

Replacement for Production Well W402 in Symmes-Shepherd Wellfield

Pre-Construction Evaluation Report

Eastern Sierra Environmental Group

1. PURPOSE

Well W402, located in the Symmes-Shepherd Wellfield, has lost pumping capacity despite attempts at rehabilitation. Well W402 is designated as a supply source for irrigating the adjacent Enhancement and Mitigation (E/M) Project alfalfa field. Due to pumping issues, W402 hasn't been able to supply full irrigation water, specifically during times of peak demand in summer. Therefore, the City of Los Angeles Department of Water and Power (LADWP) is planning to replace W402 utilizing current well construction and installation standards. The purpose of this report is to satisfy the requirement of Section IV.B of the Green Book (Technical Appendix to the Inyo/Los Angeles Agreement), Guidelines for Drilling and Activating New Production Wells.

2. BACKGROUND

2.1 Introduction

LADWP owns over 100 production wells in the Owens Valley. Over time, some of LADWP's wells fail for a variety of reasons including corrosion, casing defects and/or damage, and general degradation with time. LADWP replaces failed wells to maintain its operational flexibility in the Owens Valley. Replacement wells are drilled using the current industry standards with the goal of maximizing pumping efficiency and minimizing possible effects on nearby resources.

LADWP and Inyo County entered into an agreement for the long-term management of groundwater in the Owens Valley in 1991 (Water Agreement). According to Section VI of the Water Agreement, LADWP may replace existing wells and construct new wells in areas where hydrologic conditions are favorable. Since the implementation of the Water Agreement, LADWP has replaced a number of wells that had failed for a variety of reasons throughout the Owens Valley.

Originally constructed in 1991 (Attachment 1) as a replacement for W099, W402 only supplies water for the agricultural fields adjacent to the well. After the well's production capacity began to decline and lowering the pumping level to just above the pump setting,

the well was brushed in 2015 and again rehabilitated using carbon dioxide injection and well jetting in 2016. Neither attempts restored the pumping capacity of W402. The replacement for well W402 is planned to be installed in the vicinity of the current location.

2.2 Location

Attachment 2 shows a map of the Symmes-Shepherd Wellfield in the vicinity of Well W402. The main landmarks near the wellfield include the Manzanar Historic Site, Symmes and Shepherd creeks flowing east from the Sierra Nevada Mountains, the Los Angeles Aqueduct (LAA), and the Owens River to the east of the wellfield. Well W402 is located approximately midway in the wellfield, 500 feet west of US-395. The well is used only for irrigating the E/M project (alfalfa field). The replacement to W402 will be installed in the open area between W402 and US-395.

3. HYDROGEOLOGIC CONDITIONS

3.1 Groundwater

Groundwater in the Symmes-Shepherd Wellfield flows generally from north to south and also from the Sierra Nevada Mountain range, west of the wellfield. Percolation from the Owens River, Symmes Creek, Shepherd Creek, and LAA recharges the groundwater aquifer in this wellfield.

A review of the driller's log for Well W402 does not indicate significant variation, however, the log for well W345 located on the south end of the alfalfa field shows multiple clay zones. The extent of these clay zones are inferred to extend northeast based on the descriptive logs from other nearby wells (T784, T785, and T786).

The groundwater system in Symmes-Shepherd Wellfield includes both shallow and deep aquifers. The shallow aquifer is an unconfined aquifer while the deep aquifer in this area is effectively confined by a thick clay layer, as exhibited by 16 artesian wells in the wellfield.

3.2 Surface Water

Attachment 2 shows the location of various surface water flow measuring gauges in the Symmes-Shepherd Wellfield in the vicinity of well W402. Surface water is not a suitable irrigation alternative to well W402 due to the amount of suspended sediment in Shepherd Creek, which clogs the sprinkler heads.

The closest weather station near W402, located at Manzanar at well W075, provides meteorological data dating back to 1990. The long-term average precipitation at Manzanar is 3.5 inches per year.

