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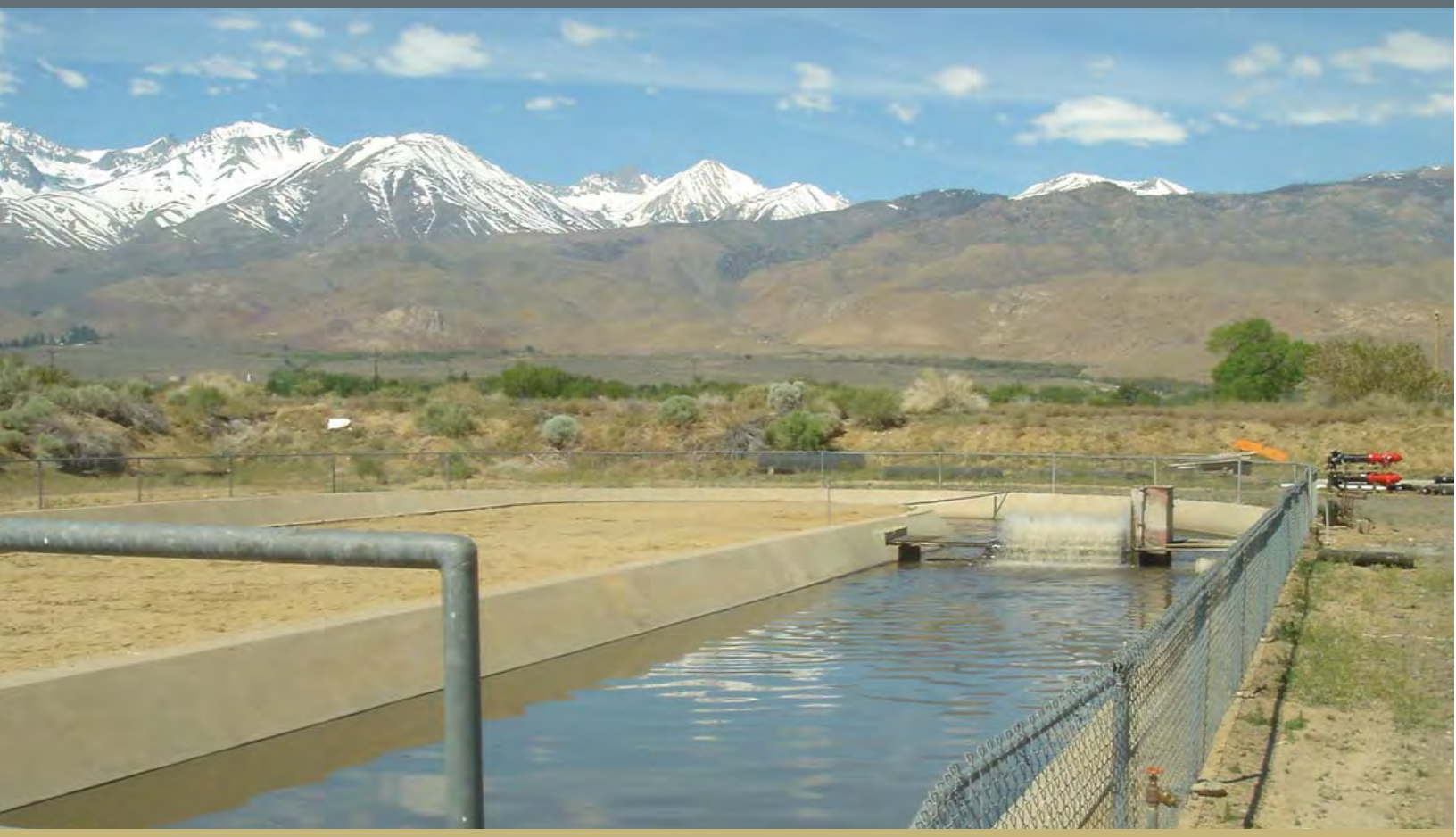
Report

Feasibility Report
Reclaimed Water for Restoration and Community Projects in Big Pine, CA

Prepared for

Inyo County Water Department

December, 2017



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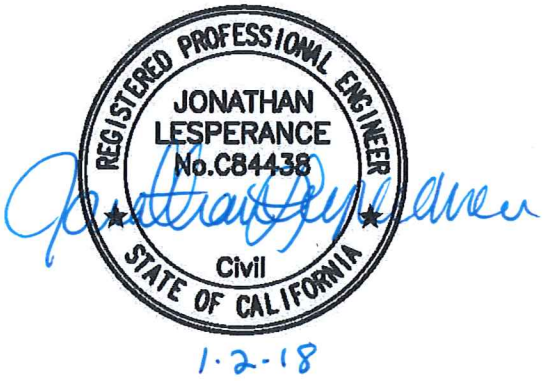
Feasibility Study
For

Reclaimed Water for Restoration and Community Projects in Big Pine, CA



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1 Executive Summary

Inyo County Water Department has contracted with R.O. Anderson Engineering, Inc. (ROA), to perform a feasibility study on the viability of recycled water reuse projects for restoration and community projects in the community of Big Pine, located in Inyo County, California. The feasibility study is intended to review and evaluate the suitability of the existing quantity of recycled water presently available for various reclaimed water reuse opportunities as well as the application of solar energy to offset existing and future costs associated with generation of recycled water. A grant for a feasibility study was awarded by the California Department of Water Resources under the Integrated Regional Water Management Program (IRWMP) with the intent of evaluating recycled water use for land restoration and community projects in Big Pine. If all involved stakeholders, including the town of Big Pine, the Big Pine Paiute Tribe, and Inyo County, determine that the project is feasible based on the findings of this study; the environmental and regulatory review process, improvement plans and contract documents, and ultimately construction of the preferred alternative, will follow in subsequent phases.

This study of effluent reuse at the Water Resource Reclamation Facility (WRRF) located in the Big Pine Community Services District (BPCSD) summarizes ROA's findings on the existing condition of the facility and relevant site investigations. It was determined that an average of 80,000 gallons per day (GPD) (48.6 gallons per minute) of recycled water is presently available for reuse in Big Pine and can be used for a variety of irrigation applications. The degree of treatment required varies depending upon how and where the recycled water is reused as well as the amount of public access to the reuse area. Allowing a high level of public access to the site will result in greater levels of treatment being required, subsequently resulting in greater capital cost and greater operation and maintenance costs. However, with moderate access restrictions, the recycled water can be applied in certain manners without additional treatment – e.g. subsurface drip irrigation.

The permitting and regulatory requirements are discussed in the Recommended Alternative section of this report. In addition to Inyo County Building Permits, approval will be required from the California Department of Public Health, and Waste Discharge Requirements (WDR) must be issued by the Lahontan Regional Water Quality Control Board (LRWQCB, Lahontan). Lahontan will require that both the existing WDR for the existing sewer plant be modified to allow the reuse and new WDR be issued to the entity that will operate the reuse systems. The new WDR are not known at this time and it is recommended that Lahontan be consulted in the next phase of the project to better estimate these requirements.

All potential reuse sites that were identified during the public input process were qualitatively evaluated for reuse and a single preferred alternative was selected from among 18 different projects that were proposed for this feasibility study. The selected alternative examines reuse of undisinfected recycled water by subsurface trickle

irrigation at the Los Angeles Department of Water and Power (LADWP) lands located south of the BPCSD WRRF that have been reserved for native-revegetation and mitigation purposes. These lands cover an area of ±160 acres, are currently vacant and under a State ordered mandate for revegetation with native plant species. Because of this mandate, the LADWP may find it advantageous to have a source of recycled water available for irrigation use.

With this alternative there will be no additional treatment or disinfection of the recycled water and therefore the reuse must not be spray-applied, and the public must be excluded from the reuse site during irrigation. Recycled water at a continuous flow rate of about 50 gallons per minute will be withdrawn from the existing BPCSD oxidation ponds following the secondary clarifier and pumped to the 160-acre LADWP revegetation area where it will be continuously reused for subsurface drip irrigation. This alternative has an estimated budgetary capital cost of 1.54 million and an estimated budgetary annual operation and maintenance (O&M) cost of approximately $6,200. With the expected delivery of up to 25.5 million gallons or approximately 78 acre-feet annually (AFA) annually, the O&M Cost is $0.24 per 1000 gallons ($79/AF). The government rate for water from the Big Pine public water system is $0.44 per 1000 gallons and therefore use of recycled water is found to be less expensive than domestic water in this application.

Additionally, this alternative includes an option for the installation of a Photovoltaic Solar Array to generate renewable energy that may potentially offset the project's O&M costs as well as reduce the estimated project lifecycle costs. This system would potentially be able to generate up to 203,951 kilowatt hours (kWh) annually and would be able to provide approximately 99.8% of the existing power requirements at the BPCSD WRRF. The estimated net savings in electrical power consumption is approximately $19,814 per year, after accounting for O&M costs.

2 Introduction & Project Background

Recent and persistent drought conditions throughout much of the arid west have brought the issue of water resources conservation to the top of priorities for many municipalities, especially within California, which has been particularly affected by the ongoing drought. As communities throughout the region have sought to bolster and augment available water supplies, the implementation of recycled water as a water-saving measure has gained steady acknowledgement and acceptance for a variety of uses. Recycled water is, simply put, the reclamation and application of treated wastewater for beneficial use. Recycled water affords communities with opportunities such as landscape irrigation, agricultural uses, and environmental restoration. Inyo County, having identified various locations and opportunities for using recycled water consistent with the California

Recycled Water Policy[1] prepared by the State Water Boards, initiated this feasibility study and contracted with R.O. Anderson Engineering, Inc. (ROA) to develop and evaluate alternatives for placing reclaimed water generated within the community of Big Pine to beneficial use.

Big Pine is an unincorporated town in Inyo County, California, located in the Owens Valley on U.S. Highway 395, 210 miles north of Los Angeles and 15 miles south of the City of Bishop. Adjacent to Big Pine is the Big Pine Paiute Tribe's (BPPT, Tribe) Reservation. The total population of the area consists of approximately 1,750 people who reside within the town and approximately 500 people who live on the BPPT's Reservation. There are approximately 340 existing residential and 20 commercial connections that are served with public sewerage by the Big Pine Community Services District (BPCSD, District), while the Tribe provides sanitary sewerage to 462 tribal members [1]. The District collects and conveys wastewater flows to the BPCSD Water Resource Recovery Facility (WRRF) located northeast of town where it is treated to secondary standards via an oxidation ditch followed by a secondary clarifier and oxidation ponds (effluent polishing), and is ultimately disposed of in percolation and evaporation ponds as shown on Figure 3. The Tribe operates a separate WRRF south of the District consisting of two evaporation ponds.

2.1 Purpose and Scope

The purpose of this feasibility study is to investigate potential opportunities to implement reclamation of treated wastewater to irrigate landscaping, recreational facilities, agriculture, and/or environmental restoration sites in the Big Pine area. The scope of this study includes the following items:

- Identifying potential alternatives for treatment options and uses of recycled water from both the BPCSD and BPPT WRRF's.
- Estimating initial cost, operation and maintenance cost and life cycle cost of any treatment upgrades and/or new facilities.
- Potential options for solar power generation for the purposes of pumping, treatment and power generation.
- Certifications required for operations personnel as related to proposed recommended alternatives.

This feasibility report is the first portion of the scope of work, and consists of evaluating the preferred alternative from all identified potential alternatives for the

[1] The California Recycled Water Policy encourages *"…local and regional water agencies to move toward clean, abundant, local water for California by emphasizing appropriate water recycling, water conservation, and maintenance of supply infrastructure and the use of stormwater…"*

reuse of recycled water in Big Pine. Each alternative was presented to stakeholders for review and the preferred alternative was then selected, the feasibility of which is reviewed in this study. If the preferred alternative is determined to be feasible, the subsequent step will be to complete a Title 22 Engineering Report as well as an environmental review, which will be reviewed by Inyo County, BPCSD and BPPT Council representatives, and the State Board. Upon approval, a Notice of Intent (NOI) Report will be submitted first to the Inyo County, BPCSD and BPPT Council representatives for review, then to the California Regional Water Quality Control Board, Lahontan Region (LRWQCB, or Lahontan) for approval. Upon submittal of the NOI, the ROA team will prepare improvement plans and specifications for the selected alternative as selected by the project stakeholders and approved by the State Board and Lahontan.

2.2 Preliminary Alternatives Analysis

Following the Notice to Proceed issued by Inyo County, a kickoff meeting was held July 12, 2017. The purpose of the kickoff meeting was to introduce the overall project and feasibility study to the project's stakeholders, as well as to refine the goals and objectives for the project. Stakeholders present at the kickoff meeting included representatives of the general public, the Tribe, BPCSD, Inyo County, and ROA. Representatives of the Los Angeles Department of Water and Power (LADWP) were unable to attend; however, LADWP did provide email correspondence in advance of the meeting indicating the Department's interest in, and support for the project, as well as the following suggestions:

- Determination of appropriate treatment levels to ensure regulatory and safety requirements for reuse are achieved;
- Potential costs of the design, construction, and installation of the distributions system;
- Potential costs for operation and maintenance;

The goals and objectives as refined at the kickoff meeting include:

1. Identify potential recycled water applications within and around the town of Big Pine.
2. Identify alternatives that minimize future operational and maintenance costs.
3. Identify alternatives that will require a minimal amount of alterations or upgrades to the existing WRRF, as the addition of advanced treatment methods will increase O&M costs and may require operators with higher levels of certification.
4. Identify alternatives that will be attractive to LADWP for meeting their State mandated revegetating projects.

During the kickoff meeting a total of 18 various alternatives were preliminarily identified. Alternatives ranged from the irrigation of a new driving range and putting green to application for dust control. Many alternatives included the application of recycled water for the purpose of revegetating various vacant parcels – especially the vacant parcel located downtown and south of the school which is commonly referred to as the *Bartell Parcel* (APN 004-160-05). Other alternatives included applying recycled water for the production of a Christmas tree crop and even for growing hops and barley which might be used for brewing.

Each of the proposed projects identified during the kickoff meeting were then evaluated (ranked on a scale of 1 to 4) according to a set of criteria jointly developed by ROA and Inyo County, with input from the project stakeholders. These criteria are listed as follows:

1. The level of treatment required, with lower levels being preferred so as to reduce costs and O&M requirements.
2. The overall capital (or construction) cost of the system.
3. The pumping distance required to transport recycled water from the WRRF to the distribution area.
4. Community acceptance.
5. Amount of labor required.
6. Economic potential.
7. Sources of grant funding necessary for implementation.
8. Associated maintenance costs.
9. Location and ownership of parcels identified as potential sites for reuse.
10. Public access restrictions.

After each project had been evaluated per the above criteria, the preliminary ratings were then distributed to representatives of the County, BPPT, and BPCSD for review and comment. A subsequent teleconference was then held with representatives of the County, BPPT, BPCSD, and ROA to further refine the evaluation criteria for the proposed project alternatives. It was determined then that any increase in O&M costs were likely untenable for either the BPPT or BPCSD as both entities are currently understaffed with strict budgets.

A result of that determination was the identification of potential for a “water trade” with LADWP. There exist at least two potential mechanisms for such a trade – the first would be to discharge recycled water into the Big Pine canal, and the second would be to supply recycled water to existing vacant LADWP lands which are under a state ordered mandate for re-greening. While the first option would likely require significant upgrades to the BPCSD treatment plant on order to achieve a surface water discharge permit (primarily requiring nutrient reduction), the second option would require relatively little improvements or modifications to the BPCSD treatment plant as irrigation of the vacant land could be

accomplished, depending on the type of plant(s) grown and manner of application, with undisinfected secondary recycled water.

Presently, LADWP values recycled water at an approximate rate of $460-$575/AF [2]. At 70,000 to 90,000 gallons per day (GPD), the Big Pine Community Services District (BPCSD) produces on average approximately 78 to 101-acre feet annually (AFA) which may be valued anywhere from $36,000 to $58,000 using LADWP's listed prices. While a wholesale agreement between the community of Big Pine and LADWP may be possible, there may be a higher economic (and social) value realized by the community of Big Pine if a trade could be arranged with LADWP in which Big Pine's recycled water is applied to an area that LADWP is already obligated to mitigate and, in turn, an equivalent amount of water from a yet-to-be determined source – e.g. surface water from the canal or potable water from the BPCSD's system, would be used to facilitate one of the other originally identified alternatives. Some of the advantages of this approach are as follows:

- It potentially reduces the required level of treatment for the recycled water supplied from BPCSD's treatment plant. Depending on the manner of application and type of vegetation grown, it is possible that no additional treatment or disinfection would be necessary so long as the area is properly signed and restricted per Title 22.
- It potentially reduces the pumping distance that would otherwise be required to deliver recycled water to another identified project site. By using water that is already adjacent to a potential project site the infrastructure necessary to apply the water may be substantially reduced.
- It potentially reduces the need for additional Operation and Maintenance requirements. Because both the BPCSD and BPPT identified O&M costs as a major obstacle for project feasibility, reducing the potential O&M financial burden improves project feasibility.
- It potentially reduces the capital costs of implementing a recycled water project. By avoiding and/or reducing treatment costs, pumping cost, and O&M costs, the overall project cost would likely be reduced.

Presently, it is uncertain if LADWP will find such an agreement to be favorable, however, assuming that an agreement could be negotiated, several locations and projects have been identified where the traded water (received from LADWP) can be placed into beneficial use in the community. During the above referenced teleconference one option that was discussed was irrigation of the trees and landscaping near the existing baseball parks, which is presently funded through the Big Pine School District. Alleviating this cost to the school district was found to be quite favorable to the representatives of BPPT and BPCSD and would likely have the support of the broader community as well.

A second public meeting was held with the project stakeholders on August 29, 2017. During the second public meeting, a revised decision matrix which included eight (8) identified high-scoring alternatives was reviewed and discussed. These high-scoring projects were selected from the original 18 potential projects previously identified during the Project's first public meeting. Stakeholders present included representatives of the public, BPPT, the Big Pine School District (BPSD), BPCSD, Inyo County, and ROA. Of the identified high-scoring projects, the stakeholders present came to the consensus that the application of recycled water to vacant lands presently held by Los Angeles Department of Water and Power (LADWP) for the restoration of native vegetation would be the most valuable and cost-effective alternative. This alternative is evaluated in detail in section 5.

It should be noted, however, that this alternative was not without some expressed controversy during the second public meeting. Some of the stakeholders present expressed concern that the alternative appeared to be providing aid to LADWP to accomplish what is already a state ordered mandate for native revegetation that, to date, has not been successfully implemented. Therefore, without the option of a water trade for applying water to beneficial use at one of the other identified alternatives, this project may ultimately be found infeasible.

3 Findings: Existing Conditions, Site Investigations

3.1 Existing Sewage Flow Rates

Sanitary sewage collected from within the town of Big Pine is transported to the headworks of the District's WRRF. Flow measurements from the town of Big Pine are not measured regularly at the WRRF, however, previous measurements were conducted in 2011 by R.O. Anderson and KASL Engineering Consultants for a Preliminary Engineering Report provided to the BPCSD. It was determined from those previous measurements that the average daily flow (ADF) entering the plant was approximately 80,000 gallons per day (GPD) or 0.07 million gallons per day (MGD) with maximum monthly flows reaching upwards of approximately 140,000 GPD or 0.14 MGD [3]. Figure 1 below shows the distribution of average and peak monthly flow throughout the year, flows occurring during the growing season are represented with colored lines. These flow values were verified with field measurements, pressure transducers, and open channel flow hydraulics analysis during the previous 2011 study.

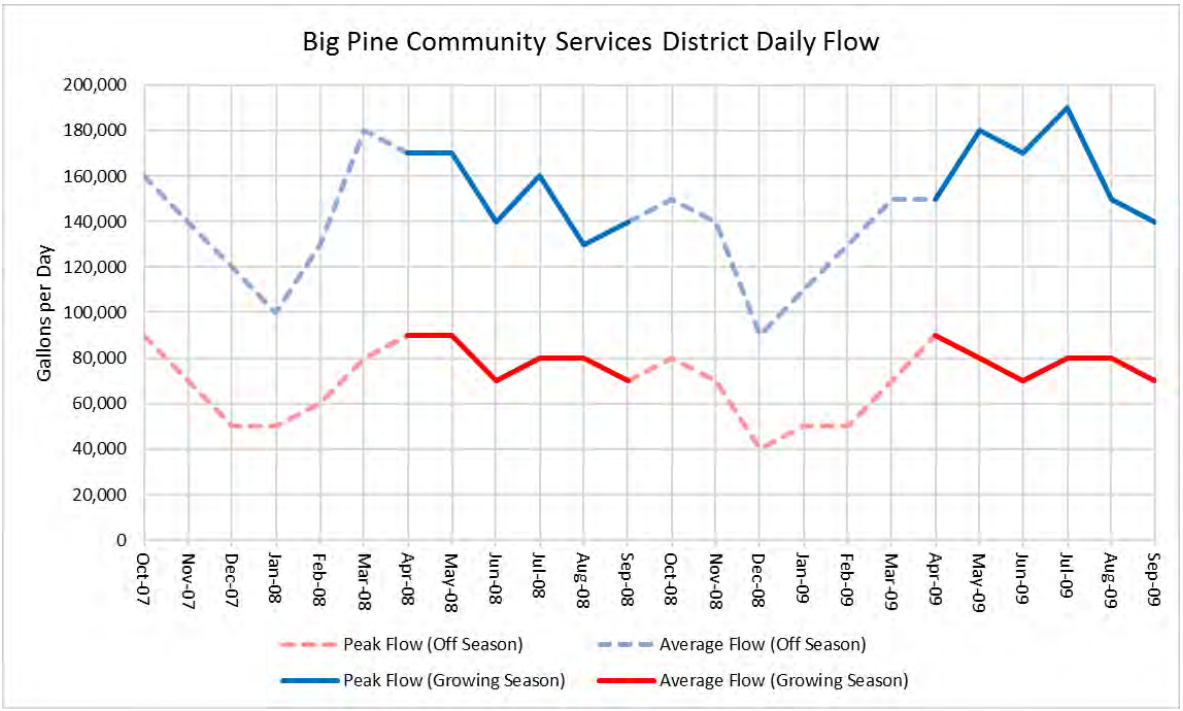

Figure 1: Big Pine Community Services District - Average Daily Flow & Average Peak Flow between 2007 and 2009

3.2 Existing Treatment Facilities

There are presently two separate WRRFs that treat municipal wastewater adjacent to the project area, viz. the Big Pine Community Service District WRRF and the Big Pine Paiute Tribe WRRF. Each facility is responsible for collecting, treating, and disposing of the wastewater generated within their respective districts and maintaining compliance with the Waste Discharge Requirements (WDR) issued through LRWQB. These two facilities are the only reasonable sources of recycled water for the project at this time, and each WRRF is described in detail below.

3.2.A BPCSD WRRF

The BPCSD WRRF is located on a parcel of land leased from LADWP (APN 018-090-19) located down gradient and approximately 1-mile northeast of town as illustrated on Figure 2. The WRRF was constructed in the early 1970's and underwent several operational changes in the years following. The original operation of the WRRF directed effluent from an oxidation ditch into a secondary clarifier before reporting to the oxidation ponds (arranged in parallel). Due to operational difficulties, the

clarifier was temporarily removed from service and the oxidation ponds were operationally rearranged into a series configuration. The clarifier was recently reinstated per recommendations included with the KASL Preliminary Engineering Report [3].

