

INDIAN WELLS VALLEY GROUNDWATER AUTHORITY POLICY ADVISORY COMMITTEE

Indian Wells Valley Water District 500 W. Ridgecrest Blvd. Ridgecrest, CA 93555

A G E N D A

Thursday, August 2, 2018 6:00 p.m.

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in this meeting, please contact Alan Christensen at (661) 868-3183. Requests must be made as early as possible and at least one full business day before the start of the meeting. Documents and material relating to an open session agenda items that are provided to the IWVGA PAC Committee prior to a regular meeting will be available for public inspection and copying at Indian Wells Valley Water District, 500 Ridgecrest Blvd, Ridgecrest, CA 93555, or online at www.co.kern.ca.us/groundwater/.

Statements from the Public

The public will be allowed to address the Committee during Public Comments about subjects within the jurisdiction of the IWVGA Policy Advisory Committee and that are NOT on the agenda. No action may be taken on off-agenda items unless authorized by law. Questions posed to the Committee may be answered after the meeting or at future meeting. Dialog or extended discussion between the public and the Committee or staff will be limited in accordance with the Brown Act. The Public Comments portion of the meeting shall be limited to three (3) minutes per speaker. Each person is limited to one comment during Public Comments.

All remarks and questions should be addressed to the Committee as a whole and not to any individual member or staff. There will be time after each action item on the agenda to receive comments from the public. Again each speaker will be limited to three (3) minutes. Speakers should be brief and limit their comments to the specific subject being discussed. Persons will be limited to one comment per person unless directed by the Chair.

1. CALL TO ORDER AND ROLL CALL

2. APPROVAL OF JULY 12, 2018 PAC MEETING MINUTES

3. PUBLIC COMMENTS

This time is reserved for the public to address the Committee about matters NOT on the agenda. No action will be taken on non-agenda items unless authorized by law. Comments are limited to three minutes per person.

4. DISCUSSION OF AD HOC COMMITTEE REPORT ON POAM INPUT FOR PAC ACTION

Committee discussion, potential action / comments / any recommended action

5. DISCUSSION OF AD HOC COMMITTEE REPORT ON OPTIONS FOR ADDITIONAL GSA FUNDING SOURCES / GRANTS

Committee discussion, potential action / comments / any recommended action

6. WRM PARTICIPATION IN PAC MEETINGS

7. OUTREACH STRATEGY FOR DAC INVOLVEMENT

Committee discussion, potential action / comments / any recommended action

8. TAC RECYCLED WATER TECH MEMO REVIEW BY PAC FOR ANY POLICY ISSUES

Committee discussion, potential action / comments / any recommended action

9. FUTURE AGENDA ITEMS

This time is reserved for the public and Committee members to address potential items for future meeting agendas. No action may be taken unless authorized by law and comments are limited to three minutes per person.

10. COMMITTEE MEMBER ANNOUNCEMENTS OR COMMENTS

11. ADJOURN TO SEPTEMBER 6, 2018 MEETING AT 6 P.M. IWVWD

Please Review and familiarize yourself with BMPs for Sustainable Groundwater Management on DWR website and handout on Sustainable Management Criteria dated July 12, 2018 prepared for TAC.



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DRAFT

MEMORANDUM

TO: Indian Wells Valley Groundwater Authority
Technical Advisory Committee

FROM: Stetson Engineers Inc.

SUBJECT: Recycled Water Study

DATE: July 20, 2018

JOB NO: 2652-09

Introduction

The Indian Wells Valley (IWV) groundwater basin was identified by the California Department of Water Resources (DWR) as a critically overdrafted basin of Medium Priority, and, as such, the Groundwater Sustainability Agency (GSA) is required to develop a groundwater sustainability plan (GSP) by January 31, 2020. Stetson Engineers Inc. (Stetson) was retained by the Indian Wells Valley Groundwater Authority (IWVGA) as the Water Resources Manager responsible for developing the GSP for the IWV groundwater basin. This recycled water study is part of the efforts to develop and analyze potential management strategies that could be used to achieve sustainability in the IWV basin.

Purpose

The IWV groundwater basin has been in a state of overdraft since the 1960s as a result of groundwater pumping exceeding the natural basin yield. In compliance with the Sustainable Groundwater Management Act (SGMA), the GSA for the IWV groundwater basin is required to submit to DWR a GSP by January 31, 2020. The GSP will provide management strategies that culminate in the absence of undesirable and unsustainable groundwater conditions within 20 years in order to provide long-term sustainable groundwater management. The beneficial use of recycled water represents a possible sustainable management action because of the potential to not only replace existing groundwater demands for irrigation and possible direct potable use with alternative supplies (i.e. recycled water) but also provide a new source of basin recharge. Mitigating the chronic lowering of groundwater levels remains an urgent matter to address in the GSP, and the beneficial use of recycled water as recommended in this study will contribute to the GSP's goal of achieving groundwater sustainability within 20 years in the IWV.

Study Area

The IWV groundwater basin is located east of the southern Sierra Nevada range in southern California with an area of approximately 382,000 acres underlying portions on Inyo, Kern, and San Bernardino Counties. Groundwater in the IWV is present in a dual-aquifer system—commonly referred to as the shallow aquifer and the deep (principal) aquifer—defined by three water-bearing zones, characterized from shallowest to deepest as the shallow hydrogeologic zone (SHZ), the intermediate hydrogeologic zone (IHZ), and the deep hydrogeologic zone (DHz). The occurrence of groundwater in the SHZ is limited to the eastern and northern portions of the IWV, where it occurs under unconfined conditions on top of low-permeability lacustrine¹ clay layers. The lacustrine clay layers separate the SHZ from the upper IHZ and act as a barrier between the shallow and deep aquifers. As a result, groundwater flow between water-bearing zones appears to be

¹ Lacustrine deposits contain silt and silty clay of Pleistocene age and exhibit low permeability (DRI 2016).

minimal, and artificial sources of recharge (e.g. aqueduct and pipe leakage, treated wastewater seepage, and infiltration from irrigation water) have a greater influence on recharge to the SHZ than to the IHZ and DHZ (TriEcoTt 2013).

The shallow aquifer also has generally poorer water quality than the deep aquifer, with concentrations of TDS, arsenic, chloride, and sulfate commonly exceeding primary and secondary drinking water standards. (TriEcoTt 2013).

Prior Studies

Various technical studies characterizing the IWW groundwater basin, current water uses, wastewater treatment facilities (WWTFs), and recycled water concepts have been prepared and were used in the preparation of this study. A reference list of these studies is included at the end of this technical memorandum.

Existing Sources of Wastewater

Below is a summary of the existing sources of wastewater within the IWW groundwater basin.

City of Ridgecrest

Prior to 1974, the Ridgecrest Sanitation District operated a small WWTF in the eastern portion of the City, near San Bernardino Boulevard south of Highway 178. At that time, the Navy operated its own WWTF on the China Lake Naval Air Weapons Station (NAWS) base. To address capacity problems, the City abandoned its old WWTF and consolidated the two treatment facilities to treat combined flow from the City and from the NAWS at a common plant. The City has since operated a 3.6 million gallon per day (MGD) WWTF located on the NAWS base, approximately 3.5 miles northeast of the City center (see Figure 1). Annual average day (AAD) flows were approximately 2.44 MGD (2,739 acre-feet per year [AFY]) in 2017. The City WWTF provides primary wastewater treatment

through a series of headworks and sedimentation tanks; secondary treatment occurs in seven (7) facultative ponds with clay lining, limiting infiltration and percolation. Effluent disposal occurs through one of three (3) methods: (1) alfalfa irrigation at the old City WWTF site; (2) disinfection and subsequent irrigation at the China Lake NAWS golf course; or (3) evaporation/percolation ponds at the City WWTF site.

Wastewater flowing to the City WWTF is collected in three (3) sewer trunks: a 24-inch diameter trunk from the NAWS and 15 and 24-inch trunks coming from the City. These trunks collect wastewater from approximately 38 miles of sewer pipelines, and local topography allows for wastewater to flow by gravity to the City WWTF without pumping. In addition, approximately 150 parcels within the City are not connected to the City sewer system and are assumed to use individual septic systems (RMC 2018).

The City is currently considering upgrading, expanding, and potentially relocating the existing City WWTF. Recommendations from the Provost & Pritchard consulting group include abandoning and demolishing the existing City WWTF for construction of a new 4.0 MGD oxidation ditch secondary treatment plant, new evaporation/percolation ponds, and new solids handling facilities. The report also made provisions for construction of tertiary treatment facilities (filtration and disinfection) to provide up to 1.8 MGD (2,016 AFY) of recycled water; a 1.8 million gallon (MG) recycled water storage tank; and a recycled water pump station. The Provost & Pritchard report also includes conceptual plans for two (2) potential sites for the new WWTF: (1) the existing WWTF site, or (2) the old City WWTF site (see Figure 2). The future WWTF location will depend on ongoing easement and land use negotiations between the City and the Navy. As listed in Table 1 below, the City has made progress regarding the Provost & Pritchard recommendations but must also complete a number of additional items before proceeding with construction of the new WWTF.

Table 1
Items Completed and Required for New City WWTF Project

<u>Items Completed</u>	<u>Items Required</u>
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• Facility planning of two site alternatives	• Final notices of determination for EIR
• Financial studies and new adopted sewer rates	• Final easement/use negotiations with Navy
• 30% plan design	• Final site selection for new WWTF
• Environmental Impact Report (EIR)	• Authorization of final design services
• Preliminary application for Clean Water State Revolving Fund (CWSRF) Loan	• Submittal of technical, environmental, and financial security packages to State Water Resources Control Board for CWSRF loan application
• New easement maps and legal descriptions with draft operating agreement	• Application for new waste discharge permits to State Water Resources Control Board

Inyokern Community Services District

Water and wastewater services for the community of Inyokern are provided by the Inyokern Community Services District (Inyokern CSD). Wastewater flows through a series of clay and PVC pipes to the Inyokern WWTF located east of Brown Road adjacent to Highway 395 (see Figure 3). Per discussions with Tim Carroll of the Inyokern CSD, the Inyokern WWTF has a design capacity of 0.035 MGD with average daily flows of 0.029 MGD (33 AFY). The Inyokern WWTF provides a minimum level of wastewater treatment; for planning purposes, wastewater effluent from the Inyokern WWTF is assumed to be of similar quality to household-generated wastewater. All wastewater disposal at the Inyokern WWTF occurs in lined evaporation ponds.