4. POTENTIAL IMPACTS ON ENVIRONMENTAL RESOURCES

The existing W402 is screened at relatively deep intervals (180-280 and 300-570 feet bgs) and is generally operated during the irrigation season to supply water the adjacent agricultural field. No impacts to the nearby resources have been experienced throughout operation of the well. The replacement well will be screened primarily within the deep (or deeper) interval with no change in operation. Therefore, no impacts to the nearby environmental resources are anticipated.

5. CONSTRUCTION AND TESTING

5.1 New Well Design

The planned location of the replacement for Well W402 will be immediately to the east the current location.

In an effort to further minimize potential impact on the shallow aquifer, the borehole for the replacement well will be drilled to 700 feet below ground surface and geologic and geophysical logging will be performed. The replacement well will be screened within the deeper zone of the formation, the exact interval to be determined after a review of driller's and geophysical log, with a screen length of approximately 300 feet. Attachment 3 shows the preliminary design of the replacement well subject to the review of the geologic and geophysical logs.

The replacement well will be drilled using mud rotary method and constructed with a pre-fabricated casing and screen with an optimum screen slot size, along with placing a properly sized gravel pack in the annular space between the screen and the borehole wall. The casing and screen diameter will be 18 inches.

The capacity of the replacement well is expected to be approximately the same as that of W402, which will be used only supplying water to the adjacent irrigation field.

5.2 Aquifer Test

Following the installation of the replacement for Well W402, the contractor will perform a step-drawdown test with up to four steps and a 24-hour, constant rate, pumping test of the new well, to include collecting water level data from nearby observation wells. Data

from the pumping test will be used to estimate aquifer characteristics to be utilized to calculate the pumping capacity of the replacement well.

5.3 Pump Design

The results of analysis of the data collected during the pumping tests will be utilized to design optimally sized pump equipment for the replacement well. Operation of the replacement for W402 is exempt from the ON/OFF Provisions of the Water Agreement for supplying the adjacent agricultural field.

5.4 Operation Plan Development

After installation of the pump for the replacement well, operation of the well will be included in LADWP's annual operation plan for the Owens Valley. The existing well W402 will then be converted to a monitoring well. No changes will be made to the operation of the new well and water produced will only be used for E/M project irrigation and not diverted to the LAA or other uses.

6. ENVIRONMENTAL ASSESSMENT

The replacement for Well W402 will be located adjacent to the existing well, with the same design, pumping from the deeper aquifer, with the capacity similar to that of the existing well, and water will be used for the same purposes as the well it is replacing. Therefore, no further impact to vegetation is expected from the operation of this well. Additional assessment will not be conducted for the replacement well and LADWP plans to file a Notice of Exemption under the California Environmental Quality Act with Inyo County Recorder's Office.

REFERENCES

City of Los Angeles, Inyo County, Technical Appendix to the Long-Term Groundwater Management Plan "Green Book", June 1990.

Inyo / Los Angeles Long-Term Groundwater Management Plan, Superior Court of California, County of Inyo, Case No. 12908, 1991.

Attachment 1 - Existing W402 Drilling Log

Owner's Copy **W402** STATE OF CALIFORNIA
 Page 1 of 1 **WELL COMPLETION REPORT**
 Owner's Well No. **401 402** Refer to Instructions Pamphlet
 Date Work Began **May 20, 1991** No. **479536**
 Local Permit Agency **Inyo County** Permit No. **S-91-18** Permit Date **Feb. 5, 1991**

WELL OWNER
 Name **San Angeles Department of Water & Power**
 Mailing Address **873 North Main Street, Suite 22**
Bishop CA 93514
 CITY STATE ZIP

WELL LOCATION
 Address **See map**
 City **Inyo**
 County **Inyo**
 Section **145** Page **35E** Parcel **23-060-04**
 Township **33** Range **35E** Section **33**
 Easting **145** North **33** Longitude **115 39 35**

ACTIVITY (✓)
 NEW WELL
 MODIFICATION/REPAIR
 Deepen
 Other (Specify)
 DESTROY (Describe Procedure and Materials Under GEOLOGIC LOG)
PLANNED USE(S) (✓)
 MONITORING
WATER SUPPLY
 Domestic
 Public
 Irrigation
 Industrial
 TEST WELL
 CATHODIC PROTECTION
 OTHER (Specify)

ORIENTATION (✓) VERTICAL HORIZONTAL ANGLE (SPECIFY)
 DEPTH TO FIRST WATER (F) BELOW SURFACE
 DESCRIBE material, grain size, color, etc.