The WRRF facility is shown in Figure 3. Flows enter the facility via a 15-inch diameter gravity sewer main. A manually cleaned bar screen removes large debris before directing flow by gravity to the oxidation ditch. The ditch has a water surface area of 6,274 square feet and a volume of 22,145 cubic feet, resulting in 56.8-hour (2.4 Day) detention time under average daily flow conditions. Flow is then routed into a secondary clarifier, which has a diameter of 20 feet and a depth of eight feet. Flow is detained for a minimum of 3 hours while solids are allowed to settle.

From the secondary clarifier, effluent flows to the first of a series of two oxidation ponds. The ponds are operated in series with effluent from pond #1 discharging into pond #2. Each pond provides a surface area of 37,560 square feet and a volume of 168,940 cubic feet. For average daily flow, the detention time of each pond is approximately 18 days (36 days total). Four 5-hp aspirating aerators have been installed in each oxidation pond to promote additional aeration and effluent polishing prior to disposal.

Secondary effluent is then discharged to a percolation system that consists of four percolation beds configured in a manner so that only a single bed operates at a given time in order to allow consistent distribution between all four beds. Each bed has a surface area of approximately 19,000 to 20,000 square feet. Beds #1 and #2 have an effective depth of approximately 3.75 feet while beds #3 and #4 have an approximate depth of 2.75 feet. Effluent is allowed to percolate through the beds at an estimated rate of 38.2 feet per year, with subterranean flow in an easterly direction where it ultimately re-enters the groundwater system.

Some consideration must be given as to whether the treated water percolating into the groundwater system from the percolation beds acts as a significant source of irrigation for plant growth adjacent to and east of the WRRF, as this water will no longer be available to the percolation beds on a daily basis if applied to beneficial use elsewhere. Aerial imagery shows that vegetation presently exists around the WRRF, with an approximate area of about 35 acres. Based upon this same aerial imagery the vegetation appears to be oriented in an easterly by

northeasterly direction, generally following the site topography which slopes east towards the Owens River.

There are two streams present that supply a perennial source of water from the Big Pine Cannel. These two streams originate approximately 1,000 feet west of the WRRF and convey water via open channel flow eastward. The northern stream approaches the northwest corner of the WRRF before diverting north around the facility and parallel to the southern edge of Highway 168. The southern stream runs parallel to the south end of the WRRF. Established plant growth is evident along the entire lengths of each channel, while additional growth appears to be promoted by surface water originating from the channels and flowing west to east. These two streams appear to be the primary source of water sustaining the existing vegetation. The orientation, extent, and density of vegetation appear similar to other locations in the valley near Big Pine where perennial drainage is present.

The estimated capacity of the percolation beds is 176,000 gallons or 0.54 acre-feet per day [3]. This percolation rate, which is more than twice the average daily flow at the WRRF, is likely due to a fast draining alluvium that is expected to be present below the percolation beds. Given the high percolation rate, it is unlikely that the current method of treated wastewater disposal is acting as a significant source of water for surrounding plant growth. If required, a shallow groundwater analysis for source nutrients like nitrates could be performed downgradient of the percolation beds to determine if they are, in fact, contributing to the existing vegetation. Because of the expected groundwater gradient towards the Owens River (similar to the existing topography), if these beds are actually sustaining local plant growth adjacent to the WRRF the extent is probably far less than the 35± acres of existing plant growth, as much of the vegetal cover (approx. 14 acres) is located upgradient of the percolation beds.

The District's current Waste Discharge Requirements (WDR) permits treatment and disposal of up to 150,000 GPD (0.15 MGD) average dry weather flow (ADWF). Lahontan Board Order No. 6-95-35, issued to BPCSD in 1995, is included in Appendix 1 of this Study.

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FIGURE 2
LOCATION MAP
FEASIBILITY STUDY - BIG PINE

2521-001 11/22/17

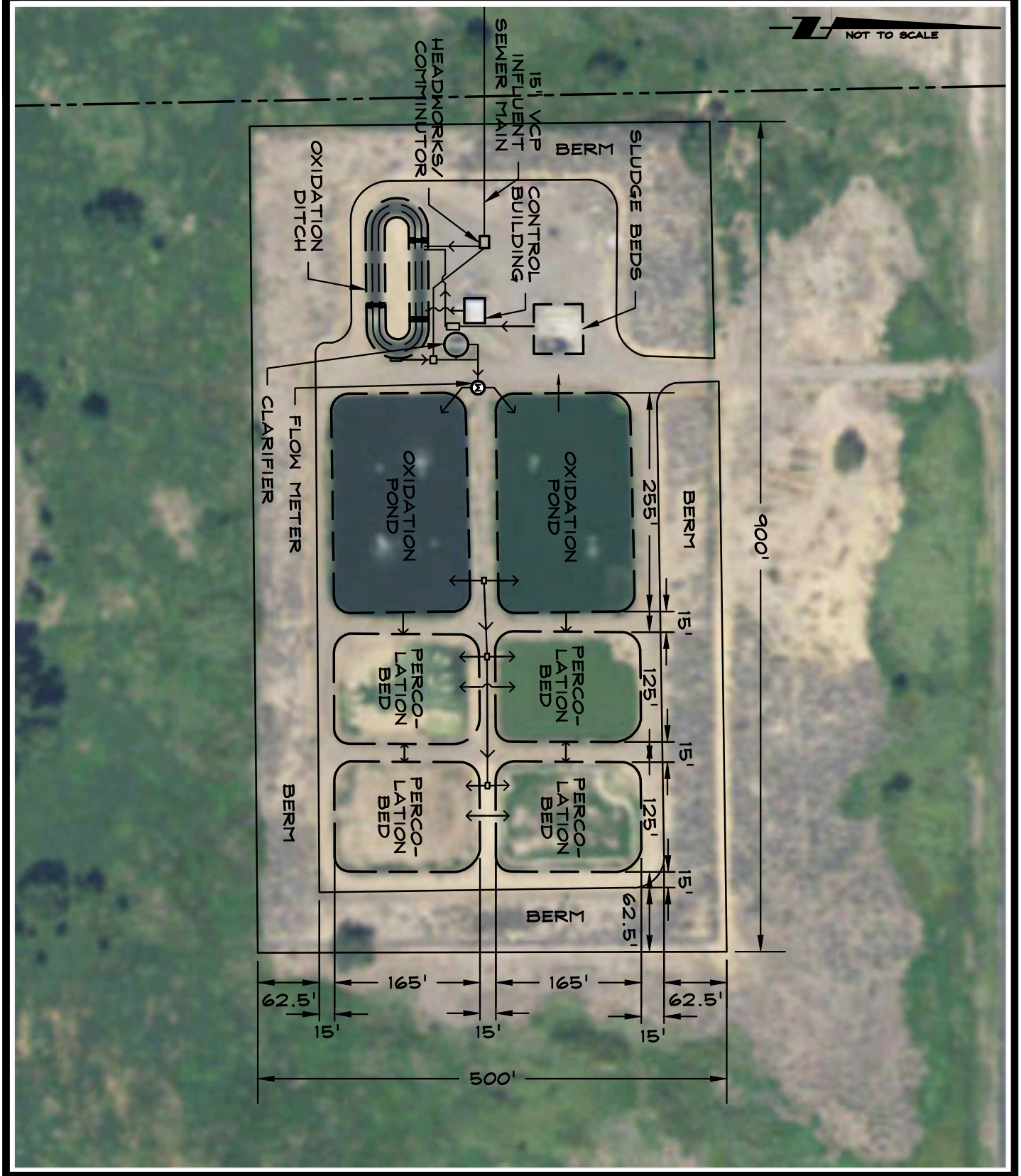

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FIGURE 3
EXISTING WRRF SITE
FEASIBILITY STUDY - BIG PINE

2521-001 11/22/17

- The only authorized disposal site currently allowed are the four evaporation/percolation ponds.
- The BOD of the effluent shall have a mean of 30 mg/L and a maximum of 45 mg/L.
- The pH of the effluent shall have a pH not less than 6 pH units and no more than 9 pH units.
- The effluent shall have a dissolved oxygen concentration of not less than 1.0 mg/L.
- The Operator of the facility shall have the appropriate grade of certification in accordance with the Regulations for Wastewater Treatment Plant Operator Certification and Plant Classification, Title 23 CCR, Division 4, Chapter 14, Section 3670 et.seq. It is noted that the appropriate grade is not determined by Lahontan but rather by the Office of Operator Certification.

The WRRF is presently operated by Mr. Frank Carr who holds the appropriate Grade III Operators Certification. The CSD's facilities are maintained under contract by McMurtrie-Tanksley, Inc. Compliance sampling is collected by the McMurtrie-Tanksley and sent to outside certified laboratories by express delivery for analysis.

3.2.B BPPT WRRF

The BPPT WRRF is located on a parcel of land owned by the BPPT (APN 018-090-20) located down gradient and approximately 1-mile east of town, and south of the District's WRRF. The WRRF consists of two lined evaporation ponds which handle approximately 20,000 GPD of domestic wastewater produced from residential areas on tribal land. The beds are periodically drained to allow removal of sludge that has settled and collected at the bottom. The BPPT WRRF also includes two percolation beds, however these beds are not in use at this time. The evaporation ponds provide primary treatment for the BPPT, however, in order for treated water to be used as recycled water, a minimum level of secondary treatment (oxidation system) would need to be implemented.

The most cost-effective method of secondary treatment would likely be to install an aeration system within each evaporation pond however, this option would require a sizable increase in plant operation and maintenance, which is currently outside of the operational budget for the WRRF. Therefore, the Tribe's effluent is not eligible for reuse applications at this time. Should secondary treatment become feasible for the BPPT at a later date, additional LADWP lands (separate from the area discussed in this study) have been identified for revegetating which

could potentially be utilized by the additional recycled water from the BPPT.

3.3 Existing Effluent Quality

The effluent quality of the water discharging from the secondary clarifier is unknown at this time, as no periodic sampling is conducted at this stage of treatment. Consequently, there are no available measurements of the nitrogen removed through the disposal process in the evaporation / percolation ponds. Nitrate sample results from the monitoring wells located east and west of the WRRF are not presently available, although the CSD reports that the monitoring wells show no significant nitrogen [4]. Due to the rapid infiltration rates and long wet-dry cycles of typical use, it is expected that approximately 20% to 30% of the nitrogen is removed through the evaporation / percolation ponds [5].

It will be necessary to conduct sampling of the effluent and the monitoring wells prior to submittal of the final design, and this will be accomplished through the Groundwater Non-Degradation Analysis which is discussed in greater detail below. High priority parameters will include Ammonia or TKN, Nitrates and groundwater depth. For the purposes of this study, lab results of primary effluent samples taken from the Lone Pine WRRF were utilized and they are included in Table 1 below. These results were determined for a similar recycled water feasibility study conducted for Lone Pine by ROA previously. It was assumed that these results are representative of Big Pine as both facilities treat domestic wastewater with similar characteristics.

Table 1: Lone Pine Effluent Quality

Test Location	Sample Date	Tested Parameter	Test Method	Result	RDL	Units
Lone Pine Effluent	1/26/2012	Dissolved Ammonia, as Nitrogen	SM 4500 NH3 D	19	1.2	mg/L
Lone Pine Effluent	1/26/2012	Ammonia, as Nitrogen	SM 4500 NH3 D	19	1.2	mg/L
Lone Pine Effluent	1/26/2012	Total Suspended Solids (TSS)	SM 2540D	53	10	mg/L
Lone Pine Effluent	1/26/2012	Bicarbonate (HCO3)	SM 2320B	260	1.0	mg/L
Lone Pine Effluent	1/26/2012	Carbonate (CO3)	SM 2320B	<1.0	1.0	mg/L
Lone Pine Effluent	1/26/2012	Hydroxide (OH)	SM 2320B	<1.0	1.0	mg/L
Lone Pine Effluent	1/26/2012	Total Alkalinity	SM 2320B	220	1.0	mg/L as CaCO3
Lone Pine Effluent	1/26/2012	Dissolved Nitrite Nitrogen	EPA 300.0	0.38	0.010	mg/L
Lone Pine Effluent	1/26/2012	Nitrate Nitrogen	EPA 300.0	1.1	1.0	mg/L
Lone Pine Effluent	1/26/2012	Nitrite Nitrogen	EPA 300.0	0.37	0.010	mg/L
Lone Pine Effluent	1/26/2012	Dissolved Nitrate Nitrogen	EPA 300.0	1.1	1.0	mg/L
Lone Pine Effluent	1/26/2012	Total Kjeldahl Nitrogen	EPA 351.2	27	2.5	mg/L
Lone Pine Effluent	1/26/2012	Total Dissolved Solids (TDS)	SM 2540C	320	10	mg/L
Lone Pine Effluent	1/26/2012	Turbidity (Nephelometric)	EPA 180.1	21	0.5	NTU
Lone Pine Effluent	11/15/2011	pH	SM 4500H+ B	7.5	1.0	pH
Lone Pine Effluent	11/15/2011	Disolved BOD	SM 5210B	ND	20	mg/L
Lone Pine Effluent	11/15/2011	MBAS	SM 5540C	0.36	0.20	mg/L
Lone Pine Effluent	1/26/2012	Particle Size Distribution				
	high diameter (um)	%	high diameter (um)	%		
	1000	0.000	16	14.640		
	707	0.000	11	1.281		
	500	0.000	7.8	3.422		
	354	0.110	5.5	3.173		
	250	0.615	3.9	1.250		
	177	0.690	2.8	1.091		
	125	0.196	2	1.019		
	88	0.002	1.4	1.294		
	63	0.342	1	0.208		
	44	9.734	0.69	0.000		
	31	29.993	0.49	0.000		
	22	30.951	0.35	0.000		
			0.24	0.000		
Monitoring Well North	11/15/2011	Nitrate as N	EPA 300.0	ND	0.20	mg/L
Monitoring Well North	11/15/2011	Semivolatile Organic Compounds (Combined)	EPA 625	ND		
Monitoring Well North	11/15/2011	Volatile Organic Compounds (Combined)	EPA 624	ND		
Monitoring Well East	11/15/2011	Nitrate as N	EPA 300.0	ND	0.20	mg/L
Monitoring Well East	11/15/2011	Semivolatile Organic Compounds (Combined)	EPA 625	ND		
Monitoring Well East	11/15/2011	Volatile Organic Compounds (Combined)	EPA 624	ND		

3.4 Amount of Water Available for Reuse

The amount of water available for reuse is the average daily discharge from the WRRF, which is the inflow to the WRRF minus the net losses in the WRRF. These losses include evaporation from all exposed surface water and infiltration occurring within the percolation beds. Some additional losses may occur due to seepage within the lined oxidation ponds and overtopping during high flow events, however such events occur rarely and, for the purposes of this report, may be considered negligible. The estimated pan evaporation for the Owens Valley area is 70 inches per year, while the average annual rainfall is reported at 4.6 inches per year [6]. This results in an annual pan evaporation of 65 inches. Assuming actual pond evaporation is 90% of pan evaporation, the net annual combined evaporation of the percolation ponds, oxidation ditch and oxidation ponds is estimated to be 10,000 gallons per day. It is important to note that the net annual combined evaporation will be less than the stated 10,000 GPD for the recommended alternative included with this study, as the recycled water will be drawn directly drawn from the oxidation pond prior to disposal in the percolation ponds (effectively reducing the available surface area for evaporation).

The percolation beds are operated in a cycle; one bed is loaded until the liquid level is approximately 1 foot below the interconnection piping. The effluent is then directed to the next bed while the previous bed's volume infiltrates. Operators report that beds 1, 2 and 4 are loaded 62.5% annually, while bed 3 is loaded 57.1% annually [3]. Based on this information the infiltration capacity is estimated to be 149,000 gallons per day, assuming the annual average flow remains at 71,000 gallons per day.

It is worth noting that the amount of effluent available for use after the oxidation ponds is somewhat reduced due to evaporation and a greater quantity of effluent could, therefore, be recovered if flow was diverted directly from the secondary clarifier prior to entering the oxidation ponds. Additionally, for irrigation activities occurring during the months of April through September, a higher average daily flow of 80,000 GPD is potentially available (Figure 4) based on the average daily flow as discussed in Section 3.1 above.

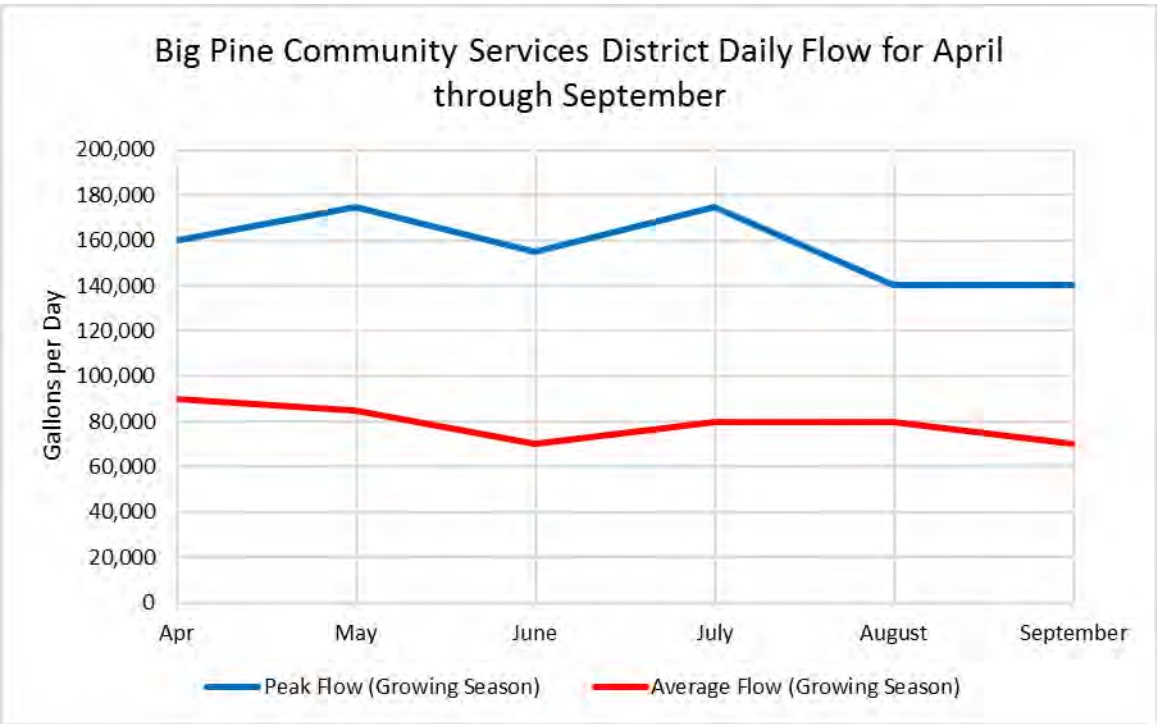

Figure 4: Big Pine Community Services District - Daily Flow for April Through September

3.5 Geology, Hydrogeology, and Soils

Big Pine is located on the valley floor of the Owens Valley at an elevation of approximately 3,989 feet. The valley fill consists of unconsolidated to moderately consolidated detritus eroded from the surrounding bedrock mountains in excess of 1,000 feet deep [7].The principle source of replenishment for groundwater in the Owens Valley is percolation of stream flow from the surrounding mountains. Lesser sources of recharge include infiltration of excess irrigation waters and precipitation. Groundwater quality is generally sufficient to meet drinking water standards. Groundwater upgradient of Big Pine has a typical nitrate concentration of 0.5 mg/L [8].

The area is included in the Owens Valley Groundwater Basin (6-12) of the South Lahontan Region. Beneficial uses of groundwater include: municipal and domestic supply; agricultural supply; industrial service supply; freshwater replenishment; and wildlife habitat. Groundwater flow in the area is generally from west to east following the surface topography. The depth to groundwater varies over the area; the nearest USGS groundwater monitoring well is located ±2300 feet southwest of the WRRF and reports an average depth of approximately 24 feet [8], while LADWP has a groundwater monitoring well

(T572) situated about 300 feet north of the BPCSD WRRF that reports groundwater levels of 10 to 15 feet below ground surface, on average [9]. Two regulatory monitoring wells are in place adjacent to the WRRF. Well #1 is located upgradient of the WRRF (40 feet west of the WRRF northeast fence corner) and Well #2 is located downgradient (40 feet east of the WRRF eastern fence). The average groundwater depth is 14 feet for the upgradient well and 12 feet for the downgradient well [3].

Soils in the area have been classified and their properties cataloged by the Natural Resource Conservation Service (NRCS). Included in Appendix 2 is an NRCS Custom Soil Report for soils in the vicinity of potential reuse areas. The selected alternative for this feasibility study had identified up to 160± acres of existing vacant LADWP lands south of the BPCSD and BPPT treatment plants as being the preferred location for irrigation applications of reuse water. From general field investigations the properties of the surface soils in the NRCS Report appear reasonable for the identified manner of application except as discussed later in this section. The soils in this area are a combination of Hesperia (65%) and Cartago (20%), the typical soil profiles for these soils are included in Appendix 2.

Several methods of irrigation and wastewater disposal have been identified by USDA as being favorable for the soil conditions present in this area, including disposal by irrigation and slow rate treatment of wastewater[2]. USDA has also identified micro-irrigation (including both above ground and subsurface drip) as a viable method of distribution for the soil available within the area of distribution. The water holding capacity is approximately 0.13 in/in [10]. This capacity implies that the soil will release water faster than may be desirable, however this can be overcome by more frequent irrigation with lesser amounts of water which will promote saturation throughout the day so that the water is more available to plants prior to percolation below the root zone.

3.6 Reuse Irrigation Criterion

In order to conserve water and avoid overirrigation that could potentially promote nutrients (e.g. nitrogen) being carried to the aquifer and causing degradation of the groundwater, it is imperative that effluent irrigation be properly designed and managed. Proper irrigation applies the calculated amount of water needed to meet the evapotranspiration (ET) rates of the plants while also providing

[2] Slow rate treatment of wastewater is defined as a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface.

sufficient additional water necessary to leach accumulated salts as well as to account for the inefficiency of the application of water, such as uneven distribution of water and evaporation of exposed surface water that has not yet permeated the soil or water that volatilizes when sprayed above crops.

For this feasibility study, only subsurface drip irrigation of native plant species is considered as irrigation was the preferred alternative identified during the public outreach process. Subsurface drip was selected over spray irrigation based on several factors. The primary consideration was the efficiency of SDI over other forms of irrigation such as spray and flood methods. Drip irrigation applies controlled quantities of water to areas where seeds have been planted, resulting in irrigation of the only the areas intended for plant growth. Significantly less water will be lost to evaporation, and as the water amount is controlled, plant roots will be able to absorb and utilize more water before it is lost through percolation into deeper soil. Additionally, spray irrigation would require higher levels of treatment under Title 22, as the spray of water has a higher chance of impacting public health during windy conditions. Flood irrigation would not require any additional treatment; however, this method would be inefficient due to evaporation losses and uneven distribution, as well as the potential to significantly disturb the uniformity of the top soil.

Daily ET rates for grass species have been preliminarily determined by using information available from CIMIS Station 35 located in Bishop California. Climate data is provided in Table 2, ET data has been summed and averaged for each month for the period of December 2016 through November 2017 and is presented on Figure 5. The annual average total ET is approximately 58 inches per year with approximately 42 inches of ET occurring within the growing season between April 1st and September 30th [11].

The leaching requirements will depend upon the salinity tolerance of the selected native vegetation to be planted as well as the salinity of the effluent [12]. For the purposes of this study, a turf or pasture of perennial ryegrass with a salinity tolerance of 6 mmho/cm was assumed, along with an average irrigation efficiency of 90% for subsurface drip irrigation. A list of potential species for revegetation as provided by Inyo County is shown on Table 3 below. The actual salinity tolerance and water requirements for the plants to be selected will need to be determined prior to final design.