Septic Systems

The community of China Lake Acres along with dense residential areas immediately west of the City boundaries are not connected to sewer systems. The Kern County Environmental Health Services and the Kern County Planning and Natural Resources Department have indicated that permitted septic system data and locations are available for each parcel upon request and payment of appropriate research fees, but are not currently compiled. This study assumes that any residence not located within the

boundaries of the City or the Inyokern CSD contains an individual septic system. Three (3) residential areas with relatively dense populations were examined as sources of wastewater for a potential recycled water project (see Figure 4):

- Septic Collection Area 1: a portion of the China Lake Acres community
- Septic Collection Area 2: a residential area immediately west of the City, bounded by Jacks Ranch Road to the west and Highway 178 to the north
- Septic Collection Area 3: a residential area immediately west of the City, bounded by Brady Street to the west and Bowman Road to the north

In addition, approximately 150 parcels within the City boundaries are not connected to the City sewer system and are also assumed to contain individual septic systems (RMC 2018). However, the locations of these parcels containing septic systems are yet to be confirmed.

Current Wastewater and Recycled Water Status

According to California Water Code section 13050(n), “recycled water” refers to water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur. The City WWTF is currently the only facility that generates a recycled water supply for direct beneficial or controlled use within the IWV groundwater basin. The City WWTF produces recycled water that is applied at the old City WWTF site for alfalfa irrigation and at the China Lake NAWS for golf course irrigation. The remaining treated wastewater generated at the City WWTF is stored in evaporation/percolation ponds at the City WWTF site. Wastewater from the Inyokern WWTF is stored in evaporation/percolation ponds at the Inyokern WWTF site.

Alfalfa Irrigation

Approximately **220 AFY** of secondary-treated wastewater from Pond 3 at the City WWTF is currently used to irrigate 30 acres of alfalfa located at the old City WWTF site. Comments received from the IWVGA Technical Advisory Committee (TAC) on March 12, 2018, stated that the recycled water sent to the old City WWTF Site is not used for alfalfa irrigation but instead used for disposal in evaporation ponds similar to those at the City WWTF. For the purposes of this study, the recycled water applied at the old City WWTF site is assumed to be applied for alfalfa irrigation.

China Lake NAWS Golf Course

The Navy receives secondary-treated effluent from Pond 3 at the City WWTF and provides additional treatment for beneficial use on the golf course. The Navy previously used a pressure filter system and a chlorine contact basin to provide tertiary-level treatment, but algae biomass accumulation has clogged the filters. Currently, the secondary-treated effluent bypasses the filters and flows directly into the chlorine contact basin. A Negotiated Sewer Service Contract between the City and the Navy reserves the Navy's right to receive up to 750 AFY of treated wastewater from the City WWTF for irrigation of the golf course located at the China Lake NAWS. However, it has been noted that the golf course only uses approximately **500 AFY** of water (Provost & Pritchard 2015).

Evaporation/Percolation Ponds

The City WWTF site contains four (4) evaporation/percolation ponds which may receive secondary-treated effluent that is not supplied for alfalfa irrigation or golf course irrigation. However, two of the ponds (Ponds 8 and 11) are currently out of service to mitigate groundwater mounding concerns around the City WWTF site. Wastewater stored in these ponds evaporates or percolates into either the underlying shallow groundwater aquifer or the Mohave Tui Chub habitat located north of the City WWTF.

Mohave Tui Chub Habitat

The U.S. Fish and Wildlife Service moved a population of Mohave Tui Chub, an endangered species of fish, to the China Lake NAWS during the 1970s as part of a series of Tui Chub translocation projects. The China Lake Mohave Tui Chub habitat consists of two seeps (areas where subsurface waters rise to the surface and form a pool). The two seeps, referred to as Lark Seep and G1 Seep, are connected through a series of man-made channels, which were originally constructed during the 1950s and 1960s to divert groundwater away from nearby roads and facilities (see Figure 5). Water is primarily provided to the habitat through seepage from the City WWTF ponds, but other sources of water for the habitat include irrigation percolation from the China Lake golf course and various contributions from the City of Ridgecrest area (such as irrigation percolation, wash-down, commercial water discharge, and transmission line leaks).

A 1993 Memorandum of Agreement between the Navy and the City ensures that treated effluent of appropriate quality and quantity are available through seepage from Ponds 9 and 10 to the Tui Chub habitat. The habitat's total annual water demand was estimated to be **805 AFY** with a maximum demand of 993,000 gallons per day (gpd) occurring in late June and early July and a minimum demand of 622,170 gpd occurring in late December and early January (ERS 1991).

To address TAC comments that the suggested habitat water demand of 805 AFY was too conservative, a simple monthly evaporation model was evaluated to estimate annual evapotranspiration (ET) occurring at the habitat and compare to the initial habitat water demand. The model was provided to Stetson by Wade Major, the large agriculture representative on the TAC and a senior consultant at Aquilogic. The model estimates total monthly ET for different bodies of water (i.e. the lake factor) at different salinities. The model's lake factor was set for large open bodies of water similar to multi-acre ponds and was therefore left unchanged. The salinity factor was adjusted to match the salinity of wastewater effluent at the City WWTF. According to the adjusted model, the annual ET occurring in the estimated 60 acres of habitat seeps is approximately 350 AFY. However, as mentioned in ERS 1991, the initial habitat demand of 805 AFY consists of ET in addition to other factors including vertical and horizontal groundwater flows and seep and

channel drainage. Therefore, the initial habitat water demand of 805 AFY was used for the purposes of this study.

DWR, in conjunction with the California Department of Fish and Wildlife and The Nature Conservancy, has released a “Groundwater Resource Hub: Understanding and Managing Groundwater Dependent Ecosystems” database containing various datasets on vegetation and wetlands in California’s groundwater basins. The vegetation and wetland datasets serve as indicators of groundwater dependent ecosystems (GDEs), defined in Title 23 of the California Code of Regulations (CCR) as “ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.” The database includes an interactive mapping tool² allowing users to view locations of seeps, springs, vegetation, and wetlands that are likely dependent on groundwater and, therefore, indicators of GDEs. Datasets from the database and mapping tool indicate that the Mohave Tui Chub habitat—as well as land farther north of the City boundaries—is an indicator of a GDE.

SGMA requires that all beneficial uses and users, including GDEs, be considered in the development and implementation of GSPs. GDE identification must be included in the GSP to determine whether groundwater conditions are having potential effects on any and all beneficial uses and users within the basin. Additionally, GDE management must be incorporated into the sustainable management criteria established as part of the GSP. Therefore, the findings of this study include identification of and commitment to the annual water demands for the Mohave Tui Chub habitat as well as consideration of a previously proposed management plan to enhance the water supply reliability for the Mohave Tui Chub species and habitat.

Recycled Water Quantification

Historic wastewater flow data for the City WWTF was provided by City staff. In 2017, total effluent flow from the City WWTF was 2,739 acre-feet (AF). However, the City WWTF experienced a total effluent flow of 2,437 AF in 2015 as a result of recent water

² The GDE database and mapping tool may be accessed at <https://groundwaterresourcehub.org/gde-tools/>

conservation efforts. Additional conservation as part of the GSP is expected to decrease the future total available wastewater at the City WWTF. Therefore, the 2015 total effluent flow of 2,437 AF was used as a baseline for quantification of future available wastewater. Future available wastewater projections through 2046 were assumed to follow the annual population growth rate of 1.8% per year to account for the City's anticipated future expansion and development (Provost & Pritchard 2015) and is listed in Table 2. The average projection of future available wastewater (**3,257 AFY**) was used for final recycled water quantification and facility sizing.

As mentioned above, average daily flow at the Inyokern WWTF is 0.029 MGD (33 AFY), and the Inyokern WWTF design capacity is 0.035 MGD. Per discussions with Tim Carroll of the Inyokern CSD, the Inyokern community is not expected to experience any increases in population or community development. Therefore, this study assumes that the **33 AFY** of wastewater available from the Inyokern WWTF will remain constant throughout the development and implementation of the GSP.

Due to the lack of a compiled septic system dataset, the amount of available wastewater from septic systems was assumed on a per-residence basis. Each residence identified within one of the septic collection areas was assumed to produce approximately 263 gpd of wastewater, based on an individual wastewater contribution of 75 gallons per capita-day (gpcd) with an average of 3.5 people per residence (RMC 2018). The number of residences in each septic collection area was estimated using Google Earth to calculate the total available wastewater in each septic collection area. The total potential wastewater that would be collected from septic systems areas is estimated to be **380 AFY**. A summary of the wastewater generated for each septic system area is presented in Table 3.

Table 2

Future Available Wastewater Projections - City WWTF

Year	Future Available Wastewater (AF)
2015	2,437
2016	2,481
2017	2,526
2018	2,571
2019	2,617
2020	2,664
2021	2,712
2022	2,761
2023	2,811
2024	2,861
2025	2,913
2026	2,965
2027	3,019
2028	3,073
2029	3,128
2030	3,185
2031	3,242
2032	3,300
2033	3,360
2034	3,420
2035	3,482
2036	3,545
2037	3,608
2038	3,673
2039	3,739
2040	3,807
2041	3,875
2042	3,945
2043	4,016
2044	4,088
2045	4,162
2046	4,237
Average	3,257

Table 3
Total Generated Wastewater from Septic Systems

	Wastewater Contribution per Residence (gpd)	Number of Identified Residences	Total Generated Wastewater (gpd)	Total Generated Wastewater (AFY)
Septic Collection Area 1	263	605	159,115	179
Septic Collection Area 2	263	340	89,420	100
Septic Collection Area 3	263	190	49,970	56
City of Ridgecrest	263	150	39,450	45
Total	-	1,285	337,955	380

The total available recycled water in the IWV basin is equal to the total available sources of wastewater less the total recycled water currently applied for beneficial uses—alfalfa irrigation, golf course irrigation, and Tui Chub habitat seepage flow. The sources of available wastewater and current beneficial uses of recycled water are listed below in Table 4. As shown in the calculations below, total additional available recycled water in the IWV basin is estimated to be **2,145 AFY**. Total available recycled water may increase in the future should the City discontinue application of 220 AFY of recycled water at the old City WWTF site for alfalfa irrigation.

