Table 4 – USR 2015 IRWM Grant Solicitation Project Summary Table

| IRWM Project Element | | City of Mt. Shasta Big Lakes Water Line Replacement Project | City of Dunsmuir South Dunsmuir Water Main Replacement Project | City of Dunsmuir North Dunsmuir Water Main Replacement Project | Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project | Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase 1) |
|---|---|---|---|---|---|---|
| IR.1 | Water supply reliability, water conservation, and water use efficiency | 1 | 1 | 1 | 1 | 1 |
| IR.2 | Stormwater capture, storage, clean-up, treatment, and management | | | | | |
| IR.3 | Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands | | | | | 1 |
| IR.4 | Non-point source pollution reduction, management, and monitoring | | | | | |
| IR.5 | Groundwater recharge and management projects | | | | 1 | |
| IR.6 | Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users | | | | | |
| IR.7 | Water banking, exchange, reclamation, and improvement of water quality | | | | | |
| IR.8 | Planning and implementation of multipurpose flood management programs | | | | 1 | |
| IR.9 | Watershed protection and management | 1 | 1 | 1 | 1 | 1 |
| IR.10 | Drinking water treatment and distribution | 1 | 1 | 1 | | |
| IR.11 | Ecosystem and fisheries restoration and protection | 1 | 1 | 1 | | 1 |
| | Total | 4 | 4 | 4 | 4 | 4 |

Project Description:
The City of Mt. Shasta Big Lakes Water Line Replacement Project includes planning, design, installation of water main and appurtenances in the Big Lakes area.

Project Description Discussion:
The Big Lakes area in northern Mt. Shasta has reported instances that when a fire hydrant south of Big Lakes is opened or the area experiences moderately large demands, the water system pressure along Ski Village Drive goes nearly to zero or negative. This condition suspends the City's ability to reliably deliver water service to residents and increases the threat of public health hazards associated with depressurized water mains. Currently the Big Lakes area is served by an aging and undersized 6-inch water main that runs along the back lot lines of properties located along N. Mt. Shasta Boulevard. Existing water services run across multiple parcels to serve properties that do not front the existing water main. Due to the location of the water main and soon-to-be installed meters, they are difficult to access for reading and maintenance. The proposed projects would abandon the existing pipeline and install a new 12-inch pipeline in N. Mt. Shasta Boulevard, and relocate meters into the street right-of-way for easier access. The proposed project consists of installing about 4,000 linear feet of new 12-inch water main, plus appurtenances, and about 3,800 linear feet of ¾-inch through 2-inch water service piping. Eighteen soon-to-be-installed water meters would be relocated and three new fire hydrants installed. Additionally, approximately 1,200 linear feet of 8-inch looping will be installed with two new pressure reducing/pressure sustaining stations to boost flows and pressures. Refer to Figure 2 in File 3 of Attachment 2 for pipeline improvements described herein. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the Big Lakes area. Another added benefit is that replacement of the pipeline will result in water savings by reducing the amount of unaccounted water due to leaks.

This project addresses several key issues identified in the IRWM Region including that of water supply, water quality, municipal water supply infrastructure, and adaption to climate change. It will provide immediate regional drought preparedness and increase local water supply reliability and the delivery of safe drinking water by implementing infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water required. This will result in long-term drought preparedness and safe drinking water supply and storage availability through a long-term reduction in water usage and unaccounted for water losses. This water conservation measure would not be possible without 2015 Grant funds as it is not locally cost-effective for the City which is a DAC.

Project Description:
The City of Dunsmuir South Dunsmuir Water Main Replacement Project includes planning, design, installation of water main and appurtenances in the Blackberry Hill area.

Project Description Discussion:
The Blackberry Hill area in South Dunsmuir is served by small 3/4-inch to 2-inch diameter pipelines that do not convey adequate fire flows and lead to unhealthy reductions in water pressure during peak demand periods. The City recently obtained $1.5M in Community Development Block Grant (CDBG) funding to replace a number of old worn-out pipelines throughout the City, including a number of pipelines in the Blackberry Hill area. Unfortunately, the available funding was not adequate to perform all the work that is required. Therefore, the City is seeking funding to perform the balance of work not covered by the CDBG grant. This includes installation of approximately 1,760 linear feet of 6-inch pipeline and 200 linear feet of 8-inch pipeline, with 4 fire hydrants, ¾-inch water services, and miscellaneous appurtenances on Oak, Welsh, Third, Marion, and Second Streets. Refer to Figure 3 in File 3 of Attachment 2 for pipeline improvements described herein. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the Blackberry Hill area. Another added benefit is that replacement of the pipeline will result in water savings by reducing the amount of unaccounted water due to leaks.

This project addresses several key issues identified in the IRWM Region including that of water supply, water quality, municipal water supply infrastructure, and adaption to climate change. It will provide immediate regional drought preparedness and increase local water supply reliability and the delivery of safe drinking water by implementing infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water required. This will result in long-term drought preparedness and safe drinking water supply and storage availability through a long-term reduction in water usage and unaccounted for water losses. This water conservation measure would not be possible without 2015 Grant funds as it is not locally cost-effective for the City which is a DAC.

Project Description:
The City of Dunsmuir North Dunsmuir Water Main Replacement Project includes planning, design, installation of water main and appurtenances in the North Dunsmuir area.

Project Description Discussion:
As indicated in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report, the City has numerous old (70 to 80 years old) existing thin-walled steel water pipelines with a history of major leaks and repairs. Many leaks have led to substantial private and public property damage and pose health and safety risks. Existing water mains in Dunsmuir, Needham, Scenic and Prospect Avenues have required costly repairs. The Dunsmuir Avenue water main is primarily located on private property and traverses under existing large trees, landscaping, and structures rendering access for repairs difficult. The deteriorating pipeline and poor access increase the health and safety risks to the City. Improvements will include installation of approximately 1,000 linear feet of 12-inch pipeline and 630 linear feet of 10-inch pipeline, complete with fire hydrants, ¾-inch water services, and miscellaneous appurtenances on Dunsmuir and Prospect Avenues. Refer to Figure 4 in File 3 of Attachment 2 for pipeline improvements described herein. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the North Dunsmuir area. Another added benefit is that replacement of the pipeline will result in water savings by reducing the amount of unaccounted water due to leaks.

This project addresses several key issues identified in the IRWM Region including that of water supply, water quality, municipal water supply infrastructure, and adaption to climate change. It will provide immediate regional drought preparedness and increase local water supply reliability and the delivery of safe drinking water by implementing infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water required. This will result in long-term drought preparedness and safe drinking water supply and storage availability through a long-term reduction in water usage and unaccounted for water losses. This water conservation measure would not be possible without 2015 Grant funds as it is not locally cost-effective for the City which is a DAC.

Project Description:

This project establishes and measures a groundwater elevation grid in DACs to evaluate the efficacy of water storage through beaver and other pending restoration works.

Project Description Discussion:

The State of California has recently begun to prioritize groundwater management with the same level of scrutiny as surface water management in the 20th century. Essentially, all surface water in California is spoken for; groundwater management will be the critical component of water resource management in response to drought, annual precipitation variability, and ultimately climate change. The Upper Sacramento, McCloud, and Lower Pit River (USR) Regional Water Management Group (RWMG) has advanced this project for consideration by the Department of Water Resources based on its awareness of groundwater management concerns. This project will provide baseline data necessary for evaluation of the efficacy of beaver reintroduction and other habitat restoration projects that increase groundwater recharge, and provide similar reference points for storm water capture and development of future groundwater management plans, The groundwater elevation data proposed to be collected herein is the first and most fundamental step in prioritizing and managing the region's groundwater resources.

Wet meadows that store and release water slowly are being acknowledged as key in water management strategies in the face of climate change. Climatologists predict changes in weather patterns that typically involve greater extremes: fewer but more intense storms, exaggerated drought patterns, and warmer winters. In the USR Region, more precipitation may be expected to fall as rain rather than snow, increasing the erosive energy of those storms and the sediment load delivered downstream. Each of these phenomena will reduce the storage capacity of the Region over time. The most cost effective way to promote and enhance wet meadows is through restoration of the North American beaver (*Castor Canadensis*). That project is in the planning phase, along with other pending flood control and habitat restoration projects that will increase water storativity. To document the success of those projects we propose collection of groundwater elevation data that will be uploaded to the California State Groundwater Elevation Monitoring (CASGEM) database.

The geographical area encompassed by the USR RWMG is, quite possibly, the only region in the State with no CASGEM-compliant monitoring well data whatsoever. This points out a pressing need for the USR RWMG: without funding from the DWR no regional groundwater elevation data will be available, and project-based monitoring may provide local, but disconnected, information.

One of the formally listed major findings of Bulletin 118, listed in boldface type on page 3 of that document, is:

**"Land use decisions affecting recharge areas can reduce the amount of groundwater in storage and degrade the quality of that groundwater.**

- In many basins, little is known about the location of recharge areas and their effectiveness.
- Protection and preservation of recharge areas are seldom considered in land use decisions.
- If recharge areas are altered by paving, channel lining, or other land use changes, available groundwater will be reduced."

A priority of this survey is the employment of local personnel to complete the work described herein. Before the survey begins, local candidates for employment on the project will be interviewed and selected; training will be provided for the successful candidates by appropriate personnel with education and experience in groundwater theory and field measurement techniques. The project technicians trained for the work will be able to use that knowledge on future local projects that may have an effect on groundwater resources.

Project Description: PFT Mt. Shasta Headwaters Forest Conservation Easement (Phase 1) includes acquisition of an easement protecting water resources and habitat on 12,800 acres of privately-owned forestland.

Project Description Discussion: Under this project Pacific Forest Trust (PFT) will acquire and monitor compliance with a working forest conservation easement (WFCE) on a strategic, privately owned 12,805 acre commercial forest property, located on the southern slopes of Mt. Shasta within the Upper Sacramento and McCloud watersheds, which are critical sources for state water supplies to agriculture and communities. The project is located within and adjacent to the McCloud Community Services District. As described further below, the project will meet the needs of the region through a partnership to enhance environmental stewardship. It will prevent fragmentation, conversion and degradation of this Wildlands-Urban Interface property, and the related negative impacts to its many public benefits, including significant watershed, habitat, climate adaptation and sustainable economic values. Such landscape scale conservation will sustain the ecological and hydrological functionality of the USR watershed, which is among the most pristine in the state.

This project will not only ensure this forest stays as a large, intact, undeveloped forest, but will also ensure on-going management under the terms of the WFCE to achieve multiple goals of the State IRWM Program, the USR IRWM Plan, and the Water Action Plan, providing widespread benefits:

***Water Supply and Watershed Protection**:* Protection of water quality and in-stream flows are achieved through forestry restrictions that maintain canopy cover, road management BMPs to reduce sedimentation, riparian buffers that are wider and more restrictive than state regulations, and conservation of stream flows/forbearance of water rights. 35+ miles of watercourses and 78 springs will be permanently protected, including the source of Pig Creek, a major tributary to Squaw Valley Creek and the McCloud River; and the source of Trail Creek, a headwaters tributary to Soda Creek and the Upper Sacramento River. Protection of water sources and flows from diversion and commercialization benefits USR region, which is a DAC, as well as other state users, and helps achieve the goals of the Human Right to Water Policy.

***Enhanced Wildlife Habitat and Ecological Health***: This project is a priority for acquisition under CDFW's Mt. Shasta Headwaters Conceptual Area Conservation Plan. It will conserve and restore habitats for 127 species, including 10 with special status, encouraging greater structural diversity of conifer habitats; as well as other rare or significant habitats: 235+ acres of wetlands, wet meadows and aspen stands; 125 acres of oak woodlands; and 700+ acres of conifer forest managed for rare, mature characteristics critical to listed species such as the northern spotted owl. As the property neighbors and connects disjunct portions of the Shasta-Trinity National Forest, including Late Successional Reserves managed for threatened old growth species, ecological functionality of the landscape will be enhanced across public-private boundaries.

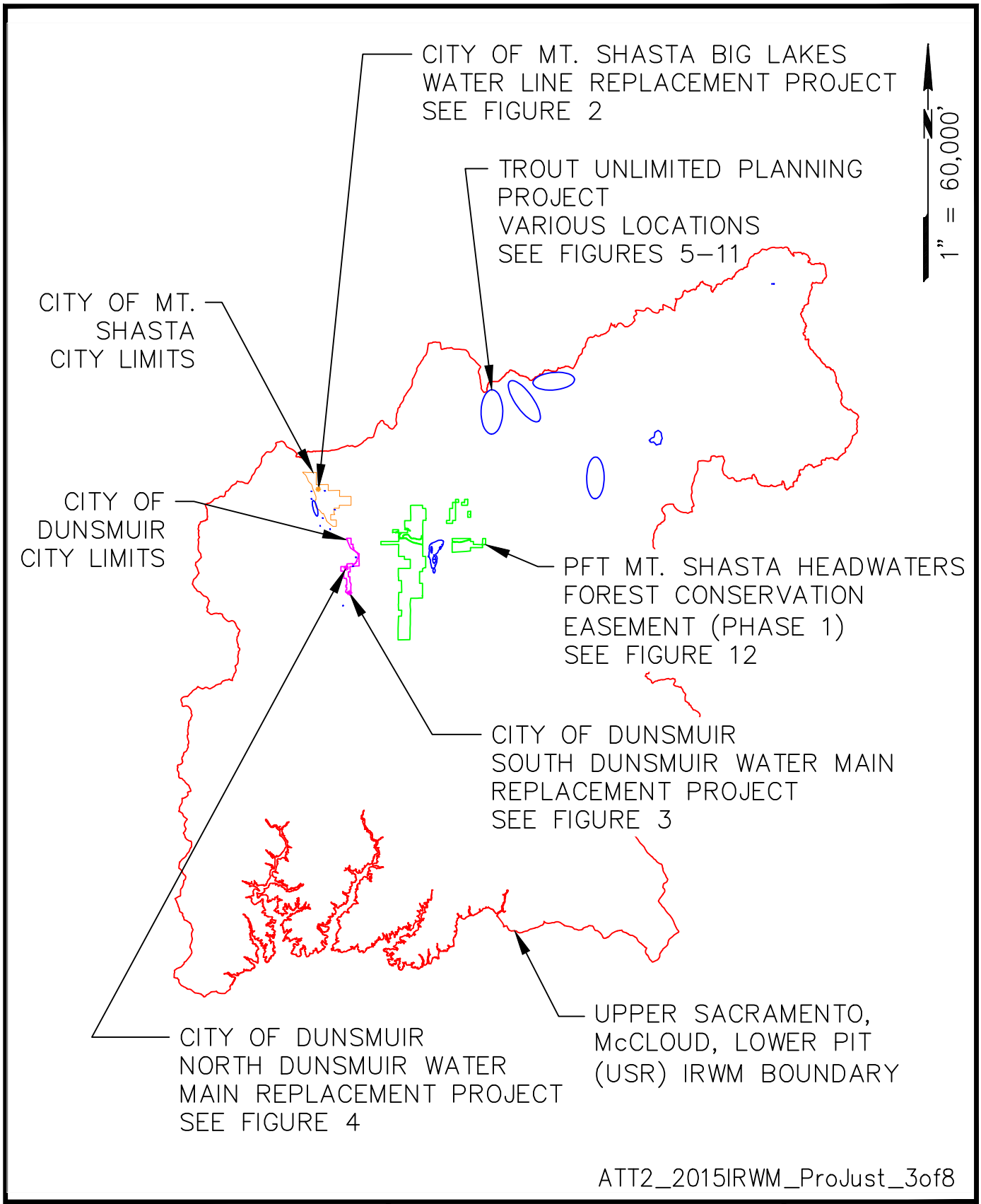
***Climate Mitigation and Adaptation***: Management under the WFCE terms will help maintain forest health, reduce fire risk and permanently increase carbon stores by an estimated 1.8 million tons of CO2 over its first 50 years. State adaptation goals will be furthered by the permanent expansion of large, inter-connected natural block of forests and migration corridors across public-private boundaries, providing more habitat elements and options, including rare ones, for the needs of native fish and wildlife.

***Sustainable Timber Management & Local Economies***: The WFCE permits ongoing sustainable timber harvest that achieves high environmental standards while supporting the local, resource-based economy.

***Enhanced Scenic and Recreational Opportunities***: The project allows for non-motorized public access for uses such as hiking, biking and wildlife viewing during daytime hours. The property's conservation will enhance the scenic enjoyment of the general public from State Highway 89 and the adjacent National Forest.

This project is ready to proceed: The conservation easement is fully negotiated, with an option to purchase it secure through February 2016, and a state-approved appraisal. $9.35 million or 80% of the $11.7 million value has been secured from the Wildlife Conservation Board and Natural Resources Agency Environmental Enhancement and Mitigation Program; applications are pending for the rest.

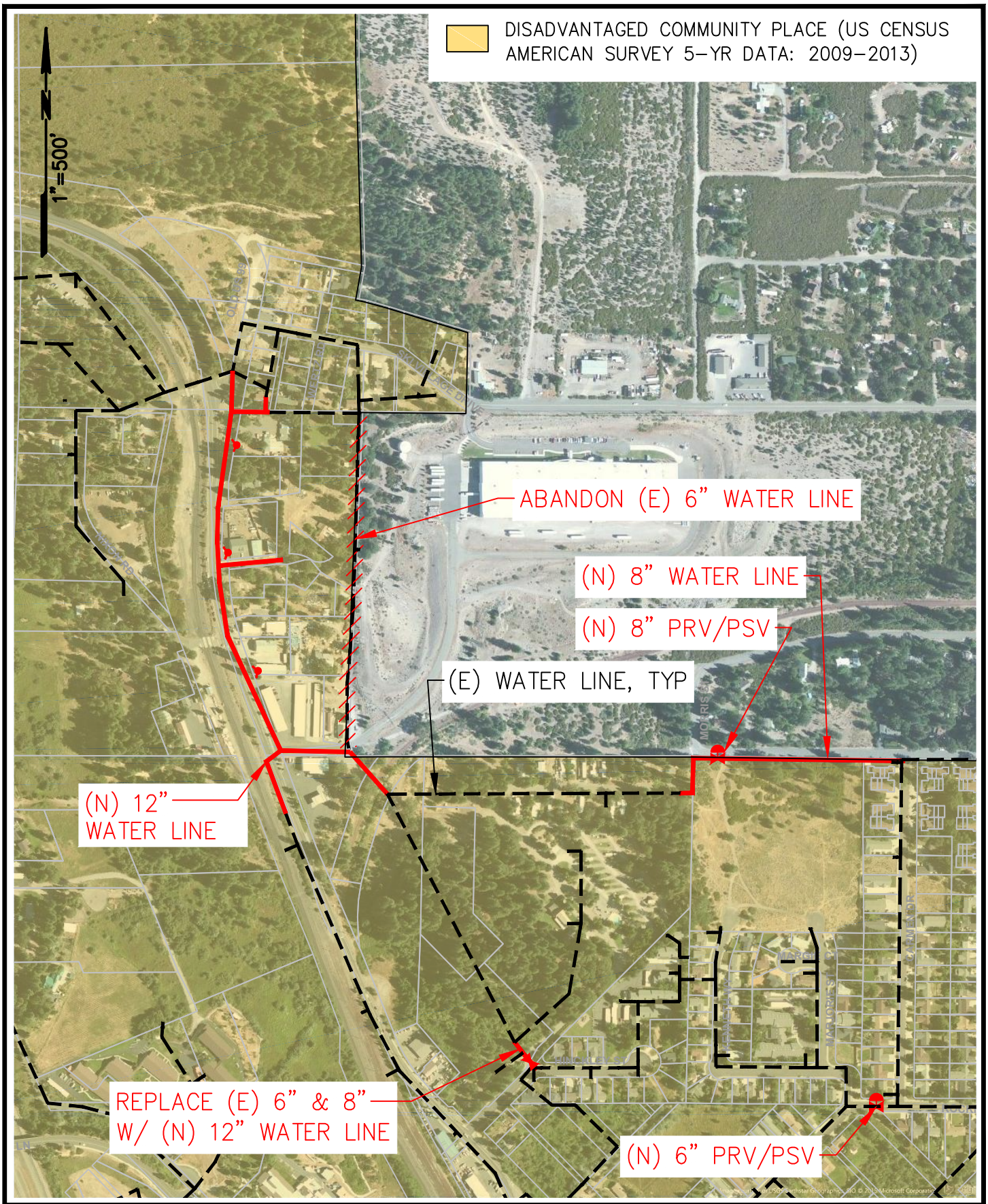
Lower cost approach: Compared to full fee title acquisition, this landscape scale WFCE is the low-cost approach to achieve conservation priorities while maintaining the contribution of the property to local and regional economies. Further, protecting the natural forest, wetland and watercourse infrastructure will sustain natural storage and water quality filtration for the region, providing a lower-cost alternative to building additional water storage and treatment facilities.