The Desert Research Institute (DRI) was contacted to provide comment regarding the irrigation requirements for native plant species listed in Table 3, which are likely to be considered for this project. DRI provided the following comment: "*These native plants live off of precipitation with the aid of some shallow groundwater, but usually depth to water is 5-30 ft so that the ET is only a few to 12 inches more than precipitation*" [13]. Although this response is valid for

the majority of the relevant plant species in Table 3, the parcel of land in question has shown that revegetation has not yet occurred naturally with available amounts of precipitation, therefore an alternative source of water is likely necessary in order to promote consistent growth of native species. Evaluation of a potential water source for this project was similarly listed as a necessary action in a recent draft of the site mitigation plan [14].

Once the revegetation has been established and the plant root zone is in contact with the existing groundwater it is expected that precipitation will be sufficient to sustain the target native ground cover of eight (8) percent [14] although this may take up to 40 years to accomplish. More recent ET estimates were completed in 2006 through combined data prepared by USGS and Steinwald, et al, for native vegetation decoupled from the water table [15]. These ET estimates indicate that the actual water demand for establishing 8% native vegetation via drip irrigation may be substantially less than those discussed above and in Figure 5 below, due in part to the increased efficiency of drip irrigation over natural processes. However, this will need to be confirmed during final design.

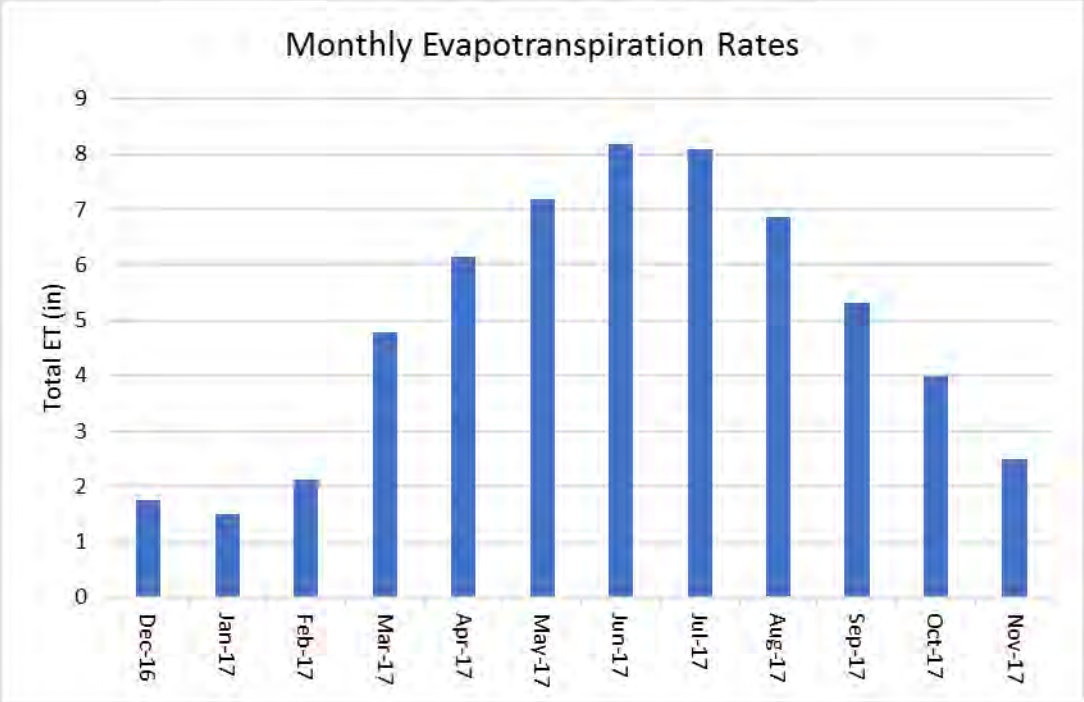

Figure 5: Monthly Evapotranspiration Rates

Table 2: Climate Data for CIMIS Bishop Station 35

Month Year	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Annual Tots/Avgs	Growing Season Tots/Avgs
Total ET (in)	1.76	1.49	2.12	4.79	6.14	7.18	8.18	8.1	6.87	5.32	3.99	2.5	**58.4**	**41.79**
Total Precip (in)	0.55	5.35	2.42	0.1	0.93	0.28	0	0.11	0.45	0.07	0	0.27	**10.5**	**1.84**
Avg Sol Rad (Ly/day)	232	229	297	472	591	652	738	666	590	504	409	299	**473.3**	**623.5**
Avg Vap Pres (mBars)	3.6	4.6	5.6	4.4	5	7.2	9.8	11.8	12.3	8.9	4.6	5.2	**6.9**	**9.2**
Avg Max Air Temp (°F)	54.7	46.8	55.7	69.4	71.3	79.3	92.8	96.2	92.9	83.2	78.3	67.4	**74.0**	**86.0**
Avg Min Air Temp (°F)	22.2	24.9	29.2	31.5	35.6	43.1	49.6	55	53.3	44.3	32	28.7	**37.5**	**46.8**
Avg Air Temp (°F)	37	35.1	41.7	50.7	55.6	63.1	72.9	77.7	73.7	64.1	53.8	46.5	**56.0**	**67.9**
Avg Max Rel Hum (%)	78	89	88	71	70	74	72	74	81	80	74	82	**77.8**	**75.2**
Avg Min Rel Hum (%)	24	44	37	15	17	19	16	19	22	20	11	22	**22.2**	**18.8**
Avg Rel Hum (%)	48	67	57	35	32	37	34	36	43	42	33	48	**42.7**	**37.3**
Avg Dew Point (°F)	18.2	23.7	26.5	23.4	25.8	35.7	42.2	48.6	49.4	40.3	24.9	27.4	**32.2**	**40.3**
Avg Wind Speed (mph)	3.4	3.4	3.8	4.2	4.7	3.6	2.8	2.6	2.3	2.9	2.7	2.9	**3.3**	**3.2**
Avg Soil Temp (°F)	42.5	38.5	42.1	48	54.9	62.2	69.9	71.7	71	66	58.1	51.5	**56.4**	**66.0**

Table 3 Potential Plant Species for Revegetation

Common name	Family	Scientific Name	Sites
alkali muhly	Poaceae	*Muhlenbergia asperifolia*	Jean Blanc Rd., Laws 124
alkali sacaton	Poaceae	*Sporobolus airoides*	Big Pine, Five Bridges, Tinemaha 54, Blackrock 16E, Symmes/Shepherd, Laws, Jean Blanc Rd., Laws 124
allscale saltbush	Chenopodiaceae	*Atriplex polycarpa*	Bishop 97, Laws, Big Pine, Symmes/Shepherd, Laws, Jean Blanc Rd., Laws 124
black greasewood	Chenopodiaceae	*Sarcobatus vermiculatus*	Bishop 97, Laws, Big Pine, Tinemaha 54, Blackrock16E, Symmes/Shepherd, Laws, Jean Blanc Rd., Laws 124
bottlebrush squirreltail	Poaceae	*Elymus elymoides Sitanion hystrix*	Bishop 97, Laws, Big Pine
bud sagebrush	Asteraceae	*Artemisia spinescens*	Bishop 97, Laws, Big Pine, Laws, Laws 124
burrobush	Asteraceae	*Hymenoclea salsola*	Bishop 97, Big Pine
Cooper's goldenbush	Asteraceae	*Happlopappus cooperi Ericameria cooperi*	Bishop 97, Big Pine
desert needlegrass	Poaceae	*Achnatherum speciosum Stipa speciosa*	Bishop 97, Big Pine
fourwing saltbush	Chenopodiaceae	*Atriplex canescens*	Bishop 97, Laws, Big Pine, Blackrock 16E, Symmes/Shepherd, Jean Blanc Rd.
Indian ricegrass	Poaceae	*Achnatherum hymenoides Oryzopsis hymenoides*	Bishop 97, Laws, Big Pine
indigo bush	Fabaceae	*Psorothamnus arborescens* var *minutifolius*	Bishop 97, Laws, Big Pine, Laws, Laws 124
little horsebush	Asteraceae	*Tetradymia glabrata*	Bishop 97, Laws, Big Pine, Laws
longspine horsebush	Asteraceae	*Tetradymia axillaris*	Bishop 124, Laws, Big Pine, Laws, Laws 124
Nevada dalea	Fabaceae	*Psorothamnus polydenius*	Bishop 97, Laws, Big Pine, Laws, Jean Blanc Rd., Laws 124
Nevada ephedra	Ephedraceae	*Ephedra nevadensis*	Bishop 97, Laws, Big Pine, Laws
Parry saltbush	Chenopodiaceae	*Atriplex parryi*	Laws, Big Pine, Laws, Jean Blanc Rd., Laws ret. ditch
saltgrass	Poaceae	*Distichlis spicata*	Bishop 97, Laws, Big Pine, Five Bridges, Blackrock 16E, Symmes/Shepherd, Laws, Jean Blanc Rd., Laws 124

Common name	Family	Scientific Name	Sites
shadscale	Chenopodiaceae	*Atriplex confertifolia*	Bishop 97, Laws, Big Pine, Blackrock 16E, Laws, Jean Blanc Rd., Laws 124
spiny hopsage	Chenopodiaceae	*Grayia spinosa*	Bishop 97, Laws, Big Pine, Laws 124
spiny menodora	Oleaceae	*Menodora spinescens*	Bishop 97, Laws, Big Pine
winterfat	Chenopodiaceae	*Krascheninnikovia lanata* *Ceratoides lanata*	Bishop 97, Laws, Big Pine

3.7 Recycled Water: Reuse Regulations and Requirements

Recycled water is promoted within the State of California and its regulatory agencies including the California Department of Public Health (CDPH) and the Lahontan Regional Water Quality Control Board (LRWQCB). However, for public health and safety, as well as the protection of the natural environment, the requirements for application of recycled water are quite rigorous. Approval from Inyo County (including Inyo County Environmental Health and Inyo County Building Department) CDPH, and the LRWQCB will be required. Inyo County will review the proposed design and provide comments on the environmental document as well as a review of plans to ensure applicable environmental considerations as well as building, plumbing and electrical codes are met. These reviews will come in subsequent phases of the project. Approval requirements from the CDPH and the LRWQCB are discussed in further detail below.

The application frequency depends upon the water holding capacity of the soil as well as the plant crop and will be determined at the time of final design when specific information regarding the irrigation system and reuse area are more fully known. Preliminarily, it is expected that the entire volume of available reuse water (approx. 80,000 GPD or 0.25 AF-day during the irrigation season) will be routed to the irrigation system on a daily basis. If irrigation operations are halted, either for routine maintenance or a system failure, it is anticipated that there will be minimal to no impact on plant vitality as the native species proposed for this project are expected to be well adjusted to arid desert environments. These plants should be capable of enduring short periods of no irrigation. If shutdowns lasting longer than a couple days are experienced, it may be necessary to supply water from an alternate source like the Big Pine Canal. This is discussed in greater detail in Section 5.2.

3.8 Lahontan RWQCB Regulations and Requirements

The LRWQCB regulates ground and surface waters in the region and especially the discharges to these waters including the existing Big Pine WRRF that discharges treated effluent to groundwater via percolation. The primary mechanism of regulation is through establishment of Waste Discharge Requirements (WDR) like those in place for the WRRF that are included in Appendix 1. There are both initial fees and annual fees associated with WDR.

In addition to issuing the WDR, LRWQCB will be the reviewing agency for the future Environmental Permitting and Documentation and will ensure CEQA compliance. Lahontan only issues WDR once the facilities are in place that would produce the discharge. Lahontan is required to include in their WDR the requirements of the CDPH. Therefore, the application for waste discharge requirements will be made after the Environmental Review is complete, final improvement plans and specifications are prepared, and CDPH has reviewed and approved the engineering report for the production, distribution, and use of recycled water.

It is noted that the existing WDR for the District does not allow reuse and therefore effluent reuse will require a new WDR for the District. It is anticipated that the current WDR will be updated to allow discharge to another entity besides the current permitted discharge to percolation ponds. At the same time the other, yet to be determined entity (presumably LADWP), will obtain a separate set of WDR for effluent reuse. There are several examples of this two-party WDR scheme within the Lahontan Region.

In either updating WDR or issuing new WDR to a new entity, Lahontan will ensure that the requirements reflect current regulations and policies. It is noted that the District's WDR were last updated in 1995 and it is recommended that the proposed reuse be submitted to Lahontan for discussion of potential WDR changes and requirements before proceeding further with the project.

It is expected that Lahontan will enforce the requirement of making findings to support any discharge to groundwater that is of lesser quality than the receiving water through a Groundwater Non-Degradation Analysis. Nitrogen is of primary concern in this study. From the limited data available, it is expected that the receiving water (groundwater) has concentrations of nitrogen that are less than 0.5 mg/L. From recent sampling it was found that Nitrate Nitrogen loading in the effluent from the CBP WRRF is approximately 2.6 mg/L [3]. However, other constituents, especially ammonia, need to be characterized in the effluent as well. At the time of this study, current effluent samples were not available for review. Therefore, findings must be made to support allowing the existing WRRF discharge to continue. Similar findings must also be made to allow the proposed

new reuse. This analysis will also be required in order to ensure that the project meets all applicable CEQA requirements.

The findings must be in accordance with the Non-Degradation Objective as stated in the Basin Plan: "the existing high quality shall be maintained until or unless it has been demonstrated to the State that any change in water quality will be consistent with the maximum benefit of the people of the State, and will not unreasonably affect present and probable future beneficial uses of such water. Therefore, unless these conditions are met, background water quality concentrations (the concentrations of substances in natural waters which are unaffected by waste management practices or contamination incidents) are appropriate water quality goals to be maintained. If it is determined that some degradation is in the best interest of the people of California, some increase in pollutant level may be appropriate. However, in no case may such increases cause adverse impacts to existing or probable future beneficial uses of waters of the State" [16]

This project will have an overall benefit to groundwater because the reuse of effluent will most probably remove more nitrogen than the existing method of disposal by percolation through the proposed agronomic reuptake of nutrients through irrigation. However, it is unknown if Lahontan will determine that this step towards reducing nitrogen is sufficient to allow the proposed manner of reuse. Communication with Lahontan and the eventual application for new and revised WDRs will determine the actual findings and Waste Discharge Requirements. The following is a list of anticipated satisfactory and unsatisfactory responses that Lahontan may provide regarding key elements of the proposal:

- Economics and the economic impact to the area of providing additional nitrogen removal.

  Satisfactory Response: The community of Big Pine is disadvantaged and additional nitrogen removal beyond what is proposed would be an economic hardship.
  Unsatisfactory Response: Sewer rates within Big Pine are reasonable and the Community can afford additional nitrogen removal above what is proposed.

- The technical feasibility of additional nitrogen removal.

  Satisfactory Response: The proposed summer reuse satisfactorily achieves common methods of nitrogen removal and given the existing treatment works and winter climate additional nitrogen removal prior to disposal through the evaporation / percolation ponds is not reasonably technically feasible.
  Unsatisfactory Response: Modifications of the WRRF are, although difficult and expensive, technically feasible to achieve much greater

nitrogen removal in the winter and an increased removal in the summer (over reuse alone).

- The potential adverse impacts to groundwater and surface water of not providing additional nitrogen removal.

  Satisfactory Response: The existing groundwater monitoring wells show no significant nitrogen increases and the proposed reuse will only lessen this impact, if any.

  Unsatisfactory Response: Even though the monitoring wells show no significant increase it is believed that the effluent reaching groundwater is degrading the groundwater.

The future WDR for the reuse may include the following.

- Monthly and/or quarterly analysis of the applied water for chemical constituents during the period of reuse. These are in addition to the analysis required by the existing WDR of the District.
- Depending upon the method of reuse up to daily analysis of bacteria and pathogens during the period the effluent is used (not anticipated for the proposed manner of application via subsurface drip).
- Depending upon the method of reuse up to continuous monitoring of chlorine residual and turbidity during the period of reuse (not anticipated as disinfection is not being proposed).
- Up to several groundwater monitoring wells sampled on an up to quarterly basis for chemical constituents.
- Fencing and/or posting of the reuse sites.
- Flow reporting.
- Possible additional reporting requirements that estimate the nitrogen and hydraulic loading as well as nitrogen uptake of the reuse.

3.9 CDPH Regulations and Requirements

The California Department of Public Health (San Bernardino Office for the Big Pine area) regulates public health concerns with respect to effluent reuse. They follow the Water Recycling Criteria as contained in Sections 60301 through 60355, inclusive, of the California Code of Regulations, Title 22 and require an engineering report for the production, distribution and use of recycled water. There are review fees assessed by CDPH for the review of the report. This report will be prepared as part of the final engineering design but for this feasibility study it is important that the proposed reuse follow the criterion. There are different criterion depending upon the manner of reuse and exposure to the public. A summary of the criterion is presented in Table 4.

Table 4 Matrix Summary of Reuse Regulations

	Undisinfected secondary	Disinfected secondary - 23	Disinfected secondary – 2.2	Disinfected tertiary -2.2
Additional Treatment of Existing Effluent	No additional treatment	Chlorination and daily coliform bacteria testing	Chlorination and daily coliform bacteria testing	Filtered, Chlorinated and daily coliform bacteria testing w/continuous turbidity monitoring
Irrigation Uses	No food crops, no milking animals allowed	No food crops but milking animals ok	Above ground food crops ok if no sprinkler irrigation	All uses, posting required
Access Restrictions	No public access within 14 days after irrigation, no school yards, or parks. Only flood irrigation or drip, no spray irrigation.	Controlled Public access ok, including cemeteries and golf courses. No playgrounds or school yards. No spray irrigation within 100' of residence, school or playground.	Controlled Public access ok, including cemeteries and golf courses. No playgrounds or school yards. No sprinkler irrigation within 100' of residence, school or playground	All access including school and playground ok. Sprinkler Irrigation ok.
Operation and Maintenance	least O&M	Medium O&M	Higher O&M cost	Highest O&M
Application method	Flood irrigation	Flood or spray with limitations	Flood or spray with limitations	Flood or spray
Expected Operator Certification Level	Grade 1	Grade 1or 2	Grade 1or 2	Grade 3

4 Preliminary Alternatives for Reuse

A number of alternatives were investigated and evaluated as potential uses for recycled water reuse, a preliminary qualification matrix of these alternatives is shown in Appendix 3. Much of the qualification criterion is self-explanatory, however some specific criterion is described below.

- Simplicity of Reuse Operations – The persons operating the irrigation systems will have to be aware of and comply with the requirements of Lahontan and CDPH as well as have some knowledge and experience with piping and control systems. Therefore, a simpler reuse system is preferred.
- Operator certification – A higher operator certification is more difficult to acquire and may not be available locally.
- Capital Costs for Distribution - Effluent will be piped to the reuse area and the piping cost is significant. These costs also include the irrigation system.
- Operation and Maintenance Costs – Higher levels of treatment and complex distribution systems will increase the annual costs for maintaining the system.

5 Recommended Alternative for Reuse

The Preliminary Alternatives for Reuse are listed in Appendix 3. Each alternative was considered and ultimately one alternative was selected from the preliminary alternatives. This alternative involves pumping recycled water to LADWP lands located about 0.5 miles south of the BPCSD WRRF for use in subsurface drip irrigation (SDI) of native plant species. The selection of this alternative was based on the following conclusions made by stakeholders present during the preliminary evaluation:

- LADWP is under a state mandate to revegetate select parcels throughout the Big Pine area determined to be barren of any native plant growth. This mandate determined that the identified parcels have been impacted by ground water utilization due in part to aquifer pumping activities. LADWP had been directed to revegetate the parcels with native vegetation, the stakeholders anticipate that LADWP will require a source of water for irrigation and that the recycled water available at the WRRF will adequately meet much of the demand for revegetating activities at this location. If LADWP is receptive to the use of recycled water for this application, the stakeholders would seek to enter into a “water trade” agreement with LADWP and trade use of the recycled water from the WRRF for access to other sources of surface water or treated water in the Big Pine area in amount commensurate for beneficial uses elsewhere. The anticipated use of this water would likely be to accomplish one of the other preliminary alternatives included with this report.

- The LADWP revegetation area exists within the same parcel as the WRRF, therefore the total distance required to pump recycled water to a feasible reuse area would be significantly reduced when compared with other proposed alternatives.
- The Title 22 Requirements for SDI are much less restrictive than those of other proposed alternatives. Recycled water would only be required to be treated to secondary treatment levels, no tertiary treatment or disinfection would be necessary. As the WRRF already produces recycled water treated to secondary standards, construction of additional infrastructure at the WRRF would not be required. Additionally, the operational and maintenance costs will be significantly reduced as the proposed alternative will have a relatively low impact to these costs as compared with other proposed alternatives.

5.1 Reuse of Undisinfected Effluent for Irrigation at LADWP Revegetation Area

With this alternative, only secondary treatment (oxidation) is required to meet Title 22 requirements. That means that disinfection of the recycled water will not be required for this type of application. However, certain administrative controls will be necessary to maintain compliance with these requirements. Reuse water must not be aerosolized, such as sprayed for aboveground irrigation, in order to avoid the possibility of undisinfected water being carried outside the designated reuse area by strong wind events. Fencing and signage will also be required around the boundary of the irrigation area to inform the public that un-disinfected recycled water is being utilized for irrigation and public access is restricted. Because the water will be supplied subterraneously, workers at the site will have very little exposure to the recycled water. While not required, basic personal protective equipment (PPE) is recommended for workers during repairs to the system where contact with recycled water is possible. The recommended PPE is limited to gloves and safety glasses.

The preliminary design was based on a conservative design flow of 70,000 gallons per day, the available flow may be as great as 80,000 gallons per day. The actual design flow will be determined upon final design of the system.

Recycled water at a continuous flow rate of ±50 GPM will be withdrawn from the southern oxidation pond and pumped to the 160-acre LADWP Revegetation Area where it will be continuously reused for Subsurface Drip Irrigation (SDI). The SDI system will initially be able to irrigate up to approximately 100 acres of area for distribution, utilization of the entire 160 acres is not being considered as this would require bridging the LADWP freshwater canal. This alternative is illustrated on Figure 6, preliminary design parameters are shown in Table 5.

Table 5 Preliminary Design Parameters

Available Area	110	Acres
Number of Irrigation Zones	6	
Area per Zone	16.7	acres
Total Utilized Area	103.7	acres
% of Total Area Available	94.2%	0.00
Available Flow	70,000	GPD
	48.61	GPM
Flushing Velocity	1.5	FPS
Dosing Period per Zone	1	hr
Doses per Day	4	
Total Daily Dosing Period	4	hr
Total System Volume	47,905	gal
Hazzen Williams C	150	
Total Elevation Change	12	ft

5.2 Treatment and Application (Pumping) System

No additional treatment or disinfection will be required for this alternative as the irrigation application method requires only undisinfected secondary-treated recycled water. Effluent will be pumped from the oxidation pond via a submersible booster pump as shown on Figure 7. Using the oxidation pond as the source of reuse water is preferable as it will act as an equalization basin and allow for consistent dosing to the distribution area. The booster pump will be a 5 horsepower (hp) centrifugal pump that will boost the pressure to approximately 50 psi at 48.6 gallons per minute. This pump will be equipped with a soft start so that it speeds up slowly and does not create hydraulic surges in the system. Further, the pump will have an automatic shut down if the pressure should exceed a set value. This is necessary should there be a malfunction in a downstream automatic valve or the irrigator discontinue reuse without shutting down the pump first.