Table 4
Summary of Current Recycled Water Status in IWV

Description	Annual Flow (AFY)
Sources	
City WWTF	3,257
Inyokern WWTF	33
Septic Systems	380
Existing Beneficial Uses	
Golf course irrigation at China Lake NAWS	500
Alfalfa irrigation at old City site	220
Tui Chub habitat seepage flow	805

Total available recycled water = (3,257 + 33 + 380) — (500 + 220 + 805) = **2,145 AFY**

Regulatory Analysis

A new recycled water project in the IWV groundwater basin would require coordination with the appropriate regulatory agencies: the State Water Resources Control Board – Division of Drinking Water, and the Regional Water Quality Control Board – Lahontan Region. Below is a brief summary of these regulatory agencies' requirements for recycled water projects in the IWV at a planning level.

State Water Resources Control Board – Division of Drinking Water

The State Water Resources Control Board – Division of Drinking Water (DDW) establishes uniform criteria for the beneficial uses of recycled water; approves proposed

recycled water projects and engineering reports; and issues approval letters with suggested permit conditions to the Regional Water Quality Control Board. The Regional Water Quality Control Board then issue permits for projects involving recycled water. The recycled water regulations contained in Title 17, Division 1, Chapter 5 and Title 22, Division 4, Chapter 3 of the CCR were reviewed as part of this study to establish the required levels of treatment, the required facilities, and the institutional restrictions on recycled water projects.

DDW has identified four (4) recycled water tiers, each with appropriate definitions of recycled water quality and regulated non-potable beneficial uses:

- “Disinfected tertiary” recycled water
 - o A filtered and subsequently disinfected wastewater
 - o Regulated beneficial uses include irrigation of:
 - Food crops where the recycled water comes into contact with the edible portion of the crop
 - Parks and playgrounds
 - School yards
 - Residential landscaping
 - Unrestricted access golf courses
- “Disinfected secondary – 2.2” recycled water
 - o An oxidized and disinfected wastewater with a median concentration of total coliform bacteria that does not exceed a most probable number (MPN) of 2.2 per 100 milliliters (mL) over the last seven days of bacteriological analysis; and the number of total coliform bacteria does not exceed an MPN of 23 per 100 mL in more than one sample in any 30-day period
 - o Regulated beneficial uses include surface irrigation of:
 - Food crops where the edible portion of the crop is produced above ground and is not contacted by the recycled water
- “Disinfected secondary – 23” recycled water
 - o An oxidized and disinfected wastewater with a total median concentration of total coliform bacteria that does not exceed an MPN of 23 per 100 mL

over the last seven days of bacteriological analysis; and the number of total coliform bacteria does not exceed an MPN of 240 per 100 mL in more than one sample in any 30-day period

- o Regulated beneficial uses include surface irrigation of:
 - Cemeteries
 - Freeway landscaping
 - Restricted access golf courses
 - Ornamental nursery stock and sod farms where access by the general public is not restricted
 - Pasture for animals producing milk for human consumption
 - Nonedible vegetation where access is controlled so that the irrigated area cannot be used as if it were part of a park, playground, or school yard
- “Undisinfected secondary” recycled water
 - o An oxidized wastewater
 - o Regulated beneficial uses include surface irrigation of:
 - Orchards where the recycled water does not come into contact with the edible portion of the crop³
 - Vineyards where the recycled water does not come into contact with the edible portion of the crop³
 - Non food-bearing trees
 - Fodder and fiber crops and pasture for animals not producing milk for human consumption
 - Seed crops not eaten by humans
 - Food crops that must undergo commercial pathogen-destroying processing before human consumption
 - Ornamental nursery stock and sod farms, provided no irrigation with recycled water occurs for a period of 14 days prior to harvesting retail sale, or allowing access to the general public

³ The Food and Drug Branch of the Division of Drinking Water recommends that disinfected secondary – 2.2 recycled water be used for irrigation of orchards and vineyards.

The City WWTF (excluding the secondary effluent that undergoes disinfection for irrigation of the NAWA golf course) currently produces “undisinfected secondary” recycled water. However, as previously mentioned, the City is currently in the process of expanding, upgrading, and potentially relocating its WWTF. The recommendations made in Provost & Pritchard 2015 include provisions for 1.8 MGD of tertiary treatment via cloth media filtration and chlorine disinfection with liquid sodium hypochlorite, thus generating recycled water of “disinfected tertiary” quality.

Title 22, Division 4, Chapter 3 of the CCR also contains two sets of regulations for projects involving groundwater recharge with recycled water. The regulations in Article 5.1 apply to groundwater recharge through surface applications (i.e. spreading areas), and those in Article 5.2 apply to groundwater recharge by means other than surface applications (i.e. subsurface applications, such as deep injection wells). The CCR includes regulations discussing the requirements for permitting; project submittal and approval; modeling; operations; and monitoring. However, for planning purposes, the key requirements described in the regulations are the required treatment systems and the retention time of recycled water recharged into the groundwater basin.

Recycled water for surface and subsurface applications must meet a “disinfected tertiary” recycled water quality, but recycled water for subsurface applications must also undergo advanced treatment through reverse osmosis and advanced oxidation.

The retention time of recycled water recharged into a groundwater basin shall (1) allow for sufficient response time to identify treatment failures and implement actions necessary for the protection of public health, and (2) allow sufficient time for recycled water to become integrated into the groundwater basin before reaching potable water supplies. The recycled water regulations in the CCR require a minimum retention time of two (2) months to allow sufficient response time to identify treatment failures and implement corrective measures, but the actual retention time required for a recycled water project must be justified and submitted to the SWRCB for approval. Groundwater modeling (e.g. tracer studies) is recommended to simulate the behavior and ratio of

recycled water relative to the groundwater basin. For the purposes of this study, a retention time of six (6) months is assumed to be equivalent to a distance of approximately 1.5 miles from a potable well. Modeling will be required in the future to determine the actual required retention time to be approved by the SWRCB.

Regional Water Quality Control Board – Lahontan Region

The IWV groundwater basin lies within the jurisdiction of the Regional Water Quality Control Board – Lahontan Region (Lahontan RWQCB). All recycled water applications within the IWV groundwater basin must comply with the basin water quality objectives in the *Water Quality Control Plan for the Lahontan Region* (Basin Plan). According to the Basin Plan, the existing beneficial uses of groundwater in the IWV basin include agricultural supply, industrial service supply, freshwater replenishment, and municipal and domestic supply⁴. The following objectives in the Basin Plan apply to all groundwater basins with a municipal and domestic supply beneficial use designation (and therefore the deep aquifer in the IWV basin):

- Coliform Bacteria: The median concentration of coliform organisms over any seven-day period shall be less than 1.1 / 100 mL.
- Chemical Constituents: In general, ground waters shall not contain concentrations of chemical constituents that adversely affect the beneficial uses. The concentration of certain chemical constituents shall not exceed the maximum contaminant levels (MCLs) or secondary maximum contaminant levels (SMCLs) based upon the following drinking water standards specified in Title 22 of the CCR:
 - o Table 64431-A (Inorganic Chemicals)
 - o Table 64431-B (Fluoride)
 - o Table 64444-A (Organic Chemicals)
 - o Table 64449-A (Secondary Maximum Contaminant Levels – Consumer Acceptance Limits)

⁴ Per SWRCB Resolution No. 2015-0063, the municipal and domestic supply beneficial use designation has been removed from certain shallow ground waters beneath the China Lake, NAWS, Kern, Inyo, and San Bernardino counties.

- o Table 64449-B (Secondary Maximum Contaminant Levels – Ranges)
- Radioactivity: The concentrations of radionuclides shall not exceed the limits specified in Table 4 of Section 64443 of Title 22 of the CCR.
- Taste and Odor: Ground water shall not contain taste or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. At a minimum, concentrations shall not exceed SMCLs specified in Table 64449-A and Table 64449-B of Title 22 of the CCR.

Non-Potable Reuse Projects

Non-potable reuse (NPR) was studied as an alternative water use method to reduce existing groundwater demands and replace them with recycled water. The following potential NPR projects were initially identified through an analysis of existing groundwater demands:

- 1) Industrial and municipal reuse: Searles Valley Minerals and city of Trona
- 2) Agricultural irrigation
- 3) Residential landscaping (greywater)
- 4) Landscape irrigation: City of Ridgecrest and China Lake NAWS

Industrial and Municipal Reuse: Searles Valley Minerals and city of Trona

Searles Valley Minerals Inc. (Searles) is a mineral extraction company based in Trona, CA, approximately 14 miles east of the City WWTF. Searles operates five (5) groundwater extraction wells in the IWW basin. Groundwater produced from these wells undergoes arsenic treatment and is conveyed through two (2) potable water pipelines into the City of Trona and to the Searles mineral extraction site. Section 60310(h) of the CCCR prohibits any physical connections from being made between any recycled water system and a system conveying potable water. Therefore, a recycled water project involving Searles and/or the city of Trona was not considered to be a feasible alternative.

Agricultural Irrigation

The IWV basin contains numerous agricultural sites including alfalfa fields and pistachio orchards; most of these sites are located along Brown Road north of the Inyokern community. It was determined that the agricultural sites along Brown Road were not in reasonable proximity to the identified sources of recycled water supplies. Therefore, a recycled water project involving agricultural irrigation was not considered to be a feasible alternative.

Residential Landscaping (Greywater)

Greywater consists of wastewater generated from non-toilet household appliances such as laundry machines, sinks, showers, etc. Comments received from the TAC indicated that many rural residents currently reuse water from laundry machines for residential landscaping. Members of the TAC also mentioned that it is common rural practice to plant wind break trees near leach field lines, thus using greywater that would otherwise be lost to evaporation. Implementing greywater practices within the IWV basin would require not only a quantification of existing greywater supplies but also an identification of all residents currently applying greywater for the beneficial uses as described by the TAC. Therefore, residential landscaping with greywater was not considered to be a feasible alternative.

Landscape Irrigation

Landscape irrigation within the City and the China Lake NAWs is considered to be the primary feasible use of recycled water for an NPR project in the IWV basin. As mentioned in the regulatory analysis, recycled water used for irrigation of landscape (schools, parks, playgrounds, etc.) must be of a “disinfected tertiary” quality. Recommendations have been made to the City for construction of tertiary treatment facilities to provide up to 1.8 MGD (2,016 AFY) of “disinfected tertiary” recycled water for landscape irrigation on various existing and future properties (Provost & Pritchard 2015). This study has incorporated the findings in Provost & Pritchard but, as part of the GSP development, has prioritized replacing existing water demands with recycled water rather than creating new water demands.

