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Nipomo Community Services DISTRICT

Preliminary Screening Evaluation of Southland Wastewater Treatment Facility Disposal Alternatives

January 2009

Nipomo Community Services District

General Manager	Bruce Buel
District Manager	Peter Sevcik, PE
Utility Superintendent	Tina Grietens

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Project Manager	Michael Nunley, PE
Project Engineer	Eileen Shields, EIT

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1.0 Introduction

1.1 Background

Nipomo Community Services District is planning to upgrade the Southland Wastewater Treatment Facility in order to meet future community demand, as described in the District's 2007 Water and Sewer Master Plan Update. The plant is currently a facultative pond system that discharges to a system of onsite percolation ponds. The draft 2007 Southland Wastewater Treatment Facility Master Plan (WWTF Master Plan) addressed plans to upgrade the plant from 0.9 to 2.34 million gallons per day (MGD) on a maximum month basis. The WWTF Master Plan recommended installing new influent screens, grit removal, an extended aeration treatment system, and clarification in order to improve effluent quality and provide capacity for future demands.

While planning for the wastewater treatment facility expansion, the District reviewed available groundwater records and with the assistance of Boyle/AECOM and Fugro West discovered the following:

- A perched mound of treated effluent was growing beneath the wastewater percolation ponds. An aquitard that existed from 60 to 140 feet below ground surface was preventing the mound from percolating to the deeper aquifer.
- Evidence suggests the mound is slowly draining to the northeast, toward Nipomo Creek. The Creek is listed as an impaired water body in the Central Coast Regional Water Quality Control Board (RWQCB) Basin Plan for fecal coliform.

The District has been working with RWQCB staff to evaluate regulatory constraints for continuing current discharge practices and pursuing other discharge or reuse alternatives after the plant upgrade is completed. Recent guidance from the Regional Board (April 29, 2008) regarding probable discharge requirements for the Southland Wastewater Treatment Facility (WWTF) indicates that alternative disposal or reuse options will need to be investigated. The District cannot continue to discharge onsite without risking surfacing of the effluent mound.

In accordance with California Environmental Quality Act (CEQA) requirements, the District is planning to prepare an Initial Study for the treatment plant upgrades described in the Southland WWTF Master Plan. Before the appropriate CEQA compliance strategy can be developed, potential disposal and reuse options must be characterized to a level where impacts can be evaluated.

Boyle was previously retained to assist the District in identifying disposal sites under Task Order # 011-07 for Engineering Support for Southland WWTF Management Program. After an initial screening, the proposed disposal sites were rejected by the NCSD Board of Directors on January 23, 2008. At the District Board meeting on August 27, 2008, the NCSD Board agreed to retain Boyle Engineering to evaluate additional disposal alternatives for use in the CEQA process.

1.2 Purpose of this Preliminary Screening Evaluation

The purpose of this preliminary-screening memorandum is to describe the set of alternatives under consideration, so that the District Board and members of the community can provide input into the development of these alternatives. In a public meeting on November 13, 2008, the District presented the alternatives and received input from the public.

1.3 Scope of Work

This report represents Task 4a of our contract with NCSD for Southland Disposal Planning Assistance. Our scope for this work includes the following tasks:

- Review hydrogeologic information and models provided by District consultants, regulatory guidance from RWQCB, wastewater quantity and quality data provided by the District, and other pertinent information;

- Describe at a preliminary screening level up to eleven (11) new disposal options for preliminary screening and identification of fatal flaws.

- Present the disposal options at a public meeting to obtain feedback from the District Board and community.

2.0 Proposed Treatment Approach

The Southland Wastewater Treatment Facility (WWTF) is approaching its permitted capacity (0.9 MGD as a maximum monthly average). To evaluate existing and future capacity of the facility, Boyle completed the Draft Southland WWTF Master Plan in February 2007. Future flow rates and BOD_5 loadings were projected. The updated draft Master Plan[1], currently in progress, estimates that the flow capacity may be reached as early as December 2010. Immediate planning for upgrades to the facility was recommended. Several treatment processes were evaluated: expansion of the existing system (aerated ponds), activated sludge, oxidation ditch, and Biolac® wave oxidation system. Effluent water quality, operation and maintenance, footprint size, and capital and operating costs were considered.

The intended end-use for the treated effluent determines the regulations and required treatment level. For instance, if unrestricted irrigation or groundwater recharge is pursued, tertiary treatment will be required. However, the current treatment process, aerated ponds, does not produce effluent appropriate for efficient tertiary filtration. The monthly average effluent total suspended solids (TSS) concentration (September 2006 through August 2008) was 34 mg/L and the maximum was 68 mg/L. The typical goal for filtration is less than 30 mg/L. High TSS concentrations increase the frequency of backwashing, which can multiply the number of filters required and increase capital and operating costs. Also, aerated ponds are ineffective at reducing nitrogen compounds which are a common water quality concern in groundwater.

The Draft Southland WWTF Master Plan recommended the Biolac® wave oxidation system, an extended aeration process that utilizes a longer solids retention time and moving aeration chains to reduce BOD and TSS concentrations to below 15 mg/L and total nitrogen to less than 10 mg/L. When compared to an aerated pond system, a Biolac® system can provide a higher level of treatment at a capital and operating cost that is lower than other biological treatment systems. It requires a higher degree of operator involvement than the current system, but routine operations and maintenance are less complex than the other, more expensive, treatment technologies reviewed (oxidation ditch and activated sludge). If the District chooses to pursue reuse options that require tertiary treatment, the Biolac® system can produce effluent appropriate for tertiary processes. Two types of filtration (sand and cloth) and two disinfection processes (chlorination and UV radiation) were reviewed in the Draft Southland WWTF Master Plan.

[1] The Draft Southland WWTF Master Plan will be finalized and updated as part of the current contract.

3.0 Water Quality

Influent water quality is influenced by drinking water source(s) and water users (commercial, various industries, domestic). The quality of wastewater treatment plant effluent is dictated by the level of treatment. Currently, Nipomo utilizes groundwater wells to provide drinking water.

Two future projects will affect the quality of treated effluent from the WWTF: NCSD Waterline Intertie Project and WWTF Upgrade. The District is also evaluating options to discourage use of self-regenerating water softeners, in order to reduce concentrations of salt in plant effluent.

NCSD Waterline Intertie Project

In 2010, the District is planning to complete construction of the NCSD Waterline Intertie Project, which will deliver up to 3,000 acre-feet per year (AFY) from the City of Santa Maria to the District. The City primarily uses water from the State Water Project, and will provide their "municipal mix" of State Water and groundwater to Nipomo. As described in the 2008 Salt Minimization Plan for Southland WWTF, the Santa Maria water supply is considerably softer than Nipomo groundwater and would result in lower concentrations of various salts.

WWTF Upgrade

The WWTF upgrade will include nitrogen removal to 10 mg/L as N. No significant nitrogen removal is performed in the existing treatment system. Potential impacts from both projects on selected contaminants are summarized in Table 3.1. Salts may be further reduced in the future if the District proceeds with a developing salts minimization plan, as mentioned above.

Table 3.1 – Future Effluent Quality with WWTF Upgrade and Waterline Intertie Project

	Existing Concentrations (2004 - 2008)	Projected Future Concentrations (2010)
5-day Biological Oxygen Demand (BOD_5), mg/L	2 - 185	< 15
Total Dissolved Solids (TDS), mg/L	980 - 1180	800 - 1000
Sodium (Na), mg/L	184 - 209	180 - 210
Chloride (Cl) mg/L	208 - 234	200 - 240
Nitrate (NO_3^-), mg/L	50 - 80	ND - 10
Total Nitrogen (TN), mg/L	28 - 46	ND - 10
Sulfate (SO_4^-), mg/L	200 - 270	175 - 210
Bacteria Count, (MPN/100 mL)	ND - 2.2	ND - 2.2
pH	7.4 - 7.8	7.4 - 7.8

Notes:
ND = non-detect
mg/L = milligrams per liter
MPN = most probable number (of colony forming units)

As the District evaluates various disposal and reuse alternatives for the WWTF effluent, potential impacts to groundwater quality should be considered. Groundwater quality at offsite locations has not yet been determined and site-specific water quality and hydrogeological investigations will be required to assist with site comparisons and project permitting.

4.0 Reuse and Disposal Alternatives

There are two general categories of end-use options for treated wastewater: reuse and disposal. Reuse refers to using the treated wastewater for another beneficial use. Examples of this include landscape and agricultural irrigation, water supply for impoundments (fish hatcheries or recreational lakes), water supply for industrial and commercial cooling towers and air conditioning, groundwater recharge, dust control on roads and streets, decorative fountains, and many others. Disposal refers to discarding the treated wastewater without the intention of using it again. The most common methods of effluent disposal are discharging to water bodies and land application via percolation or sprayfields.

Four approaches are considered viable for reuse or disposal of treated wastewater from the Southland Wastewater Treatment Facility (WWTF):

- Percolation with basins is the simplest approach from a regulatory perspective and is the existing method of disposal. Treated wastewater percolates from basins into the ground, eventually finding its way to groundwater aquifers. Treatment standards and monitoring requirements are set by the Regional Water Quality Control Board (RWQCB) to protect groundwater resources.

- Percolation with a subsurface system involves percolation below ground surface instead of through open ponds. Instead, either perforated pipes or a subsurface chamber with a permeable bottom is built to receive the treated wastewater, and hold it as it percolates. RWQCB regulates this disposal method.

- Irrigation with recycled water involves treating the wastewater to required standards, followed by delivery to the intended customer for irrigation of landscape or agricultural products. Treatment standards are set by the California Department of Public Health (CDPH) and the RWQCB and depend on the irrigated product and potential for public contact.

- Groundwater recharge also involves additional treatment, plus requirements for dilution water and groundwater monitoring. Regulatory requirements are more stringent than for the other approaches. The recycled water can be re-introduced through percolation, or via direct injection into the receiving aquifer. Due to the need for dilution water or a high level of treatment (such as reverse osmosis) this alternative is not considered feasible. However, groundwater recharge can increase a water purveyor's ability to withdraw water from an adjudicated basin or to withdraw water in excess of their water rights, if they have permit limitations.

5.0 Previous Studies

The use of recycled water for irrigation was analyzed as part of the Evaluation of Supplemental Water Alternatives study conducted by Boyle in 2007. As part of that study a preliminary water budget was analyzed to estimate the impact of this approach on groundwater resources. Those results indicated that using recycled water as a substitute for irrigating with well water resulted in a very small decrease in the net water extracted from groundwater resources.

Additionally, use of recycled water to recharge the aquifer was also studied. This alternative would result in no increase in “supply” to the District under the terms of the legal settlement. Southland WWTF discharge was included in the groundwater budget that has been presented during litigation involving the Santa Maria Valley Groundwater Basin aquifers. (i.e., WWTF groundwater recharge is already considered as “return flows” to the aquifer).

The Water and Sewer Master Plan Update and Evaluation of Supplemental Water Alternatives identified possible routes and general locations for pipelines, percolation facilities, and irrigation areas that would most directly benefit groundwater levels in observed groundwater depressions.

6.0 Summary of Disposal and Reuse Alternatives

This memo contains descriptions of ten (10) disposal alternatives with different facility options for the Southland WWTF. These alternatives are described to a level sufficient for preliminary screening and identification of fatal flaws, and are based on a review of hydro-geologic information and models provided by District consultants, regulatory guidance from the Regional Board, wastewater quantity and quality data provided by the District, and other pertinent information. Figure 1 displays the various sites considered for these alternatives.

As the remainder of the report shows, some options contain “fatal flaws” which make them infeasible. These “fatal flaws” include regulatory restrictions, lack of customers or suitable sites, or excessive cost.

Table 6.1 – Site Descriptions and Disposal or Reuse Approach

Alternative	Site Description	Disposal or Reuse Approach
0	Continued use and expansion of existing percolation basins at Southland WWTF	Percolate with onsite basins
1	Pasquini Property, 192 acre site located southwest of Orchard Road and south of Southland Street.	Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and percolate at new location with: Option A: Basins Option B: Subsurface system
2	Agricultural land south of Nipomo mesa and north of Santa Maria River	Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and percolate at new location with: Option A: Basins Option B: Subsurface system
3	Agricultural land near Mesa and Eucalyptus Roads	Percolate with basins at Southland, pump mound, and percolate at new location with Option A: Basins Option B: Subsurface system
4	Agricultural land at Kaminaka Property (bounded by Pomeroy Road and Calle Fresa)	Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and percolate at new location with: Option A: Basins Option B: Subsurface system

Alternative	Site Description	Disposal or Reuse Approach
5	Expansion of irrigation with recycled wastewater capabilities at Woodlands Golf Course, Nipomo Community Park, Blacklake Golf Course or other turf or landscape users	Irrigation with recycled water. Option A: Direct recycle. Option B: Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and irrigate at new location.
6	Continued use and possible expansion of existing percolation basins at Southland WWTF and penetration of aquitard beneath Southland facility	Groundwater recharge or percolation*
7	Highway 101 right-of-way landscape	Irrigation with recycled water. Option A: Direct recycle. Option B: Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and irrigate within right-of-way.
8	Agricultural land on Nipomo Mesa southeast of Southland WWTF	Irrigation with recycled water. Option A: Direct recycle. Option B: Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and irrigate at new location.
9	Nipomo Refinery property	Percolate with onsite basins at Southland to utilize the shallow aquifer for storage and pathogen inactivation, pump from the mound, and percolate at new location with: Option A: Basins Option B: Subsurface system

* RWQCB's opinion as to whether the project as a "groundwater recharge" or a "percolation" project is key to its regulatory requirements, feasibility, and costs.

