618.23 per residential dwelling.

The basis of these fees is contained in the 2015 Salida Sanitary District Facilities Fee Study prepared by Parsons & Associates. Per Table 1 and Appendix D of the Fee Study report the fee for properties within the District Boundary is based on the cost per gallon capacity of the existing facilities with a capacity of 2.4 Mgal/d.

For the fees for properties not within the District Boundary, fees are based on both the share of cost of capacity in existing facilities and the share of cost of facilities to expand from the current facilities capacity of 2.4 Mgal/d to 5.0 Mgal/d based on the July 22, 2010 WWTP Facilities Evaluation prepared by Black & Veatch, cited in Table 2 and Appendix D.

It should be noted that the existing connection fees presented in the Facilities Fee Ordinance No. 2023-1 present costs per fixture, loading, and per student units for other non-residential customer classes such as schools and heavy industry.

[38] The 2023 Facilities Fees include costs for non-residential uses such as commercial, schools, and light industry.

Considering only the cost of capacity for new connecting properties within the District Boundary, Table 6-6 presents the estimated increase in capacity charges on a per-unit basis to add the recommended project to the program of wastewater treatment and disposal under a range of potential grant coverage. Since the capacity charge for properties not within the District includes facilities that could be duplicative of the recycled water elements, an additional detailed facilities study for capacity beyond the 2.4 Mgal/d secondary process and 1.4 Mgal/d recycled water program would need to be developed, which is beyond the scope of this study. Considering only properties within the current District Boundary the potential capacity charge could increase to approximately $11,809 to $12,808 per EDU or $537 to $582 per fixture unit for light industrial or commercial.

Table 6-6
Existing and Additional Capacity Charges for Residential Dwelling Units

Land Use (Within Boundary) (1)	Existing Collection System Fees for FY 2023/2024(2) (Within Boundary)	0% Grant Coverage	12.5% Grant Coverage	25% Grant Coverage
		Additional Facilities Cost per Unit(1)	Additional Facilities Cost per Unit(1)	Additional Facilities Cost per Unit(1)
Customer Class	**$/Unit**	**$/Unit**	**$/Unit**	**$/Unit**
Residential Dwelling Unit	$8,815	$3,993	$3,494	$2,995
Industrial (Light) per fixture unit	$401	$181	$159	$136
Commercial per fixture unit	$401	$181	$159	$136

(1) Unit cost of capacity for the recycled water facilities of the Recommended Project with a capacity of 1.4 Mgal/d. Light industrial and commercial cost per unit calculated at a factor of 1/22 times the residential dwelling unit per Table 1 of the Parsons & Associates Fee Study Report.

(2) Residential, light industrial, and commercial capacity charges for properties within the District boundary per Ordinance 2023-1.

6.4 RECYCLED WATER USER FEES

Revenues collected from recycled water users are planned for funding the operation and maintenance of the recycled water storage and distribution system. This funding strategy is based on charging for recycled water use at the same or equivalent cost of alternative water sources available to users, namely groundwater or MID surface water.

Based on the current expected operation and maintenance costs of $63,000 per year for the recycled water storage and distribution system, and the current expected production volume of 595 AF/yr, the cost for recycled water storage and delivery is approximated at $106/AF. Since this cost exceeds the cost of alternative water sources to existing users, it is proposed that the recycled water user fee be based on covering a portion of this cost for storage and delivery, up to a cost level commensurate with the cost of alternative water sources available to growers in the recycled water use area. The remaining 68% of the cost of operating the recycled water storage and delivery, just as the cost of recycled water production, would be covered by existing sewer service users.

Based on a 4% annual escalation of the operations and maintenance costs, the total cost of recycled water by 2053 is estimated to be approximately $344/AF. By comparison, the current cost for existing growers to utilize groundwater and pressurize it for irrigation is estimated at approximately $34/AF at current rates as presented below and in Table 3-2, based on an assumed 3% escalation of the current power rates provided in the MID agricultural energy rate schedule. Recycled water charges (for each decade) between 2023 and 2053 are summarized in Table 6-7 below, with a comparison to the estimated cost of pumping groundwater.

Table 6-7
Proposed User Fees for Recycled Water Storage and Delivery

Year	Comparative Costs for Using Groundwater for Irrigation [1] ($/AF)	Proposed Fees for Recycled Water Users [2] ($/AF)
2023	$34	$34
2033	$47	$47
2043	$64	$64
2053	$88	$88

[1] Cost for groundwater use for irrigation is based on MID agricultural user energy rate schedules, escalated at an annual rate of 3%.

[2] Cost share for recycled water users, commensurate with groundwater pumping

Section 7

Implementation and Operational Plan

7.1 LEGAL AND PERMITTING IMPLEMENTATION PLAN

Implementation of the recommended project will require consideration of legal and institutional issues, compliance with the California Environmental Quality Act, and permitting. Approaches to meeting these requirements are summarized below, with a discussion of water rights issues.

7.1.1 LEGAL AND INSTITUTIONAL ISSUES

Since the Phase I recommended project is focused on producing and delivering recycled water to a limited set of interested users, the legal and institutional issues are limited. The following are likely requirements of the Phase I project implementation:

(1) Institutionally the District is expected to have the authority to produce and deliver recycled water and no changes to the District's authority are likely required.

(2) The most likely form of legal relationship between the District and a recycled water user is in the form of an individual service agreement, covering the delivery and use of recycled water. This individual service agreement should address the following elements:

   a. Responsibility for facilities operation and maintenance including recycled water delivery facilities and on-farm recycled water application and monitoring facilities;

   b. Cost of service;

   c. Responsibility for operation and monitoring and reporting under the type of permit to be issued for the recycled water program; and

   d. Other required matters between the District and an individual grower.

(3) The Phase I project service area is coordinated with the current MID irrigation service area. Coordination with MID is recommended regarding the potential overlap of meeting grower irrigation water supply needs, however specific jurisdictional and service area requirements are not expected to be challenges, particularly operating under the framework of an individual service agreement between the District and the recycled water user.

(4) In developing the recycled water program and service area, it is recommended that the District consult with the Stanislaus County Local Agency Formation Commission (LAFCO) regarding the service to be provided by the District's program and LAFCO's coordination of public agency services.

7.1.2 ENVIRONMENTAL CHECKLIST

The project scope excluded the development of an environmental checklist. If the District proceeds with the recommended project, an environmental checklist will need to be performed. The checklist will serve as an initial evaluation of the expected environmental impacts associated with the project, based on the projects level of development. The checklist should be based on the requirements for determining the significance of environmental impacts based on California Environmental Quality Act (CEQA). It should be noted that federal funding for the project could trigger the requirements for evaluation of environmental impacts under National Environmental Policy Act (NEPA) in addition to the requirements of CEQA. It is possible that an Initial Study/Mitigated Negative Declaration will be required in preparation for the proposed project.

7.1.3 Permitting Strategy

Permitting of the Recycled Use portion of the Recommended Project is anticipated to be under the General Order Water Reclamation Requirements for Recycled Water Use, Order WQ 2016-0068-DDW, which avoids the need for individual permits issued by the RWQCB for each site under the traditional WDR permit program. This option also provides the most flexibility in where recycled water can be used and would establish the District as the recycled water producer, distributor, and administrator.

For new recycled water projects, submittal of a Notice of Intent (NOI) to the RWQCB for coverage under Order WQ 2016-0068-DDW will be required in addition to an Engineering Report (ER) to the SWRCB DDW, which both contain water recycling technical reports conveying the following information:

1) A description of existing and/or proposed treatment, storage, and transmission facilities for water recycling;

2) Descriptions of how recycled water will be used by the landowners, including types of uses (crop type, irrigation method, etc.) and use areas; and

3) Proposed operations and management plans describing how the water recycling program will be managed and administered to comply with regulatory requirements.

As mentioned above, a water recycling program defining the rules and regulations of how the District will administer water recycling will also be required to accompany the NOI submitted to the RWQCB. If the water recycling program is approved by the DDW and coverage of the program under the General Order approved by the RWQCB, the permitting of recycled water uses is streamlined by the delegation of authority to the District to manage water recycling programs to an Administrator (in this case Salida Sanitary District). The general roles and responsibilities of those involved in the water recycling program are defined in Table 7-1.

Table 7-1
Water Recycling Program Roles and Responsibilities

Role	Entity in Role	Description of Responsibilities
Administrator	Salida Sanitary District	An entity that submits an NOI and application fee to the RWQCB for coverage under the General Order WQ 2016-0068-DDW. An Administrator may issue use permits for uses of recycled water consistent with the Uniform Statewide Recycling Criteria. An Administrator is responsible for coordinating, collecting data, and reporting the monitoring reports to the RWQCB.
Distributor	None	An entity that receives recycled water from a producer for the purpose of distribution to Users. In some cases, a distributor may provide additional treatment to meet the Uniform Statewide Recycling Criteria for its intended use, and distributes it to Users. A Distributor may not take physical possession of the recycled water and may act simply as an Administrator.
Producer	Salida Sanitary District	An entity that produces recycled water
Recycled Water Supervisor	Salida Sanitary District	A person designated by the Administrator that acts as the coordinator between the supplier (producer/administrator) and the User(s). The Recycled Water Supervisor shall have authority to ensure recycled water use complies with the General Order, NOA and the Uniform Statewide Recycling Criteria.
Use Area Supervisor	User(s)	A person designated, by the owner or manager of the property upon which recycled water will be applied, to discharge the responsibility from the owner or manager of the property for: (a) installation, operation and maintenance of a system that enables recycled water to be used; (b) for prevention of potential hazards; (c) implementing and complying with conditions of all Water Recycling Use Permits and associated documents; (d) coordination with the cross-connection control program of the supplier of drinking water and the local health/environmental health agency; (e) control of on-site piping to prevent any cross connections with potable water supplies; (f) routine inspection and maintenance of (any) backflow prevention devices. (A Recycled Water Supervisor and Use Area Supervisor may be one in the same in some instances).
User	User(s)	Users take physical possession of the recycled water from the Producer and/or Distributor for an approved beneficial recycled water use consistent with the Uniform Statewide Recycling Criteria. Users may use the recycled water under either a Water Recycling Use Permit from an Administrator or act as an Administrator under the General Order.

The Administrator is given the authority to manage the water recycling program and issue Water Recycling Use Permits directly rather than from the RWQCB. Users of recycled water will still be subject to the conditions of the General Order under their Recycled Water Use Permits, but responsibility for permitting and enforcement of recycled water use will fall to the District rather than the RWQCB. A general outline of a water recycling program that would need to be created by the District is provided in Table 7-2. The development of the user permit and application is excluded from the scope of this document.

Table 7-2
Sample Water Recycling Program Table of Contents

Section I	–	Definitions
Section II	–	Introduction
Section III	–	Policy for Recycled Water Use
Section IV	–	Procedure for Obtaining a Recycled Water Reuse Permit
Section V	–	Requirements for Permitted Recycled Water Users
Section VI	–	Cross-Connections in Recycled Water Use Areas (may be prohibited for ease of permitting)
Section VII	–	Prohibited Uses of Recycled Water
Section VIII	–	Best Management Practices (BMPs) for Recycled Water
Section IX	–	Salida Sanitary District Rights of Recycled Water Use
Section X	–	Enforcement of Recycled Water Permits and Uses
Section XI	–	Emergency Conditions and Operations

The current process for project approval and permitting of Recycled Water projects is depicted in Figure 7-1. The RWQCB would issue the permit based on requirements consistent with the General Order, the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan), and SWRCB DDW review of the project under Title 22 requirements.

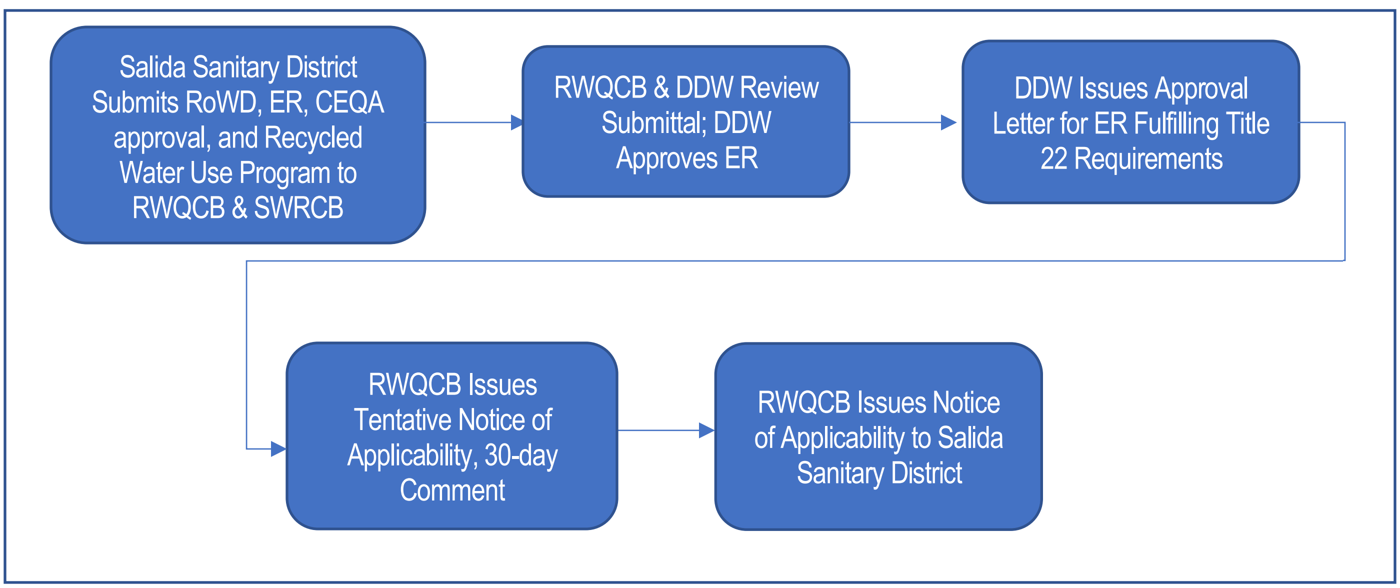

Figure 7-1
SWRCB Water Recycling Requirement Permitting Process

A variety of permits and regulatory actions are potentially required to implement the Recommended Project. As summarized in Table 7-3, the permitting agencies, regulatory programs and project phases when permits may be obtained are detailed for the Recommended Project. Although the recycled water use for irrigation can be permitted under General Order WQ 2016-0068-DDW, activities at the WWTP including disposal of treated wastewater by means of percolation ponds would not be applicable to that Order. Therefore, WDRs for the WWTP will continue to be required separately from recycled water use permitted under the General Order.

Table 7-3
Permitting Strategy for the Recommended Project

Project Phase	Regulatory Agency	Regulatory Program	Description
Required Permits			
Planning	Salida Sanitary District as Lead Agency	CEQA Compliance	California Environmental Quality Act (CEQA), is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
Planning	Environmental Protection Agency; or U.S. Bureau of Reclamation	NEPA Compliance	National Environmental Policy Act (NEPA) is the Federal equivalent of CEQA; NEPA can be done in conjunction with CEQA, pending the Lead Agency preference.
Planning and/or Design	RWQCB	WDR Permitting	Revision of existing WDRs via Report of Waste Discharge and NOI submittal for enrollment under General Order WQ-2016-0068-DDW. Submittal of the Salida Sanitary District Recycled Water Use Program
Planning and/or Design	SWRCB	DDW RW Program	Title 22 Engineering Report, Salida Sanitary District Recycled Water Use Program, and review of NOI that was submitted to the RWQCB.
Potential Required Permits			
Planning	SWRCB	Wastewater Change Petition	As discussed in Section 7.1.4, a petition would be required by the SWRCB if the District's WWTP discharged to the Stanislaus River. This requirement is not expected to be applicable to the Salida WWTP.
Planning	CA Dept. of Fish & Wildlife (CDFW) National Marine Fisheries Service (NMFS)	Section 7 Consultation/Biological Opinions	Section 7 of the Endangered Species Act (ESA) requires all federal agencies, in consultation with CDFW and NMFS, to ensure that their actions do not jeopardize the continued existence of species listed as endangered or threatened or result in the destruction or adverse modification of the critical habitat of these species. Section 7 prohibits federal agencies from implementing an action that would result in the take of a species listed as threatened or endangered unless a biological opinion issued by CDFW. Take is defined by harassing, harming, pursuing, hunting, wounding, killing, or capturing any of these species, or attempting such activities. The requirement for permit may be discussed, but it is ultimately not expected to be required. Due to the lack of direct impacts that the Study will have on the Stanislaus River flow or water quality, the likelihood that the Study would result in measurable harm or take of an endangered species is expected to be negligible.

7.1.4 WATER RIGHTS

The Recommended Project is not expected to have an impact on existing water rights. The WWTP does not currently discharge to surface water, and the existing percolation ponds at the WWTP will be maintained and expanded for seasonal use. Recycled water production will change the end use of effluent, from disposal in the percolation ponds to use in the vicinity as irrigation water. Although the location of ultimate disposal is changed by the recycled water use, it is expected that the same benefit to groundwater recharge that may result from use of the percolation ponds will be seen from the use of recycled water.

As mentioned above, the WWTP does not have a discharge to surface water, however there may be indirect connection to the Stanislaus River through the groundwater and the adjacent Lower ponds. California Water Code (CWC) Section 1211 requires that approval from the SWRCB Division of Water Rights must be obtained prior to making any change in the point of discharge, place of use, or purpose of treated wastewater that has historically been discharged to a surface stream. To approve a wastewater change petition, the SWRCB must determine that the proposed change will not injure any other legal user of the water involved, will not unreasonably affect instream uses including fish and wildlife, and is in the public's interest. Because treated effluent from the Salida WWTP is not currently discharged to surface water, no such approval is expected to be required for implementation of the Study. If in the future the WWTP did discharge to surface water, any new flows may be exempt from this requirement.

Implementation of the Recommended Project is not expected to cause significant decreases to the streamflow of the Stanislaus River due to continued use of percolation disposal methods at the WWTP. Additionally, when recycled water is produced by the WWTP and utilized for irrigation by local landowners, it is expected that the recycled water volume will offset the same volume of surface water that otherwise may have been diverted from the Stanislaus River for the same purpose.

7.1.5 MASTER PLANNING AND DISTRICT POLICIES

As the District considers implementing a recycled water program, it is recommended that facilities master planning, design and improvement standards, and standard conditions of approval for new development be created. Examples of these elements include:

> Master Planning: Master facilities planning can take the facilities alternatives and recommended project contained in this Study and develop additional improvement phasing and buildout alternatives. Master planning could consider the program for expansion of the recycled water system from the initial Phase 1 gravity system to a systematically expanded pressure system to serve future landscape irrigation needs. From such master planning, capital costs and capacity charge basis can be refined.
>
> Improvement Standards: Sinch much of the future recycled water distribution system is likely to be constructed by new development, standards for facilities design and construction would be developed to result in a consistent set of improvements that would serve the District in the future.
>
> Standard Conditions of Approval: With the improvement standards, conditions of approval for new development should include the requirements to construct and/or pay for the development of recycled water infrastructure per the master plan.

Future capacity charges would be based on the master plan facilities and implementation of future improvement standards and conditions of approval.

7.2 DESIGN AND CONSTRUCTION IMPLEMENTATION PLAN

Key milestones within the design and construction categories are summarized below.

- Design
  - Basis of Design Report (BODR) – submittal of conceptual level drawings (15% to 30%), sequence of construction, construction schedule, and cost opinion to help inform decisions.
  - 60 Percent Design – submittal of 60 percent design drawings and specifications for District review and comment. Comments from this submittal will be incorporated into the 90 percent design submittal.
  - 90 Percent Design – submittal of 90 percent design drawings and specifications for District review and comment. Comments from this submittal will be incorporated into the final bid set.
  - Final Bid Set – submittal of signed and sealed contract documents, schedule, and cost opinion.
- Construction
  - Bid Phase – the bid phase includes advertising the upcoming request for bids, responding to contractor inquiries, reviewing bids, and awarding the selected bid.
  - Construction of project.
  - Commissioning and startup of project.

7.3 OPERATIONAL PLAN

As discussed in Section 7.1.3, the District would assume the role of Administrator of the Recycled Water Use Program that submits an NOI and application fee to the RWQCB and SWRCB for coverage under the General Order. An Administrator may issue permits for use of recycled water consistent with the Uniform Statewide Recycling Criteria. An Administrator is responsible for coordinating, collecting data, and reporting the monitoring reports to the RWQCB. As the recycled water Administrator and Distributor, the District would be responsible for permitting and providing recycled water to Users under the conditions of the Water Recycling Administration Requirements of General Order WQ 2016-0068-DDW part C[39].

As a producer of recycled water from the WWTP, the District would be issued a Water Reclamation Requirement Order from the RWQCB. In addition to the notice of intent (NOI) submittal for regulatory permitting of facilities, the District would be required to submit the Recycled Water Use Program to accompany the NOI. The District's water recycling program establishes the rules and regulations for permitting recycled water uses and facilities by a water recycling program Administrator.

Monitoring and reporting requirements for the WWTP would be assigned based on the current General Order WQ 2016-0068-DDW MRP. Other requirements for staffing, record keeping and wastewater disposal are regulated under CCR Titles 22, 23 and 27 as discussed in the following sections.

[39] SWRCB Water Reclamation Requirements for Recycled Water Reuse: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/requirements.html

7.3.1 WWTP Monitoring and Reporting

Administrators of recycled water are required to comply with the Monitoring and Reporting Program (MRP) issued by the RWQCB or SWRCB. The MRP would be specifically tailored to the permitted facility and is issued pursuant to CWC §13267. Monitoring of recycled water is discussed in detail in the Production Report. Monitoring requirements specific to the use of recycled water are covered in this report.

7.3.2 Recycled Water Use Monitoring and Reporting

Recycled water applied for irrigation would be covered under a separate MRP for the recycled water system. After the recycled water Administrator (Salida Sanitary District) has received a Notice of Applicability (NOA) of coverage under WQ 2016-0068-DDW, the Administrator would be required to implement the MRP of Order WQ 2016-0068-DDW, Attachment B. It is expected that as the Administrator of the recycled water use program, the District would assign monitoring responsibilities of the recycled use areas to the recycled water Users as part of the Water Recycling Use Permit program. Discharges from recycled water use sites have been avoided by typically requiring users to apply recycled water at the appropriate agronomic rates to prevent runoff and discharge of recycled water. It is expected that the recycled water users would continue to be held to this requirement for the Recommended Project. Additionally, there may be programmatic monitoring that can occur to reduce the burden on individual users.

The District would retain responsibility to ensure the data is collected, as well as prepare and submit the annual report to the RWQCB. The District may decide to include penalties such as revoking permits from the recycled water User should they not fulfill their monitoring responsibilities. Use areas may be aggregated to combine acreages for calculation or observation purposes, and additional reporting requirements may be assigned as appropriate by the regulatory agency. Expected monitoring and reporting requirements for the recycled use areas are presented in Table 7-4.

Table 7-4
Expected Recycled Use Area Monitoring & Reporting

Parameter	Units	Sample Type	Sampling Frequency [(a)]	Reporting Frequency
Number of Recycled Water Users	--	--	--	Annually
Recycled Water Flow	gpd [(b)]	Meter [(c)]	Monthly	Annually
Acreage Applied [(d)]	Acres	Calculated	--	Annually
Application Rate	Inches/acre/year	Calculated	--	Annually
Soil Saturation/Ponding	--	Observation	Quarterly	Annually
Nuisance Odors/Vectors	--	Observation	Quarterly	Annually
Discharge Off-Site	--	Observation	Quarterly	Annually
Notification Signs [(e)]	--	Observation	Quarterly	Annually

[(a)] Or less frequently if approved by the RWQCB

[(b)] gpd denotes gallons per day

[(c)] Meter requires meter reading, a pump run time meter, or other approved method

[(d)] Acreage applied denotes the acreage to which recycled water is applied

[(e)] Notification signs are required to be consistent with the requirements of CCR, Title 22, §60310 (g)

The recycled water program Administrator is required to prepare the annual reporting of the monitoring data for the Recycled Water Use Program. Reported data is required to be arranged in tabular form so that the date, data type (e.g. flow rate, bacteriological, etc.), and reported analytical or visual inspection results are readily discernible.

Results of any monitoring done more frequently than required at locations specified in the MRP are required to be reported in the next regularly scheduled monitoring report and would need to include calculations as appropriate. The SWRCB or RWQCB may direct the District to electronically submit reports using the State Water Board's California Integrated Water Quality System (CIWQS), or an alternative database.

Annual reports are submitted to the RWQCB by April 1st following the monitoring year. Annual monitoring reports are required to include the following:

(1) A summary table of all recycled water Users and use areas. Maps may be included to identify use areas. Newly permitted recycled water Users and use areas shall be identified. When applicable, supplements to the Title 22 Engineering Report and the SWRCB approval letter supporting those additions should be included.

(2) A summary table of all inspections and enforcement activities initiated by the Administrator. Include a discussion of compliance and the corrective actions taken, as well as any planned or proposed actions needed to bring the discharge into compliance with the NOA or General Order. Copies of documentation of any enforcement actions taken by the Administrator shall be provided.

(3) An evaluation of the performance of the recycled water treatment facility, including discussion of capacity issues, system problems, and a forecast of the flows anticipated in the next year.

(4) Tabular and graphical summaries of all monitoring data collected during the year, including priority pollutant monitoring, if required.

(5) The name and contact information for the recycled water operator responsible for operation, maintenance, and system monitoring (Chief Operator).

7.3.3 Personnel

In accordance with Title 22 of the CCR §60325, the WWTP will be required to operate with a sufficient number of qualified personnel to operate the facility effectively so as to achieve the required level of treatment at all times. Qualified personnel are those meeting the requirements established pursuant to Chapter 9 of the California Water Code (CWC), beginning with CWC §13625 for wastewater operator certification requirements.

Wastewater treatment plant classification and operator certification requirements are regulated under CCR Title 23, Division 3, Chapter 26. The SWRCB staff will classify the wastewater treatment plant based on process complexity and design flow capacity. The final wastewater treatment plant classification would be used to determine the operator certification requirements. Table 7-5 indicates the corresponding wastewater treatment plant classifications for each treatment process and design flows. Based on the design production rate for tertiary recycled water at 1.4 Mgal/d, the proposed WWTP improvements would elevate the WWTP from a Class III to a Class IV (tertiary between 1.0 through 10.0 Mgal/d).

Table 7-5
Wastewater Treatment Plant Classifications

Class	Wastewater Treatment Process	Design Flow (Mgal/d)
I	Primary	1.0 or less
	Conventional Treatment Pond	All
II	Primary	Greater than 1.0 through 5.0
	Biofiltration	1.0 or less
	Modified Treatment Pond	All
III	Primary	Greater than 5.0 through 20.0
	Biofiltration	Greater than 1.0 through 10.0
	Activated Sludge	5.0 or less
	Sequencing Batch Reactor	1.0 or less
	Tertiary	1.0 or less
IV	Primary	Greater than 20.0
	Biofiltration	Greater than 10.0 through 30.0
	Activated Sludge	Greater than 5.0 through 20.0
	Sequencing Batch Reactor	Greater than 1.0 through 10.0
	Tertiary	Greater than 1.0 through 10.0
V	Biofiltration	Greater than 30.0
	Activated Sludge	Greater than 20.0
	Sequencing Batch Reactor	Greater than 10.0
	Tertiary	Greater than 10.0

Because the WWTP would be classified as a Class IV facility, the minimum grade level for the Chief Plant Operator of the WWTP would be Grade IV. While the Chief Plant Operator must be the grade level that matches the WWTP classification, the Operator-in-Charge (designated by the Chief Plant Operator) can be grade III or higher. Minimum grade levels for Chief Plant Operators and Operators-in-Charge per WWTP classification level are presented in Table 7-6, consistent with the requirements of CCR Title 23, Chapter 6, Article 3, §3680. For Class IV and V WWTPs, at least 50 percent of the Operators are required to possess valid Operator or Operator-in-training certificates at Grade II level or higher.