A flow meter will be installed on the effluent line downstream of the pump to record the flows. The pressure in the pipeline will be approximately 50 psi at the booster pump and decrease to approximately 5 psi at the southeast end of the reuse area, a lower pressure is acceptable because there will be no sprinklers in the system. The pump will be stationed either within a wet-well adjacent to the oxidation pond, or directly within the pond utilizing a rail system and cat-walk to allow access for maintenance needs. During the winter it is expected that the system will be drained to prevent freezing.

While it will increase the capital cost, a redundant supply pump is recommended. This will afford for a more resilient system as the backup pump will be readily available in the event that the primary pump fails. Should there be a in the piping system, reuse will stop until the condition is corrected. As this system can withstand brief shutdowns, no backup power is proposed and therefore in a power outage reuse will also stop until power is restored. In either scenario, flow would then continue from the oxidation ponds to the percolation ponds for disposal until the irrigation system is placed back into service. Disruption to reuse operations during a prolonged shutdown may be avoided by installing a camlock fitting on the distribution system adjacent to the Big Pine Canal and using a bypass-style diesel fired centrifugal pump to withdraw water from the Canal and discharge it into the distribution system through the camlock. This approach would also provide a good opportunity for flushing the system with fresh water should an accumulation of salts or other mineral scaling/deposition occur at the drip emitters.

Following the pump, flow will pass through a self-cleaning disk filter containing a 100-micron filtration media, followed by flow and pressure gauges. This will ensure that debris and sediment are precluded from the distribution system to avoid clogging of the emitters and inefficiency in the irrigation system.

5.3 Distribution System

The distribution system will consist of a 7,000-lineal foot 4-inch diameter force main that will direct flow from the pump to the distribution area directly south of the WRRF as shown on Figure 6. Because there is no need for a chlorine contact period the force main may be 4 inches in diameter. The distribution system will run north to south and distribute flow into six parallel irrigation zones. The force main will require additional easements in order to cross LADWP land before reaching the reuse area.

A 4-inch return line will be installed along the south side of the revegetation area and run from south to north. This line will run parallel to the influent distribution line and ultimately discharge excess flow back into the oxidation pond. The purpose of the flush line will be to allow excess flow to return to the oxidation pond during flushing events.

In order to minimize impacts and reduce ground disturbance, both the supply and return lines are expected to be installed via horizontal direction drilling (HDD). HDD is a trenchless technology that does not require ground disturbance for lineal utility construction except for two small pits where the bore enters and exits the ground. The entry pit where the bore will begin will be positioned within the BPWRRF boundary, and the receiving pit will be positioned onsite near the point of connection to the irrigation system where the ground has been previously

disturbed by drill seeding activity. This method will also allow for installing the proposed pipelines below the Big Pine Creek return (between the BPWRRF and BPPT's WRRF) to the Owens River without any disturbance of the creek or riparian areas. It is estimated that the bore will pass below the flowline of the creek by a minimum depth of 10 feet, as this is typical to avoid oversaturated soil conditions at the interface between surface water and subsurface shallow groundwater.

A separate, larger submersible pump will be installed to facilitate flushing events. The flush pump will be rated at 22 horsepower and will provide 150 psi at 207 gallons per minute of flow. It is expected that flushing events will occur on a monthly basis, or as often as needed depending upon the system performance. Preliminary design parameters for the distribution system are shown on Table 6.

Table 6 Distribution System Preliminary Design Parameters

Parameter	For Regular Flow		For 1.5 FPS flushing velocity in Lateral	
Emitter				
Number of Drippers	41		41	
Dripper Spacing	10	ft	10	ft
Dripper Flow Rate	0.40	GPH	0.03	GPM
Dripper Spacing	120	inches	120	inches
Lateral				
Number of Laterals per zone	180		180	
Lateral Diameter	0.56	in	0.56	in
Lateral Spacing	10	ft	10	ft
Lateral Length	405	ft	405	ft
Total Lateral Length	437,500	ft	437,500	ft
Lateral Flow Rate	0.27	GPM	1.15	GPM
Lateral Velocity	0.35	ft/s	1.5	ft/s
Frictional Losses	0.6	ft	8.7	ft
Distribution Line				
Distribution Line Diameter	4	in	4	in
Distribution Line Length per Zone	1,800	ft	1,800	ft
Total Distribution Line Length	10,802	ft	10,802	ft
Distribution Line Flow Rate	48.6	GPM	207.3	GPM
Distribution Line Velocity	1.24	FPS	5.29	FPS
Frictional Losses	2.8	ft	40.4	ft
Influent Line				
Influent Line Diameter	4	in	4	in
Influent Line Length	6,615	ft	6,615.00	ft
Influent Line Flow Rate	48.6	GPM	207.3	GPM
Influent Line Velocity	1.24	FPS	5.29	FPS
Frictional Losses	10.1	ft	148.6	ft
Flush Line				
Flush Line Diameter	4	in	4	in
Flush Line Length	7,020	ft	7,020	ft
Flush Line Flow Rate	0	GPM	158.7	GPM
Flush Line Velocity	0	FPS	4.05	FPS
Frictional Losses	0	ft	96.1	ft
Totals				
Total length of 4" Pipe	24,437	ft	24,437	ft
Total length of dripline	437,500	ft	437,500	ft
Total System Friction Losses	13.5	ft	293.9	ft

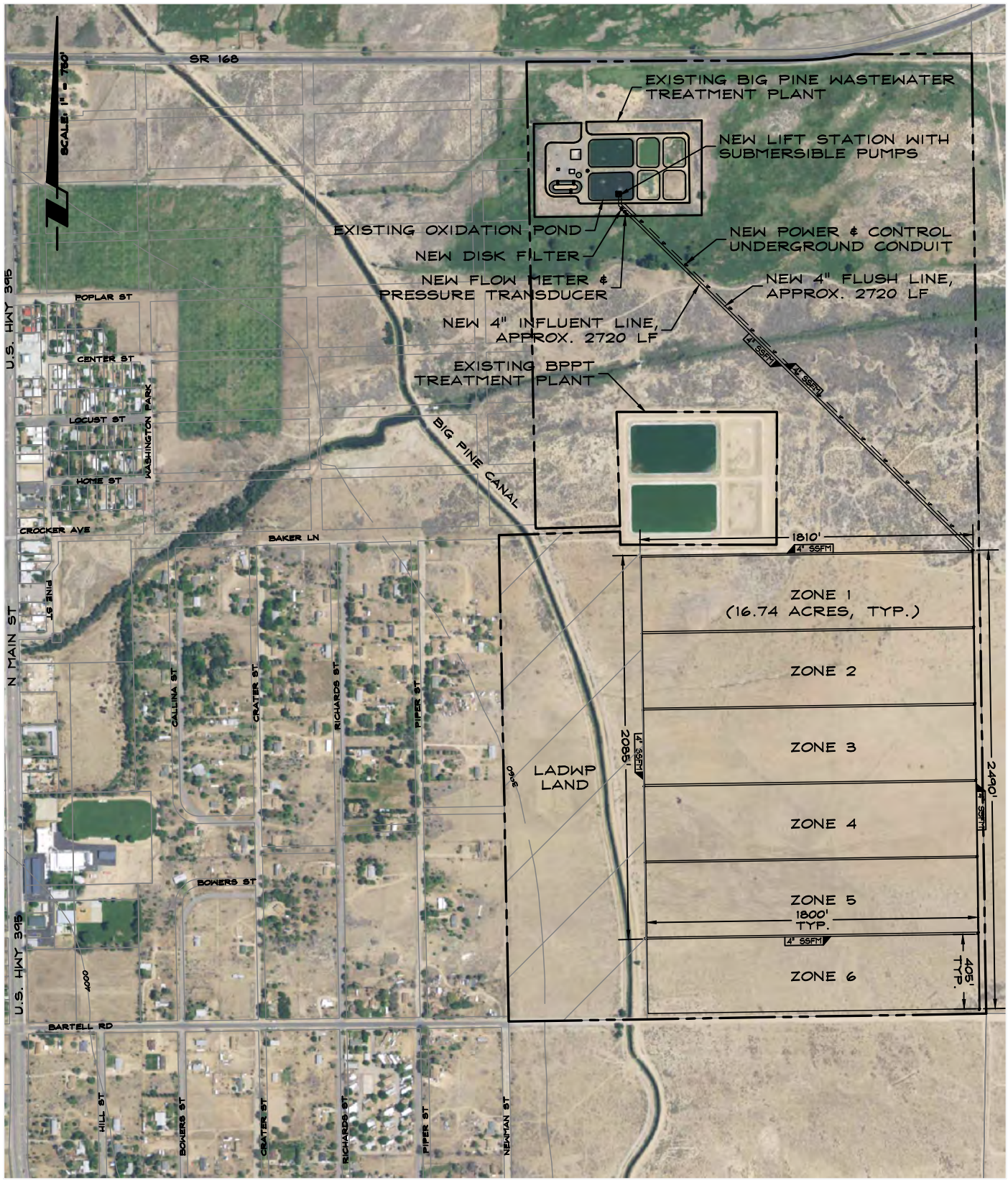

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FIGURE 5
PROJECT MAP
FEASIBILITY STUDY - BIG PINE

2521-001 11/22/17

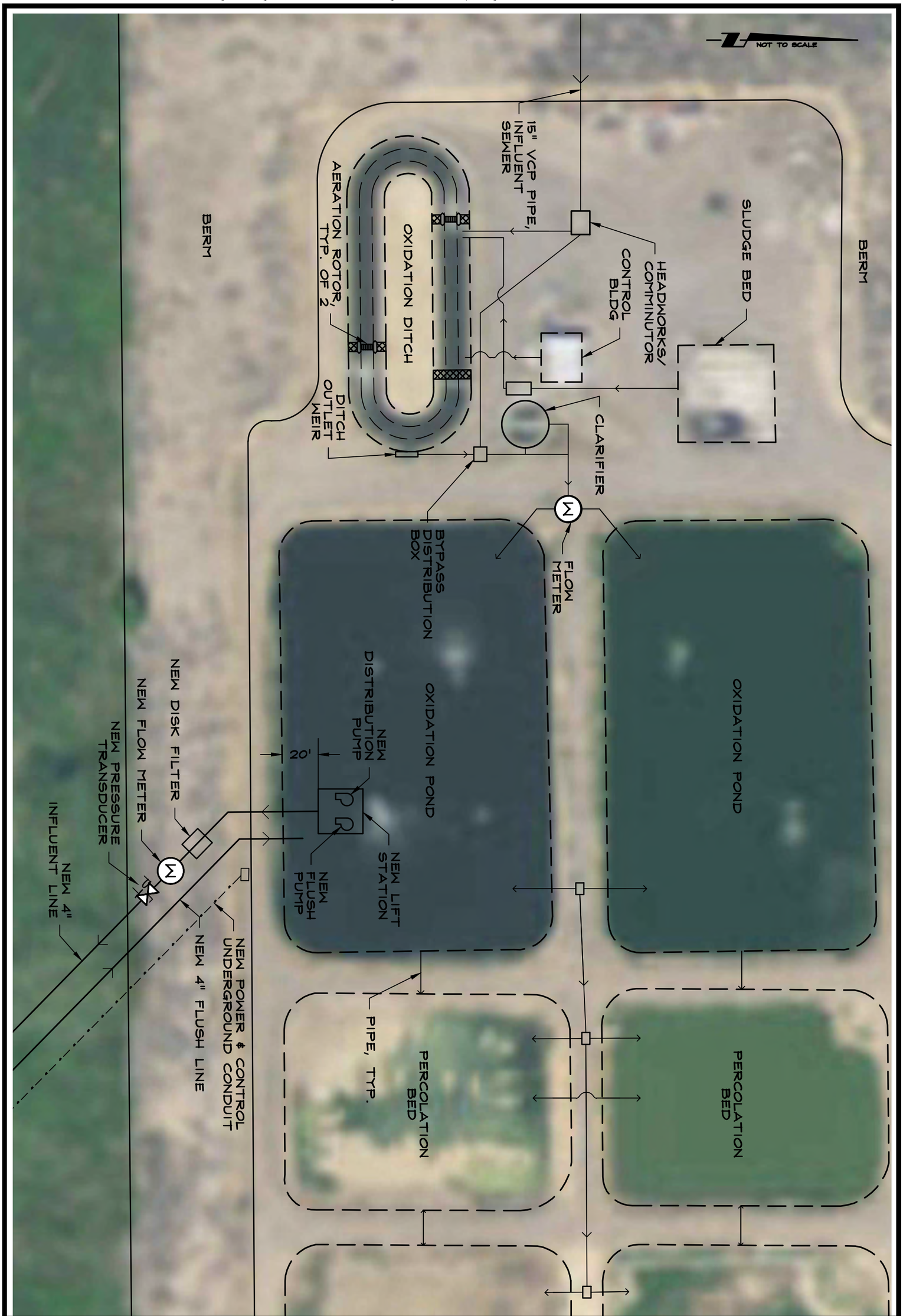

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FIGURE 6
WRRF PUMP STATION
FEASIBILITY STUDY - BIG PINE

2521-001 11/22/17

5.4 Irrigation System

Flow will be directed to one of three SDI zones as shown on Figure 8. The flow direction will be controlled by a system of automatic solenoid valves which will alternate between zones based on either a 4-hour dosing period per zone or four 1-hour dosing periods distributed throughout the day. Each zone consists of an 1,800-lineal foot 4-inch distribution line conveying flow into 180 driplines arranged in parallel, each running about 405 feet in length. The drip lines will be rated at 0.4 gallons per hour in order to maximize the area being irrigated. Orifices along the dripline will be spaced at 10 feet and laterals will be spaced at 10 feet, with each orifice irrigating approximately 3 square feet.

The return line will be equipped with two manual gate valves located at the northeast corner of the distribution area. During normal operations any excess flow available at the end of the dripline will be looped back into the system for redistribution. During flushing events, the redistribution valve will be closed, and the return valve opened to allow flow to return to the oxidation pond. Each zone will be equipped with air release valves both prior to the driplines as well as at the end of each dripline group in order to purge air from the lines during each dosing. Check valves will be installed along the receiving flush line to prevent backflow into any of the SDI zones.

Should the recycled water irrigation system be out of service, the only reasonable alternative would be to divert flow through a mobile pumping system using a camlock connection point installed after the primary pump system as described in Section 5.2 above. Water could potentially be supplied from the Big Pine Canal or from a water truck, although the latter offers limited capacities typically less than 5,000 gallons. The Big Pine Canal as an alternative (temporary) source of water offers the distinct advantage of potentially being able to provide enough water to both operate the system for irrigation as well as to flush the entire system, while a water truck would not be able to irrigate the system or flush the whole system. Potentially a water truck could be used to flush individual zones of the system as each zone has a distribution and lateral pipe volume of about 2,100 gallons.

A properly signed fence will be required around the reuse area to exclude the public. It is expected that the public may be allowed access to the reuse site 14 days after irrigation similar to Title 22, Section 60304, d, 3 that allows public access to Christmas tree farms 14 days after irrigation with recycled water. This means that the public could potentially access the site during the months of October through February, depending on the actual irrigation season dates. Prior to proceeding with this alternative this should be verified with the California Department of Public Health that this is also their interpretation.

4" FLUSH LINE

RETURN GATE VALVE

2495'

4" RETURN DISCHARGE LINE

4" CHECK VALVE, TYP.

5'

AIR RELEASE VALVE, TYP.

4" INFLUENT LINE

4" COLLECTION LINE

4" DISTRIBUTION LINE

1810'

ZONE 1 | ZONE 2 | ZONE 3 | ZONE 4 | ZONE 5 | 1800' TYP. ZONE 6

ADJACENT LINES IN COMMON TRENCH, TYP.

10' TYP.

10' TYP.

LATERALS PER ZONE:180
EMITTER SPACING:10'
LATERAL SPACING:10'
LATERAL LENGTH=405'

405' TYP.

POWER & CONTROL UNDERGROUND CONDUIT, IN COMMON TRENCH

4" INFLUENT LINE

5'

4" SOLENOID VALVE, TYP.

2085'

NOT TO SCALE

FIGURE 7
SUBSURFACE DRIP IRRIGATION SYSTEM FEASIBILITY STUDY - BIG PINE

11/22/17

2521-001

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5.5 Photovoltaic System at WRRF

Included with this alternative is the option to incorporate a Photovoltaic System Solar Array that will supplement the current power supply to the WRRF. The average annual electricity usage of the existing WRRF is approximately 191,500 kilowatt hours (kWh) [3]. The additional 2 horsepower irrigation pump operating 365 days a year at 35 kWh would create an additional electrical demand of approximately 12,780 kWh, resulting in an approximate total demand of 204,280 kWh. The total array production is estimated at 203,951 kWh which will provide approximately 99.8% of the existing WWTP electricity usage. Alternative 5.1 has a budgetary capital cost of $1,538,100 and a budgetary annual O&M cost of $6,169 as discussed in Section 6.1 below. At current power costs of 0.13 $/kWh, this will save approximately $25,983 per year for a net savings after considering O&M costs of approximately $19,814 per year. This savings may be reallocated by Inyo County as determined in agreements concerning the operation of this project. Appendix 4 includes preliminary solar design and production parameters.

5.5.A System Parameters

The solar array nodules will be will be installed to ensure that the maximum amount of solar radiation exposure is achieved throughout the year, a summary report of this design is included in Appendix 4. Nodules will be positioned with panels facing directly south, the array will be ground mounted with a fixed panel tilt of 36 degrees. The system will consist of approximately 500 solar modules with 4 modules per column, depending on the type of model selected. Each module will have a horizontal width of approximately 10 feet, each row of modules should be spaced at approximately 20 feet to avoid shading. To achieve the stated solar power generation, a total area of approximately 25,000 square feet would be required at location to be determined upon final design.

5.6 Title 22 Applicability

It may be possible to avoid Title 22 requirements by identifying the disposal area as a wastewater discharge site rather than a recycled water irrigation reuse site. This change would only be an administrative change, the actual method of effluent dispersion and disposal would remain the same. The benefit of this strategy is that meeting the more restrictive controls listed under Title 22 would not be required, such as posting signage or maintaining a fenced perimeter. The potential disadvantages may include:

1. LADWP does not recognize the wastewater disposal area as a form of reuse irrigation. It is possible that LADWP will require the site to be managed under Title 22 in order for it to meet their legal requirements for revegetating the parcel with native vegetation.

2. The project could not publicly be described as a "recycled water" project, since it is not technically defined as such under its operational permit. It would not be possible to use the project for promotional purposes.

3. Monitoring wells and periodic sampling will likely be required.

Because this project is ostensibly a recycled water project that may serve as a template for other future projects, it is recommended to comply with Title 22 as the advantages do not appear compelling enough to forgo identification as a recycled water project.

This alternative is expected to require only a Grade 1 WWTP operator. The operator will check the system daily during operations. The daily inspections will at minimum include verifying the level in the oxidation pond is no more than 6 inches below the full level, the pump is operating acceptably, and there is no runoff. There will be no daily testing but occasional (possibly quarterly or monthly) testing may be required by the WDR. The operation of the system will require electrical power and there will be repairs and maintenance items.

5.7 Additional Requirements

If the project is determined feasible, several steps will need to be completed before construction may begin. A hydraulic study of the LADWP parcel will be required in order to determine existing soil quality. This study must include infiltration testing to confirm the hydraulic conductivity of the soil in order to apply an appropriate hydraulic loading rate. An investigation must also be conducted to determine the maximum spacing tolerance allowed between plantings in order to establish an effective uniform root system. The plant spacing must also be assessed to determine if the resultant plant canopy is sufficient to meet the revegetation requirements under the State mandate for revegetating.

The project will need to be submitted to an experienced environmental consultant for an appraisal of potential environmental concerns and ultimately for CEQA documentation and compliance. It will also be necessary to determine potential Title 22 requirements, and the findings of this review will be incorporated in a full Title 22 Report.

5.8 Environmental Mitigation (1991 EIR Impact 10-19)

As previously discussed, the area proposed for the application of recycled water consists of about 100 acres and is situated on the southern half an LADWP-owned parcel (APN 018-090-19). The parcel description is more or less the eastern half of Section 17, Township 9 South, Range 34 East, MDBM. The proposed reuse area is bounded to the south by Bartell Road. The BPPT's treatment facilities are located directly north of the reuse are, with the BPPT Reservation forming the southwestern boundary. The Big Pine Canal transects the open space of the southern half of the parcel dividing the land area into two distinct areas with about 125 acres east of the canal (where the recycled water is proposed for application) and 35 acres to the west of the canal. Presently, in its unstabilized and bare soil condition, this area is a source of nuisance dust from wind driven erosion affecting both the tribal members residing on the Reservation as well as the residents of the town of Big Pine.

This southern portion of the parcel, which consists of about 160 acres, has been previously identified as a mitigation project in the 1991 Environmental Impact Report (1991 EIR) that resulted from CEQA litigation that commenced in 1972 following completion of the Second Los Angeles Aqueduct in 1970. That document resulted in identification of a number of mitigation projects and efforts which, after completion of the 1997 Memorandum of Understanding (MOU) between LADWP and Inyo County[3], were refined to a total of 64 mitigation projects dispersed throughout the Owens River Valley. The 160-acre area is known as *1991 EIR Impact No. 10-19 (Impact 10-19)*, which is part of the larger project area referred to as the Big Pine Area Revegetation Project.

As required by the MOU, both LADWP and Inyo County are responsible for preparing annual reports on the environmental condition of the identified mitigation projects, as well as the environmental condition of the Owens Valley. The 2016-2017 report prepared by Inyo County lists project Impact 10-19 as having been "fully implemented but not meeting goals" (p. 104) [17]. LADWP in their 2017 annual report similarly lists the project as "fully implemented but not meeting goals" (p. 3-6). Also noted in the 2017 report LADWP has described the project as being previously fenced in 1998, with permanent vegetation transects established in 1999. Drill seeding was further accomplished over portions of the site in 2011, 2014, and 2015/2016. The LADWP report lists the seed germination from the 2015/2016 seeding as "largely successful" and that "natural

[3] Together with Inyo County were several other groups represented in the MOU, including California Department of Fish and Game, California State Lands Commission, the Sierra Club, the Owens Valley Committee, and Carla Scheidlinger.

recruitment" was occurring along the boundary of the site. However, the native perennial vegetal cover for the project area was listed as just 2% and therefore "not yet attaining goals" (p. 3-6) [18].

It is expected that, while the native plants that were previously drill seeded on the project site may be sustained in ideal conditions primarily from precipitation as described in Section 3.6, the availability of a consistent water source through the growing season will provide the necessary conditions for establishment of more native vegetation through adequate root extension and development across a larger portion of the parcel and help the project to attain its stated goals. This approach, *viz. the application of recycled water for environmental restoration*, is consistent with both the 1991 EIR mandate for the project area as well as the California Recycled Water Policy [19]. As the recycled water identified from the project is locally sourced and the current disposal method is of limited value to surrounding native growth[4], implementation of the project is expected to provide a cost effective and efficient means of meeting the goals for Impact 10-19 and could serve as a template for implementing solutions to other existing 1991 EIR Impacts in the Owens Valley where project goals are not being met.

6 Project Costs

6.1 Construction and Capital Improvement Costs

The construction cost of this alternative is estimated to be $1,538,100 as detailed in Table 7 with an annual O&M cost estimated to be of $6,169 annually, as detailed in Table 8.

[4] Refer to discussion in Section 3.2.