ATT2_2015IRWM_ProJust_3of8

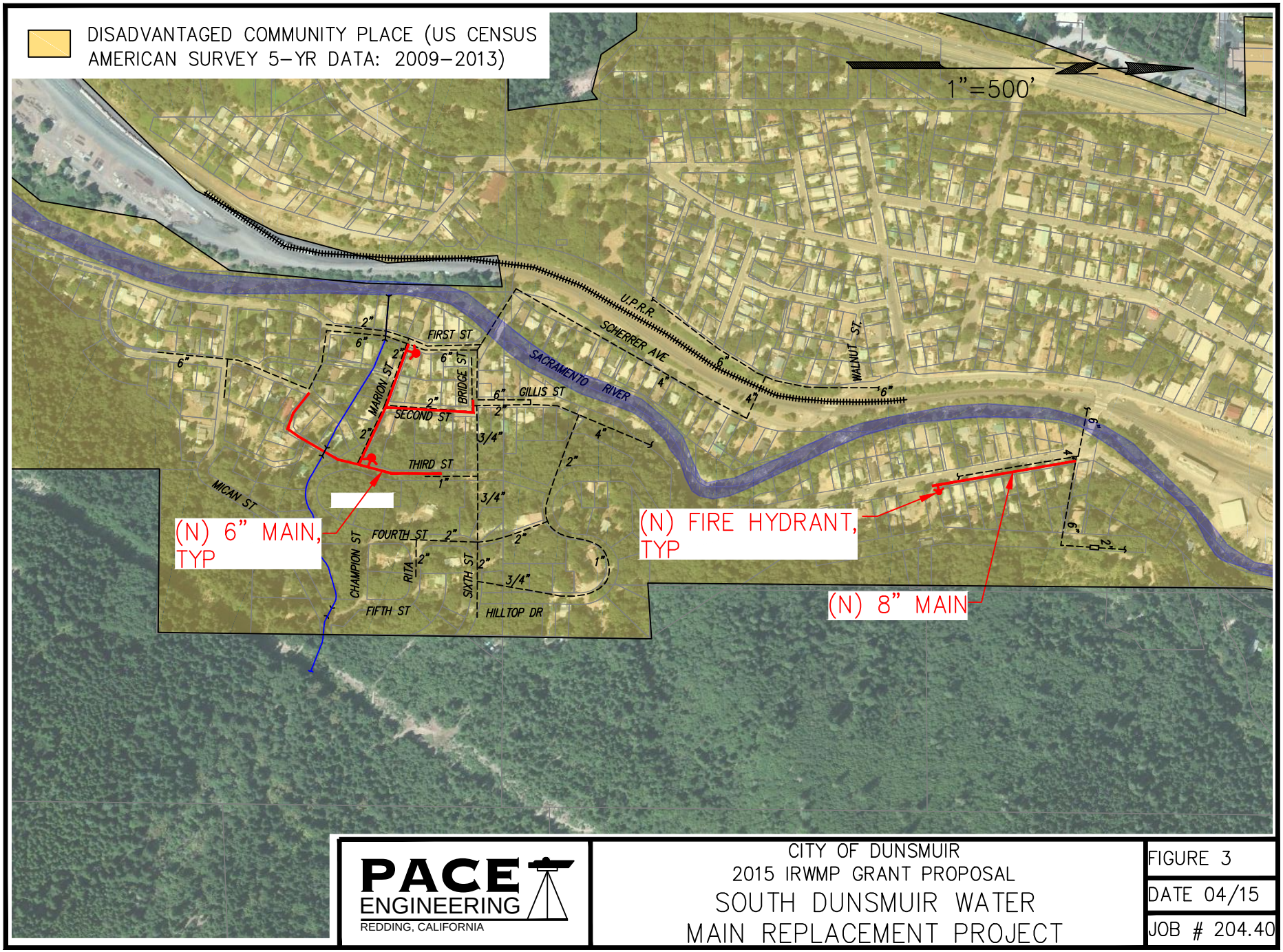
| DATE | | | |
|---|---|---|---|
| 07/30/15 | PACE ENGINEERING REDDING, CALIFORNIA | USR IRWM REGIONAL MAP | FIGURE 1 |
| | | | JOB #111.31 |

Plot Date: July 30, 2015 – 1:00 pm Login Name: lmccollum
File Name: M:\Land Projects\0111.31\DWG\PLATES2.DWG, Layout: IRWM BDRY




| DATE 4/15 | PACE ENGINEERING REDDING, CALIFORNIA | CITY OF MT. SHASTA 2015 IRWM GRANT PROPOSAL BIG LAKES WATER LINE REPLACEMENT PROJECT | FIGURE 2 |
|---|---|---|---|
| | | | JOB #111.31 |

Plot Date: July 16, 2015 – 3:24 pm Login Name: gmaxwell

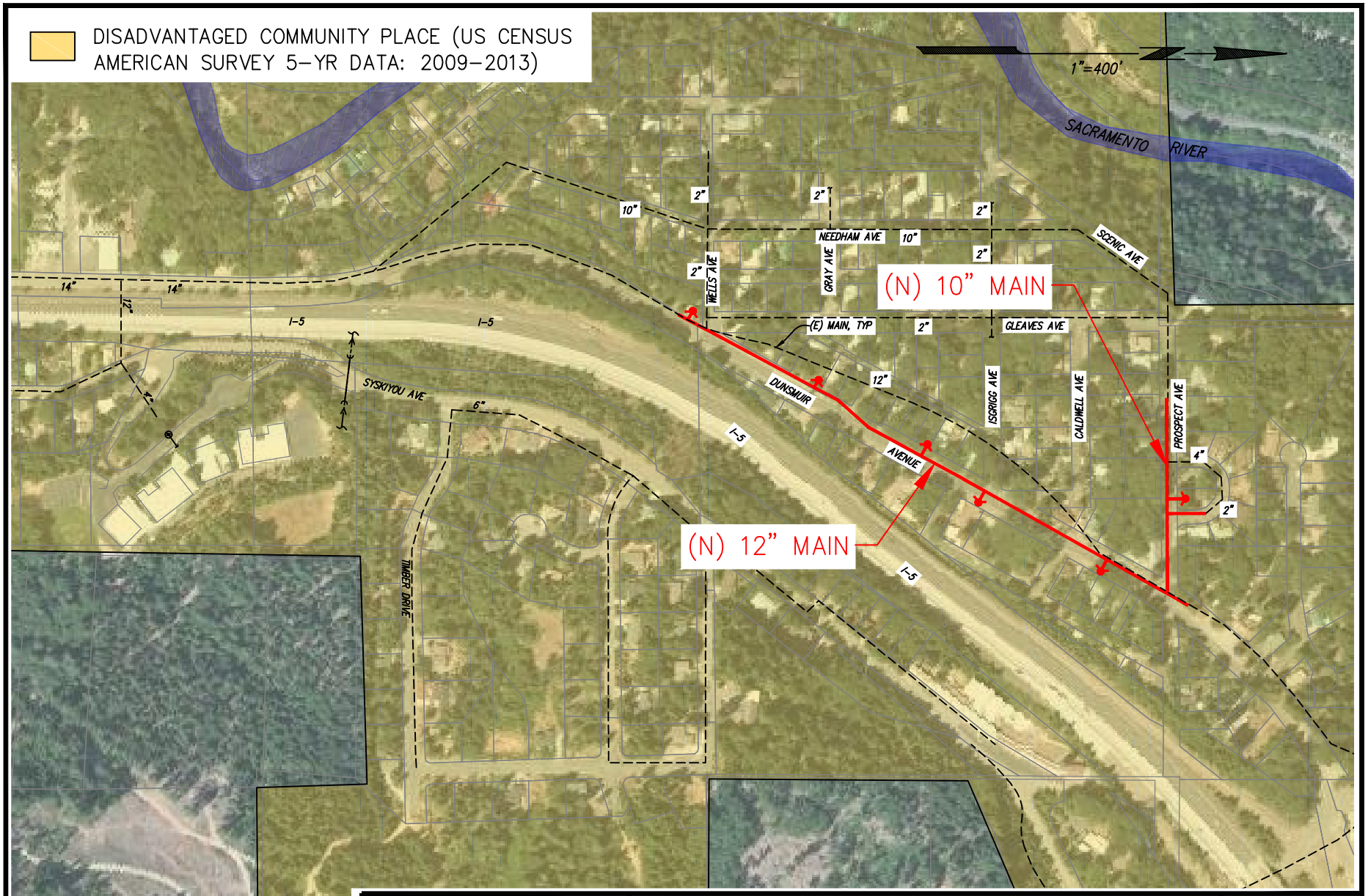



PACE ENGINEERING
REDDING, CALIFORNIA

CITY OF DUNSMUIR
2015 IRWMP GRANT PROPOSAL
SOUTH DUNSMUIR WATER MAIN REPLACEMENT PROJECT

FIGURE 3
DATE 04/15
JOB # 204.40

Plot Date: July 16, 2015 - 3:35 pm Login Name: gmaxwell
File Name: M:\Land Projects\0204.40.514 CDBG Application\IRWMP South Dunsmuir Figures.dwg, Layout: FIG 1

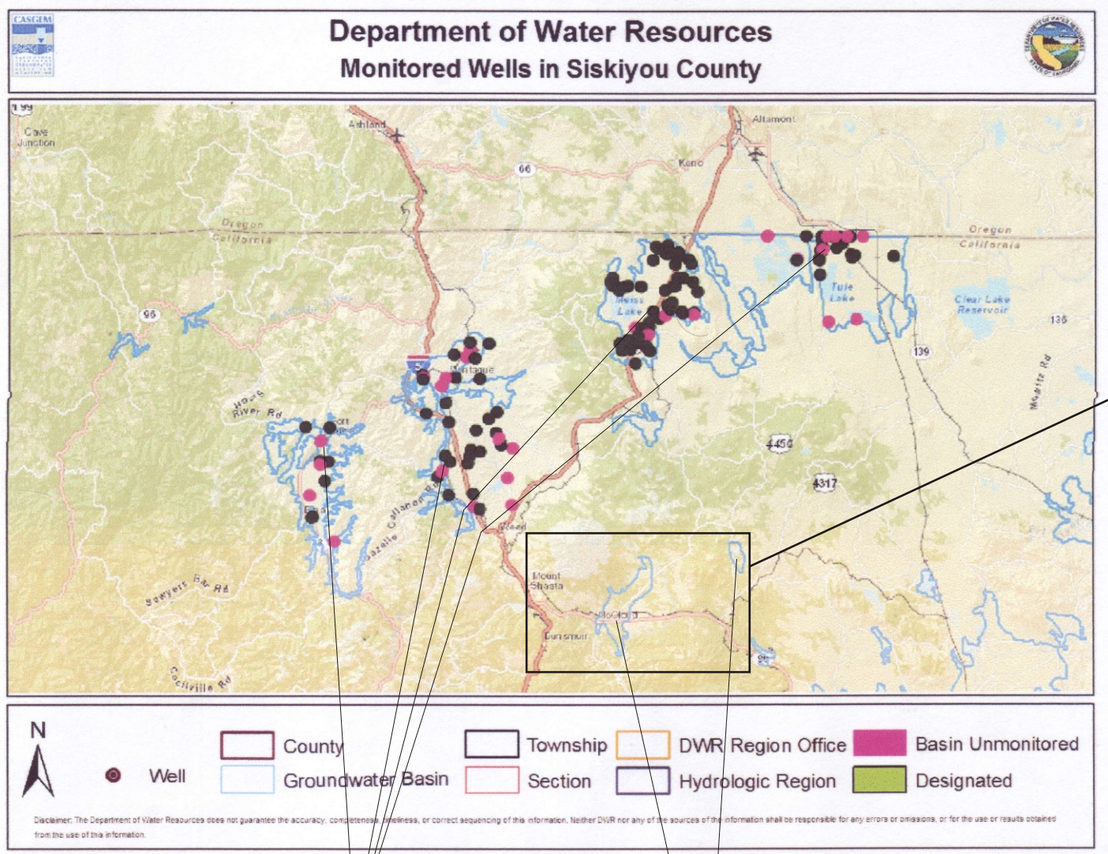


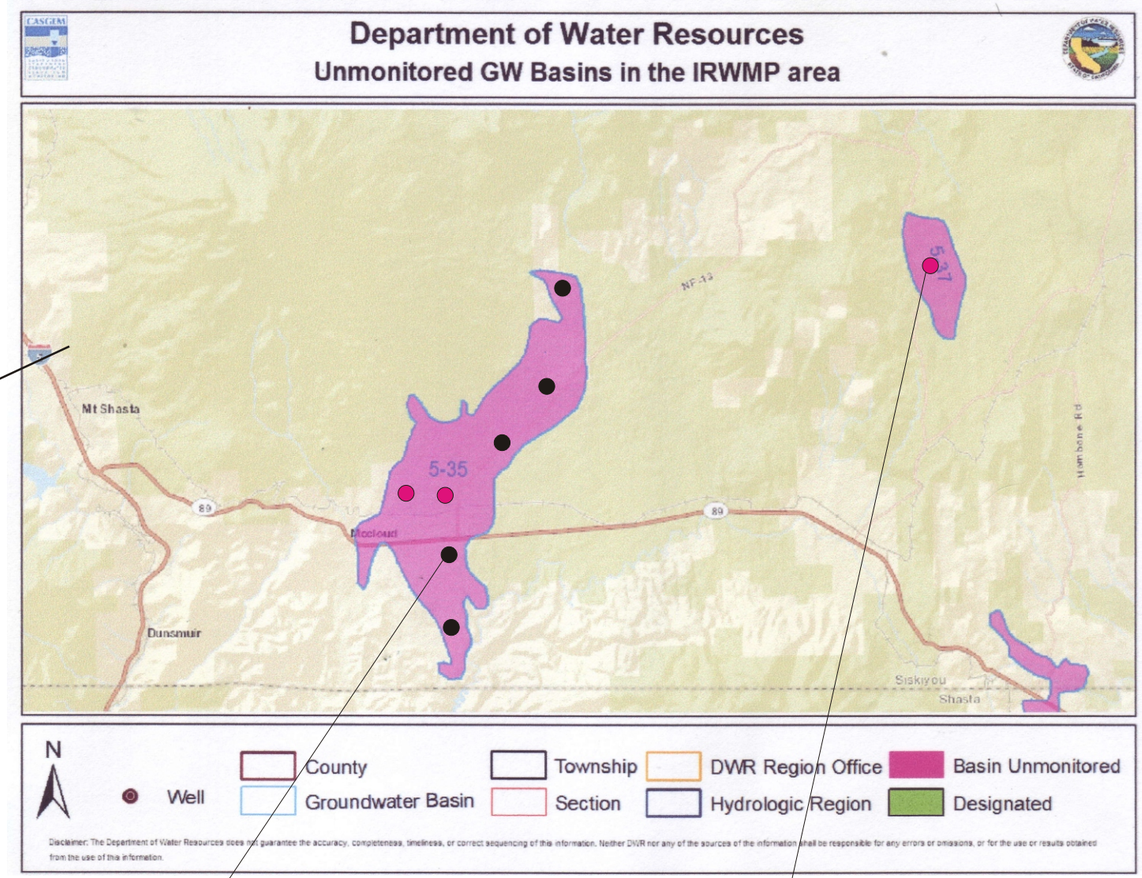

PACE ENGINEERING
REDDING, CALIFORNIA

CITY OF DUNSMUIR
2015 IRWM GRANT PROPOSAL
NORTH DUNSMUIR WATER
MAIN REPLACEMENT PROJECT

FIGURE 4
DATE 07/15
JOB # 204.40

Plot Date: July 16, 2015 – 3:29 pm Login Name: gmaxwell
File Name: M:\Land Projects\0204.40.514 CDBG Application\IRWMP North Dunsmuir Figures (Revised).dwg, Layout: FIG 1




Monitored Agricultural and Domestic Wells in the Scott, Shasta, Butte Valley, and Klamath River Valley Basins

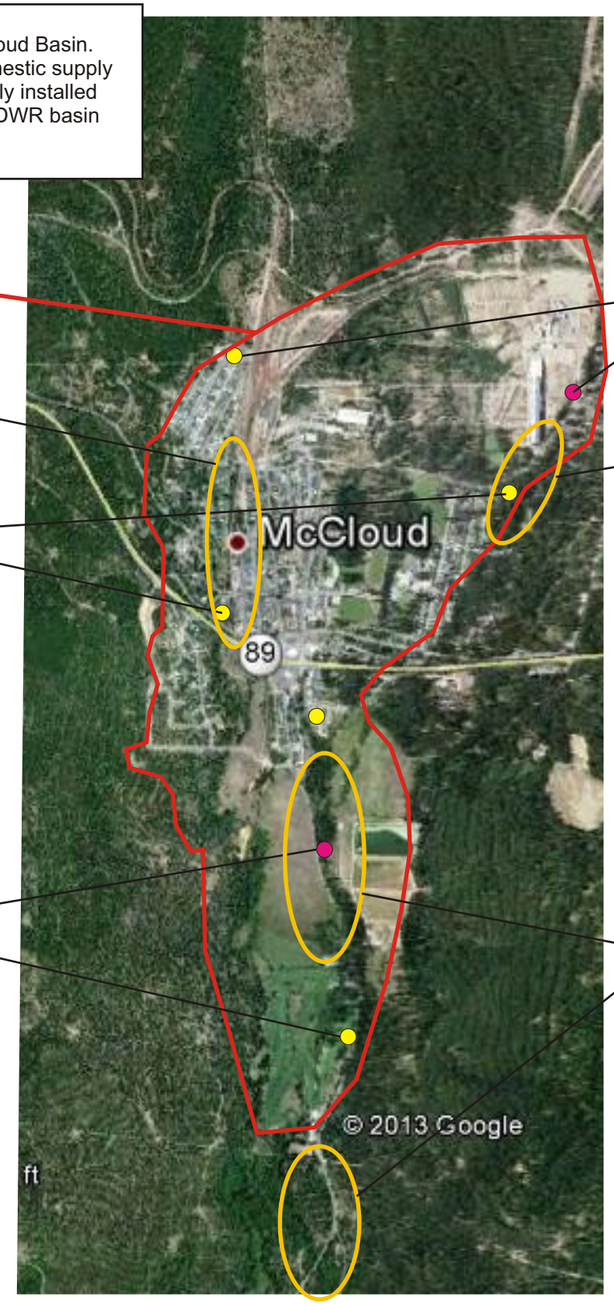
Unmonitored Basins in the IRWM plan area.