Table 7-6
WWTP Operator Grade Level Requirements

WWTP Classification	Chief Plant Operator Minimum Grade Level	Designated Operator-in-Charge Minimum Grade Level
I	I	I
II	II	I
III	III	II
IV	IV	III
V	V	III

Unless otherwise specified in the District's Recycled Water Use Program, there are no specific personnel requirements for the personnel overseeing the use of recycled water. Personnel operating the recycled water production facilities would also operate the recycled water distribution facilities to the point of deliver to the individual users.

7.3.4 RECORD KEEPING

A preventative maintenance program is required to be made for the WWTP and the recycled water pump station and distribution system to ensure that all equipment is kept in a reliable operating condition. Additionally, a cross-connection control program would be required to be developed and adhered to by the District and its recycled water Users. Operating and maintenance records will be required to be maintained at the WWTP or a central depository within the District's control. The operating records would include (at minimum) the following:

- All analyses specified in the reclamation criteria and/or Section 7.3.1;
- Records of operational problems;
- Plant and equipment breakdowns;
- Diversions to emergency storage or disposal; and
- All corrective or preventative actions taken.

A monthly report summarizing the operating records listed above would be reported to the DDW (or any other regulatory agencies of the SWRCB).

Process or equipment failures triggering an alarm would be recorded and maintained as a separate record file from the operating records. Process and equipment failure recorded information should include (at minimum) the time and cause of failure, and corrective actions taken.

APPENDICES

Appendix A

FLOWS AND LOADS TECHNICAL MEMORANDUM

KJELDSEN SINNOCK NEUDECK inc.
CIVIL ENGINEERS & LAND SURVEYORS

Stephen K. Sinnock, P.E.
Christopher H. Neudeck, P.E.
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Barry O'Regan, P.E.

2487-0010
02-001

TECHNICAL MEMORANDUM
November 8, 2022

To: Tony Tovar, District Manager – Engineer, Salida Sanitary District

Project: Salida Sanitary District Recycled Water Planning Study

Subject: Existing and Future Land Use and Flows and Loads

From: Neal T. Colwell, RCE 59437,
Steven E. Whittlesey, RCE 93241

REGISTERED PROFESSIONAL ENGINEER NEAL T. COLWELL No. C 59437 CIVIL STATE OF CALIFORNIA

Revised December 8, 2022

1.0 Background and Purpose

This Technical Memorandum (Tech Memo) defines the study area of the Recycled Water Planning Study, summarizes current and future Salida Sanitary District (SSD) land use, population characteristics, and flows and loads. This Tech Memo includes:

- Definition of the study area;
- Existing land uses and population characteristics of the study area;
- Existing flows and loads from the current SSD service area;
- Future land use and population projections within the study area;
- Future flows and loads within the study area; and
- Recommended planning criteria for the Recycled Water Planning Study.

2.0 Project Study Area

The existing SSD is located in the central northern area of Stanislaus County adjacent to the Stanislaus River, north of the City of Modesto and south of the City of Ripon. The August 7, 2007, Salida Community Plan (Community Plan) identified land uses encompassing the 1,217 acres of Existing Plan Area, which existed prior to August 7, 2007, and it also includes the 3,383 acres in the Amendment Area to encompass a total of 4,600 acres within the total Community Plan Area. Current Stanislaus County Geographical Information System (GIS) Online data included approximately 5,058 gross acres in the Community Plan Area, which is 458 acres larger than the Community Plan's reported 4,600 acres. The difference is likely due to the agricultural areas of the Modesto Irrigation District (MID) Canal and Highway 99 that are included in current mapping but were excluded from the Community Plan area. These land uses are displayed in Figure 1 but are not included for consideration of future wastewater generation. Land uses contributing to wastewater generation are discussed in greater detail in Section 3.

The most recent Stanislaus County Local Agency Formation Commission (LAFCO) update to the District's boundary indicated that the SSD boundary encompassed approximately 1,485 acres, and the Sphere of Influence (SOI) included a total of approximately 1,530 acres. The existing SSD boundary is shown in Figure 1 with sewer service provided to the community of Salida. Current SSD Boundary, SOI and Community Plan Areas are based on the most recent GIS online data and totals 5,058 acres, as detailed in Table 1, indicating an additional three acres above the LAFCO district boundary.

Table 1
Extents of Planning Study Area

Area Component	Area (acres)
Salida Sanitary District Boundary	1,488
Salida Sanitary District Sphere of Influence (Remaining Area Outside of District Boundary)	45
Community Plan Area (Remaining Area Outside of District SOI)	3,525
Total Area	5,058

Land Use	Zone Code	District Boundary	S.O.I. Acreage	Community Plan Area	Total Acreage
Agriculture	A-2, SCP-A-2	89.98	12.53	419.06	521.57
Business Park	SCP-IBP	0	0	437.54	437.54
Commercial	C-2, SCP-C-1, SCP-C-2	174.66	11.35	266.02	452.02
Industrial	L-M, SCP-PI	21.16	0	1366.21	1387.37
Low Density Residential	R-1, SCP-R-1	293.02	0	779.73	1072.75
Low Density Residential (Special Treatment Area)	SCP-R-1-ST	72.3	0	0	72.3
Medium Density Residential	R-2, SCP-R-2	7.75	0	178.18	185.93
Medium-High Density Residential	R-3, SCP-R-3	29.07	0	58.69	87.77
Planned Development	P-D	739.75	21.13	0	760.88
Planned Industrial	P-I	60.34	0	19.07	79.41
Total Acreage		1488.02	45.01	3524.5	5057.54

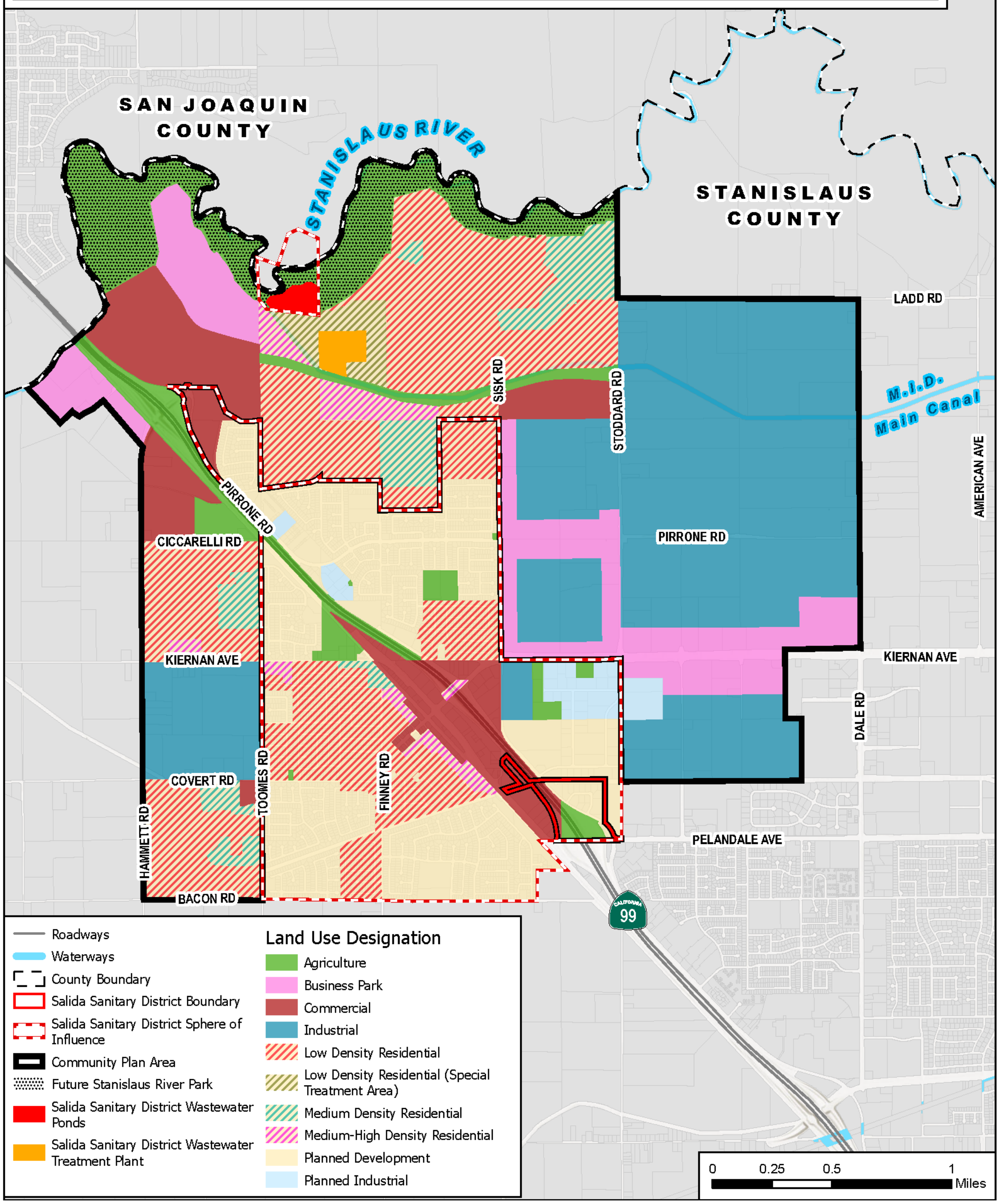

Figure 1
Salida Sanitary District Existing and Future Land Uses

3.0 Existing Land Use and Population Characteristics

Based on available records, the existing land use characteristics and population characteristics for SSD are summarized in the below sub-sections.

3.1 Existing Land Use

Existing land use within the current SOI and Community Plan area consists of a combination of residential and non-residential uses. Existing residential and non-residential land uses include[1]:

- Industrial;
- Business Park;
- Commercial;
- Planned Development;
- Low-Density Residential;
- Low-Density Residential – Special Treatment Area;
- Medium-Density Residential;
- Medium-High Density Residential; and
- Agricultural.

All of the above land uses except special treatment areas (SSD's WWTP) generate wastewater. Table 2 presents the most recent available land use inventory (last updated April 25, 2022[2]) within the Community Plan Area and the SSD Boundary and SOI. The information in Table 2 qualitatively characterizes the potential for infill development within the current Community Plan Area limits, particularly where such existing land uses as Rural, Farm, Agricultural uses would be developed to a higher intensity consistent with approved land designations.

Table 2
Existing Salida Land Use Designations

Land Use Designation (1)	Existing SSD Boundary (2) (acres)	SSD SOI Area (acres)	Community Plan Area (3) (acres)	Total Area (acres)
Industrial (4)	82	0	1,325	1,407
Business Park	0	0	438	438
Commercial	175	11	255	441
Planned Development	740	21	0	761
Low-Density Residential	293	0	580	873
Low-Density Residential (Special Treatment Area)	72	0	0	72
Medium-Density Residential	8	0	178	186
Medium-High Density Residential	29	0	59	88
Agricultural (5)	90	13	232	335
Totals	**1,488**	**45**	**3,067**	**4,600**

(1) Land use designation per Stanislaus County records, with several designations grouped.
(2) Approximate acreages within the SSD boundary that generate wastewater.
(3) Includes area within the SOI, but outside the limits of the current SSD Boundary.
(4) Approximately 60 acres identified as Industrial land use has been excluded from the GIS data due to it coinciding with major roadways planned in the Salida Community Plan that would not generate wastewater but overlie Industrial zoned areas.
(5) Approximately 45 acres designated as agricultural land use has been removed from the GIS data as it is associated with the MID Main Canal area that under future development would not generate wastewater.

[1] Land Use Designation from 2007 Salida Community Plan.
[2] Salida and Stanislaus County Zoning Data: Zoning | Zoning | Stanislaus County Open Data (arcgis.com).

3.2 Current and Historical Population Characteristics

Recent historical Salida population statistics are presented in Table 3 for the years of 2010 through 2020[3]. For this time period the overall annual growth rate in population has been 0.52% per year, with the more recent (2015 through 2020) time period having an average growth rate of 0.96% per year. Of the two trends, the more recent growth rate of 0.96% is anticipated to be a more accurate representation of growth potential of the Salida area based on recent northern San Joaquin Valley trends. Assuming a continuation of recent 2015 through 2020 annual growth rate trends, the estimated 2021 population is 15,416 and the estimated 2022 population 15,564.

Table 3
Historical Population Trends

Year	Housing Units	Salida Population	Persons per Household	Annual Population Growth (%)
2010	4,294	14,625	3.4	
2011	4,477	15,156	3.4	3.63%
2012	4,379	14,357	3.3	-5.27%
2013	4,451	14,672	3.3	2.19%
2014	4,276	14,509	3.4	-1.11%
2015	4,162	13,501	3.2	-6.95%
2016	4,224	13,898	3.3	2.94%
2017	4,341	14,424	3.3	3.78%
2018	4,188	14,658	3.5	1.62%
2019	4,133	14,229	3.4	-2.93%
2020	4,336	15,269	3.5	7.31%
2021 (Estimated)	4,514	15,416	3.4	0.52%
2022 (Estimated)	4,537	15,564	3.4	0.52%
			Overall Average	0.52%
			Average 2015-2020	0.96%

4.0 Existing Flows and Loads

This sub-section characterizes flows and loads for the SSD's system including influent flows and loads to the WWTP.

4.1 WWTP Influent Flows and Characteristics

As part of its regular monitoring and reporting program the SSD monitors the influent wastewater to the WWTP. The monitoring program includes collection of the following information:

1. Influent flow is measured continuously via parshall flume at the headworks and reported as daily totals;
2. A 24-hour time-proportional composite sample is collected once per week from the influent channel for laboratory measurement of 5-day Biochemical Oxygen Demand (BOD), total suspended solids (TSS), settleable solids, temperature, and pH; and
3. The composite sample mentioned in Item 2 is analyzed once per month for influent ammonia as nitrogen, BOD, nitrate as NO3 and as nitrogen, nitrite as NO2 and as nitrogen, total nitrogen as nitrogen, and Total Kjeldahl Nitrogen (TKN).

Weekly monitoring typically occurs on Thursdays each week. For this study the daily, weekly, and monthly influent flow data collected since 2017 has been reviewed, with a focus on more recent data to assess current flows and loads. Figure 2 presents influent flows and influent BOD, Total Nitrogen as N (Total N), and TSS results for the period of January 1, 2017, through December 31, 2021.

[3] US Census data obtained from Census Data ACS Demographic and Housing: 2010-2020." 10 Sept. 2022. DP05: Census Bureau Table

Daily flow, weekly BOD and TSS concentrations, and the monthly Total N Influent data were evaluated for outliers which may influence average flow evaluations by using the Interquartile Range (IQR) Method. The median, 1st quartile and 3rd quartile of each dataset was evaluated for 2017 to 2021 data. The difference between the 1st and 3rd quartile is the IQR, and if a specific value was above the 3rd quartile value plus 1.5 times the IQR, then it was considered an outlier. If a value was less than the 1st quartile value minus the 1.5 times the IQR, then it was also considered an outlier. However, results for BOD and/or TSS that were elevated following a high flow outlier event are considered likely representative of real conditions and were not excluded from the data set. The resulting dates and values of outliers are presented in Table 4.

Table 4
Outliers Removed from 2017 - 2021 Influent Flow, BOD, Total N and TSS

Date	Flow (Mgal/d)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)	Date (Continued)	Flow (Mgal/d)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)
1/11/2017 (1)	*1.347*				6/17/2019	1.356			
1/12/2017 (1)			*438*		6/18/2019	1.348			
1/19/2017	1.429				7/25/2019			440	
2/7/2017	1.376				8/8/2019				80
2/10/2017	1.35				9/12/2019			150	
2/21/2017	1.44				12/2/2019	1.363			
3/4/2017	0.819				1/10/2020	1.394			
3/5/2017	1.526				1/28/2020	1.351			
3/15/2017	1.341				*2/5/2020 (1)*	*1.35*			
4/6/2017			185		*2/13/2020 (1)*			*410*	
8/29/2017 (1)	*1.359*				2/20/2020			407	
8/31/2017 (1)		*450*	*695*		3/16/2020	1.342			
1/9/2018	1.459				8/25/2020	1.438			
2/8/2018			420		12/23/2020			174	
4/2/2018	1.51				1/14/2021			149	
4/26/2018			33		1/28/2021	1.408			
5/17/2018			428		1/29/2021	1.457			
9/17/2018	1.345				2/3/2021	1.37			
11/29/2018	1.362				3/30/2021	1.45			
12/17/2018	1.516				5/27/2021			476	
1/3/2019			401		6/17/2021			477	
1/13/2019	1.359				7/15/2021			156	
1/16/2019	1.359				7/29/2021			194	
1/17/2019	1.484				8/5/2021			517	
2/14/2019 (1)	*1.351*		*410*		8/12/2021			190	
5/9/2019		567			10/25/2021	1.881			
5/20/2019	1.397				12/8/2021			446	
5/21/2019	1.388				12/14/2021	1.56			
5/22/2019	1.385				12/22/2021			190	
5/29/2019	1.423				12/24/2021	1.36			

(1) Outliers with elevated TSS occurring within 1 week of an elevated influent flow outlier are likely reflective of real conditions and are not considered anomalous data / outliers. These data were

Table 5 summarizes recent annual flow and concentration data for 2017 through 2021, and Table 6 summarizes the corresponding loading data. Concentration of weekly BOD, TSS and monthly Total N data that were not outliers were applied to the daily flows during that corresponding week for BOD and TSS and corresponding month for Total N. If the daily flow or concentration data was categorized as an outlier, then the loading during that period was omitted from the monthly averages in Table 6.

Table 5
2017 through 2021 Average Monthly Influent Flow, BOD, TSS and Total N Concentrations

	2017				2018				2019				2020				2021			
Month	Flow (Mgal)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)	Flow (Mgal)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)	Flow (Mgal)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)	Flow (Mgal)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)	Flow (Mgal)	BOD (mg/L)	TSS (mg/L)	Total N (mg-N/L)
January	1.19	286	339	39	1.09	357	310	47	1.15	345	318	50	1.16	330	318	53	1.07	289	273	43
February	1.21	314	326	51	1.10	377	323	39	1.20	322	368	35	1.15	347	374	50	1.10	350	279	48
March	1.22	272	290	49	1.10	359	336	39	1.21	329	325	35	1.12	318	292	43	1.15	305	266	44
April	1.16	291	281	43	1.09	355	320	24	1.19	279	286	52	1.12	334	311	39	1.12	315	293	53
May	1.13	278	251	36	1.10	359	294	50	1.21	275	258	37	1.09	345	305	44	1.13	292	286	55
June	1.11	280	297	52	1.07	321	308	42	1.15	284	284	39	1.06	317	331	49	1.09	334	313	55
July	1.06	330	284	65	1.07	356	301	57	1.11	312	294	41	1.04	319	294	53	1.07	305	304	47
August	1.15	343	351	35	1.09	278	275	46	1.06	307	299	-- (1)	1.04	316	307	47	1.06	326	265	54
September	1.11	275	266	39	1.15	304	286	51	1.11	259	309	42	1.07	302	269	51	1.08	278	252	51
October	1.13	257	313	41	1.17	262	283	32	1.08	330	304	37	1.04	302	282	53	1.08	304	262	48
November	1.13	311	311	55	1.19	289	305	42	1.14	301	312	33	1.07	351	278	50	1.09	297	248	48
December	1.07	343	295	51	1.16	317	306	37	1.14	325	313	52	1.07	340	329	55	1.08	287	286	54
Avg Annual	1.14	298	300	46	1.12	328	304	42	1.15	306	306	41	1.09	327	308	49	1.09	307	277	50
Minimum Month	1.06	257	251	35	1.07	262	275	24	1.06	259	258	33	1.04	302	269	39	1.06	278	248	43
Maximum Month	1.22	343	351	65	1.19	377	336	57	1.21	345	368	52	1.16	351	374	55	1.15	350	313	55

(1) Data removed due to being an outlier, as presented in Table 4.

Table 6
2017 through 2021 Average Monthly Influent Flows, and BOD, TSS and Total N Loads

	2017				2018				2019				2020				2021			
Month	Flow (Mgal)	BOD (lb/d)	TSS (lb/d)	Total N (lb-N/d)	Flow (Mgal)	BOD (lb/d)	TSS (lb/d)	Total N (lb-N/d)	Flow (Mgal)	BOD (lb/d)	TSS (lb/d)	Total N (lb-N/d)	Flow (Mgal)	BOD (lb/d)	TSS (lb/d)	Total N (lb-N/d)	Flow (Mgal)	BOD (lb/d)	TSS (lb/d)	Total N (lb-N/d)
January	1.19	2,858	3,331	387	1.09	3,221	2,809	428	1.15	3,292	3,031	479	1.16	3,163	3,106	513	1.07	2,593	2,444	383
February	1.21	3,099	3,309	514	1.10	3,477	3,014	356	1.20	3,213	3,694	351	1.15	3,307	3,603	480	1.10	3,219	2,515	442
March	1.22	2,760	2,937	500	1.10	3,303	3,112	359	1.21	3,278	3,274	353	1.12	3,019	2,707	403	1.15	2,881	2,608	421
April	1.16	2,786	2,728	417	1.09	3,194	2,880	219	1.19	2,791	2,810	517	1.12	3,109	2,915	364	1.12	3,002	2,736	497
May	1.13	2,706	2,341	339	1.10	3,312	2,672	459	1.21	2,738	2,651	375	1.09	3,154	2,707	401	1.13	2,742	2,618	518
June	1.11	2,557	2,841	480	1.07	2,873	2,721	373	1.15	2,626	2,541	394	1.06	2,805	2,916	434	1.09	2,987	2,986	501
July	1.06	2,809	2,365	573	1.07	3,087	2,678	508	1.11	2,898	2,777	378	1.04	2,732	2,476	462	1.07	2,840	2,638	421
August	1.15	3,347	3,501	336	1.09	2,486	2,475	418	1.06	2,653	2,616	-- (1)	1.04	2,774	2,625	407	1.06	2,818	2,329	476
September	1.11	2,545	2,491	361	1.15	2,917	2,766	489	1.11	2,560	2,917	387	1.07	2,595	2,429	455	1.08	2,455	2,258	459
October	1.13	2,484	2,955	387	1.17	2,604	2,769	312	1.08	2,931	2,724	333	1.04	2,655	2,446	462	1.08	2,737	2,381	434
November	1.13	2,943	2,863	520	1.19	2,850	3,024	417	1.14	2,872	2,959	314	1.07	3,109	2,510	448	1.09	2,703	2,241	436
December	1.07	3,075	2,648	457	1.16	3,182	2,983	359	1.14	3,134	3,004	495	1.07	3,090	2,975	491	1.08	2,537	2,678	486
Avg Annual	1.14	2,831	2,859	439	1.12	3,042	2,825	391	1.15	2,916	2,917	382	1.09	2,959	2,785	443	1.09	2,793	2,536	456
Minimum Month	1.06	2,484	2,341	336	1.07	2,486	2,475	219	1.06	2,560	2,541	314	1.04	2,595	2,429	364	1.06	2,455	2,241	383
Maximum Month	1.22	3,347	3,501	573	1.19	3,477	3,112	508	1.21	3,292	3,694	495	1.16	3,307	3,603	513	1.15	3,219	2,986	518

(1) Data removed due to being an outlier, as presented in Table 4.

The annual average concentrations of influent BOD and TSS are generally consistent with WW strength associated with primarily residential flows. Domestic wastewater sources are associated with those land uses described above and include residential, institutional, public facility, and commercial sources. As can be seen from Figure 2, the influent wastewater flows respond to seasonal rainfall and associated infiltration and inflow (I/I), with dry-period flows occurring predominantly in July, August, and September. Recent annual average flows have ranged from 1.04 million gallons per day (Mgal/d) to 1.22 Mgal/d, and have remained relatively stable since 2017, however with 2020 and 2021 indicating a possible decreasing trend possibly resulting from water conservation measures, despite the more recent estimated increases in population.

Seasonal increases in wastewater flows expected to be a result of I/I typically occur in the months of December through March, but with occasional increases in influent flows occurring as late as May. Seasonal peak flows typically occur during very heavy rain periods, resulting in peak day influent flows reaching over 1.8 million gallons in a day. The two largest recent peak day influent flows occurred on January 29, 2020, at 1.46 Mgal/d, and October 25, 2021, at 1.88 Mgal/d. These two peak flows are considered outliers for the data set but are recommended for planning criteria to ensure there is adequate hydraulic capacity at the WWTP, particularly with the very heavy rainfall that occurred in the Salida area on October 25, 2021.

Influent BOD and TSS, annual averages ranging from 298 mg/L to 328 mg/L and 277 mg/L and 307 mg/L respectively, are generally consistent with wastewater strength associated with a mixture of primarily residential flows. Loading for BOD and TSS has typically ranged from 2,484 to 3,477 lb-BOD/day and from 2,241 to 3,694 lb-TSS/day. The peak BOD concentration of 567 mg/L occurred in May 2019 but is considered an anomalous outlier in the data set. Instead, the representative peak BOD concentration of 450 mg/L occurred on August 31, 2017. The peak TSS concentration of 695 mg/L also occurred on August 31, 2017. The peak day loads of 5,100 lb-BOD/day and 7,877 lb-TSS/day also occurred in August 2017. Although the BOD, TSS and Nitrogen data from August 2017 would normally be an outlier in the data set, it was included because there was a preceding high flow event and these otherwise higher constituent concentrations were likely in response to that event.

Total Nitrogen in the WWTP influent ranged from annual averages between 42 mg-N/L to 50 mg-N/L from 2017 through 2021. The peak nitrogen concentration of 80 mg-N/L occurred in August 2019 but is considered an outlier of the data set. Therefore, the representative peak nitrogen concentration is 65 mg-N/L occurring in July 2017. Average annual nitrogen loads range from 382 to 456 lb-N/day. The estimated peak load of 640 lb-N/day also occurred in July 2017.

4.2 Industrial Discharges

The SSD currently has only one permitted industrial discharger which is Blue Diamond Growers, Inc (Blue Diamond). Discharges from Blue Diamond include cleaning solutions and wash water at an average daily discharge of 11,300 gallons of combined wash water and domestic wastewater per day. The volume and strength of this discharge is negligible (less than 1%) compared to the 1.04 to 1.22 Mgal/d of domestic wastewater influent flows at the WWTP.

Future industrial discharges to the SSD's WWTP are assumed to be similar strength to current domestic wastewater.