DEPTH FROM SURFACE	DEPTH TO FIRST WATER (F) BELOW SURFACE	DESCRIPTION
0' - 12'		Medium sand to fine sand with some cobbles
12' - 46'		Coarse sand and gravel with cobbles
46' - 170'		Gravel with a lot of cobbles 27FPH
170' - 185'		Sand (medium-coarse) with less granite 20 FPH with occ. cobbles, more compacted
185' - 295'		Sand (fine-medium) with cobbles, 26 FPH
295' - 413'		Sand (fine-medium) very little cobbles, 35 FPH (picked up on feet per hour)
413' - 440'		Not so much sand but fine rock chips, it has slowed down a lot
440' - 480'		Cobbles and sand (fine-medium) with occ. boulders
480' - 518'		Sand (fine-medium) compacted with occ. cobbles
518' - 548'		Fine-medium sand and gravel with some clay (very little), 31 FPH
548' - 590'		Fine-medium sand and gravel with some small cobbles - no clay

LOCATION SKETCH
 Illustrate or Describe Distance of Well from Landmarks such as Road, Building, Fence, River, etc. PLEASE BE ACCURATE & COMPLETE.

DRILLING METHOD **Mud rotary** **FLUID** **Bentonite**
WATER LEVEL & YIELD OF COMPLETED WELL
 DEPTH OF STATIC WATER LEVEL **41** (Ft.) & DATE MEASURED **6-23-91**
 ESTIMATED YIELD **3000** (GPM) & TEST TYPE **Pump**
 TEST LENGTH **48.75** (Ft.) TOTAL DRAWDOWN **131** (Ft.)
 * May not be representative of a well's long-term yield.

ANNULAR MATERIAL

DEPTH FROM SURFACE	DEPTH TO FIRST WATER (F) BELOW SURFACE	ANNULAR MATERIAL TYPE			
		CEMENT (✓)	REIN. (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	150	X			
150	590			X	Birdseye

CASINGS

DEPTH FROM SURFACE	BORE HOLE DIA. (Inches)	TYPE (✓)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
		BLANK	SCREEN	PIPE	FILL PIPE				
0	28	X				Steel	18-5/8		
*180	28	X				Steel	18-5/8	.080	
280	28	X				Steel	18-5/8	.080	
*300	28	X				Steel	18-5/8	.080	
570	28	X				Steel	18-5/8	.080	