Table 7 Preliminary Estimate of Probable Costs

ENGINEER'S PRELIMINARY ESTIMATE OF PROBABLE COSTS R O Anderson

Client:	**INYO COUNTY**	**Estimated:**	**JEL**
Project:	**Feasiblity Study for Recyled Water Use in Big Pine**	**Checked:**	
Description:	**Cost Estimate for Subsurface Drip Irrigation of 100± Acres**	**Date:**	**21-Nov-17**
File:	**Y:\Client Files\2521\2521-001\Documents\[Project Decision Matrix.xlsx]High Scores**		

DIVISION 1 - GENERAL REQUIREMENTS

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	Mobilization, Demobilization, BMPs, Testing, General Requirements	1	Lump Sum	9	/%	$109,200
2	Site Restoration, Seeding and Stabilization	1	Lump Sum	$15,000.00	/LS	$15,000
					SUB TOTAL	**$124,200**

DIVISION 5 - METALS

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	Site Fencing at Application Area	1730	Lineal Feet	$11.00	/LF	$19,000
					SUB TOTAL	**$19,000**

DIVISION 26 - ELECTRICAL

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	Conduit, Conductors, Junciton Boxes and Appurtenances	5000	Lineal Feet	$15.00	/LF	$75,000
2	Lift Station Controller, Backflush Valve and Solenoid Valve Controllers	1	Lump Sum	$25,000.00	/LS	$25,000
					SUB TOTAL	**$100,000**

DIVISION 31 - EARTHWORK

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	Planting	100	Acres	$150.00	/AC	$15,000
2	Clear and Grub, Tilling	100	Acres	$1,500.00	/AC	$150,000
					SUB TOTAL	**$165,000**

DIVISION 33 - UTILITIES

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	4-inch HDPE Force Main Piping, Couplings, Connections, Appurtenances	30000	Lineal Feet	$20.00	/LF	$600,000
2	Drip Tape	437500	Lineal Feet	$0.54	/LF	$236,300
3	Irrigation System Valving, Solenoid and Isolation Valves	1	Lump Sum	$25,000.00	/LS	$25,000
					SUB TOTAL	**$861,300**

DIVISION 43 - LIQUID HANDLING & EQUIPMENT

ITEM	DESCRIPTION	QUANTITY		UNIT COST		TOTAL
1	Disk Filter	2	Each	$7,500.00	/EA	$15,000
2	Flow Meter	2	Each	$1,500.00	/LS	$3,000
3	Booster Pump Package Lift Station	1	Lump Sum	$50,000.00	/LS	$50,000
					SUB TOTAL	**$68,000**

CONSTRUCTION SUB TOTAL	**$1,337,500**
CONTINGENCY AT 15%[1]	**$200,600**
ENGINEERS PRELIMINARY ESTIMATE OF PROBABLE COSTS	**$1,538,100**

[1] Contingency is for missed items as a full design has not yet been completed.

6.2 Operation and Maintenance Costs

Estimated operation and maintenance costs are included in Table 8 below.

Table 8 Preliminary Estimate of Increase in O&M Costs

ENGINEER'S PRELIMINARY ESTIMATE OF INCREASE IN O&M COSTS

Client:	**Inyo County**	**Estimated:**	**JEL**
Project:	**Feasibility Study for Recycled Water Use in Big Pine**	**Checked:**	
Description:	**O&M Costs to Operate up to 100 Acres of Irrigated Re-greening via Subsurface Drip**	**Date:**	**11/21/2017**
File:	**Y:\Client Files\2521\2521-001\Documents\[Project Decision Matrix.xlsx]High Scores**		

GENERAL		
Construction Cost	$ 1,538,100	Construction Costs
Flow	0.07	MGD
UNIT COSTS		
Energy Cost	$ 0.14	/kWh
Labor, Including Benefits	$ 50	/Hr.
Laboratory Compliance Testing	$ 100	/Test
CRITERION / BASIS		
Labor for Operation of Irrigation System	2	Hours Per MGD Per Day
Oxidation ditch Sludge Production (Dry Ton)	1.0	Tons/MGD/Day
Maintenance and Repairs	1%	of Construction Cost per Year
Electrical Energy	500	kWh/MGD/Day
Laboratory Compliance Testing	1	Test Per Month

LIFE CYCLE COSTS

		CRITERION / BASIS				
ITEM	**DESCRIPTION**	**QUANTITY**		**UNIT COST**		**Total**
1	Labor	2	Hours Per MGD Per Day	$ 50	/Hour	$ 2,555
2	Maintenance and Repairs	0.50%	Equip. Cost	$ 125,000	/LS	$ 625
3	Electricity for Pumping & Solenoid Valve Actuation	500	kWh/MGD/Day	$ 0.14	/kWh	$ 1,789
4	Laboratory Compliance Testing	12	/Year	$ 100.00	/Test	$ 1,200
Additional Annual Irrigation O&M Cost Estimate						**$6,169**

6.3 Lifecycle Costs

It is prudent to consider life cycle costs which are the present value of the cost of a capital improvement project throughout its useful life. This includes the capital cost as well as future operation, maintenance, rehabilitation, and replacement costs that are discounted to present value based upon an assumed discount rate. Generally, a project's life cycle is selected as the expected life of the longest-lived components of the system. In this case it is the life of irrigation pipelines that are assumed to be 50 years. For this project, an additional consideration for life cycle costs is the expected time frame for the project to be successful. Based upon conversations with Inyo County Department of Water, it is anticipated that approximately 40 years will be required to establish self-sustaining native plant cover to a degree necessary to accomplish the mitigation efforts. Therefore, the design life of 50 years for this system is appropriate for

the intended results. The discount rate used in this analysis is 1.4% which is the expected real interest after accounting for inflation[5].

Table 9 below calculates the life cycle cost of the preferred alternative. The unit costs and much of the criterion are estimated from experience, various vendors and references. The estimated electrical energy use is calculated based upon typical operational parameters for the specific process.

Life cycle costs consider only the additional work to operate and maintain the new irrigation system and not existing operations such as screening, primary or secondary treatment, or collection system maintenance. The estimated costs of the major expenses associated with this project are listed and then the future expenses are calculated based upon the expected future flow rates and discounted based upon the discount rate.

Table 9 Preliminary Estimate of LiIfe Cycle Costs

ENGINEER'S PRELIMINARY ESTIMATE OF LIFE CYCLE COSTS

Client:	**Inyo County**	**Estimated:**	**JEL**
Project:	**Feasibility Study for Recycled Water Use in Big Pine**	**Checked:**	
Description:	**O&M Costs to Operate up to 100 Acres of Irrigated Re-greening via Subsurface Drip**	**Date:**	**11/21/2017**
File:	**Y:\Client Files\2521\2521-001\Documents\[Project Decision Matrix.xlsx]High Scores**		

GENERAL		
Life Cycle	50	Years
ADF Year 0	0.07	MGD
ADF Year 50	0.08	MGD
Annual Increase in Flows	0.003%	
Real Interest Rate (from Office of Management and Budget)	1.40%	
UNIT COSTS		
Detailed Design, Contract Administration, Inspection	25%	Of Construction Costs
Energy Cost	$ 0.14	/kWh
Labor, Including Benefits	$ 50	/Hr.
Laboratory Compliance Testing	$ 100	/Test
CRITERION / BASIS		
Additional Labor For Operation	2	Hours Per MGD Per Day
Maintenance and Repairs	0.5%	of Equipment Costs per Year
Electrical Energy	500	kWh/MGD/Day
Laboratory Testing	1	Test Per Month

LIFE CYCLE COSTS

ITEM	DESCRIPTION	CRITERION / BASIS QUANTITY		UNIT COST		PRESENT VALUE OF 50
1	Construction	1	Lump Sum	$ 1,538,100	LS	$ 1,538,100
2	Detailed Design, Contract Administration, Inspection	15%	Const. Cost	$ 1,538,100	LS	$ 230,715
3	Labor	2	Hours Per MGD Per Day	$ 50	/Hour	$ 99,363
4	Maintenance and Repairs	0.5%	Equip. Cost	$ 125,000	LS	$ 31,230
5	Electricity	500	kWh/MGD/Day	$ 0.14	/kWh	$ 69,554
6	Laboratory Testing	12	/Year	$ 100.00	/Test	$ 59,962

ITEM	DESCRIPTION	USEFUL LIFE		TOTAL COST	ANNUAL COST	PRESENT VALUE OF 50 YEAR LIFE
7	Replace: Solenoid Vavles; Controls	15	Years	$ 50,000	$ 3,333	$ 166,560
8	Replace: Pumps; Filters	20	Years	$ 27,500	$ 1,375	$ 68,706
9	Replace: Drip Tape	35	Years	$ 236,300	$ 6,751	$ 337,356
50 YEAR LIFE CYCLE COST ESTIMATE						**$2,601,547**

[5] From Office of Budget and Management, Circular A-94, Appendix C, Revised December 2014

6.3.A Solar Power Cost Impacts

At this time, the potential impacts of solar power generation and its associated potential revenue have not been considered with respect to lifecycle costs. It is expected that the operation and maintenance costs, together especially with the costs of energy for the project, will be reduced or perhaps completely offset by implementing solar power generation. Preliminary projections for solar generated revenue are approximately valued at about $28,000 annually, based upon an assumed solar yield of up to 216,364 kWh annually and an assumed average cost of $0.13/kWh. The 50-year lifecycle cost, neglecting O&M or equipment replacement for the solar array itself, is estimated at just over a million dollars. This potential revenue would be sufficient to mitigate all costs other than the capital (construction) cost for the project, including O&M, energy consumption, and equipment replacement. For these reasons it will be necessary to further evaluate the potential inclusion of solar generation in the project as it is expected to improve the viability of the project and make it economically more feasible.

7 Conclusions and Recommendations

Presently the community of Big Pine produces up to 80,000 GPD (78 Acre-feet) at average daily flow of secondary treated wastewater that is presently disposed of via percolation and evaporation processes at the BPCSD WRRF. An additional 20,000 GPD (22 Acre-feet) of primary treated wastewater are produced at the BPPT Reservation and disposed of at the BPPT WRRF via evaporation, however this source of recycle water would need to be treated to a secondary treatment levels at additional cost to the BPPT before it would be eligible for recycled applications. For this reason, the water generated from the BPPT was not considered to be available for reuse in this report. However, these costs could potentially be offset through solar power generation at the BPPT's WRRF.

The water generated from the BPCSD WRRF can be recycled into beneficial use without additional levels of treatment. The preferred alternative consists of application of recycled water via subsurface irrigation techniques at an existing mitigation parcel that has been previously identified for revegetating under a state mandate. The benefit of irrigation for the purposes of revegetating would be the opportunity to propose a "water trade" between the city of Big Pine and the LADWP. The parcel, located ±0.5 miles south of the BPPT WRRF, consists of ±160 acres of area, 103 of which are proposed for irrigation purposes. The proposed method of irrigation would distribute recycled water between 6 zones, each zone receiving four, 1-hour doses distributed throughout the day. This method will irrigate the maximum amount of area possible with the existing available daily flow.

The estimated cost of this alternative includes $1,538,100 for initial construction, $6,100 for operation and maintenance and $2,601,507 for the 50-year life cycle. It is anticipated that grant funding will be secured for the initial cost of construction. Operation and maintenance costs could potentially be offset by constructing a photovoltaic solar array which, if designed as outlined in this study, could potentially offset both the power costs for the WRRF and distribution system, as well as a significant portion of the operation and maintenance costs. The preferred alternative is economically feasible and would provide a beneficial use for the existing amount of recycled water available in the community of Big Pine. At this time, it is recommended that the project move forward for environmental review and a Title 22 Report.

8 References

[1] U.S. Census Bureau, "US Census," 2010. [Online]. Available: https://www.census.gov. [Accessed 22 11 2017].

[2] LADWP, "Recycled Water for Los Angeles," in *Valley Economic Alliance*, LA, 2015.

[3] KASL, "Big Pine Community Services District Wastewater Treatment Plant Engineering Report," 2011.

[4] S. B. Bobbie Lovig, "Meeting Minutes, Board Meeting, October 18,2017," 18 October 2017. [Online]. Available: http://www.bigpinecsd.org/services.html. [Accessed 28 December 2017].

[5] EPA, "Process Design Manual, Land Treatment of Municipal Wastewater," 1981.

[6] R. Farnsworth, E. Thompson and E. Peck, "Evaporation atlas for the contiguous 48 United States, NOAA Technical Report NWS 33," National Oceanic and Atmospheric Administration, Washington, DC, 1982.

[7] P. Stone, G. Dunne, J. Moore and G. Smith, "Geologic Map of the Lone Pine 15' Quadrangle," USGS, Inyo County, CA, 2000.

[8] United States Geological Survey, "Water Quality Samples for Monitoring Well HUC 18090102," 2006.

[9] W. R. Danskin, "Evaluation of the Hydrologic System and Selected Water-Management Alternatives in the Owens Valley, California," U.S. GEOLOGICAL SURVEY, Inyo County, 1998.

[10] Staff, Soil Survey, Natural Resources Conservation Service, "Web Soil Survey," United States Department of Agriculture, [Online]. Available: https://websoilsurvey.sc.egov.usda.gov/. [Accessed 22 11 2017].

[11] California Irrigation Management Information System, "CIMIS Monthy Report - Bishop Staion 35," California Department of Water Resources, 2017.

[12] USDA Soil Conservation Service, Nevada Irrigation Guide, 1981.

[13] D. J. Huntington, "Email Correspondence," Desert Research Institute, Reno, 2017.

[14] LADWP, "BP 160 Draft Revegetation Plan for 1991 EIR (December 2016)," Independence, 2016.

[15] H. R. O. D. Steinwald A.L., "Water Balance for Great Basin Phreatophytes Derived from Eddy Covariance, Soil Water, and Water Table Measurements," *Journal of Hydrology,* vol. 329, pp. 595-605, 2006.

[16] California Regional Water Quality Control Board, Lahontan Region, "Basin Plan," 2005.

[17] Inyo County Water Department, "Inyo County Water Department Annual Report," ICWD, Independence, 2016-2017.

[18] Los Angeles Department of Water and Power, "2017 Annual Owens Valley Report," LADWP, Los Angeles, 2017.

[19] Inyo County Water Department, *Request for Statement of Qualifications - Reclaimed Water for Restoration and Community Projects in Big Pine, CA,* Independence: ICWD, 2017.

[20] R.O. Anderson Engineering, "Feasibility Study for Effluent Reuse in Lone Pine," 2012.

9 Appendices

Appendix 1: California Regional Water Quality Control Board, Lahontan Region Board Order No. 6-95-35

Appendix 2: NRCS Custom Soil Report for soils in the vicinity of potential reuse areas

Appendix 3: Preliminary Alternatives Analysis for recycled water uses in the Big Pine area

Appendix 4: NREL Photovoltaic Solar Array Design Summary

Appendix 1

California Regional Water Quality Control Board, Lahontan Region
Board Order No. 6-95-35

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

BOARD ORDER NO. 6-95-35
WDID NO. 6B140100001

UPDATED WASTE DISCHARGE REQUIREMENTS

FOR

BIG PINE COMMUNITY SERVICES DISTRICT
WASTEWATER TREATMENT FACILITY

Inyo County

The California Regional Water Quality Control Board, Lahontan Region (Regional Board) finds:

1. Discharger

Mr. Dennis Tillemans, Operator of the Big Pine Community Services District submitted a completed updated report of waste discharge for the Big Pine Community Services District Wastewater Treatment Facility on December 5, 1994. For the purposes of this Order, Big Pine Community Services District is referred to as the "Discharger."

2. Facility

The Big Pine Community Services District Wastewater Treatment Facility is a facility which discharges secondary treated effluent. For the purposes of this Order, the Big Pine Community Services District Wastewater Treatment Facility is referred to as the "Facility".

3. History of Previous Regulation by the Regional Board

The Regional Board previously established waste discharge requirements for the Facility under Board Order No. 6-87-9, which was adopted on January 9, 1987, Order No. 6-78-16, which was adopted on July 5, 1978, and Order No. 6-70-42 which was adopted on November 19, 1970.

4. Reason for Action

The Regional Board is updating waste discharge requirements in order to incorporate changes in existing flows, treatment plant operations and Regional Board policies. The purpose of this Order is to establish waste discharge requirements and monitoring requirements which are appropriate for the discharge (residential and commercial sewage) and to incorporate recent changes in sludge regulatory policies.

5. Facility Location

The Facility is located approximately 0.6 mile east of Big Pine, Inyo County, south of Highway 168, NE/4, NW/4, Section 17, T9S, R34E, MDB&M, as shown on Attachment "A", which is made part of this Order.

6. Description of Facility and Discharge

The Facility collects, treats, and disposes of an average 0.090 mgd of domestic wastewater from the community of Big Pine. Wastewater treatment is provided by an oxidation ditch followed by two lined oxidation ponds which operate in series. Oxidation pond No. 1 has mechanical aerators which are used in the winter months or as needed to maintain adequate treatment. The secondary treated effluent from oxidation pond No. 2 is then discharged to four evaporation/percolation ponds. The design capacity of the treatment and disposal facilities is 0.150 mgd.

7. Sludge Treatment and Disposal

Sludge is removed from the ponds, infrequently, and dried in the sludge drying beds onsite. The Discharger has no plans to dry or dispose of sludge until the year 2000. Sludge is disposed of at the Bishop solid waste disposal site, Inyo County, or other authorized disposal location. In the Monitoring and Reporting Program, the Regional Board requires a Sludge Management Report to be submitted at least 120 days prior to the Discharger disposing of any sludge from the Facility.

8. Authorized Disposal Site

The four evaporation/percolation ponds at the Facility are the only authorized disposal site for wastewater. The authorized wastewater disposal site is located on lands owned by the Los Angeles Department of Water and Power and managed by the Big Pine Community Services District. The Inyo County solid waste disposal site located in Bishop, California is currently the only authorized disposal site for sludge. Other sites may be authorized with Executive Officer approval.

9. Site Geology

The disposal sites are underlain by alluvial deposits consisting of fine to coarse grained sands.

10. Site Hydrology

Runoff from the site generally flows east to southeast towards the Owens River (Department of Water Resources Hydrologic Unit No. 603.20) which is approximately 1.25 miles east of the disposal ponds. The Big Pine Canal is 0.4 miles to the west of the Facility site.

11. Site Hydrogeology

Depth to groundwater is approximately 15 feet. Groundwater is considered excellent for all beneficial uses. The ground water gradient is in a southeasterly direction.

12. Receiving Waters

The receiving waters are the ground waters of the Owens Valley Groundwater Basin (Department of Water Resources Groundwater Basin No. 6-12).

13. South Lahontan Basin Plan

The Regional Board adopted a Water Quality Control Plan for the South Lahontan Basin (Basin Plan) on May 8, 1975 and this Order implements the Basin Plan as amended.

14. Beneficial Uses of Ground Water

The beneficial uses of the ground waters of the Owens Valley Groundwater Basin as set forth and defined in the Basin Plan are:

a. municipal and domestic supply
b. agricultural supply
c. industrial service supply
d. freshwater replenishment

15. California Environmental Quality Act Compliance

These waste discharge requirements govern an existing facility that the Discharger is currently operating. The project consists only of the continued operation of the existing facility and is therefore exempt from the provisions of California Environmental Quality Act (Public Resources Code, Section 21000 et seq) in accordance with the California Code of Regulations Title 14, Section 15301.

16. Notification of Interested Parties

The Regional Board has notified the Discharger and interested parties of its intent to update waste discharge requirements for the discharge.

17. Consideration of Public Comments

The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the Discharger shall comply with the following:

I. DISCHARGE SPECIFICATIONS

A. Discharge/Effluent Limitations

1. The average daily effluent flow of wastewater to the Facility shall not exceed 0.150 million gallons.

2. All wastewater made available for percolation at the authorized disposal site shall not contain pollutant concentrations in excess of the following limits:

Parameter	Units	Mean[1]	Maximum
BOD[2]	mg/l	30	45
MBAS[3]	mg/l	1.0	2.0

3. All wastewater made available for percolation at the authorized disposal site shall have a pH of not less than 6 pH units nor more than 9 pH units. A pH over 9.0 is allowed if it results from a biological process within the treatment plant.

4. All wastewater made available for percolation at the authorized disposal site shall have a dissolved oxygen concentration of not less than 1.0 mg/l.

B. Receiving Water Limitations

The discharge of waste shall not cause the presence of the following substances or conditions in ground waters of the Owens Valley Groundwater Basin:

1. Any perceptible color, odor, taste or foaming.

2. Coliform orgamisms attributable to human wastes.

3. Toxic substances in concentrations that individually, collectively, or cumulatively cause detrimental physiological responses in human, plants, animals, or aquatic life.

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1 The arithmetic mean of lab results for effluent samples collected in a period of 30 consecutive days.

2 Biochemical Oxygen Demand (5 day, 20°C). Samples from oxidation ponds and other pond-type systems should be filtered (using a No. 1 Whatman filter, or equivalent) and reseeded with unfiltered sample. Other types of treatment units should analyze unfiltered samples.

3 Methylene Blue Active Substances

4. Identifiable chlorinated hydrocarbons, organophosphates, carbamates, and other pesticide and herbicide groups, in summations, in excess of the lowest detectable levels.

5. Concentrations of chemical constituents in excess of the maximum contaminant levels or secondary maximum contaminant levels based upon drinking water standards specified by the more restrictive of the California Code of Regulations, Title 22, Division 4, Chapter 15, or 40 CFR, Part 141.

C. General Requirements and Prohibitions

1. There shall be no discharge, bypass, or diversion of raw or partially treated sewage, sewage sludge, grease, or oils from the collection, transport, treatment, or disposal facilities to adjacent land areas or surface waters.

2. Surface flow or visible discharge of sewage or sewage effluent at, or from, the authorized disposal site to adjacent land areas or surface waters is prohibited.

3. The vertical distance between the liquid surface elevation and the lowest point of a pond dike or the invert of an overflow structure shall not be less than two (2) feet.

4. The discharge shall not cause a pollution as defined in Section 13050 of the California Water Code, or a threatened pollution.

5. Neither the treatment nor the discharge shall cause a nuisance as defined in Section 13050 of the California Water Code.

6. The discharge of wastewater except to the authorized disposal site is prohibited.

7. The integrity of any pond liners shall be maintained throughout the life of the ponds and shall not be diminished as the result of any maintenance or cleaning operation.

II. PROVISIONS

A. Rescission of Waste Discharge Requirements

Board Order No. 6-87-9 is hereby rescinded.

B. Standard Provisions

The Discharger shall comply with the "Standard Provisions for Waste Discharge Requirements," dated September 1, 1994, in Attachment "B", which is made part of this Order.

C. Monitoring and Reporting

1. Pursuant to Section 13267(b) of the California Water Code, the Discharger shall comply with the Monitoring and Reporting Program No. 95-35 as specified by the Executive Officer.

2. The Discharger shall comply with the "General Provisions for Monitoring and Reporting," dated September 1, 1994, which is attached to and made part of the Monitoring and Reporting Program.

D. Operator Certification

The Discharger's wastewater treatment plant shall be supervised by personnel possessing a wastewater treatment plant operator certificate of appropriate grade pursuant to *Regulations for Wastewater Treatment Plant Operator Certification and Plant Classification*, Title 23, California Code of Regulations, Division 4, Chapter 14, Section 3670 et. seq.