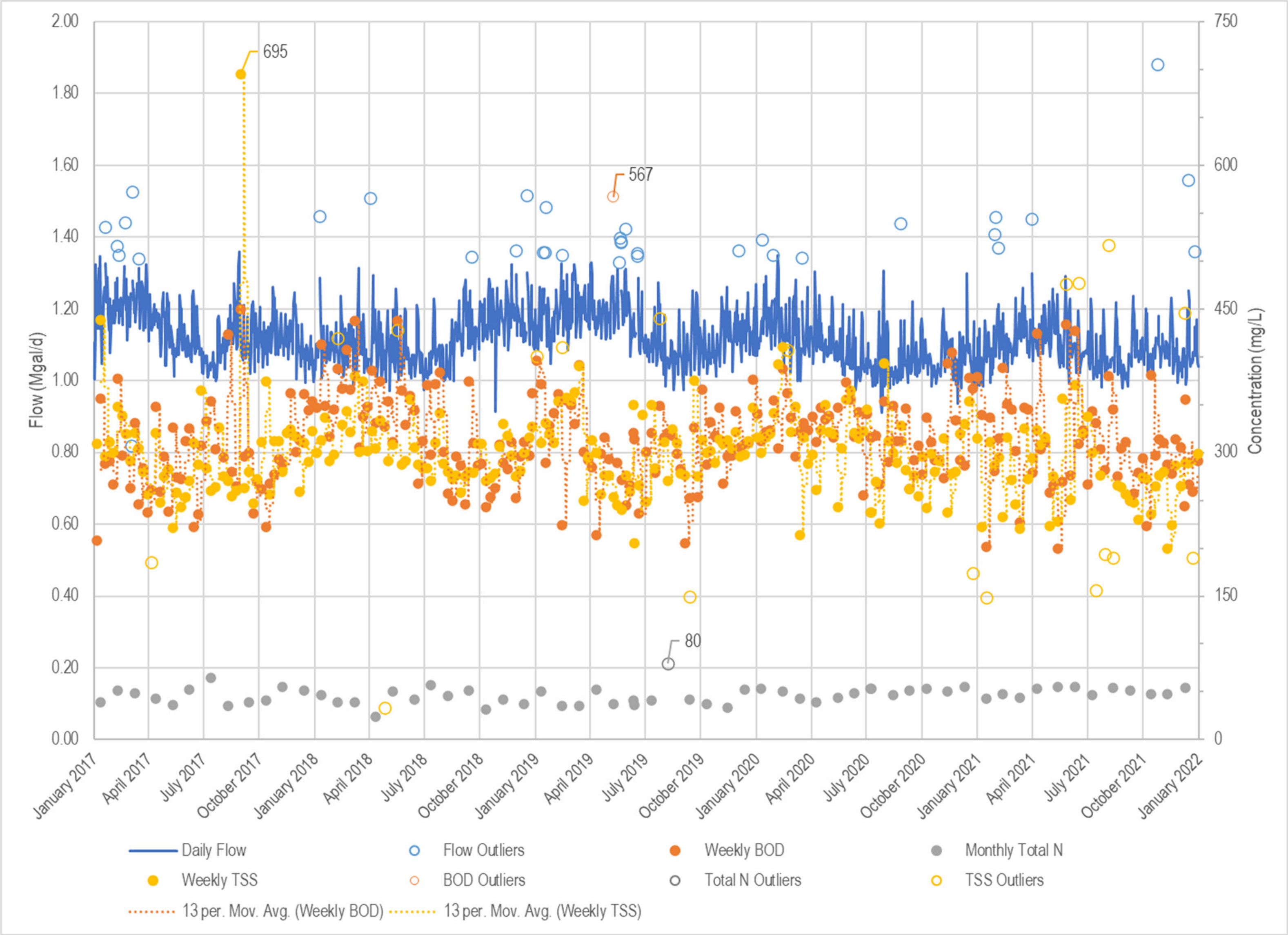

Figure 2
Salida Sanitary SSD WWTP Influent Characteristic Flows and Concentrations

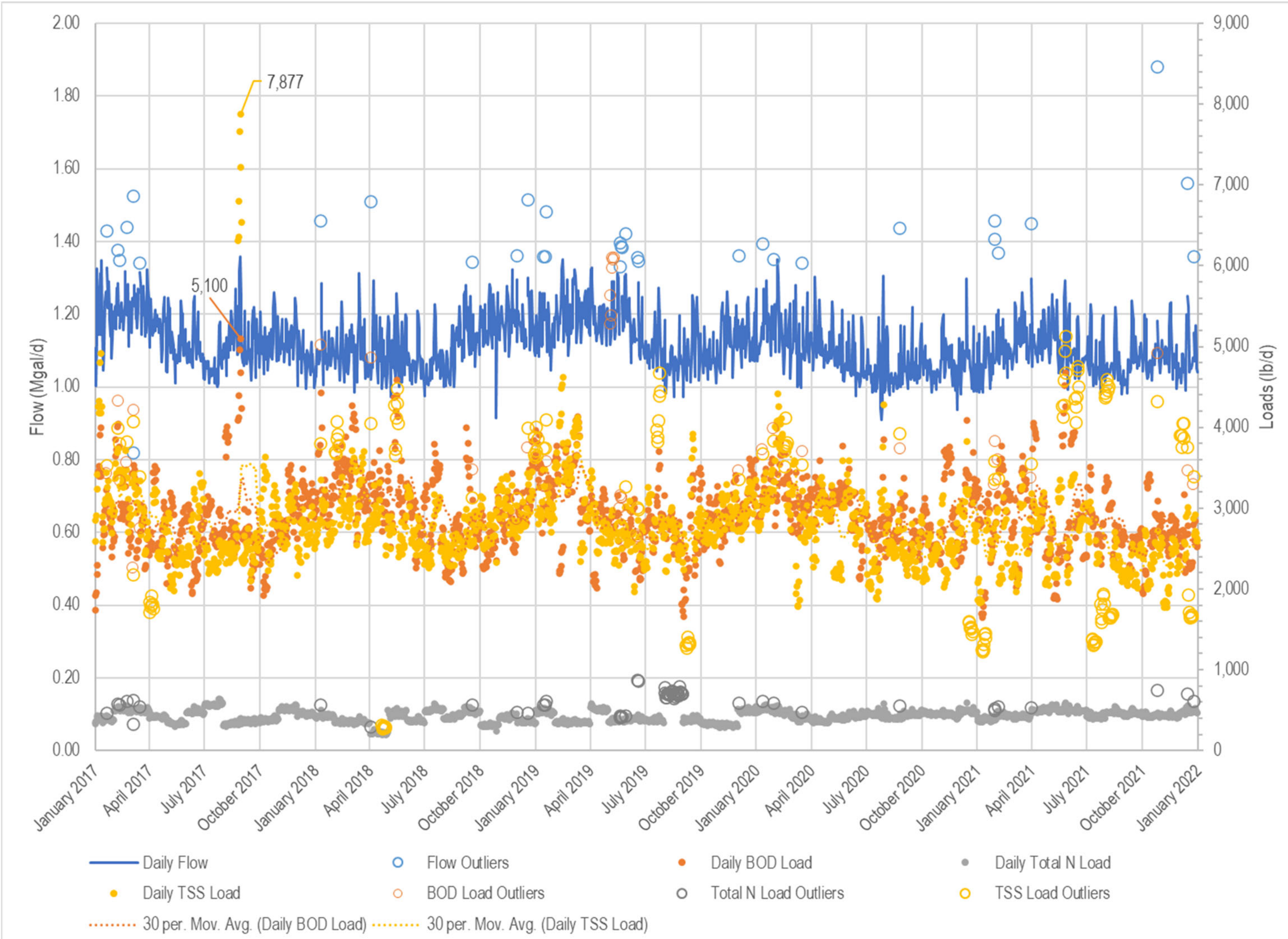

Figure 2
Salida Sanitary SSD WWTP Influent Characteristic Flows and Loads

4.3 Average Dry Weather Flows

Taking into consideration the relatively stable influent flows, Table 7 presents the estimated Average Dry Weather Flow (ADWF), based on the influent flows from the months of July, August, and September, and the resultant estimated unit flow and load characteristics of the domestic sources.

Table 7
Summary of WWTP Average Dry Weather Flows and Loads

Water Year	WWTP ADWF (1) (Mgal/d)	Population (Persons)	ADWF per Capita (2) (gal/cap-day)	ADWF BOD Load (3) (lb/d)	ADWF TSS Load (3) (lb/d)	ADWF Total N Load (3) (lb/d)	Per-Capita BOD (lbs/cap-day)	Per-Capita TSS (lbs/cap-day)	Per-Capita Total N (lbs/cap-day)
2017	1.11	14,424	77	2,900	2,786	423	0.20	0.19	0.029
2018	1.10	14,658	75	2,830	2,640	472	0.19	0.18	0.032
2019	1.09	14,229	77	2,704	2,770	383	0.19	0.19	0.027
2020	1.05	15,269	69	2,700	2,510	441	0.18	0.16	0.029
2021	1.07	15,416	69	2,704	2,408	452	0.18	0.16	0.029
Maximum	1.11	15,416	77	2,900	2,786	472	0.20	0.19	0.032
Minimum	1.05	14,229	69	2,700	2,408	383	0.18	0.16	0.027
Average	1.08	14,799	73	2,768	2,623	434	0.19	0.18	0.029

(1) Influent ADWF for water year 2017 through 2022, which includes July, August, and September flows.

(2) Estimated average per capita wastewater flow generation rate for total influent flows on a per capita basis, assuming population as presented in Table 3;

(3) Average of July, August and September loading from Table 6.

As seen in Table 7, the SSD ADWF has remained relatively constant over the last five years, with a slight decreasing trend likely influenced by water conservation. Influent BOD and TSS has been similar to what could be expected from predominantly residential and commercial wastewater sources.

Total unit wastewater generation rates in SSD have ranged from 69 gallons per capita per day (gpcd) to 77 gpcd. Wastewater BOD ranged from 0.18 to 0.20 lbs per capita per day (lbs/cap-day) for BOD and from 0.16 to 0.19 lbs/cap-day for TSS. Both BOD and TSS unit generation factors appear to be reasonably near or within ranges expected for domestic wastewater, as compared with the Ten States Standards recommended values of 0.17 – 0.20 lbs/cap-day for BOD and 0.20 – 0.22 lbs/cap-day for TSS and other northern California communities. Nitrogen in the wastewater typically ranged from 0.027 to 0.032 lbs/cap-day, of which 99% was typically comprised of Total Kjeldahl Nitrogen (TKN) which falls within the typical range of 0.02 to 0.04 lbs/cap-day.

Peak month and peak day peaking factors have been determined by comparing the representative data on a 30-day running average and a daily basis with the ADW Flows and Loads presented in Table 7. Peaking factors for BOD, TSS and Total N are determined by the ratio of peak day or peak month loading to the ADWF loads from that year. However, for influent flow the otherwise anomalous peak flow of 1.88 Mgal/d was included in the data set so that the WWTP planning criteria includes additional hydraulic capacity that may be required under heavy rain conditions that resulted in this peak flow. The recommended peaking factors for each parameter are presented in Table 8.

Table 8
Summary of WWTP Peak Month and Peak Day Peaking Factors

Water Year	Influent Flow		BOD Loading		TSS Loading		Total N Loading	
	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor	Peak Month Peaking Factor	Peak Day Peaking Factor
2017	1.1	1.4	1.2	1.8	1.3	2.8	1.4	1.5
2018	1.1	1.4	1.3	1.6	1.2	1.4	1.1	1.2
2019	1.1	1.4	1.3	1.5	1.4	1.7	1.4	1.5
2020	1.1	1.4	1.3	1.5	1.5	1.8	1.2	1.3
2021	1.1	1.8	1.2	1.7	1.3	1.4	1.2	1.3
Recommended Peaking Factors	**1.1**	**1.8**	**1.3**	**1.8**	**1.5**	**2.8**	**1.4**	**1.5**

The City of Modesto, which supplies Salida's potable water system, implemented Senate Bill (SB) X7-7, 2009 with an efficiency target of 228 gpcd of total water usage for 2020. In 2020, the City of Modesto reported a total of 179 gpcd for total water use. Using the State Water Resources Control Board (SWRCB) Water use Objective Exploration Tool[4], the estimated current *indoor* residential water use is approximately 49 gpcd at the total water use of 179 gpcd. By 2030 and beyond, the SB X7-7 water use efficiency target is 42 gpcd of indoor residential water use[5], which is expected to result in a reduction of approximately 6 to 7 gpcd from the current Salida indoor residential water use and result in a reduction in the overall community wastewater generation rate.

The current overall ADWF wastewater generation in Salida was 69 gpcd in 2020 and 2021. The 69 gpcd of ADWF wastewater generation rate is an overall generation rate including residential, commercial, limited industrial, and institutional flows divided by the resident population. Therefore, since the future water usage will likely decrease from 2020 and 2021 as required by SB X7-7, future wastewater flows are recommended to be reduced by the 7 gpcd of indoor water use reduction for sizing future facilities (69 gpcd ADWF wastewater generation from 2021, minus 7 gpcd from indoor residential water conservation). The overall per capita ADWF wastewater generation rate of 62 gpcd is recommended for projecting future wastewater generation based on community population increases. Existing wastewater users are expected to remain at the current ADWF wastewater generation rate of approximately 69 gpcd. The ADWF wastewater generation factor of 62 gpcd has been applied to future projected population growth shown in Table 11.

[4] Objective Exploration Tool | California State Water Resources Control Board, accessed September 20, 2022:
[5] DWR Recommended Indoor Residential Water Use Standard, November 30, 2021

5.0 Future Land Use and Population Projections

The Recycled Water Planning Study includes reviewing future population and associated wastewater flows and loads and evaluating the facilities alternatives for incorporating those future flows and loads. This sub-section characterizes potential future flows and loads based on potential future land use and population projections.

Future growth within the District is managed under land use policies of Stanislaus County, such as the policies of the Salida Community Plan and adopted Zoning. With respect to future wastewater generation, development within Salida is expected to occur under two means:

1. As infill development within the existing SSD boundary or SOI; and
2. New development within the SSD Community Plan Amendment Area.

Infill development may occur as a result of changing levels of development on already developed lands, e.g., intensified development of underutilized land in the SSD boundary, or development on otherwise vacant land within the SSD boundary and SOI.

New development within the Community Plan Amendment Area will typically occur through a process for land use planning, approval, and annexation of new parcels into the SSD boundary and SOI. New development proceeding under this process may take decades to occur and ultimately develop build-out wastewater flows. According to current information, the SSD has not identified any significant currently active development projects. Buildout development is projected based on potential increased utilization of vacant lands in the existing SSD SOI and annexation and development of the Community Plan Amendment Area. The estimated potential buildout and land use planning assumptions for SSD are presented in Table 9.

For this planning study, the 30-year horizon for population growth is used to estimate near-term flows and loads to the WWTP. Projected population growth is presented in Table 10.

Table 9
Projection of Buildout of SSD SOI and Community Plan Zoning

Land Use Designation (1)	Developed Existing Plan Area (Acres)	Infill Existing Plan Area (Acres)	SSD SOI Area (Acres)	Community Plan Amendment Area (Acres)	Total Community Plan Area (Acres)	Non-Use Fraction (6) (%)	Building Intensity (7) (DU/Net Acre)	Population Density (8) (Capita/DU)	FAR –	Existing Wastewater Generation Factors (gpd/Net Acre)	Future Wastewater Generation Factors (gpd/Net Acre)	Developed Existing Plan Area ADWF (Mgal/d)	Infill Existing Plan Area ADWF (Mgal/d)	SSD SOI Area ADWF (Mgal/d)	Community Plan Amendment Area ADWF (Mgal/d)	Total Buildout ADWF (Mgal/d)
Industrial	82	5	0	1,325	1,407	30%	N/A	N/A	0.02	211	211	0.011	0.001	0.000	0.28	0.29
Business Park (3)	0	0	0	438	438	30%	12.5	2	0.25	1,225	1,050	0.000	0.000	0.000	0.46	0.46
Commercial (4)	175	24	11	255	441	30%	N/A	N/A	0.25	2,814	2,814	0.297	0.067	0.032	0.72	1.11
Planned Development (5)	740	22	21	0	761	30%	5.5	3.6	N/A	959	822	0.482	0.018	0.017	0.00	0.52
Low-Density Residential	293	6	0	580	873	30%	5.5	3.6	N/A	959	822	0.193	0.005	0.000	0.48	0.67
Low-Density Residential (Special Treatment Area)	72	0	0	0	72	100%	0	N/A	N/A	0	0	0.000	0.000	0.000	0.00	0.00
Medium-Density Residential	8	0	0	178	186	30%	10	3.01	N/A	1,475	1,264	0.008	0.000	0.000	0.23	0.23
Medium-High Density Residential	29	0	0	59	88	30%	23.4	3.01	N/A	3,451	2,958	0.069	0.001	0.000	0.17	0.24
Agricultural	90	2	13	232	335	30%	0.67	5	0.01	122	106	0.008	0.000	0.001	0.02	0.03
Totals (Rounded)	**1,488**	**60**	**45**	**3,067**	**4,600**	**–**	**–**	**–**	**–**	**–**	**–**	**1.07**	**0.09**	**0.05**	**2.36**	**3.57**

(1) Land use designation per Stanislaus County records, with several designations grouped.
(2) Approximate acreages within the SSD boundary that generate wastewater.
(3) Business Park land uses are consistent with the Salida Community Plan and are anticipated to add approximately 25 jobs/acre, but do not directly contribute to anticipated population growth.
(4) Commercial Zoning is assumed to have negligible residential units.
(5) Assumes that Planned Development Zoning is to be developed to Low-Density Residential Intensity.
(6) Estimated fraction of development that buildings will cumulatively occupy on parcel areas within that land use type. Area on the parcel not occupied is assumed occupied by roads, open spaces, etc.
(7) Building Intensity is consistent with Table 3 of the Salida Community Plan, except for Low-Density Residential which is intensified compared to the Community Plan to maintain consistency with the 1.07 Mgal/d for existing development within the SSD boundary, based on 2021 data.
(8) Low-Density Residential population density is consistent with average 2020 Census persons per household, whereas other land use population densities are consistent with Table 3 of the Salida Community Plan.

Infill of the Existing SSD Boundary may increase the ADWF by 0.09 Mgal/d and buildout of the remaining SSD SOI would generate approximately 0.05 Mgal/d, resulting in a total District/SOI buildout flow of 1.21 Mgal/day when added to 1.07 Mgal/day contribution of the existing SSD boundary. Buildout of the remaining Community Plan Amendment Area has the potential to add an estimated 2.36 Mgal/d of ADWF to the WWTP, therefore buildout of the overall Salida Community Plan Area would result in approximately 3.57 Mgal/d of ADWF to the WWTP. The timing of new development in the Amendment Plan Area is uncertain and may occur over 30 or more years. Excluding commercial development and assuming an average occupancy of 3.57 people per housing unit[6], the population of future development could reach approximately 31,435. This future potential population increase due to new development represents an approximately 104% increase in Salida's current estimated population of 15,416 and is greater than the initial estimate of 29,063 from the Salida Community Plan. Increased future building intensity and land usage in Salida may increase the population beyond the current estimated buildout population.

Assuming an annual average population growth rate ranging from 0.52% to 0.96% (historical 10-year average vs. 5-year average), the potential future population for Salida over a 30-year planning horizon is as outlined in Table 10. Within these ranges of population growth, from 2021 the 30-year future Salida population is estimated to increase by approximately 2,680 to 5,380 residents. This increase in population would occur because of both infill development and as new development occurs.

Table 10
Estimated Future Salida Population

Year	0.52% Annual Growth	0.96% Annual Growth	Year	0.52% Annual Growth	0.96% Annual Growth	Year	0.52% Annual Growth	0.96% Annual Growth
2020	15,269	15,269	2031	16,165	16,961	2042	17,115	18,841
2021	15,348	15,416	2032	16,250	17,124	2043	17,204	19,022
2022	15,428	15,564	2033	16,334	17,288	2044	17,293	19,204
2023	15,508	15,713	2034	16,419	17,454	2045	17,383	19,388
2024	15,589	15,864	2035	16,504	17,622	2046	17,473	19,575
2025	15,670	16,016	2036	16,590	17,791	2047	17,564	19,763
2026	15,752	16,170	2037	16,676	17,962	2048	17,656	19,952
2027	15,834	16,325	2038	16,763	18,134	2049	17,747	20,144
2028	15,916	16,482	2039	16,850	18,308	2050	17,840	20,337
2029	15,999	16,640	2040	16,938	18,484	2051	17,932	20,532
2030	16,082	16,800	2041	17,026	18,662	2052	18,026	20,730

It is anticipated that population growth for Salida will proceed similar to the more recent annual growth rate of 0.96% from 2015 to 2020. As illustrated in Figure 3, the annual 0.96% annual population growth is recommended to be used to estimate the future Salida population to ensure the future treatment and disposal systems are adequately sized.

[6] US Census Bureau, Salida CDP 2020 Census Tables, Demographic and Housing Estimates (DP05).

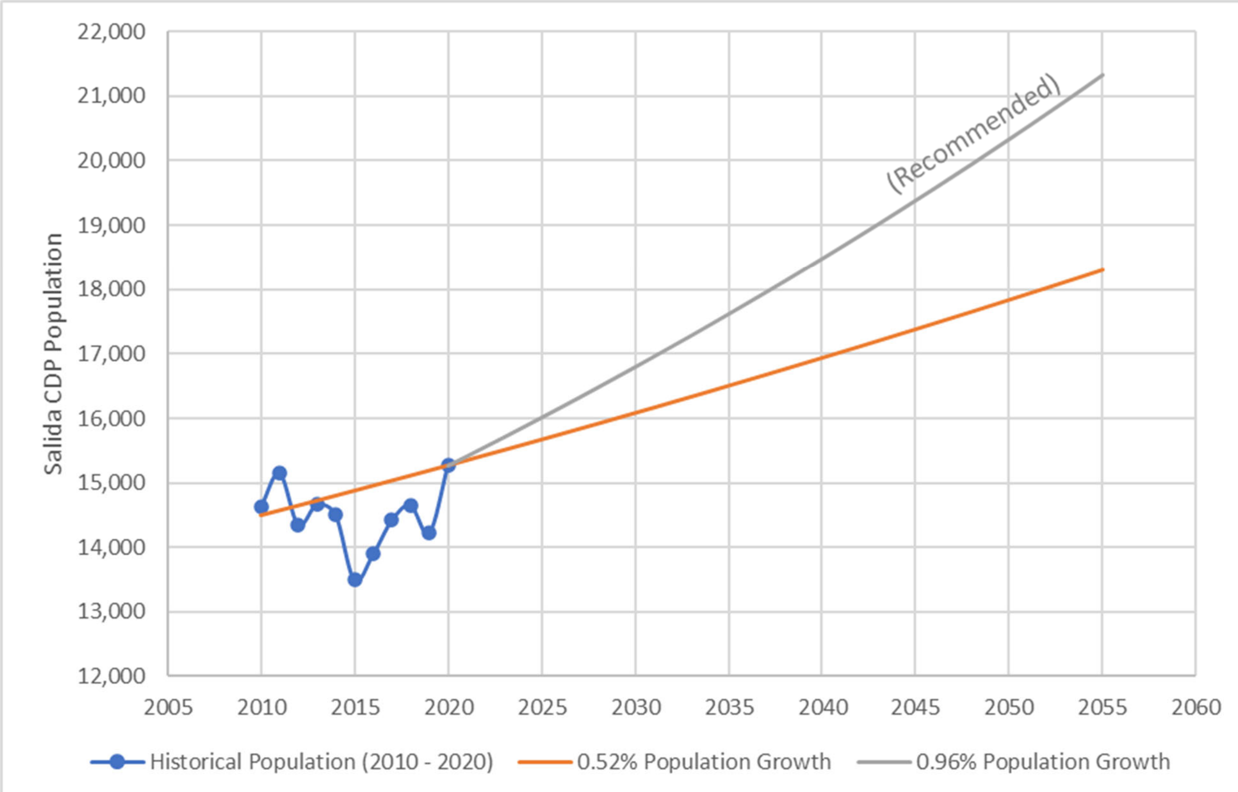

Figure 3
Comparison of Estimated Future Salida Population Trends

6.0 Future Flows and Loads

Future wastewater flows and loads are expected to occur as a result infill development and new development from any future development projects within the community plan area. No new industrial discharges are known to be planned, therefore future industrial discharges from the community plan amendment area are assumed to be consistent with historical discharges, including an assumed discharge equivalent to Blue Diamond which will continue to discharge to SSD. Therefore, future increases in flows and loads are expected to result primarily from new residential and commercial development occurring as infill and within the SSD Sphere of Influence. In lieu of projecting flows and loads based on full build-out development of new development projects, which may occur well beyond a 30-year planning horizon, the basis of future flows and loads to the SSD WWTP is recommended to be based on future population growth projected to the year 2052.

Future 30-year planning horizon flows and load ranges are presented in Table 13 based on the range of population growth outlined in Table 11. These future flows and loads are based on supporting Water Year 2017 through 2021 data as presented in Tables 7 and 8, and include the following criteria:

1. A future development wastewater generation factor of 62 gallons per capita per day;
2. BOD unit generation of 0.18 lbs per capita per day;
3. TSS unit generation of 0.16 lbs per capita per day; and
4. Nitrogen as N unit generation of 0.03 lbs per capita per day (rounded from Table 7 average).

Table 11
Estimated Future Salida Flows and Loads

Wastewater Characteristic	Additional Population	Unit Generation Factor	Range of Flow/Load
Flows			
Current ADWF (Mgal/d)			1.07
Flow Increase (Mgal/d)	2,610 – 5,310	62 gpcd	0.16 - 0.33
Projected Year 2052 Flows (Mgal/d)			1.23 – 1.40
Loads			
BOD			
Current BOD (lb/day)			2,704
BOD Increase (lb/day)	2,610 – 5,310	0.18 lbs/cap-day	470 - 956
Projected Year 2052 BOD (lb/day)			3,174 – 3,660
TSS			
Current TSS (lb/day)			2,408
TSS Increase (lb/day)	2,610 – 5,310	0.16 lbs/cap-day	418 – 850
Projected Year 2052 TSS (lb/day)			2,826 – 3,258
Total Nitrogen			
Current Total N (lb-N/day)			494
Total N Increase (lb-N/day)	2,610 – 5,310	0.03 lbs/cap-day	78 – 159
Projected Year 2052 Total N (lb-N/day)			572 – 653

gpcd = gallons per capita per day.

7.0 Recommended Planning Criteria

Table 12 presents the recommended Recycled Water Facilities planning criteria based on historical SSD monitoring data and a 30-year projection of population to 20,730 and projection of the recommended annual growth rate of 0.96% per year and a community-based future wastewater generation rate of 62 gpcd. For reference, buildout population projected wastewater flows are also shown in Table 12. This 30-year population projection is consistent with infill development that may occur within the Salida Community Plan Area. Additional facilities would be needed to accommodate wastewater generated beyond the 30-year projection and to accommodate build-out development.

Table 12
Future Facilities Planning Criteria

Wastewater Characteristic	Unit	Recommended Planning Study Criteria	Buildout (2)
Flows			
ADWF	Mgal/d	1.40	3.57
Peak Month Peaking Factor	Unitless	1.1	1.1
Peak Day Peaking Factor	Unitless	1.8	1.8
Loads			
BOD			
Average BOD Daily Load	Lbs/day	3,660	9,331
BOD Peak Month Peaking Factor (1)	Unitless	1.3	1.3
BOD Peak Day Peaking Factor (1)	Unitless	1.8	1.8
TSS			
Average TSS Daily Load	Lbs/day	3,258	8,306
TSS Peak Month Peaking Factor (1)	Unitless	1.4	1.4
TSS Peak Day Peaking Factor (1)	Unitless	2.8	2.8
Nitrogen			
Total N Load (1)	Lbs/day	653	1,665
Total N Peak Month Peaking Factor (1)	Unitless	1.4	1.4
Total N Peak Day Peaking Factor (1)	Unitless	1.5	1.5

(1) Peaking factors for BOD, TSS and Total N based on 2017 through 2021 weekly and monthly influent monitoring data (See Tables 6, 7 and 8, and Figures 2 and 3).
(2) Buildout loading is linearly projected to the estimated Buildout ADWF in Table 9.