Proposed Monitoring Wells in the McCloud Basin. Five (5) of the wells will be existing domestic supply wells (in black) and two (2) will be newly installed dedicated monitoring wells (magenta). DWR basin number 5-35.

Proposed Monitoring Well in the Toad Well area. No known domestic supply. Newly installed dedicated monitoring well (magenta). DWR basin number 5-37.

| | | | | | |
|---|---|---|---|---|---|
| **H/REM**<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #344<br>Los Alamitos, CA 90720<br>(562) 795-0088 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents groundwater elevation monitoring wells in Siskiyou County. The screen capture on the left shows the entire county, and the screen capture on the right details the unmonitored basins in the IRWM plan area. | Siskiyou County Groundwater Elevation Monitoring Well Overview<br>Unmonitored Groundwater Basins in the Upper Sac, McCloud, Pit River IRWMP Area. | Figure No.<br>1<br>N |

Proposed Monitoring Wells in the McCloud Basin. Five (5) of the wells will be existing domestic supply wells (in yellow) and two (2) will be newly installed dedicated monitoring wells (magenta). DWR basin number 5-35.




Approximate McCloud Basin Boundary

Proposed Monitoring Well Locations

Area of pending flood control, GW recharge, and native species restoration

Area of pending culvert removal, flood control, and native species restoration

Proposed Monitoring Well Locations

Proposed Monitoring Well Locations

Area of known beaver populations along Squaw Creek

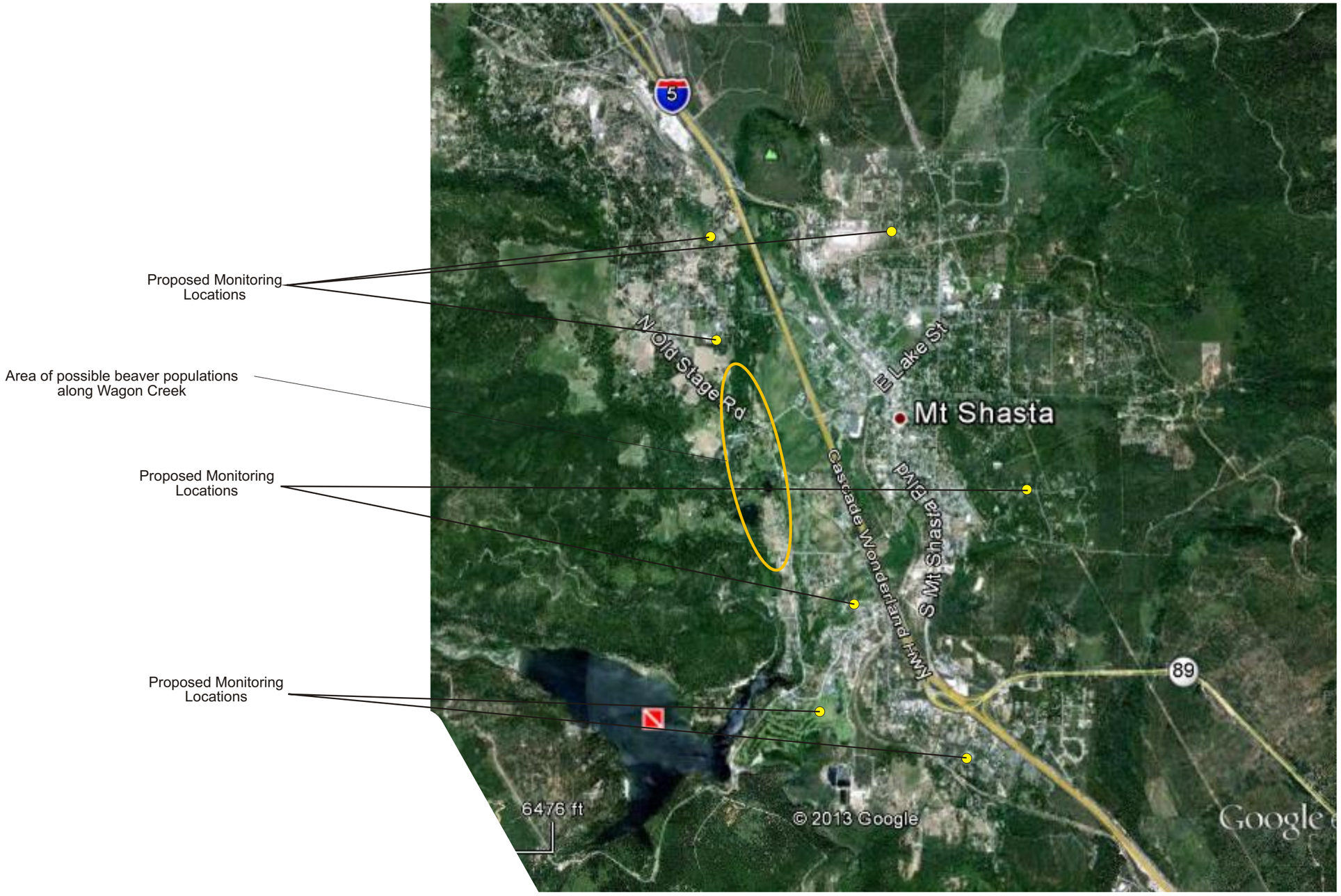
Approximate Toad Well Basin Boundary

Proposed Monitoring Well Location

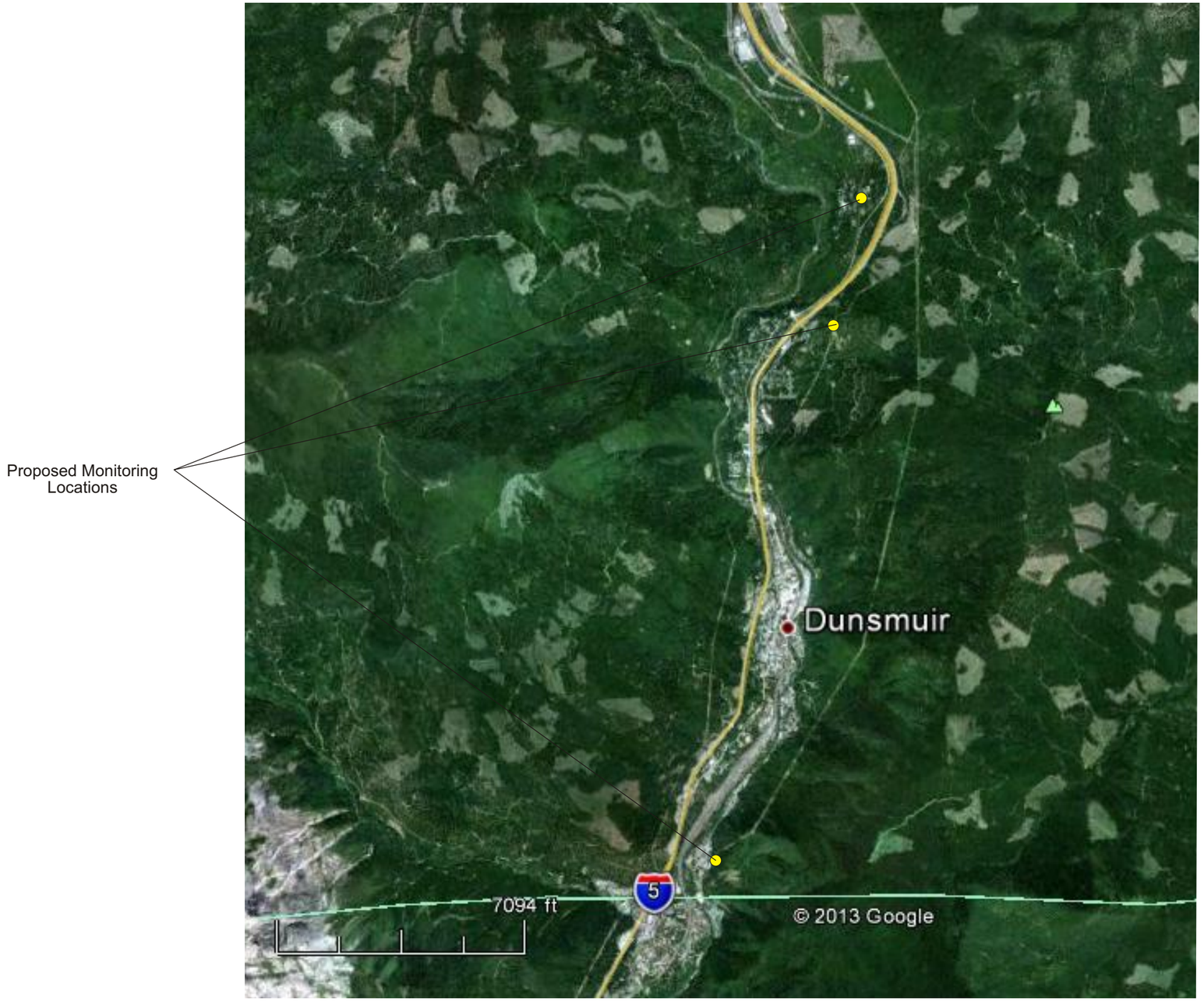
Proposed Monitoring Well in the Toad Well Basin. No known domestic supply. Newly installed dedicated monitoring well (magenta). DWR basin number 5-37.

| | | | | | |
|---|---|---|---|---|---|
| **H/REM**<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #709<br>Los Alamitos, CA 90720<br>(562) 355-2876 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents an aerial view of the McCloud area and the Toad Well Area. The view is from Google Earth. The McCloud Basin is designated as Basin 5-35 by the DWR, and the Toad Well Basin is designated as basin 5-37. Proposed well locations are preliminary and general in nature. Further input needed to finalize. | McCloud Basin & Toad Well Basin Proposed Monitoring Well Locations<br>● Proposed Dedicated Monitoring Well<br>● Proposed Domestic Monitoring Well (Existing) | Figure No.<br>2<br>N |

USR 2015 IRWM Grant Proposal - Figure 6




| | | | | | |
|---|---|---|---|---|---|
| H/REM<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #709<br>Los Alamitos, CA 90720<br>(562) 355-2876 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents an aerial view of the Mt. Shasta area. The view is from Google Earth. The Mt. Shasta area is not within a basin designated by the DWR. The area is, however, a recharge area for groundwater with an expected high hydraulic gradient. These factors make it an area of environmental interest for the IRWM Plan. Further input needed to finalize well locations. | Mt. Shasta Area<br>Proposed Monitoring Well Locations<br>Proposed Domestic Monitoring Well | Figure No.<br>3<br>N |

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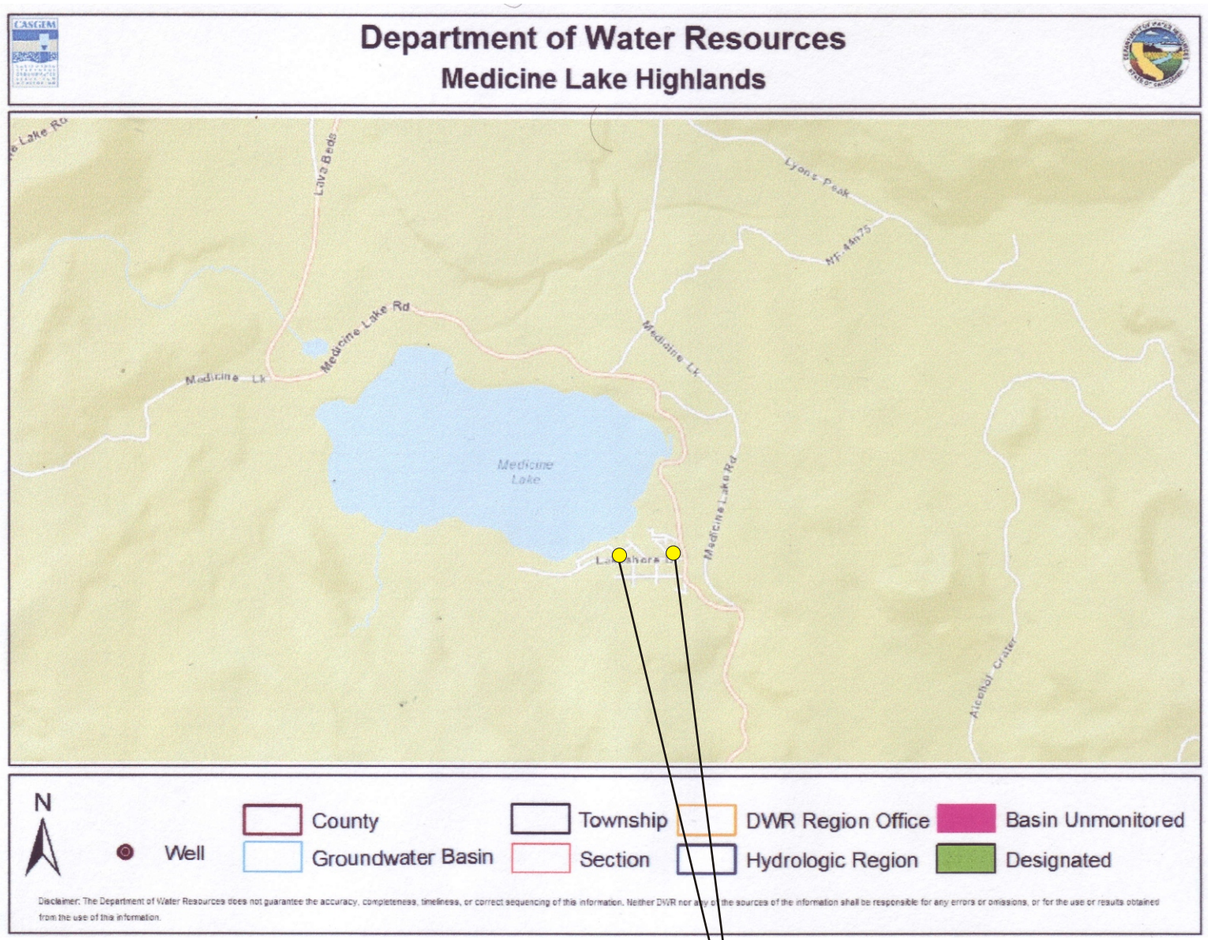
|---|---|---|---|---|---|
| **H/REM**<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #709<br>Los Alamitos, CA 90720<br>(562) 355-2876 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents an aerial view of the Dunsmuir area. The view is from Google Earth. The Dunsmuir area is not within a basin designated by the DWR. The area is, however, a recharge area for groundwater with an expected high hydraulic gradient. These factors make it an area of environmental interest for the IRWM Plan. | Dunsmuir Area<br>Proposed Monitoring Well Locations<br>Proposed Domestic Monitoring Well | Figure No.<br>4<br>N |




Proposed Monitoring Locations

Proposed Monitoring Locations

| | | | | |
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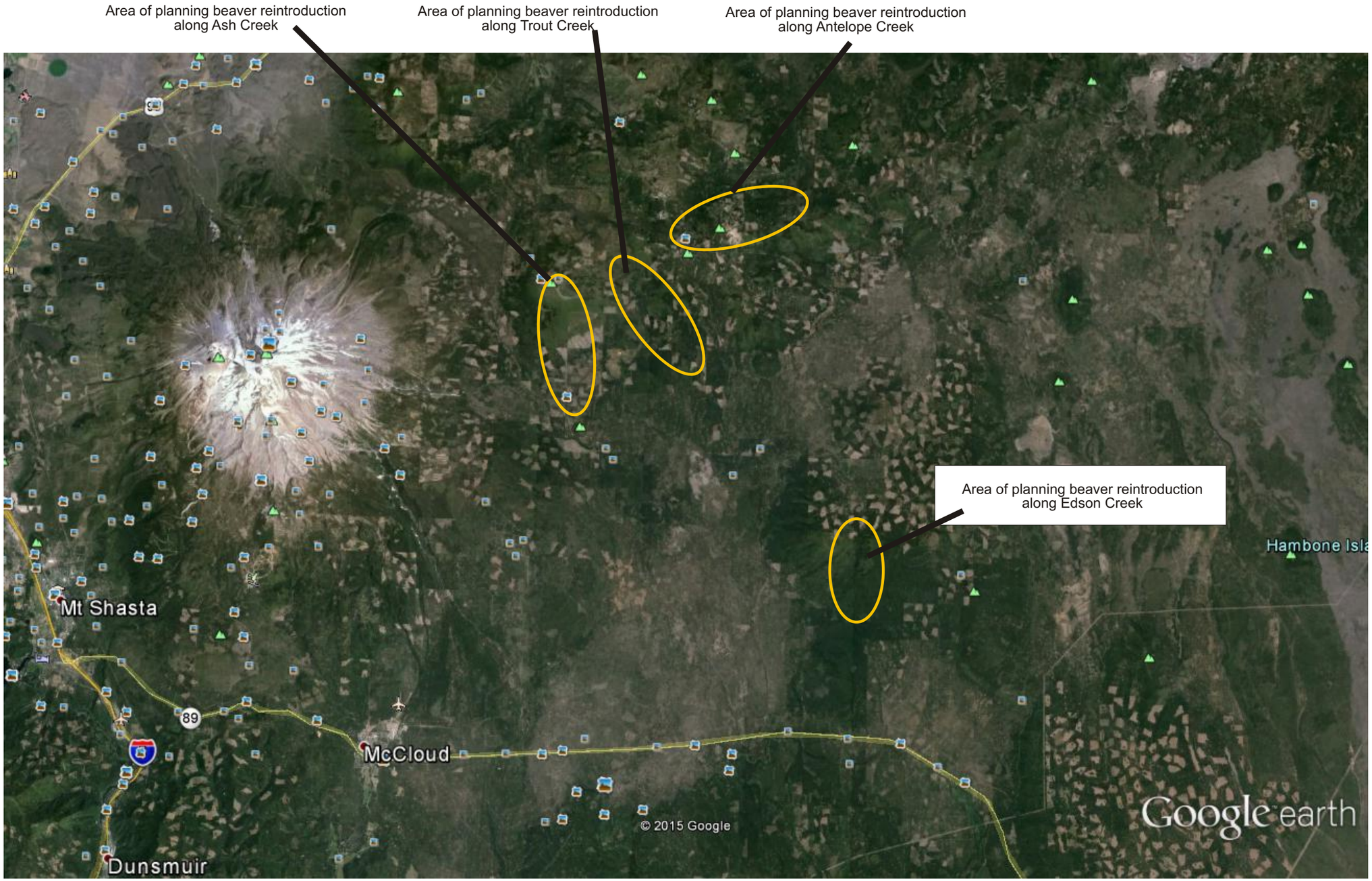
| **H/REM**<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #709<br>Los Alamitos, CA 90720<br>(562) 355-2876 | Site: Medicine Lake Highlands<br>Address: To be determined<br>Project: File Review<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents an aerial view of the Medicine Lake area. Proposed well locations are at private residences adjacent to Medicine Lake and should be considered a minimum. The Medicine Lake area is hydrologically complex, a major recharge area for groundwater, and subject to significant developmental pressures. These factors make it an area of significant environmental concern in the IRWM plan. | Medicine Lake Area<br>Proposed Monitoring Well Locations<br>Proposed Domestic Monitoring Well | Figure No.<br>5<br>N |

USR 2015 IRWM Grant Proposal - Figure 9

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|---|---|---|---|---|---|
| **H/REM**<br>Harrison/Roberts Environmental Management<br>11278 Los Alamitos Blvd. #344<br>Los Alamitos, CA 90720<br>(562) 795-0088 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents areas of potential and proposed beaver reintroduction in the USR Region. | Wet Meadow Beaver Reintroduction Areas in the Upper Sac, McCloud, Pit River IRWMP Area. | Figure No.<br>6<br>N |

All of the wells will have their elevation measured for four (4) consecutive calendar quarters...