7.0 Assessment Criteria

Each disposal alternative was evaluated to provide a basis for comparison and to determine if any critical factor (i.e., a fatal flaw) would eliminate the alternative from further consideration. The criteria are described below.

7.1 Regulatory Restrictions and Legal Considerations

7.1.1 Regulatory Restrictions

Existing and draft state and federal regulations regarding the disposal of treated wastewater and the re-use of recycled water are summarized below, as are recent, pertinent communication with the RWQCB. An alternative was considered to have a "fatal flaw" from a regulatory perspective if the proposed action was prohibited. Alternatives for which significant additional costs would be incurred were noted.

Different regulations come into play depending on the intent of the proposed project or as described in previous sections. Disposal projects are regulated by the RWQCB. Reuse projects are regulated by both the RWQCB, and the CDPH under California Code of Regulations Title 22, Division 4, Chapter 3, Water Recycling Requirements (Title 22).

Preliminary consultation with the RWQCB indicates that:

- Continued discharge in a manner that contributes to significant increase in mineral constituent concentrations in groundwater and/or Nipomo Creek is not acceptable (Waste Discharge Requirements for NCSD Southland Wastewater Works, Order No. 97-75, Central Coast Regional Water Quality Control Board, 10/29/1997).

- If the perched treated effluent mound is pumped for irrigation, its use would be regulated by Title 22. Various levels of treatment are dictated by the type of crop and/or level of public access. For the purposes of this study, disinfected tertiary recycled water (the most stringent treatment level) is assumed to allow the majority of reuse options. If the water is demonstrated to have bacteria counts below Title 22 criteria, disinfection would not be required. The following table summarizes the requirements for effluent constituents.

Table 7.1 – Effluent Concentrations Required for Disinfected Tertiary Recycled Water

Parameter	Units	Mean	Maximum
BOD_5	mg/L	10	30
Coliform bacteria	MPN/100 ml	median < 2.2	23
Suspended Solids	mg/L	10	30
Settleable Solids	ml/L	0.1	0.3
Turbidity*	NTU	2	5
pH	Units	Within the range 6.5 to 8.4	

* Shall not exceed daily average of 2 NTU, or 5 NTU for more than 5% of the time over 24 hrs.

- Treating the water to appropriate standards and then directly injecting to the lower aquifer would likely be regulated under the draft groundwater recharge reuse project regulations of Title 22. Under this regulatory arrangement, the effluent would need to (1) be filtered and disinfected, (2) meet primary and secondary drinking water standards, and (3) be diluted with an appropriate water source before it is "injected".

- RWQCB staff indicates that replacing a portion of the aquitard with permeable material would be considered direct injection and would be regulated accordingly. However, even with perforation of the aquitard, the effluent would have over 100 feet of soil column to travel through before combining with groundwater. California regulations do not provide a clear definition for a groundwater recharge project as opposed to a percolation disposal project. If the District wishes to investigate this option, additional research would be required to develop a better understanding of the feasibility of the project.

- Nipomo Creek is classified as an impaired water body under the State Water Quality Control Board for fecal coliform and may soon be subject to a fecal bacteria loading allocation under a Total Maximum Daily Load process.

- Southland WWTF is nearing its capacity and upgrades to the treatment and disposal capacity are required. The RWQCB will be revising the Waste Discharge Requirements (WDR) upon the District's application to increase capacity and/or change processes at Southland.

7.1.2 Legal Considerations

Legal considerations primarily include issues related to the Santa Maria Valley Groundwater Basin litigation, easement or property acquisition required for new facilities, and contracts between the District and recycled water customers.

- The groundwater basin litigation established the right of Nipomo CSD to include their return flows from Southland WWTF in estimates of the availability of water on the mesa. Exporting water across the Nipomo Mesa Management Area (NMMA) boundary is not allowed in the court settlement without approval from all parties involved in the lawsuit. If an agreement can be reach, and this water is allowed to be exported outside the NMMA, the quantity of groundwater available to the District could be reduced in the future as groundwater management activities proceed. This is considered to be a significant constraint for Alternative 2 (percolation on agricultural land south of the Nipomo Mesa and north of the Santa Maria River)

- Property acquisition will be required for percolation facilities on property not owned by the District. Pipeline easements will be required outside of District property or County right-of-way.

- Recycled water distribution to users other than the District will require long-term delivery contracts that specify the term of engagement and quantity of water to be delivered, at a minimum.

7.2 Irrigation Demand

In the Evaluation of Supplemental Water Alternatives study (ibid), average irrigation demand in the Nipomo area was estimated to be 2.5 ft/year. The average annual flow rates from the Southland WWTF are currently 0.59 MGD, equivalent to approximately 662 acre-feet per year (AFY)[2]. These flows are projected to increase to 1,568 AFY (1.4 MGD) at buildout[3]. Therefore, as much as 627 acres of land will need to be irrigated in order to use the entire volume of treated wastewater at buildout.

The District contacted approximately 30 owners of agricultural production land south of the Southland WWTF and provided them with information regarding recycled water, the range of water quality that can be expected from Southland, and a questionnaire regarding the potential to use treated effluent as an irrigation source. Potential obstacles are expected to be concerns about high salts content, pH, public health, and public perception. As of October, 2008, minimal interest has been expressed by agricultural users. This is considered a significant constraint for agricultural reuse.

In cases where direct recycle to irrigation is proposed as part of the disposal project, seasonal storage or seasonal disposal to the existing percolation facilities at Southland must be provided so that irrigation can be interrupted during periods of rainfall.

7.3 Site Suitability and Water Quality

The following investigations by Fugro West were considered in evaluating the relative suitability of each of the disposal sites considered:

July 17, 2007 – Hydrogeologic Characterization, Southland WWTP, Nipomo, California
Key findings include:

- A dual aquifer exists beneath the WWTF percolation basins.
- The discharged treated effluent may be flowing to Nipomo Creek.
- The shallow aquifer appears to consist of treated WWTF effluent.
- The water quality in the deeper aquifer is unknown.
- Insufficient information is available to determine if the treated effluent is percolating into the deeper aquifer.

December 20, 2007 – Nipomo Creek Water Quality Sampling Program Phase 2
Results of a preliminary sampling effort indicate that treated effluent from Southland WWTF disposal basins is likely contributing to flows in Nipomo Creek.

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[2] Flow rate is based on September 2006 through August 2008 records.

[3] NCSD Water and Sewer Master Plan Update. Cannon and Associates. December 2007.

January 29, 2008 – Assessment of the Potential for Extracting Discharge Water from Beneath the Southland WWTP
This preliminary aquifer testing and modeling work suggests that if the wastewater flow increases from 0.6 MGD to 1.13 MGD (2008 to 2017) and the existing percolation ponds are used, then a network of five wells could extract up to 60% of the total treated effluent flow. If annual pumping rates start at 0.51 MGD and rise to 0.67 MGD over the same time frame, this extraction would reduce the flow to Nipomo Creek to half (0.05 MGD) of the WWTF's current estimated contribution (0.10 MGD).

January 22, 2008 – Feasibility Level Exploration Program for New Percolation Basin Sites
All of the sites investigated (three sites: north and south of Mesa Road, and west of Osage) appear suitable for percolation. Of the three areas investigated in this study, the area south of Mesa appears most suitable because of the minimal relief at the site.

July 30, 2008 – Supplemental Groundwater Modeling Analysis
Additional modeling was used to estimate that up to 0.57 MGD could be disposed at the existing site without increasing the size of the perched treated effluent mound.

July 30, 2008 – Hydrogeologic and Geotechnical Assessment of APN 090-311-001.
Results of this preliminary assessment indicate that the (Pasquini) property may be able to percolate up to 1.2 MGD in the 35-acre northerly third of the 192 acre parcel. Additional investigation into actual percolation rates and impacts to groundwater levels, as well as additional modeling to determine the fate and transport of percolated treated effluent, would be needed to determine whether the site is suitable for this use.

In cases where primary disposal is proposed through percolation basins located in a flood plain, or where elevated groundwater levels may be present (e.g., along the Santa Maria River), additional disposal options will need to be provided so that use of the percolation basins can be interrupted during periods of potential flooding or high groundwater.

Potential impacts to water quality are an important consideration and should be addressed as site investigations continue. At this point in the study, local groundwater conditions at the potential offsite disposal and reuse locations are considered an unknown. However, potential impacts and mitigation measures will need to be addressed during the CEQA and permitting processes. Groundwater analysis, hydrogeological characterization, and treated effluent transport modeling will assist the District with planning.

7.4 Public Opinion

A public meeting was held at the NCSD office on November 13, 2008 at 6:00 pm. The purpose was to review the administrative draft screening analysis and collect public input. Three members from the general public, two NCSD Board members, and two NCSD staff members attended. Following the presentation, the following comments were made:

- Explore the possibility of combining elements of the options, rather than looking at each option as a stand-alone solution

- The proposed score of 1 is too high in regards to public opposition to the Mesa Road Disposal Option – it should be negative 25
- Explore the possibility of irrigating Woodlands with recycled water
- Integrate reuse with water supply to fairly evaluate the true cost of disposal
- Look at the reliability of the Waterline Intertie Project in comparison to recycled water
- Secure information on the native water quality for each percolation site to determine if the quality of the disposal will degrade the resident groundwater
- Re-evaluate the projected quality of the discharge given the likelihood of future Santa Maria Valley Groundwater being a high percentage of the Waterline Intertie Project yield

7.5 Cost Projections

Screening-level cost projections were developed for each of the alternatives considered. A uniform set of assumptions were used, as listed below:

7.5.1 Demands

Each disposal and reuse alternative was sized to handle projected buildout demands. The existing average annual flow (AAF) and peaking factors were determined with plant records from September 2006 through August 2008. The projected AAF for 2030 was estimated in the NCSD Water and Sewer Master Plan (Cannon, December 2007) under various land use and growth scenarios. Under direction of District staff, the AAF under Scenario 1 was used for this analysis, existing land use and a 2.3% growth rate. With a peaking factor of 2.0, the projected peak daily flow (PDF) for the year 2030 is 3.34 MGD.

Table 7.2 – Existing and Projected Wastewater Demands

Flow Condition	Peaking Factor	Existing Flow (MGD)	Projected 2030 Flow (MGD)
Average Annual Flow (AAF)	--	0.59	1.67
Maximum Month Flow (MMF)	1.09	0.64	1.82
Peak Daily Flow (PDF)	2.00	1.19	3.34
Peak Hourly Flow (PHF)	3.00	--	5.01

7.5.2 Design Criteria

For the purposes of this study, all offsite pipelines, pump stations, tertiary treatment, and disinfection facilities will be sized to convey the projected Peak Daily Flow (PDF) for the year 2030. Percolation facilities and required irrigation area will be sized to receive the future 2030 maximum month flow (MMF).

Onsite Percolation Coupled with Offsite Disposal or Recycling

The District may choose to investigate the potential to allow up to 0.57 MGD to percolate onsite without impacting the size of the mound. In some alternatives, effluent would be percolated onsite prior to being pumped offsite to a new disposal or reuse facility. Wells would be installed to extract water from the existing perched aquifer. Fugro modeled the aquifer conditions onsite and analyzed percolation and extraction for up to 1.13 MGD utilizing the existing infiltration basins. Additional testing and analysis would be required to determine if greater capacity to percolate and extract exists onsite. For the purposes of this study, it is assumed that expansion of the infiltration basins onsite will provide the capacity to percolate up to 1.4 MGD of average annual flow and extract 0.83 MGD.

Offsite pumping facilities and pipelines will be sized to convey the 2030 peak daily flow (3.34 MGD). Offsite disposal facilities will be sized to handle maximum month flows (1.82 MGD). It is assumed the onsite “mound” will serve as a buffer for short-term peak flows, or possibly to store seasonal or wet-weather flows.

Table 7.3 summarizes the unit costs and assumptions used to develop the opinion of costs for each alternative.

Table 7.3 – Unit Costs and Assumptions

Description	Assumptions for Cost Opinions
16-inch diameter pipeline	Installed Capital: $210 per LF Annual O&M: 1% of total capital
Tertiary Filtration Facility[1]	Sized for 2030 Peak Daily Flow Installed Capital: $2,014,000 Annual O&M: 1% of total capital
Disinfection Facility[1]	Sized for 2030 Peak Daily Flow Installed Capital: $1,641,000 Annual O&M: 1% of total capital
500,000-gallon Tank	Installed Capital: $1,360,000 Annual O&M: 0.5 % of total capital
Energy Use	Pump & Motor Efficiency: 50 % Electrical Power: $0.13 / kWh
Financing	Term: 20 Years Interest: 8 %
Land	Land costs are not included
Subsurface Infiltration Systems	Percolation Capacity: 10 gpd/ft^2 Percolation area per trench: 5 ft^2 per LF of trench Area needed for "resting": additional 100% Area for roads, fence, etc: additional 20% Installed Capital: $30 per LF
Infiltration Basins	Percolation Capacity: 10 gpd/ft^2 Size per Basin: 110 ft x 650 ft x 5 ft depth Gross land area per basin: 2 acres Area needed for "resting": additional 100% Area for roads, fence, etc: additional 20% Installed Capital: $15 per YD^3
Highway Landscape Irrigation	Installed Capital Initial Infrastructure: $200,000 Landscaping & drip system: $90,000 per acre Annual O&M: $8,000 per acre per year
Engineering & Administration	25%
Contingency	25%
Notes: [1] Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI	

8.0 Preliminary Screening

The regulatory restrictions, legal considerations, availability of irrigation customers, site suitability, water quality and cost projections for the alternatives considered are briefly discussed below. Figures are included at the end of this document.