Appendix B

WATERBALANCE CALCULATIONS

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WATER BALANCE, AVG YEAR

1.07 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)................ 1.07

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	AVG YEAR
PRECIP/AVG PRECIP RATIO................	1.00
OCT-APR EVAP/AVG EVAP RATIO................	0.78
MAY-SEP EVAP/AVG EVAP RATIO................	1.00
LAND PRECIP COLLECTED (FRAC)................	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)................	0.0
IRRIGATION EFFICIENCY (DECIMAL FRACT)................	0.75

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY)................ **3.05**

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name/Number	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY)................ **15.25**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.02	0.02	0.08	0.09	0.12	0.11	0.05	0.02	0.00	0.00	0.00	0.00	0.52
INFLUENT- EXCLUDING I&I (MGD)	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, AVG YEAR (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.12	0.28	0.41	0.48	0.40	0.39	0.21	0.10	0.02	0.00	0.01	0.04	2.47
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.17	0.69	1.03	1.19	0.99	0.96	0.52	0.25	0.05	0.01	0.02	0.10	5.98
TOTAL RAINFALL ADDITION (MG)	***0.29***	***0.97***	***1.44***	***1.66***	***1.39***	***1.35***	***0.73***	***0.36***	***0.07***	***0.01***	***0.02***	***0.14***	***8.45***
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	33.17	32.10	33.17	33.17	29.96	33.17	32.10	33.17	32.10	33.17	33.17	32.10	390.55
I&I FLOW VOLUME (MG)	0.70	0.68	2.43	2.80	3.34	3.40	1.55	0.70	0.10	0.00	0.00	0.00	15.68
TOTAL INFLUENT FLOW VOLUME (MG)	***33.87***	***32.78***	***35.60***	***35.97***	***33.30***	***36.57***	***33.65***	***33.87***	***32.20***	***33.17***	***33.17***	***32.10***	***406.23***
TOTAL INFLOW (MG)	**34.16**	**33.75**	**37.04**	**37.63**	**34.69**	**37.92**	**34.38**	**34.22**	**32.27**	**33.18**	**33.19**	**32.24**	**414.69**
WATER OUTPUTS													
EVAPORATION-RELATED CALCULATIONS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 (IN)	3.59	1.38	1.05	0.89	1.95	4.01	4.80	6.98	6.74	8.27	7.59	5.79	53.04
SEASONALLY ADJUSTED EVAPORATION (IN)	2.80	1.08	0.82	0.69	1.52	3.13	3.74	6.98	6.74	8.27	7.59	5.79	49.15
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.43	0.17	0.13	0.11	0.24	0.48	0.58	1.08	1.04	1.28	1.18	0.90	7.61
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.73	0.28	0.21	0.18	0.40	0.82	0.98	1.82	1.76	2.16	1.98	1.51	12.81
ACTUAL EVAP. LOSS FROM WWTP PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTUAL EVAP. LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL EVAP (MG)	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
PERCOLATION-RELATED CALCULATIONS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	64.20	62.13	64.20	64.20	57.99	64.20	62.13	64.20	62.13	64.20	64.20	62.13	755.92
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	34.16	33.75	37.04	37.63	34.69	37.92	34.38	34.22	32.27	33.18	33.19	32.24	414.69
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC (MG)	***34.16***	***33.75***	***37.04***	***37.63***	***34.69***	***37.92***	***34.38***	***34.22***	***32.27***	***33.18***	***33.19***	***32.24***	***414.69***
IRRIGATION													
CROP COEFFICIENT, Kc = Etc/Eto	0.81	0.80	1.09	1.15	0.85	0.66	0.75	0.65	0.71	0.80	0.81	0.78	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.26	0.86	0.89	0.80	1.29	2.06	2.83	4.51	4.78	6.58	6.16	4.49	37.51
TOTAL IRRIG DEMAND (IN)	2.24	0.00	0.00	0.00	0.00	0.31	2.45	5.37	6.24	8.75	8.17	5.73	39.26
TOTAL IRRIGATION DEMAND (MG)	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
TOTAL OUTFLOW (MG)	**34.16**	**33.75**	**37.04**	**37.63**	**34.69**	**37.92**	**34.38**	**34.22**	**32.27**	**33.18**	**33.19**	**32.24**	**414.69**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS													
BEGINNING STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STORAGE GAIN/LOSS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FINAL STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PERCENT OF TOTAL CAPACITY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	34.16	33.75	37.04	37.63	34.69	37.92	34.38	34.22	32.27	33.18	33.19	32.24	414.69
DISPOSAL REQUIRED (MG)	34.16	33.75	37.04	37.63	34.69	37.92	34.38	34.22	32.27	33.18	33.19	32.24	414.69
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)................	0
TOTAL AVAILABLE STORAGE (MG)................	26
PERCENT OF STORAGE USED................	0%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER................	391	EVAPORATION................	0	DISPOSAL CAPACITY BALANCE (MG)................	0
INFLOW AND INFILTRATION................	16	PERCOLATION................	415		
PRECIPITATION INTO PONDS................	8	IRRIGATION................	0	STORAGE CAPACITY BALANCE (MG)................ (MUST NOT BE NEGATIVE)	26
TOTAL	**415**	**TOTAL**	**415**		

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WATER BALANCE, 1-in-100 YEAR

1.07 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD).. 1.07

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY).. **3.05**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
PRECIP/AVG PRECIP RATIO........	2.03
OCT-APR EVAP/AVG EVAP RATIO........	0.78
MAY-SEP EVAP/AVG EVAP RATIO........	1.00
LAND PRECIP COLLECTED (FRAC)........	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)........	**0.0**
IRRIGATION EFFICIENCY (DECIMAL FRACT)........	0.75

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name/Number	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

Percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY).. **15.25**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.02	0.02	0.08	0.09	0.12	0.11	0.05	0.02	0.00	0.00	0.00	0.00	0.52
INFLUENT- EXCLUDING I&I (MGD)	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, 1-in-100 YEAR (IN)	1.18	2.66	3.96	4.57	3.82	3.72	2.01	0.97	0.20	0.04	0.06	0.39	23.58
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.25	0.57	0.84	0.97	0.81	0.79	0.43	0.21	0.04	0.01	0.01	0.08	5.01
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.34	0.78	1.16	1.34	1.12	1.09	0.59	0.29	0.06	0.01	0.02	0.11	6.90
TOTAL RAINFALL ADDITION (MG)	***0.59***	***1.34***	***2.00***	***2.31***	***1.93***	***1.88***	***1.02***	***0.49***	***0.10***	***0.02***	***0.03***	***0.19***	***11.91***
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	33.17	32.10	33.17	33.17	29.96	33.17	32.10	33.17	32.10	33.17	33.17	32.10	390.55
I&I FLOW VOLUME (MG)	0.70	0.68	2.43	2.80	3.34	3.40	1.55	0.70	0.10	0.00	0.00	0.00	15.68
TOTAL INFLUENT FLOW VOLUME (MG)	***33.87***	***32.78***	***35.60***	***35.97***	***33.30***	***36.57***	***33.65***	***33.87***	***32.20***	***33.17***	***33.17***	***32.10***	***406.23***
TOTAL INFLOW (MG)	**34.46**	**34.12**	**37.60**	**38.28**	**35.23**	**38.44**	**34.66**	**34.36**	**32.30**	**33.19**	**33.20**	**32.29**	**418.14**
WATER OUTPUTS													
EVAPORATION-RELATED CALCULATIONS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTUAL EVAP. LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL EVAP (MG)	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
PERCOLATION-RELATED CALCULATIONS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	64.20	62.13	64.20	64.20	57.99	64.20	62.13	64.20	62.13	64.20	64.20	62.13	755.92
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	34.46	34.12	37.60	38.28	35.23	38.44	34.66	34.36	32.30	33.19	33.20	32.29	418.14
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC (MG)	***34.46***	***34.12***	***37.60***	***38.28***	***35.23***	***38.44***	***34.66***	***34.36***	***32.30***	***33.19***	***33.20***	***32.29***	***418.14***
IRRIGATION													
SELECTED CROP COEFFICIENT	0.85	0.91	1.13	1.02	1.67	0.96	0.94	1.15	0.82	0.78	0.75	0.92	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.90	1.10	1.15	1.03	1.65	2.64	3.62	4.51	4.78	6.58	6.16	4.49	40.61
TOTAL IRRIG DEMAND (IN)	2.29	0.00	0.00	0.00	0.00	0.00	2.15	4.71	6.10	8.72	8.13	5.47	37.58
TOTAL IRRIGATION DEMAND (MG)	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
TOTAL OUTFLOW (MG)	**34.46**	**34.12**	**37.60**	**38.28**	**35.23**	**38.44**	**34.66**	**34.36**	**32.30**	**33.19**	**33.20**	**32.29**	**418.14**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS													
BEGINNING STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STORAGE GAIN/LOSS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FINAL STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PERCENT OF TOTAL CAPACITY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	34.46	34.12	37.60	38.28	35.23	38.44	34.66	34.36	32.30	33.19	33.20	32.29	418.14
DISPOSAL REQUIRED (MG)	34.46	34.12	37.60	38.28	35.23	38.44	34.66	34.36	32.30	33.19	33.20	32.29	418.14
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cl

MAXIMUM STORAGE REQUIRED (MG)........	0
TOTAL AVAILABLE STORAGE (MG)........	26
PERCENT OF STORAGE USED........	0%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER........	391	EVAPORATION........	0	DISPOSAL CAPACITY BALANCE (MG)........	0
INFLOW AND INFILTRATION........	16	PERCOLATION........	418		
PRECIPITATION INTO PONDS........	12	IRRIGATION........	0	STORAGE CAPACITY BALANCE (MG)........ (MUST NOT BE NEGATIVE)	26
TOTAL	**418**	**TOTAL**	**418**		

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NO PROJECT ALTERNATIVE WATER BALANCE, 1-in-100 YEAR

1.40 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)..	1.40

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
PRECIP/AVG PRECIP RATIO..	2.03
OCT-APR EVAP/AVG EVAP RATIO...	1.00
MAY-SEP EVAP/AVG EVAP RATIO...	1.00
LAND PRECIP COLLECTED (FRAC)...	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)..	0.0
IRRIGATION EFFICIENCY (DECIMAL FRACT)...	0.75

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY)..	**3.05**

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name/Number	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
Additional RIBs:	1.1	0.8	1.0	0.7
0	0.0	0.0	0.0	0.0
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY)..	**15.25**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.03	0.03	0.10	0.12	0.16	0.14	0.07	0.03	0.00	0.00	0.00	0.00	0.68
INFLUENT- EXCLUDING I&I (MGD)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, 1-in-100 YEAR (IN)	1.18	2.66	3.96	4.57	3.82	3.71	2.01	0.97	0.20	0.04	0.06	0.39	23.57
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.27	0.62	0.92	1.06	0.88	0.86	0.47	0.23	0.05	0.01	0.01	0.09	5.47
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.35	0.78	1.16	1.34	1.12	1.09	0.59	0.28	0.06	0.01	0.02	0.11	6.89
TOTAL RAINFALL ADDITION (MG)	***0.62***	***1.39***	***2.08***	***2.39***	***2.00***	***1.95***	***1.05***	***0.51***	***0.11***	***0.02***	***0.03***	***0.20***	***12.36***
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	43.40	42.00	43.40	43.40	39.20	43.40	42.00	43.40	42.00	43.40	43.40	42.00	511.00
I&I FLOW VOLUME (MG)	0.92	0.89	3.18	3.66	4.37	4.44	2.02	0.92	0.13	0.00	0.00	0.00	20.52
TOTAL INFLUENT FLOW VOLUME (MG)	***44.32***	***42.89***	***46.58***	***47.06***	***43.57***	***47.84***	***44.02***	***44.32***	***42.13***	***43.40***	***43.40***	***42.00***	***531.52***
TOTAL INFLOW (MG)	**44.93**	**44.28**	**48.66**	**49.46**	**45.57**	**49.79**	**45.08**	**44.83**	**42.23**	**43.42**	**43.43**	**42.20**	**543.88**
WATER OUTPUTS													
IRRIGATION													
CROP COEFFICIENT	0.85	0.91	1.13	1.02	1.67	0.96	0.94	1.15	0.82	0.78	0.75	0.92	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.90	1.10	1.15	1.03	1.65	2.64	3.62	4.51	4.78	6.58	6.16	4.49	40.61
TOTAL IRRIG DEMAND (IN)	2.29	0.00	0.00	0.00	0.00	0.00	2.15	4.71	6.10	8.72	8.13	5.47	37.58
TOTAL IRRIGATION DEMAND (MG)	***0.06***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.06***	***0.13***	***0.17***	***0.24***	***0.22***	***0.15***	***1.02***
IRRIGATION DELIVERIES (MG)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
EVAPORATION-RELATED CALCULATIONS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTUAL EVAP. LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL EVAP (MG)	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
PERCOLATION-RELATED CALCULATIONS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	73.21	70.85	73.21	73.21	66.13	73.21	70.85	73.21	70.85	73.21	73.21	70.85	861.99
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	44.93	44.28	48.66	49.46	45.57	49.79	45.08	44.83	42.23	43.42	43.43	42.20	543.88
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC (MG)	***44.93***	***44.28***	***48.66***	***49.46***	***45.57***	***49.79***	***45.08***	***44.83***	***42.23***	***43.42***	***43.43***	***42.20***	***543.88***
TOTAL EVAP AND PERC (MG)	**44.93**	**44.28**	**48.66**	**49.46**	**45.57**	**49.79**	**45.08**	**44.83**	**42.23**	**43.42**	**43.43**	**42.20**	**543.88**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS													
BEGINNING STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STORAGE GAIN/LOSS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FINAL STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PERCENT OF TOTAL CAPACITY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	44.93	44.28	48.66	49.46	45.57	49.79	45.08	44.83	42.23	43.42	43.43	42.20	543.88
DISPOSAL REQUIRED (MG)	44.93	44.28	48.66	49.46	45.57	49.79	45.08	44.83	42.23	43.42	43.43	42.20	543.88
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)..	0
TOTAL AVAILABLE STORAGE (MG)..	26
PERCENT OF STORAGE USED...	0%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER...	511	EVAPORATION..............................	0	DISPOSAL CAPACITY BALANCE (MG)........................	0
INFLOW AND INFILTRATION....................................	21	PERCOLATION..............................	544		
PRECIPITATION INTO PONDS...	12	IRRIGATION..................................	0	STORAGE CAPACITY BALANCE (MG)........................ .... (MUST NOT BE NEGATIVE)	26
TOTAL	**544**	**TOTAL**	**544**		

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ALTERNATIVE D1 WATER BALANCE, 1-in-100 YEAR

1.40 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)........	1.40

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY)........	**3.05**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
PRECIP/AVG PRECIP RATIO........	2.03
OCT-APR EVAP/AVG EVAP RATIO........	1.00
MAY-SEP EVAP/AVG EVAP RATIO........	1.00
LAND PRECIP COLLECTED (FRAC)........	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)........	**180.0**
IRRIGATION EFFICIENCY (DECIMAL FRACT)........	0.75

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name/Number	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
Additional RIBs:	1.1	0.8	1.0	0.7
0	0.0	0.0	0.0	0.0
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY)........	**15.25**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.03	0.03	0.10	0.12	0.16	0.14	0.07	0.03	0.00	0.00	0.00	0.00	0.68
INFLUENT- EXCLUDING I&I (MGD)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, 1-in-100 YEAR (IN)	1.18	2.66	3.96	4.57	3.82	3.71	2.01	0.97	0.20	0.04	0.06	0.39	23.57
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.27	0.62	0.92	1.06	0.88	0.86	0.47	0.23	0.05	0.01	0.01	0.09	5.47
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.35	0.78	1.16	1.34	1.12	1.09	0.59	0.28	0.06	0.01	0.02	0.11	6.89
TOTAL RAINFALL ADDITION (MG)	***0.62***	***1.39***	***2.08***	***2.39***	***2.00***	***1.95***	***1.05***	***0.51***	***0.11***	***0.02***	***0.03***	***0.20***	***12.36***
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	43.40	42.00	43.40	43.40	39.20	43.40	42.00	43.40	42.00	43.40	43.40	42.00	511.00
I&I FLOW VOLUME (MG)	0.92	0.89	3.18	3.66	4.37	4.44	2.02	0.92	0.13	0.00	0.00	0.00	20.52
TOTAL INFLUENT FLOW VOLUME (MG)	***44.32***	***42.89***	***46.58***	***47.06***	***43.57***	***47.84***	***44.02***	***44.32***	***42.13***	***43.40***	***43.40***	***42.00***	***531.52***
TOTAL INFLOW (MG)	**44.93**	**44.28**	**48.66**	**49.46**	**45.57**	**49.79**	**45.08**	**44.83**	**42.23**	**43.42**	**43.43**	**42.20**	**543.88**
WATER OUTPUTS													
IRRIGATION													
CROP COEFFICIENT	0.85	0.91	1.13	1.02	1.67	0.96	0.94	1.15	0.82	0.78	0.75	0.92	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.90	1.10	1.15	1.03	1.65	2.64	3.62	4.51	4.78	6.58	6.16	4.49	40.61
TOTAL IRRIG DEMAND (IN)	2.29	0.00	0.00	0.00	0.00	0.00	2.15	4.71	6.10	8.72	8.13	5.47	37.58
TOTAL IRRIGATION DEMAND (MG)	***11.19***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***10.51***	***23.04***	***29.80***	***42.63***	***39.73***	***26.75***	***183.65***
IRRIGATION DELIVERIES (MG)	**11.19**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.51**	**23.04**	**29.80**	**42.63**	**39.73**	**26.75**	**183.65**
IRRIGATION DELIVERIES (Ac-ft)	**34.34**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**32.26**	**70.72**	**91.47**	**130.83**	**121.92**	**82.11**	**563.65**
EVAPORATION-RELATED CALCULATIONS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	1.42	0.50	0.42	0.42	0.41	1.14	1.60	1.63	2.43	0.79	3.43	2.02	16.20
TOTAL EVAP (MG)	***1.42***	***0.50***	***0.42***	***0.42***	***0.41***	***1.14***	***1.60***	***1.63***	***2.43***	***0.79***	***3.43***	***2.02***	***16.20***
PERCOLATION-RELATED CALCULATIONS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	73.21	70.85	73.21	73.21	66.13	73.21	70.85	73.21	70.85	73.21	73.21	70.85	861.99
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	33.74	44.28	48.66	49.46	45.57	49.79	34.57	21.78	12.43	0.79	3.71	15.45	360.23
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC (MG)	***33.74***	***44.28***	***48.66***	***49.46***	***45.57***	***49.79***	***34.57***	***21.78***	***12.43***	***0.79***	***3.71***	***15.45***	***360.23***
TOTAL EVAP AND PERC (MG)	**35.16**	**44.78**	**49.08**	**49.87**	**45.98**	**50.93**	**36.16**	**23.41**	**14.86**	**1.58**	**7.13**	**17.47**	**376.43**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS													
BEGINNING STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STORAGE GAIN/LOSS (MG)	-1.42	-0.50	-0.42	-0.42	-0.41	-1.14	-1.60	-1.63	-2.43	-0.79	-3.43	-2.02	
FINAL STORAGE (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PERCENT OF TOTAL CAPACITY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	46.35	44.78	49.08	49.87	45.98	50.93	46.67	46.45	44.66	44.21	46.86	44.22	560.09
DISPOSAL REQUIRED (MG)	44.93	44.28	48.66	49.46	45.57	49.79	45.08	44.83	42.23	43.42	43.43	42.20	543.88
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)........	0
TOTAL AVAILABLE STORAGE (MG)........	26
PERCENT OF STORAGE USED........	0%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER........	511	EVAPORATION........	16	DISPOSAL CAPACITY BALANCE (MG)........	16
INFLOW AND INFILTRATION........	21	PERCOLATION........	360		
PRECIPITATION INTO PONDS........	12	IRRIGATION........	184	STORAGE CAPACITY BALANCE (MG)........ (MUST NOT BE NEGATIVE)	26
TOTAL	**544**	**TOTAL**	**560**		

ALTERNATIVE D2 WATER BALANCE, 1-in-100 YEAR

1.40 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)..	1.40

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
PRECIP/AVG PRECIP RATIO..	2.03
OCT-APR EVAP/AVG EVAP RATIO..	1.00
MAY-SEP EVAP/AVG EVAP RATIO..	1.00
LAND PRECIP COLLECTED (FRAC)...	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)..	180.0
IRRIGATION EFFICIENCY (DECIMAL FRACT).................................	0.75

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**
GROSS PERCOLATION RATE (IN/DAY)...		**3.05**	

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name/Number	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
Additional RIBs:	1.1	0.8	1.0	0.7
0	0.0	0.0	0.0	0.0
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**
GROSS PERCOLATION RATE (IN/DAY)...		**15.25**		

percolation cycle factor: 0.88

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.03	0.03	0.10	0.12	0.16	0.14	0.07	0.03	0.00	0.00	0.00	0.00	0.68
INFLUENT- EXCLUDING I&I (MGD)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	43.40	42.00	43.40	43.40	39.20	43.40	42.00	43.40	42.00	43.40	43.40	42.00	511.00
I&I FLOW VOLUME (MG)	0.92	0.89	3.18	3.66	4.37	4.44	2.02	0.92	0.13	0.00	0.00	0.00	20.52
TOTAL INFLUENT FLOW VOLUME (MG)	***44.32***	***42.89***	***46.58***	***47.06***	***43.57***	***47.84***	***44.02***	***44.32***	***42.13***	***43.40***	***43.40***	***42.00***	***531.52***
TOTAL INFLOW (MG)	**44.32**	**42.89**	**46.58**	**47.06**	**43.57**	**47.84**	**44.02**	**44.32**	**42.13**	**43.40**	**43.40**	**42.00**	**531.52**
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, 1-in-100 YEAR (IN)	1.18	2.66	3.96	4.57	3.82	3.71	2.01	0.97	0.20	0.04	0.06	0.39	23.57
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.27	0.62	0.92	1.06	0.88	0.86	0.47	0.23	0.05	0.01	0.01	0.09	5.47
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.34	0.78	1.16	1.34	1.12	1.09	0.59	0.28	0.06	0.01	0.02	0.11	6.89
TOTAL RAINFALL ADDITION WWTP AND LOWER PONDS (MG)	***0.62***	***1.39***	***2.08***	***2.39***	***2.00***	***1.95***	***1.05***	***0.51***	***0.11***	***0.02***	***0.03***	***0.20***	***12.36***
WATER OUTPUTS													
EVAPORATION-RELATED CALCULATIONS FOR WWTP AND LOWER PONDS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	1.42	0.50	0.42	0.42	0.41	1.14	1.60	1.63	2.43	0.00	0.23	2.02	12.21
TOTAL EVAP FROM WWTP AND LOWER PONDS(MG)	***1.42***	***0.50***	***0.42***	***0.42***	***0.41***	***1.14***	***1.60***	***1.63***	***2.43***	***0.00***	***0.23***	***2.02***	***12.21***
PERCOLATION-RELATED CALCULATIONS FOR WWTP AND LOWER PONDS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	73.21	70.85	73.21	73.21	66.13	73.21	70.85	73.21	70.85	73.21	73.21	70.85	861.99
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	34.05	42.89	47.47	48.72	45.54	49.43	39.04	34.16	16.43	0.00	0.21	19.95	377.90
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC FROM WWTP AND LOWER PONDS (MG)	***34.05***	***42.89***	***47.47***	***48.72***	***45.54***	***49.43***	***39.04***	***34.16***	***16.43***	***0.00***	***0.21***	***19.95***	***377.90***
TOTAL EVAP AND PERC FROM WWTP AND LOWER PONDS (MG)	**35.47**	**43.39**	**47.89**	**49.14**	**45.96**	**50.57**	**40.64**	**35.79**	**18.87**	**0.00**	**0.43**	**21.97**	**390.11**
IRRIGATION													
CROP COEFFICIENT, Kc = Etc/Eto	0.81	0.80	1.09	1.15	0.85	0.66	0.75	0.65	0.71	0.80	0.81	0.78	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.75	0.97	1.10	1.17	0.84	1.81	2.90	2.53	4.15	6.70	6.69	3.77	35.37
TOTAL IRRIG DEMAND (IN)	2.10	0.00	0.00	0.00	0.00	0.00	1.18	2.08	5.26	8.88	8.84	4.51	32.85
TOTAL IRRIGATION DEMAND (MG)	10.26	0.00	0.00	0.00	0.00	0.00	5.79	10.16	25.69	43.41	43.21	22.05	160.57
IRRIGATION DELIVERIES (MG)	**10.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.79**	**10.16**	**25.69**	**43.40**	**43.21**	**22.05**	**160.57**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS FOR WWTP AND LOWER PONDS													
BEGINNING STORAGE (MG)	0.0	0.00	0.89	1.66	1.98	1.59	0.81	0.00	0.00	0.00	0.02	0.00	
STORAGE GAIN/LOSS (MG)	-0.80	0.89	0.76	0.32	-0.39	-0.78	-1.35	-1.12	-2.32	0.02	-0.22	-1.82	
FINAL STORAGE (MG)	0.00	0.89	1.66	1.98	1.59	0.81	0.00	0.00	0.00	0.02	0.00	0.00	
PERCENT OF TOTAL CAPACITY	0%	3%	6%	8%	6%	3%	0%	0%	0%	0%	0%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	45.73	44.28	49.55	51.11	47.54	51.38	46.43	45.94	44.56	43.42	43.65	44.02	557.62
DISPOSAL REQUIRED (MG)	44.93	44.28	48.66	49.46	45.57	49.79	45.08	44.83	42.23	43.42	43.43	42.20	543.88
ADDITIONAL STORAGE REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)..	2
TOTAL AVAILABLE STORAGE (MG)...	26
PERCENT OF STORAGE USED...	8%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER..	511	EVAPORATION..	12	DISPOSAL CAPACITY BALANCE (MG)....................................	7
INFLOW AND INFILTRATION......................................	21	PERCOLATION..	378		
PRECIPITATION INTO PONDS..	12	IRRIGATION..	161	STORAGE CAPACITY BALANCE (MG)...................................... (MUST NOT BE NEGATIVE)	24
TOTAL	**544**	**TOTAL**	**551**		

SALIDA, CA 2/28/2024 16:18

ALTERNATIVE D3 WATER BALANCE, AVG YEAR 1.40 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)........ 1.40

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY)........ **3.05**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	AVG YEAR
PRECIP/AVG PRECIP RATIO........	1.00
OCT-APR EVAP/AVG EVAP RATIO........	0.78
MAY-SEP EVAP/AVG EVAP RATIO........	1.00
LAND PRECIP COLLECTED (FRAC)........	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)........	410.0
IRRIGATION EFFICIENCY (DECIMAL FRACT)........	0.75

