17N/3W-32 H

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do Not Fill In

No. 93568

State Well No. CONFIDENTIAL LOG Water Code Sec. 13752

Other Well No.

(2) LOCATION OF WELL:

County Colusa Owner's number, if any

Township, Range, and Section

Distance from cities, roads, railroads, etc. 2 mi W. & 3/4 mi N. of Maxwell on Cemetery Road

(3) TYPE OF WORK (check):

New Well ☑ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☑
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: ☑ OTHER: SINGLE ☑ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	112	6 5/8	10 Ga	12	0	140

If gravel packed

Size of shoe or well ring:

Size of gravel: 3/4

Describe joint Butt welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen 3/16 x 1½ Punched

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
68	72		8	3/16 x 1½
104	112			

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☑ No ☐ To what depth 40 ft.

Were any strata sealed against pollution? Yes ☑ No ☐ If yes, note depth of strata

From 0 ft. to 40 ft.

From ft. to ft.

Method of sealing Cement

(9) WATER LEVELS:

Depth at which water was first found, if known ft.

Standing level before perforating, if known ft.

Standing level after perforating and developing 8 ft.

(10) WELL TESTS:

Was pump test made? Yes ☑ No ☐ If yes, by whom? Air jetted approx 200 GPM.

Yield: gal./min. with ft. drawdown after hrs.

Temperature of water 68 Was a chemical analysis made? Yes ☐ No ☑

Was electric log made of well? Yes ☐ No ☑ If yes, attach copy

(11) WELL LOG:

Total depth 140 ft. Depth of completed well 112 ft.

Formation: *Describe by color, character, size of material, and structure*

ft.	to	ft.	
0	-	18	Yellow Clay
18	-	32	Sand & Gravel
32	-	70	Yellow Clay
70	-	71	Sand & Gravel
71	-	105	Yellow Clay
105	-	108	Sandy Clay & Gravel
108	-	112	Yellow Clay
112	-	140	Blue Clay

CONFIDENTIAL LOG
Water Code Sec. 13752

Plotted and Coded

As Well 17N/3W-32H80

Work started 3/29 19 74, Completed 3/29 19 74

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Western Well Drilling Co
(Person, firm, or corporation) (Typed or printed)

Address P.O. Box 470 Willows

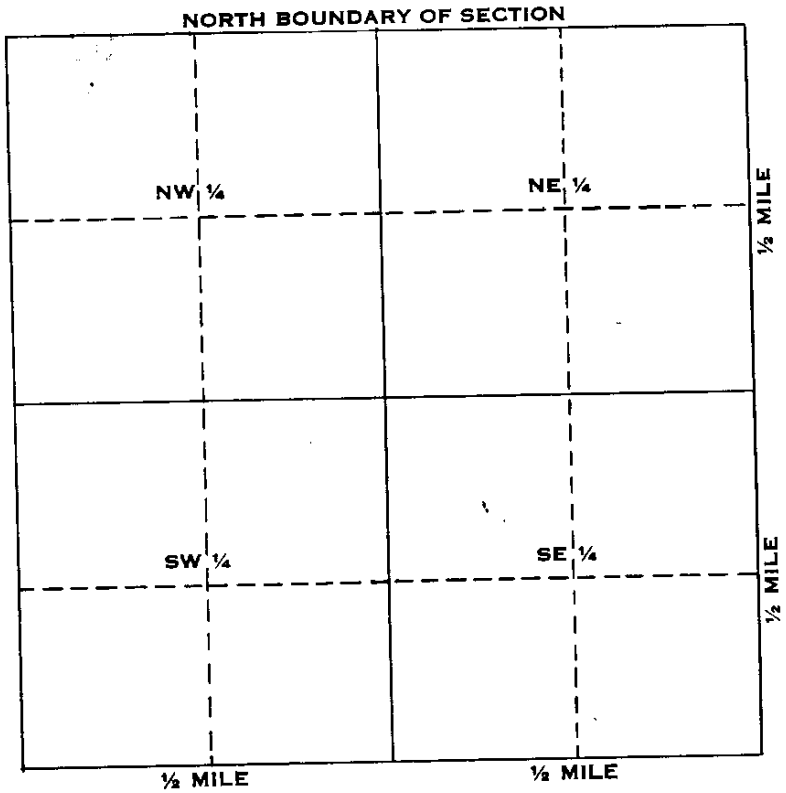
[SIGNED] Ralph J. Smith
(Well Driller)

License No. 195165 Dated 4/6, 19 74

SKETCH LOCATION OF WELL ON REVERSE SIDE

25179-950 9-68 50M TRIP △D OSP

WELL LOCATION SKETCH

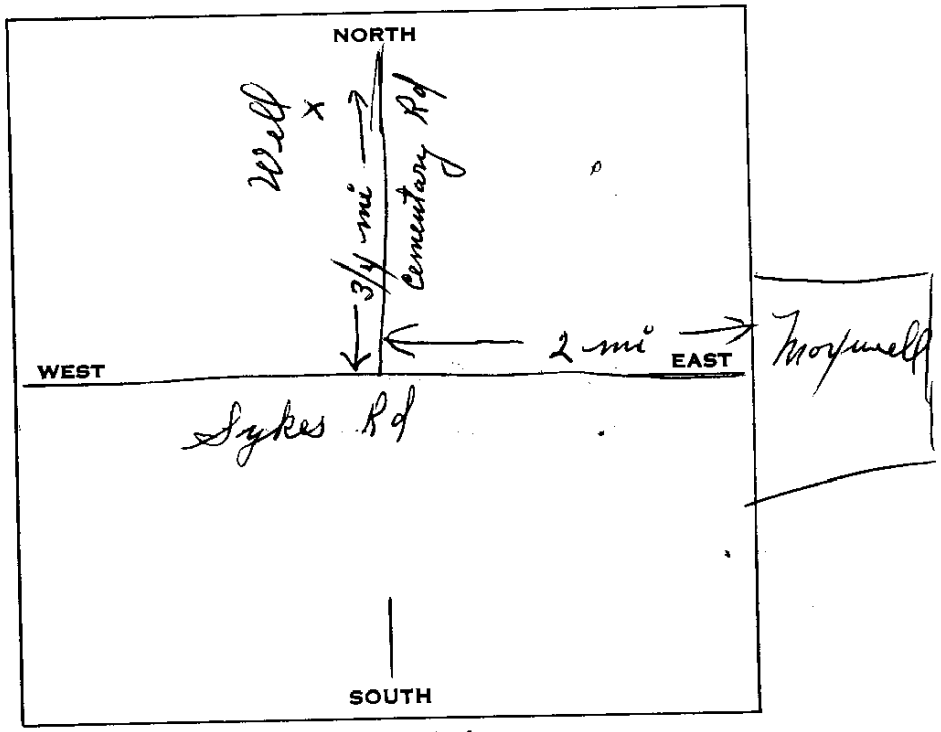


Township _____ N/S

Range _____ E/W

Section No. _____

A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
Indicate distances.