8.1 Alternative 0: Infiltration at Existing Facilities

8.1.1 Description of Alternative

This alternative would continue disposal of treated effluent at the Southland WWTF by utilizing the existing ponds and possibly new percolation ponds on the existing site. (See Figure 2)

8.1.2 Regulatory Restrictions and Legal Considerations

The most significant regulatory challenges are subsurface flow to Nipomo Creek and potential for mounding at the plant site. RWQCB staff has indicated that "continued discharge in a manner that contributes to significant increase in constituent concentrations in groundwater and Nipomo Creek is not acceptable." Increased flow rates to the existing facility are clearly not acceptable to RWQCB staff. We assume the RWQC Board would take the same position. For purposes of this preliminary screening, we conclude that regulatory restrictions represent a fatal flaw to continued disposal at the existing facility at existing or increased flow rates.

8.1.3 Site Suitability and Water Quality

Recent investigations show that treated effluent is "perching" on an aquitard which is encountered between 60 and 140 feet below the surface. Some of the treated effluent contributes to flows in Nipomo Creek. At flow rates above 0.57 MGD the size of the "perched mound" would increase. An increased mound would probably result in increased flows to Nipomo Creek as well as destabilization of the percolation basins.

Therefore, the existing percolation basins are not suitable for flow rates above 0.57 MGD. This is considered another "Fatal Flaw" for this alternative. If onsite percolation could be used in conjunction with another alternative to provide adequate disposal capability, it is not clear if a continued disposal rate of 0.57 MGD would be allowed by the RWQCB, or if a lower limit would be established. Approximately 10 acres southwest of the existing percolation basins is available for expansion. However, assuming the aquitard also exists underneath this land, percolation here would likely contribute to the perched effluent mound. If the aquitard is absent, testing would be required to determine percolation capacity. For the purposes of this study, it is assumed that future onsite percolation will be possible, but rates greater than 0.57 MGD will contribute to the effluent mound.

8.1.4 Cost Projection

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,000	$155,000
Engineering & administration (25%)	$362,000		$37,000	$37,000
Contingency (25%)	$362,000		$37,000	$37,000
Total Alternative 0	$2,200,000	$7,230	$221,000	$228,000

* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI

8.2 Alternative 1: Infiltration at Pasquini Property

8.2.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, expansion of the existing percolation basins to accommodate increased flows, followed by extraction of treated effluent from the perched aquifer.

The extracted water would be pumped approximately 4,500 feet to the northern portion of the Pasquini property and put into percolation basins (Option A) or into subsurface percolation systems (Option B). Approximately 24 acres of land would be utilized to create the new percolation facility. (See Figure 3)

8.2.2 Regulatory Restrictions and Legal Considerations

We expect that regulatory restrictions at the expanded existing disposal facility and at the new disposal facility would be similar to those now imposed on Southland WWTF disposal facilities. We anticipate monitoring requirements will be increased and effluent limits would be established for some constituents (TDS, sulfate, and boron) and that effluent limits for nitrogen compounds may be more stringent. (See Boyle Technical Memorandum for Task 3 – Regulatory Comparison, July 23, 2007). However, we expect that it would be possible to meet these effluent limits with the planned treatment process upgrade.

As noted above, analysis has indicated that it will be possible to percolate 1.13 MGD at the existing facility, extract 0.67 MGD, and reduce the contribution to Nipomo Creek from 0.10 MGD to 0.05 MGD. For purposes of this preliminary screening, we assume that it will be possible to percolate up to 1.4 MGD onsite with expanded infiltration basins, extract 0.67 to 1.4 MGD, and that the RWQCB will allow disposal and partial re-extraction at the facility in this manner because it reduces the contribution of treated effluent to Nipomo Creek.

Legal considerations are primarily related to acquisition of property for the percolation facilities, pipelines, and support facilities on private property. It is assumed the property owner would be willing to lease/sell property and provide easements to the District. Otherwise, the District would need to acquire the property through court proceedings and this is considered to be a significant constraint.

8.2.3 Site Suitability and Water Quality

Recent investigations by Fugro West indicate that the northerly 35 acres of the 192 acre parcel may be suitable for use as a percolation facility, but that additional investigations would be warranted. The property borders a relatively steep bluff to the south. Based on preliminary investigations, the study concluded that construction of percolation basins at the Pasquini site would likely not adversely impact the slope stability, provided that groundwater elevations remain below the base of the bluff and the proposed percolation ponds are adequately set back from the top of the bluff. To fully evaluate the feasibility of the proposed project at this site, it is critical to obtain a better definition of the hydrogeological character beneath the site to ensure that introduced water percolates more or less vertically through the unstaturated zone and merges with groundwater at a depth below the bluff base and does not daylight along the bluff face.

If the District chooses to move forward with this alternative, specific investigations should be performed to determine the native water quality at the site and evaluate the potential impacts of the proposed project to water quality.

8.2.4 Cost Projections

Alternative 1A: Percolation Basins

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 4,500 LF 16-inch PVC water main	$945,000	$9,500	$96,300	$106,000
Expand percolation basins at Southland*	$1,446,000	$7,200	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$32,500	--	$33,000
Construct 10 percolation basins (110' x 650' x 5' each)	$2,904,000	$14,500	$295,800	$310,000
Subtotal Option 1A.	$5,695,000			
Engineering & administration (25%)	$1,423,800		$145,000	$145,000
Contingency (25%)	$1,423,800		$145,000	$145,000
Total Option 1A.	$8,542,500	$67,700	$870,100	$938,000
+ Land cost for 24 acres on Pasquini property * Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

Alternative 1B: Subsurface Systems

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 4,500 LF 16-inch PVC water main	$945,000	$9,500	$96,300	$106,000
Expand percolation basins at Southland*	$1,446,000	$7,200	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$30,700	--	$33,000
Install subsurface system at new site	$4,008,000	$20,000	$408,200	$428,000
Subtotal Alternative 1B	$6,799,000			
Engineering & administration (25%)	$1,699,800		$173,100	$173,000
Contingency (25%)	$1,699,800		$173,100	$173,000
Total Alternative 1B	$10,199,000	$71,400	$1,038,700	$1,110,000
+ Land cost for 24 acres on Pasquini property * Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

8.3 Alternative 2: Infiltration South of Nipomo Mesa

8.3.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, expansion of the existing percolation basins to accommodate increased flows, followed by extraction of treated effluent from the perched aquifer.

The extracted water would be pumped approximately 9,500 feet to agricultural land at the base of the Nipomo Mesa and put into percolation basins (Option A) or into subsurface percolation systems (Option B). Approximately 24 acres of land would be utilized to create this new disposal facility. (See Figure 4)

Additional disposal options would be required so that use of the percolation basins can be interrupted during periods of possible flooding. One option would involve using the shallow Southland aquifer for seasonal storage by allowing pumping from the existing facility to stop during times of impending flooding, and then re-start after the danger of flooding passed. This option would require additional wells and larger transmission facilities for a comparable annual rate of extraction.

8.3.2 Regulatory Restrictions and Legal Considerations

We expect that regulatory restrictions at the expanded existing disposal facility and at the new disposal facility would be similar to those now imposed on Southland WWTF disposal facilities. We anticipate monitoring requirements will be increased and effluent limits would be established for some constituents (TDS, sulfate, and boron) and that effluent limits for nitrogen compounds may be more stringent. (See Boyle Tech memo Task 3 –

Regulatory Comparison, July 23, 2007). We expect that it would be possible to meet these effluent limits with the treatment improvements as discussed in the Facility Master Plan.

As noted above, analysis has indicated that it will be possible to percolate 1.13 MGD at the existing facility, extract 0.67 MGD, and reduce the contribution to Nipomo Creek from 0.10 MGD to 0.05 MGD. For purposes of this preliminary screening, we assume that it will be possible to percolate and extract up to 1.4 MGD onsite with expanded infiltration basins, extract 0.67 to 1.4 MGD, and that the RWQCB will allow disposal and partial re-extraction at the facility in this manner because it reduces the contribution of treated effluent to Nipomo Creek.

Legal considerations are primarily related to acquisition of property for the percolation facilities, pipelines, and support facilities on private property. It is assumed the property owner would be willing to lease/sell property and provide easements to the District. Otherwise, the District would need to acquire the property through court proceedings and this is considered to be a significant constraint.

8.3.3 Site Suitability and Water Quality

We believe that land in this area may be physically suitable for use as a percolation facility, but additional investigations will be needed. However, this are is considered prime agricultural land and converting its use to a municipal facility would represent a Class 1 (significant and non-mitigable) impact under CEQA.

If the District chooses to move forward with this alternative, specific investigations should be performed to determine the native water quality at the site and evaluate the potential impacts of the proposed project to water quality.

8.3.4 Cost Projections

Alternative 2A: Percolation Basins

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 9,500 LF 16-inch PVC water main	$1,995,000	$19,950	$203,200	$223,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$23,900	--	$24,000
Install percolation basins at new site	$2,904,000	$14,520	$295,800	$310,000
Subtotal Alternative 2A	$6,745,000			
Engineering & administration (25%)	$1,686,300		$171,700	$172,000
Contingency (25%)	$1,686,300		$171,700	$172,000
Total Alternative 2A	$10,117,500	$69,600	$1,030,500	$1,100,000
+ Land cost for 24 acres on agricultural property south of Nipomo mesa				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

Alternative 2B: Subsurface Systems

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 9,500 LF 16-inch PVC water main	$1,995,000	$19,950	$203,200	$223,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$23,900	--	$24,000
Install subsurface system at new site	$4,008,000	$20,040	$408,200	$428,000
Subtotal Alternative 2A	$7,849,000			
Engineering & administration (25%)	$1,962,250		$199,900	$200,000
Contingency (25%)	$1,962,250		$199,900	$200,000
Total Alternative 2A	$11,733,500	$75,100	$1,199,200	$1,274,000
+ Land cost for 24 acres on agricultural property south of Nipomo mesa				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

8.4 Alternative 3: Infiltration near Mesa and Eucalyptus Roads

8.4.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, expansion of the existing percolation basins to accommodate increased flows, followed by extraction of treated effluent from the perched aquifer.

The extracted water would be pumped approximately 18,500 feet to suitable land near Mesa and Eucalyptus Roads and put into percolation basins (Option A) or subsurface systems (Option B). Approximately 24 acres of land would be utilized to create this new disposal facility. (See Figure 5)

8.4.2 Regulatory Restrictions and Legal Considerations

We expect that regulatory restrictions at the expanded existing disposal facility and at the new disposal facility would be similar to those now imposed on Southland WWTF disposal facilities. We anticipate monitoring requirements will be increased and effluent limits would be established for some constituents (TDS, sulfate, and boron) and that effluent limits for nitrogen compounds may be more stringent. (See Boyle Tech memo Task 3 – Regulatory Comparison, July 23, 2007). We expect that it would be possible to meet these effluent limits with the treatment improvements as discussed in the Facility Master Plan.

As noted above, analysis has indicated that it will be possible to percolate 1.13 MGD at the existing facility, extract 0.67 MGD, and reduce the contribution to Nipomo Creek from 0.10 MGD to 0.05 MGD. For purposes of this preliminary screening, we assume that it will be possible to percolate and extract up to 1.4 MGD onsite with expanded infiltration basins, extract 0.67 to 1.4 MGD, and that the RWQCB will allow disposal and partial re-extraction at the facility in this manner because it reduces the contribution of treated effluent to Nipomo Creek.

Legal considerations are primarily related to acquisition of property for the percolation facilities, pipelines, and support facilities on private property. It is assumed the property owner would be willing to lease/sell property and provide easements to the District. Otherwise, the District would need to acquire the property through court proceedings and this is considered to be a significant constraint.

8.4.3 Site Suitability and Water Quality

Recent investigations show that the area south of Mesa road and west of Osage is suitable for percolation. The hydraulic conductivity was estimated to be approximately 1.1 feet/day, but is expected to be less for treated plant effluent. However, residents near this location have expressed strong opposition to percolation at this site.

If the District chooses to move forward with this alternative, specific investigations should be performed to determine the native water quality at the site and evaluate the potential impacts of the proposed project to water quality.

8.4.4 Cost Projections

Alternative 3A: Percolation Basins

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 18,500 LF 16-inch PVC water main	$3,885,000	$38,850	$395,700	$435,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$25,600	--	$26,000
Install percolation basins at new site	$2,904,000	$14,520	$295,800	$310,000
Subtotal Alternative 3A	$8,635,000			
Engineering & administration (25%)	$2,158,800		$219,900	$220,000
Contingency (25%)	$2,158,800		$219,900	$220,000
Total Alternative 3A	$12,952,500	$90,200	$1,319,200	$1,409,000
+ Land cost for 24 acres on suitable land near Mesa and Eucalyptus Roads				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

Alternative 3B: Subsurface Systems

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 18,500 LF 16-inch PVC water main	$3,885,000	$38,850	$395,700	$435,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$23,900	--	$24,000
Install subsurface system at new site	$4,008,000	$20,040	$408,200	$428,000
Subtotal Alternative 3B	$9,739,000			
Engineering & administration (25%)	$2,434,800		$248,000	$248,000
Contingency (25%)	$2,434,800		$248,000	$248,000
Total Alternative 3B	$16,633,500	$94,000	$1,487,900	$1,582,000
+ Land cost for 24 acres on suitable land near Mesa and Eucalyptus Roads				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

8.5 Alternative 4: Infiltration at Kaminaka Property

8.5.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, expansion of the existing percolation basins to accommodate increased flows, followed by extraction of treated effluent from the perched aquifer.