The City currently operates five (5) groundwater wells that provide irrigation for 41 acres of turf located at City Hall, Pearson Park, Jackson Park, and the Kerr-McGee Sports Complex. The total annual water demand for irrigation at these locations is estimated to be approximately 320 AFY (Todd 2014). The Indian Wells Valley Water District (IWWVD) service area includes a large portion of the City. With the exception of City Hall, Pearson Park, Jackson Park, and the Kerr-McGee Sports Complex, it is assumed that the IWWVD provide water for landscape irrigation within the City boundaries. The Navy operates wells that provide groundwater for landscape irrigation within the NAWS base.

Approximately 103.5 acres of existing landscaping were identified within the City and the China Lake NAWS for potential landscape irrigation with recycled water (see Figure 7). Assuming an applied irrigation rate of 7.8 feet per year, the total annual water demand for landscape irrigation is estimated to be approximately 807 AFY. The identified existing landscaping and appropriate water demands are listed in Table 5.

Table 5
Landscape Irrigation Water Demands: City/NAWS Core Areas

Description	Landscape Area (acres)	Applied Irrigation Rate (feet per year)⁵	Annual Water Demand (AFY)
<i>City of Ridgecrest</i>			
City Hall	8.7	7.8	67.9
Jackson Park	29.9	7.8	233.2
Kerr-McGee Sports Complex	10.8	7.8	84.2
Pearson Park	4.1	7.8	31.2
Subtotal	53.5	-	416.5
<i>Indian Wells Valley Water District</i>			
Burroughs High School	16.9	7.8	131.8
Heritage Village	5.5	7.8	42.9
Las Flores Elementary School	1.5	7.8	11.7
Mesquite High School	1.6	7.8	12.5
Pierce Elementary School	0.4	7.8	3.1
Subtotal	25.9	-	202.0
<i>Navy</i>			
Fields located on Blandy Ave.	12.1	7.8	94.4
Fields located on Forrestal St.	8.0	7.8	62.4
Fields located on Inyokern Rd.	2.0	7.8	15.6
Solar Park	2.0	7.8	15.6
Subtotal	24.1	-	188.0
Total	103.5	-	806.5

⁵ Assumed annual irrigation rate of 7.8 feet per year: Todd 2014.

The facilities and conceptual costs for an NPR project to irrigate the landscaping identified above are discussed below and listed in Table 6.

Tertiary Treatment Facilities

The Provost & Pritchard recommendations included provisions for the City to construct tertiary treatment facilities to treat up to 1.8 MGD (2,016 AFY) of wastewater at the City WWTF. This study assumes that the City will implement the Provost & Pritchard recommendations. Therefore, no additional treatment capacity will be required to provide 807 AFY of recycled water for landscape irrigation.

Booster Pump Station

The Provost & Pritchard report included recommendations for the City to install a new booster pump system to pump recycled water into a purple pipe distribution system. However, the required capacity of the booster pump station was not mentioned in the report. This study assumes that a new booster pump station with sufficient capacity will be required for the specific purpose of pumping recycled water to the landscaping identified above.

Based on the patterns of water demands for similar NPR projects, sufficient system capacity will be required to pump and convey up to 20% of total annual irrigation demand within one month, typically during a summer month, to address seasonal and diurnal variance in irrigation demand. To minimize human contact with recycled water, irrigation of public areas is limited to between the hours of 10:00 pm – 6:00 am. Therefore, the booster pump system must have sufficient capacity to pump up to 3,700 gpm of recycled water throughout the recycled water distribution system.

Purple Pipe Distribution System

Approximately 11 miles of purple distribution pipe will be required to deliver recycled water to the landscaping areas identified above (see Figure 8).

Connections to Existing Irrigation Mains

To prevent interconnection with the existing water distribution system, site retrofits will be required at each landscape irrigation site. The site retrofits include connections to existing irrigation mains, recycled water meters, pressure-reducing valves, and backflow prevention devices.

Table 6
Conceptual Costs for Landscape Irrigation with Recycled Water: City/NAWS Core Areas

Item	Unit Price	Units	Quantity	Total
<i>Capital Costs</i>				
20" purple pipe	\$480	Linear Foot	6,200	\$2,976,000
18" purple pipe	\$432	Linear Foot	11,700	\$5,054,400
14" purple pipe	\$336	Linear Foot	2,250	\$756,000
10" purple pipe	\$240	Linear Foot	10,600	\$2,544,000
8" purple pipe	\$192	Linear Foot	12,250	\$2,352,000
6" purple pipe	\$144	Linear Foot	15,500	\$2,232,000
3,700 gpm pump station	\$3,300,000	Each	1	\$3,300,000
Connections to existing irrigation mains	\$5,900	Each	26	\$153,400
Recycled water meter and pressure-reducing valves	\$20,000	Each	26	\$520,000
Backflow prevention devices	\$4,700	Each	26	\$122,200
Total Capital Cost				\$20,010,000
<i>Annual O&M Costs</i>				
Pump station: maintenance (5% of capital cost, per year)	\$165,000	Lump Sum	1	\$165,000
Pump station: power (\$0.14 per kWh; ~350,000 kWh/year)	\$49,000	Lump Sum	1	\$49,000

Purple pipe: maintenance (\$0.70 per linear foot, per year)	\$40,950	Lump Sum	1	\$40,950
Total Annual O&M Cost				\$254,950

Cerro Coso Community College

Cerro Coso Community College (Cerro Coso) is located in the southernmost portion of the City boundaries, along College Heights Boulevard. At the recommendation of members of the TAC, Cerro Coso was also considered as a potential recycled water user. Approximately 25 acres of landscaping at Cerro Coso were identified for potential irrigation with recycled water. With an applied irrigation rate of 7.8 feet per year, the potential annual recycled water demand at Cerro Coso is approximately 195 AFY. Additional facilities will be required to deliver 195 AFY of recycled water to Cerro Coso including a 900 gpm booster pump station, nearly 4 miles of purple distribution pipe (see Figure 9), and appropriate site retrofits. Conceptual costs for an NPR project extension to include Cerro Coso as a potential recycled water user are listed in Table 7.

Table 7

Conceptual Costs for Landscape Irrigation with Recycled Water: Cerro Coso Community College

Item	Unit Price	Units	Quantity	Total
<i>Capital Costs</i>				
12" purple pipe	\$288	Linear Foot	20,000	\$5,760,000
900 gpm pump station	\$950,000	Each	1	\$950,000
Connections to existing irrigation mains	\$5,900	Each	6	\$35,400
Recycled water meter and pressure-reducing valves	\$20,000	Each	6	\$120,000
Backflow prevention devices	\$4,700	Each	6	\$28,200

Total Capital Cost				\$6,893,600
<i>Annual O&M Costs</i>				
Pump station: maintenance (5% of capital cost, per year)	\$47,000	Lump Sum	1	\$47,000
Pump station: power (\$0.14 per kWh; ~85,700 kWh/year)	\$12,000	Lump Sum	1	\$12,000
Purple pipe: maintenance (\$0.70 per linear foot, per year)	\$14,000	Lump Sum	1	\$14,000
Total Annual O&M Cost				\$73,000

As shown in Table 6, the total conceptual capital cost for facilities for landscape irrigation with recycled water in the City/NAWS core areas is **\$20,010,000** with an annual O&M cost of **\$254,950**. Through a cost amortization at a 4% interest rate, the total annual cost for landscape irrigation in the City/NAWS core areas is approximately **\$1,412,130**. The annual water demand for landscape irrigation in the City/NAWS core areas is approximately 807 AFY; therefore, the total cost per AF of recycled water is estimated to be **\$1,750 / AF**.

As shown in Table 7, the total conceptual capital cost for facilities for landscape irrigation with recycled water at Cerro Coso is **\$6,893,600** with an annual O&M cost of **\$73,000**. Through a cost amortization at a 4% interest rate, the total annual cost for landscape irrigation at Cerro Coso is approximately **\$471,660**. The annual water demand for landscape irrigation at Cerro Coso is approximately 195 AFY; therefore, the total cost per AF of recycled water is estimated to be **\$2,420 / AF**. It should be noted that the facilities for landscape irrigation with recycled water at Cerro Coso are considered an extension of the facilities required for landscape irrigation in the core areas of the City/NAWS; therefore, the costs presented in this paragraph and in Table 7 are considered incremental extensions of the costs listed in the preceding paragraph and in Table 6.

Indirect Potable Reuse (IPR) Projects

The California Water Code section 13561(c) defines indirect potable reuse (IPR) for groundwater recharge as “the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system.” IPR for groundwater recharge was studied as a potential new beneficial use for recycled water in the IWV basin. As mentioned above, SWRCB regulations presiding over groundwater recharge projects vary based on the method of recharge: surface applications or subsurface applications. The findings of potential groundwater recharge with recycled water through surface (spreading grounds) and subsurface (deep injection wells) applications are summarized below.

The feasibility of implementing an IPR project through surface spreading grounds was evaluated first due to the generally lower cost of recharge through spreading grounds compared to deep injection wells. Upon review of the Tetra Tech 2003 document and TriEcoTt 2013 document, along with discussions with the IWVGA TAC, it was concluded that an IPR project through surface spreading grounds would not be a feasible alternative due to the following geologic and hydrogeologic conditions:

- The presence of thick lacustrine clay layers in the geological cross sections in proximity to the areas for potential collection and treatment of wastewater
- Minimal groundwater flow between water-bearing zones, preventing surface recharge from reaching the deep aquifer

An IPR project through deep injection was evaluated as an alternative for groundwater recharge with recycled water collected from (1) the Inyokern WWTF, (2) septic tanks, and (3) the City WWTF. Estimated recycled water supply for deep injection is listed in Table 8, and the required facilities for deep injection of recycled water are discussed below.