...In addition to the elevation monitoring, the monitored wells will disclose their well drillers logs and have that data publicly available.

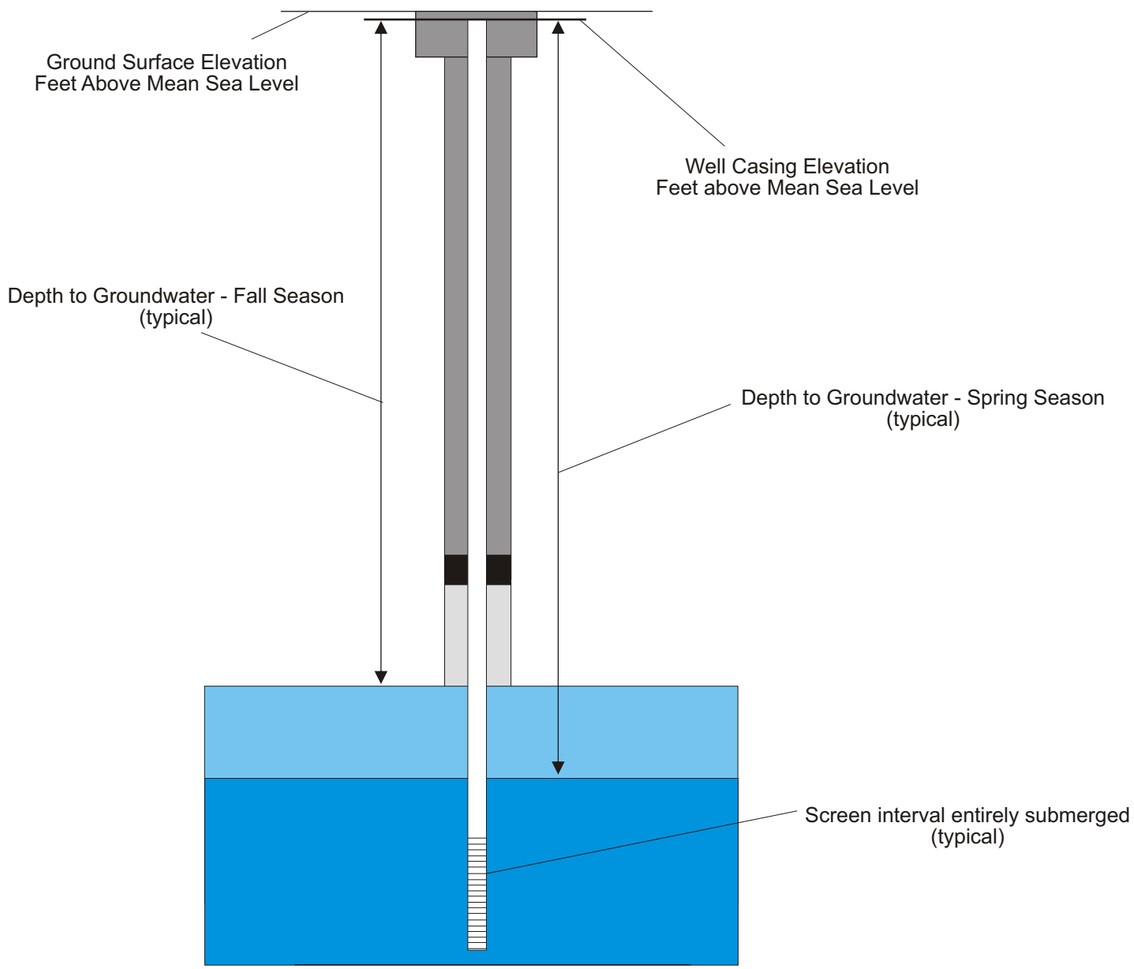
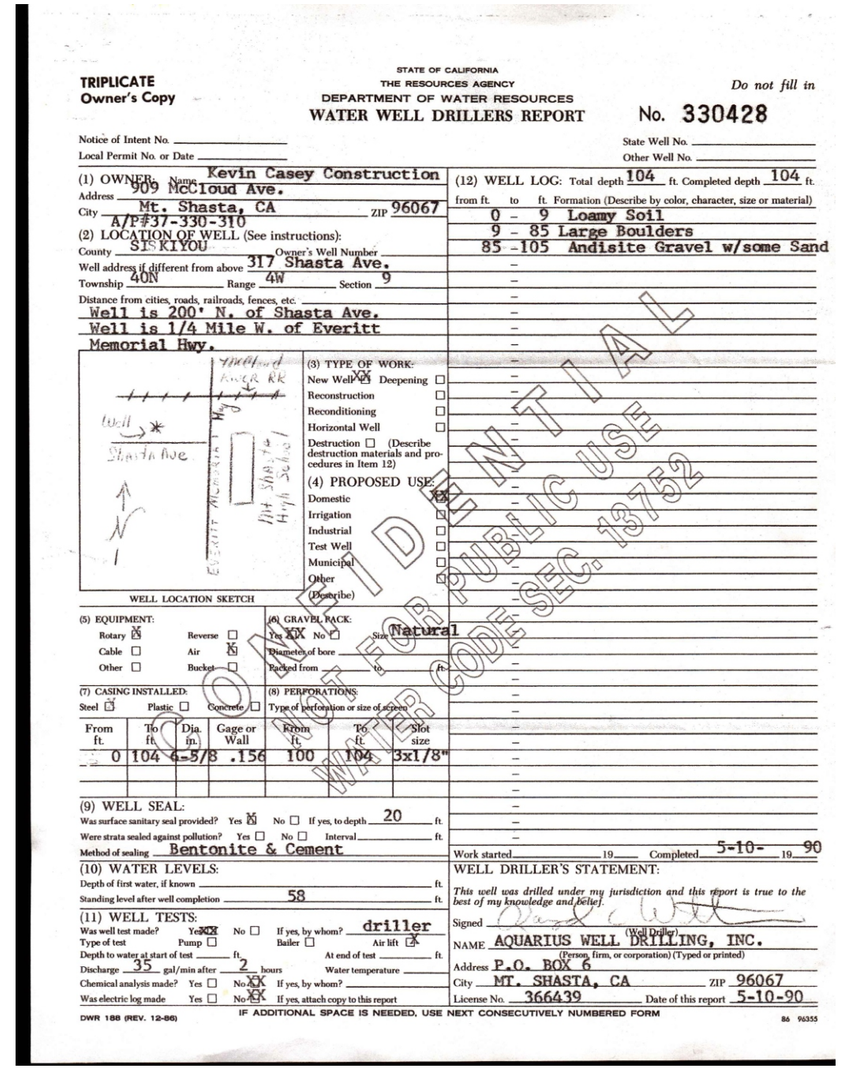



Illustration 1



TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in
No. 330428

Notice of Intent No.
Local Permit No. or Date
State Well No.
Other Well No.

(1) OWNER: Name Kevin Casey Construction
Address 909 McCloud Ave.
City Mt. Shasta, CA ZIP 96067
A/P#37-330-310

(2) LOCATION OF WELL (See instructions):
County SISKIYOU Owner's Well Number
Well address if different from above 317 Shasta Ave.
Township 40N Range 4W Section 9
Distance from cities, roads, railroads, fences, etc.
Well is 200' N. of Shasta Ave.
Well is 1/4 Mile W. of Everitt
Memorial Hwy.

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well XX Deepening
Reconstruction
Reconditioning
Horizontal Well
Destruction (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic XX
Irrigation
Industrial
Test Well
Municipal
Other
(Describe)

(5) EQUIPMENT:
Rotary X Reverse
Cable Air X
Other Bucket

(6) GRAVEL PACK:
Yes XX No Size Natural
Diameter of bore
Packed from to ft.

(7) CASING INSTALLED:
Steel X Plastic Concrete

| From ft. | To ft. | Dia. in. | Gage or Wall | From ft. | To ft. | Slot size |
|---|---|---|---|---|---|---|
| 0 | 104 | 6-5/8 | .156 | 100 | 104 | 3x1/8" |

(8) PERFORATIONS:
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes X No If yes, to depth 20 ft.
Were strata sealed against pollution? Yes No Interval ft.
Method of sealing Bentonite & Cement

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 58 ft.

(11) WELL TESTS:
Was well test made? Yes XX No If yes, by whom? driller
Type of test Pump Bailer Air lift X
Depth to water at start of test ft. At end of test ft.
Discharge 35 gal/min after 2 hours Water temperature
Chemical analysis made? Yes No XX If yes, by whom?
Was electric log made Yes No XX If yes, attach copy to this report

(12) WELL LOG: Total depth 104 ft. Completed depth 104 ft.

| from ft. | to ft. | Formation (Describe by color, character, size or material) |
|---|---|---|
| 0 | 9 | Loamy Soil |
| 9 | 85 | Large Boulders |
| 85 | 105 | Andisite Gravel w/some Sand |

Work started 19 Completed 5-10- 19 90

WELL DRILLER'S STATEMENT:
*This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.*
Signed (Well Driller)
NAME AQUARIUS WELL DRILLING, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 6
City MT. SHASTA, CA ZIP 96067
License No. 366439 Date of this report 5-10-90

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

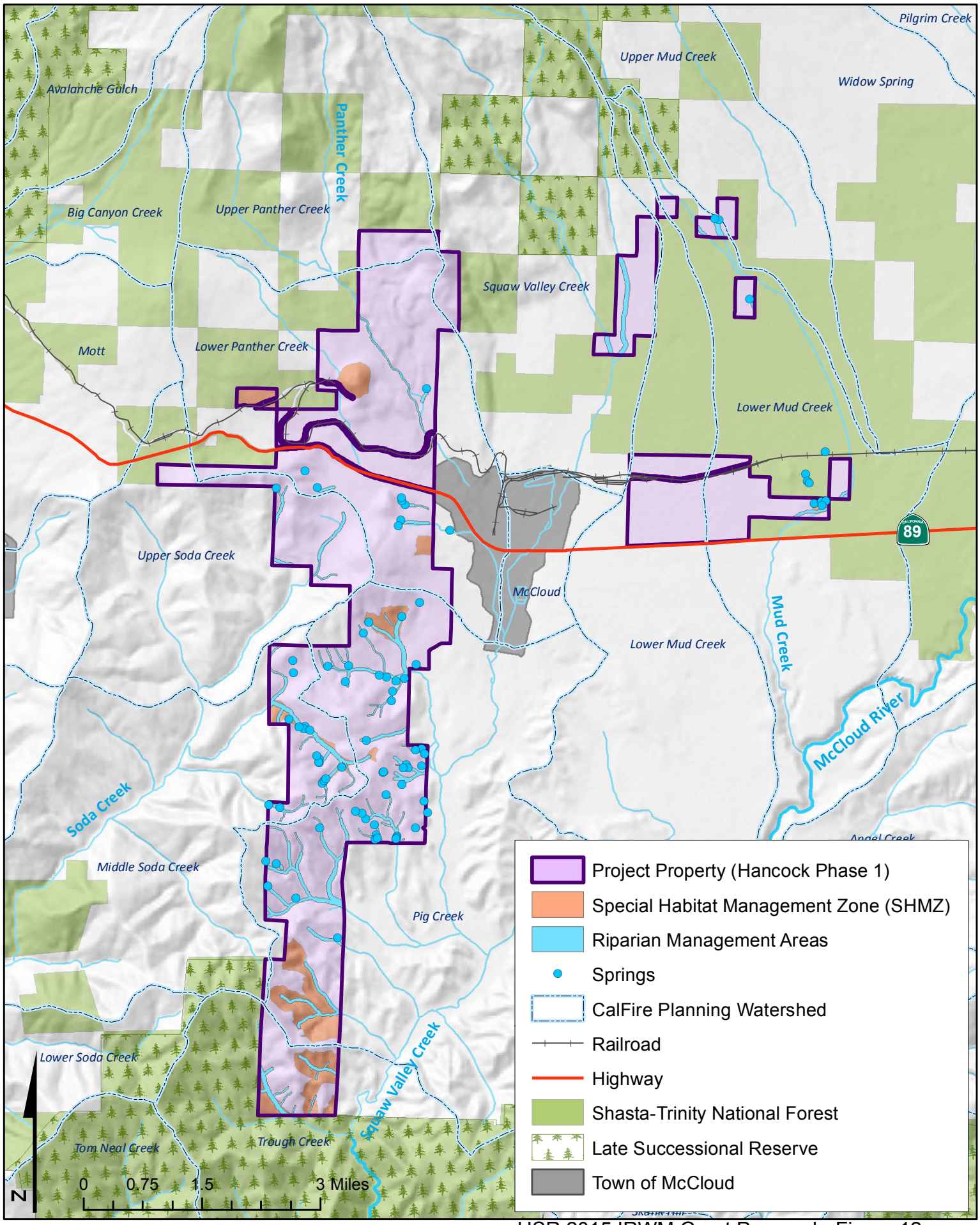
CONFIDENTIAL
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

Illustration 2

| | | | | | |
|---|---|---|---|---|---|
| **H/REM** Harrison/Roberts Environmental Management 11278 Los Alamitos Blvd. #709 Los Alamitos, CA 90720 (562) 355-2876 | Site: As shown<br>Address: As shown<br>Project: IRWM Plan - Groundwater Monitoring<br>Scale: As shown | Drawn: R. Blankenship<br>Checked:<br>Date Measured: | This figure presents the components of a typical monitoring well (Illustration 1) and a well drillers log to be included in the survey (Illustrations 1 and 2, inclusive). | Typical Domestic Monitoring Well Schematic<br>Typical DWR Well Completion Report | Figure No. 7<br>N |

# PFT Mt. Shasta Headwaters Forest Conservation Easement (Phase 1)

PACIFIC FOREST TRUST




Map produced on July 21, 2015 by Justin Garland for Pacific Forest Trust, San Francisco, CA | Created using ArcGIS 10.2.1 | Projection: Teale Albers, Datum: NAD 1984

USR 2015 IRWM Grant Proposal - Figure 12

Table 5 – Annual Project Physical Benefits

Project Name: City of Mt. Shasta Big Lakes Water Line Replacement Project

Type of Benefit Claimed: The primary benefit is improved water system O&M including increased system pressures meeting minimum CDPH requirements and fire flows meeting Uniform Fire Code requirements by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Resulting system pressures in areas of improvements in pounds per square inch (PSI)

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | <20 | <20 | 0 |
| 2016 | <20 | 25-50 | 10-30 PSI increase |
| 2017-2116 | <20 | 25-50 | 10-30 PSI increase |

Comments: The project will be completed by August 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

Table 5 – Annual Project Physical Benefits

Project Name: City of Mt. Shasta Big Lakes Water Line Replacement Project

Type of Benefit Claimed: A secondary benefit is water savings by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Gallons per day

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | 0 | 0 | 0 |
| 2016 | 0 | 3,000 | 3,000 |
| 2017-2116 | 0 | 3,000 | 3,000 |

Comments: The project will be completed by August 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

Table 5 – Annual Project Physical Benefits

Project Name: City of Dunsmuir South Dunsmuir Water Main Replacement Project

Type of Benefit Claimed: The primary benefit is improved water system O&M including increased system pressures meeting minimum CDPH requirements and fire flows meeting Uniform Fire Code requirements by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Resulting system pressures in areas of improvements in pounds per square inch (PSI)

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | <20 | <20 | 0 |
| 2016 | <20 | 25-50 | 10-30 PSI increase |
| 2017-2116 | <20 | 25-50 | 10-30 PSI increase |

Comments: The project will be completed by June 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

Table 5 – Annual Project Physical Benefits

Project Name: City of Dunsmuir South Dunsmuir Water Main Replacement Project

Type of Benefit Claimed: A secondary benefit is water savings by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Gallons per day

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | 0 | 0 | 0 |
| 2016 | 0 | 1,200 | 1,200 |
| 2017-2116 | 0 | 1,200 | 1,200 |

Comments: The project will be completed by June 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

Table 5 – Annual Project Physical Benefits

Project Name: City of Dunsmuir North Dunsmuir Water Main Replacement Project

Type of Benefit Claimed: The primary benefit is improved water system O&M including increased system pressures meeting minimum CDPH requirements and fire flows meeting Uniform Fire Code requirements by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Resulting system pressures in areas of improvements in pounds per square inch (PSI)

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | <20 | <20 | 0 |
| 2016 | <20 | 25-50 | 10-30 PSI increase |
| 2017-2116 | <20 | 25-50 | 10-30 PSI increase |

Comments: The project will be completed by July 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

Table 5 – Annual Project Physical Benefits

Project Name: City of Dunsmuir North Dunsmuir Water Main Replacement Project

Type of Benefit Claimed: A secondary benefit is water savings by replacing leaking undersized antiquated water mains.

Units of the Benefit Claimed : Gallons per day

Anticipated Useful Life of Project (years): More than 100 years

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| | Physical Benefits | | |
| Year | Without Project | With Project | Change Resulting from Project (c) – (b) |
| 2015 | 0 | 0 | 0 |
| 2016 | 0 | 1,200 | 1,200 |
| 2017-2116 | 0 | 1,200 | 1,200 |

Comments: The project will be completed by July 2016. As such, no benefits will be seen until that time. The expected lifetime of C900 PVC pipeline is more than 100 years. As such, benefits will be seen for at least this lifecycle.

**Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project Qualitative Description and Anticipated Benefits of the Project:**

Data collected during this planning phase of various IRWM projects will be used as baseline data in proposed restoration projects and uploaded to the CASGEM database for use by scientists and engineers for species reintroduction, habitat restoration, climate change evaluation, and groundwater management.