WATER WELL DRILLERS REPORT

FIELD WORK SHEET

Report No. 93562

Owner ___

Pump No. SUB

Meter No. ___

1100 ft. by Engr

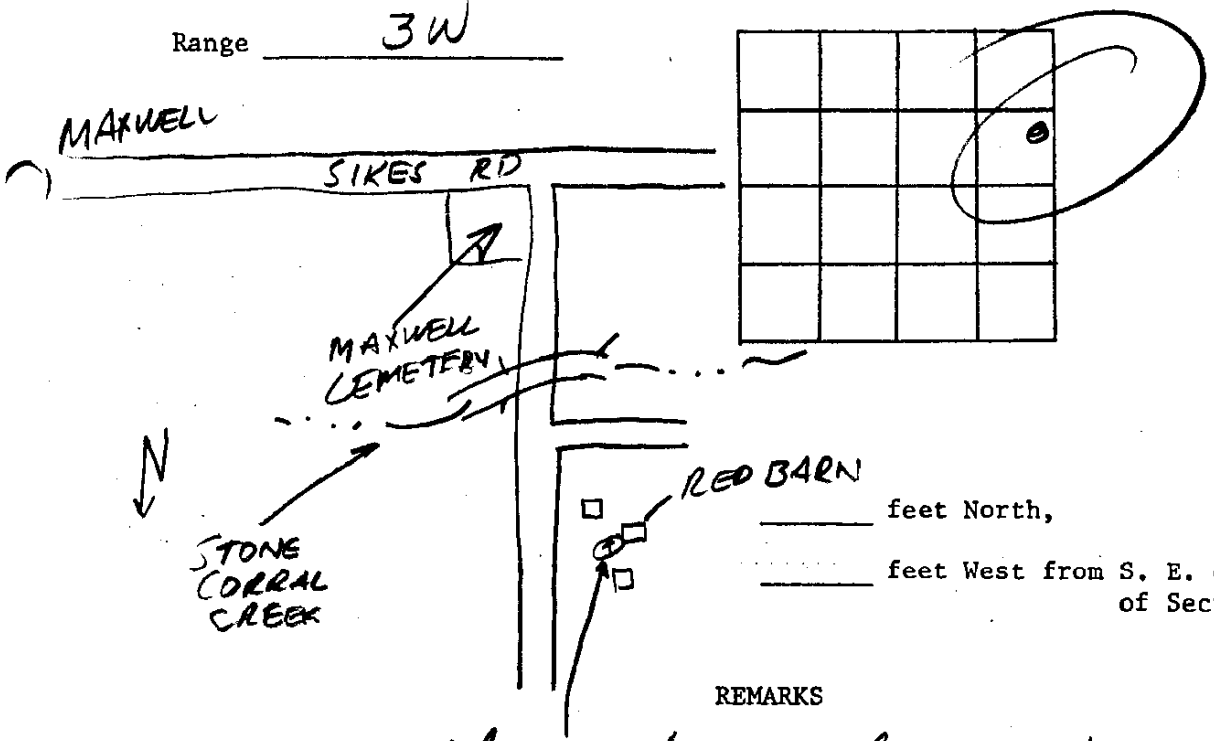
Not attached for more location

LOCATION

Section 32H

Township 17N

Range 3W



___ feet North,

___ feet West from S. E. corner of Section

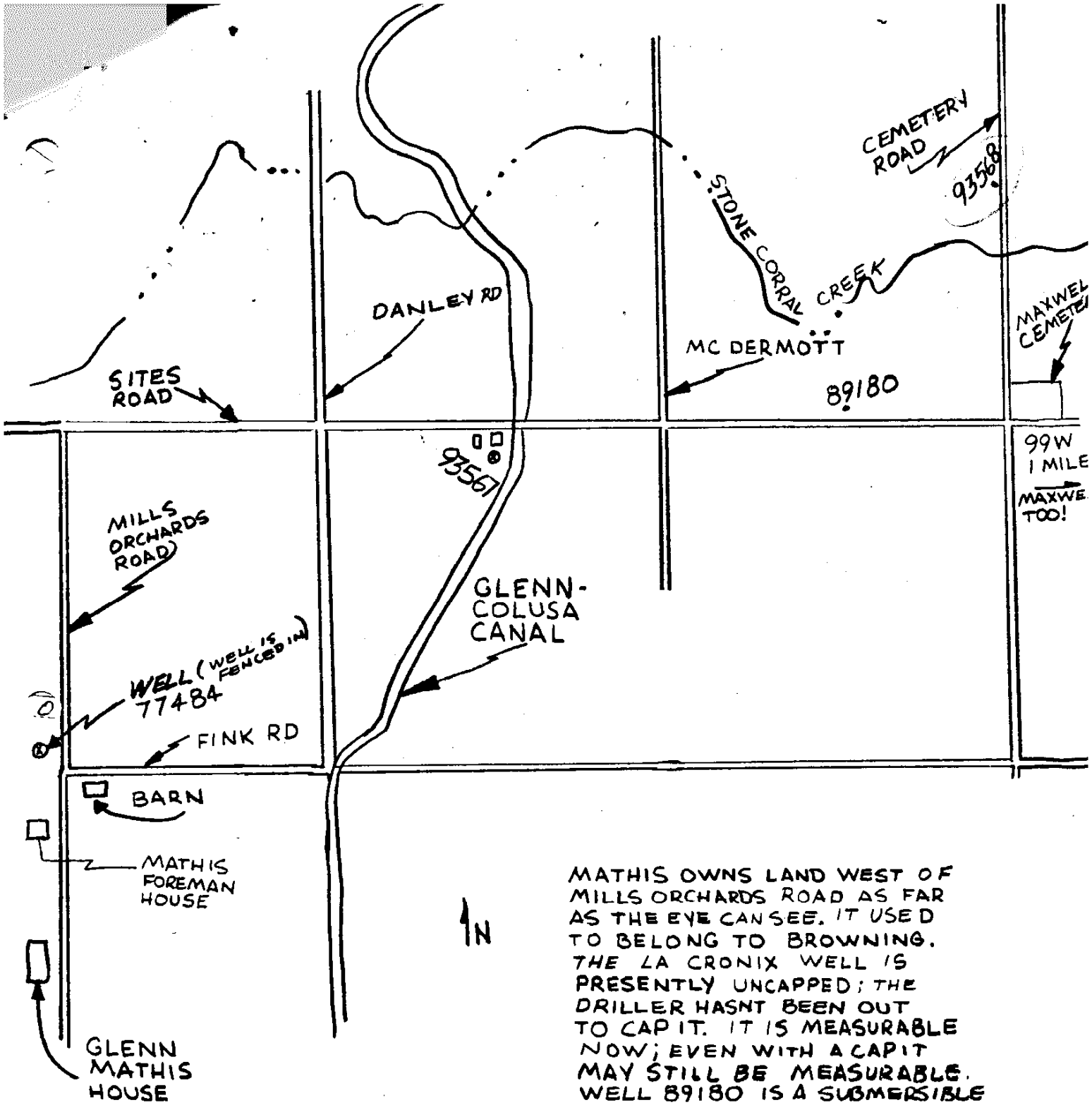
REMARKS

measurable - the well is on the west side of tin shed (which covers red barn

Sam

Field Checked by

8-12-74



MATHIS OWNS LAND WEST OF MILLS ORCHARDS ROAD AS FAR AS THE EYE CAN SEE. IT USED TO BELONG TO BROWNING. THE LA CRONIX WELL IS PRESENTLY UNCAPPED; THE DRILLER HASNT BEEN OUT TO CAP IT. IT IS MEASURABLE NOW; EVEN WITH A CAP IT MAY STILL BE MEASURABLE. WELL 89180 IS A SUBMERSIBLE LOCATED BEHIND THE LARGE BRICK HOUSE SURROUNDED BY RICE FIELDS.

EL.

ORIGINAL
File with DWR

Page 1 of 12

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E045412

DWR USE ONLY -- DO NOT FILL IN
18N/02W-18
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7986
Date Work Began 9/5/2006, Ended 9/14/2006
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 247-06 Permit Date 6/15/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	DARK BROWN CLAY
20	100	SILTY ORANGE BROWN CLAY
100	170	SILTY YELLOW BROWN CLAY WITH FINE SAND
170	210	TAN CLAY WITH MINIMUM SAND
210	280	BROWN TAN CLAY WITH COARSE SAND
280	400	BROWN TAN CLAY WITH SAND
400	520	SOFT YELLOW BROWN CLAY WITH COARSE SAND
520	700	SAND AND GRAVEL WITH BRITTLE YELLOW BROWN CLAY
700	710	BLUE CLAY WITH SAND AND GRAVEL
710	720	SOFT YELLOW BROWN CLAY WITH SAND AND GRAVEL
720	760	SOFT BLUE GRAY CLAY WITH SAND AND GRAVEL
760	800	SOFT YELLOW CLAY WITH SAND
800	850	SOFT YELLOW CLAY WITH BRITTLE GRAY CLAY AND SAND
850	1025	BRITTLE GRAY BROWN CLAY WITH SAND AND GRAVEL
1025	1040	COARSE SAND
1040	1195	BRITTLE GRAY BROWN CLAY WITH SAND AND GRAVEL STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1000 (Feet)