Table 8
Recycled Water Supply Available for Deep Injection

Source	Annual Recycled Water Supply (AFY)
Inyokern WWTF	33
Septic Collection Area 1	179
Septic Collection Area 2	100
Septic Collection Area 3	56
City of Ridgecrest – Septic Collection	45
City WWTF ^a	731
Total	1,144

Notes:

- a. Recycled water supply from the City WWTF that is available for deep injection is estimated to be the difference between projected total available wastewater at the City WWTF (3,257 AFY) and the following: (a) recycled water applied for golf course irrigation (500 AFY), (b) recycled water applied for alfalfa irrigation (220 AFY), (c) wastewater seepage to the Tui Chub habitat (805 AFY), (d) recycled water from the City WWTF applied for landscape irrigation at the City/NAWS (807 AFY), and (e) recycled water from the City WWTF applied for landscape irrigation at Cerro Coso (195 AFY).

Inyokern WWTF and Septic Collection Facilities

Approximately 33 AFY (0.029 MGD) of wastewater from the Inyokern community is available for collection, treatment, and injection. Wastewater would be collected from the Inyokern WWTF to undergo full treatment—primary, secondary, tertiary, and advanced⁶—at a new WWTF located on the China Lake NAWS north of Highway 178 (see Figure 10) prior to on-site deep injection into the IWV groundwater basin. Similarly, approximately 380 AFY (0.35 MGD) of wastewater from the septic collection areas and the City would be collected to undergo full treatment at the proposed new WWTF location. Because no sewer systems exist in these areas, additional facilities would be required for collection including house retrofits and septic tank conversions; sewer mains; and sewage lift stations. Following City’s Engineering Design Standards and Details guideline, a minimum size of 8” diameter pipeline would be used for any new sewer line. Collected wastewater would also undergo full treatment prior to deep injection into the IWV groundwater basin. Conceptual costs of the facilities required for collection, conveyance,

⁶ Advanced treatment would consist of microfiltration (MF), reverse osmosis (RO), and an advanced oxidation process using a combination of ultraviolet light (UV) and hydrogen peroxide (H₂O₂).

and full treatment of **413 AFY** (0.4 MGD) of wastewater from the Inyokern WWTF along with the septic collection areas and City are listed in Table 9.

Table 9

Conceptual Costs for Collection, Conveyance, and Treatment of Inyokern WWTF and Septic Wastewater for Deep Injection

Item	Unit Price	Units	Quantity	Total
<i>Capital Costs</i>				
House retrofits and septic conversions	\$18,000	Residence	1,285	\$23,130,000
8" sewer pipes	\$136	Linear Foot	301,000	\$40,936,000
10" sewer pipes	\$170	Linear Foot	50,000	\$8,500,000
Lift stations	\$440,200	Each	4	\$1,760,800
Wastewater treatment (to secondary standards)	\$13	gpd	500,000	\$6,500,000
Tertiary treatment	\$2	gpd	500,000	\$1,000,000
Advanced treatment (MF-RO-UV/H ₂ O ₂)	\$5,500,000	Lump Sum	1	\$5,500,000
500 gpm deep injection well	\$1,500,000	Each	2	\$3,000,000
Total Capital Cost				\$88,742,800
<i>Annual O&M Costs</i>				
Lift station: maintenance (5% of capital cost, per year)	\$22,000	Lump Sum	1	\$22,000
4 lift stations: power (\$0.14 per kWh; ~15,000 kWh/station/year)	\$8,400	Lump Sum	1	\$8,400
Sewer pipe: maintenance (\$0.70 per linear foot, per year)	\$245,700	Lump Sum	1	\$245,700

Wastewater treatment: maintenance	\$200,000	Lump Sum	1	\$200,000
Tertiary treatment: maintenance	\$200,000	Lump Sum	1	\$200,000
Advanced treatment: maintenance	\$300,000	Lump Sum	1	\$300,000
Total Annual O&M Cost				\$976,100

City WWTF Facilities

The City has been recommended to upgrade the existing City WWTF to include treatment of 1.8 MGD (2,016 AFY) of wastewater to “disinfected tertiary” standards (Provost & Pritchard 2015). 1,002 AFY of “disinfected tertiary” recycled water is proposed as part of this study for landscape irrigation in the City, NAWS, and at Cerro Coso. Therefore, the recommendations for the new City WWTF will have sufficient tertiary treatment capacity to provide additional treatment of **731 AFY** (approximately 0.7 MGD) of wastewater to “disinfected tertiary” standards for deep injection. However, as mentioned in the regulatory analysis, subsurface applications of recycled water require advanced treatment through reverse osmosis and advanced oxidation. “Disinfected tertiary” recycled water generated at the City WWTF would be conveyed through a 500 gpm booster pump system and a purple pipeline to the proposed wastewater treatment facility for advanced treatment and subsequent deep injection on-site (see Figure 11). Conceptual costs of the facilities required for conveyance and advanced treatment of “disinfected tertiary” recycled water from the City WWTF are listed in Table 10.

Table 10

Conceptual Costs for Conveyance and Treatment of City WWTF “Disinfected Tertiary” Recycled Water for Deep Injection

Item	Unit Price	Units	Quantity	Total
<i>Capital Costs</i>				
20” purple pipe	\$480	Linear Foot	31,000	\$14,880,000
500 gpm pump station	\$728,000	Each	1	\$728,000

Advanced treatment (MF-RO-UV/H ₂ O ₂)	\$7,700,000	Lump Sum	1	\$7,700,000
500 gpm deep injection well	\$1,500,000	Each	2	\$3,000,000
Total Capital Cost				\$26,308,000
<i>Annual O&M Costs</i>				
Pump station: maintenance (5% of capital cost, per year)	\$36,400	Lump Sum	1	\$36,400
Pump station: power (\$0.14 per kWh; ~55,000 kWh/year)	\$7,700	Lump Sum	1	\$7,700
Purple pipe: maintenance (\$0.70 per linear foot, per year)	\$21,700	Lump Sum	1	\$21,700
Advanced treatment: maintenance	\$420,000	Lump Sum	1	\$420,000
Total Annual O&M Cost				\$485,800

As shown in Table 9, the total conceptual capital cost for deep injection of recycled water generated from Inyokern CSD and septic systems is **\$88,742,800** with an annual O&M cost of **\$976,100**. Through a cost amortization at a 4% interest rate, the total annual cost for deep injection of recycled water from Inyokern and septic tanks is approximately **\$6,108,100**. The annual recycled water supply from Inyokern CSD and septic systems available for deep injection is 413 AFY; therefore, the total cost per AF of recycled water is estimated to be **\$14,790 / AF**.

As shown in Table 10, the total conceptual capital cost for deep injection of recycled water generated from the City WWTF is **\$26,308,000** with an annual O&M cost of **\$485,800**. Through a cost amortization at a 4% interest rate, the total annual cost for deep injection of recycled water from the City WWTF is approximately **\$2,007,200**. The annual recycled water supply from the City WWTF available for deep injection is 731 AFY; therefore, the total cost per AF of recycled water is estimated to be **\$2,750 / AF**.

Direct Potable Reuse Projects

The California Water Code section 12561(b) defines direct potable reuse (DPR) as “the planned introduction of recycled water either directly into a public water system [treated drinking water augmentation] or into a raw water supply immediately upstream of a water treatment plant [raw water augmentation].” The SWRCB currently has no regulatory criteria regarding DPR projects in California. However, the SWRCB convened two independent research groups in 2014 to advise the SWRCB on issues related to the investigation of developing uniform water recycling criteria for DPR projects. The groups’ findings indicated that although developing uniform criteria for DPR is technically feasible, further research would need to be conducted by the state to address source control, unknown/unidentified contaminants, pathogen removal, additional treatment processes, final water quality monitoring, etc. Enhancing treatment reliability would also need to be addressed given that treated wastewater in DPR projects lacks the protection otherwise provided by environmental and engineered buffers. The SWRCB plans to convene a “blue ribbon panel” every five years to review scientific literature and report on the risk of emerging constituents to public health. In addition, the SWRCB plans to coordinate with other regulatory agencies in the future to address the knowledge gaps identified by the research groups and translate the groups’ findings into objective, unambiguous criteria regulating DPR (SWRCB 2016).

In 2011 and 2012, the RWQCB – San Diego Region and the California Department of Public Health (now DDW), respectively, granted the city of San Diego conceptual approval of a raw water augmentation project using advanced treated recycled water as part of San Diego’s “Pure Water San Diego Program.” The proposed project involves advanced treatment of tertiary-treated wastewater effluent at a new advanced water purification facility followed by storage and blending in a surface reservoir that stores imported water from the Colorado River Aqueduct and the State Water Project. The blended water from the reservoir would then flow into a conventional drinking water treatment plant for subsequent use in San Diego’s potable water distribution system. In 2017, the United States Environmental Protection Agency (USEPA) and the RWQCB – San Diego Region approved a new wastewater discharge permit for San Diego’s Point

Loma Wastewater Treatment Plant, which would feed secondary-treated effluent to the proposed advanced water purification facility. The “Pure Water San Diego” program would initially consist of raw water augmentation but will transition into a future treated drinking water augmentation project following regulatory approval.

The only existing treated drinking water augmentation project in the United States is located in El Paso, TX, and was pursued out of necessity after the region’s severe drought conditions persisted despite conservation efforts. The State of Texas Commission on Environmental Quality (TCEQ) does not have uniform water recycling criteria for DPR projects but approves DPR projects on a case-by-case basis. El Paso Water Utilities (EPWU) proposed to the TCEQ a DPR project involving a 10 MGD advanced water purification facility feeding treated effluent for direct use in the local potable water distribution system. The advanced water purification facility would receive secondary-treated wastewater effluent to feed through an advanced treatment system consisting of microfiltration, reverse osmosis, UV/advanced oxidation, granular activated carbon filtration, and chlorination. Following significant coordination and planning with the TCEQ staff, EPWU began 9-month pilot testing of the advanced water purification facility in 2015 to analyze treated effluent samples and compare them to primary and secondary drinking water standards. TCEQ reviewed the pilot testing results and granted approval for design of the full-scale 10 MGD facility. TCEQ approval of the final plans and specifications is currently pending, and additional review will be required before construction and operation.

Because the IWV currently has no surface water storage facilities, a treated drinking water augmentation project would currently be the only feasible alternative for DPR of recycled water. Significant coordination (e.g. conceptual-level planning, treatment evaluations, permit issuance, pilot testing, regulation development, establishing monitoring requirements, etc.) with the SWRCB, DDW, the Lahontan RWQCB, and potentially the USEPA would be required to implement such a project. However, should the IWVGA pursue imported water opportunities that would require construction of new surface water treatment and storage facilities, a raw water augmentation project may be

a feasible alternative that would follow a similar regulatory compliance process to the “Pure Water San Diego” program.