By compiling and measuring baseline data for groundwater elevations currently unknown to the public, this project will meet the following USR IRWM plan objectives by:

1) Increasing knowledge of basin characteristics and public understanding of watershed dynamics;
2) Uploading information collected to the CASGEM database will provide the scientific, unbiased data necessary for groundwater management conversations;
3) Generating data that can be used to support the sustainable revitalization of disadvantaged and indigenous communities;
4) Informing public understanding of basin characteristics to foster meaningful public participation in watershed stewardship;
5) Measuring baseline data from which we can identify trends and ensure adequate source water supplies; and
6) Generate data that can be used to ensure public health and safety and protect ecological health in this critical source water basin

This project meets seven of the Upper Sacramento Region IRWMP objectives. Further, our proposal addresses the concerns of the Winnemem Wintu tribe near Mt. Shasta, the Modoc tribe in the Medicine Lake area, the Pit River tribe in the eastern USR area, the McCloud Watershed Council in McCloud, and the cities of Mt. Shasta and Dunsmuir with elevation monitoring in their general vicinity. Many of the aforementioned also have overlapping interests in the listed areas. Also we would satisfy the DWR by monitoring two groundwater basins not currently monitored.

| Table 5 – Annual Project Physical Benefits<br>Project Name: Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase1)<br>Type of Benefit Claimed: Watershed lands and habitats permanently conserved and enhanced (Primary)<br>Units of the Benefit Claimed : Acres<br>Anticipated Useful Life of Project (years): Perpetual | | | |
|---|---|---|---|
| (a) | (b) | (c) | (d) |
| | Physical Benefits | | |
| Lifetime of Project | Without Project | With Project | Change Resulting from Project<br>(c) – (b) |
| Perpetuity | 0 | 12,805 | 12,805 |
| Comments: If this WFCE is acquired in 2015, the physical benefits of permanent, property-wide watershed and habitat conservation and enhancement will be immediately achieved and can be sustained through time through management under the terms of the WFCE. Watershed elements include 35 miles of streams, 78 springs, 766 acres of riparian areas, 235 acres of wetlands and meadows; as well as conifer, oak woodland, and instream-aquatic habitats. | | | |

| Table 5 – Annual Project Physical Benefits<br>Project Name: Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase1)<br>Type of Benefit Claimed: Species protected (Secondary)<br>Units of the Benefit Claimed : Numbers of species<br>Anticipated Useful Life of Project (years): Perpetual | | | |
|---|---|---|---|
| (a) | (b) | (c) | (d) |
| | Physical Benefits | | |
| Lifetime of Project | Without Project | With Project | Change Resulting from Project<br>(c) – (b) |
| Perpetuity | 0 | 127 | 127 |
| Comments: If this WFCE is acquired in 2015, the physical benefits of permanent protection of habitats on which an estimated 127 species depend for one or more life functions (based on CDFW Wildlife Habitat Relationship analysis) will be achieved immediately and can be sustained and enhanced through time by management under the terms of the WFCE. This includes 10 special status species that are known to use or potentially use the property. | | | |

**City of Mt. Shasta Big Lakes Water Line Replacement Project**

The primary expected physical benefit of the City of Mt. Shasta Big Lakes Water Line Replacement Project is the operation and maintenance (O&M) savings from replacing aged and leaking water mains, primarily resulting in increased system pressures and fire flows. Currently the Big Lakes area is served by an aging and undersized 6-inch water main that runs along the back lot lines of properties located along N. Mt. Shasta Boulevard. Existing water services run across multiple parcels to serve properties that do not front the existing water main. Due to the location of the water main, they are difficult to access for reading and maintenance. Additionally, low water system pressures in this area minimize the City's ability to reliably deliver water to residents and increases the threat of public health hazards associated with depressurized water mains that occur during leaks. The proposed projects would abandon the existing pipeline and install a new 12-inch pipeline in N. Mt. Shasta Boulevard, and relocate meters into the street right-of-way for easier access. Problems due to the aged water mains in this area are well documented as discussed in the 2010 Master Water Plan (MWP) and June 2010 memorandum of hydraulic model alternative analyses, portions of which are included herein.

Existing System Capacity/Analysis: The capacity of a distribution system is generally considered to be adequate if it can meet both of the following criteria:

1. Supply all the water necessary to meet consumers' needs during periods of maximum usage (maximum hourly demand [MHD]), at a reasonable residual-pressure, usually not less than 40 PSI (preferably 50 PSI) and normally not greater than 125 PSI.

2. Supply the needed fire flow coincident with MHD and not drop the pressure below 20 PSI.

To evaluate the distribution system, a computer model of the entire distribution system was prepared. Nearly all 4-inch and larger pipelines were included in the model. The model contained 487 pipelines. Flow demands were assigned to approximately 394 nodes. The system was then input into a computer at PACE Engineering and analyzed using the MWH Soft Inc., $H_2O$ Net Version 8.0 software program. The model was created from existing City water system maps and the input reviewed by City staff. Once operational, the model was calibrated using the City's hydrant testing data for 2007, which is assumed to have been equivalent to maximum month demand (MMD). The City's water system database has summer static fire hydrant pressures for all hydrants in the distribution system. A10 PSI discrepancy was set as the maximum acceptable model difference between the model and measured residual pressures. The hydraulic model was calibrated based on this criterion. In order to correct pressure differences greater than 10 PSI, pressure reducing valve settings, pipe roughness coefficients, and pump set points were adjusted. After calibration, 95 percent of the model junctions were within 10 PSI of the actual measured pressures. Field tests were then performed on the system's fire hydrants under static conditions to further calibrate the model in areas where pressure discrepancies differed more than 10 PSI. In addition, fire flow tests were conducted to verify the models ability to accurately predict fire flows.

The existing system was evaluated under a flow condition based on 2009 consumption data to determine if there were any apparent weaknesses (low pressures). Analysis of output pressures, flows, and headloss in pipelines provided the information needed to identify system deficiencies. The distribution system model was analyzed under an Extended Period Simulation (EPS). The EPS model simulates system demands, reservoir level fluctuations, pump run times, and other time related changes that occur over a defined period. For the 2010 Master Plan, a 24-hour period on a maximum demand day was simulated. Adjustments were made to the estimated demands to obtain a model which would duplicate the actual system as closely as possible.

The 2010 computer model indicated low pressures (below 20 PSI) at the higher elevations adjacent to the Quail Hill Reservoirs in the system, which is to be expected. In addition, moderately low pressures

between 30 and 50 PSI are localized near the northwest end of the Main Pressure Zone in the Big Lakes Area during maximum hour demand (MHD) conditions.

For design evaluation purposes, fire flows used in the study were those recommended by the Uniform Fire Code. These flows were assumed to be coincident with a consumers' demand rate equivalent to the MHD. The 2009 hydraulic model was used to estimate available fire flows in various areas of the City distribution system. For single-family residential areas, a fire flow of 1,000 GPM is normally needed, and for high-density residential, commercial zones, and public schools a fire flow of up to 3,500 GPM or higher can be needed. The Uniform Fire Code requires that the fire flow be attained at any time; therefore, the system was evaluated under the worst conditions at maximum hour demand which appears to occur at about 6:00 a.m. on the maximum day demand. For the purposes of the analysis, a standard 1,000 GPM fire flow was required at all nodes, including those in the Big Lakes Area. The model indicated available flows in this area to be 450-550 GPM, much less than that required to meet fire flow requirements.

As further described in the 2010 MWP, the Big Lakes Area experiences low pressures during summer months. This is especially true when moderately large flows are experienced in the area. The model indicated that pressures may drop below the minimum CDPH requirement of 20 PSI during MHD if an additional demand of as little as 350 GPM is experienced in the area. As the City develops, flows down the North Mt. Shasta Boulevard Main and the surrounding supply lines will increase and pressures will degrade even further. Plate 2, taken from the MWP and attached hereto, indicates recommended improvements based on water system evaluation completed at that time. The fire flow improvements shown on Plate 2 focus on increasing pipe sizes in key locations currently restricting fire flows to critical locations. These improvements include the addition of an 8-inch main down North Mt. Shasta Boulevard in the Big Lakes area. This will improve pressures in the area under normal condition as well as increase fire flow to the hospital and Elementary school.

The secondary expected physical benefit of the City of Mt. Shasta Big Lakes Water Line Replacement Project is the water savings from replacing aged and leaking water mains. In June 2010, as part of the MWP water system evaluation, the City had Utility Services Associates (USA) conduct a water line leak location project. This study discovered 14 leaks in the system, ranging in severity from about 1 GPM to 20 GPM, two of which were on the Big Lakes Water Main. One such leak was located on the water main and was discovered to be leaking at a rate of 2 GPM, which translates to almost 3,000 gallons per day, over 80,000 gallons per month, and over 1 million gallons per year. The other leak was located on a service line and was reportedly leaking at 4 GPM. This is a substantial amount of water loss that equates to more than 161,000 gallons per month. As indicated in the USA Water Line Leak Location Project Final Report, due to the limited access on the Big Lakes water line there is a possibility that more leaks went undetected. Other leaks will occur, if they have not already, if the pipeline is not replaced. Applicable sections of the Final Report are attached hereto, and a complete copy is available for review.

Without this project, none of the above described benefits will be seen in the near future. No projects are currently planned if funding cannot be obtained, as the City is a DAC and cannot afford to pay with existing funds. In order to achieve these physical benefits, the replacement water main and appurtenances must be constructed and placed into service. No potentially adverse physical effects are expected to result from this project.

This project will address the statewide priority of long-term drought preparedness. Replacement of antiquated supply lines will reduce the number of leaks and unaccounted for water loss that occurs and therefore achieve a long-term reduction in water usage in a DAC which is especially important during a time of drought. This will increase available clean water for immediate and downstream uses, including improving water supply reliability to the Sacramento-San Joaquin Delta.

# Water Line Leak Location Project
# Final Report

## Mt. Shasta, CA Water Distribution System

**Prepared For:**

**Pace Engineering, Redding, CA**

**Prepared By:**

Utility Services Associates LLC

You Leak, We Seek™

**Project Dates:**

**05/03/10 through 05/06/10**

# PROJECT OBSERVATIONS
## (Water Distribution Lines)

**GENERAL**
On May 06, 2010 USA completed a 4-day leak detection survey on **various** sections of the water distribution system for the City of Mt. Shasta, CA. This project was completed under sub contract to Pace Engineering from Redding, CA. The notes below have been generated by our Field Technician and have been included as part of the Executive Summary.

**SPECIFICS**
The survey was broken down in two different phases:

1. *Survey Phase* – sounding of appurtenances and recording leak type noises that were detected.

2. *Pinpointing Phase* – pinpointing noises that were detected during the Survey Phase.

***1. Survey Phase Information***

The scope of the project was to test lines in various areas of the water system. The total amount selected amounted to approximately 14 miles. These locations were picked by Pace Engineering. After the first day of testing, we decided to switch to a night survey. This was due to the amount of noise detected during the day one survey. The system is un-metered and the weather was warm. This meant a lot of watering. Water use on a system that is un-metered can sound very much like a leak.

As mentioned, the original contract was for approximately 14 miles; however, we did about 15 miles. There were double mains on several roads that were not marked on the map. We also surveyed approximately 3.4 miles of "intersecting" lines which are lines that get tested because they cross lines that were checked as part of the scope of work.

With the exception of the Big Lakes water line, all areas surveyed had good contact. On the Big Lakes line, there was limited access. On this line, there is always a slight possibility that a quiet leak may have gone undetected. As a result of the survey, 47 leak type noises were detected.

***2. Pinpointing Phase Information***

As result of our survey, we were able to locate and pinpoint twelve (12) leaks. We have also listed one (1) location as "undefined" which is an area we suspect leakage but were not able to find. We have also listed two (2) suspected consumer side leaks. More information follows on specific leaks. For additional information and a drawing on each leak, please refer to the Leak Report section of this Final Report:

*Leak Report #4 – 312 Merritt Ave.*
We suspect this leak is at or near the service connection. However, we could not shut of the curb stop to ensure that the leak was not on the customer's side. We suggest that this location only be dug if the shut off can be closed and the leak confirmed to be on the "city side" of the shut off.

# PINPOINTING PHASE REVIEW
## (Water Distribution Lines)

All indications of leaks found during the survey were verified a second time, after which, the leaks were pinpointed with a computer based sound correlator when possible. Pinpointing leak locations through interpretation of sound intensity, either by ear, decibel metering or other like methods was not used when contact points were available for use with the correlator. However, ground listening devises were used as a quick double check on pinpointed leaks.

The equipment used did not normally require valves to be operated during surveying and pinpointing. However, on occasion, services or valves were operated to eliminate service draw noises or to change velocity noise.

The correlator equipment used had the capability to prompt the operator to input the variables when different pipe sizes and/or pipe material were encountered in the same span to be investigated. This is necessary to insure accuracy of results based on the automatic computation of the correct leak sound velocity in leak pinpointing operations. Our correlators have the capability of correlating up to seven various pipe sizes and types at one time in a given space. To insure effective performance in all field environments encountered in the distribution system (i.e. traffic noise, draw, pump operation, industrial noise, etc.), the correlator equipment provides 12 multi-range High and Low Pass filters.

We provided a copy of leak reports, when pinpointed, which included leak locations and estimated GPM loss.

**Leaks Pinpointed**

| Number | Leak Type | Location | GPM |
|---|---|---|---|
| 1 | Other | Adams Dr & Rockfellow Dr | 20.00 |
| 2 | Other | Pine St & W Lake St | 5.00 |
| 3 | Hydrant | E Lake St & Chestnut St | 1.00 |
| 4 | Service Connection | 312 Merritt Ave | 5.00 |
| 5 | Hydrant | Kennedy Dr & Terry Lynn Ave | 1.00 |
| 6 | Main | W Alma St & Forest Service | 10.00 |
| 7 | Main | W Jesse St & Cedar St | 10.00 |
| 8 | Main | 622 Mt Shasta | 5.00 |
| 9 | Main | Mt Oak Dr & | 5.00 |
| 10 | Service Line | Mill St & Water St | 20.00 |
| 11 | Main | Big Lake line | 2.00 |
| 12 | Service Line | Big Lake line | 4.00 |
| **Total** | | | **88.0** |

These leak reports, also included a leak repair priority classification. These classifications are as follows:

Class I Any leak which is hazardous in terms of potential undermining, possibly resulting in surface collapse, encroachment and/or damage to nearby utilities, commercial or private properties or leaks severe enough to warrant immediate repair.

Class II All leaks that display water losses significant enough to be monitored on a regular repair schedule.

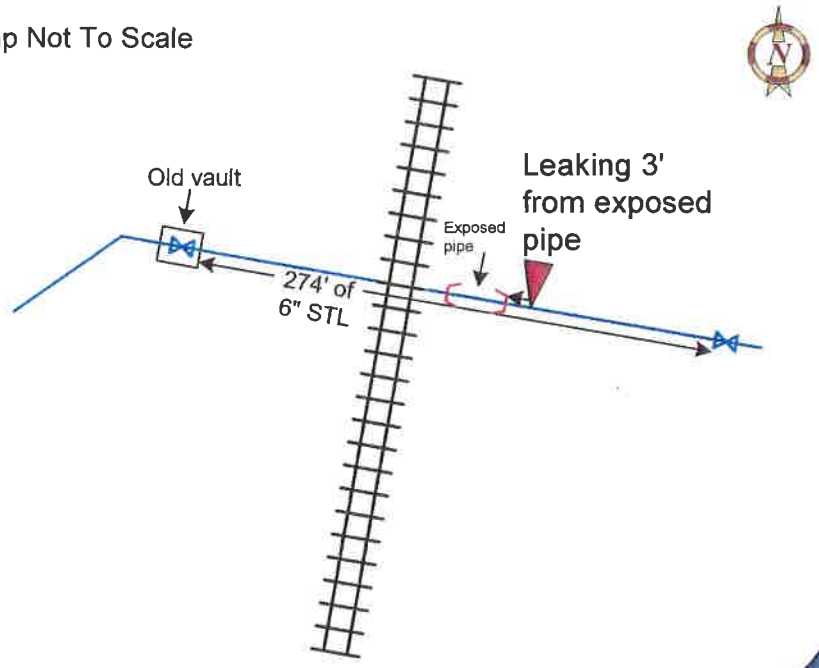
Class III Relatively small leaks that should be repaired as workload permits.

# Leak Report

**Utility Services Associates, LLC**

Location: Big Lake Line valve under tree & old vault by railroad tracks
Map #: _____ GPS: _____
Remarks: Leak 3' south of exposed line.
Leak Type: Main
Recommendations: Excavate & Repair

Map Not To Scale




Field Tech: RC
Leak No: 11
Leak Class: 2
Leak Rate: 2.0 GPM
Cover Type: Soil
Site Marked: Yes
Date: 05/06/10
Job No: 10090

*Space left blank for digital photo.*

Equipment used: LD-12 Portable Listening Device & LC-2500 Correlator

**Computer Correlation Results**

| Scan Time | Grade | Dist "Red" | Dist "Blue" |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Water Loss
*(this leak, in gallons)*

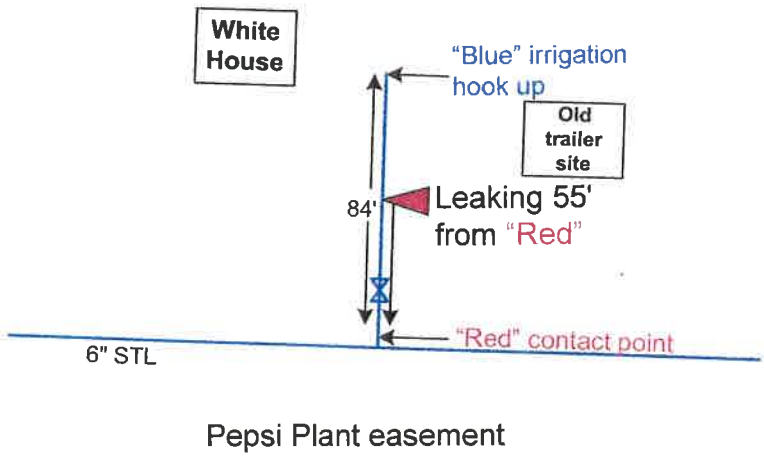
DAILY ..... 2,880
WEEKLY ..... 20,160
MONTHLY ..... 80,640

# Leak Report

**Utility Services Associates, LLC**

Location: Big Lake line – Old Trailer site
Map #: _____ GPS: _____
Remarks: Leak on service line at old repair.
Leak Type: Service Line
Recommendations: Excavate & Repair

Map Not To Scale




Field Tech: RC
Leak No: 12
Leak Class: 2
Leak Rate: 4.0 GPM
Cover Type: Soil
Site Marked: No
Date: 05/06/10
Job No: 10090

*Space left blank for digital photo.*

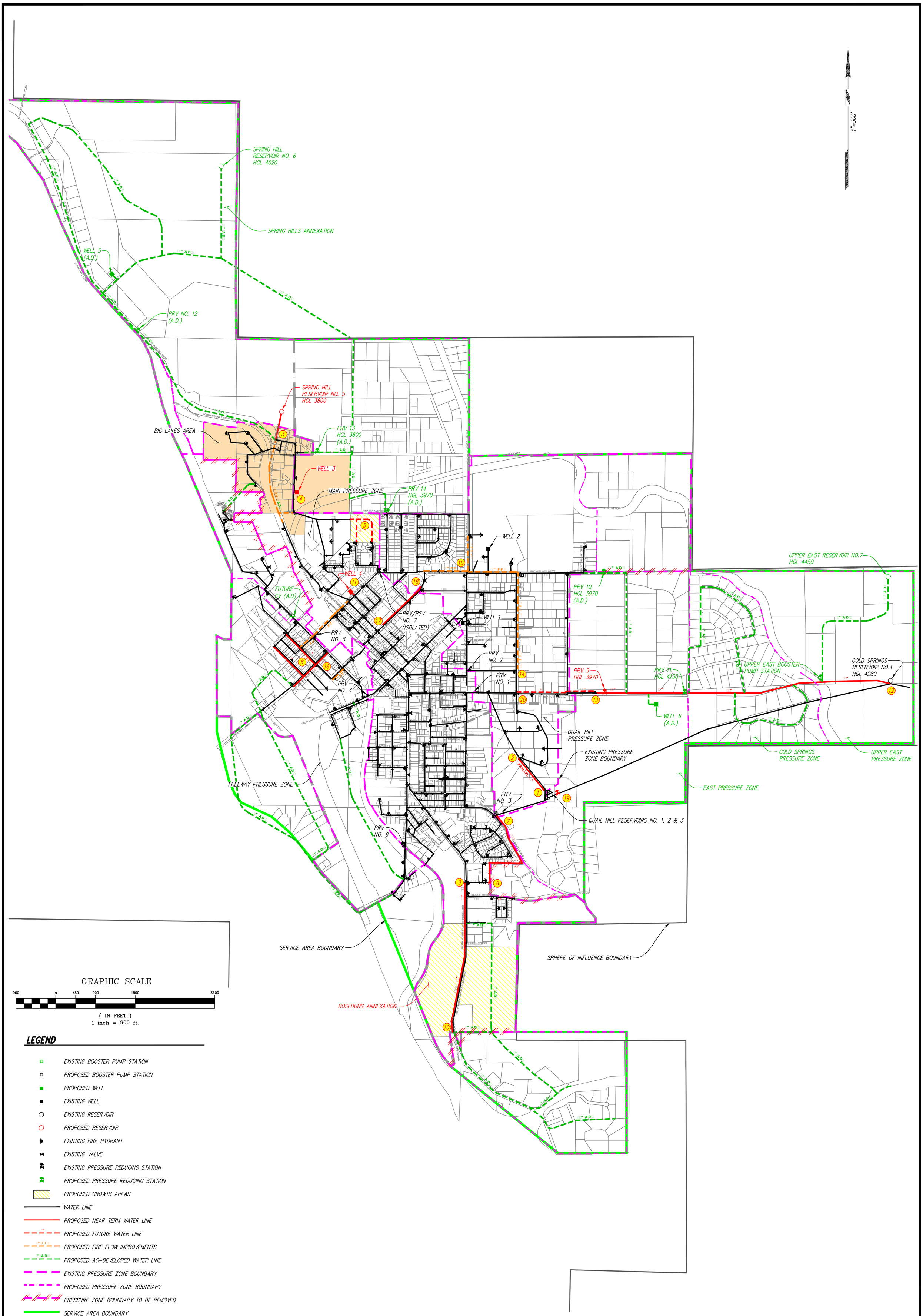
Equipment used: LD-12 Portable Listening Device & LC-2500 Correlator