WELL LOCATION

Address .93 MI NOF RD 68 & 525' EOF NORMAN RD
City CA
County GLENN
APN Book 013 Page 280 Parcel 001
Township 18 N Range 2 W Section 18
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
0	246	14	✓				PVC F480	2.5	SCH 80	
246	256	14		✓			PVC F480	2.5	SCH 80	.030
256	266	14	✓				PVC F480	2.5	SCH 80	
ZONE	2									
0	510	14	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	130	✓			SAND SLURRY
130	134		✓		BENTONITE S
134	223			✓	SRI#8 SAND
223	235		✓		BENTONITE S
235	280			✓	SRI#8 SAND
280	290		✓		BENTONITE S

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 WEST KENTUCKY AVE ADDRESS, WOODLAND CITY, CA STATE, 95695 ZIP
Signed Mark Damion WELL DRILLER/AUTHORIZED REPRESENTATIVE
10/05/06 DATE SIGNED
C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E045412

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7986
Date Work Began 9/5/2006, Ended 9/14/2006
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 247-06 Permit Date 6/15/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	DARK BROWN CLAY
20	100	SILTY ORANGE BROWN CLAY
100	170	SILTY YELLOW BROWN CLAY WITH FINE SAND
170	210	TAN CLAY WITH MINIMUM SAND
210	280	BROWN TAN CLAY WITH COARSE SAND
280	400	BROWN TAN CLAY WITH SAND
400	520	SOFT YELLOW BROWN CLAY WITH COARSE
		SAND
520	700	SAND AND GRAVEL WITH BRITTLE YELLOW
		BROWN CLAY
700	710	BLUE CLAY WITH SAND AND GRAVEL
710	720	SOFT YELLOW BROWN CLAY WITH SAND
		AND GRAVEL
720	760	SOFT BLUE GRAY CLAY WITH SAND AND
		GRAVEL
760	800	SOFT YELLOW CLAY WITH SAND
800	850	SOFT YELLOW CLAY WITH BRITTLE GRAY
		CLAY AND SAND
850	1025	BRITTLE GRAY BROWN CLAY WITH SAND
		AND GRAVEL
1025	1040	COARSE SAND
1040	1195	BRITTLE GRAY BROWN CLAY WITH SAND
		AND GRAVEL STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1000 (Feet)

WELL LOCATION

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County GLENN
APN Book 013 Page 280 Parcel 001
Township 18 N Range 2 W Section 18
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public ___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
510	520	14		✓			PVC F480	2.5	SCH 80	.030
520	530	14	✓				PVC F480	2.5	SCH 80	
ZONE	3									
0	620	14	✓				PVC F480	2.5	SCH 80	
620	630	14		✓			PVC F480	2.5	SCH 80	.030
630	670	14	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
290	488			✓	SRI#8 SAND
488	500		✓		BENTONITE S
500	543			✓	SRI#8 SAND
543	553		✓		BENTONITE S
553	598			✓	SRI#8 SAND
598	608		✓		BENTONITE S

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP

Signed Mark Dawson WELL DRILLER/AUTHORIZED REPRESENTATIVE — 10/05/06 DATE SIGNED — C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
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STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E045412

DWR USE ONLY -- DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
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Owner's Well No. 7986
Date Work Began 9/5/2006, Ended 9/14/2006
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 247-06 Permit Date 6/15/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

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280	400	BROWN TAN CLAY WITH SAND
400	520	SOFT YELLOW BROWN CLAY WITH COARSE
		SAND
520	700	SAND AND GRAVEL WITH BRITTLE YELLOW
		BROWN CLAY
700	710	BLUE CLAY WITH SAND AND GRAVEL
710	720	SOFT YELLOW BROWN CLAY WITH SAND
		AND GRAVEL
720	760	SOFT BLUE GRAY CLAY WITH SAND AND
		GRAVEL
760	800	SOFT YELLOW CLAY WITH SAND
800	850	SOFT YELLOW CLAY WITH BRITTLE GRAY
		CLAY AND SAND
850	1025	BRITTLE GRAY BROWN CLAY WITH SAND
		AND GRAVEL
1025	1040	COARSE SAND
1040	1195	BRITTLE GRAY BROWN CLAY WITH SAND
		AND GRAVEL STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1000 (Feet)

WELL LOCATION

Address .93 MI NOF RD 68 & 525 EOF NORMAN RD
City CA
County GLENN
APN Book 013 Page 280 Parcel 001
Township 18 N Range 2 W Section 18
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

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CASING (S)

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670	680	14		✓			PVC F480	2.5	SCH 80	.030
680	700	14	✓				PVC F480	2.5	SCH 80	
ZONE	4									
0	975	14/8-3/4	✓				PVC F480	2.5	SCH 80	
975	985	8-3/4		✓			PVC F480	2.5	SCH 80	.030
985	1000	8-3/4	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
608	693			✓	SRI#8 SAND
693	716		✓		BENTONITE S
716	930			✓	SRI#8 SAND
930	944		✓		BENTONITE S
944	996			✓	SRI#8 SAND
996	1002		✓		BENTONITE S

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

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✓ NEW WELL
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PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

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256	266	14	✓				PVC F480	2.5	SCH 80	
ZONE	2									
0	510	14	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
1002	1200			✓	NATIVE FILL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

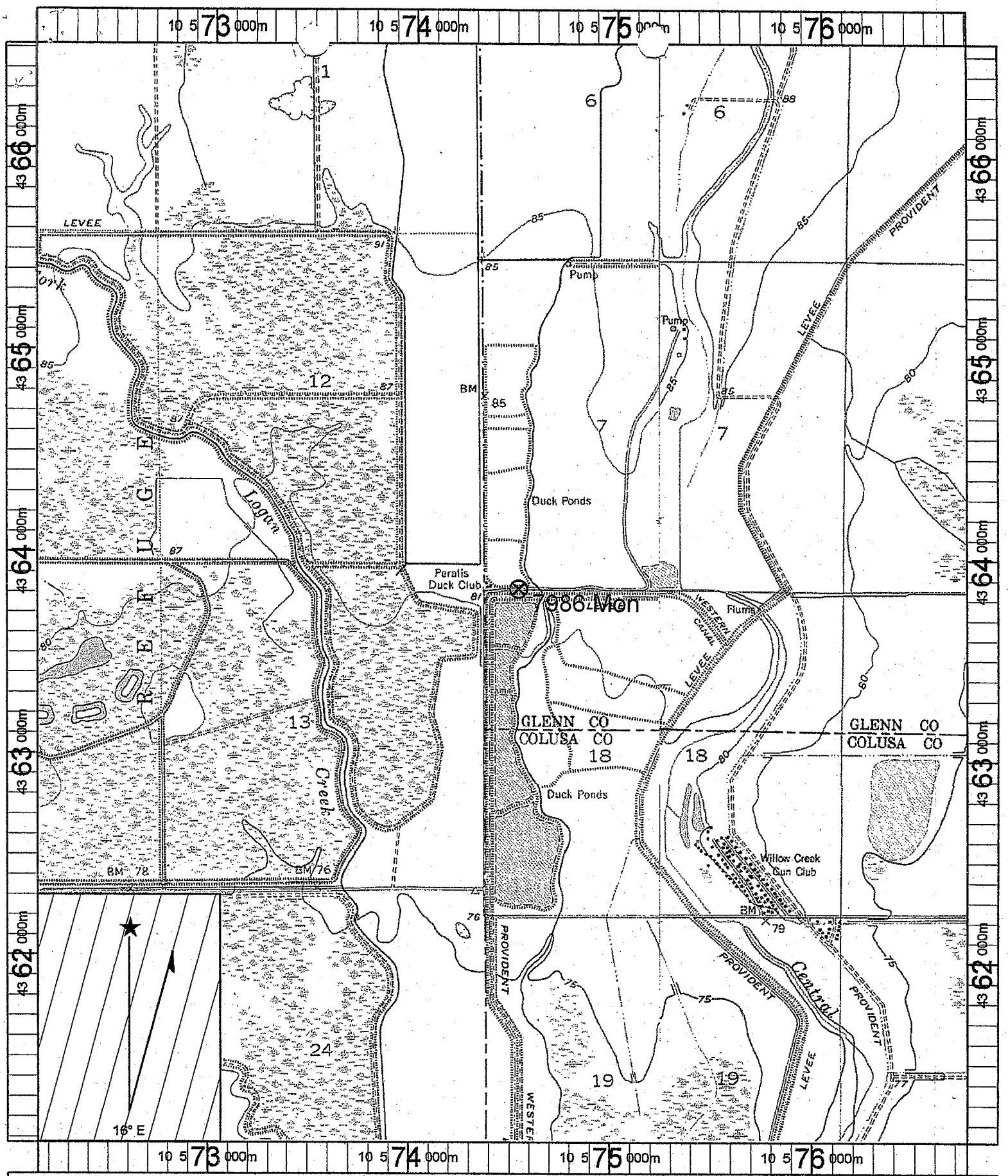
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS | WOODLAND CITY | CA STATE | 95695 ZIP

Signed Mark A Davison WELL DRILLER/AUTHORIZED REPRESENTATIVE | 10/05/06 DATE SIGNED | C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: LOGANDALE
Date: 6/12/2006
Scale: 1 inch equals 2000 feet

Caption: DWR (GCID) - Job# 7986 Mon
APN: 013-280-001 (103 acres)
T18N R2W s18

Copyright (C) 1997, Maptech, Inc.