The extracted water would be pumped approximately 24,000 feet to suitable land on the Kaminaka Property, bounded by Pomeroy Road and Calle Fresca, and put into percolation basins (Option A) or subsurface systems (Option B). Approximately 24 acres of land would be utilized to create this new disposal facility. (See Figure 6)

8.5.2 Regulatory Restrictions and Legal Considerations

We expect that regulatory restrictions at the expanded existing disposal facility and at the new disposal facility would be similar to those now imposed on Southland WWTF disposal facilities. We anticipate monitoring requirements will be increased and effluent limits would be established for some constituents (TDS, sulfate, and boron) and that effluent limits for nitrogen compounds may be more stringent. (See Boyle Tech memo Task 3 – Regulatory Comparison, July 23, 2007). We expect that it would be possible to meet these effluent limits with the treatment improvements as discussed in the Facility Master Plan.

As noted above, analysis has indicated that it will be possible to percolate 1.13 MGD at the existing facility, extract 0.67 MGD, and reduce the contribution to Nipomo Creek from 0.10 MGD to 0.05 MGD. For purposes of this preliminary screening, we assume that it will be possible to percolate and extract up to 1.4 MGD onsite with expanded infiltration basins, extract 0.67 to 1.4 MGD, and that the RWQCB will allow disposal and partial re-extraction at the facility in this manner because it reduces the contribution of treated effluent to Nipomo Creek.

Legal considerations are primarily related to acquisition of property for the percolation facilities, pipelines, and support facilities on private property. It is assumed the property owner would be willing to lease/sell property and provide easements to the District. Otherwise, the District would need to acquire the property through court proceedings and this is considered to be a significant constraint.

8.5.3 Site Suitability and Water Quality

Unknown; site-specific investigations would be needed.

8.5.4 Cost Projections

Alternative 4A: Percolation Basins

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 24,000 LF 16-inch PVC water main	$5,040,000	$50,400	$513,300	$564,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$37,600	--	$38,000
Install percolation basins at new site	$2,904,000	$14,520	$295,800	$310,000
Subtotal Alternative 4A	$9,790,000			
Engineering & administration (25%)	$2,448,000		$249,300	$249,000
Contingency (25%)	$2, 448,000		$249,300	$249,000
Total Alternative 4A	$14,685,000	$113,800	$1,495,700	$1,609,000
+ Land cost for 24 acres on suitable land on the Kaminaka property				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

Alternative 4B: Subsurface Systems

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 24,000 LF 16-inch PVC water main	$5,040,000	$50,400	$513,300	$564,000
Expand percolation basins at Southland*	$1,446,000	$7,230	$147,200	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$34,200	--	$34,000
Install subsurface system at new site	$4,008,000	$20,040	$408,200	$428,000
Subtotal Alternative 4B	$10,894,000			
Engineering & administration (25%)	$2,723,500		$277,400	$277,000
Contingency (25%)	$2,723,500		$277,400	$277,000
Total Alternative 4B	$16,341,000	$115,900	$1,664,400	$1,780,000
+ Land cost for 24 acres on suitable land on the Kaminaka property				
* Costs from 2007 Draft Southland WWTF Master Plan and adjusted using ENR CCI				

8.6 Alternative 5: Irrigate Landscape with Recycled Water

8.6.1 Description of Alternative

This reuse project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, and either (A) additional treatment (filtration and disinfection) of Southland WWTF effluent, or (B) expansion of the existing percolation basins to accommodate increased flows, followed by extraction and additional treatment of the water from the perched aquifer. (See Figure 7)

Under Option (A) a tertiary filtration system followed by disinfection would be used to treat the Southland WWTF effluent.

Under Option (B) we assume that the pumped perched effluent may require pH adjustment, but otherwise would meet all the chemical requirements of Title 22. Additionally, water from the perched aquifer may require disinfection to ensure compliance with the pathogen indicator requirements for use on landscapes.

The recycled water would be pumped to the customer(s) and applied to landscaping. The length of pipeline depends on the location(s) of the customer(s). For this preliminary screening we assumed the pipeline distance would be approximately 36,500 feet (distance to Blacklake Golf Course).

A long-term contract would be established to assure the District that the investment in this alternative was justified. Users would need to provide their own onsite pumping and distribution system to apply the water.

Under Option (A), either the District or users would also need to provide additional wet weather storage. Under Option (B) the existing percolation basins would be used during wet weather when disposal via irrigation is not feasible.

8.6.2 Regulatory Restrictions and Legal Considerations

As noted above, reuse projects are regulated by the California Department of Public Health under Title 22 Water Recycling Requirements. If the water is demonstrated to have bacteria counts below Title 22 criteria, disinfection would not be required. Reclaimed water discharged to irrigation reclamation areas shall at all times be adequately oxidized, coagulated, clarified, filtered, disinfected and shall not exceed specific limits established in the regulations.

No recent data is available regarding the parameters listed for Title 22 water recycling, with the exception of pH. The perched effluent had pH values of 6.42 and 6.46 in samples collected from monitoring wells in October 2007. Therefore, the pH of the water may need to be adjusted to a pH of 7 before delivery to customers.

Legal considerations are primarily related to the need for contracts between the District and the property owner that specify the term and conditions for delivery, such as quantity and variations in supply. In addition, the District may need to acquire property or easements for pipelines and supporting facilities.

8.6.3 Availability of Irrigation Customers

At the present time, the Blacklake Golf Resort uses approximately 100,000 gallons per day (gpd) of unmixed treated secondary effluent from the Blacklake wastewater treatment plant, and could apply an additional 100,000 gpd of the same quality effluent, if it were available. Assuming the water from Southland is filtered and disinfected, as planned under this proposed project, the Blacklake resort could take considerably more (Scott Walwyn, Maintenance Supervisor, Blacklake Golf resort, personal communication, 11/26/2007). If we use an estimated recycled water application rate of 200,000 gpd applied on 6 fairways, and assume expansion of this use to include all 27 fairways, we estimate an application rate of as much as 900,000 gpd during irrigation season.

The Woodlands produces and reuses recycled water. However, current wastewater generation rates are lower than planned. Preliminary estimates suggest that Woodlands could use an additional 300 – 400 acre-feet of recycled water per year.

Nipomo Community Park could also use this water. Assuming approximately 90 acres would be irrigated at 1.25 to 2.5 feet per year, 110 – 225 acre-ft per year of recycled water could be used at the Park.

8.6.4 Site Suitability and Water Quality

Existing use of secondary effluent and recycled water at Blacklake and The Woodlands implies that these sites are suitable for use of recycled water. Use of recycled water for irrigation will require that the inorganic characteristics (such as sodium, chloride, and other salts) be routinely monitored and adjusted as necessary, through addition of soil amendments, and/or through blending with water from another source.

If the District chooses to move forward with this alternative, specific investigations should be performed to determine the native water quality at the site and evaluate the potential impacts of the proposed project to water quality.

8.6.5 Cost Projections

Alternative 5A: Additional Treatment of Southland Effluent

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 36,500 LF 16-inch PVC water main	$7,665,000	$76,650	$780,700	$857,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & Install pump station	$300,000	$3,000	$30,600	$34,000
Electricity for Pumping	--	$20,500	--	$21,000
Additional Treatment – Tertiary Filtration	$2,014,000	$20,140	$205,100	$225,000
Additional Treatment - Chlorination	$1,641,000	$16,410	$167,100	$184,000
Furnish & install 0.5-MG storage tank	$1,350,000	$6,750	$137,500	$144,000
Subtotal Alternative 5A	$14,416,000			
Engineering & administration (25%)	$3,604,000		$367,000	$367,000
Contingency (25%)	$3,604,000		$367,000	$367,000
Total Alternative 5A	$21,624,000	$150,700	$2,202,500	$2,353,000

Alternative 5B: Percolation and Extraction at Southland

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 36,500 LF 16-inch PVC water main	$7,665,000	$76,650	$780,700	$857,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$39,300	--	$39,000
Subtotal Alternative 5B	$9,511,000			
Engineering & administration (25%)	$2,377,800		$242,200	$242,000
Contingency (25%)	$2,377,800		$242,200	$242,000
Total Alternative 5B	$14,267,000	$127,200	$1,453,100	$1,580,000

8.7 Alternative 6: Modify Aquitard to Continue Infiltration at Southland

8.7.1 Description of Alternative

This project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan. Dry wells or other conduits would be installed in the aquitard to enhance percolation from the upper (perched) aquifer to the lower aquifer. (See Figure 8)

8.7.2 Regulatory Restrictions and Legal Considerations

RWQCB staff has indicated that replacing a portion of the aquitard with permeable material would be considered “direct injection” and would be regulated under draft direct injection regulations of the Department of Public Health. If this position is officially adopted by the Regional Board, the costs for additional treatment and to supply diluent water may be prohibitive. In this case, regulatory restrictions could be treated as a “fatal flaw.”

However, it may be possible to demonstrate that a feasible system could be installed, and that travel times would be similar to those initially anticipated for typical surface percolation systems. If so, it may be possible for the Regional Board to treat this alternative as a “disposal” project, and permit it similarly as with the existing facility.

8.7.3 Site Suitability and Water Quality

The aquitard beneath the Southland WWTF is approximately 50 feet thick and is encountered between 100 and 150 feet below the ground surface. Making the site suitable will require significant cost. Long-term operation and maintenance of drywell systems will be a challenge.

8.7.4 Cost Projections

Additional investigations and design efforts will need to be undertaken before a reasonable cost projection can be developed for the construction of dry wells or other conduits to enhance percolation from the upper (perched) aquifer to the lower aquifer. Given RWQCB staff’s opposition to this approach, it should not be pursued without exhausting other, more favorable options and then developing a study plan acceptable to RWQCB.

8.8 Alternative 7: Irrigation of Highway 101 Right-of-Way with Recycled Water

8.8.1 Description of Alternative

This reuse project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, and either (A) additional treatment (filtration and disinfection) of Southland WWTF effluent, or (B) expansion of the existing percolation basins to accommodate increased flows, followed by extraction and additional treatment of the water from the perched aquifer. (See Figure 9)

Under Option (A) a filtration system followed by disinfection would be used to treat the Southland WWTF effluent.

Under Option (B) we assume that the pumped perched effluent may require pH adjustment, but otherwise would meet all the chemical requirements of Title 22. Additionally, water from the perched aquifer may require disinfection to ensure compliance with the pathogen indicator requirements for use on landscapes.

The recycled water would be pumped to the right-of-way for distribution to landscaping. The length of pipeline was estimated to be 750 feet.

A long-term contract would be established to assure the District that the investment in this alternative was justified. Caltrans would need to provide their own onsite pumping and distribution system to apply the water.

Under Option (A), Caltrans would also need to provide additional storage. Under Option (B) the existing percolation basins and subsurface storage would be used during wet weather when disposal via irrigation is not feasible.

8.8.2 Regulatory Restrictions and Legal Considerations

As noted above, recycle projects are regulated by the California Department of Public Health under Title 22 Water Recycling Requirements. Reclaimed water discharged to irrigation reclamation areas shall at all times be adequately oxidized, coagulated, clarified, filtered, disinfected and shall not exceed the certain limits. Water quality requirements are based on the use of the irrigation water, e.g., for orchards, or food crops, or ornamental plants. If the water is demonstrated to have bacteria counts below Title 22 criteria, disinfection would not be required.

No recent data is available regarding the parameters listed for Title 22 water recycling, with the exception of pH. The perched effluent had pH values of 6.42 and 6.46 in samples collected from monitoring wells in October 2007. Therefore, the pH of the water may need to be adjusted before delivery to customers.

Because no bacteria information is available, we assume that extracted water will need to be disinfected prior to use.

Legal considerations are primarily related to the need for contracts between the District and Caltrans that specify the term and conditions for delivery, such as quantity and variations in supply. In addition, the District may need to acquire property or easements for pipelines and supporting facilities from Caltrans and adjacent property owners.

8.8.3 Availability of Irrigation Area

A 1990 law (AB 2217-Baker), requires Caltrans to use reclaimed water for the irrigation of freeway landscaping and also permits local agencies to place recycled water transmission lines in the right-of-way for transmission of recycled water to others. However, there may not be sufficient demand to take all the water available.

Typical, low demand highway landscaping can use between 0.3 and 0.9 MG/year/acre (Reeves, D., pers. comm.., 2008). Assuming that landscaping in Nipomo could be irrigated with recycled water at a rate of 0.6 MG/year per acre, approximately 850 acres would be required to dispose of the projected buildout AAF of 1.4 MGD.

1.4 MGD / 0.6 MG/yr/acre = 2.3 acres-year/day x 365 days/year = 850 acres.

Assuming approximately 4 acres of landscaping per mile of freeway, approximately 215 miles of highway could be irrigated, excluding interchanges.

A new interchange is planned for Willow Road. A recently completed interchange on Highway 101 in Morgan Hill, California, covers approximately 40 acres (¼ mile x ¼ mile). Therefore, the proposed use of 1.4 MGD could irrigate 22 similarly-sized interchanges.

Therefore, while Caltrans may be willing to take the recycled water, it may be unable to use the total amount that could be provided unless plants with a higher water demand are installed.

In addition, installation costs are expected to be approximately $200,000 for the initial infrastructure (main line, control systems, flow meter cut off valves, etc.), plus $90,000/acre for landscaping and irrigation, plus $10,000/acre per year initially (tapering to $6,000/acre per year) for operation and maintenance. These costs may need to be provided by the District.

The required area is considered a "Fatal Flaw" for this alternative.