**Computer Correlation Results**

| Scan Time | Grade | Dist "Red" | Dist "Blue" |
|---|---|---|---|
| 100 | A | 55' | 29' |
| | | | |
| | | | |
| | | | |
| | | | |

Water Loss
*(this leak, in gallons)*

DAILY ..... 5,760
WEEKLY ..... 40,320
MONTHLY ..... 161,280




| DATE | | | PLATE |
|---|---|---|---|
| 3/11 | PACE ENGINEERING REDDING, CALIFORNIA | CITY OF MT. SHASTA<br>2010 MASTER WATER PLAN<br>DISTRIBUTION SYSTEM IMPROVEMENTS | 2 |

Plot Date: May 10, 2011 - 9:09 am Login Name: spetrie
File Name: M:\Land Projects\0111134 MT. SHASTA MASTER WATER PLAN\DWG\PLATES.DWG, Layout: PLATE 2 (24X36)

**City of Dunsmuir South Dunsmuir Water Main Replacement Project**

The primary expected physical benefit of the City of Dunsmuir South Dunsmuir Water Main Replacement Project is the O&M savings from replacing aged and leaking water mains, primarily resulting in increased system pressures and fire flows. The City spends a considerable amount of time repairing leaks throughout the water system. Just during the week of June 8, 2015 the City repaired six leaks. According to City repair records, the City repaired 107 leaks in 2013 and 2014, and spent over 1,350 man-hours, or about 675 hours per year. Pursuant to records provided as part of a 2008 project funding application, the City spent over 1,200 hours repairing leaks between 2005 and 2008, or about 400 hours per year. Thus, in the last five years, the man-hour effort to repair leaks has increased by almost 70 percent and is expected rise until leaky pipelines are replaced. Labor cost alone – not accounting for materials, and equipment – is estimated to be in the $35,000 range. Overall costs are likely double or triple this amount. If the City can eliminate this expenditure, it can focus on making other needed improvements to the water system. Assuming the City could save about $50,000 per year in overtime, material, and equipment rental costs if leaky pipes are replaced, it could debt service a capital project in excess of $1,000,000, which would go a long way to replacing existing worn-out pipelines. City leak repair histories for 2013 and 2014 are included herein.

Problems with leaks and inadequate system pressures and fire flows due to the aged water mains in this area are also well documented as discussed in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report (PER), applicable portions of which are described below. Complete documents are available for review as needed.

As detailed in the PER, approximately 34,000 feet of 4-inch to 18-inch mains are 60- to 70-year old steel lines, which have a theoretical useful life of 55 to 75 years, depending upon the type of lining and coating provided. Although many of these steel lines are at, or beyond, their theoretical useful life, the need to replace them is dependent upon their actual condition, which is difficult to ascertain. One obvious indicator of their condition is the history of leak repairs on the various sections of pipeline. Many pipes had been identified by City staff as needing significant repair in the 2010 PER, including those in the Blackberry Hill Area. The Blackberry Hill area is currently served by a 4-inch water main, which significantly limits the hydraulic capacity for all services south of the Sacramento River and west of the Scherrer Avenue Bridge. During maximum demand periods, system pressure to a number of residents drops to below 20 PSI. The improvements to the Blackberry Hill area will bolster water pressures and fire flows to the area and meet CDPH and Uniform Fire Code Requirements.

The secondary expected physical benefit of the City of Dunsmuir South Dunsmuir Water Main Replacement Project is the water savings from replacing aged and leaking water mains. It is difficult to quantify the amount of water lost to leaks; however, as described above and shown on attached leak records, the City repaired 107 leaks in 2013 and 2014. Although the City cannot easily quantify each leak, they do indicate if it is a small or medium size leak, which is further shown in the number of man-hours it took to repair the leak in the comments section of the records. If it is assumed each leak was the equivalent of a 1/2-inch diameter hole with 100 PSI of pressure, the leakage rate would be about 45 GPM. If it was assumed the leak occurred for one week before it was noticed, which is likely a conservative estimate, the water loss would be about 450,000 gallons. If all 107 leaks had these characteristics, the total water loss would be about 48 million gallons. Given these approximations, if the proposed improvements eliminated the possibility of only two new leaks, a water savings of approximately 1,200 gallons per day would result. The actual leakage is probably much greater as many leaks go on for weeks before being noticed unless they are catastrophic leaks.

Without this project, none of the above described benefits will be seen in the near future. No projects are currently planned if funding cannot be obtained, as the City is a DAC and cannot afford to pay with existing funds. In order to achieve these physical benefits, the replacement water main and appurtenances must be constructed and placed into service. No potentially adverse physical effects are expected to result from this project.

This project will address the statewide priority of long-term drought preparedness. Replacement of antiquated supply lines will reduce the number of leaks and unaccounted for water loss that occurs and therefore achieve a long-term reduction in water usage in a DAC which is especially important during a time of drought. This will increase available clean water for immediate and downstream uses, including improving water supply reliability to the Sacramento-San Joaquin Delta.

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~

– 2013 –

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 1/7 | River | m. | | 872 3.0 851 2.0 (5) |
| 2/1 | Francis | ~~m~~ S | | 872 3.5 (3.5) |
| 2/4 | Francis | S | | 872 6.0 851 7.0 (13) |
| 3/1 | Shasta Ave | m. | | 872 7.0 871. 2.0 (10) |
| 3/5 | Shasta Ave | m | | 872 3.0 851 5.0 (8) |
| 3/6 | Shasta Ave | | | 872 6.0 851. 1.0 871 1.0 (8) |
| 3/7 | Butterfly. | m | | 872-7.0 851-9.0 (16) |
| 3/11 | Butterfly | m. | | 872 7.0 851 8.0 871 2.0 (17) |
| 3/12 | Butterfly | m | | 872 7/1 851 16 863 8/1 871 2 (25/2) |
| 3/13 | Butterfly | m | | 872.6.0 863.5.0 (11) |
| 3/14 | Willow | S | | 872.3.0 (3) |
| 4/15 | Willow | m | | 872.4/2 851 10/0 863 7/0 (23/2) |
| 4/16 | River (5408) | m | | 872.8.0 851 7.5 863 7.0 (22.5) |
| 4/20 | Wood St | m | | 872 5.0 851-7.0 863 5.0 (17) |
| 4/30 | Wood & Lisa | m | | 872 7.0 851.7.0 863. 6.0 (20) |
| 5/1 | River (5408) | m | | 872- 7.0 851 - 7.5 (14.5) |
| 5/6 | Tank New | m | | 872. 6.0 851.7.0 863 8.0 (21) |
| 5/7 | Tank New | m | | 872 7.0 851-7.0 863 7.0 (21) |
| 5/13 | Bransetter | S | | 872 4.0 (4) |
| 5/14 | Bransetter | m | | 872.5.0 851-7.0 863 8.0 (20) |
| 5/15 | 121 So First | S | | 872. 6.0 (6) |
| 5/16 | Pool / Frostey | S | | 872- 5.0 851-4.0 (9) |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2013

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 5/20 | Pool & Frosty | S | | 872-8.0 851 9.0 (17) |
| 5/22 | Marion | S | | 872-1.0 (1) |
| 5/23 | Shasta | S | | 872-4.0 (4) |
| 5/29 | Oak | m | | 872-8.0 851-7.5 (15.5) |
| 5/30 | Oak | m | | 851-4.0 (4) |
| 6/4 | Oak | m | | 872-5.0 851-5.0 863-4.0 (14) |
| 6/12 | Dows & Spring | m | | 872 8.0 851-8.5 (16.5) |
| 6/13 | Dows & Spring | m | | 872-1.0 (1.0) |
| 6/20 | Wood | m | | 872 3.0 851-5.0 863.60 (14) |
| 7/15 | Pine | m | | 872-6.0 863.6.0 (12) |
| 8/6 | Oak | m | | 872-7.0/1.5 851 9/0 863 7/1.5 (23/3.0) |
| 8/10 | Pine Castle | m | | 872 0/10 863 9/10 871 0/10 (0/30) |
| 8/11 | Pine & Castle | m | | 872 5.0 851 5.0 863 7.0 (17) |
| 8/13 | Marion & Shasta Retreat | m | | 872-6.0 851-9.0 (15) |
| 8/20 | Pine | m | | 872-7.0 851-8.0 (15) |
| 8/21 | Pine | m | | 872-4.0 (4) |
| 8/26 | River | m | | 872 3.0/1.5 851 4/0 (7/1.5) |
| 8/29 | River | m | | 872 4.0 851 8.0 (12) |
| 9/9 | Hill Oak | S | | 872-2.0 851 2.0 (4) |
| 9/11 | Castle | m | | 872-3.0 851 5.0 (8) |
| 9/17 | Sonic | m | | 872-2.0 851-8.0 863.7.0 (17) |
| 9/20 | McCloud R.A. Martin | S | | 872 3.0 (3.0) |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2013

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 9/23 | BUCKBOARD RA MARTIN | S | 872.3.0 | 851-2.0 (5.0) |
| 9/24 | BUCKBOARD RA MARTIN | S | 872-1.0 | (1.0) |
| 10/4 | 6344 DUNSMUIR | m. | 872.8/4 | 851 7.5 871. 1/5 (16.5/9) |
| 10/22 | 6125 ROSE | S | 872.5.0 | 851-1.0 (6) |
| 11/12 | CANC | m | 872. 1.0 | 851.3.0 863.4.0 (8) |
| NODEC LEAKS | | | | |

Dennis

~~4780 REG MAIN~~

MAIN REPAIR HOURS.

478 REG TIME

38.5 OVERTIME

516 HRS.

SERVICE REPAIR HOURS.

73 REG TIME

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2017~~

2014 -

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 1/6 | CASTLE | m | | 872 5.0 851 8.5 863 7.0 871 2.0 | 22.5 |
| 1/7 | CASTLE | m | | 872 6.0 851 2.0 | 8 |
| 2/7 | ISCRIGG | S | | 872 5.0 | 5 |
| 2/10 | DUNS AVE (OHILL) | S | | 872 7/1 851 9/0 863 8/0 | 24/1 |
| 2/26 | VISTA | m | | 872 7/2 851 10/0 | 17/1 |
| 2/27 | VISTA | m | | 872 1/0 | 1 |
| 3/4 | 109 SC FIRST | S | | 872 6/0 851 8/0 863 7/0 | 21/0 |
| 3/5 | VISTA | m | | 872 7/0 851 4/0 | 11/0 |
| 3/6 | CASTLE & VISTA | m | | 872 3/0 | 3/0 |
| 3/14 | SHASTA RETREAT | m | | 872 3/0 | 3/0 |
| 3/20 | 6344 DUNS AVE | m | | 872 7/1 851 9/0 863 4/2 871 6/3 | 22/6 |
| 3/26 | DUNS AVE PIZZA FACTORY | S | | 872 5/0 851 6/0 | 11/0 |
| 3/27 | DUNS AVE " " | S | | 872 2/0 851 2/0 | 4/0 |
| 4/9 | FRANCIS | S | | 872 3/0 851 7/0 | 10/0 |
| 4/12 | BUSH | m | | 872 6/3.5 851 6/3.5 863 6/3.5 | 18/10.5 |
| 4/14 | VISTA | m | | 872 4/2.5 851 6/0 863 7/1.5 | 17/4 |
| 4/15 | BUSH | m | | 872 1/0 863 4/0 | 5/0 |
| 4/17 | HIGH SCHOOL (WILLOW) | m | | 872 6/0 851 6/0 | 12/0 |
| 4/22 | FRANCIS | m | | 872 9/2.5 851 2/0 871 6/3 | 21/5.5 |
| 4/28 | 5711 SAC | S | | 872 4/0 851 8/0 | 12/0 |
| 4/29 | CASTLE & DUNS (PACIFIC) | m | | 872 3/0 851 9/0 863 8/0 | 20/0 |
| 5/5 | VISTA | m | | 872 2/0 851 6/0 863 8/0 | 16/0 |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2014

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 6/32 | OAK | m | | 851 9/0 863 8/0 871 9/3 | 17/3 |
| 6/3 | OAK | m | | 872 8/0 851 8/0 863 8/0 | 24/0 |
| 6/9 | GOOD SAC | S | | 872 3/3 851 6/3 | 9/6 |
| 6/30 | RITA & SHASTA | S | | 872 7/0 851 8/0 | 15/0 |
| 7/1 | SHASTA & PINE | m | | 872 6/0 851 8/0 863 8/0 871 9/3 | 22/3 |
| 7/11 | ROSE | S | | 872 2/0 | 2/0 |
| 7/12 | ROSE | S | | 872 0/3 | 0/3 |
| 7/13 | SISKIYOU & RIVER (DOUBLE) | m | | 872 0/6 851 0/6 863 0/6 871 0/6 | 0/24 |
| 7/14 | SAC & BUTTERFLY | m | | ~~872 0/0~~ | |
| 7/14 | SISKIYOU & RIVER (DOUBLE) | m | | 851 7/0 863 8/0 | 15/0 |
| 7/15 | SAC & BUTTERFLY | m | | 872 6/0 851 9/0 863 8/0 | 19/0 |
| 7/28 | SAC & BUTTERFLY | m | | 872 8/0 851 9/0 863 8/0 | 25/0 |
| 7/29 | SIMPSON | m | | 851 9/0 863 8/1 872 4/0 | 21/0 |
| 8/4 | DUNS AVE | S | | 851 5/0 863 5/0 | 10/0 |
| 8/11 | WOOD | m | | 872 5/0 863 5/0 | 10/0 |
| 8/15 | SIMPSON | S | | 872 0/3 | 0/3 |
| 8/19 | VISTA | m | | 872 2/0 851 5/0 863 8/0 | 15/0 |
| 8/23 | BUTTERFLY | m | | 872 0/8.5 851 0/5.5 863 0/5 | 0/19 |
| 8/31 | MICAN | S | | 872 0/3 | 0/3 |
| 9/2 | TIMBER | S | | 851 8/0 863 8/0 | 16/0 |
| 9/3 | CHUC | S | | 872 6/0 851 8/0 | 14/0 |
| 9/10 | MICAN | S | | 872 3/0 851 2/0 | 5/0 |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2017~~ 2014

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 9/16 | SHASTA. | m | | 872 4/5.5 851 10/2 843 8/5.5 871 1/3 | 24/16 |
| 9/17 | SHASTA | m | | 872 7/0 851 7/0 | 9/0 |
| 10/2 | FRANCIS | m | | 872 7/0 851 2/0 | 4/0 |
| 10/7 | SHASTA RETREAT. | m | | 872 7/0 851 7/0 | 14/0 |
| 10/14 | RITA | S | | 872 6/0 851 7/0 843 8/0 | 21/0 |
| 10/16 | SAC | m | | 872 7/2 851 9/0 | 14/2 |
| 10/20 | SAC | m | | 872 7/0 851 8/0 | 15/0 |
| 10/21 | SAC 6007 | S | | 872 7/0 851 8/0 | 15/0 |
| 10/27 | SAC 6007 | S | | 872 4/0 851 4/0 | 10/0 |
| 10/28 | SHASTA | S | | 872 4/0 851 6/0 843 8/0 | 18/2 |
| 10/29 | SAC | S | | 872 7/0 851 1/0 | 3/0 |
| 11/3 | SO FIRST | S | | 851 3/0 843 6/0 | 9/0 |
| 11/4 | SO FIRST | S | | 851 4/0 843 4/0 | 8/0 |
| 11/18 | 5423 DUNS | S | | 872 3/0 851 3/0 871 4/3 | 4/3 |
| 12/10 | NO DEC. | | | | |

| MAINS REPAIR | SERVICE REPAIR |
|---|---|
| 403.5 REG TIME | 248. REG TIME |
| 92.5 OVER TIME | 18. OVER TIME |

**City of Dunsmuir North Dunsmuir Water Main Replacement Project**

The primary expected physical benefit of the City of Dunsmuir North Dunsmuir Water Main Replacement Project is the O&M savings from replacing aged and leaking water mains, primarily resulting in increased system pressures and fire flows. The City spends a considerable amount of time repairing leaks throughout the water system. Just during the week of June 8, 2015 the City repaired six leaks. According to City repair records, the City repaired 107 leaks in 2013 and 2014, and spent over 1,350 man-hours, or about 675 hours per year. Pursuant to records provided as part of a 2008 project funding application, the City spent over 1,200 hours repairing leaks between 2005 and 2008, or about 400 hours per year. Thus, in the last five years, the man-hour effort to repair leaks has increased by almost 70 percent and is expected to rise until leaky pipelines are replaced. Labor cost alone – not accounting for materials, and equipment – is estimated to be in the $35,000 range. Overall costs are likely double or triple this amount. If the City can eliminate this expenditure, it can focus on making other needed improvements to the water system. Assuming the City could save about $50,000 per year in overtime, material, and equipment rental costs if leaky pipes are replaced, it could debt service a capital project in excess of $1,000,000, which would go a long way to replacing existing worn-out pipelines. City leak repair histories for 2013 and 2014 are included herein.

Problems with leaks and inadequate system pressures and fire flows due to the aged water mains in this area are also well documented as discussed in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report (PER), applicable portions of which are described below. Complete documents are available for review as needed.

As detailed in the PER, approximately 34,000 feet of 4-inch to 18-inch mains are 60- to 70-year old steel lines, which have a theoretical useful life of 55 to 75 years, depending upon the type of lining and coating provided. Although many of these steel lines are at, or beyond, their theoretical useful life, the need to replace them is dependent upon their actual condition, which is difficult to ascertain. One obvious indicator of their condition is the history of leak repairs on the various sections of pipeline. Many pipes had been identified by City staff as needing significant repair in the 2010 PER, including those on Dunsmuir and Prospect Avenues. The Dunsmuir Avenue water main is primarily located on private property and traverses under existing large trees, landscaping, and structures rendering access for repairs difficult. The deteriorating pipeline and poor access increase the health and safety risks to the City. Proposed improvements to these areas will bolster water pressures and fire flows to the area and meet CDPH and Uniform Fire Code Requirements.