18N/02W-36M

ORIGINAL

File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 177869

Notice of Intent No.

Local Permit No. or Date

State Well No.

Other Well No.

(2) LOCATION OF WELL (See instructions):

County Colusa Owner's Well Number

Well address if different from above

Township 18 N Range 2 W Section 36

Distance from cities, roads, railroads, fences, etc.

Extreme Notheast corner of Secion 36

(3) TYPE OF WORK:

New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic [ ]
Irrigation [X]
Industrial [ ]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other [ ]

WELL LOCATION SKETCH

(5) EQUIPMENT:

Rotary [ ] Reverse [ ]
Cable [X] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:

Yes [ ] No [X] Size

Diameter of bore

Packed from ft. to ft.

(7) CASING INSTALLED:

Steel [X] Plastic [ ] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall
0	234	18	1/4
230	410	16	8-GA

(8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Slot size
88	128	1/4" mills Knife
195	225	1/4" mills Knife
240	340	1/4 mills Knife

(9) WELL SEAL:

Was surface sanitary seal provided? Yes [ ] No [X] If yes, to depth ft.

Were strata sealed against pollution? Yes [X] No [ ] Interval ft.

Method of sealing Clay Seal

(10) WATER LEVELS:

Depth of first water, if known 40 ft.

Standing level after well completion 38 ft.

(11) WELL TESTS:

Was well test made? Yes [X] No [ ] If yes, by whom? Valley Pump

Type of test Pump [X] Bailer [ ] Air lift [ ]

Depth to water at start of test 38 ft. At end of test 36 ft

Discharge 3100 gal/min after 90 hours Water temperature

Chemical analysis made? Yes [ ] No [X] If yes, by whom?

Was electric log made? Yes [ ] No [X] If yes, attach copy to this report

(12) WELL LOG: Total depth 455 ft. Depth of completed well 455 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	9	top Soil
9	38	Brown Clay
38	41	gravel
41	88	Brown Clay
88	127	Sand & Gravel
127	196	Blue Clay
196	224	River Rock
224	268	Blue Clay
268	310	Sand & Gravel
310	446	Blue Clay
446	455	Shale & Gravel

NOT VALID FOR PUBLIC USE
PUBLIC RESOURCES CODE SEC. 13752

DEC 3 1985

Work started JAN 2 1985 Completed JAN 16 1985

WELL DRILLER'S STATEMENT: 00281

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED: (Well Driller)

NAME Valley Pump & motor Works Inc (Person, firm, or corporation) (Typed or printed)

Address 470 No. Geo. Wash Blvd

City Yuba City CA Zip 95991

License No. 256384 Date of this report MAY 16, 1985

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

OCT 19 2004

ORIGINAL
File with DWR

Page 1 of 6

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726952A B

DWR USE ONLY — DO NOT FILL IN
19N/02W-08
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7679
Date Work Began 7/19/2004, Ended 7/23/2004
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 206-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	68	TAN BROWN CLAY
68	92	SAND AND GRAVEL
92	160	TAN BROWN CLAY
160	202	TAN BROWN SILTY CLAY
202	226	GRAVEL AND SAND
226	240	BLUE CLAY
240	260	TAN BROWN CLAY
260	298	TAN BROWN SILTY CLAY WITH SAND
298	374	TAN BROWN CLAY WITH SAND
374	462	TAN BROWN SILTY CLAY WITH SAND
462	468	GRAVEL
468	556	TAN BROWN CLAY WITH SILTY SAND
556	600	TAN BROWN SILTY CLAY
600	638	SANDSTONE AND CLAYEY SAND
638	776	TAN BROWN SILTY CLAY
776	796	GRAVEL
796	822	LIGHT TAN CLAY
822	826	SANDSTONE
826	856	LIGHT TAN CLAY WITH FINE SAND
856	882	GRAVEL
882	936	TAN BROWN SILTY,CLAYEY FINE SAND
936	965	GRAVEL AND SAND WITH BLUE TAN SILTY CLAY
965	1000	BLUE SILTY SANDY CLAY

TOTAL DEPTH OF BORING 1000 (Feet)
TOTAL DEPTH OF COMPLETED WELL 939.7 (Feet)

WELL LOCATION

Address SOF HWY 162 & EOF C/R R
City CA
County GLENN
APN Book 016 Page 210 Parcel 012
Township 19 N Range 2 W Section 8
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH
NORTH / WEST / EAST / SOUTH
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	CASING (S) TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
0	77	24/18	✓				PVC C200	2.5	SCH 80	
77	87	18		✓			PVC C200	2.5	SCH 80	.030
87	97	18	✓				PVC C200	2.5	SCH 80	
ZONE	2									
0	208	24/18	✓				PVC C200	2.5	SCH 80	

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	59	✓			SAND SLURRY
0	136			✓	SRI#8 SAND
136	171		✓		BENTONITE S
171	265			✓	SRI#8 SAND
265	829		✓		BENTONITE S
829	910			✓	SRI#8 SAND

MAY 04 2005

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY AVE. ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE — 09/16/04 DATE SIGNED — C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726952

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7679

Date Work Began 7/19/2004, Ended 7/23/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT

Permit No. MW 206-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	68	TAN BROWN CLAY
68	92	SAND AND GRAVEL
92	160	TAN BROWN CLAY
160	202	TAN BROWN SILTY CLAY
202	226	GRAVEL AND SAND
226	240	BLUE CLAY
240	260	TAN BROWN CLAY
260	298	TAN BROWN SILTY CLAY WITH SAND
298	374	TAN BROWN CLAY WITH SAND
374	462	TAN BROWN SILTY CLAY WITH SAND
462	468	GRAVEL
468	556	TAN BROWN CLAY WITH SILTY SAND
556	600	TAN BROWN SILTY CLAY
600	638	SANDSTONE AND CLAYEY SAND
638	776	TAN BROWN SILTY CLAY
776	796	GRAVEL
796	822	LIGHT TAN CLAY
822	826	SANDSTONE
826	856	LIGHT TAN CLAY WITH FINE SAND
856	882	GRAVEL
882	936	TAN BROWN SILTY,CLAYEY FINE SAND
936	965	GRAVEL AND SAND WITH BLUE TAN SILTY CLAY
965	1000	BLUE SILTY SANDY CLAY

TOTAL DEPTH OF BORING 1000 (Feet)

TOTAL DEPTH OF COMPLETED WELL 939.7 (Feet)

WELL LOCATION

Address SOF HWY 162 & EOF C/R R

City CA

County GLENN

APN Book 016 Page 210 Parcel 012

Township 19 N Range 2 W Section 8

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if **necessary. PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
208	218	18		✓			PVC C200	2.5	SCH 80	.030
218	228	18	✓				PVC C200	2.5	SCH 80	
ONE	3									
0	290.6	24/18	✓				ASTM-135	4	.312	
290.6	299.9	18					COMP SEC			
299.9	720.9	18	✓				ASTM-135	4	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
910	1000	✓			SAND SLURRY

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY AVE. WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed Mark Damian 09/16/04 C57 A HIC - 133783
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 3 of 6