8.8.4 Site Suitability and Water Quality

The use of recycled water on highway landscaping is accepted practice. No site conditions have been identified that would prevent the use of recycled water on Highway 101 landscaping.

8.8.5 Cost Projections

Alternative 7A: Additional Treatment of Southland Effluent

Description	**Capital Cost**	**Annual O & M Cost**	**Annual Amortized Capital Cost**	**Total Annual Cost**
Install 750 LF 16-inch PVC water main	$157,500	$1,575	$16,000	$18,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & Install pump station	$200,000	$2,000	$20,400	$22,000
Electricity for Pumping	--	$29,000	--	$29,000
Additional Treatment - Tertiary Filtration	$2,014,000	$20,140	$205,100	$225,000
Additional Treatment - Chlorination	$1,641,000	$16,410	$167,100	$184,000
0.5-MG Storage Tank	$1,350,000	$6,750	$137,500	$144,000
Irrigation Infrastructure	$200,000	-	$20,400	$20,000
Landscape and Irrigation (850 acres)	$76,500,000	$6,800,000	$7,791,700	$14,592,000
Subtotal Alternative 7A.	$83,508,500			
Engineering & administration (25%)	$20,877,100		$2,126,400	$2,126,000
Contingency (25%)	$20,877,100		$2,126,400	$2,126,000
Total Alternative 7A.	$125,262,800	$6,883,000	$12,758,300	$19,641,000

Alternative 7B: Percolation and Extraction at Southland

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 750 LF 16-inch PVC water main	$157,500	$1,575	$16,000	$18,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$47,800	--	$48,000
Irrigation Infrastructure	$200,000	-	$20,400	$20,000
Landscape and Irrigation (850 acres)	$76,500,000	$6,800,000	$7,791,700	$14,592,000
Subtotal Alternative 7B.	$78,703,500			
Engineering & administration (25%)	$19,675,900		$2,004,000	$2,004,000
Contingency (25%)	$19,675,900		$2,004,000	$2,004,000
Total Alternative 7B.	$118,055,300	$6,860,600	$12,024,200	$18,885,000

8.9 Alternative 8: Irrigate Near the Treatment Facility

8.9.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, and either (A) additional treatment (filtration and disinfection) of Southland WWTF effluent, or (B) expansion of the existing percolation basins to accommodate increased flows, followed by extraction and additional treatment of the water from the perched aquifer. (See Figure 10)

Under Option (A) a filtration system followed by disinfection would be used to treat the Southland WWTF effluent.

Under Option (B) we assume that the pumped perched effluent may require pH adjustment, but otherwise would meet all the chemical requirements of Title 22. Additionally, water from the perched aquifer would require disinfection to ensure compliance with the pathogen indicator requirements for use on crops.

The recycled water would be pumped to the ultimate customer and applied to crops. The length of pipeline depends on the location of the ultimate customer(s). For this preliminary screening, we assumed the pipeline distance would be 5,000 feet. Users would need to provide their own onsite pumping and distribution system to apply the water.

Long-term contracts would be established to assure the District that the investment in transmission pipelines was justified. Users would need to provide their own onsite pumping and distribution system to apply the water.

Under Option (A), users would also need to provide their own storage. Under Option (B) onsite (expanded) percolation basins would be used during wet weather when disposal via irrigation is not feasible.

8.9.2 Regulatory Restrictions and Legal Considerations

As noted above, recycle projects are regulated by the California Department of Public Health under Title 22 Water Recycling Requirements. Reclaimed water discharged to irrigation reclamation areas shall at all times be adequately oxidized, coagulated, clarified, filtered, disinfected and shall not exceed the certain limits. Water quality requirements are based on the use of the irrigation water, e.g., for orchards, or food crops, or ornamental plants. If the water is demonstrated to have bacteria counts below Title 22 criteria, disinfection would not be required.

No recent data is available regarding the parameters listed for Title 22 water recycling, with the exception of pH. The perched effluent had pH values of 6.42 and 6.46 in samples collected from monitoring wells in October 2007. Therefore, the pH of the water may need to be adjusted before delivery to customers.

Because no bacteria information is available, we assume that extracted water will need to be disinfected prior to use.

Legal considerations are primarily related to the need for contracts between the District and the property owner that specify the term and conditions for delivery, such as quantity and variations in supply. In addition, the District may need to acquire property or easements for pipelines and supporting facilities.

8.9.3 Availability of Irrigation Customers

Few potential users expressed interest in recycled water. This lowers the probability that this alternative can be implemented.

8.9.4 Site Suitability and Water Quality

No site conditions have been identified that would prevent the use of recycled water in the areas noted.

If the District chooses to move forward with this alternative, specific investigations should be performed to determine the native water quality at the site and evaluate the potential impacts of the proposed project to water quality.

8.9.5 Cost Projections

Alternative 8A: Additional Treatment of Southland Effluent

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 5,000 LF 16-inch PVC water main	$1,050,000	$10,500	$107,000	$117,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & Install pump station	$200,000	$2,000	$20,400	$22,000
Electricity for Pumping	--	$3,400	--	$3,000
Additional Treatment - Tertiary Filtration	$2,014,000	$20,140	$205,100	$225,000
Additional Treatment - Chlorination	$1,641,000	$16,410	$167,100	$184,000
Furnish & install 0.5-MG Storage Tank	$1,350,000	$6,750	$137,500	$144,000
Subtotal Alternative 8A	$7,701,000			
Engineering & administration (25%)	$1,925,250		$196,100	$196,000
Contingency (25%)	$1,925,250		$196,100	$196,000
Total Alternative 8A	$11,551,500	$59,700	$1,176,500	$1,236,000

Alternative 8B: Percolation and Extraction at Southland

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 5,000 LF 16-inch PVC water main	$1,050,000	$10,500	$107,000	$117,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$22,200	--	$22,000
Subtotal Alternative 8B	$2,896,000			
Engineering & administration (25%)	$725,000		$73,700	$74,000
Contingency (25%)	$725,000		$73,700	$74,000
Total Alternative 8B	$4,344,000	$44,000	$442,400	$486,000

8.10 Alternative 9: Infiltration at Nipomo Refinery Property

8.10.1 Description of Alternative

This disposal project would involve upgrades to the Southland WWTF treatment process described in the Southland Master Plan, expansion of the existing percolation basins to accommodate increased flows, followed by extraction of treated effluent from the perched aquifer.

The extracted water would be pumped approximately 24,000 feet to suitable land near the Nipomo oil refinery property off of Highway 1, and put into percolation basins (Option A) or subsurface systems (Option B). Approximately 24 acres of land would be utilized to create this new disposal facility. (See Figure 11)

8.10.2 Regulatory Restrictions and Legal Considerations

We expect that regulatory restrictions at the expanded existing disposal facility and at the new disposal facility would be similar to those now imposed on Southland WWTF disposal facilities. We anticipate monitoring requirements will be increased and effluent limits would be established for some constituents (TDS, sulfate, and boron) and that effluent limits for nitrogen compounds may be more stringent. (See Boyle Tech memo Task 3 – Regulatory Comparison, July 23, 2007.) We expect that it would be possible to meet these effluent limits with the treatment improvements as discussed in the Facility Master Plan.

As noted above, analysis has indicated that it will be possible to percolate 1.13 MGD at the existing facility, extract 0.67 MGD, and reduce the contribution to Nipomo Creek from 0.10 MGD to 0.05 MGD. For purposes of this preliminary screening, we assume that it will be possible to percolate and extract up to 1.4 MGD onsite with expanded infiltration basins, extract 0.67 to 1.4 MGD, and that the RWQCB will allow disposal and partial re-extraction at the facility in this manner because it reduces the contribution of treated effluent to Nipomo Creek.

Legal considerations are primarily related to the need for contracts between the District and the Refinery property owner that specify the term and conditions for delivery, such as quantity and variations in supply. In addition, the District may need to acquire property or easements for pipelines and supporting facilities.

8.10.3 Site Suitability and Water Quality

Based on conversations with the District staff, well records indicate clay layers are prolific in the area. If the District chooses to pursue this alternative, site-specific investigations would be needed to ensure sufficient percolation would be feasible. The native water quality at the site should also be determined in order to evaluate the potential impacts of the proposed project on water quality.

It has been suggested that percolation at this location could help protect the drinking water aquifer against saltwater intrusion. The District may need to address this concern in the future. However, percolation introduces water to the upper aquifer, which drains to surface water and rarely merges with the lower aquifer. In order to protect the lower aquifer (drinking water aquifer) from salt water intrusion, direct injection would be required. Direct injection projects are subject to CDPHS groundwater recharge regulations (as discussed in Section 8.7), and would require a high level of treatment (such as RO), and/or dilution water – both substantially increasing the project cost. For this reason, direct injection is not considered a feasible alternative for the District at this point in time.

8.10.4 Cost Projections

Alternative 9A: Percolation Basins

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 41,000 LF 16-inch PVC water main	$8,610,000	$86,100	$876,900	$963,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$30,700	--	$31,000
Install percolation basins at new site	$2,904,000	$14,520	$295,800	$310,000
Subtotal Alternative 9A	$13,360,000			
Engineering & administration (25%)	$3,340,000		$340,200	$340,000
Contingency (25%)	$3,340,000		$340,200	$340,000
Total Alternative 9A	$20,040,000	$128,000	$2,041,000	$2,169,000

+ Land cost for 24 acres on suitable land near the Nipomo refinery property

Alternative 9B: Subsurface Systems

Description	Capital Cost	Annual O & M Cost	Annual Amortized Capital Cost	Total Annual Cost
Install 41,000 LF 16-inch PVC water main	$8,610,000	$86,100	$877,000	$963,000
Expand percolation basins at Southland	$1,446,000	$7,230	$147,300	$155,000
Furnish & install extraction wells	$400,000	$4,000	$40,700	$45,000
Electricity for Pumping	--	$29,000	--	$29,000
Install subsurface system at new site	$4,008,000	$20,040	$408,200	$428,000
Subtotal Alternative 9B	$14,464,000			
Engineering & administration (25%)	$3,616,000		$368,300	$368,000
Contingency (25%)	$3, 616,000		$368,300	$368,000
Total Alternative 9B	$21,696,000	$126,000	$2,210,000	$2,336,000

+ Land cost for 24 acres on suitable land near the Nipomo refinery property

8.11 Combination of Alternatives

The analysis and cost opinions in this screening analysis are based on implementation of one disposal or reuse alternative. However, one alternative is not likely to produce the best project. A combination of two or more alternatives will more likely be able to provide an effective and efficient reuse and/or disposal project. This screening analysis is intended to help compare major alternatives, solicit input from the public on their preferences, and to determine which concepts (recycling, groundwater recharge, or disposal) meet the District's water resource management objectives. Once one or a few feasible alternatives are identified, compatible disposal or reuse options may be determined for investigation.

For instance, if one or more agricultural lands are identified for recycled water reuse near Highway 101, it may be possible to also use the recycled water for irrigation of highway landscape and potentially identify other users along the pipeline corridor. If an offsite disposal alternative is pursued, recycled water users along the pipeline route may be identified. Combinations can be investigated further, with input from the District Board, during the planning-level stages of the project and during preparation of the CEQA document for the plant upgrade and disposal project.

8.12 Summary of Results and Preliminary Ranking

Cost projections are summarized in Table 8-1, below. Table 8-2 is a comparison matrix summarizing each alternative and establishing the preliminary rankings.

Table 8.1 – Summary of Cost Projections

Option	Description	Total Capital Cost	Annual Amortized Capital	Annual O&M	Total Annual Cost
0	Continued use and expansion of existing infiltration basins at WWTF	$2,169,000	$220,900	$7,200	$230,000
1	Offsite Infiltration - Pasquini Property				
	A: Basins	$8,542,500	$870,100	$67,700	$940,000
	B: Subsurface system	$10,198,500	$1,038,700	$71,400	$1,110,000
2	Offsite Infiltration - South of the Mesa				
	A: Basins	$10,117,500	$1,030,500	$69,600	$1,100,000
	B: Subsurface system	$11,773,500	$1,199,200	$75,100	$1,270,000
3	Offsite Infiltration - agriculture near Mesa & Eucalyptus Roads				
	A: Basins	$12,952,500	$1,319,200	$90,200	$1,410,000
	B: Subsurface system	$14,608,500	$1,487,900	$94,000	$1,580,000
4	Offsite Infiltration - Kaminaka Property				
	A: Basins	$14,685,000	$1,495,700	$113,800	$1,610,000
	B: Subsurface system	$16,341,000	$1,664,400	$115,900	$1,780,000
5	Irrigate landscape with recycled water				
	A: Utilize additional treatment	$21,624,000	$2,202,500	$150,700	$2,350,000
	B: Utilize onsite infiltration	$14,266,500	$1,453,100	$127,200	$1,580,000
7	Irrigate Hwy 101 ROW with recycled water				
	A: Utilize additional treatment	$125,262,750	$12,758,300	$6,883,100	$19,640,000
	B: Utilize onsite infiltration	$118,055,250	$12,024,200	$6,860,600	$18,880,000
8	Irrigate agricultural property near the WWTF with recycled water				
	A: Utilize additional treatment	$11,551,500	$1,176,500	$59,700	$1,240,000
	B: Utilize onsite infiltration	$4,344,000	$442,400	$43,900	$490,000
9	Offsite Infiltration at Nipomo refinery property				
	A: Basins	$20,040,000	$2,041,100	$128,000	$2,170,000
	B: Subsurface system	$21,696,000	$2,209,800	$126,330	$2,340,000