Findings and Recommendations

Four (4) potential recycled water projects were evaluated as potential feasible management actions for development of the IWW groundwater basin GSP. The total capital costs, annual O&M costs, and total cost per AF of recycled water for each potential recycled water project are summarized in Table 11.

Table 11
Cost Summary of Potential Recycled Water Projects

Recycled Water Project	Annual Recycled Water Demand (AFY)	Total Capital Cost (\$)	Annual O&M Cost (\$)	Total Cost per AF of Recycled Water (\$/AF)
NPR: City/NAWS core areas	807	\$20,010,000	\$255,000	\$1,750
NPR: Cerro Coso Community College ⁷	195	\$6,893,600	\$73,500	\$2,420
IPR: Inyokern CSD and septic systems	413	\$88,742,800	\$976,100	\$14,790
IPR: City WWTF effluent	731	\$26,308,000	\$485,800	\$2,750

Through an evaluation of recycled water demand, total cost, and overall feasibility, the following recycled water projects are considered to have priority as management actions for development of the GSP:

- NPR: City/NAWS core areas

⁷ Total capital cost and annual O&M costs for the Cerro Coso recycled water project are considered incremental extensions of the City/NAWS core areas recycled water project.

- NPR: Cerro Coso Community College
- IPR: City WWTF effluent

SGMA requires that all beneficial uses and users be addressed in the GSP. If the above priority projects for the City WWTF are implemented, it is recommended that the Tui Chub habitat water demand (805 AFY) be supplied through a new management strategy similar to the enhanced Tui Chub habitat management plan proposed in ERS 1991. The enhanced habitat management plan would supply most of the habitat's water demands through pipe discharge instead of evaporation/percolation pond seepage from the City WWTF. Three (3) pipe discharge areas—located at the East Shop channel, the George Road channel, and the G1 connector channel—would release treated wastewater from the City WWTF into Lark Seep and the G1/Pole Line channels to protect the water demands of the Tui Chub and its habitat. The proposed pipe discharge areas are shown in Figure 12.

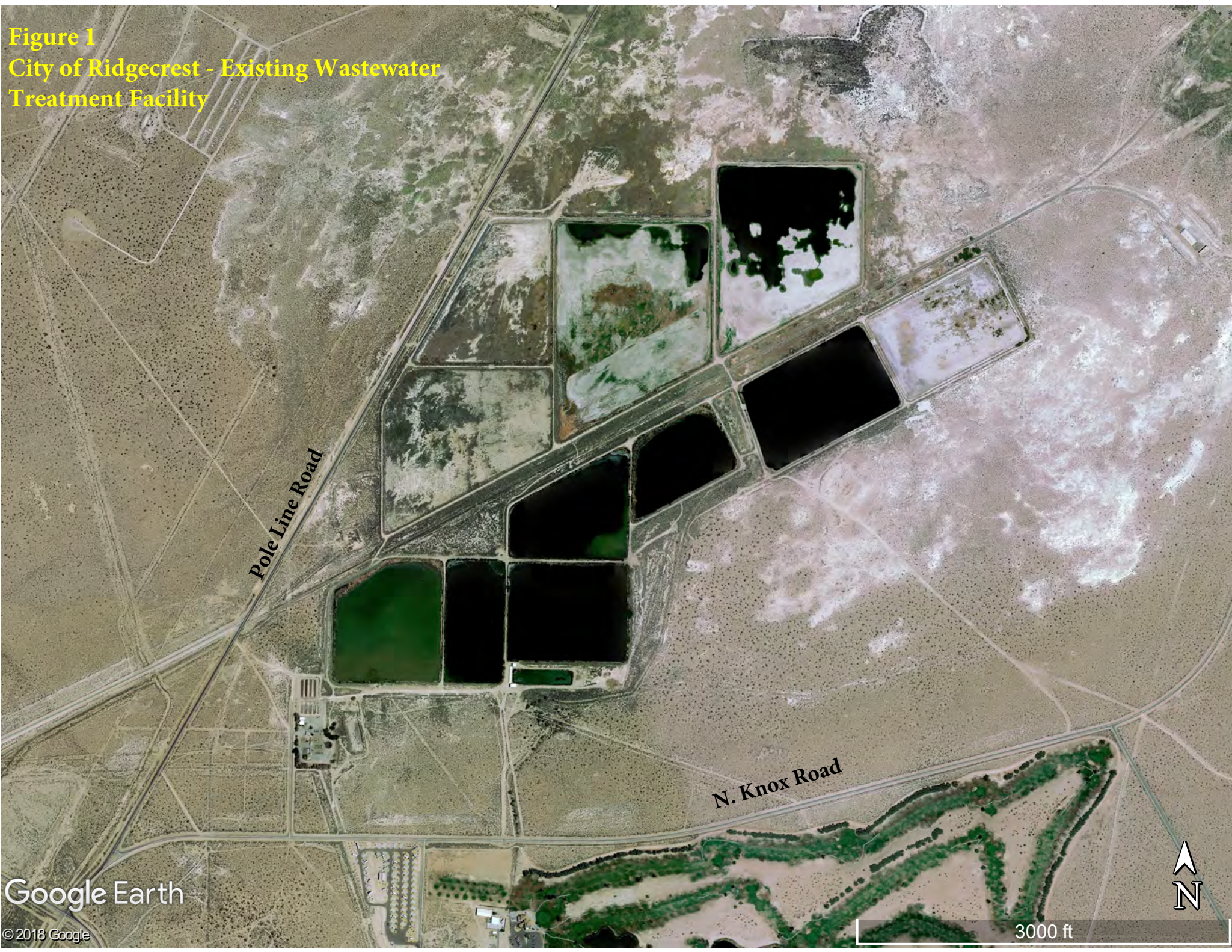
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Figure 1
City of Ridgecrest - Existing Wastewater
Treatment Facility



Google Earth

© 2018 Google



3000 ft

Figure 2
City of Ridgecrest - Alternative
Wastewater Treatment Facility Site

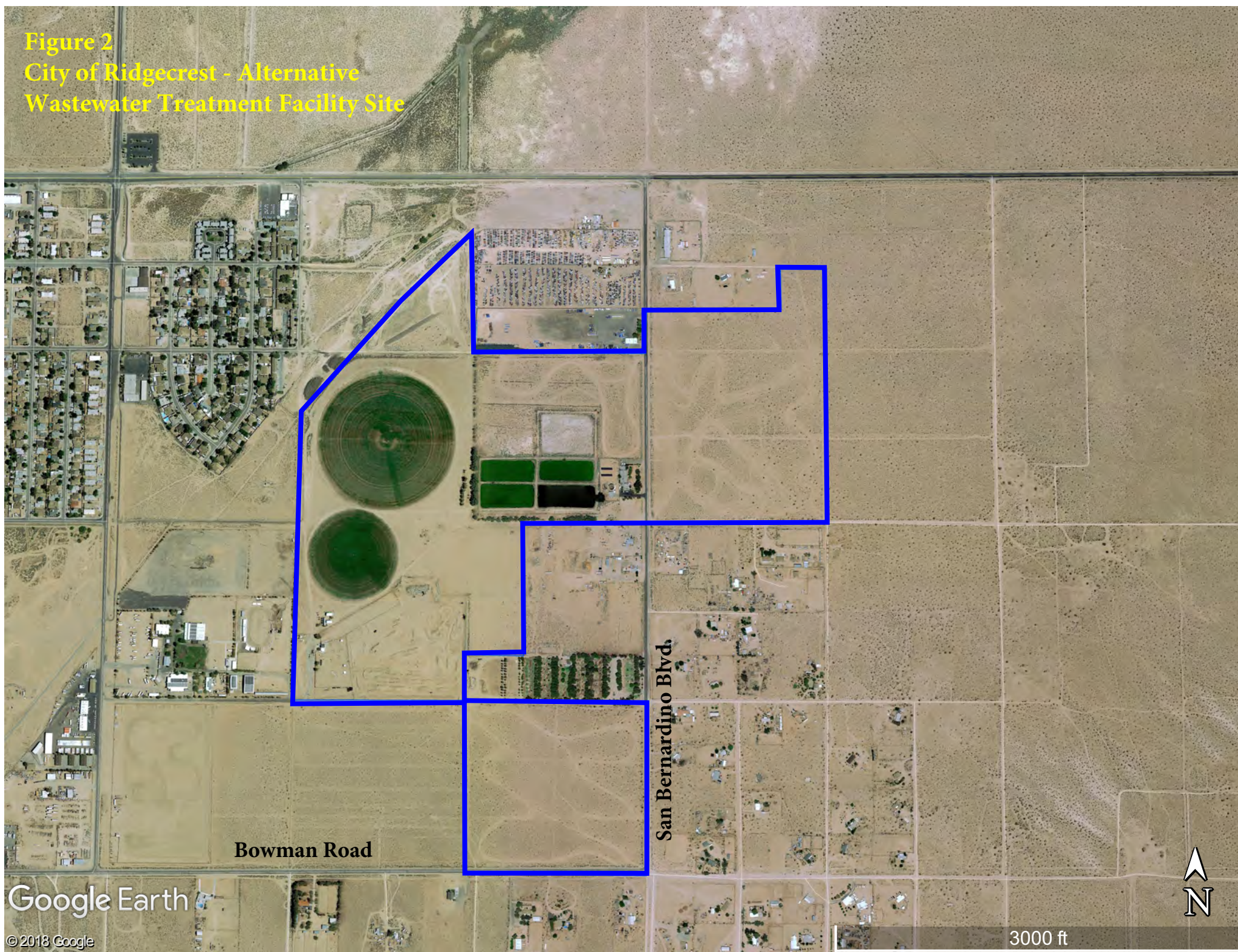


Figure 3
Inyokern Community Services District -
Existing Wastewater Treatment Facility