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 726952

DWR USE ONLY --- DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7679
Date Work Began 7/19/2004, Ended 7/23/2004
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 206-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 68	TAN BROWN CLAY
68 – 92	SAND AND GRAVEL
92 – 160	TAN BROWN CLAY
160 – 202	TAN BROWN SILTY CLAY
202 – 226	GRAVEL AND SAND
226 – 240	BLUE CLAY
240 – 260	TAN BROWN CLAY
260 – 298	TAN BROWN SILTY CLAY WITH SAND
298 – 374	TAN BROWN CLAY WITH SAND
374 – 462	TAN BROWN SILTY CLAY WITH SAND
462 – 468	GRAVEL
468 – 556	TAN BROWN CLAY WITH SILTY SAND
556 – 600	TAN BROWN SILTY CLAY
600 – 638	SANDSTONE AND CLAYEY SAND
638 – 776	TAN BROWN SILTY CLAY
776 – 796	GRAVEL
796 – 822	LIGHT TAN CLAY
822 – 826	SANDSTONE
826 – 856	LIGHT TAN CLAY WITH FINE SAND
856 – 882	GRAVEL
882 – 936	TAN BROWN SILTY,CLAYEY FINE SAND
936 – 965	GRAVEL AND SAND WITH BLUE TAN SILTY CLAY
965 – 1000	BLUE SILTY SANDY CLAY

TOTAL DEPTH OF BORING 1000 (Feet)
TOTAL DEPTH OF COMPLETED WELL 939.7 (Feet)

WELL LOCATION

Address SOF HWY 162 & EOF C/R R
City CA
County GLENN
APN Book 016 Page 210 Parcel 012
Township 19 N Range 2 W Section 8
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if **necessary. PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
720.9 – 730.2	18					COMP SEC			
730.2 – 856.6	18	✓				ASTM-135	4	.312	
856.6 – 876.6	18		✓			DBL MILLSL	4	.312	.060
876.6 – 939.7	18	✓				ASTM-135	4	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 59	✓			SAND SLURRY
0 – 136			✓	SRI#8 SAND
136 – 171		✓		BENTONITE S
171 – 265			✓	SRI#8 SAND
265 – 829		✓		BENTONITE S
829 – 910			✓	SRI#8 SAND

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 20 W. KENTUCKY AVE. CITY WOODLAND STATE CA ZIP 95695
Signed Mark Damian (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 09/16/04 C-57 LICENSE NUMBER C57 A HIC - 133783

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

RECEIVED
DEC 20 1994
D.W.R.

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 581475

DWR USE ONLY — DO NOT FILL IN
19N/02W-32M
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page ___ of ___
Owner's Well No. ___
Date Work Began 11/7/94 Completed 11/11/94
Local Permit Agency Glenn County Environmental Health
Permit No. 59698 Permit Date 10/17/94

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	7	Clay
7	17	Gravel
17	25	Clay
25	33	Gravel
33	44	Clay
44	46	Gravel
46	120	Clay
120	124	Small gravel
124	160	Clay
160	190	Gravel, cobblestones
190	197	Clay
197	251	Gravel, cobblestones
251	265	Clay
265	270	Gravel
270	274	Small gravel
274	300	Clay

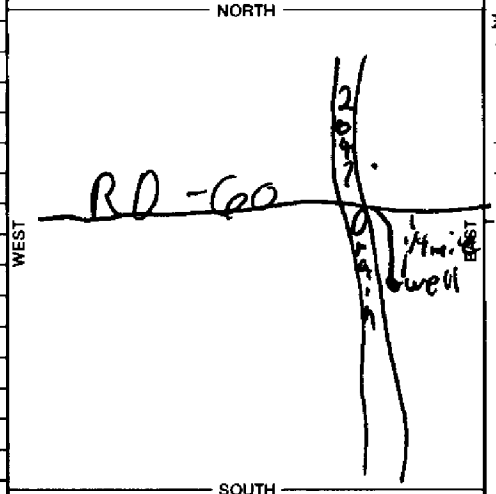
TOTAL DEPTH OF BORING 300 (Feet)
TOTAL DEPTH OF COMPLETED WELL 260 (Feet)

WELL OWNER

WELL LOCATION

Address 3/4 - 1 mi. West of SS on ~~CR~~ 60
City 4 Corners
County Glenn
APN Book 13 Page 22 Parcel 0 - 018
or Township ___ Range ___ Section ___
or Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
X Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Reverse Rotary FLUID Water

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 94 (Ft.) & DATE MEASURED 12-7-94
ESTIMATED YIELD* 5000 (GPM) & TEST TYPE turbine
TEST LENGTH 10 (Hrs.) TOTAL DRAWDOWN 70 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	100	28	x				steel	20	.250	
100	160	28	x				steel	16	.250	
160	260	28		x			steel	16		.080

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	35	x			
35	260				3/8" grave

DEC

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Sullivan Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED) 1768

ADDRESS P.O. Box 1448 CITY Corning STATE CA ZIP 96021

Signed Charlie Sullivan WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 12/14/94 C-57 LICENSE NUMBER 656504

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

~~ORIGINAL~~ MAY 3 1 2005
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 816220

DWR USE ONLY — DO NOT FILL IN
19W/04W-14
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7821
Date Work Began 3/15/2005, Ended 3/17/2005
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW226-05 Permit Date 2/15/2005

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	9	TOP SOIL
9	20	SANDY CLAY
20	30	YELLOW CLAY
30	42	LOOSE SAND AND GRAVEL
42	64	SANDY BROWN CLAY
64	70	YELLOW CLAY
70	400	BLUE CLAY WITH SAND
400	425	SAND WITH BLUE CLAY
425	494	BLUE CLAY WITH SAND
494	502	TIGHT SAND WITH SMALL GRVEL
502	750	BLUE CLAY WITH BRITTLE CLAY STREAKS
750	758	SAND WITH BLUE CLAY
758	863	SILTY BLUE CLAY WITH SAND
863	1010	BLUE/PURPLE CLAY WITH HARD CLAY STREAK

TOTAL DEPTH OF BORING 366 (Feet)
TOTAL DEPTH OF COMPLETED WELL 65 (Feet)

WELL LOCATION

Address .35 MI WOF ROAD BB & 1.5 MI SOF HWY 162
City CA
County GLENN
APN Book 018 Page 030 Parcel 032
Township 19 N Range 4 W Section 14
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	45	8	✓				PVC ASTM	2-1/2	F480	
45	55	8		✓			PVC ASTM	2-1/2	F480	.030
55	65	8	✓				PVC ASTM	2-1/2	F480	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	21.5	✓			SAND SLURRY
21.5	25		✓		BENTONITE C
25	147			✓	SRI#8 SAND
147	160		✓		BENTONITE C
160	209			✓	SRI#8 SAND
209	366	✓			SAND SLURRY

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 20 W. KENTUCKY AVE. CITY WOODLAND STATE CA ZIP 95695
Signed Mark Damion WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 05/12/05
C-57 LICENSE NUMBER C57 A HIC - 133783

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

20N/2W-11A1

REGION

COUNTY Glenn

NEAR

DEPT. OF WATER RESOURCES

Log# 3669

BASIN 20N/2W 11

OTHER NOS. SCF 5

WELL LOG

LOCATION 1,050' West and 5,200' North of SW corner, NE¼ NE¼ of Sec. 11, T20N R2W

DRILLED BY CalTrans for DWR ADDRESS P. O. Box 607, Red Bluff, CA 96080

DRILLING METHOD Rotary GRAVEL PACKED 0-700' DATE COMPLETED 9-2-76

SIZE OF CASING-DEPTH hole 4¾" TO 70' & 4½" TO 700' DATE STARTED STRUCK WATER AT 8-30-76

PERFORATIONS @ 70-90' (A1), @ 140-160' (A2), @ 490-510' (A3) SIZE 1½" PVC PIPES

WATER LEVEL BEFORE PERFORATING AFTER

TEST DATA: DISCHARGE G. P. M. DRAWDOWN FT. HOURS RUN

OTHER DATA AVAILABLE: WATER LEVEL RECORD ANALYSIS

SURFACE ELEV. 120' DATUM MSL SOURCE OF INFORMATION Geologist

DEPTH	ELEV. OF BOTTOM OF STRATUM	MATERIAL	THICKNESS	SP. YIELD %	
0-3'		soil	3'		
3-70		yellow clay with some gravel	67		
70-92		medium-small gravel	22		
92-109		graveley brown clay	11		
109-160		medium-small gravel with thin beds of fine gravel	51		
160-258		sandy brown clay	98		
258-283		coarse sand with medium-small gravel	25		
283-303		brown sandy clay	20		
303-335		fine sand beds (thin) with brown clay	32		
335-350		coarse sand and medium-small gravel with brown clay	15		
350-388		brown clay with medium sand	38		
388-398		fine sand	10		
398-405		fine sand with brown clay	8		
405-412		fine sand	7		
412-438		fine sand with brown clay	26		
438-450		fine-coarse sand	12		
450-456		brown silty clay	6		
456-480		fine-coarse sand	24		
480-515		medium-small gravel beds (1' thick) in medium sands	35		
515-526		brown silty clay with sand	11		
526-578		fine-medium sand with brown clay	52		
578-592		medium coarse sand with small gravel	14		
592-598		sandy brown clay	6		
598-608		medium-small gravel with thin sandy brown clay beds	10		
608-624		medium coarse gravel with coarse sand	16		