Table 8.2 – Comparison Matrix

Alternative	Regulatory Restrictions / Legal Considerations	Site Suitable for Percolation or Irrigation / Water Quality	Public Opinion	Relative Cost	Total Preliminary Score	Fatal Flaw	Preliminary Ranking
Total Points Possible (Weighting Factor)	**25**	**25**	**25**	**25**	**100**		
Alternative 0 – Infiltration at Existing WWTF (expand percolation basins)	**Fatal Flaw** Score = 0 Existing disposal method is not acceptable to RWQCB staff.	Poor. Score = 5 • Top of mound is rising. • Flows to Nipomo Creek. • Impermeable layer.	NA	NA	NA	**X**	
Alternative 1 – Infiltration at Pasquini Property – Percolate at WWTF, pump mound, and percolate at new facilities Option 1A: Basins Option 1B: Subsurface systems	Score = 25 Probably OK	Score = 15 Apparently fair, need more info	10 -------------- 15	Option 1A Score = 20 Annual Cost: $940,000 ---------------------------------- Option 1B Score = 20 Annual Cost: $1,110,000	70 ------------------ 75		**3** --------------- **1**
Alternative 2 – Infiltration South of Nipomo Mesa – Percolate at WWTF, pump mound, and percolate at new facilities Option 1A: Basins Option 1B: Subsurface systems	Score = 10 Questionable due to ongoing groundwater adjudication.	Score = 7 Unknown Suitability, need more info	10 -------------- 15	Option 2A Score = 20 Annual Cost: $1,100,000 ---------------------------------- Option 2B Score = 20 Annual Cost: $1,270,000	47 ------------------ 52		**12** --------------- **11**
Alternative 3 – Infiltration near Mesa and Eucalyptus Roads - Percolate at WWTF, pump mound, and percolate at new facilities Option 3A: Basins Option 3B: Subsurface systems	Score = 25 Probably OK	Score = 20 Good (Based on studies)	Score = 1 Poor	Option 3A Score = 15 Annual Cost: $1,410,000 ---------------------------------- Option 3B Score = 15 Annual Cost: $1,580,000	61 ------------------ 61		**8** --------------- **8**
Alternative 4 – Infiltration at Kaminaka Property – Percolate at WWTF, pump mound, and percolate at new facilities Option 1A: Basins Option 1B: Subsurface systems	Score = 25 Probably OK	Score = 15 Presumed Good (existing storm water basins on property)	10 -------------- 15	Option 4A Score = 15 Annual Cost: $1,610,000 ---------------------------------- Option 4B Score = 10 Annual Cost: $1,780,000	65 ------------------ 65		**5** --------------- **5**
Alternative 5 - Irrigate Landscape with recycled water Option 5A: Additional treatment at Southland Option 5B: Percolate at Southland, pump mound and irrigate	Score = 20 Need to meet Title 22 requirements for landscape irrigation.	Score = 15 Presumed good	20 -------------- 20	Option 5A Score = 5 Annual Cost: $2,350,000 ---------------------------------- Option 5B Score = 15 Annual Cost: $1,580,000	60 ------------------ 70		**10** --------------- **3**
Alternative 6 – Modify Aquitard and Continue Infiltration at Southland - Groundwater recharge or percolation	**Fatal Flaw** Score = 0 If the RWQCB considers this "direct injection," additional costs may be prohibitive. Need more information.	Score = 5 Underlying material assumed good. Modification may be challenging.	NA	Unknown. Depends on modification technique.	NA	**X**	
Alternative 7 – Irrigate Highway 101 Right-of-Way with Recycled Water Option 7A: Additional treatment at Southland Option 7B: Percolate at Southland, pump mound and irrigate	Score = 20 Need to meet Title 22 requirements for landscape irrigation	Score = 10 Presumed good percolation Sufficient area may not be available nearby.	NA	**Fatal Flaw** Option 7A Score = 0 Annual Cost: $19,640,000 ---------------------------------- Option 7B Score = 0 Annual Cost: $18,880,000	NA	**X**	
Alternative 8 – Irrigate Agricultural lands near the WWTF with Recycled Water Option 8A: Additional treatment at Southland Option 8B: Percolate at Southland, pump mound and irrigate	Score = 15 Need to meet Title 22 requirements for agricultural use	Score = 15 Presumed good	20 -------------- 20	Option 8A Score = 20 Annual Cost: $1,240,000 ---------------------------------- Option 8B Score = 25 Annual Cost: $490,000	70 ------------------ 75		3 --------------- **1**
Alternative 9 – Infiltration at Refinery Property – Percolate at WWTF, pump mound, and percolate at new facilities Option 1A: Basins Option 1B: Subsurface systems	Score = 10 Questionable due to clay layers.	Score = 5 Expected poor. Multiple clay layers in area.	10 -------------- 15	Option 9A Score = 5 Annual Cost: $2,170,000 ---------------------------------- Option 9B Score = 5 Annual Cost: $2,340,000	30 ------------------ 35		14 --------------- **13**

9.0 Conclusions and Recommendations

This screening memorandum is presented to help identify alternatives with "fatal flaws", and assist the District determine which alternatives to investigate further. It is not a comprehensive analysis of disposal alternatives; rather the study relied on existing information and identified areas that needed further study. The analysis revealed several information gaps.

During the course of further investigation, the District may discover prohibitive issues with one or more of the alternatives. The following alternatives are recommended for further investigation based on the analysis contained herein.

Infiltration Alternatives

- Alternative 1: Infiltration at the Pasquini Property
- Alternative 4: Infiltration at the Kaminaka Property

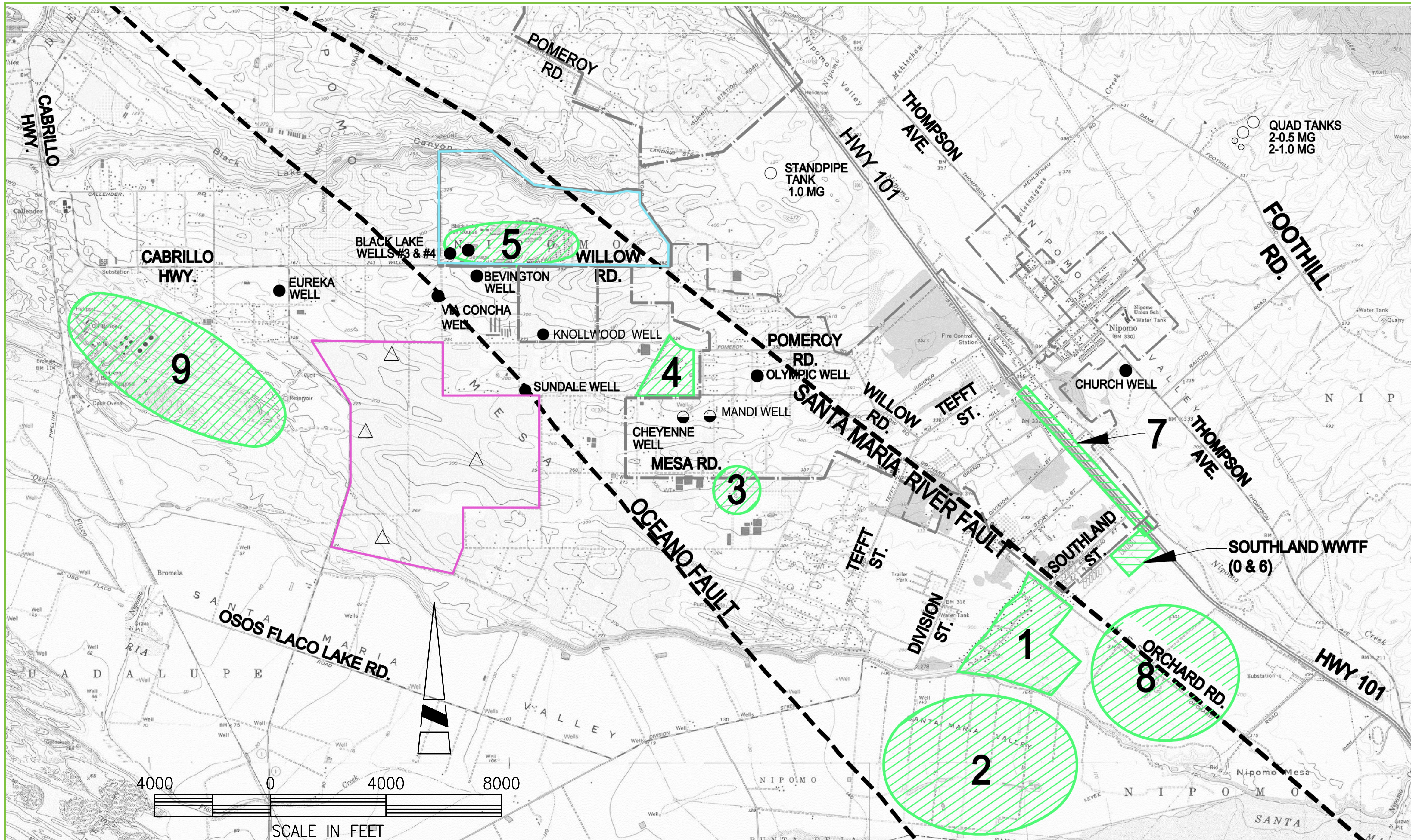
Irrigation Alternatives

- Alternative 5B: Irrigation of landscape (Blacklake, Woodlands, the Community Park, and others) with percolation at Southland and pumping to users
- Alternative 8B: Irrigation of agricultural lands near Southland WWTF, with percolation at Southland and pumping to users

AECOM

Southland WWTF Disposal Screening Analysis

Potential Effluent Disposal/Reuse Sites



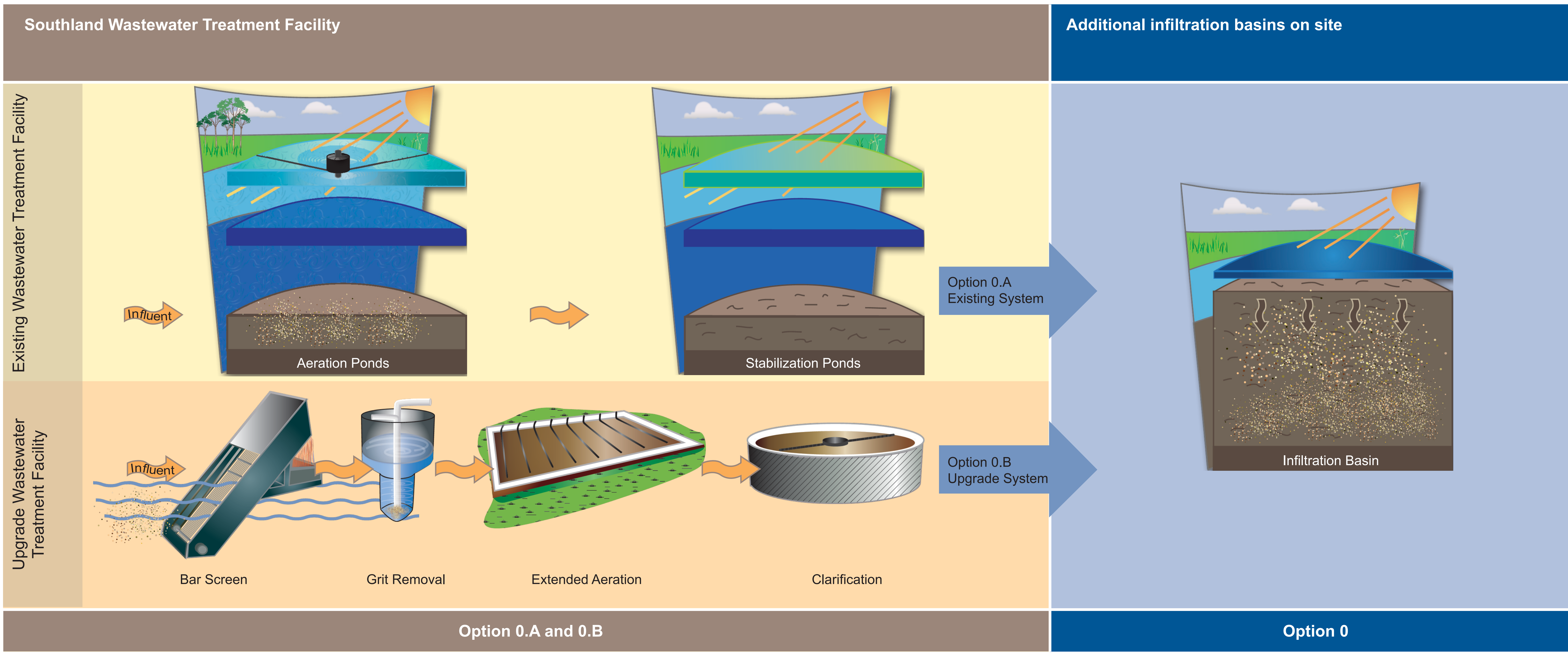
Site Descriptions	
Site Number	**Descriptions**
0 and 6	Southland WWTF
1	Pasquini Property
2	Agricultural land south of Nipomo Mesa
3	Agricultural land near Mesa and Eucalyptus Road
4	Kaminaka Property
5	Blacklake Golf Course
7	Highway 101 Right-of-Way
8	Agricultural land near Southland WWTF
9	Nipomo Refinery

Legend

- Nipomo CSD Wells
- Nipomo CSD Wells (Standby)
- Nipomo CSD Tanks
- Woodlands Wells
- Existing Water System Service Area Boundary
- Approximate Fault Line
- Potential Percolation or Reuse Sites
- Blacklake Development
- Woodlands Development