The secondary expected physical benefit of the City of Dunsmuir North Dunsmuir Water Main Replacement Project is the water savings from replacing aged and leaking water mains. It is difficult to quantify the amount of water lost to leaks; however, as described above and shown on attached leak records, the City repaired 107 leaks in 2013 and 2014. Although the City cannot easily quantify each leak, they do indicate if it is a small or medium size leak, which is further shown in the number of man-hours it took to repair the leak in the comments section of the records. If it is assumed each leak was the equivalent of a 1/2-inch diameter hole with 100 PSI of pressure, the leakage rate would be about 45 GPM. If it was assumed the leak occurred for one week before it was noticed, which is likely a conservative estimate, the water loss would be about 450,000 gallons. If all 107 leaks had these characteristics, the total water loss would be about 48 million gallons. Given these approximations, if the proposed improvements eliminated the possibility of only two new leaks, a water savings of approximately 1,200 gallons per day would result. The actual leakage is probably much greater as many leaks go on for weeks before being noticed unless they are catastrophic leaks.

Without this project, none of the above described benefits will be seen in the near future. No projects are currently planned if funding cannot be obtained, as the City is a DAC and cannot afford to pay with existing funds. In order to achieve these physical benefits, the replacement water main and appurtenances must be constructed and placed into service. No potentially adverse physical effects are expected to result from this project.

This project will address the statewide priority of long-term drought preparedness. Replacement of antiquated supply lines will reduce the number of leaks and unaccounted for water loss that occurs and therefore achieve a long-term reduction in water usage in a DAC which is especially important during a time of drought. This will increase available clean water for immediate and downstream uses, including improving water supply reliability to the Sacramento-San Joaquin Delta.

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~

– 2013 –

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 1/7 | River | m. | | 872 3.0 851 2.0 (5) |
| 2/1 | Francis | ~~m~~ S | | 872 3.5 (3.5) |
| 2/4 | Francis | S | | 872 6.0 851 7.0 (13) |
| 3/1 | Shasta Ave | m. | | 872 7.0 871. 2.0 (10) |
| 3/5 | Shasta Ave | m | | 872 3.0 851 5.0 (8) |
| 3/6 | Shasta Ave | | | 872 6.0 851. 1.0 871 1.0 (8) |
| 3/7 | Butterfly. | m | | 872-7.0 851-9.0 (16) |
| 3/11 | Butterfly | m. | | 872 7.0 851 8.0 871 2.0 (17) |
| 3/12 | Butterfly | m | | 872 7/1 851 16 863 8/1 871 2 (25/2) |
| 3/13 | Butterfly | m | | 872.6.0 863.5.0 (11) |
| 3/14 | Willow | S | | 872.3.0 (3) |
| 4/15 | Willow | m | | 872.4/2 851 10/0 863 7/0 (23/2) |
| 4/16 | River (5408) | m | | 872.8.0 851 7.5 863 7.0 (22.5) |
| 4/20 | Wood St | m | | 872 5.0 851-7.0 863 5.0 (17) |
| 4/30 | Wood & Lisa | m | | 872 7.0 851.7.0 863. 6.0 (20) |
| 5/1 | River (5408) | m | | 872- 7.0 851 - 7.5 (14.5) |
| 5/6 | Tank New | m | | 872. 6.0 851.7.0 863 8.0 (21) |
| 5/7 | Tank New | m | | 872 7.0 851-7.0 863 7.0 (21) |
| 5/13 | Bransetter | S | | 872 4.0 (4) |
| 5/14 | Bransetter | m | | 872.5.0 851-7.0 863 8.0 (20) |
| 5/15 | 121 So First | S | | 872. 6.0 (6) |
| 5/16 | Pool / Frostey | S | | 872- 5.0 851-4.0 (9) |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2013

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 5/20 | Pool & Frosty | S | | 872-8.0 851 9.0 (17) |
| 5/22 | Marion | S | | 872-1.0 (1) |
| 5/23 | Shasta | S | | 872-4.0 (4) |
| 5/29 | Oak | m | | 872-8.0 851-7.5 (15.5) |
| 5/30 | Oak | m | | 851-4.0 (4) |
| 6/4 | Oak | m | | 872-5.0 851-5.0 863-4.0 (14) |
| 6/12 | Dows & Spring | m | | 872 8.0 851-8.5 (16.5) |
| 6/13 | Dows & Spring | m | | 872-1.0 (1.0) |
| 6/20 | Wood | m | | 872 3.0 851-5.0 863.60 (14) |
| 7/15 | Pine | m | | 872-6.0 863.6.0 (12) |
| 8/6 | Oak | m | | 872-7.0/1.5 851 9/0 863 7/1.5 (23/3.0) |
| 8/10 | Pine Castle | m | | 872 0/10 863 9/10 871 0/10 (0/30) |
| 8/11 | Pine & Castle | m | | 872 5.0 851 5.0 863 7.0 (17) |
| 8/13 | Marion & Shasta Retreat | m | | 872-6.0 851-9.0 (15) |
| 8/20 | Pine | m | | 872-7.0 851-8.0 (15) |
| 8/21 | Pine | m | | 872-4.0 (4) |
| 8/26 | River | m | | 872 3.0/1.5 851 4/0 (7/1.5) |
| 8/29 | River | m | | 872 4.0 851 8.0 (12) |
| 9/9 | Hill Oak | S | | 872-2.0 851 2.0 (4) |
| 9/11 | Castle | m | | 872-3.0 851 5.0 (8) |
| 9/17 | Sonic | m | | 872-2.0 851-8.0 863.7.0 (17) |
| 9/20 | McCloud R.A. Martin | S | | 872 3.0 (3.0) |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2013

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS |
|---|---|---|---|---|
| 9/23 | BUCKBOARD RA MARTIN | S | 872.3.0 | 851-2.0 (5.0) |
| 9/24 | BUCKBOARD RA MARTIN | S | 872-1.0 | (1.0) |
| 10/4 | 6344 DUNSMUIR | m. | 872.8/4 | 851 7.5 871. 1/5 (16.5/9) |
| 10/22 | 6125 ROSE | S | 872.5.0 | 851-1.0 (6) |
| 11/12 | CANC | m | 872. 1.0 | 851.3.0 863.4.0 (8) |
| NODEC LEAKS | | | | |

Dennis

~~4780 REG MAIN~~

MAIN REPAIR HOURS.

478 REG TIME

38.5 OVERTIME

516 HRS.

SERVICE REPAIR HOURS.

73 REG TIME

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2017~~

2014 -

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 1/6 | CASTLE | m | | 872 5.0 851 8.5 863 7.0 871 2.0 | 22.5 |
| 1/7 | CASTLE | m | | 872 6.0 851 2.0 | 8 |
| 2/7 | ISCRIGG | S | | 872 5.0 | 5 |
| 2/10 | DUNS AVE (OHILL) | S | | 872 7/1 851 9/0 863 8/0 | 24/1 |
| 2/26 | VISTA | m | | 872 7/2 851 10/0 | 17/1 |
| 2/27 | VISTA | m | | 872 1/0 | 1 |
| 3/4 | 109 SC FIRST | S | | 872 6/0 851 8/0 863 7/0 | 21/0 |
| 3/5 | VISTA | m | | 872 7/0 851 4/0 | 11/0 |
| 3/6 | CASTLE & VISTA | m | | 872 3/0 | 3/0 |
| 3/14 | SHASTA RETREAT | m | | 872 3/0 | 3/0 |
| 3/20 | 6344 DUNS AVE | m | | 872 7/1 851 9/0 863 4/2 871 6/3 | 22/6 |
| 3/26 | DUNS AVE PIZZA FACTORY | S | | 872 5/0 851 6/0 | 11/0 |
| 3/27 | DUNS AVE " " | S | | 872 2/0 851 2/0 | 4/0 |
| 4/9 | FRANCIS | S | | 872 3/0 851 7/0 | 10/0 |
| 4/12 | BUSH | m | | 872 6/3.5 851 6/3.5 863 6/3.5 | 18/10.5 |
| 4/14 | VISTA | m | | 872 4/2.5 851 6/0 863 7/1.5 | 17/4 |
| 4/15 | BUSH | m | | 872 1/0 863 4/0 | 5/0 |
| 4/17 | HIGH SCHOOL (WILLOW) | m | | 872 6/0 851 6/0 | 12/0 |
| 4/22 | FRANCIS | m | | 872 9/2.5 851 2/0 871 6/3 | 21/5.5 |
| 4/28 | 5711 SAC | S | | 872 4/0 851 8/0 | 12/0 |
| 4/29 | CASTLE & DUNS (PACIFIC) | m | | 872 3/0 851 9/0 863 8/0 | 20/0 |
| 5/5 | VISTA | m | | 872 2/0 851 6/0 863 8/0 | 16/0 |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2011~~ 2014

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 6/32 | OAK | m | | 851 9/0 863 8/0 871 9/3 | 17/3 |
| 6/3 | OAK | m | | 872 8/0 851 8/0 863 8/0 | 24/0 |
| 6/9 | GOOD SAC | S | | 872 3/3 851 6/3 | 9/6 |
| 6/30 | RITA & SHASTA | S | | 872 7/0 851 8/0 | 15/0 |
| 7/1 | SHASTA & PINE | m | | 872 6/0 851 8/0 863 8/0 871 9/3 | 22/3 |
| 7/11 | ROSE | S | | 872 2/0 | 2/0 |
| 7/12 | ROSE | S | | 872 0/3 | 0/3 |
| 7/13 | SISKIYOU & RIVER (DOUBLE) | m | | 872 0/6 851 0/6 863 0/6 871 0/6 | 0/24 |
| 7/14 | SAC & BUTTERFLY | m | | ~~872 0/0~~ | |
| 7/14 | SISKIYOU & RIVER (DOUBLE) | m | | 851 7/0 863 8/0 | 15/0 |
| 7/15 | SAC & BUTTERFLY | m | | 872 6/0 851 9/0 863 8/0 | 19/0 |
| 7/28 | SAC & BUTTERFLY | m | | 872 8/0 851 9/0 863 8/0 | 25/0 |
| 7/29 | SIMPSON | m | | 851 9/0 863 8/1 872 4/0 | 21/0 |
| 8/4 | DUNS AVE | S | | 851 5/0 863 5/0 | 10/0 |
| 8/11 | WOOD | m | | 872 5/0 863 5/0 | 10/0 |
| 8/15 | SIMPSON | S | | 872 0/3 | 0/3 |
| 8/19 | VISTA | m | | 872 2/0 851 5/0 863 8/0 | 15/0 |
| 8/23 | BUTTERFLY | m | | 872 0/8.5 851 0/5.5 863 0/5 | 0/19 |
| 8/31 | MICAN | S | | 872 0/3 | 0/3 |
| 9/2 | TIMBER | S | | 851 8/0 863 8/0 | 16/0 |
| 9/3 | CHUC | S | | 872 6/0 851 8/0 | 14/0 |
| 9/10 | MICAN | S | | 872 3/0 851 2/0 | 5/0 |

CITY OF DUNSMUIR

WATER SYSTEM LEAKS ~~2017~~ 2014

| DATE | LOCATION | TYPE | DATE REPAIRED | COMMENTS | |
|---|---|---|---|---|---|
| 9/16 | SHASTA. | m | | 872 4/5.5 851 10/2 843 8/5.5 871 1/3 | 24/16 |
| 9/17 | SHASTA | m | | 872 7/0 851 7/0 | 9/0 |
| 10/2 | FRANCIS | m | | 872 7/0 851 2/0 | 4/0 |
| 10/7 | SHASTA RETREAT. | m | | 872 7/0 851 7/0 | 14/0 |
| 10/14 | RITA | S | | 872 6/0 851 7/0 843 8/0 | 21/0 |
| 10/16 | SAC | m | | 872 7/2 851 9/0 | 14/2 |
| 10/20 | SAC | m | | 872 7/0 851 8/0 | 15/0 |
| 10/21 | SAC 6007 | S | | 872 7/0 851 8/0 | 15/0 |
| 10/27 | SAC 6007 | S | | 872 4/0 851 4/0 | 10/0 |
| 10/28 | SHASTA | S | | 872 4/0 851 6/0 843 8/0 | 18/2 |
| 10/29 | SAC | S | | 872 7/0 851 1/0 | 3/0 |
| 11/3 | SO FIRST | S | | 851 3/0 843 6/0 | 9/0 |
| 11/4 | SO FIRST | S | | 851 4/0 843 4/0 | 8/0 |
| 11/18 | 5423 DUNS | S | | 872 3/0 851 3/0 871 4/3 | 4/3 |
| 12/10 | NO DEC. | | | | |

| MAINS REPAIR | SERVICE REPAIR |
|---|---|
| 403.5 REG TIME | 248. REG TIME |
| 92.5 OVER TIME | 18. OVER TIME |

**Trout Unlimited Groundwater Evaluation and Habitat Restoration Planning Project**

The USR region contains the headwaters of the Sacramento and McCloud Rivers, both of which supply Lake Shasta. Climatologists predict warmer winters in the USR Region, and recent drought conditions and subsequent low water levels in Lake Shasta have provided an example of potential future consequences of climate change. Interestingly, some climate models have predicted greater precipitation in the immediate area of Mt. Shasta; however, that precipitation may fall more as rain than snow, and may arrive in shorter, more intense storms. The variability and uncertainty of future conditions strongly suggest that ecosystem function restoration is vital to the natural capture and storage of precipitation, and water quality will be improved as it moves slower, through a more natural ecosystem.

A number of projects are pending in the disadvantaged communities that comprise the USR Region. These include restoration of beaver populations to restore wet meadow function, flood control to enhance groundwater recharge and public safety, and abandonment of surface water extractions to restore stream function. Each of those projects, during their design and implementation phases, will need basic groundwater elevation data to evaluate the efficacy of the projects.

A consequential function of the USR Region is the recharge for California's surface water supplies. As a recharge area located in fractured and chaotic volcanic soils, little is understood of the region's groundwater resources even as development pressures, with associated increases in water use, increase. As stated elsewhere in this proposal package, the USR Region has no organized system of groundwater elevation monitoring and not a single CASGEM monitoring well. The USR lies primarily within southern Siskiyou County and its groundwater basins are considered low priority; paradoxically, the surface and groundwater that drains from the USR fills Lake Shasta, considered by many to be the highest priority reservoir in the State.

Our proposal establishes the baseline necessary for management and evaluation of pending regional projects, provides raw data necessary for input into climate change evaluation, and will support the development and implementation of groundwater management plans going forward. The project will employ local participants to provide income to disadvantaged community members, while coordinating the work with Mr. Bill Ehorn of the DWR Red Bluff office to ensure the integrity of the data. We respectfully request that DWR embrace full funding for this project.

Data collected during this planning phase of various IRWM projects will be used as a baseline in proposed restoration projects and uploaded to the CASGEM database. The publicly available data will be available for use by scientists and engineers in the evaluation of species reintroduction, habitat restoration, climate change effects, and groundwater management.

**Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase 1) Project**
The primary physical benefit claimed for the Mt. Shasta Headwaters Forest Conservation Easement Project is that of the permanent conservation and enhancement of watershed and habitat values over 12,805 acres; the secondary physical benefit is the permanent protection of an estimated 127 species, including 10 special status species (including northern spotted owl, northern goshawk, Pacific fisher, American pine marten and willow flycatcher), supported by the property's ten habitat types. While there are other significant benefits that will accrue from this multi-faceted project, including an estimated 1.8 million in tons of greenhouse gas emissions reduced over 50 years, this analysis is focused on the primary and secondary claims. Both claims are centered on the goal of conserving and enhancing ecological health and functionality of the USR watershed through a public-private partnership to expand environmental stewardship.

Project need: As identified in the state Water Action Plan, *Safeguarding California* (the state's climate adaptation strategy), the state Water Plan, the state Wildlife Action Plan, CDFW Essential Habitat Connectivity Project and CDFW *Mt. Shasta Headwaters Forest Conceptual Area Protection Plan* (Mt. Shasta Headwaters CAPP), and, indeed the USR IRWMP, loss of ecosystem function is a critical challenge facing the source watersheds of California. Ecosystem function at the landscape scale is undermined by encroaching development, loss and fragmentation of habitats, loss of connectivity across ownerships, loss of critical habitat elements within habitat types (such as large trees with distinctive habitat features). Rare and threatened habitat types in the headwaters region include old growth forests, early seral woodlands, wet meadows, springs and seeps. Many of the same forces detrimentally alter hydrologic function, as development or management create more impermeable surfaces, reduce vegetative cover, alter and concentrate drainage, increase erosion and sedimentation, and divert flows to other uses.

The state's headwaters forests are generally owned in a mix of public and private lands, with the Upper Sacramento IRWM region being about 50-50 in proportionate public-private ownership. Half of privately owned forests in the region are in larger (>2500 acre) ownerships typically used for commercial production of wood products. As is true statewide, private forests are being broken up into smaller parcels and converted to more developed uses, most especially in or near high amenity value public lands and in the Wildland-Urban Interface (WUI). This creeping pattern of loss and degradation across the forested upper watersheds undermines state water security.

The project is located within and adjacent to the town of McCloud, with approximately 11,000 acres within the McCloud River (Squaw Valley Creek) watershed and 1,800 acres within the Upper Sacramento (Soda Creek) watershed. Consisting of 20 square miles, the property comprises 5% of the privately owned portion of the McCloud basin, which is identified by the RWQCB as one of the most pristine in the state. The property forms a unique north-south bridge between two widely separated blocks of the Shasta-Trinity National Forest, creating essential habitat connectivity between two Late Successional Reserves. Its conservation would significantly expand an existing network of 17,500 acres of conserved private forests within the McCloud watershed, enhancing ecological functionality across the public-private landscape.

The property has significant water resources: 35+ miles of watercourses (including 24 miles of fish-bearing streams) and 78 springs will be permanently protected, including the source of Pig Creek and headwaters of Dairy Creek, both major tributaries to Squaw Valley Creek and the McCloud River; and the source of Trail Creek, a headwaters tributary to Soda Creek and the Upper Sacramento River. Associated with these water sources are 235 acres of wet meadows and riparian hardwood habitats. The conservation of these resources provides direct water-related benefits to the USR region, which is a DAC.

Comparison of with and without project conditions: The project site is about a 15 minute drive from Interstate-5 and is readily visible from and accessible by public roads, including State Highway 89, the Volcanic Legacy Scenic Byway. While zoned for timber production, the property consists of 80 legal parcels. It is immediately adjacent to a similar 1,400-acre property that was taken out of timber production zoning and rezoned for 5- and 40-acre parcels, neighboring the municipal golf course. The

current owner is a pension fund which has Hancock Timber Resource Group managing the property on its behalf, with a fiduciary obligation to generate income for retirees, including from disposition to other timber operators or for development. Absent the project, due to landowner objectives to maximize current income, it is likely the property will be managed more intensively for timber production than it is currently; and/or broken up into smaller parcels for development into rural residential uses, as has occurred on the surrounding former timberland. This would negatively and permanently impact habitat and species benefits, and overall ecological functioning of the watershed, as described above.

Alternatively, the project will not only keep the forest as forest and prevent its sub-division into 80 parcels with associated development; it will both conserve and enhance its watershed and habitat values, benefiting species and basin management. Forest practices will be permanently restricted under the terms of the conservation easement as described in detail below. The goal is to maintain native vegetative cover and qualities, with diverse habitat structures and values. In addition to the direct habitat and species benefits, the conservation easement's terms will help maintain watershed function through reducing fragmentation and road impacts; increasing numbers of large trees whose atmospheric interactions can increase precipitation; restoring more open, complex canopy structures to provide shade and slow snow melt and better maintain soil moisture; expanding canopy cover in riparian areas for cooler water; protecting cold water sources from development and diversion; and enhance wet meadows for upland water storage and summer release.