FOR FIELD COPIES USE ALTERNATE LINES

LOG OBTAINED BY Jorge Martinez DATE 10-4-76 SHEET 1 OF 2

Log # 3669

DEPARTMENT OF WATER RESOURCES

Stony Creek Fan

WELL LOG

LOCAL DESIGNATION SCF 5

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% VOIDS	ABSOLUTE VOIDS FEET	TOTAL VOIDS FEET
624-638'		fine sand with layers of brown clay	14'			
638-700		blue silty clay with fine sand	32			

FOR FIELD COPIES USE ALTERNATE LINES

20N/02W-18

ORIGINAL
File with DWR

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Owner's Well No. G-1

No. 801448A,B,C,D

Date Work Began 1/3/01, Ended 1/23/02

Local Permit Agency Glenn Co

Permit No. MW 120-01 Permit Date

DWR USE ONLY — DO NOT FILL IN

20N/02W-18R (5-7) M

STATE WELL NO./STATION NO.

QUARTER OF QUARTER SECTION

LATITUDE well LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Rotary FLUID Mud

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	70	Brown to tan Clay
70	80	Coarse Sand
80	130	Blue Grey Clay
130	180	Sand & gravel
180	290	Light Brown Clay
290	295	Sand
295	445	Brown to tan Clay
445	451	Sand
451	490	Brown Clay
490	500	Sand
500	515	Yellow to tan Clay
515	525	Sand
525	575	Yellow Clay
575	580	Sand
580	630	Yellow to Tan Clay
630	655	Sand
655	695	Yellow to Tan Clay
695	705	Silt/Tuff Deposit
705	750	Yellow to Tan Clay
750	805	Brown siltstone w/Tuff Fragments
805	822	Green/Grey Siltstone
822	840	Lt. Grey Clay
840	905	Brown Siltstone with Clay
905	940	Sand w/Basalt Chips
940	950	Blue/Grey Clay
950	977	Volcanic Sands
977	1020	Lt Green to Yellow Clay

TOTAL DEPTH OF BORING 1020 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1000 (Feet)

WELL LOCATION

Address Co. Rd R & Co. Rd 39

City Glenn

County Glenn

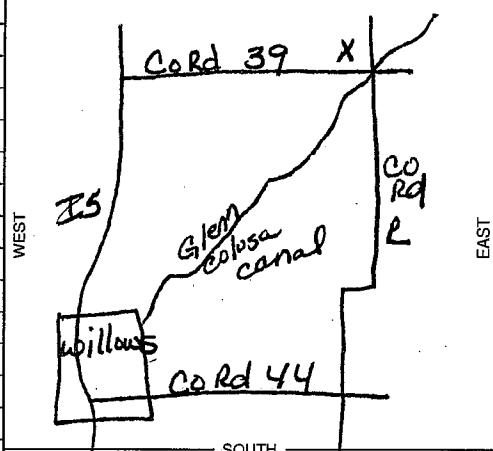
APN Book 019 Page 220 Parcel 011

Township ___ Range ___ Section ___

Latitude ___ DEG. ___ MIN. ___ SEC. NORTH

Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING X
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
Please see attach. Log										

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
→					

Rec'd 4 2002

ATTACHMENTS (✓)

___ Geologic Log
X Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Spectrum Exploration (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 47 CITY Zamora STATE Ca ZIP 95698

Signed Charlene Borchers WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 3/18/02

C-57 LICENSE NUMBER 512268

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

#801448

Casing

Deep Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
1000 – 980		Blank	Steel	2"	Sch 40	
980 – 970		Screen	Steel	2"	Sch 40	.020
970 – 930		Blank	Steel	2"	Sch 40	
930 – 920		Screen	Steel	2"	Sch 40	.020
920 - +6"		Blank	Steel	2"	Sch 40	

A

#2 Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
675 – 655		Blank	Steel	2"	Sch 40	
655 – 635		Screen	Steel	2"	Sch 40	.020
635 - +1		Blank	Steel	2"	Sch 40	

B

Middle Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
545 – 525		Blank	Steel	2"	Sch 40	
526 – 515		Screen	Steel	2"	Sch 40	.020
515 – 460		Blank	Steel	2"	Sch 40	
460 – 450		Screen	Steel	2"	Sch 40	.020
450 - +2.5		Blank	Steel	2"	Sch 40	

C

Shallow Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
201 – 180		Blank	Steel	2"	Sch 40	
180 – 170		Screen	Steel	2"	Sch 40	.020
170 – 150		Blank	Steel	2"	Sch 40	
150 – 140		Screen	Steel	2"	Sch 40	.020
140 - +2		Blank	Steel	2"	Sch 40	

D

Annular Material

Ft. to Ft.	Type
100 – 925	#8 Sand
925 – 917	#60 Sand
917 – 902	Hot Batch Grout
902 – 513	Cement Grout
531 – 403	#8 Sand
403 – 393	#60 Sand
393 – 283	Cement Grout
283 – 171	#8 Sand
171 – 163	#60 Sand
163 – 101	Cement Grout
101 – 35	# 8 Sand
35 – 31	#60 Sand
31 – Surface	Cement Grout

20N/02W-25

ORIGINAL
File with DWR

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

DWR USE ONLY — DO NOT FILL IN
20N/02W 25 F(1-4) M
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. G-2
Date Work Began 10/3/01, Ended 1/23/02
No. 782025A,B,L,D
Local Permit Agency Glenn Co
Permit No. MW121-01 Permit Date 10/1/01

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ___ FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	Sand
20	60	Lt. Brown Clay
60	80	Sands & Gravels
80	190	Brown Clay
190	200	Coarse Sand
200	250	Brown Clay
250	260	Sand
260	410	Blue/Grey Clay
410	440	Sand
440	450	Blue/Grey Clay
450	480	Sand
480	510	Blue/Grey Clay
510	520	Sand & Gravel
520	930	Blue/Grey Clay
930	960	Sand
960	1000	Blue/Grey Clay

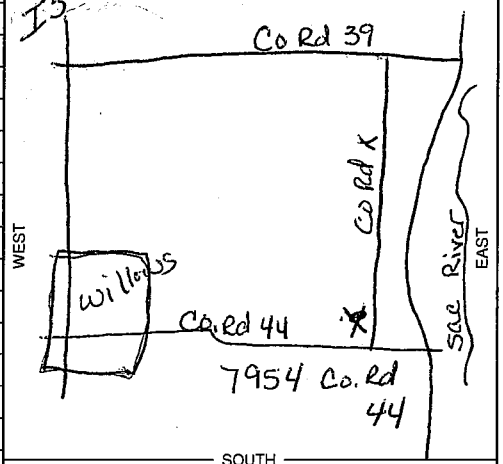
TOTAL DEPTH OF BORING 1000 (Feet)
TOTAL DEPTH OF COMPLETED WELL 980 (Feet)

WELL OWNER

WELL LOCATION

Address 7954 Co Rd 44
City Glenn
County Glenn
APN Book 019 Page 110 Parcel 025-9
Township ___ Range ___ Section ___
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH
Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



*Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING X
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED
ESTIMATED YIELD * ___ (GPM) & TEST TYPE Airlift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
Please see attached log										