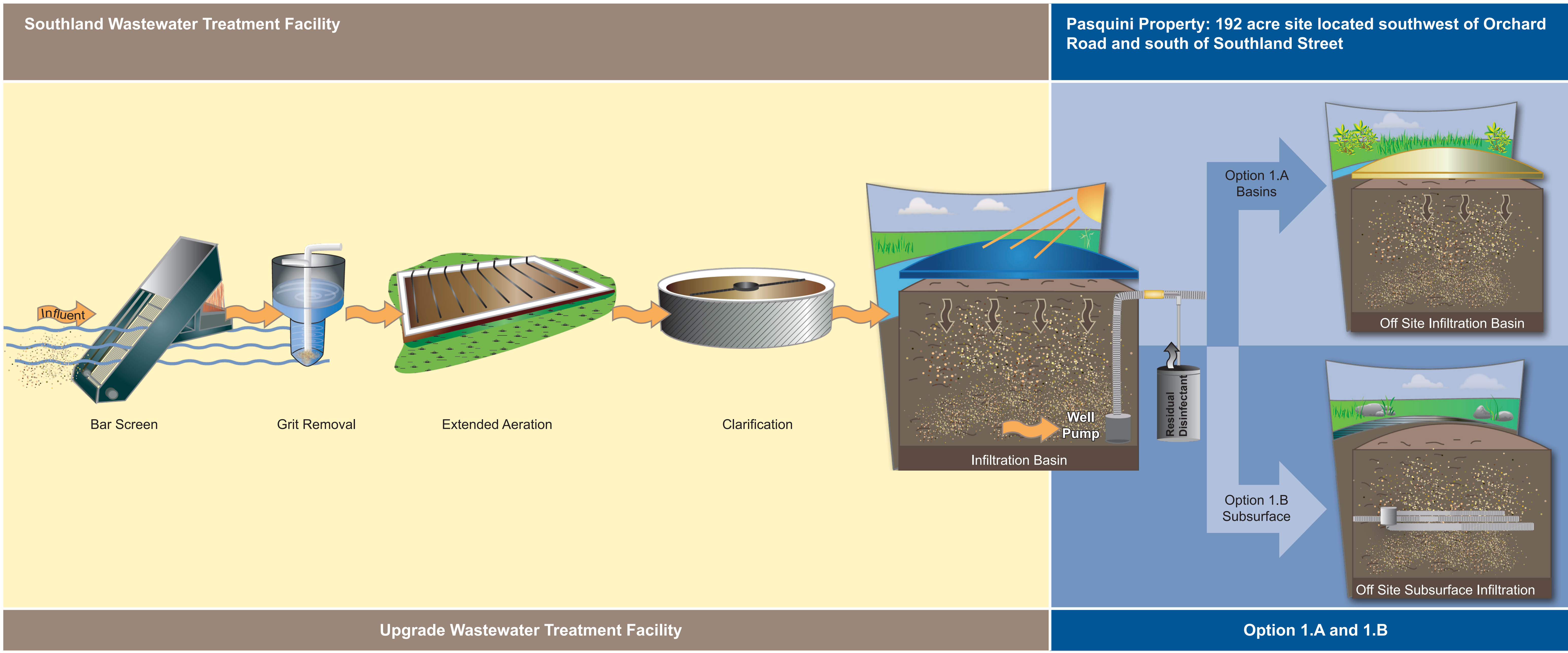
Process Flow Diagram

Option 0.A and O.B: Infiltration at Existing Facilities



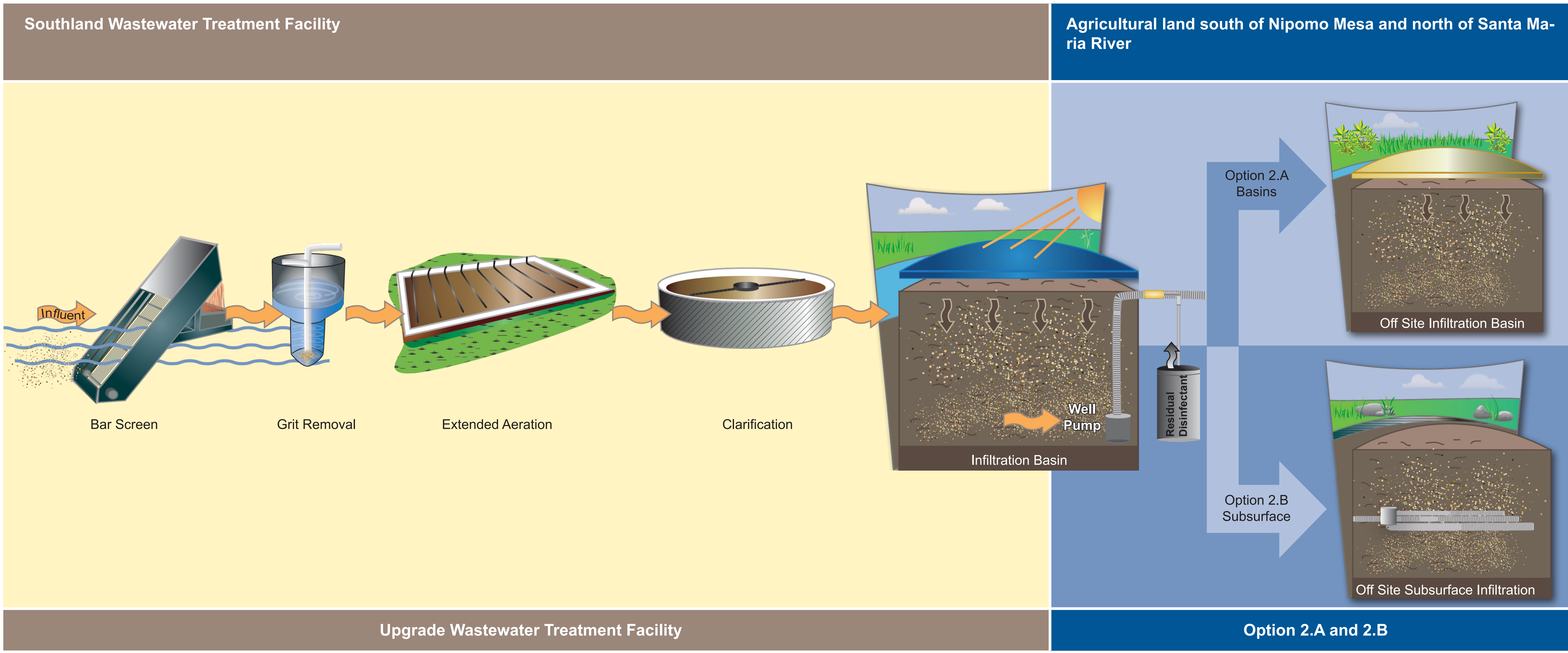
Process Flow Diagram

Options 1.A and 1.B: Infiltration at Pasquini Property



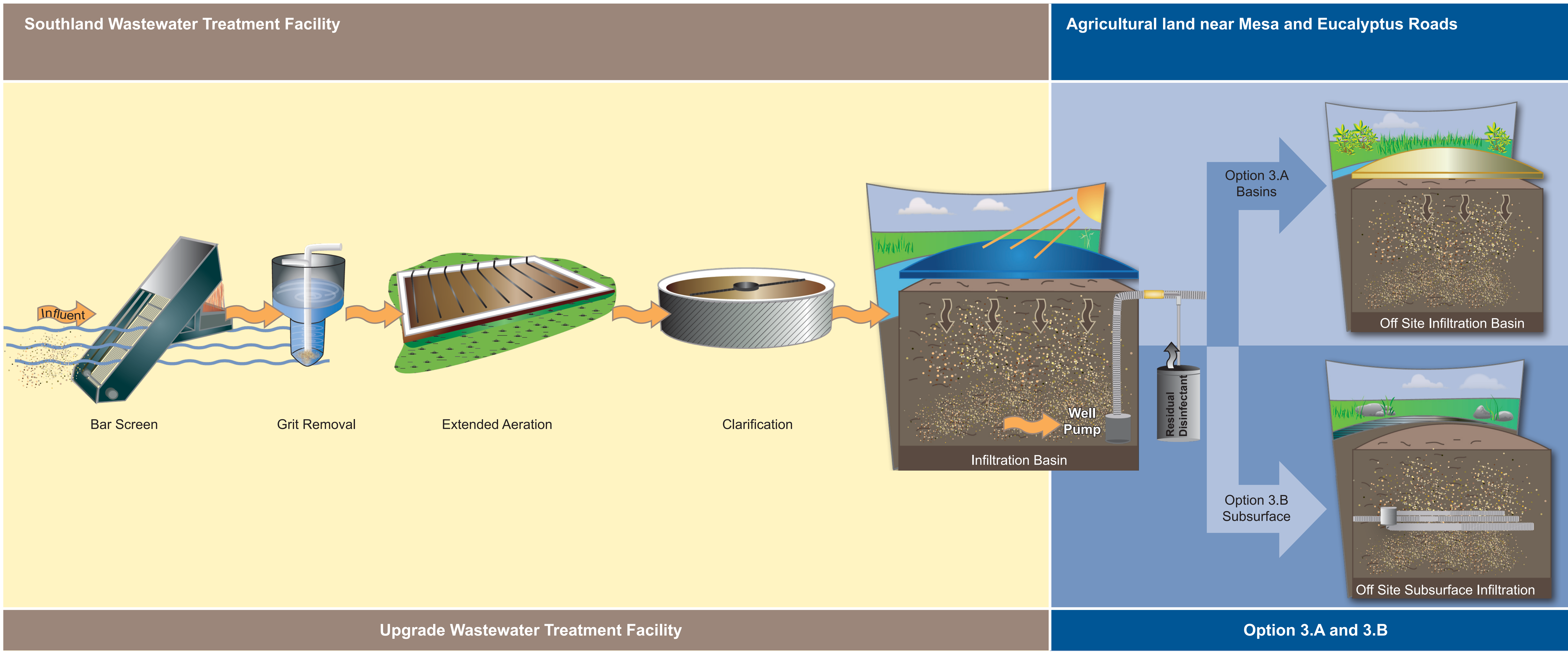
Process Flow Diagram

Options 2.A and 2.B: Infiltration South of Nipomo Mesa



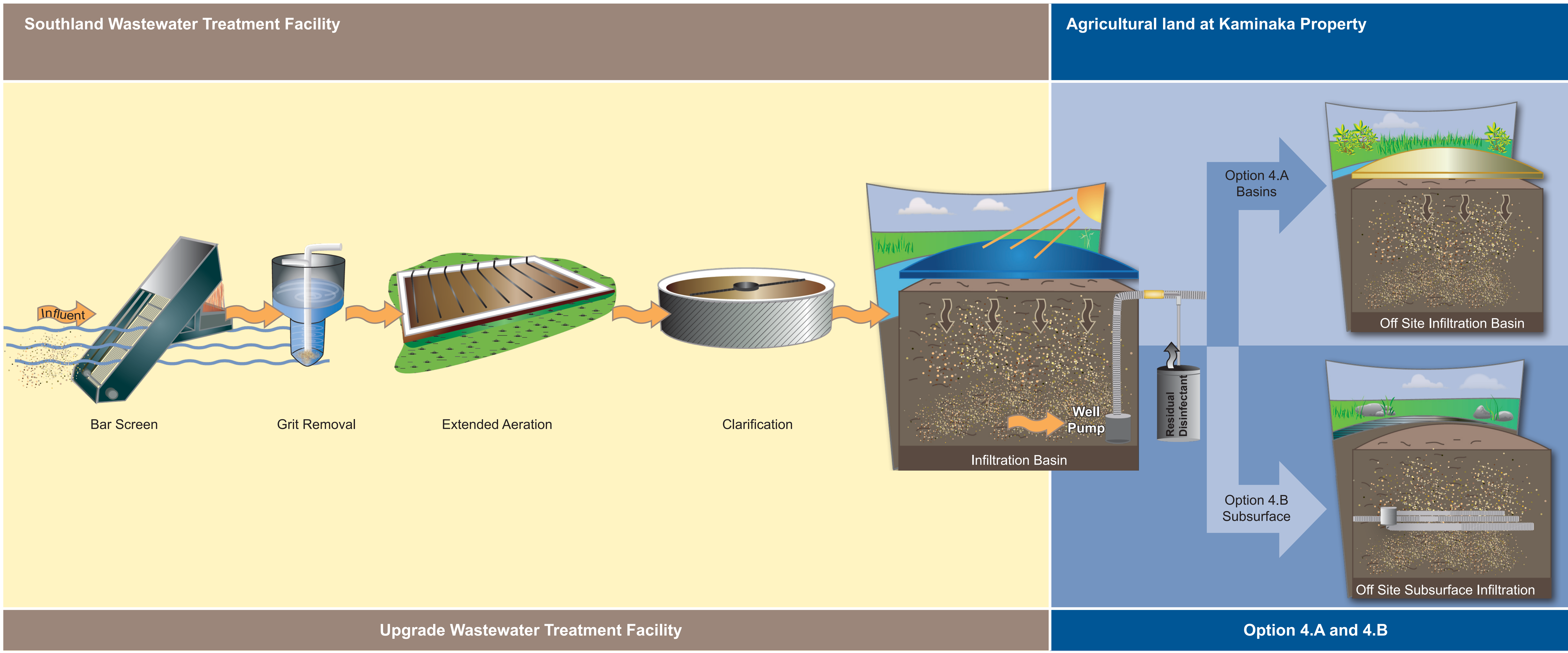
Process Flow Diagram

Options 3.A and 3.B: Infiltration near Mesa and Eucalyptus Roads



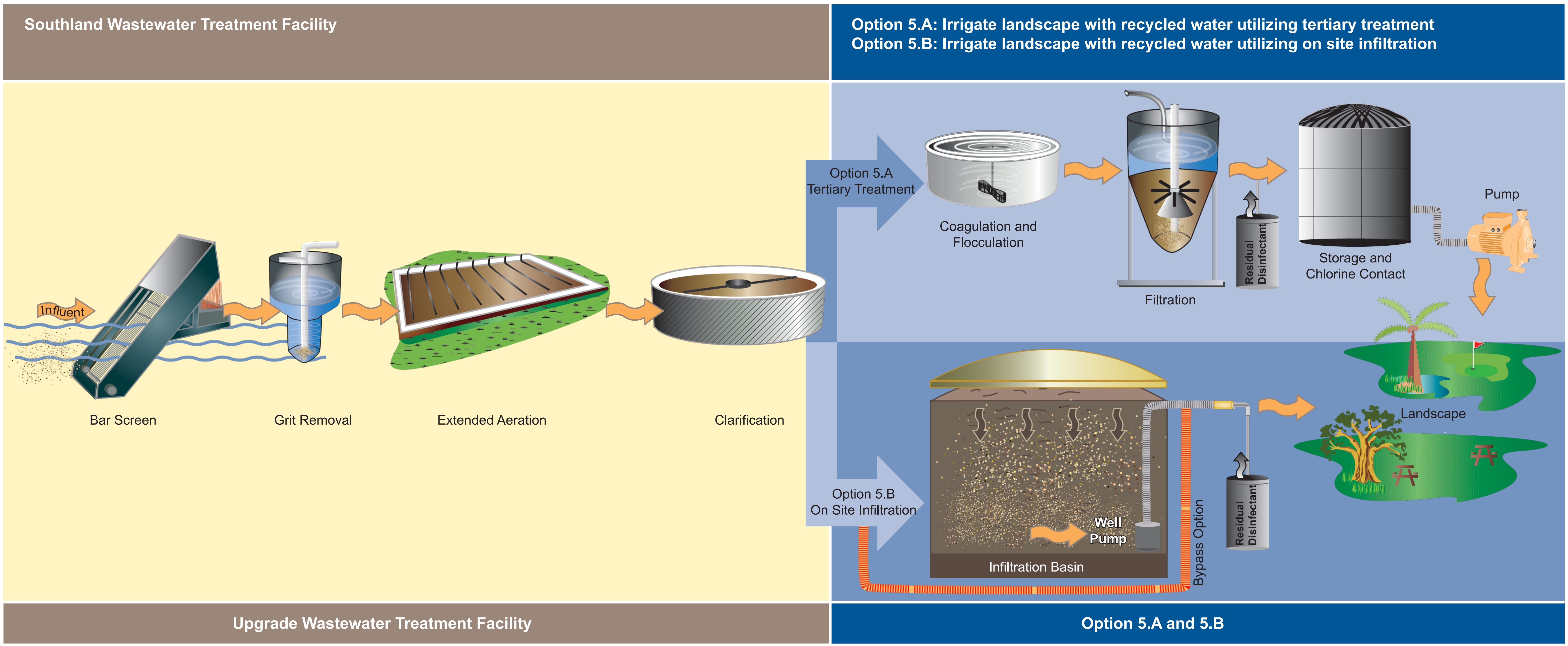
Process Flow Diagram

Options 4.A and 4.B: Infiltration at Kaminaka Property