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY)........ **15.25**

ADDITIONAL REMOTE STORAGE BASIN CHARACTERISTICS

TOTAL VOLUME NEEDED (MG)	Gross Area Including Roadway CL (Ac)	Gross Area (Ac)	Storage Capacity @ Max WSE (MG)
250.0	76.7	63.9	250.0
TOTAL	**76.7**	**63.9**	**250.0**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.03	0.03	0.10	0.12	0.16	0.14	0.07	0.03	0.00	0.00	0.00	0.00	0.68
INFLUENT- EXCLUDING I&I (MGD)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	43.40	42.00	43.40	43.40	39.20	43.40	42.00	43.40	42.00	43.40	43.40	42.00	511.00
I&I FLOW VOLUME (MG)	0.92	0.89	3.18	3.66	4.37	4.44	2.02	0.92	0.13	0.00	0.00	0.00	20.52
TOTAL INFLUENT FLOW VOLUME (MG)	***44.32***	***42.89***	***46.58***	***47.06***	***43.57***	***47.84***	***44.02***	***44.32***	***42.13***	***43.40***	***43.40***	***42.00***	***531.52***
TOTAL INFLOW (MG)	**44.32**	**42.89**	**46.58**	**47.06**	**43.57**	**47.84**	**44.02**	**44.32**	**42.13**	**43.40**	**43.40**	**42.00**	**531.52**
RECYCLED WATER PRODUCTION TO STORAGE RESERVOIR (MG)	44.32	42.89	46.58	47.06	43.57	47.84	36.32	44.32	42.13	43.40	43.40	42.00	523.82
OVERFLOW EFFLUENT TO PERCOLATION PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	7.70	0.00	0.00	0.00	0.00	0.00	7.70
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, AVG YEAR (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.13	0.30	0.45	0.52	0.44	0.42	0.23	0.11	0.02	0.00	0.01	0.04	2.69
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.17	0.38	0.57	0.66	0.55	0.54	0.29	0.14	0.03	0.01	0.01	0.06	3.40
PRECIP. VOLUME CAPTURED BY REMOTE STORAGE POND (MG)	0.35	0.78	1.17	1.35	1.13	1.10	0.59	0.29	0.06	0.01	0.02	0.11	6.96
TOTAL RAINFALL ADDITION ALL PONDS (MG)	***0.65***	***1.47***	***2.19***	***2.53***	***2.11***	***2.06***	***1.11***	***0.54***	***0.11***	***0.02***	***0.03***	***0.21***	***13.04***
WATER OUTPUTS													
IRRIGATION													
CROP COEFFICIENT	0.85	0.91	1.13	1.02	1.67	0.96	0.94	1.15	0.82	0.78	0.75	0.92	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.90	1.10	1.15	1.03	1.65	2.64	3.62	4.51	4.78	6.58	6.16	4.49	40.61
TOTAL IRRIG DEMAND (IN)	3.09	0.00	0.00	0.00	0.00	1.08	3.51	5.37	6.24	8.75	8.17	5.73	41.94
TOTAL IRRIGATION DEMAND (MG)	34.40	0.00	0.00	0.00	0.00	12.05	39.08	59.82	69.41	97.41	90.95	63.84	466.95
IRRIGATION DELIVERIES (MG)	**34.40**	**0.00**	**0.00**	**0.00**	**0.00**	**12.05**	**39.08**	**59.82**	**69.41**	**97.41**	**90.95**	**48.66**	**451.76**
EVAPORATION-RELATED CALCULATIONS FOR REMOTE POND													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM REMOTE STORAGE POND (MG)	5.92	2.10	1.75	1.75	1.72	4.76	6.67	6.81	10.16	14.62	14.32	8.44	79.01
ACTUAL EVAP. LOSS FROM REMOTE STORAGE POND (MG)	5.92	2.10	1.75	1.75	1.72	4.76	6.67	6.81	10.16	14.62	14.32	8.44	79.01
TOTAL EVAP FROM REMOTE STORAGE PONDS (MG)	***5.92***	***2.10***	***1.75***	***1.75***	***1.72***	***4.76***	***6.67***	***6.81***	***10.16***	***14.62***	***14.32***	***8.44***	***79.01***
EVAPORATION-RELATED CALCULATIONS FOR ON-SITE PONDS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	0.00	0.30	0.42	0.42	0.41	0.99	0.96	0.52	0.25	0.05	0.01	0.02	4.35
TOTAL EVAP FROM ON-SITE PONDS (MG)	***0.00***	***0.30***	***0.42***	***0.42***	***0.41***	***0.99***	***0.96***	***0.52***	***0.25***	***0.05***	***0.01***	***0.02***	***4.35***
PERCOLATION-RELATED CALCULATIONS FOR ON-SITE PONDS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	73.21	70.85	73.21	73.21	66.13	73.21	70.85	73.21	70.85	73.21	73.21	70.85	861.99
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	0.00	0.00	0.27	0.60	0.77	0.00	7.70	0.00	0.00	0.00	0.00	0.00	9.34
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC FROM ON-SITE PONDS(MG)	***0.00***	***0.00***	***0.27***	***0.60***	***0.77***	***0.00***	***7.70***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***9.34***
TOTAL EVAP AND PERC FROM WWTP AND LOWER PONDS (MG)	**0.00**	**0.30**	**0.69**	**1.02**	**1.18**	**0.99**	**8.66**	**0.52**	**0.25**	**0.05**	**0.01**	**0.02**	**13.69**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS FOR REMOTE STORAGE													
BEGINNING STORAGE (MG)	0.00	4.35	45.92	91.91	138.57	181.54	213.68	204.85	182.82	145.44	76.83	14.98	
STORAGE GAIN/LOSS (MG)	4.35	41.57	46.00	46.65	42.98	32.14	-8.83	-22.03	-37.38	-68.61	-61.85	-14.98	
FINAL STORAGE (MG)	4.35	45.92	91.91	138.57	181.54	213.68	204.85	182.82	145.44	76.83	14.98	0.00	
PERCENT OF REMOTE STORAGE CAPACITY	2%	18%	37%	55%	73%	85%	82%	73%	58%	31%	6%	0%	
STORAGE CALCULATIONS FOR WWTP AND LOWER PONDS													
BEGINNING STORAGE (MG)	0.00	0.30	0.69	1.02	1.18	0.99	0.96	0.52	0.25	0.05	0.01	0.02	
STORAGE GAIN/LOSS (MG)	0.30	0.38	0.34	0.16	-0.19	-0.03	-0.44	-0.27	-0.20	-0.04	0.01	0.20	
FINAL STORAGE (MG)	0.30	0.69	1.02	1.18	0.99	0.96	0.52	0.25	0.05	0.01	0.02	0.21	
PERCENT OF WWTP AND LOWER POND CAPACITY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
TOTAL FACILITY STORAGE AND CAPACITY													
BEGINNING STORAGE (MG)	0.00	4.65	46.60	92.94	139.75	182.53	214.64	205.37	183.08	145.50	76.84	15.00	
STORAGE GAIN/LOSS (MG)	4.65	41.95	46.33	46.81	42.78	32.11	-9.27	-22.29	-37.58	-68.65	-61.85	-14.78	
FINAL STORAGE (MG)	4.65	46.60	92.94	139.75	182.53	214.64	205.37	183.08	145.50	76.84	15.00	0.21	
PERCENT OF TOTAL CAPACITY	2%	17%	34%	51%	66%	78%	75%	66%	53%	28%	5%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	0.30	0.99	1.71	2.20	2.17	1.95	9.18	0.77	0.30	0.06	0.03	0.23	19.89
OFF-SITE DISPOSAL (MG)	44.66	43.67	47.75	48.41	44.69	48.94	36.91	44.60	42.19	43.41	43.42	42.11	530.77
DISPOSAL REQUIRED (MG)	44.97	44.36	48.77	49.59	45.68	49.90	45.14	44.85	42.24	43.42	43.43	42.21	544.56
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)........	215
TOTAL AVAILABLE STORAGE (MG)........	276
PERCENT OF STORAGE USED........	78%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER........	511	EVAPORATION........	83	DISPOSAL CAPACITY BALANCE (MG)........	0
INFLOW AND INFILTRATION........	21	PERCOLATION........	9		
PRECIPITATION INTO PONDS........	13	IRRIGATION........	452	STORAGE CAPACITY BALANCE (MG)........ (MUST NOT BE NEGATIVE)	61
TOTAL	**545**	**TOTAL**	**544**		

SALIDA, CA 2/23/2024 15:13

ALTERNATIVE D3 WATER BALANCE, 1-in-100 YEAR

1.40 mgd ADWF

INPUT DATA

SANITARY FLOW CHARACTERISTICS

AVERAGE DRY WEATHER FLOW (MGD)........ 1.40

SALIDA SANITARY DISTICT LOWER POND CHARACTERISTICS

	Contributing Gross Area (Ac) Google Earth	Storage Capacity @ Max WSE (MG)	Percolation (Bottom of Pond) Surface Area (Ac)
POND 2	4.8	7.6	3.9
POND 4	4.5	7.1	4.3
POND 1	1.6	2.4	1.4
POND 3 (Not in service)	~~0.6~~	~~0.8~~	~~0.4~~
POND TOTAL	**10.9**	**17.2**	**9.6**

GROSS PERCOLATION RATE (IN/DAY)........ 3.05

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
PRECIP/AVG PRECIP RATIO........	2.03
OCT-APR EVAP/AVG EVAP RATIO........	1.00
MAY-SEP EVAP/AVG EVAP RATIO........	1.00
LAND PRECIP COLLECTED (FRAC)........	0.90

IRRIGATION AREA CHARACTERISTICS

IRRIGATION AREA (AC)........	430.0
IRRIGATION EFFICIENCY (DECIMAL FRACT)........	0.75

GROSS RAPID INFILTRATION BASIN CHARACTERISTICS

SALIDA WWTP Pond Name	Gross Area Including Roadway CL (Ac) Google Earth	Max. Water Surface Area (Ac) @ 2 FT FREEBOARD	Pond Storage Capacity @ Max WSE (MG)	Bottom Surface Area (Ac)
North R.I.B - Pond 1:		0.8	0.9	0.6
North R.I.B - Pond 2:	2.8	0.7	0.9	0.6
North R.I.B - Pond 3:		0.8	0.9	0.6
East R.I.B - Pond 4:		0.8	0.9	0.6
East R.I.B - Pond 5:	2.8	0.7	0.9	0.6
East R.I.B - Pond 6:		0.8	0.9	0.6
North R.I.B - Pond 7:		0.8	1.0	0.7
North R.I.B - Pond 8:	3.1	0.8	1.0	0.7
North R.I.B - Pond 9:		0.9	1.0	0.7
TOTAL	**8.7**	**7.1**	**8.4**	**5.7**

percolation cycle factor: 0.88

GROSS PERCOLATION RATE (IN/DAY)........ 15.25

ADDITIONAL REMOTE STORAGE BASIN CHARACTERISTICS

TOTAL VOLUME NEEDED (MG)	Gross Area Including Roadway CL (Ac)	Gross Area (Ac)	Storage Capacity @ Max WSE (MG)
270.0	82.9	69.1	270.0
TOTAL	**82.9**	**69.1**	**270.0**

CALCULATIONS

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
WATER INPUTS													
AVG PRECIP (IN)	0.58	1.31	1.95	2.25	1.88	1.83	0.99	0.48	0.10	0.02	0.03	0.19	11.61
I&I (MGD/MGD)	0.02	0.02	0.07	0.08	0.11	0.10	0.05	0.02	0.00	0.00	0.00	0.00	0.49
I&I (MGD)	0.03	0.03	0.10	0.12	0.16	0.14	0.07	0.03	0.00	0.00	0.00	0.00	0.68
INFLUENT- EXCLUDING I&I (MGD)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	43.40	42.00	43.40	43.40	39.20	43.40	42.00	43.40	42.00	43.40	43.40	42.00	511.00
I&I FLOW VOLUME (MG)	0.92	0.89	3.18	3.66	4.37	4.44	2.02	0.92	0.13	0.00	0.00	0.00	20.52
TOTAL INFLUENT FLOW VOLUME (MG)	***44.32***	***42.89***	***46.58***	***47.06***	***43.57***	***47.84***	***44.02***	***44.32***	***42.13***	***43.40***	***43.40***	***42.00***	***531.52***
TOTAL INFLOW (MG)	**44.32**	**42.89**	**46.58**	**47.06**	**43.57**	**47.84**	**44.02**	**44.32**	**42.13**	**43.40**	**43.40**	**42.00**	**531.52**
RECYCLED WATER PRODUCTION TO STORAGE RESERVOIR (MG)	44.32	42.89	46.58	47.06	43.57	47.84	31.05	31.01	42.13	43.40	43.40	42.00	505.24
OVERFLOW EFFLUENT TO PERCOLATION PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	12.98	13.31	0.00	0.00	0.00	0.00	26.28
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)	5.0%	11.3%	16.8%	19.4%	16.2%	15.8%	8.5%	4.1%	0.9%	0.2%	0.3%	1.6%	
ESTIMATED RAINFALL, 1-in-100 YEAR (IN)	1.18	2.66	3.96	4.57	3.82	3.71	2.01	0.97	0.20	0.04	0.06	0.39	23.57
PRECIP. VOLUME CAPTURED BY WWTP POND (MG)	0.27	0.62	0.92	1.06	0.88	0.86	0.47	0.23	0.05	0.01	0.01	0.09	5.47
PRECIP. VOLUME CAPTURED BY LOWER PONDS (MG)	0.35	0.78	1.16	1.34	1.12	1.09	0.59	0.28	0.06	0.01	0.02	0.11	6.89
PRECIP. VOLUME CAPTURED BY REMOTE STORAGE POND (MG)	0.76	1.72	2.56	2.96	2.47	2.40	1.30	0.63	0.13	0.03	0.04	0.25	15.25
TOTAL RAINFALL ADDITION PERC AND LOWER PONDS (MG)	***1.38***	***3.11***	***4.64***	***5.35***	***4.47***	***4.35***	***2.35***	***1.14***	***0.24***	***0.05***	***0.07***	***0.45***	***27.61***
WATER OUTPUTS													
IRRIGATION													
CROP COEFFICIENT	0.85	0.91	1.13	1.02	1.67	0.96	0.94	1.15	0.82	0.78	0.75	0.92	
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Seasonal ETo * Weighted Kc)	2.90	1.10	1.15	1.03	1.65	2.64	3.62	4.51	4.78	6.58	6.16	4.49	40.61
TOTAL IRRIG DEMAND (IN)	2.29	0.00	0.00	0.00	0.00	0.00	2.15	4.71	6.10	8.72	8.13	5.47	37.58
TOTAL IRRIGATION DEMAND (MG)	26.73	0.00	0.00	0.00	0.00	0.00	25.11	55.04	71.19	101.84	94.90	63.91	438.73
IRRIGATION DELIVERIES (MG)	**26.73**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**25.11**	**55.04**	**71.19**	**101.84**	**94.90**	**60.34**	**435.16**
EVAPORATION-RELATED CALCULATIONS FOR REMOTE POND													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM REMOTE STORAGE POND (MG)	6.39	2.27	1.89	1.89	1.86	5.14	7.20	7.35	10.97	15.79	15.47	9.11	85.33
ACTUAL EVAP. LOSS FROM REMOTE STORAGE POND (MG)	6.39	2.27	1.89	1.89	1.86	5.14	7.20	7.35	10.97	15.79	15.47	9.11	85.33
TOTAL EVAP FROM REMOTE STORAGE PONDS (MG)	***6.39***	***2.27***	***1.89***	***1.89***	***1.86***	***5.14***	***7.20***	***7.35***	***10.97***	***15.79***	***15.47***	***9.11***	***85.33***
EVAPORATION-RELATED CALCULATIONS FOR ON-SITE PONDS													
AVG EVAPOTRANSPIRATION, ETo ZONE 13 WET YEAR (IN)	3.41	1.21	1.01	1.01	0.99	2.74	3.84	3.92	5.85	8.42	8.25	4.86	45.51
POTENTIAL EVAP. LOSS FROM WWTP PONDS (MG)	0.53	0.19	0.16	0.16	0.15	0.42	0.59	0.61	0.91	1.30	1.28	0.75	7.05
POTENTIAL EVAP. LOSS FROM LOWER PONDS (MG)	0.89	0.32	0.26	0.26	0.26	0.71	1.00	1.02	1.52	2.19	2.15	1.27	11.86
ACTUAL EVAP. LOSS FROM WWTP AND LOWER PONDS (MG)	0.00	0.50	0.42	0.42	0.41	1.14	1.60	1.05	0.51	0.11	0.02	0.03	6.21
TOTAL EVAP FROM ON-SITE PONDS (MG)	***0.00***	***0.50***	***0.42***	***0.42***	***0.41***	***1.14***	***1.60***	***1.05***	***0.51***	***0.11***	***0.02***	***0.03***	***6.21***
PERCOLATION-RELATED CALCULATIONS FOR ON-SITE PONDS													
ESTIMATED WWTP PONDS PERCOLATION RATE (IN/DAY)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	
ESTIMATED LOWER PONDS PERCOLATION RATE (IN/DAY)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
WWTP POND PERCOLATION (IN)	472.74	457.49	472.74	472.74	426.99	472.74	457.49	472.74	457.49	472.74	472.74	457.49	5566.08
LOWER POND PERCOLATION (IN)	94.55	91.50	94.55	94.55	85.40	94.55	91.50	94.55	91.50	94.55	94.55	91.50	1113.25
POTENTIAL PERC LOSS FROM WWTP PONDS (MG)	73.21	70.85	73.21	73.21	66.13	73.21	70.85	73.21	70.85	73.21	73.21	70.85	861.99
POTENTIAL PERC LOSS FROM LOWER PONDS (MG)	21.61	20.92	21.61	21.61	19.52	21.61	20.92	21.61	20.92	21.61	21.61	20.92	254.48
ACTUAL PERC LOSS FROM WWTP PONDS (MG)	0.00	0.12	0.97	1.66	1.98	0.86	13.33	13.31	0.00	0.00	0.00	0.00	32.23
ACTUAL PERC LOSS FROM LOWER PONDS (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PERC FROM ON-SITE PONDS(MG)	***0.00***	***0.12***	***0.97***	***1.66***	***1.98***	***0.86***	***13.33***	***13.31***	***0.00***	***0.00***	***0.00***	***0.00***	***32.23***
TOTAL EVAP AND PERC FROM WWTP AND LOWER PONDS (MG)	**0.00**	**0.62**	**1.39**	**2.08**	**2.39**	**2.00**	**14.93**	**14.36**	**0.51**	**0.11**	**0.02**	**0.03**	**38.44**
CAPACITY CALCULATIONS													
STORAGE CALCULATIONS FOR REMOTE STORAGE													
BEGINNING STORAGE (MG)	0.00	11.95	54.29	101.54	149.66	193.84	238.95	238.99	208.24	168.33	94.13	27.20	
STORAGE GAIN/LOSS (MG)	11.95	42.34	47.25	48.12	44.18	45.11	0.04	-30.76	-39.90	-74.20	-66.93	-27.20	
FINAL STORAGE (MG)	11.95	54.29	101.54	149.66	193.84	238.95	238.99	208.24	168.33	94.13	27.20	0.00	
PERCENT OF REMOTE STORAGE CAPACITY	4%	20%	38%	55%	72%	89%	89%	77%	62%	35%	10%	0%	
STORAGE CALCULATIONS FOR WWTP AND LOWER PONDS													
BEGINNING STORAGE (MG)	0.00	0.62	1.39	2.08	2.39	2.00	1.95	1.05	0.51	0.11	0.02	0.03	
STORAGE GAIN/LOSS (MG)	0.62	0.78	0.68	0.32	-0.39	-0.05	-0.89	-0.54	-0.40	-0.09	0.01	0.42	
FINAL STORAGE (MG)	0.62	1.39	2.08	2.39	2.00	1.95	1.05	0.51	0.11	0.02	0.03	0.45	
PERCENT OF WWTP AND LOWER POND CAPACITY	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%	
TOTAL FACILITY STORAGE AND CAPACITY													
BEGINNING STORAGE (MG)	0.00	12.57	55.68	103.61	152.06	195.84	240.90	240.05	208.75	168.44	94.16	27.24	
STORAGE GAIN/LOSS (MG)	12.57	43.11	47.93	48.44	43.79	45.06	-0.86	-31.30	-40.31	-74.28	-66.92	-26.78	
FINAL STORAGE (MG)	12.57	55.68	103.61	152.06	195.84	240.90	240.05	208.75	168.44	94.16	27.24	0.45	
PERCENT OF TOTAL CAPACITY	4%	19%	35%	51%	66%	82%	81%	71%	57%	32%	9%	0%	
ON-SITE CAPACITY CALCULATIONS													
ON-SITE DISPOSAL (MG)	0.62	2.01	3.47	4.47	4.40	3.95	15.98	14.87	0.62	0.13	0.05	0.48	51.05
OFF-SITE DISPOSAL (MG)	45.08	56.56	103.43	151.55	195.70	244.09	271.30	270.63	250.49	211.76	137.57	69.45	2007.62
DISPOSAL REQUIRED (MG)	45.70	46.00	51.22	52.41	48.04	52.20	46.38	45.46	42.36	43.45	43.47	42.45	559.13
EXPORT REQUIRED (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)........	241
TOTAL AVAILABLE STORAGE (MG)........	296
PERCENT OF STORAGE USED........	82%

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER........	511	EVAPORATION........	92	DISPOSAL CAPACITY BALANCE (MG)........	0
INFLOW AND INFILTRATION........	21	PERCOLATION........	32		
PRECIPITATION INTO PONDS........	28	IRRIGATION........	435	STORAGE CAPACITY BALANCE (MG)........ (MUST NOT BE NEGATIVE)	55
TOTAL	**559**	**TOTAL**	**559**		

Appendix C

SALIDA WWTP RIB CHARACTERISTIC MEMORANDUM

KJELDSEN SINNOCK NEUDECK inc.
CIVIL ENGINEERS & LAND SURVEYORS

Stephen K. Sinnock, P.E.
Christopher H. Neudeck, P.E.
Neal T. Colwell, P.E.
Barry O'Regan, P.E.

2487-0010
Task 2

TECHNICAL MEMORANDUM

January 31, 2024

To: Tony Tovar, District Manager – Engineer, Salida Sanitary District

Project: Salida Sanitary District Recycled Water Planning Study

Subject: Salida WWTP RIB Characteristic Study

From: Neal T. Colwell, RCE 59437,

Jade Fredeen, EIT No. 178992

REGISTERED PROFESSIONAL ENGINEER NEAL T. COLWELL No. C 59437 CIVIL STATE OF CALIFORNIA

1.0 Background and Purpose

In November of 2023, the State Water Quality Control Board (SWQCB) authorized the use of the Salida Recycled Water Planning Study grant funding for a refined field investigation of the capacity and characteristics of the rapid infiltration basin (RIB) facilities which are integral to the recommended plan for meeting the reliability requirements of Title 22 under Article 10. This memorandum has been prepared to summarize the components and present the results of the field investigation. The field investigation consists of supplemental field studies to gather information on existing and proposed RIB soil classification, hydraulic conductivity rates, measured percolation rates, and soil nitrogen data. The study results will be used to refine the percolation characteristics of the existing RIBs and expansion area RIBs and provide insight to the nitrogen conditions in the underlying soils. The results of the field studies will be incorporated in the Salida Recycled Water Planning Study. The components of the Salida WWTP RIB Characteristic Study are discussed in the subsections below.

2.0 Soil Classification

Prior to conducting field work, a preliminary investigation was performed to identify the soil types within the greater Salida Sanitary District (District) WWTP Area. In effort to understand the potential hydraulic conductivity of the soils, the Natural Resource Conservation Service (NRCS) web soil survey was referenced[1]. The NRCS web survey identified four predominant soil classifications in the area including Hanford Sandy Loam (HdA), Hanford Sandy Loam Moderately Deep Over Silt (HdpA), Modesto Loam (MoA), and Oakdale Sandy Loam (OaA). The NRCS defined soil types and approximate locations are shown in Figure 1.

[1] NRCS Web Soil Survey: Web Soil Survey (usda.gov)

Figure 1
NRCS Soil Types and Approximate Locations
Reference: NRCS Web Soil Survey

NRCS Soil Surveys define predicted soil profiles of the soils found in the region from surface to 60 inches below surface. NRCS Soil Profiles are summarized by depth in Table 1. Detailed NRCS soil surveys for each soil type are provided in Exhibit A.

Table 1
Summary of NRCS Regional Soil Profiles

Soil Type	Abbreviation	Profile Depth, inches	Soil Type
Oakdale Sandy Loam	OaA	0 to 45	Sandy Loam
		45 to 60	Loamy Sand
Hanford Sandy Loam	HdA	0 to 60	Sandy Loam
Hanford Sandy Loam Moderately Deep Over Silt	HdpA	0 to 36	Sandy Loam
		36 to 60	Silt Loam
Modesto Loam	MoA	0 to 10	Loam
		10 to 12	Clay Loam
		12 to 35	Clay
		35 to 55	Sandy Clay Loam
		55 to 60	Stratified Very Fine Sand to Silty Clay

During the field visit on December 5, 2023, soil classification and analysis was performed by KSN within test pits in 3 existing RIB pond locations and in hard auger borings at 5 RIB expansion area locations. The NRCS soil types were used as a reference to identify potential expected soil types in the area. The field sampling was performed at the locations indicated by the green triangles below in Figure 2. Soil samples were also taken from test pits in existing RIB ponds 2, 5 and 7 and analyzed for Nitrogen content. Soil classification and sampling was performed concurrent with Guelph Permeameter permeability testing.

Figure 2
RIB Soil Sampling Locations

Test pits were excavated to a depth of 5 feet below the bottom of RIB pond surface. Each of the test pits were visually inspected for changes in soil consistency, color and general characteristics. Soil samples were taken from each different layer resulting in three individual soil samples taken from RIB ponds 2 and 5 and four soil samples taken from RIB pond 7. Proposed RIB expansion areas soil samples were taken by hard auger from an average depth of 21 inches below ground surface. Soil samples were generally taken at locations where differing soil layers were visibly identified. Each individual soil sample was classified and documented in a test pit or boring soil log. A summary of the results of the soil characteristic logs is shown in Table 2 and provided in Exhibit B.

Table 2
Summary of Salida RIB Soil Sample Log Results

Sample	Soil Layer	Top Depth, in	Bottom Depth, in	NRCS Class	Symbol	Soil Description
RIB 2	1	0	53	MoA	SW	Brownish grey fine clean sand with some silt intermixed with grey and gold medium sand of little fines.
	2	53	82		SM	Moderate brown-grey. Very fine sand with silt.
	3	82	-		SW	Grey interspersed with some gold layering. Dense fine clean sand with some silt.
RIB 5	1*	0	10	OaA	SM	Light olive-grey fine sand with silt and clay.
	2	10	54		SW	Light olive-grey very fine sand with small amount of silt.
	3	54	below 88		SW	Greenish-grey fine sand with very small amount of silt.
RIB 7	1	0	33	OaA	SW	Moderate brown to yellowish orange fine clean sand.
	2	33	51		SW	Greyish brown with red modeling finer clean sand (finer than top layer).
	3	51	84		SW	Yellowish orange medium very clean sand (no fines).
	4	84	-		SW	Greyish brown with red layering fine clean sand with some silt.
Exp Area 1	1	0	below 35.5	HdpA	SM	Moderate reddish-brown very fine sand with silt.
Exp Area 2	1	0	13	HdpA	SW	Moderate brown fine sand with very little silt.
	2	13	below 29.5		SM	Light brown fine silty-sand.
Exp Area 3	1	0	below 28.5	OaA	SM or SC	Greyish red fine and very fine sand with [clay or silt].
Exp Area 4	1	0	below 24.5	OaA	SW-SM	Light brown fine sand with very fine silty sand.
Exp Area 5	1	0	26	HdA	SW	Greyish-red fine sand with very fine sand with little silt.
	2	26	below 28.5		SM	Light brown fine sand with very fine sand moderate silt.