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

DEC 24 2002

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Spectrum Exploration Inc (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 471 CITY Zamora STATE Ca ZIP 95698
Signed Charlise Borchers (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 3/18/03
C-57 LICENSE NUMBER 512268

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

#782025

Casing

Deep Well

A

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
980 - 960		Blank	Steel	2"	Sch 40	
960 – 940		Screen	Steel	2"	Sch 40	.020
940 – +6"		Blank	Steel	2"	Sch 40	

#2 Well

B

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
490 – 470		Blank	Steel	2"	Sch 40	
470 – 460		Screen	Steel	2"	Sch 40	.020
460 – 430		Blank	Steel	2"	Sch 40	
430 – 420		Screen	Steel	2"	Sch 40	.020
420 - +1		Blank	Steel	2"	Sch 40	

Middle Well

C

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
280 – 260		Blank	Steel	2"	Sch 40	
260 – 250		Screen	Steel	2"	Sch 40	.020
250 – 200		Blank	Steel	2"	Sch 40	
200 – 190		Screen	Steel	2"	Sch 40	.020
190 - +2.5		Blank	Steel	2"	Sch 40	

Shallow Well

D

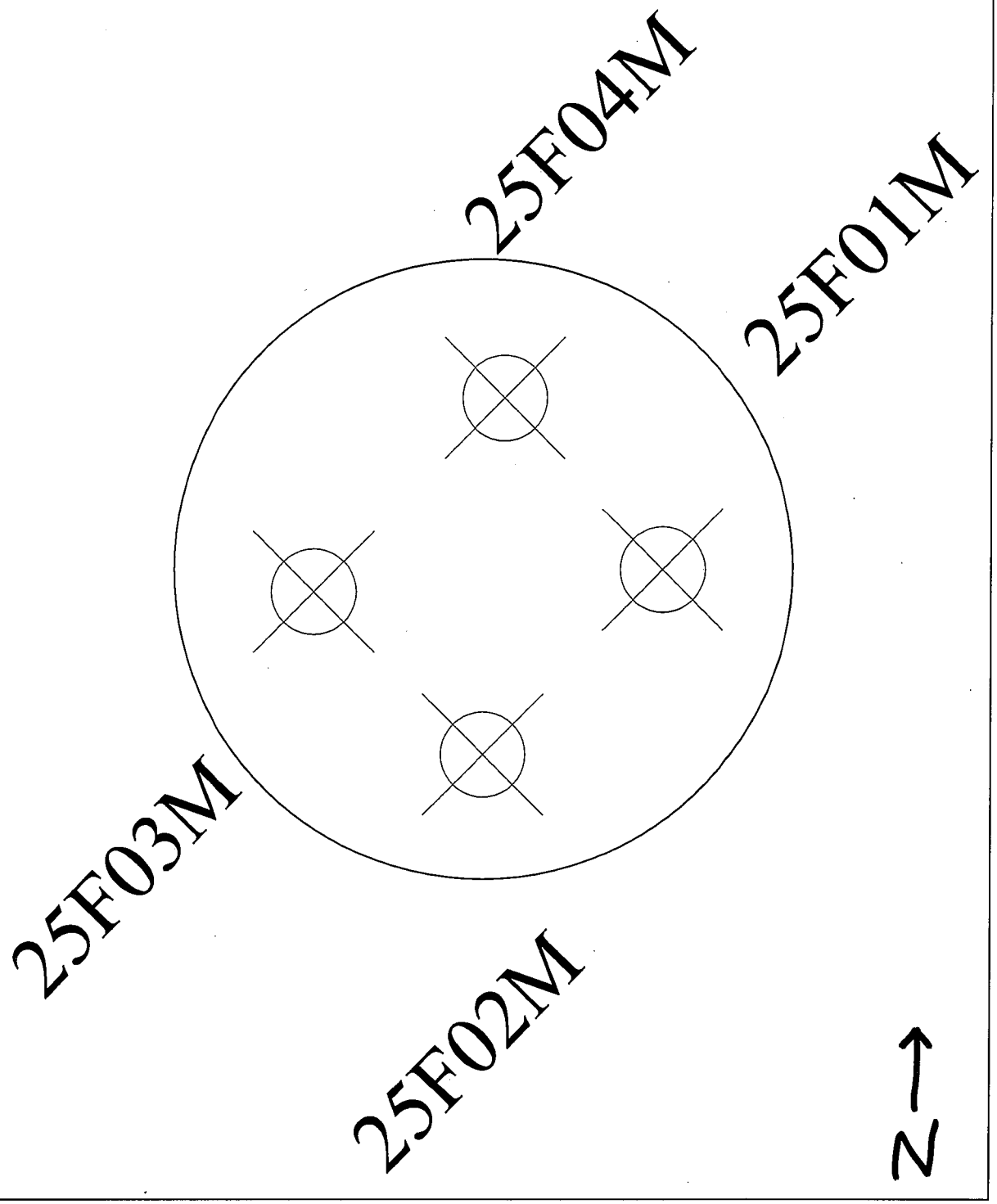
Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
85 – 65		Blank	Steel	2"	Sch 40	
65 – 55		Screen	Steel	2"	Sch 40	.020
55 - +2		Blank	Steel	2"	Sch 40	

Annular Material

Ft. to Ft.	Type
985 - 925	#8 Sand
925 - 500	Cement Grout
500 - 400	#8 Sand
400 – 285	Cement Grout
285 – 170	#8 Sand
170 – 85	Cement Grout
85 – 45	#8 Sand
45 – Surface	Cement Grout

#782025

20N02W-Mirande Farms (G-2)



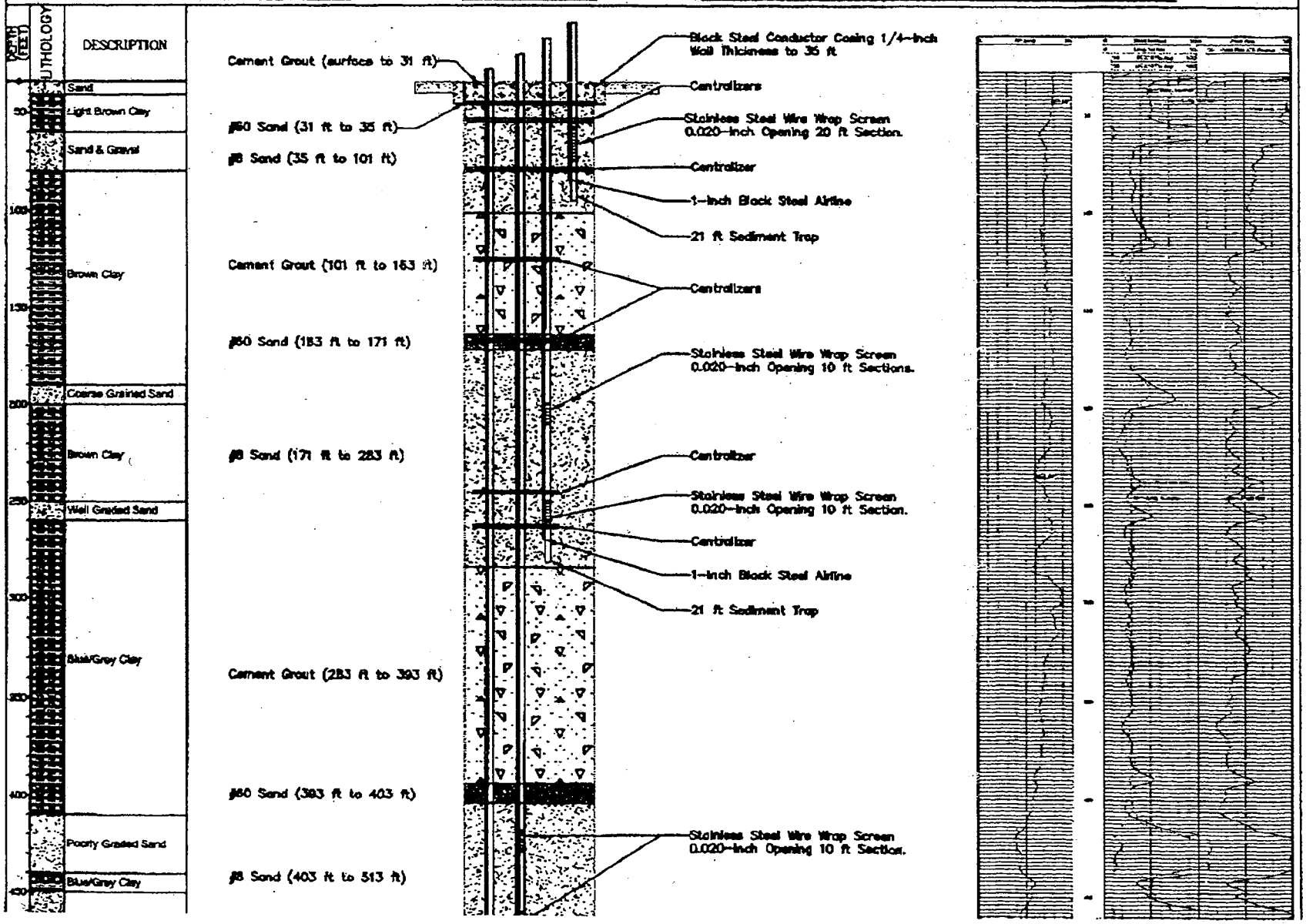
STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