Actions needed to obtain the physical benefits: To achieve the physical benefits of protecting watershed values, habitats, and the species dependent on them, the landowner has agreed to grant a conservation easement to the Pacific Forest Trust with terms that will ensure the following permanent limits on land use and forestry, which are more restrictive than under state or county regulation:

- No **subdivision** other than potentially splitting property into 2 parcels no smaller than 5,000 acres.
- No **residential or agricultural development** or uses, although limited grazing is permitted as a vegetation management tool consistent with the other easement terms; and temporary housing for seasonal workers is permitted with limits.
- No **industrial uses or structures** are permitted, with the exception of portable forest products processing equipment with limits on location and clearing.
- Permitted **commercial uses** are forest management, non-motorized recreation, outdoor education or other compatible uses. The cumulative extent of any commercial or non-residential structures or improvements, including communications towers or powerlines, is limited to 40 acres. Power generating facilities are not permitted.
- **Public recreation:** Non-motorized, non-consumptive public recreation will be allowed across the whole of the property. Grantor retains the right to restrict access during timber harvest, periods of fire or weather danger, and hunting season.
- **Road construction** will be limited on steep or unstable slopes and in Special Habitat Management Zones, and generally conducted pursuant to a road management plan encompassing DFW approved Best Management Practices, reducing sedimentation and potential mass wasting.
- **Special Habitat Management Zones (SHMZs)**: In addition to Riparian Management Zones (described below), approximately 8% of the property, or 1,066 acres, will be managed exclusively as for conservation and restoration of sensitive and/or rare habitat types, such as the wet meadows, aspen groves, oak stands, and mature forest (with late seral or "old growth" characteristics). Habitat enhancement plans for each SHMZ will be developed in consultation with CDFW.
- **Riparian Management Zones (RMZs):** About 766 acres, or an additional 5% of the property, is in stream zones with buffer widths wider than required by state forest practice rules: 150' for

Class I, 100' for Class II and 50' for Class III. These are to be managed for native riparian vegetation, including large conifer and hardwood trees in multi-storied stands.

- Canopy cover for Class I and II of 65% will be recruited and maintained and at least 50% of BA in trees 10"+ DBH will be retained, with half of that 24"+ DBH.
- For Class III, 50% of pre-harvest over-story and 50% of understory will be retained.

- A **Forest Management Plan** will be required in conformance with the easement's **Performance Goals** for the managed forest area, which include standards for recruiting and retaining a balanced and resilient species composition for the site, a range of stand ages, and a more complex forest structure that will benefit a wide variety of special status species. In particular, the Performance Goals include targets for maintaining/achieving across the forest landscape:
    - "Large Trees": At least 10 square feet of basal area (BA) on average of trees >= 30" diameter at breast height (DBH)
    - "Multi-Storied Stands": At least 20% of the forest area characterized as at least two-storied, with an overstory of trees averaging at least 24" DBH
    - Large and small snags and down wood, early seral openings
- **Specific timber harvests are restricted as follows to conserve and restore habitat and watershed values over time:**
    - In all harvests (outside of SHMZs and RMZs) must retain at least 15% of the harvested area in forest, with priority for retention of trees with high habitat value. This ensures greater structural diversity and habitat value throughout the forest than is otherwise permitted. (Today, under state regulations clear cuts typically retain 1 – 2% of trees for wildlife values.)
    - The same basal area of Large Trees will be at least maintained and will increase to meet the Performance Goal over time. (There are no restrictions on cutting large trees in the state forestry rules.)
    - Harvest cannot exceed 30% of "net merchantable inventory" in any decade. This level is about 25% less than growth and will yield higher stocking levels on this property over time including in SHMZs and RMZs, and more Large Trees. (Under state rules, all the growth can be harvested.)
    - To provide early seral habitat in this commercially managed forest, for twenty years after a regeneration harvest, 10% of the ground area will be managed for native shrubs and herbaceous plants. (State regulations do not promote early seral habitats.)
    - Snags (standing dead trees) will in general be retained for wildlife habitat benefits. (Snags are critical habitat features and regulations have not protected them.)

Description of methods for estimate of physical benefits: The physical benefits claimed for the project are estimated using landowner surveys, consultation with CDFW, query of the California Natural Diversity Database, and analysis of CDFW Wildlife Habitat Relationships for species dependent on the property's habitats for one or more life functions.

Adverse physical effects: There are no potential adverse impacts from this project. Conservation easements are categorically exempt from CEQA. Actual forest management will be permitted, subject to the terms of the conservation easement, through the standard timber harvest permitting process under CEQA. Any specific habitat enhancement activities are not being funded under this project, but when conducted, will be compliant with CEQA.

Drought preparedness: The Mt. Shasta Headwaters Forest Conservation Easement Project helps achieve the Statewide Priority of drought preparedness through contributing to more efficient basin management of groundwater resources, by protecting and enhancing watershed and ecosystem functionality in a very direct and monitorable way. The water flows of 35+ miles of watercourses (including 24 miles of fish-bearing streams) and 78 springs will be permanently protected, including the source of Pig Creek and headwaters of Dairy Creek, both major tributaries to Squaw Valley Creek and the McCloud River; and the source of Trail Creek, a headwaters tributary to Soda Creek and the Upper Sacramento River. Associated with these water sources are 235 acres of wet meadows and riparian hardwood habitats. The landowner will be agreeing not to develop, divert or commercialize these very productive springs and perennial water flows, making them available for beneficial public use downstream.

As indicated and shown in Attachment 7, the entire Upper Sacramento, McCloud, and Lower Pit IRWM Region (USR) has been determined to be a DAC according to Appendix G of the 2015 IRWM Guidelines and the DAC mapping tool. All projects included in this 2015 IRWM Grant Proposal are located within the USR, and therefore all projects serve a DAC with an MHI of less than $48,875. As such, a waiver of funding match is respectfully requested for all projects.

City of Mt. Shasta Big Lakes Water Line Replacement Project:

This project meets a critical water supply need in the DAC as detailed in the 2015 IRWM Guidelines in that it will provide infrastructure renovations to the City public water supply system necessary to assure continued reliability of the minimum quality and quantity of water for public health and safety. The Big Lakes area in northern Mt. Shasta has reported instances that when a fire hydrant south of Big Lakes is opened or the area experiences moderately large demands, the water system pressure along Ski Village Drive goes nearly to zero or negative. This condition suspends the City's ability to reliably deliver water service to residents and increases the threat of public health hazards associated with depressurized water mains. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the Big Lakes area which is a DAC.

City of Dunsmuir South Dunsmuir Water Main Replacement Project:

This project meets a critical water supply need in the DAC as detailed in the 2015 IRWM Guidelines in that it will provide infrastructure renovations to the City public water supply system necessary to assure continued reliability of the minimum quality and quantity of water for public health and safety. The Blackberry Hill area in South Dunsmuir is served by small 3/4-inch to 2-inch diameter pipelines that do not convey adequate fire flows and lead to unhealthy reductions in water pressure during peak demand periods. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the Blackberry Hill area.

City of Dunsmuir North Dunsmuir Water Main Replacement Project:

This project meets a critical water supply need in the DAC as detailed in the 2015 IRWM Guidelines in that it will provide infrastructure renovations to the City public water supply system necessary to assure continued reliability of the minimum quality and quantity of water for public health and safety. As indicated in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report, the City has numerous old (70 to 80 years old) existing thin-walled steel water pipelines with a history of major leaks and repairs. Many leaks have led to substantial private and public property damage and pose health and safety risks. Existing water mains in Dunsmuir, Needham, Scenic and Prospect Avenues have required costly repairs. The Dunsmuir Avenue water main is primarily located on private property and traverses under existing large trees, landscaping, and structures rendering access for repairs difficult. The deteriorating pipeline and poor access increase the health and safety risks to the City. This project is necessary to ensure reliable delivery of safe drinking water and fire suppression to the residents in the North Dunsmuir area.

Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project:

The groundwater elevation survey and planning project is integral to both characterizing the present condition of groundwater resources and evaluating the efficacy of projects included in the USR Integrated Regional Water Management Plan. The project will provide baseline data for groundwater levels in both numbered groundwater basins identified by the DWR in the CASGEM program, and groundwater source areas identified in Bulletin 118.

The communities of McCloud, Mt. Shasta, and Dunsmuir are entirely dependent on local groundwater resources for their municipal water supplies, either through capture of spring water or from typical extraction wells. Unlike many large, lower elevation communities they do not have connections to State or Federal water projects that could provide safe drinking water in the event of prolonged drought or other interruptions to their water supplies. Understanding the local groundwater characteristics is thus a critical concern for this area and groundwater elevation monitoring is the single most important element in addressing that concern.

Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase 1) Project:

Consistent with the demonstration that the USR region meets the definition of a DAC in Proposal Attachment 7, the Mt. Shasta Headwaters Forest Conservation Easement Project is entirely located within the DAC and addresses multiple water related needs of the community through meeting multiple USR IRWM Plan goals and objectives: climate change, ecological health, sustainable forest management, building cooperation and trust through partnerships, and aiding in regulatory compliance through the binding voluntary requirements of the conservation easement.

In particular, the project contributes to more efficient management of USR groundwater resources and facilitating the equitable distribution of this benefit by protecting and enhancing watershed and ecosystem functionality in a very direct and monitorable way. The water flows of 35+ miles of watercourses (including 24 miles of fish-bearing streams) and 78 springs will be permanently protected, including the source of Pig Creek and headwaters of Dairy Creek, both major tributaries to Squaw Valley Creek and the McCloud River; and the source of Trail Creek, a headwaters tributary to Soda Creek and the Upper Sacramento River. Associated with these water sources are 235 acres of wet meadows and riparian hardwood habitats. The landowner will be agreeing not to develop, divert, or commercialize these very productive springs and perennial water flows, making them available for beneficial public use downstream in the USR and beyond.

| Table 6 – Project Performance Monitoring Plan<br>Project: City of Mt. Shasta Big Lakes Water Line Replacement Project | | |
|---|---|---|
| Proposed Physical Benefits | Targets | Measurement tools and methods |
| O&M savings from replacing leaky water mains | No leaks in new pipelines, reduced staff time in repairing leaks, increased pressures | Upon project completion, compare before and after number of leaks and staff time required in areas where new water mains are installed |
| Water savings from replacing leaky water mains | Minimal water loss due to leaks in those pipelines; 3,000± gallons per day savings after project completion | Upon project completion, compare before and after gallons lost due to leaks |

| Table 6 – Project Performance Monitoring Plan<br>Project: City of Dunsmuir South Dunsmuir Water Main Replacement Project | | |
|---|---|---|
| Proposed Physical Benefits | Targets | Measurement tools and methods |
| O&M savings from replacing leaky water mains | No leaks in new pipelines, reduced staff time in repairing leaks, increased pressures | Upon project completion, compare before and after number of leaks and staff time required in areas where new water mains are installed |
| Water savings from replacing leaky water mains | Minimal water loss due to leaks in those pipelines; 3,000± gallons per day savings after project completion | Upon project completion, compare before and after gallons lost due to leaks |

| Table 6 – Project Performance Monitoring Plan<br>Project: City of Dunsmuir North Dunsmuir Water Main Replacement Project | | |
|---|---|---|
| Proposed Physical Benefits | Targets | Measurement tools and methods |
| O&M savings from replacing leaky water mains | No leaks in new pipelines, reduced staff time in repairing leaks, increased pressures | Upon project completion, compare before and after number of leaks and staff time required in areas where new water mains are installed |
| Water savings from replacing leaky water mains | Minimal water loss due to leaks in those pipelines; 3,000± gallons per day savings after project completion | Upon project completion, compare before and after gallons lost due to leaks |

The Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project will provide direct water-related benefits to the USR Region which is entirely a DAC, therefore a project performance monitoring plan is not required.

**Project Performance Monitoring Plan**

The primary proposed physical benefit claimed for the Mt. Shasta Headwaters Forest Conservation Easement Project is that of the permanent conservation and enhancement of watershed and habitat values over 12,805 acres; the secondary physical benefit is the permanent protection of an estimated127 species, including 10 special status species (including northern spotted owl, northern goshawk, Pacific fisher, American pine marten and willow flycatcher), supported by the property's ten habitat types.

The terms of the conservation are designed to achieve these physical benefits both immediately upon its grant by the landowner to PFT and over time. A conservation easement is a permanent deed restriction, binding on the grantor and all successors in interest. The conservation easement terms are described further in the Technical Analysis of Physical Benefits Claimed.

PFT will be responsible, as the easement grantee, to monitor and enforce the terms of the agreement, including the physical benefits claimed; with the back-up of the state in the event PFT is unable to fulfill these responsibilities, pursuant to the grant agreement with the Wildlife Conservation Board. PFT currently holds conservation easements on 26 properties covering more than 82,000 acres, and has staff dedicated to this function.

The project property will have an individualized monitoring plan that guides the ongoing assessment of both the resources and achievement of the claimed physical benefits over time, consistent with the terms of the easement. This methodology will enable PFT to track progress on the achievement of the physical benefits: PFT conducts monitoring through annual on-site visits, through off-site monitoring, and by being regularly engaged with the land owner and managers. During on-site visits, PFT's stewardship staff tour the property at least annually to assess both the current conditions as well as the appropriateness of the management activities that have been conducted or are planned. Depending on management activities, PFT staff may be on site several times during the year; for instance, before and after timber harvest. Offsite methods include tracking the volume of harvested timber by review of California Board of Equalization Yield Tax records, use of aerial imagery and Geographic Information Systems, and a thorough permit check conducted with county and state agencies. PFT also uses statistically robust forest inventory data developed by the landowner according to the terms of the easement to track and assess changing forest conditions, WHR habitats, habitat structures and other progress toward the achieving the physical benefits, as well as compliance with the other terms of the easement. This data is updated at least every 10 years. PFT reserves the right to ground-truth this data and develop its own datasets as necessary.

The terms of the easement provide for rights of enforcement consistent with California Civil Code Section 815 *et seq*. These include right of entry for monitoring, enforcement and restoration activities; the ability to seek restraining orders and injunctions; and the ability to obtain monetary damages to restore the property in the event of breach.

At the time of the grant of the easement, the property owner will be making a contribution to PFT of funds for easement monitoring and enforcement.

| Table 7 – Cost Effective Analysis<br>Project name: City of Mt. Shasta Big Lakes Water Line Replacement Project | |
|---|---|
| Question 1 | Types of benefits provided as shown in Table 5 include increasing water system pressures and fire flows to meet current requirements, as well as water savings by replacing leaking and undersized deteriorated pipelines. |
| Question 2 | Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes |
| | If no, why? N/A |
| | If yes, list the methods (including the proposed project) and estimated costs. A total of five alternatives were analyzed utilizing the City's hydraulic model. The first alternative is the current proposed Big Lakes Water Line Replacement Project. The second alternative was similar to the first except pressure reducing valves would be strategically located to move the Big Lakes Area into a higher pressure zone. This alternative was deemed unviable due to the negative impacts on pressures it would have to the rest of the higher-elevation services in the water system. A third alternative considered was to construct a water storage tank north of the Big Lakes area. This alternative was deemed unviable due to hydraulic capacity limitations between the City's water supply sources and the Big Lakes Area. The new tank would never refill during maximum demand periods, and would therefore not be utilized to its greatest potential. The estimated cost of the new tank and necessary piping would be approximately $2.25 million. A fourth alternative considered was similar to the third but would also include construction of a 900 GPM well in the Big Lakes area in addition to the new tank. While this alternative would achieve and exceed the physical benefits as that of the proposed project, it was the most expensive at an estimated cost of $4.1 million and is therefore not recommended at this time. It should be considered in the future for its positive impacts not only in the Big Lakes area but for the entire municipal water system. A fifth and final alternative investigated was the construction of a 900 GPM well, but with no storage tank. This option would have some positive impacts to the Big Lakes area; however, it was deemed unviable due to inadequate system pressure drops that would result during fire flows in excess of 1,000 GPM. |
| Question 3 | If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The proposed project is the least cost alternative of all viable alternatives considered. |

| Table 7 – Cost Effective Analysis<br>Project name: City of Dunsmuir South Dunsmuir Water Main Replacement Project | |
|---|---|
| Question 1 | Types of benefits provided as shown in Table 5 include increasing water system pressures and fire flows to meet current requirements, as well as water savings by replacing leaking and undersized deteriorated pipelines. |
| Question 2 | Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes |
| | If no, why? N/A |
| | If yes, list the methods (including the proposed project) and estimated costs. Alternatives to the recommended project were considered in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report. As described therein, one alternative to alleviate water system deficiencies is to make localized improvements in the deficient areas of the system. For example, in the Blackberry Hill area, a booster pump station could be installed to increase system pressures and fire flows. However, due to undersized existing infrastructure a booster pump alone would not correct the deficiencies. If the undersized infrastructure is improved, a booster pump station will not be required. There are no other viable alternatives for the remaining project components. This project consists of replacement of leaking water mains that have met their useful service life. The proposed replacement pipeline sizes are just adequate for sufficient hydraulic capacity over the remainder of its useful service life and are not oversized. As such, no other alternatives for providing localized improvements to deal with specific system deficiencies are possible other than replacing the mains. |
| Question 3 | If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The proposed project is the least cost alternative. |

| Table 7 – Cost Effective Analysis<br>Project name: City of Dunsmuir North Dunsmuir Water Main Replacement Project | |
|---|---|
| Question 1 | Types of benefits provided as shown in Table 5 include increasing water system pressures and fire flows to meet current requirements, as well as water savings by replacing leaking and undersized deteriorated pipelines. |
| Question 2 | Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes |
| | If no, why? N/A |
| | If yes, list the methods (including the proposed project) and estimated costs. Alternatives to the recommended project were considered in the 1994 Master Water Plan and 2010 Draft Preliminary Engineering Report. As described therein, one alternative to alleviate water system deficiencies is to make localized improvements in the deficient areas of the system. However, due to undersized and poorly located existing infrastructure other localized improvements would not correct the deficiencies. There are no other viable alternatives for the remaining project components. This project consists of relocation and replacement of leaking water mains that have met their useful service life. The proposed replacement pipeline sizes are just adequate for sufficient hydraulic capacity over the remainder of its useful service life and are not oversized. As such, no other alternatives for providing localized improvements to deal with specific system deficiencies are possible other than replacing the mains. |
| Question 3 | If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The proposed project is the least cost alternative. |

| Table 7 – Cost Effective Analysis<br>Project name: Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project |
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| The Trout Unlimited Groundwater Elevation and Habitat Restoration Planning Project will provide direct water-related benefits to the USR Region which is entirely a DAC, therefore a cost effective analysis is not required. |

| Table 7 – Cost Effective Analysis<br>Project name: Pacific Forest Trust Mt. Shasta Headwaters Forest Conservation Easement (Phase1) | |
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| Question 1 | Types of benefits provided as shown in Table 5 include watershed, habitat, and species protection benefits. |
| Question 2 | Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes |
| | If no, why? N/A |
| | If yes, list the methods (including the proposed project) and estimated costs. The alternative approach to achieving the suite of public benefits of this project (including but not limited to the Physical Benefits in Table 5) is to buy the full fee property (e.g, outright purchase of the land and its rights). If there were a willing seller, the appraisal shows it would cost $30.6 million. In addition there would be on-going costs of land ownership and management to achieve the benefits. The proposed project uses a conservation easement to achieve the benefits for an acquisition cost of $11.7 million or 38% of the fee purchase. Further, the landowner and PFT will bear the costs of on-going management and monitoring of project results. |
| Question 3 | If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The proposed project is the least cost alternative. |
| Comments: While it is beyond the scope of this analysis, it is worth noting that the cost of the watershed ecosystem services is not fully valued in the easement appraisal; however, the natural storage and water filtration services provided by this project are likely less costly than that of building additional water storage and treatment facilities if this property were to be fragmented and developed. | |