*Note: Soil differences noticed in first layer after returning to the jobsite on 12/7/23 after the original sampling event on 12/5/23.

Generally, the observed soil classifications corresponded with the initial NRCS classifications. RIBs in areas classified by the NRCS as OaA typically consist of fine sand within the upper layers and silt present within the deeper layers. Expansion area 5 was the only location sampled that was classified as HdA, which is identified by the NRCS as a sandy loam. The collected sample contained moderate silt at depth of 26 inches below surface, which is more silt than the typical sandy loam classification.

Both samples considered HdpA, expansion area 1 and expansion area 2, contained majority sand with silt quantities that increased with depth.

RIB 2 was the only location with soil classified as MoA by NRCS. MoA soil is identified as loamy soil with layers of clay. Clay was not visibly identified within the soil sample, but the permeability rates observed from the surface permeameter testing in the northern part of the RIB 2 were significantly lower than the rates observed from surface testing in the southern part of the basin, indicating the potential of finer soil material within the northern part of the basin which limit the transmittance of water.

In discussion with District operations staff, RIBs 1, 2 and 3 were identified as having typically slower percolation rates than the other ponds and currently RIB 1 is not normally used for percolation for this reason. District staff also indicate that RIBs 2 and 7 were deep ripped in late October 2023 to increase percolation and have not been in use since. This process may have changed the soil characteristics of RIBs 2 and 7. Deep ripping is also expected to enhance permeability and percolation rates, therefore the average rates for these RIBs are expected to be on the high end of a normal range of RIB percolation rates.

3.0 Soil Nitrogen Sampling and Results

Soil Nitrogen sampling was performed to provide an understanding of the potential for soil aquifer treatment with respect to nitrogen. Composite samples were collected in conjunction with the soil classification performed in the on-site RIB test pits described in Section 2.0. Ten total samples were taken from RIBs 2, 5,and 7, and analyzed for Nitrate as NO_3 and Total Kjeldahl Nitrogen (TKN) concentrations. The lab results of the soil samples are presented in Table 3 and provided in Exhibit C.

Table 3
On-Site RIB Nitrogen Soil Sample Results

Sample	Soil Layer	Top Depth, in	Bottom Depth, in	Nitrate as NO_3, mg/kg Reporting Level = 20 mg/kg	Total Kjeldahl Nitrogen, mg/kg Reporting Level = 20 mg/kg	Soil Description
RIB 2	1	0	53	ND	51	Brownish grey fine clean sand with some silt intermixed with grey and gold medium sand of little fines.
	2	53	82	ND	86	Moderate brown-grey. Very fine sand with silt.
	3	82	Below	ND	54	Grey interspersed with some gold layering. Dense fine clean sand with some silt.
RIB 5	1*	0	10	55.4	720	Light olive-grey fine sand with silt and clay.
	2	10	54	ND	180	Light olive-grey very fine sand with small amount of silt.
	3	54	Below 88	ND	60	Greenish-grey fine sand with very small amount of silt.
RIB 7	1	0	33	ND	67	Moderate brown to yellowish orange fine clean sand.
	2	33	51	ND	54	Greyish brown with red modeling finer clean sand (finer than top layer).
	3	51	84	ND	24	Yellowish orange medium very clean sand (no fines).
	4	84	Below	ND	48	Greyish brown with red layering fine clean sand with some silt.

*Note: Sample taken after returning to the jobsite on 12/7/23 after the original sampling event on 12/5/23.

The samples returned non-detect for Nitrate in 9 of 10 samples at a reporting level of 20 mg/kg. One Nitrate level was detected at 55.4 mg/kg in RIB 5 within the surface sample taken on December 7, 2023. The same sample also returned the highest TKN levels at 720 mg/kg.

TKN levels display a general decreasing trend with depth, with the exception of RIB 2 where the lowest basin TKN concentration of 51 mg/kg was identified in the surface sample. The highest concentrations of TKN noticeably correlate with a higher presence of silt identified in the soil descriptions in Table 3.

Of the basins sampled, RIB 5 has the highest concentrations of TKN overall with 60 mg/kg detected at a depth of 7 feet 4 inches. The soil classification for RIB 5 identified higher levels of silt and clay in the surface layer than at depth. High amounts of organic material were also observed in the surface soils of RIB 5.

RIB 7 demonstrates a similar downward trend in TKN concentration with depth, until about 7 feet below the surface, where TKN concentrations increase from 24 mg/kg to 48 mg/kg at the lowest sampled level. The fourth and deepest sample taken at RIB 7 was the only soil sample identified at RIB 7 that contained silt. All other samples taken at RIB 7 were classified as larger particle, fine clean sand.

4.0 Percolation Rates, Permeability Rates and Sampling

The NRCS web soil survey referenced in Figure 1 and provided in Exhibit A defines a wide array of permeability rates among the identified soils, reported as field saturated hydraulic conductivity rates (K_{fs}), ranging from 0 to 17.14 in/day. A summary of the NRCS reported hydraulic conductivity values is provided in Table 4 below.

Table 4
Summary of NRCS Reported Hydraulic Conductivity Rates

Soil Type	Abbreviation	Hydraulic Conductivity, Lower Limit, in/day	Hydraulic Conductivity, Upper Limit, in/day
Oakdale Sandy Loam	OaA	17.14	34.33
Hanford Sandy Loam	HdA	4.58	8.81
Hanford Sandy Loam Moderately Deep Over Silt	HdpA	4.58	8.81
Modesto Loam	MoA	0.00	0.08

In the original waterbalance calculations, a conservative factor of 8% was applied to a weighted average of these values based upon relative coverage of RIB area. The resulting percolation rate was 3.33 in/day. Using this value as the generalized RIB pond percolation rate and assuming typical full usage of the 3 lower ponds in service, the original water balance calculations determined a need of 6 additional RIBs to account for the 0.33 MGD projected increase in flow. To validate and refine the percolation value used in the waterbalance, permeameter testing was performed at 15 locations: 10 tests were performed within the existing RIB ponds and 5 tests were performed in the proposed expansion areas identified below in Figure 3.

Figure 3
Permeameter Testing Locations

4.1 Permeability Rates and Guelph Permeameter Testing

Permeability testing was performed using a Guelph Permeameter to measure field saturated hydraulic conductivity. Testing was performed on-site in existing RIB ponds 2, 5 and 7 on pond bottom soils and within test pits. The bottom of the RIB ponds are situated approximately 6 feet below typical ground surface. Test pits were dug to a depth of approximately 5 feet below the pond bottom. Testing of the on-site existing RIB ponds was performed at the surface of the pond at a depth of approximately 9 inches as shown in Figure 4. Figures 5 and 6 depict the relative location of the test pit and the depth at which the permeability testing was performed in RIB 2.

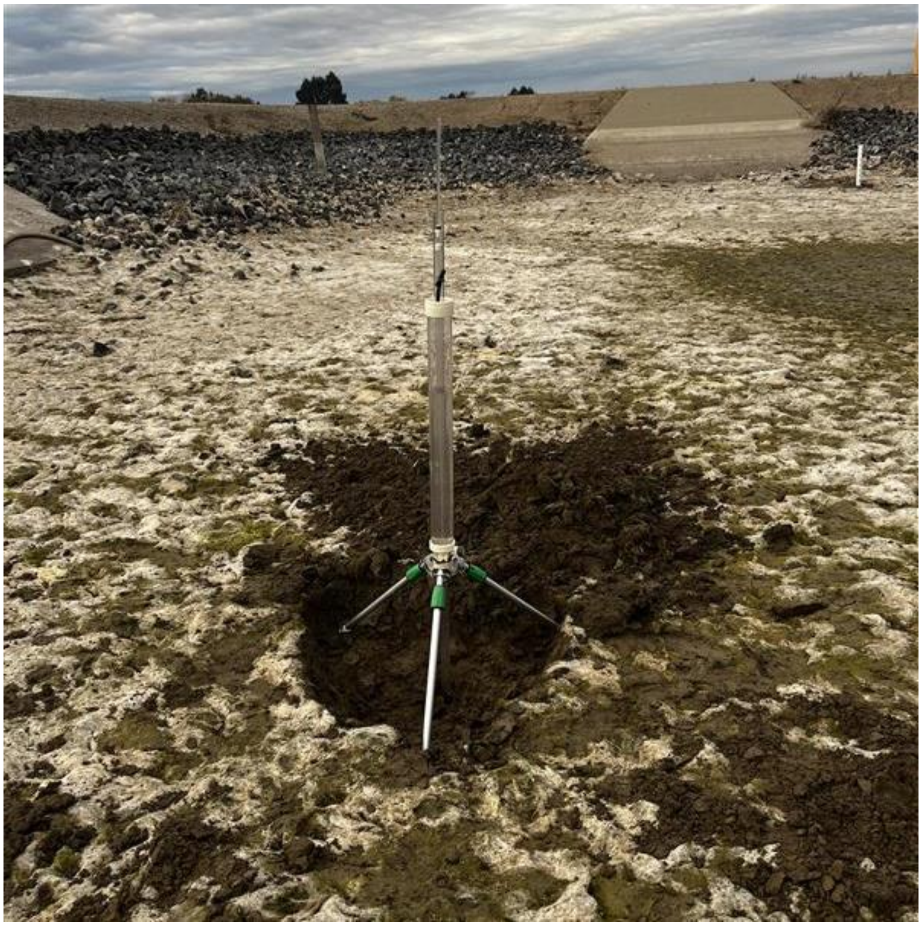

Figure 4
Example Surface Permeability Testing of RIB 5 by Guelph Permeameter
December 2023

Figure 5
RIB 2 Test Pit Location
December 2023

Figure 6
RIB 2 Test Pit Permeability Testing Location
December 2023

Permeability testing of the expansion areas was performed similar to the surface RIB testing process and orientation shown in Figure 4, but at an average depth of approximately 21 inches below ground surface in the orchard east of the WWTP as indicated by Figure 3.

Steady state of flow readings (R_1 and R_2) were recorded for two different head levels per testing location, except for testing location RIB 5-1 where a single head measurement was conducted due to the very low permeability rate of the soil surface. At most locations, the head height of the water in the permeameter was set to a 5 cm for the first set of readings (H_1) and 10 cm for the second set of readings (H_2). Combined reservoirs were used as a default for the readings when the water level in the reservoirs chambers reduced in an observably consistent manner, producing adequate flow. In cases where resistance to flow was observed and the water level did not change for extended periods of time, the inner reservoir was isolated, head height for H_1 was adjusted to 10 cm, and H_2 was adjusted to 15 cm.

All measurements were recorded using Guelph Permeameter Data Sheet field forms, converted to excel format, and mainly analyzed using the double head method. One instance of the single head method was utilized for the analysis of RIB 5-1. The flow readings R_1 and R_2, observed soil texture and structure, assumed soil matrix flux potential, and the dimensions of the borehole were used to derive hydraulic saturated conductivity for each testing location. The SoilMoisture Guelph Permeameter calculator[2] was used to derive the permeability rates. The Guelph Permeameter Data Sheet field forms

[2] SoilMoisture Equipment Operation Sheet: Microsoft Word - 0898-2800K1 (Dec 2012).doc (soilmoisture.com)

are provided in Exhibit D. The results of the on-site RIB surface and test pit permeability testing are shown in Table 5 and Table 6, respectively. Results of the off-site RIB expansion area testing is shown in Table 7.

Table 5
Summary of Measured On-Site Existing RIB Surface Permeability Rates

<table>
<tr><th>RIB and Test Number</th><th>Field Saturated Hydraulic Conductivity, K_{fs}, in/day</th><th>Average Surface Field Saturated Hydraulic Conductivity, K_{fs}, in/day</th></tr>
<tr><td>RIB 2-1, SW Surface</td><td>44.56</td><td rowspan="3">22.63</td></tr>
<tr><td>RIB 2-2, NW Surface</td><td>3.06</td></tr>
<tr><td>RIB 2-3, NE Surface</td><td>20.27</td></tr>
<tr><td>RIB 5-1, NW Surface</td><td>0.15</td><td>0.15</td></tr>
<tr><td>RIB 7-1, SW Surface</td><td>212.60</td><td rowspan="3">122.80</td></tr>
<tr><td>RIB 7-2, NW Surface</td><td>74.83</td></tr>
<tr><td>RIB 7-3, NE Surface</td><td>80.96</td></tr>
<tr><td>Average:</td><td>62.35</td><td>62.35</td></tr>
<tr><td>Average, RIBs 2 and 5:</td><td>17.01</td><td>11.39</td></tr>
</table>

Table 6
Summary of Measured On-Site Existing RIB Test Pit Permeability Rates

RIB and Test Number	Field Saturated Hydraulic Conductivity, K_{fs}, in/day
RIB 2-4, Test Pit	241.85
RIB 5-2, Test Pit	534.05
RIB 7-4, Test Pit	310.56
Average:	**362.15**

Table 7
Summary of Measured Off-Site RIB Expansion Area Surface Permeability Rates

RIB and Test Number	Field Saturated Hydraulic Conductivity, K_{fs}, in/day
Expansion Area 1	11.57
Expansion Area 2	20.27
Expansion Area 3	12.62
Expansion Area 4	3.23
Expansion Area 5	6.77
Average:	**10.89**

Hydraulic conductivity rates for the existing RIBs were used to validate the calculated percolation rates from values obtained from operations staff and pressure transducer readings. Hydraulic conductivity rates measured in the proposed RIB expansion areas were used to derive the expected percolation rates of the proposed RIBs. Percolation rates are discussed in Section 4.2 below.

4.2 Percolation Rates

On-site existing RIB percolation rates were measured from recorded observations of water height in the RIBs over time provided by the District and as recorded by data logging pressure transducers. Typical values for evaporation and percolation were accounted for in the incremental pond water level analysis. Observations for each pond were analyzed per foot increment of the RIB water height to assess percolation rates at different levels of head.

Pressure data was obtained from pressure transducers which were encased in perforated PVC pipes and placed at the bottom of RIBs 2, 5, and 7. A fourth pressure transducer was placed at the effluent pump station and programmed to take ambient pressure readings for reference. Pressure readings for each pond were converted to pond water height using the ratio of pressure to specific weight of the wastewater. Local average evaporation and precipitation were accounted for in the analysis. The water height was then divided by time increment to develop the percolation rate. Observations for each pond were analyzed per foot increment of the RIB water height to assess percolation rates at different levels of head and compared to the District reported rates.

A pond percolation cycle analysis was developed for RIB ponds 2, 5 and 7 to account for the application of real world pond percolation cycling and availability for use in a 1 in 100 year flood scenario. Using the pressure transducer readings, the duration of RIB pond use was analyzed for one fill and drain cycle. The duration of the fill and drain cycle was divided by the full cycle duration plus an additional of one day of RIB rest between cycles. The resulting average pond percolation cycle factor was estimated at 0.88. The pond percolation cycle factor was applied to the percolation rate analysis to account for RIB cycling. Results of the percolation rate analysis and permeability comparison are shown in Table 8.

Table 8
On-Site RIB Percolation and Permeability Analysis Results

RIB Number	District Observation Based Average Percolation Rate, In/Day	Pressure Transducer Based Total Average Percolation Rate, In/Day	Average Measured Surface Hydraulic Conductivity, K_{fs}, In/Day
RIB 2	22.33	21.38	22.63
RIB 5	8.55	13.40	0.15
RIB 7	19.94	22.70	122.80
Average:	**15.44**	**17.39**	**11.39**
Applied Percolation Cycle Ratio, 0.88:	**13.54**	**15.25**	**9.99**

As mentioned in Section 1.0, RIB Ponds 2 and 7 were ripped in late October 2023. Ripping of the RIB soil is expected to contribute to enhanced permeability and percolation rates, therefore percolation rates are considered to be on the high end of normal operational range for this analysis. RIB 5 is considered to be the low end of a normal operational range due to the consistently low percolation rates observed in the permeability test and the percolation calculations. The percolation rates measured in RIB 7 were similar to the rates of RIB 2 and were also on the high end of the percolation rate range but measured abnormally high in the permeability readings. Because of this inconsistency, RIB 7 was excluded from the average overall percolation analysis value. The total average percolation rate was determined to be 15.25 in/day with the application of the percolation cycle factor of 0.88, which is nearly 5 times greater than the original percolation rate of 3.33 in/day assumed in the waterbalance performed for the Recycled Water Planning Study. With the percolation update, it is estimated that the need for percolation ponds for additional storage will significantly reduce in the updated water balance and recommended alternatives, although the waterbalance analysis is yet to be performed. If the calculations determine a need for additional percolation ponds for effluent storage, expansion area percolation rates should be considered in future design.

The potential expansion area percolation rates were calculated using the ratio of existing on-site RIB percolation rates from the pressure transducer readings to measured existing RIB hydraulic conductivity rates. The estimated expansion area percolation rates are shown in Table 9.

Table 9
Off-Site RIB Expansion Area Percolation and Permeability Analysis Results

RIB and Test Number	Average Measured Surface Field Saturated Hydraulic Conductivity, K_{fs}, In/day	Estimated Expansion Area Percolation Rate, In/day
Expansion Area 1	11.57	10.93
Expansion Area 2	20.27	19.15
Expansion Area 3	12.62	11.92
Expansion Area 4	3.23	3.05
Expansion Area 5	6.77	6.39
Average:	**10.89**	**10.29**
Applied Percolation Cycle Ratio, 0.88:	**9.55**	**9.02**

The measured hydraulic conductivity rates of the RIB expansion area fell within range of the existing on-site RIB measured hydraulic conductivity rates. The percolation rates in the northern expansion areas were much higher than the rates found in the southern area where expansion areas 4 and 5 were proposed, as shown in Figure 3, therefore if the need for additional RIBs does arise, it is suggested that the basins are constructed in the northern proposed expansion areas first.

Exhibit A

NRCS Soil Surveys

Eastern Stanislaus Area, California

HdA—Hanford sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2zy00
Elevation: 30 to 280 feet
Mean annual precipitation: 12 to 19 inches
Mean annual air temperature: 62 to 63 degrees F
Frost-free period: 317 to 331 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

Ap - 0 to 12 inches: sandy loam
C - 12 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Grangeville

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: Yes

Dinuba

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Data Source Information

Soil Survey Area: Eastern Stanislaus Area, California
Survey Area Data: Version 17, Sep 11, 2023

Soil Survey Area: San Joaquin County, California
Survey Area Data: Version 17, Sep 11, 2023

Eastern Stanislaus Area, California

HdpA—Hanford sandy loam, moderately deep over silt, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2zy05
Elevation: 20 to 300 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 62 to 64 degrees F
Frost-free period: 320 to 331 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

Ap - 0 to 12 inches: sandy loam
C1 - 12 to 36 inches: sandy loam
C2 - 36 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 36 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: R017XY905CA - Dry Alluvial Fans and Terraces
Hydric soil rating: No

Minor Components

Dinuba

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Grangeville

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: Yes

Tujunga

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Data Source Information

Soil Survey Area: Eastern Stanislaus Area, California
Survey Area Data: Version 17, Sep 11, 2023

Soil Survey Area: San Joaquin County, California
Survey Area Data: Version 17, Sep 11, 2023

Eastern Stanislaus Area, California

MoA—Modesto loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2zy03
Elevation: 40 to 200 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 62 to 63 degrees F
Frost-free period: 321 to 331 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Modesto and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modesto

Setting

Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

Ap - 0 to 10 inches: loam
AB - 10 to 12 inches: clay loam
Bt1 - 12 to 25 inches: clay
Bt2 - 25 to 35 inches: clay
Bt3 - 35 to 44 inches: sandy clay loam
Bt4 - 44 to 55 inches: sandy clay loam
Cg - 55 to 60 inches: stratified very fine sandy loam to silty clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: D
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Chualar

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Dinuba

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Data Source Information

Soil Survey Area: Eastern Stanislaus Area, California
Survey Area Data: Version 17, Sep 11, 2023

Soil Survey Area: San Joaquin County, California
Survey Area Data: Version 17, Sep 11, 2023

Eastern Stanislaus Area, California

OaA—Oakdale sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hjfg
Elevation: 50 to 150 feet
Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Oakdale and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oakdale

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 25 inches: sandy loam
H2 - 25 to 45 inches: sandy loam
H3 - 45 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: A
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Dinuba

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Eastern Stanislaus Area, California
Survey Area Data: Version 17, Sep 11, 2023

Soil Survey Area: San Joaquin County, California
Survey Area Data: Version 17, Sep 11, 2023

Exhibit B

Soil Characteristic Logs

Sheet 1 of 1	LOG OF TEST PIT: R.I.B. #2					
Elevation: N/A				Equipment:		Date: 12/5/23

Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes
			grab 2-1	SW	Fine clean sand w/ some silt intermixed w/ grey & gold medium sand of little fines. Brown-ish grey	
4'5"						
5			grab 2-2	SM	Very fine sand w/ silt. Moderate brown-grey	
6'10"	↓		grab 2-3	SW	Dense fine clean sand w/ some silt. Grey interspersed w/ some gold layering.	
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JWF/NTC

Groundwater Depth: N/A
Total Depth: 6'10"
Screen Depth (partial / full): N/A

Sheet 1 of 1	LOG OF TEST PIT: RIB. #5		
Elevation: N/A	Equipment:	Date: 12/5/23 & 12/7/23	

Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes
			Grab 5-0	SM	Fine sand w/ silt & clay. Light olive-grey	Taken 12/7/23
10"	—	—	Grab 5-1	SW	Very fine sand w/ small amount of silt. Light olive-grey	Taken 12/5/23
4'6"	—	—				
5			Grab 5-2	SW	Fine sand w/ very small amount of silt. Greenish-grey	Taken 12/5/23 goes to depth of 7'4" & below
7'4"	↓					
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JWF/NTC

Groundwater Depth: N/A
Total Depth: 7'4"
Screen Depth (partial / full): N/A

Sheet 1 of 1	LOG OF TEST PIT: R.I.B. #7		
Elevation: N/A	Equipment:		Date: 12/5/23

Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes
			grab 7-1	SW	Fine clean sand moderate brown to yellowish orange	
2'9"			grab 7-2	SW	Finer clean sand (finer than top layer) Greyish brown w/ red modeling	
4'3"			grab 7-3	SW	Medium very clean sand (no fines) yellowish-orange	
5						
7'	↓		grab 7-4	SW	Fine clean sand w/ some silt Greyish brown w/ red layering	
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JWF/NTC

Groundwater Depth: N/A
Total Depth: ~~9'4"~~ 7'0"
Screen Depth (partial / full): N/A

NRCS - HdpA soil

Sheet 1 of 1	LOG OF TEST PIT: Historical WWTP Site					
Elevation:				**Equipment:**		**Date: 12/27/23**
Depth (ft)	**Pent. (tsf)**	**Moist (%)**	**Sample Type**	**Symbol**	**Material Description**	**Notes** RIB 10 Exp Area 1
			Grab	SM	Moderate reddish-brown very fine sand w/ silt	
2' 11.5"	↓					
5						
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JAF and JWF

Groundwater Depth: N/A
Total Depth: 2' 11.5"
Screen Depth (partial / full): N/A

NRCS – HdpA soil

Sheet 1 of 1	LOG OF TEST PIT: Historical WWTP Site					
Elevation:				Equipment:	Date: 12/27/23	
Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes RIB 11 Exp Area 2
			Grab	SW	Moderate brown fine sand w/ very little silt	
1'1"			Grab	SM	Light brown fine silty-sand	a lot of silt
2'5.5"	↓					
5						
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JAF and JWF

Groundwater Depth: N/A
Total Depth: 2' 5.5"
Screen Depth (partial / full): N/A

NRCS-OaA soil

Sheet 1 of 1	LOG OF TEST PIT: Historical WWTP Site					
Elevation:				Equipment:		Date: 12/27/23
Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes RIB 12 Exp Area 3
			Grab	SM or SC	Greyish red fine & very fine sand w/ [clay or silt]	Unsure if clay or silt, ~20-30% clay or silt
2'4.5" ↓						
5						
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JAF and JWF

Groundwater Depth: N/A
Total Depth: 2'4.5"
Screen Depth (partial / full): N/A

NRCS-OaA soil

Sheet 1 of 1	LOG OF TEST PIT: Historical WWTP Site					
Elevation:				Equipment:	Date: 12/27/23	
Depth (ft)	Pent. (tsf)	Moist (%)	Sample Type	Symbol	Material Description	Notes RIB13 Exp Area 4
			Grab	SM/SW	Light brown fine sand w/ very fine silty sand	Little fines visible
2'0.5"	↓					
5						
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JAF and JWF

Groundwater Depth: N/A
Total Depth: 2'0.5"
Screen Depth (partial / full): N/A

NRCS- HdA soil

Sheet 1 of 1	LOG OF TEST PIT: Historical WWTP Site					
Elevation:				**Equipment:**		**Date: 12/27/23**
Depth (ft)	**Pent. (tsf)**	**Moist (%)**	**Sample Type**	**Symbol**	**Material Description**	**Notes** RIB 14 Exp Area 5
				SW	Greyish-red fine sand w/ very fine sand w/ little silt.	
1'2"				SM	Light brown fine sand w/ very fine sand & moderate silt.	
2'4.5"	↓					
5						
10						
15						
20						

Project Name: Salida Sanitary District Recy
Project No.: 2487-0010
Logged By: JAF and JWF

Groundwater Depth: N/A
Total Depth: 2'4.5"
Screen Depth (partial / full): N/A

Exhibit C

Soil Nitrogen Testing Results

January 4, 2024

Lab No. : STK2356685
Customer No. : 3017441

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Laboratory Report

Introduction: This report package contains a total of 12 pages divided into 3 sections:

Case Narrative	(2 pages)	: An overview of the work performed at FGL.
Sample Results	(9 pages)	: Results for each sample submitted.
Quality Control	(1 page)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab No.	Matrix
RIB No. 2 - 1	12/05/2023	12/05/2023	STK2356685-001	S
RIB No. 2 - 2	12/05/2023	12/05/2023	STK2356685-002	S
RIB No. 2 - 3	12/05/2023	12/05/2023	STK2356685-003	S
RIB No. 5 - 1	12/05/2023	12/05/2023	STK2356685-007	S
RIB No. 5 - 2	12/05/2023	12/05/2023	STK2356685-008	S
RIB No. 7 - 1	12/05/2023	12/05/2023	STK2356685-013	S
RIB No. 7 - 2	12/05/2023	12/05/2023	STK2356685-014	S
RIB No. 7 - 3	12/05/2023	12/05/2023	STK2356685-015	S
RIB No. 97- 4	12/05/2023	12/05/2023	STK2356685-016	S

Sampling and Receipt Information:

All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples were received, prepared and analyzed within the method specified holding times. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the associated Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to established quality control criteria. Any exceptions are noted in the Quality Control Section of this report.

Test Summary	
EPA 351.2	Preparation and analysis performed by FGL-Santa Paula (FGL-SP ELAP# 1573)
SM 4500-NO3 F	Preparation and analysis performed by FGL-Santa Paula (FGL-SP ELAP# 1573)

Certification: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above and in the QC Section. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature. This report shall not be reproduced except in full, without the written approval of the laboratory.