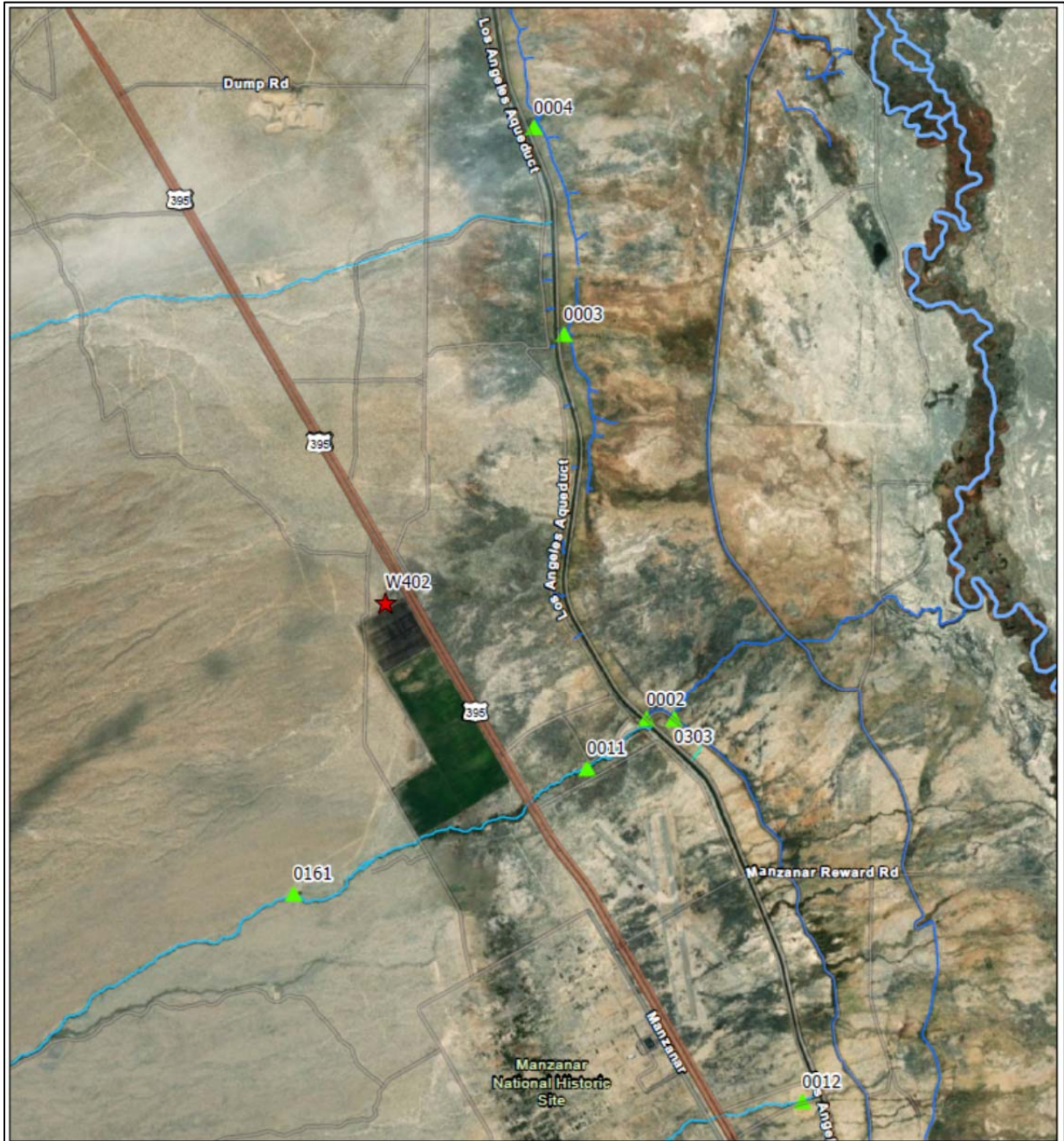
* Roseco Mass Standard Shutter

ATTACHMENTS (✓)
 Geologic Log
 Well Construction Diagram
 Geophysical Logs
 Soil/Water Chemical Analyses
 Other

CERTIFICATION STATEMENT
 I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
 NAME **Howard Pump, Inc.**
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 1249, Barstow, CA 92312
 ADDRESS CITY STATE ZIP
 Signed *Howard Pump, Inc.* DATE SIGNED **10-18-91** 281814
 WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED CST LICENSE NUMBER

DWR 186 REV. 7-90 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM **W402**