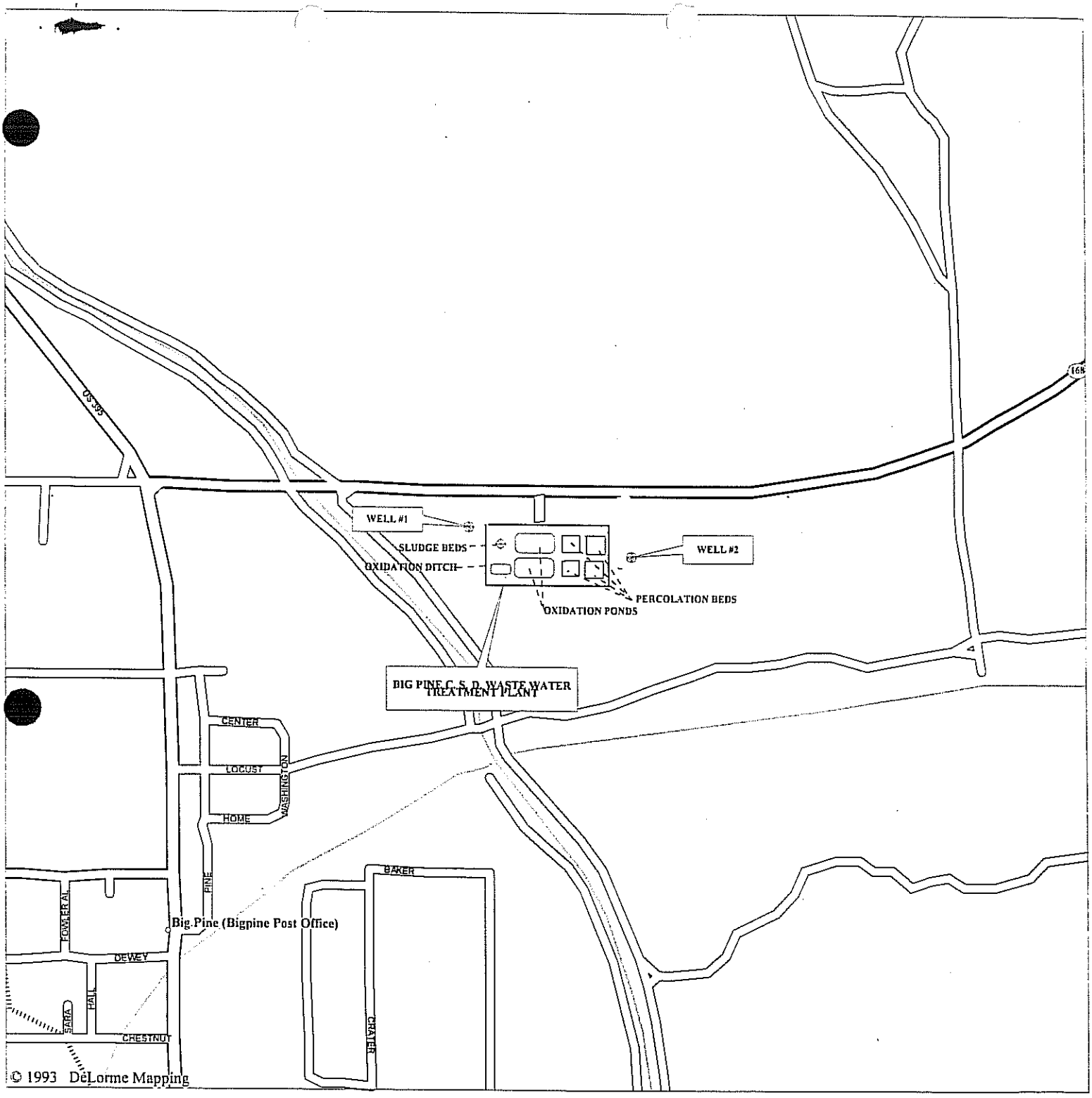
I, Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Lahontan Region, on March 9, 1995.

Harold J. Singer

HAROLD J. SINGER
EXECUTIVE OFFICER

Attachments:

A. Location Map
B. Standard Provisions for Waste Discharge Requirements



LEGEND

- Population Center
- Street, Road
- State Route
- US Highway
- River
- Open Water
- Contour
- Utility (powerline)

Scale 1:10,937 (at center)

1000 Feet

200 Meters

Attachment "A"
Location Map:
Big Pine Community Service Distri
Waste Water Treatment Plant

Location: 0.6 mile east of Big Pine, Inyo County, south of Highway 168, NE/4, NW/4, Section 17, T9S, R34E, MDB&M.

ATTACHMENT "B"

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

STANDARD PROVISIONS
FOR WASTE DISCHARGE REQUIREMENTS

1. Inspection and Entry

The discharger shall permit Regional Board staff:

a. to enter upon premises in which an effluent source is located or in which any required records are kept;

b. to copy any records relating to the discharge or relating to compliance with the waste discharge requirements;

c. to inspect monitoring equipment or records; and

d. to sample any discharge.

2. Reporting Requirements

a. Pursuant to California Water Code 13267(b), the discharger shall immediately notify the Regional Board by telephone whenever an adverse condition occurred as a result of this discharge; written confirmation shall follow within two weeks. An adverse condition includes, but is not limited to, spills of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance.

b. Pursuant to California Water Code Section 13260 (c), any proposed material change in the character of the waste, manner or method of treatment or disposal, increase of discharge, or location of discharge, shall be reported to the Regional Board at least 120 days in advance of implementation of any such proposal. This shall include, but not be limited to, all significant soil disturbances.

c. The owner(s) of, and discharger upon, property subject to waste discharge requirements shall be considered to have a continuing responsibility for ensuring compliance with applicable waste discharge requirements in the operations or use of the owned property. Pursuant to California Water Code Section 13260(c), any change in the ownership and/or operation of property subject to the waste discharge requirements shall be reported to the Regional Board. Notification of applicable waste discharge requirements shall be furnished in writing to the new owners and/or operators and a copy of such notification shall be sent to the Regional Board.

d. If a discharger becomes aware that any information submitted to the Regional Board is incorrect, the discharger shall immediately notify the Regional Board, in writing, and correct that information.

e. Reports required by the waste discharge requirements, and other information requested by the Regional Board, must be signed by a duly authorized

e. Reports required by the waste discharge requirements, and other information requested by the Regional Board, must be signed by a duly authorized representative of the discharger. Under Section 13268 of the California Water Code, any person failing or refusing to furnish technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1000) for each day of violation.

f. If the discharger becomes aware that their waste discharge requirements are no longer needed (because the project will not be built or the discharge will cease) the discharger shall notify the Regional Board in writing and request that their waste discharge requirements be rescinded.

3. Right to Revise Waste Discharge Requirements

The Board reserves the privilege of changing all or any portion of the waste discharge requirements upon legal notice to and after opportunity to be heard is given to all concerned parties.

4. Duty to Comply

Failure to comply with the waste discharge requirements may constitute a violation of the California Water Code and is grounds for enforcement action or for permit termination, revocation and reissuance, or modification.

5. Duty to Mitigate

The discharger shall take all reasonable steps to minimize or prevent any discharge in violation of the waste discharge requirements which has a reasonable likelihood of adversely affecting human health or the environment.

6. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the discharger to achieve compliance with the waste discharge requirements. Proper operation and maintenance includes adequate laboratory control, where appropriate, and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by the discharger, when necessary to achieve compliance with the conditions of the waste discharge requirements.

7. Waste Discharge Requirement Actions

The waste discharge requirements may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for waste discharge requirement modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any of the waste discharge requirements conditions.

8. Property Rights

The waste discharge requirements do not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

9. Enforcement

The California Water Code provides for civil liability and criminal penalties for violations or threatened violations of the waste discharge requirements including imposition of civil liability or referral to the Attorney General.

10. Availability

A copy of the waste discharge requirements shall kept and maintained by the discharger and be available at all times to operating personnel.

11. Severability

Provisions of the waste discharge requirements are severable. If any provision of the requirements is found invalid, the remainder of the requirements shall not be affected.

12. Public Access

General public access shall be effectively excluded from treatment and disposal facilities.

13. Transfers

Providing there is no material change in the operation of the facility, this Order may be transferred to a new owner or operation. The owner/operator must request the transfer in writing and receive written approval from the Regional Board Executive Officer.

14. Definitions

a. "Surface waters" as used in this Order, include, but are not limited to, live streams, either perennial or ephemeral, which flow in natural or artificial water courses and natural lakes and artificial impoundments of waters. "Surface waters" does not include artificial water courses or impoundments used exclusively for wastewater disposal.

b. "Ground waters" as used in this Order, include, but are not limited to, all subsurface waters being above atmospheric pressure and the capillary fringe of these waters.

15. Storm Protection

All facilities used for collection, transport, treatment, storage, or disposal of waste shall be adequately protected against overflow, washout, inundation, structural damage or a significant reduction in efficiency resulting from a storm or flood having a recurrence interval of once in 100 years.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MONITORING AND REPORTING PROGRAM NO. 95-35
WDID NO. 6B140100001

FOR

BIG PINE COMMUNITY SERVICES DISTRICT
WASTEWATER TREATMENT FACILITY

Inyo County

I. MONITORING

A. Flow Monitoring

The Discharger shall monitor the following:

1. The total volume, in million gallons, of wastewater flow to the treatment facility for each month.

2. The average flow rate, in million gallons per day (mgd), of wastewater to the treatment facility calculated for each month.

3. The freeboard (distance from the top of the lowest part of the dike to the wastewater surface in the pond) measured each month in each surface impoundment. If a surface impoundment does not contain wastewater, indicate that it is empty.

B. Plant Effluent Monitoring

Beginning in April 1995, grab samples of the effluent from oxidation pond No. 2 shall be collected and analyzed to determine the magnitude of the following parameters:

Parameter	Units	Frequency
Biochemical Oxygen Demand (filtered)	mg/l	Monthly
Methylene Blue Active Substances	mg/l	Quarterly

C. Ground Water Monitoring

Grab samples from the entire thickness or the upper 20 feet, whichever is less, of the uppermost ground water bearing zone shall be collected from the monitoring wells and analyzed to determine the magnitude of the following parameters:

Parameter	Units	Frequency
Nitrate Nitrogen	mg/l as N	Semi-Annually (Apr, Oct)
Purgeable Organics* (EPA Test Method No. 624)	µg/l	Annually
Base/Neutral and Acids Extractable Organics* (EPA Test Method No. 625)	µg/l	Annually

* Analysis shall be conducted for those substances included on the EPA list of priority pollutants and all other toxic substances known to be discharged to the Discharger's system.

1. Each time a monitoring well is sampled, and prior to well purging as specified below, the elevation (mean sea level) and depth (below ground surface) of ground water in each well shall be measured, and reported with the results of ground water analyses.

2. Well Purging

   a. Ground water samples shall be collected only after at least three volumes of water in the well casing have been removed or temperature, electrical conductivity, and pH measurements of the water in the well have stabilized to approximately ±10% for each successive well volume removed.

   b. If measured, the last three measurements of temperature, electrical conductivity and pH during purging shall be reported with the results of ground water analyses. Parameter values shall be reported in the following units:

Parameter	Units
Temperature	°C or °F
Electrical Conductivity	mmhos/cm or dS/m
pH	pH units

   c. If the measurements in No. (2) are not made, the well casing diameter, well depth, and total volume purged prior to sampling shall be reported with the results of ground water analyses.

3. The direction of ground water flow under the facility site shall be determined at least annually unless it can be shown that no changes have occurred.

D. Sludge Monitoring

1. The Discharger shall submit a Sludge Management Plan Report by **at least 120 days prior to disposing any wastewater sludge from the Facility**.

2. The Discharger shall provide information on any deviations from the Sludge Management Plan.

3. Total quantity of sludge generated (cleaned from any ponds) during the monitoring period.

4. Date and quantity of any sludge landfilled or moved offsite, recipient (including name and address), location of receiving area, and sludge disposal method (including crops grown, if applicable).

5. Cumulative total quantity of sludge currently stockpiled onsite, including the quantity of sludge added to the stockpile during the monitoring period.

6. For sewage sludge removed from ponds, stockpiled onsite, or discharged offsite during the previous month, a representative composite sample shall be collected and analyzed for the following constituents:

   a. total Kjeldahl nitrogen as N

   b. ammonia nitrogen as N

   c. nitrate nitrogen as N

   d. total phosphate as P

   e. organic and inorganic persistent and bioaccumulative toxic substances listed in Section 66261.24, subsections (a)(2)(A) and (a)(2)(B), of Title 22, Division 4.5, Chapter 11, Article 3 of the California Code of Regulations.

7. The Discharger shall make a determination whether the analyses in 6.e above, indicate that the sludge shall be considered a toxic hazardous material.

8. At least 90 days prior to sample collection and analysis, a sludge sampling protocol shall be submitted to the Executive Officer for approval.

II. REPORTING

A. General Provisions

The Discharger shall comply with the "General Provisions for Monitoring and Reporting," dated September 1, 1994, which is attached to and made part of this Monitoring and Reporting Program.

B. Submittal Periods

By not later April 15, 1995, the Discharger shall submit a monitoring report including the preceding information to the Regional Board. Subsequent monitoring reports shall be submitted to the Regional Board by the 15th day following each quarter.

C. Annual Report

By January 15 of each year, the Discharger shall submit an annual report along with the report to the Regional Board with the results of the annual monitoring and the following additional information:

1. The compliance record, and corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements.

2. Tabular presentation of the monitoring data obtained for the previous year.

Ordered by: Harold J. Singer Dated: Mar 29, 1995
HAROLD J. SINGER
EXECUTIVE OFFICER

Attachments: General Provisions for Monitoring and Reporting

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

GENERAL PROVISIONS
FOR MONITORING AND REPORTING

1. SAMPLING AND ANALYSIS

a. All analyses shall be performed in accordance with the current edition(s) of the following documents:

   i. Standard Methods for the Examination of Water and Wastewater

   ii. Methods for Chemical Analysis of Water and Wastes, EPA

b. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Health Services or a laboratory approved by the Regional Board Executive Officer. Specific methods of analysis must be identified on each laboratory report.

c. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The methods used shall also be reported. If methods other than EPA-approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the Regional Board Executive Officer prior to use.

d. The discharger shall establish chain-of-custody procedures to insure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage, and analysis shall be conducted in accordance with an approved Sampling and Analysis Plan (SAP). The most recent version of the approved SAP shall be kept at the facility.

e. The discharger shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall insure that both activities will be conducted. The calibration of any wastewater flow measuring device shall be recorded and maintained in the permanent log book described in 2.b, below.

f. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

g. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

2. OPERATIONAL REQUIREMENTS

a. Sample Results

Pursuant to California Water Code Section 13267(b), the discharger shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

b. Operational Log

Pursuant to California Water Code Section 13267(b), an operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

3. REPORTING

a. For every item where the requirements are not met, the discharger shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time, and shall submit a timetable for correction.

b. Pursuant to California Water Code Section 13267(b), all sampling and analytical results shall be made available to the Regional Board upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

c. The discharger shall provide a brief summary of any operational problems and maintenance activities to the Board with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

d. Monitoring reports shall be signed by:

i. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates;

ii. In the case of a partnership, by a general partner;

iii. In the case of a sole proprietorship,by the proprietor; or

iv. In the case of a municipal, state or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

e. Monitoring reports are to include the following:

i. Name and telephone number of individual who can answer questions about the report.

ii. The Monitoring and Reporting Program Number.

iii. WDID Number.

f. Modifications

This Monitoring and Reporting Program may be modified at the discretion of the Regional Board Executive Officer.

4. NONCOMPLIANCE

Under Section 13268 of the Water Code, any person failing or refusing to furnish technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1,000) for each day of violation.

Appendix 2

NRCS Custom Soil Report for soils in the vicinity of potential reuse areas

Map – Area of Interest

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

USDA Soil Survey

Component Legend

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[This report shows only the major soils in each map unit]

Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. Slope		
				Low	RV	High
210:						
Hesperia-Cartago complex, 0 to 5 percent slopes						
	65	Hesperia	Series	0	3	5
	20	Cartago	Series	0	3	5
281:						
Pits-Dumps complex, 0 to 50 percent slopes						
	45	Pits	Miscellaneous area	0	25	50
	40	Dumps	Miscellaneous area	0	25	50
318:						
Shondow-Hessica association, 0 to 2 percent slopes						
	50	Shondow	Series	0	1	2
	30	Hessica	Series	0	1	2
370:						
Xerofluvents, 0 to 5 percent slopes						
	85	Xerofluvents	Taxon above family	0	3	5

Component Text

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Only those components that have entries for the selected text kinds and categories are included in this report. This report shows only the major soils in each map unit]

Map unit: 210 - Hesperia-Cartago complex, 0 to 5 percent slopes

Componet: Hesperia

Text kind/Category: Nontechnical description/GENSOIL

The Hesperia component makes up 65 percent of the map unit. Slopes are 0 to 5 percent. This component is on fan piedmonts, alluvial fans. The parent material consists of alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R029XG017CA Loamy 5-8" P.z. ecological site. Nonirrigated land capability classification is 7e. Irrigated land capability classification is 2s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.

Componet: Cartago

Text kind/Category: Nontechnical description/GENSOIL

The Cartago component makes up 20 percent of the map unit. Slopes are 0 to 5 percent. This component is on alluvial fans, fan piedmonts. The parent material consists of alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R029XG011CA Sandy 5-8" P.z. ecological site. Nonirrigated land capability classification is 7e. Irrigated land capability classification is 3s. This soil does not meet hydric criteria.

Map unit: 281 - Pits-Dumps complex, 0 to 50 percent slopes

Componet: Pits

Text kind/Category: Nontechnical description/GENSOIL

Generated brief soil descriptions are created for major soil components. The Pits is a miscellaneous area.

Componet: Dumps

Text kind/Category: Nontechnical description/GENSOIL

Generated brief soil descriptions are created for major soil components. The Dumps is a miscellaneous area.

Component Text

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Map unit: 318 - Shondow-Hessica association, 0 to 2 percent slopes

Componet: Shondow

Text kind/Category: Nontechnical description/GENSOIL

The Shondow component makes up 50 percent of the map unit. Slopes are 0 to 2 percent. This component is on stream terraces, river valleys. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 66 inches during March, April, May. Organic matter content in the surface horizon is about 2 percent. This component is in the R029XG002CA Saline Meadow ecological site. Nonirrigated land capability classification is 7s. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a strongly saline horizon within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 37 within 30 inches of the soil surface.

Componet: Hessica

Text kind/Category: Nontechnical description/GENSOIL

The Hessica component makes up 30 percent of the map unit. Slopes are 0 to 2 percent. This component is on higher remnants of stream terraces, river valleys. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R029XG007CA Saline Bottom ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 19 within 30 inches of the soil surface.

Map unit: 370 - Xerofluvents, 0 to 5 percent slopes

Componet: Xerofluvents

Text kind/Category: Nontechnical description/GENSOIL

The Xerofluvents component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on drainageways, river valleys. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during March, April, May, June. Organic matter content in the surface horizon is about 1 percent. This component is in the R029XG027CA Streambank ecological site. Nonirrigated land capability classification is 6w. This soil meets hydric criteria.

Engineering Properties

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Absence of an entry indicates that the data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
210:												
Hesperia	0-16	Sandy loam	SC-SM, SM	A-2, A-4	0	0	90-100	85-100	55-70	25-40	15-25	NP-5
	16-60	Fine sandy loam, sandy loam	SC-SM, SM	A-2, A-4	0	0	90-100	85-100	55-75	30-50	15-25	NP-5
Cartago	0-12	Loamy sand	SM, SM, SP-SM, SP-SM	A-1, A-2	0-5	0-5	80-95	75-90	35-60	10-25	0	NP
	12-26	Gravelly loamy coarse sand, loamy coarse sand	SM, SP-SM	A-1	0-5	0-5	70-90	60-80	30-50	10-25	0	NP
	26-60	Very cobbly loamy coarse sand, very gravelly loamy coarse sand	GM, GP-GM, SM, SP-SM	A-1	0-5	10-40	40-60	25-50	20-40	5-15	0	NP
281:												
Pits	0-60	Variable	---	---	---	---	---	---	---	---	---	---
Dumps	0-60	Variable	---	---	---	---	---	---	---	---	0-14	---

Engineering Properties

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
318:												
Shondow	0-8	Loam	CL, CL-ML, ML	A-4	0	0	95-100	90-100	75-95	55-75	15-25	NP-10
	8-22	Sandy clay loam	CL, SC	A-2, A-6	0	0	95-100	90-100	70-90	30-55	25-40	10-20
	22-40	Sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	95-100	90-100	55-70	25-40	15-25	NP-10
	40-52	Sandy clay loam	CL, SC	A-2, A-6	0	0	95-100	90-100	70-90	30-55	25-40	10-20
	52-60	Coarse sand, loamy sand	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	50-75	5-30	0-14	NP
Hessica	0-6	Loamy sand	SM, SP-SM	A-1, A-2	0	0	95-100	90-100	45-70	10-25	0	NP
	6-18	Sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	55-70	25-40	20-25	NP-5
	18-60	Loam, sandy clay loam	CL, SC	A-2, A-6	0	0	95-100	90-100	70-90	30-55	25-35	10-15

Engineering Properties

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
370:												
Xerofluvents	0-11	Gravelly sandy loam	GC, GM, SC-SM, SM	A-1, A-2	0-5	0-5	55-80	50-75	30-55	15-30	15-25	NP-10
	11-18	Gravelly sandy loam	GC, GM, SC-SM, SM	A-1, A-2	0-5	0-5	55-80	50-75	30-55	15-30	15-25	NP-10
	18-34	Very gravelly loam	GM, SM	A-2, A-4	0-5	0-5	50-75	50-75	40-65	30-50	20-35	NP-10
	34-60	Stratified very gravelly sand to very cobbly sandy clay loam	GC, GP, GP-GM, SP	A-1, A-2, A-3	0-5	15-25	45-65	40-60	20-55	0-35	5-40	NP-20

Physical Soil Properties

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to the surface layer. Absence of an entry indicates that data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
210:														
Hesperia	0-16	---	---	8-18	1.60-1.70	14.11-42.34	0.10-0.13	0.0-2.9	0.0-0.5	.24	.24	5	3	86
	16-60	---	---	8-18	1.60-1.70	14.11-42.34	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
Cartago	0-12	---	---	3-10	1.60-1.70	42.34-141.14	0.06-0.08	0.0-2.9	0.0-0.5	.15	.15	4	2	134
	12-26	---	---	3-10	1.60-1.70	42.34-141.14	0.04-0.07	0.0-2.9	0.0-0.5	.05	.15			
	26-60	---	---	3-10	1.60-1.70	42.34-141.14	0.02-0.04	0.0-2.9	0.0-0.5	.05	.15			
281:														
Pits	0-60	---	---	---	---	---	---	---	---	---	---	---	---	---
Dumps	0-60	---	---	---	---	---	0.00	---	---	---	---	---	---	---
318:														
Shondow	0-8	---	---	10-18	1.30-1.55	0.42-1.41	0.11-0.14	0.0-2.9	1.0-3.0	.43	.43	4	5	56
	8-22	---	---	18-35	1.45-1.55	0.42-1.41	0.02-0.14	3.0-5.9	1.0-2.0	.24	.24			
	22-40	---	---	10-18	1.55-1.65	14.11-42.34	0.08-0.10	0.0-2.9	0.5-1.0	.28	.28			
	40-52	---	---	18-35	1.45-1.55	1.41-4.23	0.14-0.18	3.0-5.9	0.0-0.5	.24	.24			
	52-60	---	---	2-6	1.65-1.85	42.34-141.14	0.03-0.08	0.0-2.9	0.0-0.5	.05	.05			
Hessica	0-6	---	---	0-5	1.60-1.75	42.34-141.14	0.05-0.08	0.0-2.9	1.0-2.0	.32	.32	2	2	134
	6-18	---	---	10-18	1.40-1.50	14.11-42.34	0.10-0.13	0.0-2.9	1.0	.28	.28			
	18-60	---	---	20-27	1.20-1.40	0.42-1.41	0.13-0.16	3.0-5.9	0.0-0.5	.28	.28			
370:														
Xerofluvents	0-11	---	---	8-18	1.60-1.70	14.11-42.34	0.07-0.12	0.0-2.9	0.5-1.0	.10	.20	5	5	56
	11-18	---	---	8-18	1.60-1.70	14.11-42.34	0.07-0.12	0.0-2.9	0.0-0.5	.10	.28			
	18-34	---	---	8-18	1.35-1.60	4.23-14.11	0.09-0.17	0.0-2.9	0.0-0.5	.20	.49			
	34-60	---	---	0-27	1.50-1.75	1.41-4.23	0.02-0.11	3.0-5.9	0.0-0.5	.10	.32			