Bow Ave

Brown Road

U.S. Highway 395

Google Earth

© 2018 Google

1000 ft



Figure 4
Potential Septic Collection Areas

Legend

-  City of Ridgecrest
-  Potential Septic Collection Areas

Area 1

Area 2

Area 3

City of Ridgecrest

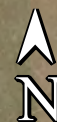


Figure 5
Tui Chub Habitat - Seeps and
Channels

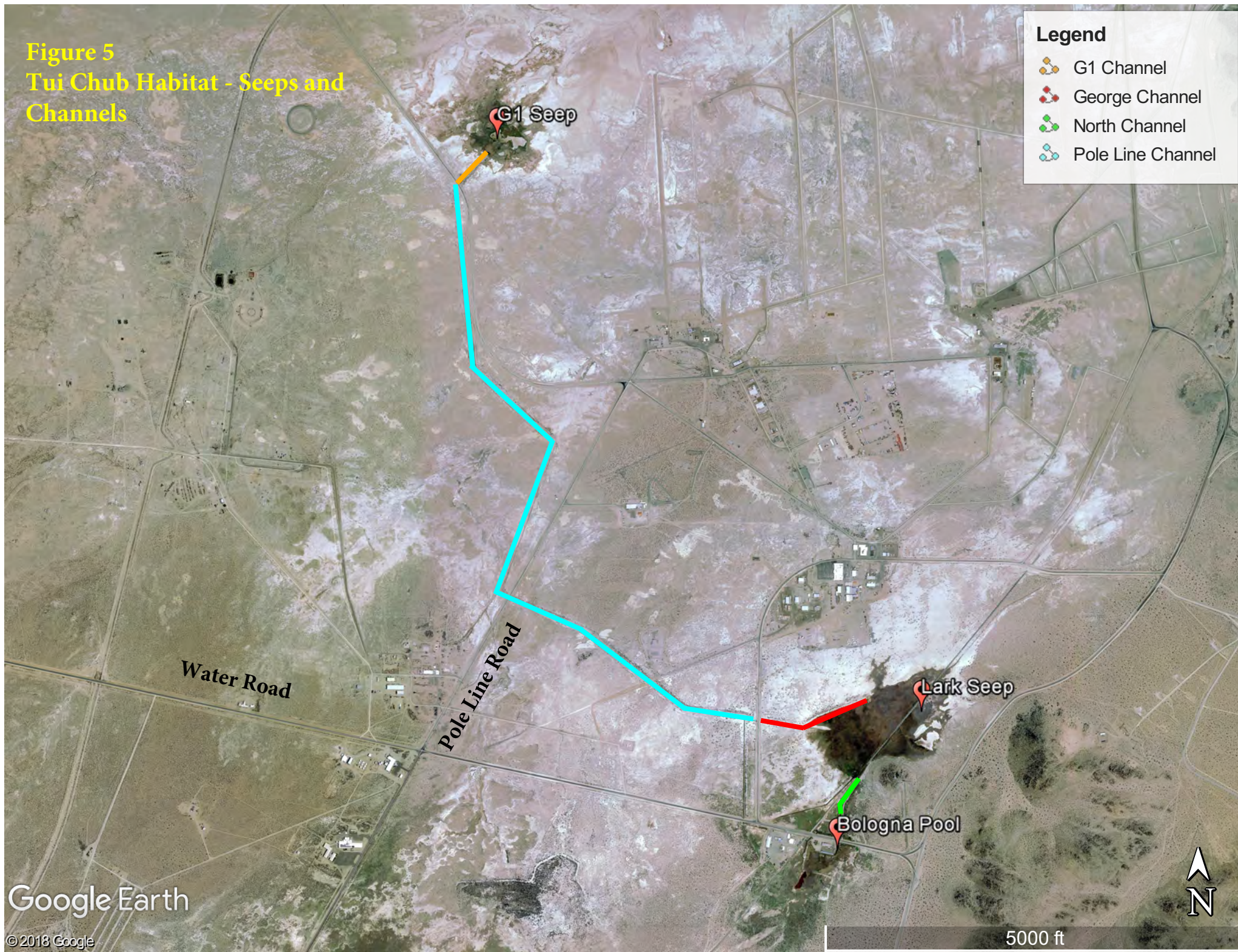


Figure 6
International Symbol for "Do Not
Drink - Recycled Water" Signs



Source:
Regulations Related to Recycled
Water. State Water Resources
Control Board. July 2015.