KD: MKH

Approved By **Kelly A. Dunnahoo, B.S.**
Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2024-01-04

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
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Description : RIB No. 2 - 1
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-001
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:40
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:13	lfs
Nitrogen, Total Kjeldahl	51	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:32	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
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Description : RIB No. 2 - 2
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-002
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:40
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:15	lfs
Nitrogen, Total Kjeldahl	86	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:44	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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January 4, 2024

KSN, Inc.
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Description : RIB No. 2 - 3
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-003
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:40
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:18	lfs
Nitrogen, Total Kjeldahl	54	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:48	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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Description : RIB No. 5 - 1
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-007
Customer No. : 3017441

Sampled On : December 5, 2023 at 14:02
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:20	lfs
Nitrogen, Total Kjeldahl	180	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:52	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

Page 5 of 11

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853 Corporation Street
Santa Paula, CA 93060
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Office & Laboratory
9415 W. Goshen Avenue
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TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 5 - 2
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-008
Customer No. : 3017441

Sampled On : December 5, 2023 at 14:02
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:23	lfs
Nitrogen, Total Kjeldahl	60	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:27	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 7 - 1
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-013
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:09
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:25	lfs
Nitrogen, Total Kjeldahl	67	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:50	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 7 - 2
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-014
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:09
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:39	lfs
Nitrogen, Total Kjeldahl	54	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:29	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

Page 8 of 11

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 7 - 3
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-015
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:09
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:40	lfs
Nitrogen, Total Kjeldahl	24	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:24	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

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January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 97- 4
Project : Salida Sanitary 2487-0010

Lab No. : STK2356685-016
Customer No. : 3017441

Sampled On : December 5, 2023 at 12:09
Sampled By : N.Colwell/J.Fletcher
Received On : December 5, 2023 at 14:45
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	ND	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:43	lfs
Nitrogen, Total Kjeldahl	48	20	mg/kg		0.8		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:45	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level , Dil.=Dilution

Page 10 of 11

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January 4, 2024
KSN, Inc.

Lab No. : STK2356685
Customer No. : 3017441

Quality Control - Wet Chem

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Wet Chem								
Nitrogen, Total Kjeldahl	351.2	12/23/2023:214471LCR	Blank	mg/kg		ND	<25	
			LCS	mg/kg	300.0	100%	31-149	
			MS	mg/kg	240.0	-1460%	<¼	406
		(VI 2348724-001)	MSD	mg/kg	240.0	-1860%	<1/4	
			MSRPD	mg/kg		20.8%	≤80	
			MS	mg/kg	240.0	-1.33%	<¼	406
		(SP 2319970-001)	MSD	mg/kg	240.0	207%	<1/4	
			MSRPD	mg/kg		4.9%	≤80	
Nitrate	4500NO3F	12/22/2023:214506LFS	Blank	mg/kg		ND	<20	
			LCS	mg/kg	112.2	98.5%	80-120	
			MS	mg/kg	56.09	100%	10-150	
		(STK2356685-001)	MSD	mg/kg	56.09	100%	10-150	
			MSRPD	mg/kg		0.2%	≤0	435

Definition

Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
DQO : Data Quality Objective - This is the criteria against which the quality control data is compared.
LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyted. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSRPD : MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
ND : Non-detect - Result was below the DQO listed for the analyte.

Explanation

406 : Matrix Spike (MS) not within the Acceptance Range (AR) because of high analyte concentration in the sample. Data was accepted based on the LCS or CCV recovery.
435 : Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.

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Analytical Chemists

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Laboratory Copy (1 of 2)

37446:12/04/2023 TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information

Client: KSN, Inc.
Address: Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Phone: (916)403-5900 Fax: (916)403-5901
Contact Person: Neal Colwell
Project Name: **Salida Sanitary 2487-0010**
Purchase Order Number:
Quote Number:

Sampler(s) Neal Collwel
John Fletcher

Sampling Fee: ________ Pickup Fee: ________
Compositor Setup Date: __/__/__ Time: __/__

Lab Number: STK 2356685 3-17441

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite(C) Grab(G)	Type of Sample **SEE REVERSE SIDE**	Potable(P) Non-Potable(NP) Ag Water(AgW)	Bacti Type: Other(O) System(SYS) Source(SR) Waste(W)	Bacti Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL)	Wet Chemistry-NO3,TKN	***DI Extract*** Bag(P)
1	RIB No. 2 - 1	12/5/23	12:40PM	C	S					1
2	RIB No. 2 - 2	12/5/23	12:40PM	C	S					1
3	RIB No. 2 - 3	12/5/23	12:40PM	C	S					1
4	~~RIB No. 2 - 4~~			~~C~~	~~S~~					~~1~~
5	~~RIB No. 2 - 5~~			~~C~~	~~S~~					~~1~~
6	~~RIB No. 2 - 6~~			~~C~~	~~S~~					~~1~~
7	RIB No. 5 - 1 2:02PM	12/5/23	~~12:40PM~~	C	S					1
8	RIB No. 5 - 2 2:02PM	12/5/23	~~12:40PM~~	C	S					1
9	~~RIB No. 5 - 3~~	~~12/5/23~~	~~12:40PM~~	~~C~~	~~S~~					~~1~~
10	~~RIB No. 5 - 4~~			~~C~~	~~S~~					~~1~~

Remarks: **Multiple Chains**

1 of 2

Relinquished	Date:	Time:	Relinquished	Date:	Time:	Relinquished	Date:	Time:
[signature]	12/5/2023	1445	Dn	12/05/2023	1700	GLS	12/6/23	1353
Received By:	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**
Dn	12/5/2023	1445	GLS	12/05/2023	1700	MC	/	/

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Laboratory Copy (1 of 2)

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37446:12/04/2023

TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information

Client: KSN, Inc.
Address: Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Phone: (916)403-5900 Fax: (916)403-5901

Contact Person: Neal Colwell

Project Name: **Salida Sanitary 2487-0010**

Purchase Order Number:

Quote Number:

Sampler(s) Neal Collwel, John Fletcher

Sampling Fee: ________ Pickup Fee: ________

Compositor Setup Date: __/__/__ Time: __/__

Lab Number: STK 2356685 3-17441

Samp Num	Location Description	Time Sampled	Date Sampled	Method of Sampling: Composite(C) Grab(G)	Type of Sample **SEE REVERSE SIDE**	Potable(P) Non-Potable(NP) Ag Water(AgW)	Bacti Type: Other(O) System(SYS) Source(SR) Waste(W)	Bacti Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL)	Wet Chemistry-NO3,TKN	***DI Extract*** Bag(P)
11	~~RIB No. 5 - 5~~			~~C~~	~~S~~					~~1~~
12	~~RIB No. 5 - 6~~			~~C~~	~~S~~					~~1~~
13	RIB No. ~~9~~ 7 - 1	12:09PM	12/5/23	C	S					1
14	RIB No. ~~9~~ 7 - 2	12:09PM	12/5/23	C	S					1
15	RIB No. ~~9~~ 7 - 3	12:09PM	12/5/23	C	S					1
16	RIB No. ~~9~~ 7 - 4	12:09PM	12/5/23	C	S					1
~~17~~	~~RIB No. 7 - 5~~			~~C~~	~~S~~					~~1~~
~~18~~	~~RIB No. 7 - 6~~			~~C~~	~~S~~					~~1~~

Remarks: Multiple Chains

Relinquished	Date:	Time:	Relinquished	Date:	Time:	Relinquished	Date:	Time:
[signature]	12/5/2023	1445	GLS	12/7/23	1353			
Received By:	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**
[signature]	12/5/2023	1445	[signature]	/	/			

Inter-Laboratory Condition Upon Receipt (Attach to COC) 2356685

Sample Receipt at: CC CH STK VI

1. Number of ice chests/packages received: 1 Shipping tracking #(s):
2. Temp IR Gun ID #: UV front
3. Were samples received on ice? Yes No Temps: RT / / / /
   Surface water SWTR bact samples: A sample that has a temperature upon receipt of >10° C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.
4. Do the number of bottles received agree with the COC? Yes No N/A
5. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
6. VOAs checked for Headspace? Yes No N/A
7. Were all analyses within holding times at time of receipt? Yes No
8. Verify sample date, time and sampler name Yes No

Sign and date the COC, place in a ziplock and put in the same ice chest as the samples.
Sample Receipt Review completed by (initials): BV

Sample Receipt at SP:

1. Number of ice chests/packages received: 5 Shipping tracking #(s): 560579265 8945 8738 567 611
2. Temp IR Gun ID #: TH261
3. Were samples received on ice? Yes No Temps: 1c / / / /
   Acceptable is above freezing to 6°C. If many packages are received at one time check for tests/H.T.'s/rushes/
4. Do the number of bottles received agree with the COC? Yes No N/A
5. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? Yes No
2. Did bottle labels correspond with the client's ID's? Yes No
3. Were all bottles requiring sample preservation properly preserved? Yes No N/A FGL
   [Exception: Oil & Grease, VOA and CrVI verified in lab]
4. VOAs checked for Headspace? Yes No N/A
5. Have rush or project due dates been checked and accepted? Yes No N/A
6. Were all analyses within holding times at time of receipt? Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.
Sample Receipt, Login and Verification completed by (initials): MC

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: Phone Number:
   Initiated By: Date:
   Problem:
   Resolution:
2. Person Contacted: Phone Number:
   Initiated By: Date:
   Problem:
   Resolution:

(3017441)
KSN, Inc.
STK2356685
iv 12/06/2023 06:08:25
STK2356685

(Please use the back of this sheet for additional comments or conta

January 4, 2024

Lab No. : **STK2356788**
Customer No. : **3017441**

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Laboratory Report

Introduction: This report package contains a total of 3 pages divided into 3 sections:

Case Narrative	(1 page)	: An overview of the work performed at FGL.
Sample Results	(1 page)	: Results for each sample submitted.
Quality Control	(1 page)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab No.	Matrix
RIB No. 5-0	12/07/2023	12/07/2023	STK2356788-001	S

Sampling and Receipt Information:

The Sample was received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. The Sample was received, prepared and analyzed within the method specified holding times. All samples arrived room temperature. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the associated Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to established quality control criteria. Any exceptions are noted in the Quality Control Section of this report.

Test Summary	
EPA 351.2	Preparation and analysis performed by FGL-Santa Paula (FGL-SP ELAP# 1573)
SM 4500-NO3 F	Preparation and analysis performed by FGL-Santa Paula (FGL-SP ELAP# 1573)

Certification: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above and in the QC Section. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature. This report shall not be reproduced except in full, without the written approval of the laboratory.

KD: MKH

Approved By **Kelly A. Dunnahoo, B.S.**
Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2024-01-04

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CA ELAP Certification No. 2810

January 4, 2024

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Description : RIB No. 5-0
Project : Salida Sanitary 2487-0010

Lab No. : STK2356788-001
Customer No. : 3017441

Sampled On : December 7, 2023 at 08:05
Sampled By : Neal Colwell
Received On : December 7, 2023 at 08:25
Matrix : Soil

Sample Results - Inorganic

Constituent	Result	RL	Units	Note	Dil.	DQF	Sample Preparation			Sample Analysis			
Wet Chemistry							Date	Time	Who	Method	Date	Time	Who
Nitrate as NO3	55.4	20	mg/kg		1	U	12/22/2023	08:00	lfs	SM 4500-NO3 F	12/22/2023	16:50	lfs
Nitrogen, Total Kjeldahl	720	400*	mg/kg		20		12/23/2023	16:21	lcr	EPA 351.2	12/29/2023	15:22	lcr

DQF Flags Definition:
U Constituent results were non-detect.

ND=Non-Detected, RL=Reporting Level * RL adjusted for dilution, Dil.=Dilution

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January 4, 2024
KSN, Inc.

Lab No. : STK2356788
Customer No. : 3017441

Quality Control - Wet Chem

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Wet Chem								
Nitrogen, Total Kjeldahl	351.2	12/23/2023:214471LCR	Blank	mg/kg		ND	<25	
			LCS	mg/kg	300.0	100%	31-149	
			MS	mg/kg	240.0	-1460%	<¼	406
		(VI 2348724-001)	MSD	mg/kg	240.0	-1860%	<1/4	
			MSRPD	mg/kg		20.8%	≤80	
			MS	mg/kg	240.0	-1.33%	<¼	406
		(SP 2319970-001)	MSD	mg/kg	240.0	207%	<1/4	
			MSRPD	mg/kg		4.9%	≤80	
Nitrate	4500NO3F	12/22/2023:214506LFS	Blank	mg/kg		ND	<20	
			LCS	mg/kg	112.2	98.5%	80-120	
			MS	mg/kg	56.09	100%	10-150	
		(STK2356685-001)	MSD	mg/kg	56.09	100%	10-150	
			MSRPD	mg/kg		0.2%	≤0	435

Definition

- Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
- DQO : Data Quality Objective - This is the criteria against which the quality control data is compared.
- LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
- MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
- MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyted. The recoveries are an indication of how that sample matrix affects analyte recovery.
- MSRPD : MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
- ND : Non-detect - Result was below the DQO listed for the analyte.

Explanation

- 406 : Matrix Spike (MS) not within the Acceptance Range (AR) because of high analyte concentration in the sample. Data was accepted based on the LCS or CCV recovery.
- 435 : Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.

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FGL ENVIRONMENTAL AGRICULTURAL Analytical Chemists

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CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT

Client: KSN, Inc.
Customer Number: 3017441
Address: Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691
Phone: (916)403-5900 Fax: (916)403-5901
Email Address: ncolwell@ksninc.com
Contact Person: Neal Colwell
Project Name: Salida Sanitary 2487-0010
Purchase Order Number:
Quote Number:

Rush Analysis: ☐ 5 Day ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 24 hour
Rush pre-approval by lab (initals): ____________
Electronic Data Transfer: ☐ No ☐ State ☐ Client Other: __________

Sampler(s): Neal

Sampling Fee: ___________ Pickup Fee: ___________
Compositor Setup Date: ___________ Time: ___________

Lab Number: 2356788

TEST DESCRIPTION AND ANALYSES REQUESTED

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite (C) Grab (G)	Number of Containers	Type of Containers: (G)Glass (P)Plastic (V)VOA (MT)Metal Tube	Potable (P) Non-Potable (NP) Ag Water (AgW)	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (WW) Waste Water (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sys) System (SRC) Source (W) Waste	BacT: (ROUT)Routine (RPT)Repeat (OTH)Other (RPL)Replace	(LT) Leaf Tissue (PET) Petiole Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other	Wet Chemistry - NO3, TKN *** DI Extract ***													
1	RIB 5-0	12/7/23	0805	C					S					1													

Remarks

Relinquished	Date:	Time:	Relinquished	Date:	Time:	Relinquished	Date:	Time:
[signature]	12/7/2023	0825	[signature]	12/7/2023	1700	GUS	12/8/23	1230
Received By:	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**
[signature]	12/7/2023	0825	[signature]	12/07/2023	1700	[signature]	12/8/23	1230

Inter-Laboratory Condition Upon Receipt (Attach to COC) 2356788

Sample Receipt at: CC CH (STK) VI

1. Number of ice chests/packages received: 1 Shipping tracking #(s):
2. Temp IR Gun ID #: uy front
3. Were samples received on ice? (Yes) No Temps: RRT / / / /

   Surface water SWTR bact samples: A sample that has a temperature upon receipt of >10° C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.

4. Do the number of bottles received agree with the COC? (Yes) No N/A
5. Were samples received intact? (i.e. no broken bottles, leaks etc.) (Yes) No
6. VOAs checked for Headspace? Yes No (N/A)
7. Were all analyses within holding times at time of receipt? (Yes) No
8. Verify sample date, time and sampler name (Yes) No

Sign and date the COC, place in a ziplock and put in the same ice chest as the samples.
Sample Receipt Review completed by (initials): DN

Sample Receipt at SP:

1. Number of ice chests/packages received: 3 Shipping tracking #(s): 5100546390, 5100545445, 5100546150
2. Temp IR Gun ID #: 2060
3. Were samples received on ice? (Yes) No Temps: 2 / / 1 / 3 / 3

   Acceptable is above freezing to 6°C. If many packages are received at one time check for tests/H.T.'s/rushes/

4. Do the number of bottles received agree with the COC? (Yes) No N/A
5. Were samples received intact? (i.e. no broken bottles, leaks etc.) (Yes) No

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? (Yes) No
2. Did bottle labels correspond with the client's ID's? (Yes) No
3. Were all bottles requiring sample preservation properly preserved? Yes No ~~N/A~~ (FGL)

   [Exception: Oil & Grease, VOA and CrVI verified in lab]

4. VOAs checked for Headspace? Yes No (N/A)
5. Have rush or project due dates been checked and accepted? Yes No (N/A)
6. Were all analyses within holding times at time of receipt? (Yes) No

Attach labels to the containers and include a copy of the COC for lab delivery.
Sample Receipt, Login and Verification completed by (initials): JL

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: Phone Number:
   Initiated By: Date:
   Problem:
   Resolution:
2. Person Contacted: Phone Number:
   Initiated By: Date:
   Problem:
   Resolution:

(3017441)
KSN, Inc.
STK2356788
jaw 12/07/2023 16:38:50
STK2356788

(Please use the back of this sheet for additional comments c

Exhibit D

Permeameter Testing Forms

GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	cm²	

Depth of Well Hole: 9.5"

GP test designation: RIB 2-1, SW, surface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	9:00am	2	17.9	—	—
2	9:02am	2	18.3	0.4	0.2
3	9:04am	2	20.7	2.4	1.2
4	9:06am	2	22.8	2.1	1.05
5	9:08am	2	24.8	2.0	1.0
6	9:10am	2	26.9	2.1	1.05
7	9:12am	2	28.9	2.0	1.0
8	9:14am	2	30.9	2.0	1.0
9	9:16am	2	33.0	2.1	1.05
10	9:18am	2	34.9	1.9	0.95

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	9:21am	2	40.8	—	—
2	9:23am	2	44.6	3.8	1.9
3	9:25am	2	48.5	3.9	1.95
4	9:27am	2	52.3	3.8	1.9
5	9:29am	2	55.7	3.4	1.7
6	9:31am	2	60.1	4.4	2.2
7	9:33am	2	63.6	3.5	1.75
8	9:35am	2	67.4	3.8	1.9
9	9:37am	2	70.9	3.5	1.75
10	9:39am	2	74.4	3.5	1.75

Observations:

First bore hole. the soil was noticeably soft. NRCS charactizes the soils as Oakdale Sandy loam with high soil transmittance (estimated at 1.98 to 5.95 in/hr)

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GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	cm²	
Inner Reservoir Y 2.16	cm²	X

Depth of Well Hole: 9.5"

GP test designation: RIB 2-2, NW surface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at ~~5 cm~~ 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	10:20am	10	2.9	—	—
2	10:30am	10	4.4	1.5	0.15
3	10:40am	10	5.3	0.9	0.09
4	10:50am	2	5.7	0.4	0.2
5	10:52am	2	6.0	0.3	0.15
6	10:54am	2	6.3	0.3	0.15
7	10:56am	2	6.6	0.3	0.15

Second set of readings with height of water in well (H_2) set at ~~10 cm~~ 15 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	10:59am	2	6.6	—	—
2	11:00am	2	10	3.4	1.7
3	11:03am	2	11.9	1.9	0.95
4	11:05am	2	13.6	1.7	0.85
5	11:07am	2	15.4	1.8	0.9

Observations:

NRCS characterized this location as Modesto Loam with very low percolation rates (estimated 0.00 to 0.01 in/hr). First round of testing verified low permeability rate with no change using both Reservoirs after 10 mins. Inner tube was then to document level changes after first attempt. Constant head was then adjusted to 10 cm from 5cm to attain results.

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GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study | **Project No.:** 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	☒
Inner Reservoir Y	~~2.16~~ cm²	☒

Depth of Well Hole: 9.5"

GP test designation: RIB 2-3, NE surface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set ~~at 5 cm~~ 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	11:28 am	2	14.7	—	—
2	11:30 am	2	15.5	0.8	0.4
3	11:32 am	2	16.0	0.5	0.25
4	11:34 am	2	16.7	0.7	0.35
5	11:36 am	2	17.3	0.6	0.3

Second set of readings with height of water in well (H_2) set at ~~10 cm~~ 15 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	11:38 am	2	22.3	—	—
2	11:40 am	2	23.7	1.4	0.7
3	11:42	2	24.9	1.2	0.6
4	11:44	2	26.1	1.2	0.6

Observations

Soil seems to be a mixture of clay and more permeable soils at first RIB2 location (SW)

Using combined Reservoirs at this location

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GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22	cm^2	X
Inner Reservoir Y		cm^2	

Depth of Well Hole: 10"

GP test designation: RIB 2-4, test pit, center

Depth below g.s.: 5 ft

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	12:06p	0.5	8.8	—	—
2	12:06:30p	0.5	10.8	2.0	4.0
3	12:07p	0.5	12.7	1.9	3.8
4	12:07:30p	0.5	14.5	1.8	3.6
5	12:08p	0.5	16.0	1.5	3.0
6	12:08:30p	0.5	17.7	1.7	3.4
7	12:09p	0.5	19.2	1.5	3.0
8	12:09:30p	0.5	20.5	1.3	2.6
9	12:10p	0.5	21.7	1.2	2.4
10	12:10:30p	0.5	23.1	1.4	2.8
11	12:11p	0.5	24.4	1.3	2.6
12	12:11:30p	0.5	25.6	1.2	2.4
13	12:12p	0.5	26.7	1.1	2.2
14	12:12:30p	0.5	28.0	1.3	2.6

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	12:19p	0.5	14.8	—	—
2	12:19:30p	0.5	17.5	2.7	5.4
3	12:20p	0.5	20.6	3.1	6.2
4	12:20:30p	0.5	23.6	3	6
5	12:21p	0.5	26.5	2.9	5.8
6	12:21:30p	0.5	29.6	3.1	6.2
7	12:22p	0.5	32.6	3	6
8	12:22:30p	0.5	35.2	2.6	5.2
9	12:23p	0.5	38.6	3.4	6.8

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STOCKTON, CA 95203

GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/4/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X		cm^2	
Inner Reservoir Y	2.16	cm^2	X

Depth of Well Hole: 9.5"

GP test designation: RIB 5-1, NWsurface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at ~~5 cm~~ 15cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	4:04p	10	22.3	—	—
2	4:14p	10	23.1	0.8	0.08
3	4:19p	5	24.5	1.4	0.28
4	4:24p	5	25.9	1.4	0.28
5	4:29p	5	27.4	1.5	0.3

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)

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GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	~~2.16~~ cm²	~~X~~

Depth of Well Hole: 9.5"

GP test designation: RIB 5-2 test pit

Depth below g.s.: 5'

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	4:37	0.5	13.0	—	—
2	4:37:30	0.5	18.4	5.4	10.8
3	4:38	0.5	23.9	5.5	11
4	4:38:30	0.5	29.0	5.1	10.2
5	4:39	0.5	33.8	4.8	9.6
6	4:39:30	0.5	38.4	4.6	9.2
7	4:40	0.5	43.2	4.8	9.6
8	4:40:30	0.5	47.4	4.2	8.4
9	4:41	0.5	51.9	4.5	9
10	4:42	0.5	55.7	3.8	7.6

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	4:45	0.5	18.0	—	—
2	4:45:30	0.5	28.4	10.4	20.8
3	4:46	0.5	38.2	9.8	19.6
4	4:46:30	0.5	47.0	8.8	17.6
5	4:47	0.5	55.4	8.4	16.8
6	4:47:30	0.5	64.2	8.8	17.6
7	4:48	0.5	72.5	8.3	16.6

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CIVIL ENGINEERS AND LAND SURVEYORS
711 N. PERSHING AVENUE
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GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study

Project No.: 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	cm²	

Depth of Well Hole: 9.5"

GP test designation: RIB 7-1, SW

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	1:58	0.5	15.5	—	—
2	1:58:30	0.5	18.3	2.8	5.6
3	1:59	0.5	21.2	2.9	5.8
4	1:59:30	0.5	23.5	2.3	4.6
5	2:00	0.5	26.0	2.5	5
6	2:00:30	0.5	28.7	2.7	5.4
7	2:01	0.5	31.0	2.3	4.6
8	2:01:30	0.5	33.8	2	4
9	2:02	0.5	35.7	1.9	3.8

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	2:04	0.5	15.6	—	—
2	2:04:30	0.5	19.7	4.1	8.2
3	2:05	0.5	25.0	5.3	10.6
4	2:05:30	0.5	29.1	4.1	8.2
5	2:06	0.5	33.2	4.1	8.2
6	2:06:30	0.5	37.6	4.4	8.8
7	2:07	0.5	42.0	4.4	8.8
8	2:07:30	0.5	46.2	4.2	8.4

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CIVIL ENGINEERS AND LAND SURVEYORS
711 N PERSHING AVENUE
STOCKTON, CA 95203

GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study

Project No.: 2487-0010

Date: 12/6/23 Investigator JAF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22	cm^2	X
Inner Reservoir Y		cm^2	

Depth of Well Hole: 9.5"

GP test designation: R1B7-2, NW surface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	2:18	0.5	16.0	—	—
2	2:18:30	0.5	19.4	3.4	6.8
3	2:19	0.5	23.0	3.6	7.2
4	2:19:30	0.5	26.3	3.3	6.6
5	2:20	0.5	29.8	3.5	7
6	2:20:30	0.5	32.7	2.9	5.8
7	2:21	0.5	35.4	2.7	5.4
8	2:21:30	0.5	37.9	2.5	5
9	2:22	0.5	40.7	2.8	5.6

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	2:24	0.5	13.0	—	—
2	2:24:30	0.5	15.3	2.3	4.6
3	2:25	0.5	18.3	3	6
4	2:25:30	0.5	20.2	1.9	3.8
5	2:26	0.5	22.7	2.5	5
6	2:26:30	0.5	25.2	2.5	5
7	2:27	0.5	27.5	2.3	4.6
8	2:27:30	0.5	29.7	2.2	4.4

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CIVIL ENGINEERS AND LAND SURVEYORS
711 N PERSHING AVENUE
STOCKTON, CA 95203

GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study **Project No.:** 2487-0010

Date: 12/6/23 Investigator JHF/JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	cm²	

Depth of Well Hole: 9.5"

GP test designation: RIB 7-3. NE surface

Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	2:34	0.5	13.0	—	—
2	2:34:30	0.5	14.7	1.7	3.4
3	2:35	0.5	18.4	3.7	7.4
4	2:35:30	0.5	20.8	2.4	4.8
5	2:36	0.5	23.2	2.4	4.8
6	2:36:30	0.5	25.5	2.3	4.6
7	2:37	0.5	27.7	2.2	4.4
8	2:37:30	0.5	30.0	2.3	4.6

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	2:40	0.5	15.0	—	—
2	2:40:30	0.5	18.5	3.5	7
3	2:41	0.5	22.0	3.5	7
4	2:41:30	0.5	25.4	3.4	6.8
5	2:42	0.5	28.9	3.5	7
6	2:42:30	0.5	32.0	3.1	6.2

KJELDSEN, SINNOCK, AND NEUDECK INC
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711 N PERSHING AVENUE
STOCKTON, CA 95203

GP FIELD DATA SHEET

Project Name: Salida Sanitary District Recycled Water Planning Study
Project No.: 2487-0010

Date: 12/6/23 Investigator JMF/IWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22	cm²	X
Inner Reservoir Y		cm²	