RUSLE2 Related Attributes

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
210:							
Hesperia	65	A	.24	5	67.4	19.6	13.0
Cartago	20	A	.15	4	84.3	9.2	6.5
281:							
Pits	45	---	---	---	---	---	---
Dumps	40	---	---	---	---	---	---
318:							
Shondow	50	C	.43	4	44.8	41.2	14.0
Hessica	30	C	.32	2	81.1	16.4	2.5
370:							
Xerofluvents	85	C/D	.20	5	67.4	19.6	13.0

Soil Features

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Absence of an entry indicates that the feature is not a concern or that data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Restrictive layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
210:									
Hesperia	---	---	---	---	0	0	Moderate	Low	Low
Cartago	---	---	---	---	0	0	Low	Low	Low
281:									
Pits	---	---	---	---	0	---	Low	---	---
Dumps	---	---	---	---	0	---	Low	---	---
318:									
Shondow	---	---	---	---	0	0	Moderate	High	High
Hessica	---	---	---	---	0	0	Low	Moderate	Moderate
370:									
Xerofluvents	---	---	---	---	0	0	Moderate	High	Low

Water Features

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Hydrologic group	Surface runoff	Months	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
210:										
Hesperia	A	Very low	Jan-Dec			---	---	None	---	None
Cartago	A	Negligible	Jan-Dec			---	---	None	---	None
281:										
Pits	---	---	Jan-Dec			---	---	None	---	None
Dumps	---	---	Jan-Dec			---	---	None	---	None

Water Features

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Map symbol and soil name	Hydrologic group	Surface runoff	Months	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
318:										
Shondow	C	High	January	---	---	---	---	None	Long (7 to 30 days)	Rare
			February	---	---	---	---	None	Long (7 to 30 days)	Rare
			March	5.0->6.0	>6.0	---	---	None	Long (7 to 30 days)	Rare
			April	5.0->6.0	>6.0	---	---	None	Long (7 to 30 days)	Rare
			May	5.0->6.0	>6.0	---	---	None	Long (7 to 30 days)	Rare
			June	---	---	---	---	None	Long (7 to 30 days)	Rare
			July	---	---	---	---	None	Long (7 to 30 days)	Rare
			August	---	---	---	---	None	Long (7 to 30 days)	Rare
			September	---	---	---	---	None	Long (7 to 30 days)	Rare
			October	---	---	---	---	None	Long (7 to 30 days)	Rare
			November	---	---	---	---	None	Long (7 to 30 days)	Rare
			December	---	---	---	---	None	Long (7 to 30 days)	Rare

Water Features

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Map symbol and soil name	Hydrologic group	Surface runoff	Months	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
318:										
Hessica	C	High	January	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			February	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			March	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			April	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			May	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			June	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			July	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			August	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			September	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			October	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			November	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
			December	---	---	---	---	None	Very brief (4 to 48 hours)	Rare
370:										
Xerofluvents	C/D	Low	March	0.5-1.5	>6.0	---	---	None	Long (7 to 30 days)	Frequent
			April	0.5-1.5	>6.0	---	---	None	Long (7 to 30 days)	Frequent
			May	0.5-1.5	>6.0	---	---	None	Long (7 to 30 days)	Frequent
			June	0.5-1.5	>6.0	---	---	None	Long (7 to 30 days)	Frequent

Sewage Disposal

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Not limited		Very limited	
				Seepage	1.00
				Slope	0.08
Cartago	20	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Slope	0.08
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	1.00		
		Flooding	0.40		
		Depth to saturated zone	0.08		
Hessica	30	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
		Flooding	0.40	Flooding	0.40
370:					
Xerofluvents	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	1.00
				Slope	0.08

Agricultural Disposal of Wastewater by Irrigation and Overland Flow

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation		Overland flow of wastewater	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Not limited		Very limited	
				Seepage	1.00
Cartago	20	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Droughty	1.00		
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Very limited		Very limited	
		Filtering capacity	1.00	Sodium content	1.00
		Sodium content	1.00	Flooding	0.40
		Slow water movement	1.00		
		Salinity	0.50		
Hessica	30	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Sodium content	1.00	Sodium content	1.00
		Slow water movement	1.00	Flooding	0.40
370:					
Xerofluvents	85	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Flooding	1.00	Depth to saturated zone	1.00
		Slow water movement	0.31	Flooding	1.00
		Droughty	0.01		

Agricultural Disposal of Wastewater by Rapid Infiltration and Slow Rate Treatment

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater		Slow rate treatment of wastewater	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Somewhat limited		Not limited	
		Slow water movement	0.31		
Cartago	20	Somewhat limited		Very limited	
		Cobble content	0.01	Filtering capacity	1.00
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Very limited		Very limited	
		Slow water movement	1.00	Filtering capacity	1.00
		Depth to saturated zone	1.00	Sodium content	1.00
				Slow water movement	0.96
				Salinity	0.50
Hessica	30	Very limited		Very limited	
		Slow water movement	1.00	Filtering capacity	1.00
				Sodium content	1.00
				Slow water movement	0.96
370:					
Xerofluvents	85	Very limited		Very limited	
		Flooding	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Slow water movement	0.21

Irrigation - General and Sprinkler

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Irrigation general		Irrigation sprinkler (close spaced outlet drops)		Irrigation sprinkler (general)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
210:							
Hesperia	65	Very limited		Somewhat limited		Not limited	
		Rapid water movement	1.00	Slope	0.48		
		Seepage	0.45				
		Slope	0.04				
Cartago	20	Very limited		Somewhat limited		Somewhat limited	
		Rapid water movement	1.00	Low water holding capacity	0.99	Low water holding capacity	0.99
		Seepage	1.00	Slope	0.48		
		Low water holding capacity	1.00				
		Slope	0.04				
281:							
Pits	45	Not rated		Not rated		Not rated	
Dumps	40	Not rated		Not rated		Not rated	
318:							
Shondow	50	Very limited		Very limited		Very limited	
		Seepage	1.00	Excess Sodium	1.00	Excess Sodium	1.00
		Excess Sodium	1.00	Excess Salt	0.50	Excess Salt	0.50
		Excess Salt	0.50	Slow water movement	0.29	Slow water movement	0.29
		Low water holding capacity	0.11	Low water holding capacity	0.27	Low water holding capacity	0.27
Hessica	30	Very limited		Somewhat limited		Somewhat limited	
		Seepage	1.00	Excess Sodium	0.99	Excess Sodium	0.99
		Excess Sodium	0.99	Too alkaline	0.50	Too alkaline	0.50
		Too alkaline	0.50	Slow water movement	0.29	Slow water movement	0.29
370:							
Xerofluvents	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Rapid water movement	0.71	Frequent or very frequent flooding	0.70	Frequent or very frequent flooding	0.70
		Frequent or very frequent flooding	0.70	Slope	0.48	Low water holding capacity	0.06
		Large surface stones	0.67	Low water holding capacity	0.06		
		Seepage	0.45				
		Low water holding capacity	0.25				

Irrigation - Micro

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Irrigation micro (above ground)		Irrigation micro (subsurface drip)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Somewhat limited		Somewhat limited	
		Seepage	0.19	Seepage	0.19
Cartago	20	Very limited		Very limited	
		Seepage	1.00	Seepage	1.00
		Low water holding capacity	0.99	Low water holding capacity	0.99
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Very limited		Very limited	
		Excess Sodium	1.00	Excess Sodium	1.00
		Excess Salt	0.50	Excess Salt	0.50
		Low water holding capacity	0.27	Low water holding capacity	0.27
		Seepage	0.19	Seepage	0.19
Hessica	30	Very limited		Very limited	
		Seepage	1.00	Seepage	1.00
		Excess Sodium	0.99	Excess Sodium	0.99
		Too alkaline	0.50	Shrink-swell (LEP 3-6)	0.50
				Too alkaline	0.50
370:					
Xerofluvents	85	Somewhat limited		Somewhat limited	
		Frequent or very frequent flooding	0.70	Frequent or very frequent flooding	0.70
		Large surface stones	0.67	Large surface stones	0.67
		Seepage	0.19	Seepage	0.19
		Low water holding capacity	0.06	Low water holding capacity	0.06

Irrigation - Surface

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Irrigation surface (graded)		Irrigation surface (level)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Very limited		Very limited	
		Rapid water movement	1.00	Rapid water movement	1.00
		Slope	1.00	Slope	1.00
		Seepage	0.45	Seepage	0.45
Cartago	20	Very limited		Very limited	
		Rapid water movement	1.00	Rapid water movement	1.00
		Seepage	1.00	Seepage	1.00
		Low water holding capacity	1.00	Low water holding capacity	1.00
		Slope	1.00	Slope	1.00
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Very limited		Very limited	
		Seepage	1.00	Seepage	1.00
		Excess Sodium	1.00	Excess Sodium	1.00
		Excess Salt	0.50	Excess Salt	0.50
		Low water holding capacity	0.11	Low water holding capacity	0.11
Hessica	30	Very limited		Very limited	
		Seepage	1.00	Seepage	1.00
		Excess Sodium	0.99	Excess Sodium	0.99
		Too alkaline	0.50	Too alkaline	0.50
370:					
Xerofluvents	85	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Rapid water movement	0.71	Rapid water movement	0.71
		Frequent or very frequent flooding	0.70	Frequent or very frequent flooding	0.70
		Seepage	0.45	Seepage	0.45
		Low water holding capacity	0.25	Low water holding capacity	0.25

Damage by Fire and Seedling Mortality on Forestland

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
210:					
Hesperia	65	Low		Low	
Cartago	20	High		Low	
		Texture/rock fragments	1.00		
281:					
Pits	45	Not rated		Not rated	
Dumps	40	Not rated		Not rated	
318:					
Shondow	50	Low		High	
				Soil reaction	1.00
				Salinity	1.00
				Available water	1.00
				Wetness	0.50
Hessica	30	High		Moderate	
		Texture/rock fragments	1.00	Soil reaction	0.50
370:					
Xerofluvents	85	Low		High	
				Wetness	1.00
				Available water	1.00

Windbreaks and Environmental Plantings

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

[Absence of an entry indicates that trees generally do not grow to the given height on the soil. This report shows only the major soils in each map unit]

Map symbol and soil name	Trees having predicted 20-year average height of--				
	8 feet or less	>8 to 15 feet	>15 to 25 feet	>25 to 35 feet	>35 feet
210:					
Hesperia	---	---	---	---	---
Cartago	---	---	---	---	---
281:					
Pits	---	---	---	---	---
Dumps	---	---	---	---	---
318:					
Shondow	---	---	---	---	---
Hessica	---	---	---	---	---
370:					
Xerofluvents	---	---	---	---	---

Survey Area Data Summary

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Survey area version:	15
Survey area version established date:	9/13/2017 8:37:47 PM
Tabular data version:	10
Tabular data version established date:	9/13/2017 8:37:47 PM
Tabular data NASIS export date:	9/11/2017 4:33:16 PM
Tabular data certification status:	certified, major components
Tabular data certification status description:	A full set of national interpretations were included with the export. From the NSSC Regional group, the BLM interpretations and the AGR - Pesticide Loss interpretations were included. From Region 2, the AGR - Avocado Root Rot Hazard, AGR - CA Revised Storie Index, GRL - Western Juniper Encroachment Potential - OR, and WLF-Desert Tortoise interpretations were included.

Included Soil Interpretations

Interpretation Name	Design Date	Generation Date
AGR - Avocado Root Rot Hazard (CA)	4/24/2013 6:07:01 PM	9/11/2017 4:33:24 PM
AGR - California Revised Storie Index (CA)	6/11/2014 9:20:54 PM	9/11/2017 4:33:24 PM
AWM - Irrigation Disposal of Wastewater	9/27/2012 8:16:34 PM	9/11/2017 4:33:24 PM
AWM - Land Application of Municipal Sewage Sludge	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
AWM - Manure and Food Processing Waste	9/27/2012 8:16:31 PM	9/11/2017 4:33:24 PM
AWM - Overland Flow Process Treatment of Wastewater	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
AWM - Rapid Infiltration Disposal of Wastewater	1/20/2015 4:28:41 PM	9/11/2017 4:33:24 PM
AWM - Slow Rate Process Treatment of Wastewater	9/27/2012 8:16:34 PM	9/11/2017 4:33:24 PM
BLM - Fencing	8/29/2017 3:40:05 PM	9/11/2017 4:33:24 PM
BLM - Mechanical Treatment, Rolling Drum	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
BLM - Pygmy Rabbit Habitat Potential	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
BLM - Rangeland Drill	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
BLM - Yellow Star-thistle Invasion Susceptibility	9/27/2012 8:16:31 PM	9/11/2017 4:33:24 PM
DHS - Catastrophic Mortality, Large Animal Disposal, Pit	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
DHS - Catastrophic Mortality, Large Animal Disposal, Trench	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
DHS - Potential for Radioactive Bioaccumulation	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
DHS - Potential for Radioactive Sequestration	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
DHS - Rubble and Debris Disposal, Large-Scale Event	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
DHS - Site for Composting Facility - Subsurface	7/27/2017 5:30:06 PM	9/11/2017 4:33:24 PM
DHS - Site for Composting Facility - Surface	7/27/2017 5:30:06 PM	9/11/2017 4:33:24 PM

Survey Area Data Summary

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Included Soil Interpretations

Interpretation Name	Design Date	Generation Date
DHS - Suitability for Clay Liner Material	12/21/2012 5:17:39 PM	9/11/2017 4:33:24 PM
DHS - Suitability for Composting Medium and Final Cover	9/27/2012 8:16:32 PM	9/11/2017 4:33:24 PM
ENG - Construction Materials; Gravel Source	11/27/2012 5:55:38 PM	9/11/2017 4:33:24 PM
ENG - Construction Materials; Reclamation	7/8/2015 4:46:43 PM	9/11/2017 4:33:24 PM
ENG - Construction Materials; Roadfill	9/1/2017 3:28:26 PM	9/11/2017 4:33:24 PM
ENG - Construction Materials; Sand Source	12/21/2012 6:31:04 PM	9/11/2017 4:33:24 PM
ENG - Construction Materials; Topsoil	3/30/2017 2:52:37 PM	9/11/2017 4:33:24 PM
ENG - Daily Cover for Landfill	9/27/2012 8:16:34 PM	9/11/2017 4:33:24 PM
ENG - Dwellings W/O Basements	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
ENG - Dwellings With Basements	10/28/2015 8:57:30 PM	9/11/2017 4:33:24 PM
ENG - Lawn, Landscape, Golf Fairway	5/6/2015 5:17:39 PM	9/11/2017 4:33:24 PM
ENG - Local Roads and Streets	2/16/2016 4:56:30 PM	9/11/2017 4:33:24 PM
ENG - Sanitary Landfill (Area)	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
ENG - Sanitary Landfill (Trench)	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
ENG - Septic Tank Absorption Fields	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
ENG - Sewage Lagoons	12/3/2012 4:48:09 PM	9/11/2017 4:33:24 PM
ENG - Shallow Excavations	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
ENG - Small Commercial Buildings	1/20/2015 4:28:41 PM	9/11/2017 4:33:24 PM
ENG - Unpaved Local Roads and Streets	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
Farm and Garden Composting Facility - Surface	7/27/2017 5:30:06 PM	9/11/2017 4:33:24 PM
FOR - Construction Limitations for Haul Roads/Log Landings	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Hand Planting Suitability	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Harvest Equipment Operability	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Log Landing Suitability	1/8/2013 8:53:33 PM	9/11/2017 4:33:24 PM
FOR - Mechanical Planting Suitability	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Mechanical Site Preparation (Deep)	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Mechanical Site Preparation (Surface)	2/9/2016 5:19:52 PM	9/11/2017 4:33:24 PM
FOR - Potential Erosion Hazard (Off-Road/Off-Trail)	1/8/2013 7:42:10 PM	9/11/2017 4:33:24 PM
FOR - Potential Erosion Hazard (Road/Trail)	1/8/2013 7:42:10 PM	9/11/2017 4:33:24 PM
FOR - Potential Fire Damage Hazard	2/9/2016 5:52:59 PM	9/11/2017 4:33:24 PM
FOR - Potential Seedling Mortality	1/8/2013 7:42:10 PM	9/11/2017 4:33:24 PM

Survey Area Data Summary

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Included Soil Interpretations

Interpretation Name	Design Date	Generation Date
FOR - Road Suitability (Natural Surface)	1/8/2013 8:53:33 PM	9/11/2017 4:33:24 PM
FOR - Soil Rutting Hazard	2/8/2016 6:36:02 PM	9/11/2017 4:33:24 PM
Fragile Soil Index	8/16/2017 8:00:40 PM	9/11/2017 4:33:24 PM
GRL - Fencing, Post Depth =<24 inches	3/4/2015 4:20:09 PM	9/11/2017 4:33:24 PM
GRL - Fencing, Post Depth =<36 inches	3/4/2015 4:20:09 PM	9/11/2017 4:33:24 PM
GRL - Western Juniper Encroachment Potential (OR)	6/10/2014 10:26:05 PM	9/11/2017 4:33:24 PM
Ground Penetrating Radar Penetration	6/22/2011 3:44:42 PM	9/11/2017 4:33:24 PM
MIL - Bivouac Areas (DOD)	1/10/2013 10:59:31 PM	9/11/2017 4:33:24 PM
MIL - Excavations Crew-Served Weapon Fighting Position (DOD)	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
MIL - Excavations for Individual Fighting Position (DOD)	1/11/2013 10:10:07 PM	9/11/2017 4:33:24 PM
MIL - Excavations for Vehicle Fighting Position (DOD)	12/2/2015 10:37:38 PM	9/11/2017 4:33:24 PM
MIL - Helicopter Landing Zones (DOD)	1/16/2013 5:33:04 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 1 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 1 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 1 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 2 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 2 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 2 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 3 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 3 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 3 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 4 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 4 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 4 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 5 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 5 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 5 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 6 1-pass wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 6 50-passes wet season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 6 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 7 1-pass wet season (DOD)	2/9/2016 4:02:12 PM	9/11/2017 4:33:24 PM

Survey Area Data Summary

Benton-Owens Valley Area Parts of Inyo and Mono Counties, California

Included Soil Interpretations

Interpretation Name	Design Date	Generation Date
MIL - Trafficability Veh. Type 7 50-passes wet season (DOD)	2/9/2016 4:02:12 PM	9/11/2017 4:33:24 PM
MIL - Trafficability Veh. Type 7 dry season (DOD)	2/9/2016 4:10:47 PM	9/11/2017 4:33:24 PM
NCCPI - National Commodity Crop Productivity Index (Ver 2.0)	7/27/2017 7:04:44 PM	9/11/2017 4:33:24 PM
NCCPI - National Commodity Crop Productivity Index (Ver 3.0)	7/25/2017 9:15:02 PM	9/11/2017 4:33:24 PM
Soil Habitat for Saprophite Stage of Coccidioides	5/17/2017 9:46:44 PM	9/11/2017 4:33:24 PM
Soil Susceptibility to Compaction	8/14/2017 9:49:01 PM	9/11/2017 4:33:24 PM
URB/REC - Camp Areas	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
URB/REC - Off-Road Motorcycle Trails	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
URB/REC - Paths and Trails	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
URB/REC - Picnic Areas	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
URB/REC - Playgrounds	7/11/2014 3:09:22 PM	9/11/2017 4:33:24 PM
WLF - Desert Tortoise (CA)	7/11/2017 7:25:44 PM	9/11/2017 4:33:24 PM
WMS - Embankments, Dikes, and Levees	9/6/2013 6:52:24 PM	9/11/2017 4:33:24 PM
WMS - Excavated Ponds (Aquifer-fed)	9/27/2012 8:16:30 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, General	2/9/2016 4:25:56 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Micro (above ground)	2/9/2016 4:25:56 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Micro (subsurface drip)	8/15/2017 5:09:34 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Sprinkler (close spaced outlet drops)	8/21/2014 6:22:22 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Sprinkler (general)	8/21/2014 6:22:22 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Surface (graded)	1/22/2013 4:23:28 PM	9/11/2017 4:33:24 PM
WMS - Irrigation, Surface (level)	1/22/2013 4:23:28 PM	9/11/2017 4:33:24 PM
WMS - Pond Reservoir Area	9/27/2012 8:16:33 PM	9/11/2017 4:33:24 PM
WMS - Subsurface Water Management, Outflow Quality	9/27/2012 8:16:35 PM	9/11/2017 4:33:24 PM
WMS - Subsurface Water Management, System Installation	9/27/2012 8:16:35 PM	9/11/2017 4:33:24 PM
WMS - Subsurface Water Management, System Performance	9/27/2012 8:16:35 PM	9/11/2017 4:33:24 PM
WMS - Surface Water Management, System	9/27/2012 8:16:35 PM	9/11/2017 4:33:24 PM

Interpretation design date is the date that the interpretation logic was last modified.
Interpretation generation date is the date that the corresponding interpretive results were actually generated.