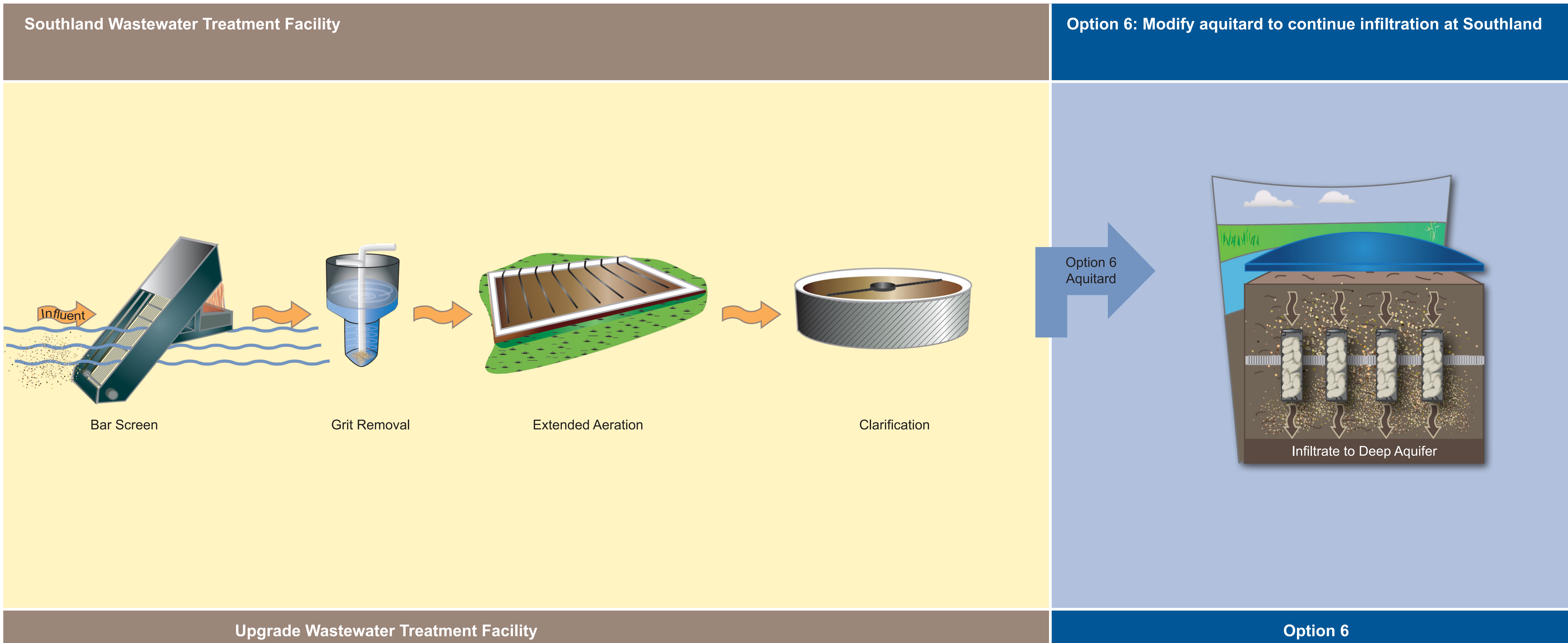
Process Flow Diagram

Options 5.A and 5.B: Irrigate Landscape with Recycled Water



Process Flow Diagram

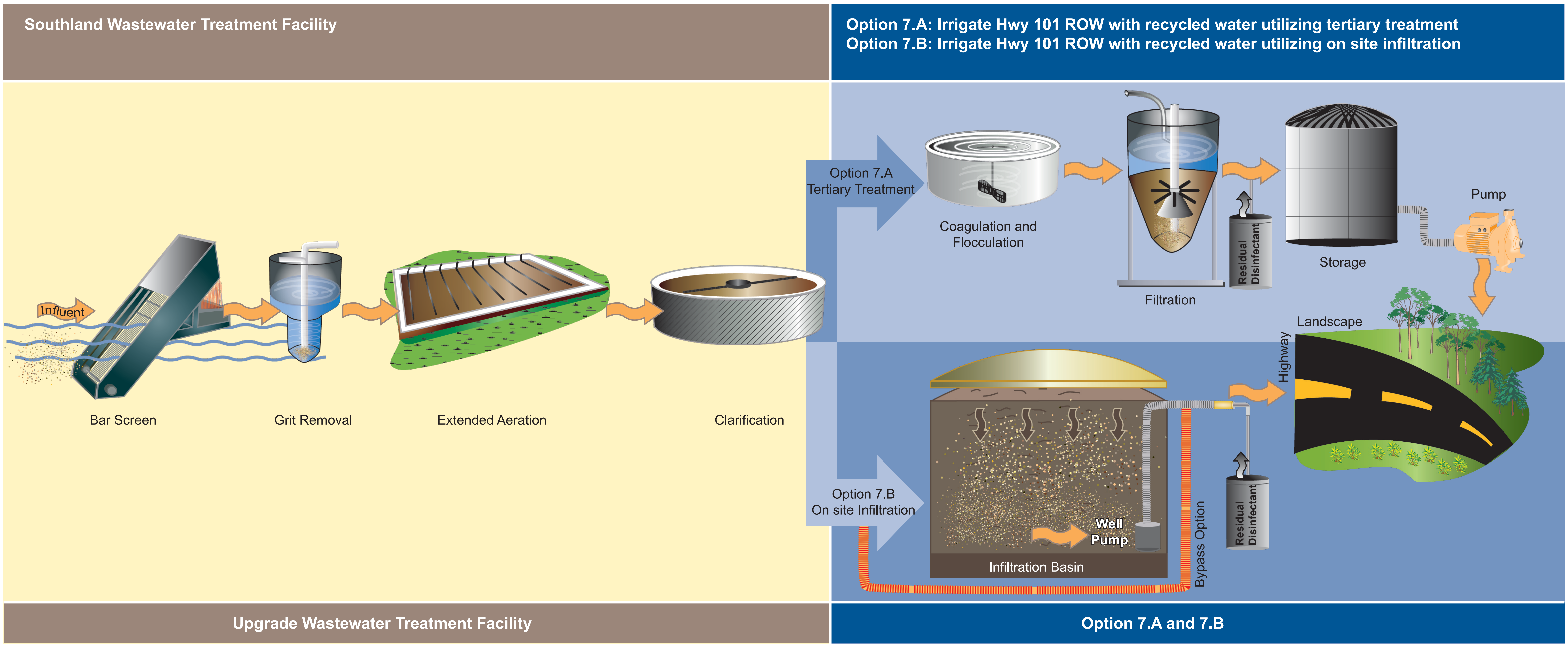
Option 6: Modify Aquitard to Continue Infiltration at Southland



AECOM

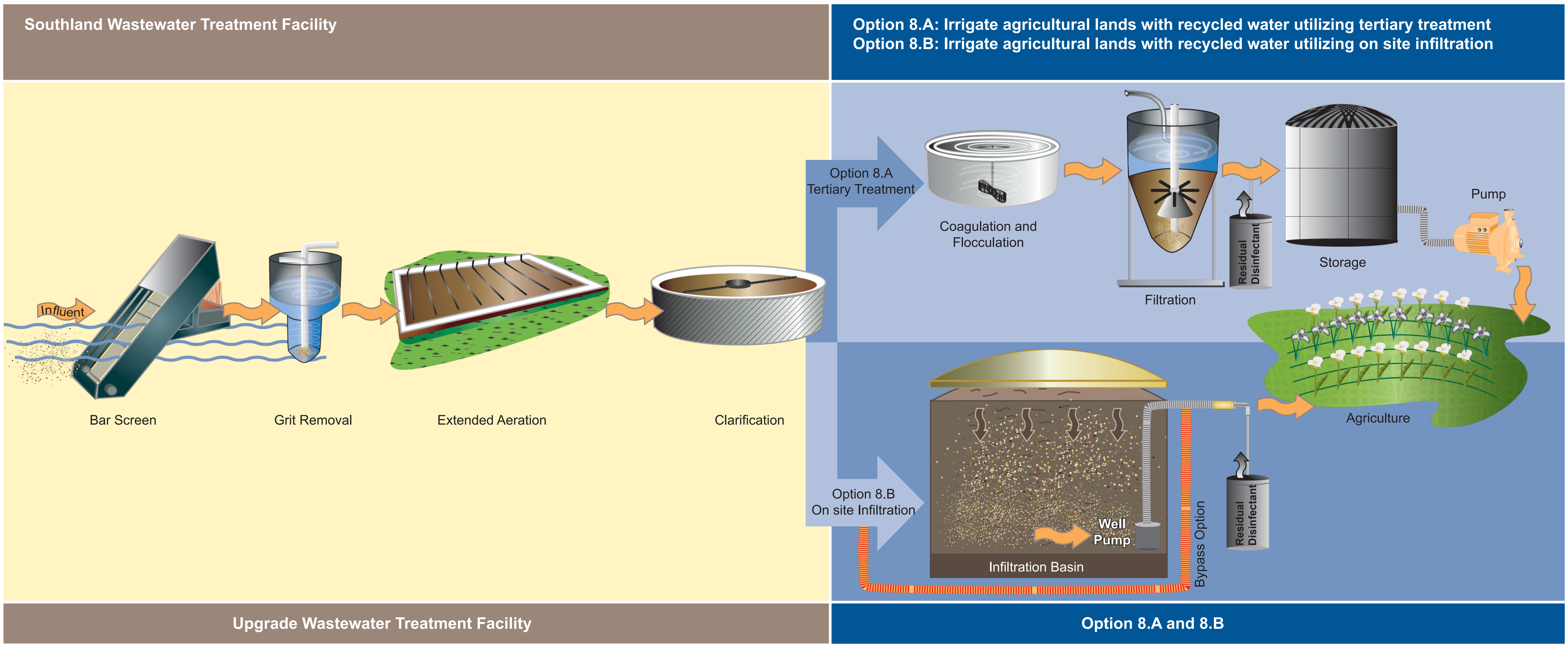
Process Flow Diagram

Options 7.A and 7.B: Irrigation of Highway 101 Right-of-Way with Recycled Water



Process Flow Diagram

Options 8.A and 8.B: Irrigate near the Treatment Facility



Process Flow Diagram

Options 9.A and 9.B: Infiltration at Nipomo Refinery Property