Depth of Well Hole: 9.5"
GP test designation: RIB 7-4, test pit
Depth below g.s.: 14"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	2:48	0.5	9.0	—	—
2	2:48:30	0.5	10.8	1.8	3.6
3	2:49	0.5	12.0	1.2	2.4
4	2:49:30	0.5	13.5	1.5	3
5	2:50	0.5	14.8	1.3	2.6
6	2:50:30	0.5	16.0	1.2	2.4
7	2:51	0.5	17.3	1.3	2.6

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	2:54	0.5	25.0	—	—
2	2:54:30	0.5	28.9	3.9	7.8
3	2:55	0.5	32.7	3.8	7.6
4	2:55:30	0.5	36.2	3.5	7
5	2:56	0.5	39.8	3.6	7.2
6	2:56:30	0.5	43.1	3.3	6.6

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711 N PERSHING AVENUE
STOCKTON, CA 95203

GP FIELD DATA SHEET

Date: 12/27/2023 Investigator JAF and JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	cm^2	
Inner Reservoir Y 2.16	cm^2	X

Depth of Well Hole: 8.5"

GP test designation: RIB10 (exp Area 1)

Depth below g.s.: 27"

First set of readings with height of water in well (H_1) set at 5 cm

	Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
	1	9:17	—	4.9	—	—
	2	9:18	1	5.9	1.0	1.0
	3	9:19	1	5.9	0	0
	4	9:22	3	6.2	0.3	0.1
	5	9:25	3	9.2	3.0	1
	6	9:28	3	12.3	3.1	1.03
	7	9:31	3	17.2	4.9	1.63
	8	9:34	3	23.1	5.9	1.97
	9	9:37	3	28.1	5.0	1.67
Restart	10	9:39	—	29.6	—	—
	11	9:42	3	34.2	4.6	1.53

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	9:45	—	12.5	—	—
2	9:46	1	12.7	0.2	0.2
3	9:47	1	17.1	4.4	4.4
4	9:48	1	21.0	3.9	3.9
5	9:49	1	24.8	3.8	3.8
6	9:50	1	29.0	4.2	4.2

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STOCKTON, CA 95203

GP FIELD DATA SHEET

Date: 12/27/2023 Investigator JAF and JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	cm²	

Depth of Well Hole: 7.5"

GP test designation: R1B11 (exp Area 2)

Depth below g.s.: 22"

First set of readings with height of water in well (H_1) set at ~ cm

Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	10:48	-	4.3	-	-
2	10:50	2	4.5	0.2	0.1
3	10:52	2	4.9	0.4	0.2
4	10:54	2	5.4	0.5	0.25
5	10:56	2	5.7	0.3	0.15
6	10:58	2	6.3	0.6	0.30

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	11:00	—	9.6	—	—
2	11:02	2	10.6	1.0	0.5
3	11:04	2	11.6	1.0	0.5
4	11:06	2	12.6	1.0	0.5
5	11:08	2	13.5	0.9	0.45
6	11:10	2	14.5	1.0	0.5

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GP FIELD DATA SHEET

Date: 12/27/2023 Investigator JAF and JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	35.22 cm²	X
Inner Reservoir Y	cm²	

Depth of Well Hole: 8.5"

GP test designation: RIB12 (Exp Area 3)

Depth below g.s.: 20"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	11:37	—	19.9	—	—
2	11:38	1	20.3	0.4	0.4
3	11:39	1	20.6	0.3	0.3
4	11:40	1	21.2	0.6	0.6
5	11:41	1	21.6	0.4	0.4
6	11:42	1	22.1	0.5	0.5
7	11:43	1	22.5	0.4	0.4
8	11:44	1	22.8	0.3	0.3

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time (AM)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	11:45	—	27.1	—	—
2	11:46	1	27.7	0.6	0.6
3	11:47	1	28.4	0.7	0.7
4	11:48	1	29.0	0.6	0.6
5	11:49	1	29.7	0.7	0.7
6	11:50	1	30.5	0.8	0.8
7	11:51	1	31.1	0.6	0.6

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GP FIELD DATA SHEET

Date: 12/27/2023 Investigator JAF and JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X	cm²	
Inner Reservoir Y	2.16 cm²	X

Depth of Well Hole: 6.5"

GP test designation: RIB 13 (E+P Area A)

Depth below g.s.: 18"

First set of readings with height of water in well (H_1) set at 5 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	3:07.0	—	19.5	—	—
2	3:07.30	0.5	19.5	0	0
3	3:08.0	0.5	19.6	0.1	0.2
4	3:08:30	0.5	19.6	0	0
5	3:09.0	0.5	19.6	0	0
6	3:09.30	0.5	19.6	0	0
7	3:10.0	0.5	19.6	0	0
8	3:10.30	0.5	19.7	0.1	0.2

Second set of readings with height of water in well (H_2) set at 10 cm

Reading #	Time	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	3:10.30	—	22.0	—	—
2	3:11.0	0.5	22.3	0.3	0.6
3	3:11.30	0.5	22.6	0.3	0.6
4	3:12	0.5	23.0	0.4	0.8
5	3:12.30	0.5	23.4	0.4	0.8
6	3:13.0	0.5	24.0	0.6	1.2

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GP FIELD DATA SHEET

Date: 12/27/2023 Investigator JAF and JWF

Reservoir Constants (see label on Permemameter)

Combined Reservoirs X		cm²	
Inner Reservoir Y	2.16	cm²	X

Depth of Well Hole: 7.25"

GP test designation: RIB 14 (Exp Area 5)

Depth below g.s.: 21"

First set of readings with height of water in well (H_1) set at ~~5 cm~~ 10 cm

Reading #	Time (pm)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_1 (cm/min)
1	2:44	—	11.0	—	—
2	2:45	1	11.1	0.1	0.1
3	2:46	1	11.2	0.1	0.1
4	2:47	1	12.9	1.7	1.7
5	2:48	1	16.4	3.5	3.5
6	2:49	1	20.1	3.7	3.7
7	2:50	1	23.1	3.0	3.0

Second set of readings with height of water in well (H_2) set at ~~10 cm~~ 15 cm

Reading #	Time (pm)	Time Interval (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Rate of Water Level Change, R_2 (cm/min)
1	2:51	—	17.5	—	—
2	2:52	1	17.6	0.1	0.1
3	2:53	1	18.0	0.4	0.4
4	2:54	1	20.1	2.1	2.1
5	2:55	1	27.7	7.6	7.6
6	2:56	1	34.8	7.1	7.1
7	2:57	1	39.9	5.1	5.1

KJELDSEN, SINNOCK, AND NEUDECK INC
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STOCKTON, CA 95203

Appendix D

COST ESTIMATE

Proposed SSD Tertiary Treatment Facilities - Alternative T1					
		Opinion of Probable Costs [1]			
Item	**Description**	**Unit**	**Estimated Quantity**	**Item Price**	**Total**
	Filter Feed PS				
1	Structure Excavation and Backfill Wet Weather Pump Station	CY	534.5	$91.29	$49,000
2	Piping HDPE Sckt Ftg Field Run Piping 10" From PS to Mixers	LF	40.0	$1,079.59	$43,000
3	Iron Body Flanged Valves	EA	2.0	$15,787.38	$32,000
4	Slab Wet Weather Foundation 2' Thick x 28' x 18'	CY	37.3	$831.22	$31,000
5	Concrete Walls WW PS 18.5' long x 1.5' Thick	CY	830.7	$1,061.96	$882,000
6	Elevated Slab WW PS 1' Thick	CY	18.7	$1,222.05	$23,000
7	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	100.0	$561.89	$56,000
8	Iron Body Flanged Valves	EA	6.0	$13,063.19	$78,000
9	Sluice Gates	EA	2.0	$48,523.46	$97,000
10	Dry Well PS Equipment	LS	1.0	$111,001.02	$111,000
11	Electrical, Instrumentation, and Controls	LS	1.0	$165,646.39	$166,000
				FILTER FEED PS SUBTOTAL	**$1,568,000**
	Equilization Tank and Mixer				
12	Piping HDPE Sckt Ftg Field Run Piping 10" From PS to Cloth Disk and Bypass	LF	60.0	$782.09	$47,000
13	Iron Body Flanged Valves	EA	2.0	$15,787.39	$32,000
14	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	20.0	$1,466.97	$29,000
15	Iron Body Flanged Valves	EA	2.0	$15,787.39	$32,000
16	Equilization Tank with Jet Mixers	EA	2.0	$73,305.41	$147,000
17	Electrical and Instrumentation (FACTORED)	LS	1.0	$73,620.61	$74,000
				EQUILIZATION TANK AND MIXER SUBTOTAL	**$361,000**
	Flocculation Tank				
18	Foundattion for Flocculant Tank 2' Thick x 14' x 20'	CY	20.7	$1,149.61	$24,000
19	Concrete Walls 13.5' Tall and 18" Thick	CY	51.0	$1,771.87	$90,000
20	Jet Mixers	EA	2.0	$67,387.87	$135,000
21	Electrical and Instrumentation (FACTORED)	LS	1.0	$32,209.01	$32,000
				FLOCCULATION TANK SUBTOTAL	**$281,000**
	Chemical Feed Area				
22	Spread Footings 2' Thick 17' x 8.5'	CY	11.2	$1,235.69	$14,000
23	Equipment Pads	CY	0.9	$2,095.49	$2,000
24	Pre-Engineered Metal Canopy 17' x 8.5'	SF	144.5	$80.30	$12,000
25	Piping Allowances	LS	1.0	$92,025.77	$92,000
26	Coagulant Tank and Pumps	EA	3.0	$18,913.51	$57,000
27	Electrical and Instrumentation (FACTORED)	LS	1.0	$28,527.99	$29,000
				CHEMICAL FEED AREA SUBTOTAL	**$206,000**
	Cloth Disk Filters				
28	Slabs (On Grade & Mat) 2' thick 26' x 17'	CY	32.7	$1,046.09	$34,000
29	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	30.0	$1,076.22	$32,000
30	Iron Body Flanged Valves	EA	2.0	$15,787.40	$32,000
31	Cloth Disc Filter	LS	1.0	$1,388,094.31	$1,388,000
32	Electrical and Instrumentation (FACTORED)	LS	1.0	$671,182.60	$672,000
				CLOTH DISK FILTERS SUBTOTAL	**$2,158,000**
	UV Channel and Equipment				
33	Structure Excavation and Backfill (Sloped Sides)	CY	936.6	$398.89	$374,000
34	Concrete Paving	SF	811.0	$65.02	$53,000
35	Foundation 2' Thick x 47' long x 6' wide	CY	21.5	$1,246.50	$27,000
36	Slabs (On Grade & Mat)	CY	10.4	$1,260.39	$14,000
37	Concrete Walls 1.5' Thick	CY	88.7	$1,698.11	$151,000
38	Grading	LS	1.0	$15,871.81	$16,000
39	Pre-Engineered Metal Canopy 70' x 25'	SF	1,750.0	$57.80	$102,000
40	UV Equipment	LS	1.0	$1,165,286.70	$1,166,000
41	Electrical and Instrumentation (FACTORED)	LS	1.0	$563,762.73	$564,000
				UV CHANNEL AND EQUIPMENT SUBTOTAL	**$2,467,000**
	Electrical Building				
42	Slab On Grade Electrical Building 9'6" x 28'8"	CY	20.2	$831.73	$17,000
43	Pre-Engineered Metal Building 9'6" x 28'8" x 10' Height	SF	273.1	$133.51	$36,000
44	Architectural and Interior Allowance	SF	273.1	$143.10	$39,000
45	Bldg, Plumbing	SF	273.1	$20.25	$6,000
46	HVAC	SF	273.1	$82.82	$23,000
47	Fire Suppression System	SF	273.1	$27.61	$8,000
48	Electrical, Instrumentation, and Controls	LS	1.0	$71,964.16	$72,000
				ELECTRICAL BUILDING SUBTOTAL	**$201,000**
	Recycled Water Pump Station				
49	Sitework - Structure Excavation and Backfill	CY	462.5	$99.27	$46,000
50	Piping HDPE Sckt Ftg Field Run Piping 10" From UV to PS	LF	40.0	$1,079.59	$43,000
51	Slab Wet Weather Foundation 2' Thick x 33' x 23'	CY	56.2	$848.26	$48,000
52	Concrete Walls WW PS 12' long x 1.5' thick	CY	851.2	$1,068.88	$910,000
53	Elevated Slab WW PS 1' thick	CY	18.7	$1,222.05	$23,000
54	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	100.0	$561.89	$56,000
55	Iron Body Flanged Valves	EA	6.0	$13,063.19	$78,000
56	Sluice Gates	EA	2.0	$48,523.46	$97,000
57	Dry Well PS Equipment	LS	1.0	$206,401.80	$207,000
58	Electrical, Instrumentation, and Controls	LS	1.0	$211,659.28	$212,000
				RECYCLED WATER PUMP STATION SUBTOTAL	**$1,720,000**
				FILTER FEED PS SUBTOTAL	$1,568,000
				EQUILIZATION TANK AND MIXER SUBTOTAL	$361,000
				FLOCCULATION TANK SUBTOTAL	$281,000
				CHEMICAL FEED AREA SUBTOTAL	$206,000
				CLOTH DISK FILTERS SUBTOTAL	$2,158,000
				UV CHANNEL AND EQUIPMENT SUBTOTAL	$2,467,000
				ELECTRICAL BUILDING SUBTOTAL	$201,000
				RECYCLED WATER PUMP STATION SUBTOTAL	$1,720,000
				ALTERNATIVE T1 SUBTOTAL	$8,962,000
				DESIGN, ENGINEERING, ADMINISTRATION, AND CM 25%	$2,241,000
				ENVIRONMENTAL, PERMITTING AND LEGAL 10%	$896,000
				TOTAL	**$12,099,000**

Proposed SSD Tertiary Treatment Facilities - Alternative T2

Opinion of Probable Costs [1]

Item	Description	Unit	Estimated Quantity	Item Price	Total
	Filter Feed Pump Station				
1	Structure Excavation and Backfill Wet Weather PS	CY	534.5	$91.48	$49,000
2	Piping HDPE Sckt Ftg Field Run Piping 10" From PS to Mixers	LF	40.0	$1,081.84	$43,000
3	Iron Body Flanged Valves	EA	2.0	$15,819.63	$32,000
4	Slab Wet Weather Foundation 2' Thick x 28' x 18'	CY	37.3	$832.93	$31,000
5	Concrete Walls WW PS 18.5' long x 1.5' Thick	CY	830.7	$1,064.16	$884,000
6	Elevated Slab WW PS 1' Thick	CY	18.7	$1,224.58	$23,000
7	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	100.0	$563.06	$56,000
8	Iron Body Flanged Valves	EA	6.0	$13,089.87	$79,000
9	Sluice Gates	EA	2.0	$48,623.54	$97,000
10	Dry Well PS Equipment	LS	1.0	$111,232.35	$111,000
11	Electrical, Instrumentation, and Controls	LS	1.0	$166,003.89	$166,000
				FILTER FEED PUMP STATION SUBTOTAL	**$1,571,000**
	Equilization Tank and Mixer				
12	Piping HDPE Sckt Ftg Field Run Piping 10" From PS to Cloth Disk and ByPass	LF	60.0	$783.73	$47,000
13	Iron Body Flanged Valves	EA	2.0	$15,819.62	$32,000
14	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	20.0	$1,470.04	$29,000
15	Iron Body Flanged Valves	EA	2.0	$15,819.62	$32,000
16	Equilization Tank with Jet Mixers	EA	2.0	$73,459.20	$147,000
17	Electrical and Instrumentation (FACTORED)	LS	1.0	$73,779.53	$74,000
				EQUILIZATION TANK AND MIXER SUBTOTAL	**$361,000**
	Flocculation Tank				
18	Foundation for Flocculant Tank 2' Thick x 14' x 20'	CY	20.7	$1,151.98	$24,000
19	Concrete Walls 13.5' Tall x 18" Thick	CY	51.0	$1,775.55	$91,000
20	Jet Mixers	EA	1.0	$67,529.52	$68,000
21	Electrical and Instrumentation (FACTORED)	LS	1.0	$32,278.53	$32,000
				FLOCCULATION TANK SUBTOTAL	**$215,000**
	Chemical Feed Area				
22	Spread Footings 2' Thick 17' x 8'6"	CY	11.2	$1,238.25	$14,000
23	Equipment Pads	CY	0.9	$2,099.82	$2,000
24	Pre-Engineered Metal Canopy 17' x 8.5'	SF	144.5	$80.47	$12,000
25	Piping Allowances	LS	1.0	$92,224.38	$92,000
26	Coagulant Tank and Pumps	EA	3.0	$18,952.90	$57,000
27	Electrical and Instrumentation (FACTORED)	LS	1.0	$28,589.55	$29,000
				CHEMICAL FEED AREA SUBTOTAL	**$206,000**
	UV Channel and Equipment				
28	Structure Excavation and Backfill (Sloped Sides)	CY	936.6	$399.73	$374,000
29	Concrete Paving	SF	811.0	$65.15	$53,000
30	Foundation 2' Thick x 47' long x 6' wide	CY	21.5	$1,249.07	$27,000
31	Slabs (On Grade & Mat)	CY	10.4	$1,262.99	$13,000
32	Concrete Walls 1.5' Thick	CY	88.7	$1,701.64	$151,000
33	Grading	LS	1.0	$15,904.40	$16,000
34	Pre-Engineered Metal Canopy 50' x 20'	SF	1000.0	$57.97	$58,000
35	UV Equipment	LS	1.0	$1,167,720.17	$1,168,000
36	Electrical and Instrumentation (FACTORED)	LS	1.0	$564,979.49	$565,000
				UV CHANNEL AND EQUIPMENT SUBTOTAL	**$2,425,000**
	Electrical Building				
37	Slab On Grade Electrical Building 9'6" x 28'8"	CY	20.2	$833.45	$17,000
38	Pre-Engineered Metal Building 9'6" x 28'8" x 10' Height	SF	273.1	$133.79	$37,000
39	Architectural and Interior Allowance	SF	273.1	$143.40	$39,000
40	Bldg, Plumbing	SF	273.1	$20.29	$6,000
41	HVAC	SF	273.1	$83.00	$23,000
42	Fire Suppression System	SF	273.1	$27.67	$8,000
43	Electrical, Instrumentation, and Controls	LS	1.0	$72,119.46	$72,000
				ELECTRICAL BUILDING SUBTOTAL	**$202,000**
	Recycled Water Pump Station				
43	Sitework - Structure Excavation and Backfill	CY	462.5	$99.27	$46,000
44	Piping HDPE Sckt Ftg Field Run Piping 10" From UV to PS	LF	40.0	$1,079.59	$43,000
45	Slab Wet Weather Foundation 2' Thick x 33' x 23'	CY	56.2	$848.26	$48,000
46	Concrete Walls WW PS 12' long x 1.5' thick	CY	851.2	$1,068.88	$910,000
47	Elevated Slab WW PS 1' thick	CY	18.7	$1,222.05	$23,000
48	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	100.0	$561.89	$56,000
49	Iron Body Flanged Valves	EA	6.0	$13,063.19	$78,000
50	Sluice Gates	EA	2.0	$48,523.46	$97,000
51	Dry Well PS Equipment	LS	1.0	$206,401.80	$207,000
52	Electrical, Instrumentation, and Controls	LS	1.0	$211,659.28	$212,000
				RECYCLED WATER PUMP STATION SUBTOTAL	**$1,720,000**
	Continuous Backwash Filters				
52	Sitework - Structure Excavation and Backfill 10' Deep	CY	821.8	$183.16	$151,000
53	Slab Foundation 2' Thick x 36' x 19.25'	CY	51.3	$824.14	$42,000
54	Concrete Walls 24' Tall x 1.5' Thick'	CY	1,033.4	$1,120.48	$1,158,000
55	Flowable Fill	CY	65.0	$228.60	$15,000
56	Piping HDPE Sckt Ftg Field Run Piping 10"	LF	30.0	$1,078.47	$32,000
57	Iron Body Flanged Valves	EA	6.0	$13,063.19	$78,000
58	Backwash Filters	LS	1.0	$1,225,953.29	$1,226,000
59	Electrical, Instrumentation, and Controls (FACTORED)	LS	1.0	$211,659.28	$212,000
				CONTINUOUS BACKWASH FILTERS SUBTOTAL	**$2,914,000**
				FILTER FEED PUMP STATION SUBTOTAL	$1,571,000
				EQUILIZATION TANK AND MIXER SUBTOTAL	$361,000
				FLOCCULATION TANK SUBTOTAL	$215,000
				CHEMICAL FEED AREA SUBTOTAL	$206,000
				UV CHANNEL AND EQUIPMENT SUBTOTAL	$2,425,000
				ELECTRICAL BUILDING SUBTOTAL	$202,000
				RECYCLED WATER PUMP STATION SUBTOTAL	$1,720,000
				CONTINUOUS BACKWASH FILTERS SUBTOTAL	$2,914,000
				ALTERNATIVE T2 SUBTOTAL	$9,614,000
				DESIGN, ENGINEERING, ADMINISTRATION, AND CM 25%	$2,404,000
				ENVIRONMENTAL, PERMITTING AND LEGAL 10%	$961,000
				TOTAL	**$12,979,000**

Proposed SSD WWTP Upgrades - Alternative D1: Operational Recycled Water Storage Only					
Opinion of Probable Costs [1]					
Item	**Description**	**Unit**	**Estimated Quantity**	**Item Price**	**Total**
Recycled Water Operational Storage Tank And Lift Station					
1	Recycled Water Lift Station	LS	1	$500,000	$500,000
2	RW Storage Tank (900,000 gal) with Coating	GALLON	912,000	$1.19	$1,085,000
3	Recycled Water Storage Tank Foundation Pad - 12" Reinforced Foundation	CY	833	$750	$625,000
4	Allowance for Piping and Valves	LS	1	$50,000	$50,000
5	Instrumentation & Electrical	LS	1	$150,000	$150,000
				RECYCLED WATER OPERATIONAL STORAGE TANK AND LIFT STATION SUBTOTAL	**$2,410,000**
Recycled Water Distribution Piping					
6	18" HDPE Pressure Pipe, Distribution Piping	LF	14,750	$130	$1,918,000
7	Allowance for Pipe Supports	LS	1	$39,000	$39,000
8	Allowance for Valves	LS	1	$192,000	$192,000
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	**$2,149,000**
On-Farm Connection Assemblies					
9	18" Underground Piping and Appurtenances	LS	2	$45,500	$91,000
10	18" Modulating Control Valve	EA	2	$82,120	$165,000
11	18" Magnetic Flow Meter	EA	2	$12,430	$25,000
12	18" Double Door Disc Check Valve	EA	2	$18,570	$38,000
13	Pressure Indicating Transmitter	EA	2	$16,610	$34,000
14	18" Dismantling Joint	EA	2	$7,760	$16,000
15	Allowance for Piping and Valves	LS	2	$35,000	$70,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	**$439,000**
				RECYCLED WATER OPERATIONAL STORAGE TANK AND LIFT STATION SUBTOTAL	$2,410,000
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	$2,149,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	$439,000
				SUBTOTAL	$4,998,000
				CONTINGENCY 25%	$1,250,000
				DESIGN, ENGINEERING, ADMINISTRATION, AND CM 25%	$1,250,000
				ENVIRONMENTAL, PERMITTING AND LEGAL 10%	$500,000
				TOTAL	**$7,998,000**

Proposed SSD WWTP Upgrades - Alternative D2: Maximized Use of On-Site Ponds as Seasonal Storage					
Opinion of Probable Costs [1]					
Item	**Description**	**Unit**	**Estimated Quantity**	**Item Price**	**Total**
Recycled Water Distribution Piping					
1	18" HDPE Pressure Pipe, Distribution Piping	LF	14,750	$130	$1,918,000
2	Allowance for Pipe Supports	LS	1	$39,000	$39,000
3	Allowance for Valves	LS	1	$192,000	$192,000
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	**$2,149,000**
On-Farm Connection Assemblies					
4	18" Underground Piping and Appurtenances	LS	2	$45,500	$91,000
5	18" Modulating Control Valve	EA	2	$82,120	$165,000
6	18" Magnetic Flow Meter	EA	2	$12,430	$25,000
7	18" Double Door Disc Check Valve	EA	2	$18,570	$38,000
8	Pressure Indicating Transmitter	EA	2	$16,610	$34,000
9	18" Dismantling Joint	EA	2	$7,760	$16,000
10	Allowance for Piping and Valves	LS	2	$35,000	$70,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	**$439,000**
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	$2,149,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	$439,000
				SUBTOTAL	$2,588,000
				CONTINGENCY 25%	$647,000
				DESIGN, ENGINEERING, ADMINISTRATION, AND CM 25%	$647,000
				ENVIRONMENTAL, PERMITTING AND LEGAL 10%	$259,000
				TOTAL	**$4,141,000**

Proposed SSD WWTP Upgrades - Alternative D3: Remote Storage for Maximized Beneficial Use of Recycled Water for Irrigation					
Opinion of Probable Costs [1]					
Item	**Description**	**Unit**	**Estimated Quantity**	**Item Price**	**Total**
Recycled Water Distribution Piping					
1	18" HDPE Pressure Pipe, Distribution Piping	LF	14,750	$130	$1,918,000
2	Allowance for Pipe Supports	LS	1	$39,000	$39,000
3	Allowance for Valves	LS	1	$192,000	$192,000
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	**$2,149,000**
Remote Storage Pond					
4	Remote Storage Transfer Pump Station	LS	1	$500,000	$500,000
5	Land Acquisition	AC	70	$150,000	$10,500,000
6	Aggregate Base, Pond Perimeter Roadway	CY	2,480	$32	$80,000
7	Earthwork - Excavation/Fill	CY	120,600	$30	$3,618,000
8	Liner - Geotextile Underlayment	SF	2,896,400	$1.00	$2,897,000
9	Liner - 80-mil HDPE Single Liner	SF	2,896,400	$3.00	$8,690,000
10	Liner - Leak Detection, Startup QA/QC	EA	5	$65,000	$294,000
11	Allowance for Piping and Valves	LS	1	$305,700	$306,000
				REMOTE STORAGE POND SUBTOTAL	**$26,885,000**
On-Farm Connection Assemblies					
12	18" Underground Piping and Appurtenances	LS	2	$45,500	$91,000
13	18" Modulating Control Valve	EA	2	$82,120	$165,000
14	18" Magnetic Flow Meter	EA	2	$12,430	$25,000
15	18" Double Door Disc Check Valve	EA	2	$18,570	$38,000
16	Pressure Indicating Transmitter	EA	2	$16,610	$34,000
17	18" Dismantling Joint	EA	2	$7,760	$16,000
18	Allowance for Piping and Valves	LS	2	$35,000	$70,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	**$439,000**
				RECYCLED WATER DISTRIBUTION PIPING SUBTOTAL	$2,149,000
				REMOTE STORAGE POND SUBTOTAL	$26,885,000
				ON-FARM CONNECTION ASSEMBLIES SUBTOTAL	$439,000
				SUBTOTAL	$29,473,000
				CONTINGENCY 25%	$7,368,000
				DESIGN, ENGINEERING, ADMINISTRATION, AND CM 25%	$7,368,000
				ENVIRONMENTAL, PERMITTING AND LEGAL 10%	$2,947,000
				TOTAL	**$47,156,000**

NOTES:

1. Costs are based on an ENR CCI of 15458.96 as of Mar 2024 and include labor, material and equipment markups.