Appendix 3

Preliminary Alternatives Analysis for recycled water uses in the Big Pine area

INYO COUNTY - RECYCLED WATER PROJECTS - SCORING MATRIX

SCORING CRITERIA	DOTS	TREATMENT LEVEL (RA)	SYSTEM COST (RA)	PUMP DISTANCE (RA)	COMMUNITY ACCEPTANCE (LF)	LABOR REQUIREMENT (RA)	ECONOMIC POTENTIAL (LF)	IMPLEMENTATION GRANT FUNDING POTENTIAL (LF)	MAINTENANCE COSTS (annual) (RA)	LOCATION/ PARCEL OWNERSHIP	PUBLIC ACCESS PER TREATMENT LEVEL
PROJECT DESCRIPTIONS	SUM OF SCORES	**[1]** - Disinfected Tertiary **[2]** - Disinfected Secondary 2.2 **[3]** - Disinfected Secondary 23 **[4]** - Undisinfected Secondary	**[1]** - >$1,000,000 **[2]** - $500,000- $1,000,000 **[3]** - <$500,000	**[1]** - > 1 mile **[2]** - 0.5 -1.0 mile **[3]** - 0.25-0.5 mile **[4]** - 0.125-0.25 mile **[5]** - < 0.125 mile	**[1]** - Opposition **[2]** - Controversial **[3]** - Neutral **[4]** - Accepting **[5]** - Encouraged	**[1]** -Daily **[2]** - Biweekly **[3]** - Weekly **[4]** - Monthly **[5]** - Quarterly	**[1]** - None **[2]** - Indirect **[3]** - Direct **[4]** - Sustaining **[5]** - Profitable	**[1]** - Low **[2]** - Moderately Low **[3]** - Moderate **[4]** - Moderately High **[5]** - High	**[1]** - > $10,000 **[2]** - 5,000-10,000 **[3]** - $1,000-$5,000 **[4]** - <$1,000	**[1]** - LADWP **[2]** -PRIVATE **[3]** - COUNTY/BPPT	**[1]** - Restricted **[2]** - Controlled **[3]** - No Restrictions **Note:** Not included in DOTS calculation.
PROJECT A Revegetation with native vegetation - ≤ 180 acres of abandoned agricultural land owned by LADWP	**20.5**	Will depend on type and use of vegetation. **[3]/[4]**	**[3]** - <$500,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement and dust control offer indirect economic potential	LADWP funding	**[3]** - $1,000-$5,000	[1] - LADWP	**[1]** - Restricted
		3.5	3	4		1	1	4	3	1	
PROJECT B Irrigate baren parcel - restore to working pasture area	**18**	Pastures supporting animals producing milk for human consumption: **[3]** - Disinfected Secondary - 23 Recycled Water [§ 60304.c)(5)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	pasturage for profit	LADWP funding	**[4]** - <$1,000	[1] - LADWP	**[1]** - Restricted
		3	2	1		1	3	3	4	1	
	23	Pastures supporting animals not producing milk for consumption: **[4]** - Undisinfected Secondary Recycled Water [§ 60304.(d)(4)].	**[3]** - <$500,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	pasturage for profit.	LADWP funding	**[4]** - <$1,000	[1] - LADWP	**[1]** - Restricted
		4	3	1		4	3	3	4	1	
PROJECT C Irrigate landscaping at public park and asssociated baseball field	**13**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[1]** - >1 mile 1.1 miles from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic benefit	LADWP funding	**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	2	3	2	1	
PROJECT D Irrigate landscaping at BPPT planned commercial park - location TBD	**14**	For unrestricited access: **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(6)].	**[2]** - $500,000 -$1,000,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	landscape enhances park	Tribal ED grant funding tied to larger ED project	**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	2	4	2	1	
	17	Controlled Access: **[3]** - Disinfected Secondary - 2.2 Recycled Water [§ 60304.(c)(6)].	**[3]** - <$500,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	controlled access diminishes value of enhancement	Tribal ED grant funding tied to larger ED project	**[3]** - $1,000-$5,000	[1] - LADWP	**[2]** - Controlled
		3	3	1		1	1	4	3	1	
PROJECT E Irrigate community garden or commercial horticultural operation Location: Bartell Parcel	**14**	Requires **[1]** [§ 60304.(a)(1)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	economic development would be a direct benefit	small ag and ed grants available	**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	3	3	2	1	
PROJECT F Irrigate agricultural area for beer brewing crop production (hop, rye and/or barley) Location: Bartell Parcel	**19.5**	Brewing process likely qualifies as a commercial pathogen-destroying process, **[4]** - Undisinfected Secondary Recycled Water is required [§ 60304.(d)(6)]	[3] or [2] depending on location and confirmation of pathogen-destroying process	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	economic development would be a direct benefit	small ag and ed grants available	**[1]** - > $10,000	[1] - LADWP	**[1]** - Restricted
		4	2.5	1		4	3	3	1	1	

INYO COUNTY - RECYCLED WATER PROJECTS - SCORING MATRIX

SCORING CRITERIA	DOTS	TREATMENT LEVEL (RA)	SYSTEM COST (RA)	PUMP DISTANCE (RA)	COMMUNITY ACCEPTANCE (LF)	LABOR REQUIREMENT (RA)	ECONOMIC POTENTIAL (LF)	IMPLEMENTATION GRANT FUNDING POTENTIAL (LF)	MAINTENANCE COSTS (annual) (RA)	LOCATION/ PARCEL OWNERSHIP	PUBLIC ACCESS PER TREATMENT LEVEL
PROJECT DESCRIPTIONS	SUM OF SCORES	**[1]** - Disinfected Tertiary **[2]** - Disinfected Secondary 2.2 **[3]** - Disinfected Secondary 23 **[4]** - Undisinfected Secondary	**[1]** - >$1,000,000 **[2]** - $500,000- $1,000,000 **[3]** - <$500,000	**[1]** - > 1 mile **[2]** - 0.5 -1.0 mile **[3]** - 0.25-0.5 mile **[4]** - 0.125-0.25 mile **[5]** - < 0.125 mile	**[1]** - Opposition **[2]** - Controversial **[3]** - Neutral **[4]** - Accepting **[5]** - Encouraged	**[1]** -Daily **[2]** - Biweekly **[3]** - Weekly **[4]** - Monthly **[5]** - Quarterly	**[1]** - None **[2]** - Indirect **[3]** - Direct **[4]** - Sustaining **[5]** - Profitable	**[1]** - Low **[2]** - Moderately Low **[3]** - Moderate **[4]** - Moderately High **[5]** - High	**[1]** - > $10,000 **[2]** - 5,000-10,000 **[3]** - $1,000-$5,000 **[4]** - <$1,000	**[1]** - LADWP **[2]** -PRIVATE **[3]** - COUNTY/BPPT	**[1]** - Restricted **[2]** - Controlled **[3]** - No Restrictions **Note:** Not included in DOTS calculation.
PROJECT G Dust control	**21**	Requires **[3]** - Disinfected Secondary - 23 Recycled Water [§ 60307.(b)(6)	**[3]** - <$500,000	Likely will require haul truck **[5]**		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	dust control enhances town	GBUAPCD grant	**[3]** - $1,000-$5,000	[3] - COUNTY/BPPT	Not Applicable
		3	3	5		1	2	1	3	3	
PROJECT H Irrigation of Putting Green and Driving Range Location: TBD	**16**	If driving range is only irrigated when public access is restriced, qualifies as restricted access golf course **[3]** - Disinfected Secondary - 2.2 Recycled Water is required [§ 60304.(c)(3).	**[2]** - $500,000 -$1,000,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	economic development and town beautification would be a direct benefit	some private funding would be expected	**[2]** - 5,000-10,000	[1] - LADWP	**[2]** - Controlled
		3	2	1		1	3	3	2	1	
	13	If public access is not restricted, **[1]** - Disinfected Tertiary Recycled Water is required [§ 60304.(a)(5)]	**[2]** - $500,000 -$1,000,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	economic development and town beautification would be a direct benefit	some private funding would be expected	**[1]** - > $10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	3	3	1	1	
PROJECT I Woodlot - Christmas tree farm Location: Bartell parcel	**23**	Requires **[4]** - Undisinfected Secondary Recycled Water (conditional, no irrigation with waste water 14 days prior to harvesting or public access) [§ 60304.(d)(3)]	**[3]** - <$500,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	economic development and town beautification would be a direct benefit	some private funding would be expected	**[4]** - <$1,000	[1] - LADWP	**[1]** - Restricted Can open to public 14 days after ceasing all irrigation
		4	3	1		4	3	3	4	1	
PROJECT J Irrigation of ornamental and/or native plants for containerized sale Location: Bartell parcel or BPPT lands	**19**	Requires **[3]** - Disinfected Secondary - 2.2 Recycled Water [§ 60304.(c)(4)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.53 miles from treatment plant (for Bartell parcel)		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	economic development from a commercial enterprise is a direct benefit	some mix of ed funding, private funding and possibly LADWP might be expected	**[3]** - $1,000-$5,000	[1] - LADWP [3] - COUNTY/BPPT	**[2]** - Controlled
		3	2	1		1	3	4	3	2	
PROJECT K Irrigation of Brown's Campground	**11**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[1]** - >$1,000,000	**[2]** - 0.5 - 1.0 mile 0.76 from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	landscape enhancement would likely make the parcel more attractive and attract new business	some private funding and possibly LADWP assistance might be possible	**[1]** - > $10,000	[1] - LADWP	**[3]** - No Restrictions
		1	1	1		1	3	3	1		
PROJECT L Irrigation of Dog Park Location: TBD	**11**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	assuming the park is landscaped there would be civic improvement and indirect value	some agency funding and possibly LADWP assistance might be possible	**[1]** - > $10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	2	3	1		
PROJECT M Supplement water usage for irrigation of BP beautification - reduce current pumping demand	**11**	Requires **[1]**, assuming project application is similar to Project P (i.e. planter boxes, trees, etc.) [§ 60304.(a)(4)]	**[1]** - >$1,000,000	**[3]** - 0.25 to 0.5 miles 0.49 miles from treatment plant		Requires **[1]** Based on treatment level, daily bacteriological testing will be required.	beautification is civic improvement and provides indirect economic value	some agency funding and possibly LADWP assistance might be possible	**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions

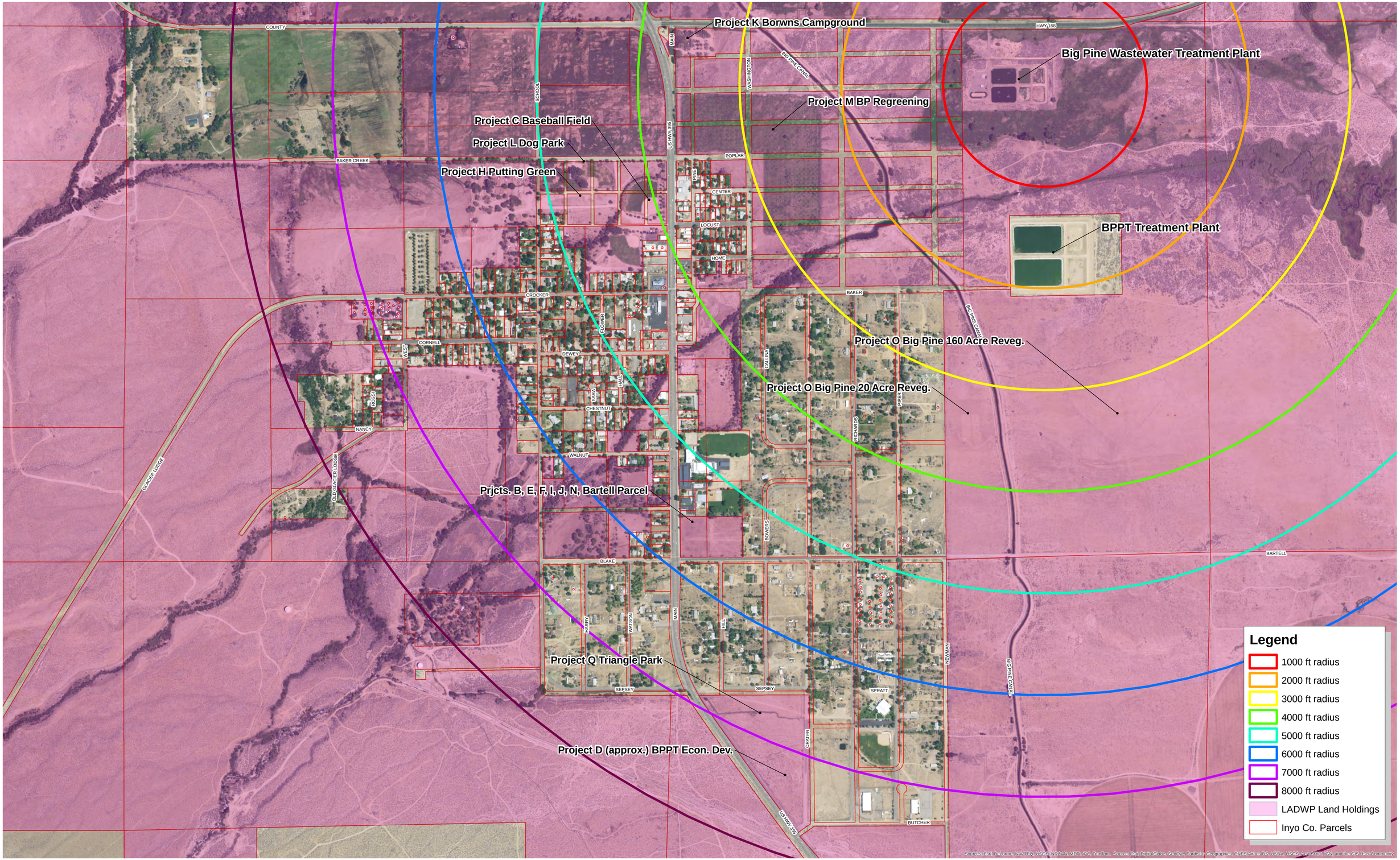
INYO COUNTY - RECYCLED WATER PROJECTS - SCORING MATRIX

SCORING CRITERIA	DOTS	TREATMENT LEVEL (RA)	SYSTEM COST (RA)	PUMP DISTANCE (RA)	COMMUNITY ACCEPTANCE (LF)	LABOR REQUIREMENT (RA)	ECONOMIC POTENTIAL (LF)	IMPLEMENTATION GRANT FUNDING POTENTIAL (LF)	MAINTENANCE COSTS (annual) (RA)	LOCATION/ PARCEL OWNERSHIP	PUBLIC ACCESS PER TREATMENT LEVEL
PROJECT DESCRIPTIONS	SUM OF SCORES	**[1]** - Disinfected Tertiary **[2]** - Disinfected Secondary 2.2 **[3]** - Disinfected Secondary 23 **[4]** - Undisinfected Secondary	**[1]** - >$1,000,000 **[2]** - $500,000- $1,000,000 **[3]** - <$500,000	**[1]** - > 1 mile **[2]** - 0.5 -1.0 mile **[3]** - 0.25-0.5 mile **[4]** - 0.125-0.25 mile **[5]** - < 0.125 mile	**[1]** - Opposition **[2]** - Controversial **[3]** - Neutral **[4]** - Accepting **[5]** - Encouraged	**[1]** -Daily **[2]** - Biweekly **[3]** - Weekly **[4]** - Monthly **[5]** - Quarterly	**[1]** - None **[2]** - Indirect **[3]** - Direct **[4]** - Sustaining **[5]** - Profitable	**[1]** - Low **[2]** - Moderately Low **[3]** - Moderate **[4]** - Moderately High **[5]** - High	**[1]** - > $10,000 **[2]** - 5,000-10,000 **[3]** - $1,000-$5,000 **[4]** - <$1,000	**[1]** - LADWP **[2]** -PRIVATE **[3]** - COUNTY/BPPT	**[1]** - Restricted **[2]** - Controlled **[3]** - No Restrictions **Note:** Not included in DOTS calculation.
		1	1	1		1	2	3	2		
PROJECT N Supply Water to Bartell Parcel for greening.	**11**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[1]** Based on treatment level, daily bacteriological testing will be required.	beautification is civic improvement and provides indirect economic value	LADWP funding	**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	2	2	2		
PROJECT O Irrigate BP 20 and 160 revegetation projects	**16**	Requires **[3]**, assuming vegetation is non-edible/not intended for consumption and public access is controlled [§ 60304.(c)(6)]	**[2]** - $500,000 -$1,000,000	**[2]** - 0.5 - 1.0 mile 0.83 miles from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement and dust control offer indirect economic potential	LADWP funding	**[3]** - $1,000-$5,000	[1] - LADWP	**[2]** - Controlled
		3	2	2		1	2	5	1		
PROJECT P Supply water for Big Pine Town Beautification Irrigation - trees, potted plants, planters, etc.	**19**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[5]** - > 0.125 mile On-site storage tank could store recyled water, tank truck would transport water to irrigation uses		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement offers indirect economic potential	some County funding and possibly LADWP assistance might be possible	**[2]** - 5,000-10,000	[3] - COUNTY/BPPT	**[3]** - No Restrictions
		1	2	5		1	2	3	2	3	
PROJECT Q Irrigate Triangle Park Location: E Sepsey /Crater/Hwy 395	**11**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.65 miles from treatment plant		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement offers indirect economic potential		**[2]** - 5,000-10,000	[1] - LADWP	**[3]** - No Restrictions
		1	2	1		1	2	1	2	1	
PROJECT R Civic Permaculture Project - Main Street Planters	**19**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[5]** - > 0.125 mile On-site storage tank could store recyled water, tank truck would transport water to irrigation uses		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement offers indirect economic potential	some County funding and possibly LADWP assistance might be possible	**[2]** - 5,000-10,000	[3] - COUNTY/BPPT	**[3]** - No Restrictions
		1	2	5		1	2	3	2	3	

R|O|Anderson

INYO COUNTY - RECYCLED WATER PROJECTS - HIGH SCORE ALTERNATIVES

SCORING CRITERIA	DOTS	TREATMENT LEVEL (RA)	SYSTEM COST (RA)	PUMP DISTANCE (RA)	COMMUNITY ACCEPTANCE (LF)	LABOR REQUIREMENT (RA)	ECONOMIC POTENTIAL (LF)	IMPLEMENTATION GRANT FUNDING POTENTIAL (LF)	MAINTENANCE COSTS (annual) (RA)	LOCATION/ PARCEL OWNERSHIP	PUBLIC ACCESS PER TREATMENT LEVEL
PROJECT DESCRIPTIONS	SUM OF SCORES	**[1]** - Disinfected Tertiary **[2]** - Disinfected Secondary 2.2 **[3]** - Disinfected Secondary 23 **[4]** - Undisinfected Secondary	**[1]** - >$1,000,000 **[2]** - $500,000- $1,000,000 **[3]** - <$500,000	**[1]** - > 1 mile **[2]** - 0.5 -1.0 mile **[3]** - 0.25-0.5 mile **[4]** - 0.125-0.25 mile **[5]** - < 0.125 mile	**[1]** - Opposition **[2]** - Controversial **[3]** - Neutral **[4]** - Accepting **[5]** - Encouraged	**[1]** -Daily **[2]** - Biweekly **[3]** - Weekly **[4]** - Monthly **[5]** - Quarterly	**[1]** - None **[2]** - Indirect **[3]** - Direct **[4]** - Sustaining **[5]** - Profitable	**[1]** - Low **[2]** - Moderately Low **[3]** - Moderate **[4]** - Moderately High **[5]** - High	**[1]** - > $10,000 **[2]** - 5,000-10,000 **[3]** - $1,000-$5,000 **[4]** - <$1,000	**[1]** - LADWP **[2]** -PRIVATE **[3]** - COUNTY/BPPT	**[1]** - Restricted **[2]** - Controlled **[3]** - No Restrictions **Note:** Not included in DOTS calculation.
PROJECT A Revegetation with native vegetation - ≤ 180 acres of abandoned agricultural land owned by LADWP	**20.5**	Will depend on type and use of vegetation. **[3]/[4]**	**[3]** - <$500,000	**[1]** Location Dependent		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement and dust control offer indirect economic potential	LADWP funding	**[3]** - $1,000-$5,000	[1] - LADWP	**[1]** - Restricted
		3.5	3	4		1	1	4	3	1	
PROJECT B Irrigate baren parcel - restore to working pasture area	**23**	Pastures supporting animals not producing milk for consumption: **[4]** - Undisinfected Secondary Recycled Water [§ 60304.(d)(4)].	**[3]** - <$500,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	pasturage for profit.	LADWP funding	**[4]** - <$1,000	[1] - LADWP	**[1]** - Restricted
		4	3	1		4	3	3	4	1	
PROJECT F Irrigate agricultural area for beer brewing crop production (hop, rye and/or barley) Location: Bartell Parcel	**19.5**	Brewing process likely qualifies as a commercial pathogen-destroying process, **[4]** - Undisinfected Secondary Recycled Water is required [§ 60304.(d)(6)]	[3] or [2] depending on location and confirmation of pathogen-destroying process	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	economic development would be a direct benefit	small ag and ed grants available	**[1]** - > $10,000	[1] - LADWP	**[1]** - Restricted
		4	2.5	1		4	3	3	1	1	
PROJECT G Dust control	**21**	Requires **[3]** - Disinfected Secondary - 23 Recycled Water [§ 60307.(b)(6)	**[3]** - <$500,000	Likely will require haul truck **[5]**		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	dust control enhances town	GBUAPCD grant	**[3]** - $1,000-$5,000	[3] - COUNTY/BPPT	Not Applicable
		3	3	5		1	2	1	3	3	
PROJECT I Woodlot - Christmas tree farm Location: Bartell parcel	**23**	Requires **[4]** - Undisinfected Secondary Recycled Water (conditional, no irrigation with waste water 14 days prior to harvesting or public access) [§ 60304.(d)(3)]	**[3]** - <$500,000	**[1]** - > 1 mile 1.53 miles from treatment plant		Requires **[4]** - Monthly	economic development and town beautification would be a direct benefit	some private funding would be expected	**[4]** - <$1,000	[1] - LADWP	**[1]** - Restricted Can open to public 14 days after ceasing all irrigation
		4	3	1		4	3	3	4	1	
PROJECT J Irrigation of ornamental and/or native plants for containerized sale Location: Bartell parcel or BPPT lands	**19**	Requires **[3]** - Disinfected Secondary - 2.2 Recycled Water [§ 60304.(c)(4)]	**[2]** - $500,000 -$1,000,000	**[1]** - > 1 mile 1.53 miles from treatment plant (for Bartell parcel)		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	economic development from a commercial enterprise is a direct benefit	some mix of ed funding, private funding and possibly LADWP might be expected	**[3]** - $1,000-$5,000	[1] - LADWP [3] - COUNTY/BPPT	**[2]** - Controlled
		3	2	1		1	3	4	3	2	
PROJECT P Supply water for Big Pine Town Beautification Irrigation - trees, potted plants, planters, etc.	**19**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[5]** - > 0.125 mile On-site storage tank could store recyled water, tank truck would transport water to irrigation uses		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement offers indirect economic potential	some County funding and possibly LADWP assistance might be possible	**[2]** - 5,000-10,000	[3] - COUNTY/BPPT	**[3]** - No Restrictions
		1	2	5		1	2	3	2	3	
PROJECT R Civic Permaculture Project - Main Street Planters	**19**	Requires **[1]** - Disinfected Tertiary Recycled Water [§ 60304.(a)(2)]	**[2]** - $500,000 -$1,000,000	**[5]** - > 0.125 mile On-site storage tank could store recyled water, tank truck would transport water to irrigation uses		Requires **[1]** Based on treatment level,daily bacteriological testing will be required.	civic improvement offers indirect economic potential	some County funding and possibly LADWP assistance might be possible	**[2]** - 5,000-10,000	[3] - COUNTY/BPPT	**[3]** - No Restrictions
		1	2	5		1	2	3	2	3	



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N

600 300 0 600 1,200 Feet

1 inch = 400 feet

RECYCLED WATER FOR RESTORATION AND COMMUNITY PROJECTS CITY OF BIG PINE, CALIFORNIA

POTENTIAL ALTERNATIVES & PROJECT LOCATIONS

JOB: 2521-001
DRAWN:
ENGINEER: JEL
SCALE: AS NOTED
DATE: 08/24/2017

Appendix 4

NREL Photovoltaic Solar Array Design Summary

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

203,951 kWh/Year*

System output may range from 198,241 to 209,519kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	4.77	13,490	1,719
February	5.41	13,743	1,751
March	6.85	18,965	2,416
April	7.50	19,479	2,482
May	7.32	19,015	2,422
June	7.35	18,078	2,303
July	7.38	18,464	2,352
August	7.54	18,743	2,388
September	7.15	17,687	2,253
October	6.13	16,601	2,115
November	5.64	15,023	1,914
December	5.19	14,662	1,868
Annual	6.52	203,950	$ 25,983

Location and Station Identification

Requested Location	Big Pine, CA
Weather Data Source	(TMY3) BISHOP AIRPORT, CA 15 mi
Latitude	37.37° N
Longitude	118.35° W

PV System Specifications (Commercial)

DC System Size	115 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	36°
Array Azimuth	180°
System Losses	15%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Economics

Average Cost of Electricity Purchased from Utility	0.13 $/kWh

Performance Metrics

Capacity Factor	20.2%