Attachment 2 – Location Map

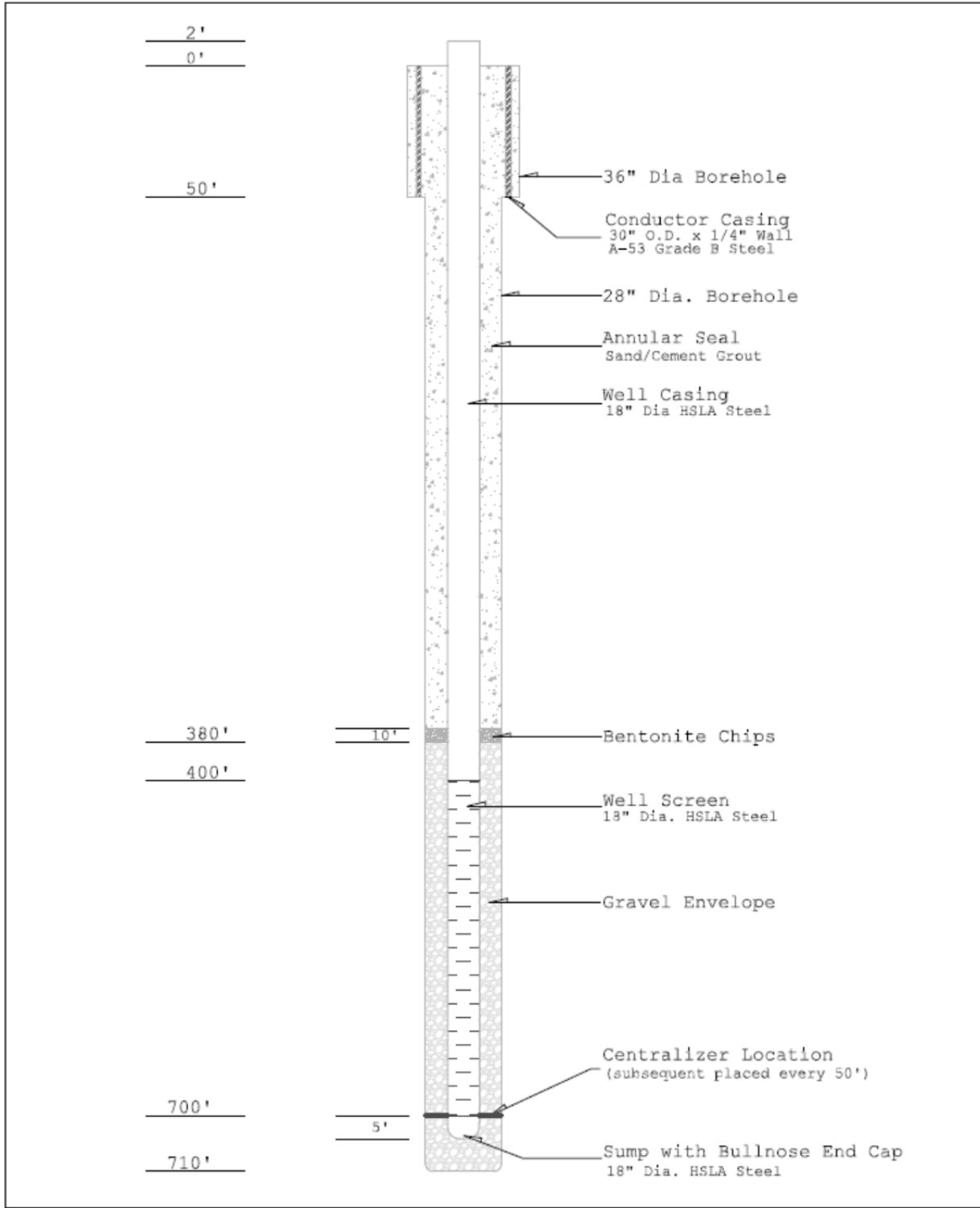


-  Selected Measuring Stations
-  W402
-  Owens River
-  Irrigation Diversion
-  Ditches
-  Creeks



0 0.150.3 0.6 0.9 1.2
Miles

Attachment 3 – Proposed New Well Design



TYPICAL 18-INCH PRODUCTION WELL DESIGN
 DRILLING METHOD: MUD-ROTARY
 EASTERN SIERRA - OWENS VALLEY, CA

REV1: 12/16/2016

FIGURE 1

IFB 791R1