Figure 7
Landscape Irrigation with Recycled Water - City/NAWS Core Areas

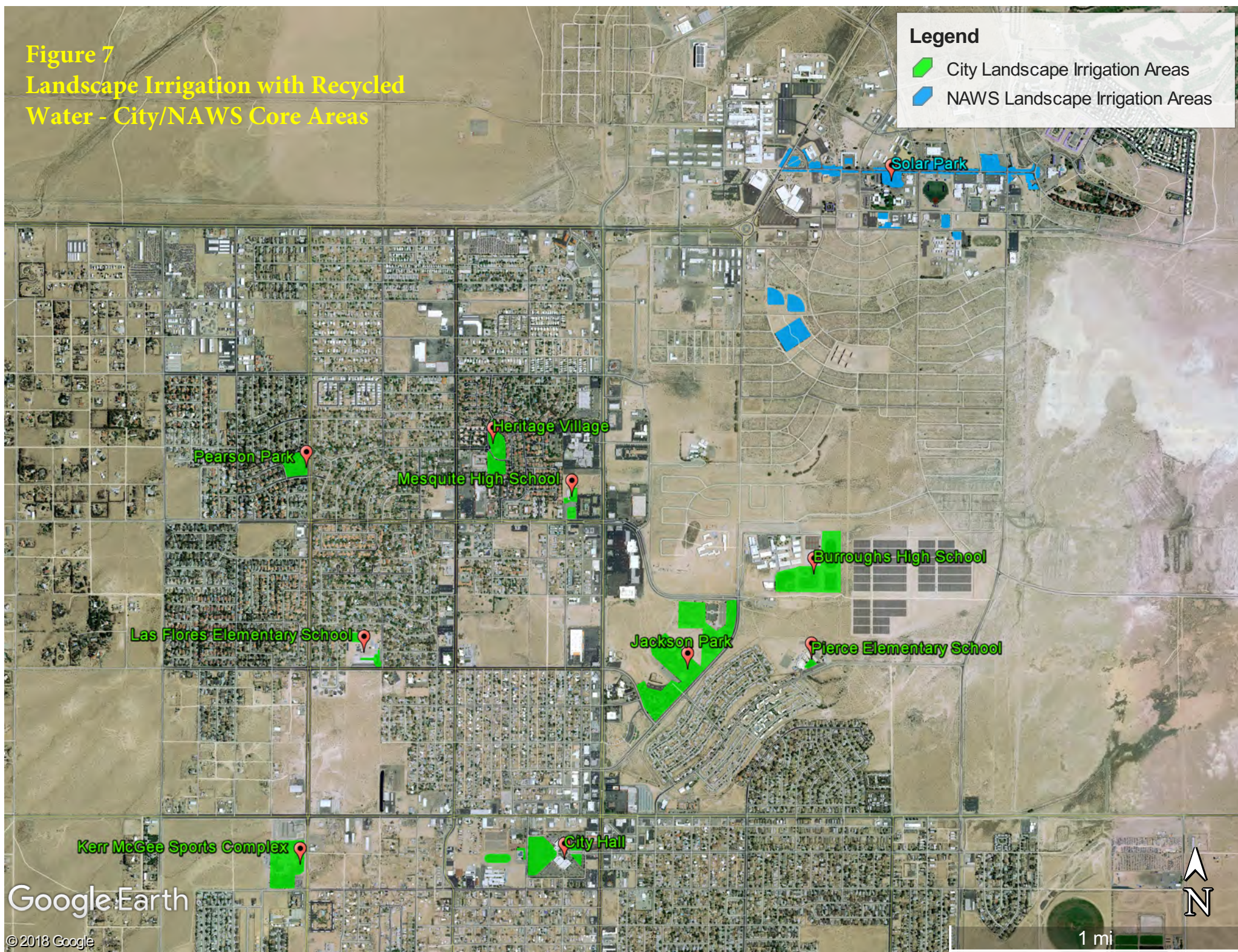


Figure 8
Landscape Irrigation with Recycled
Water - City/NAWS Purple Pipe System

Legend

-  City Landscape Irrigation Areas
-  NAWS Landscape Irrigation Areas

W. Inyokern Road

E. Ridgecrest Blvd.

Google Earth

© 2018 Google



1 mi

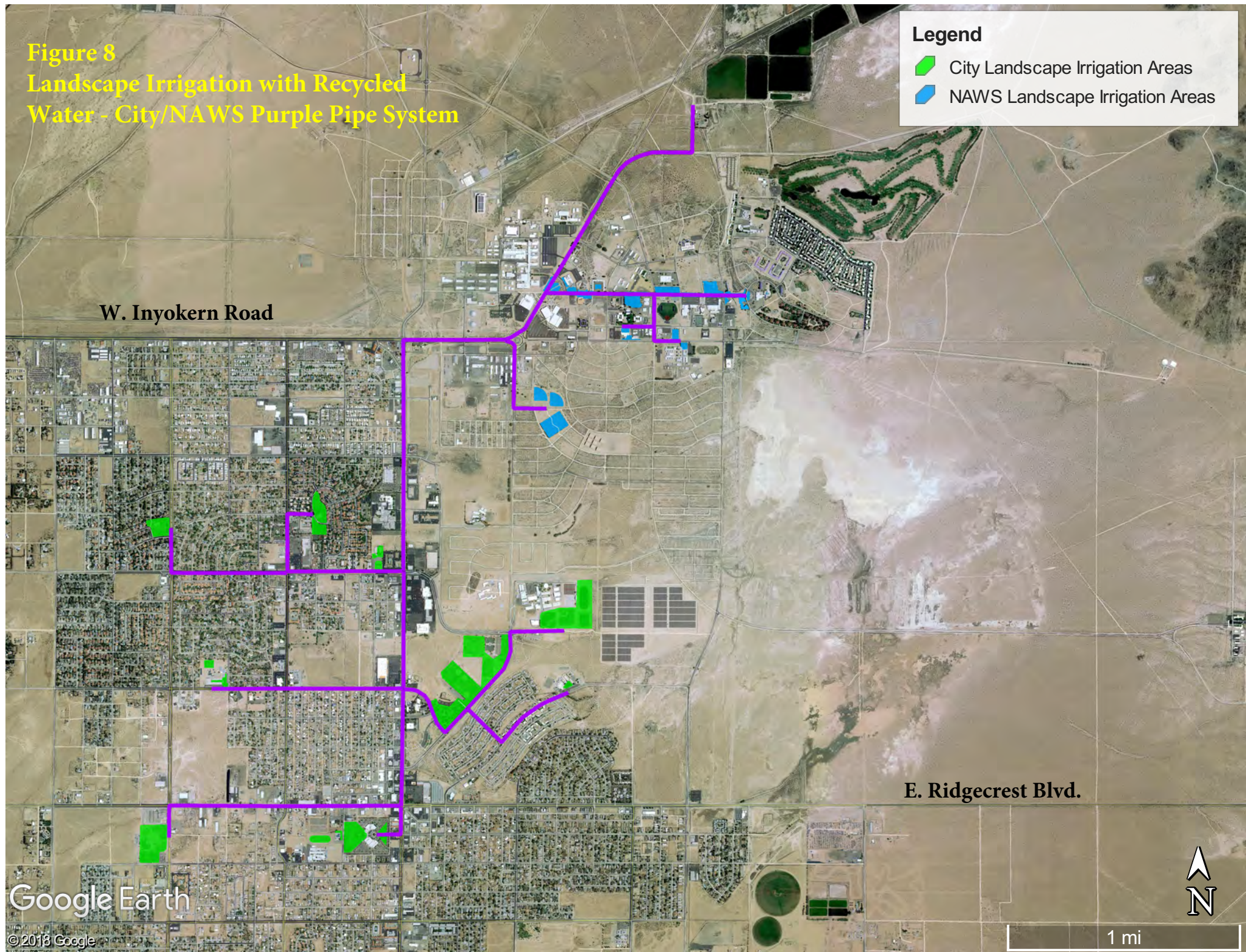


Figure 9
Landscape Irrigation with Recycled
Water - Cerro Coso Community College
Purple Pipe Extension

Legend

 Cerro Coso Landscape Irrigation Areas

4-mile purple pipe
extension of City/NAWS
core areas recycled water
project

Cerro Coso Community College

Google Earth

© 2018 Google



3 mi

Figure 10
IPR Project Facilities - Inyokern CSD
and Septic System Wastewater

Legend

-  Inyokern Community Services District
-  Potential Septic Collection Areas
-  Sewer Lines

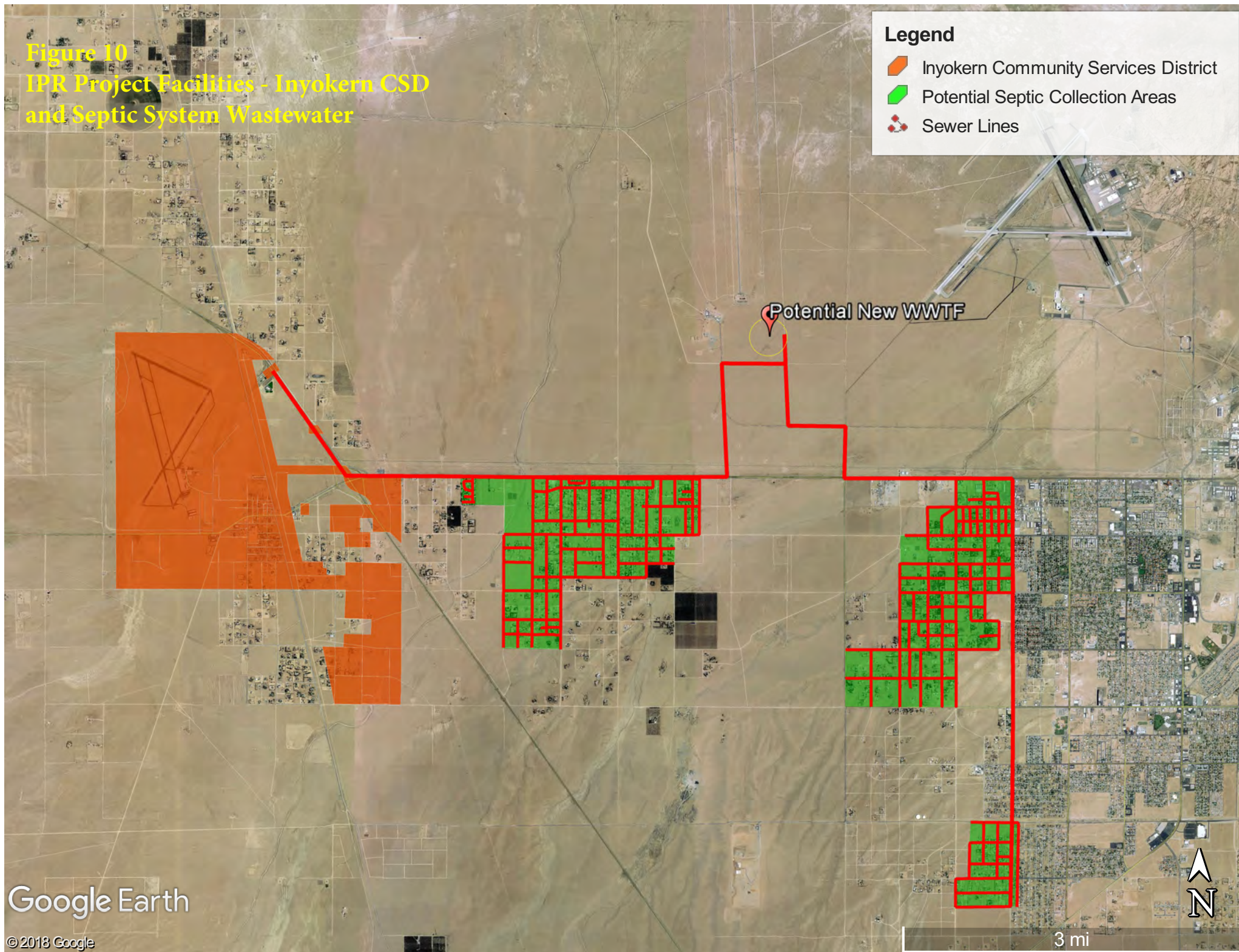


Figure 11
IPR Project Facilities- City WWTF
"Disinfected Tertiary" Recycled Water

Legend

-  City of Ridgecrest
-  City WWTF Tertiary Effluent Pipeline

Potential New WWTF

Google Earth

© 2018 Google



5 mi

[illegible]

To: PAC

From: PAC Ad Hoc Committee on PAC POAM Responsibilities (Janiec, Katzenstein, Panzer)

Subject: Assign PAC POAM Responsibilities

Date: July 26, 2018

Expand POAM to include the following new line items *specific* to PAC:

1. Expand line 45 of the July 13, 2018 POAM (Discussion of Initial Sustainable Management Criteria) to include the following new subcategories:

a. Prioritize groundwater uses. Note: This has already been tasked to the PAC as “Pumping Allocation,” but does not yet appear in the POAM.

b. Develop and answer key policy questions concerning Sustainable Management Criteria. Note: “Sustainable Management Criteria” are defined in SUBARTICLE 3 of ARTICLE 5 of the California Code of Regulations.

2. Add subcategories to the following line items in the POAM making PAC responsible to timely develop and answer related policy questions. This will usually involve a PAC start date that front-runs the work itself.

a. #84 Imported Water Study.

b. #89 Recycled Water Study.

c. #96-100 Prepare Draft GSP Chapters

d. #101-105 Plan Implementation

e. #106-109 Develop Draft and Final GSP

As addressing these questions will likely involve iterative/interactive processes, expect additions to the POAM as new policy issues or new facts arise.

Item #6 PAC Agenda
August 2, 2018

Donna Thomas

From: Steve Johnson <stevej@stetsonengineers.com>
Sent: Friday, July 27, 2018 9:32 AM
To: Donna Thomas
Cc: Jeff Helsley; Heather Steele; Steve Reich; Jean Moran
Subject: FW: Draft Agenda for PAC August 2, 2018
Attachments: DRAFT Recycled Water Study Technical Memorandum with Figures - 072018.pdf

Hi Donna—I think Heather sent you the draft Recycled Water Tech Memo---(attached)

For the Item on WRM attending/participating in PAC meetings, it was taken from your July PAC meeting Minutes and also because Peggy has suggested it for the GA Board meeting.

I do not have any attachments for this (potential) PAC Agenda Item---but I should provide this---

1. I/we are not currently planning to attend the August PAC meeting.
2. For the September PAC meeting, Attorney Markman is scheduled to talk with the PAC about "water allocations" and has suggested I be present. It is expected the Markman discussions will carry over to future PAC meetings too.
3. As you are aware, attending the PAC meetings has GA cost implications. If the PAC meeting is on the same day as TAC—there is no additional travel time. However, with evening PAC meetings—it brings in overnight costs too.
4. Participating by phone/skype is also possible---but I am usually traveling after the TAC meeting.

I/we are very concerned about GA costs—and minimizing Stetson's costs. At the same time, I/we have committed to the IWVGA as your WRM---essentially whatever that requires.

Steve

From: Heather Steele
Sent: Friday, July 27, 2018 9:09 AM
To: Steve Johnson <stevej@stetsonengineers.com>
Subject: RE: Draft Agenda for PAC August 2, 2018

Steve,

Attached is the draft recycled water study to send to Donna.

Heather

From: Steve Johnson
Sent: Friday, July 27, 2018 9:02 AM
To: Jeff Helsley <jeffh@stetsonengineers.com>; Heather Steele <heathers@stetsonengineers.com>
Subject: FW: Draft Agenda for PAC August 2, 2018

Heather—let's talk

From: Donna Thomas <dcthomas@wildblue.net>
Sent: Friday, July 27, 2018 7:44 AM
To: Steve Johnson <stevej@stetsonengineers.com>; rstrand@ridgecrest-ca.gov; Keith Lemieux <klemieux@omlowlaw.com>; Phillip W. Hall <phall@kerncounty.com>; James A. Worth <jim@mcmurtreyhartsock.com>;

Peggy Breeden <pbreeden@ridgecrest-ca.gov>

Cc: lduffy@iwvwd.com

Subject: Draft Agenda for PAC August 2, 2018

Dear All,

I will need to add attachments for item 2 (minutes of July 12, 2018), item 5 (ad hoc report for additional funding sources/grants).

Steve, can you provide any attachment materials for item 6 (WRM participation) and item 7 (TAC Recycled Water Tech Memo)

I will also scan and attach the 7/11/2018 handout prepared for the TAC on Sustainable Management Criteria for background information for PAC members.

Please respond to Lauren Duffy when the Draft agenda is approved and ready to be posted. Thank you.

Donna Thomas, IWVGA PAC Chair