FEATURE Quadruple Completion Monitoring Well HOLE NUMBER G2 Miranda Farms LOCATION Glenn County, County Rd 44 and County Rd X UTM COORDINATES UTM 10 S 0583104 4379316

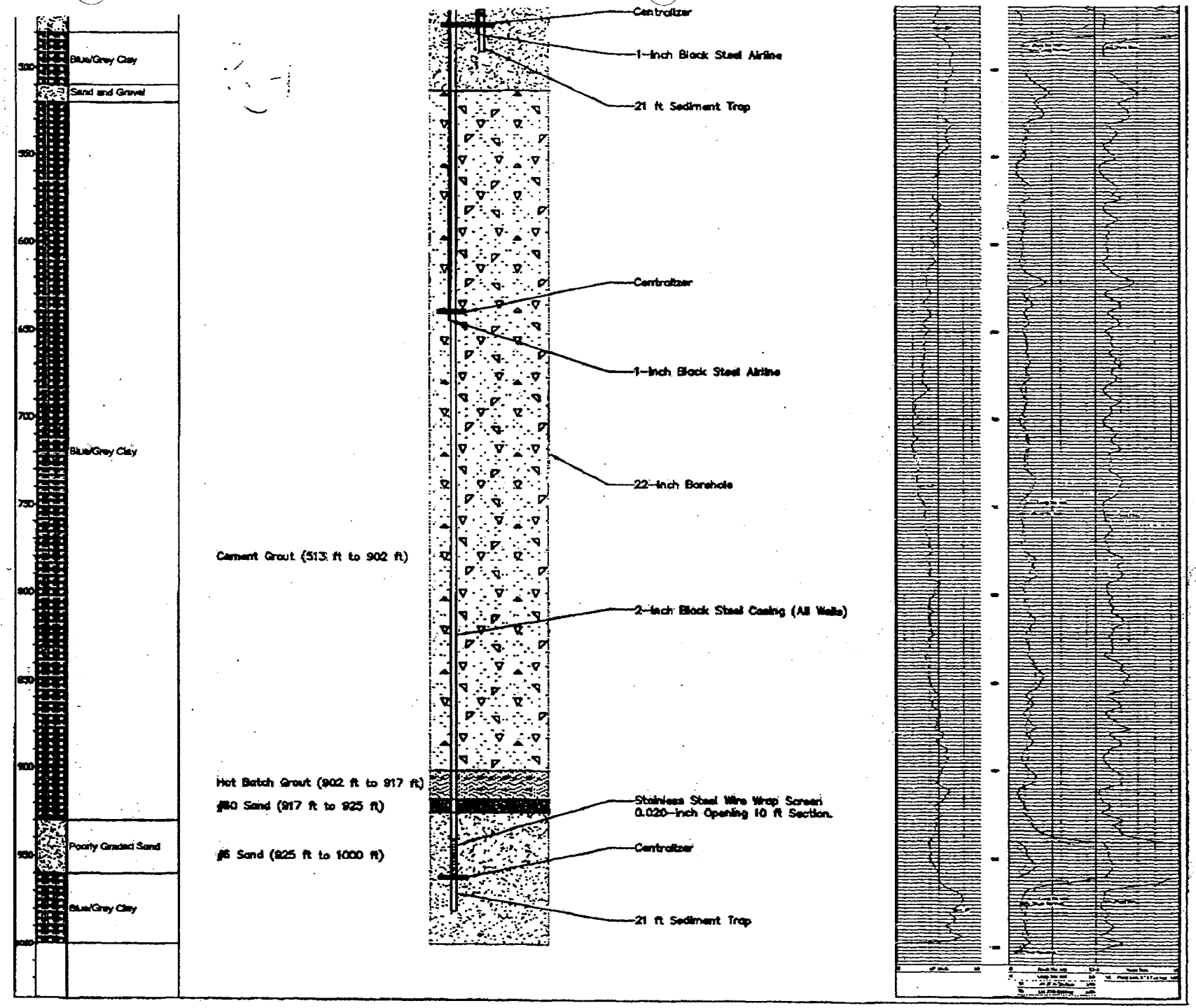
TYPE OF HOLE Reverse Mud Rotary TYPE OF RIG Hornschade TOTAL DEPTH 1000 ft DATE STARTED 10/15/01 DATE COMPLETED 01/23/02

CONTRACTOR Spectrum Exploration Inc. DRILL FOREMAN Sundy & Dan DRILL HELPER(S) Kenney ext. NUMBER OF COMPLETIONS 4

INSPECTED BY K. Staton & D. Stamoski PROJECT Butte/Glenn Online 2001 COMMENTS 9.5 inch test hole drilled 10/15/01 to 10/19/01 well construction from 12/13/01 to 01/23/02



#78205


Blue/Grey Clay
Sand and Gravel
Blue/Grey Clay
Poorly Graded Sand
Blue/Grey Clay
Centralizer
1-Inch Black Steel Airline
21 ft Sediment Trap
Centralizer
1-Inch Black Steel Airline
22-Inch Borehole
Cement Grout (513 ft to 902 ft)
2-Inch Black Steel Casing (All Wells)
Hot Batch Grout (902 ft to 917 ft)
#80 Sand (917 ft to 925 ft)
#6 Sand (925 ft to 1000 ft)
Stainless Steel Wire Wrap Screen
0.020-Inch Opening 10 ft Section
Centralizer
21 ft Sediment Trap

#782825

REGION

COUNTY Glenn

NEAR

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

BASIN 5-21.02

DWR No. 20N/2W-33B MD B & M

OTHER Nos SCF-6

WELL LOG

36886

LOCATION 1 mile west from intersection of "Rd V" and "Rd 46"; and 2200' north of intersection of "Rd 46" and irrigation road west of Lewis home, west side of road

DRILLED BY Caltrans for DWR ADDRESS Northern Division, Red Bluff, Ca.

DRILLING METHOD Rotary GRAVEL PACKED yes DATE COMPLETED 8/15/77 - 8/23/77

SIZE OF CASING DEPTH 10 5/8" hole; 3" casing 0-20'; 6" casing 0-320' STRUCK WATER AT 74'

PERFORATIONS 100'-120'; 200-320' SIZE 6" casing No.

WATER LEVEL BEFORE PERFORATING AFTER

TEST DATA: DISCHARGE G. P. M. DRAWDOWN FT. HOURS RUN

OTHER DATA AVAILABLE: WATER LEVEL RECORD ANALYSIS

SURFACE ELEV. 103' DATUM MSL SOURCE OF INFORMATION Geologist

DEPTH	ELEV. OF BOTTOM OF STRATUM	MATERIAL	THICKNESS	SP. YIELD %	
0-8'		Sandy brown soil	8'		
8-15'		Brown clay	7'		
15-20'		Pea Gravel lense	5'		
20-42'		Sandy brownish-yellow clay w/minor gravel	22'		
42-46'		Brown clay, very little fine sand	4'		
46-70'		Sandy brown clay	24'		
70-84'		Coarse sand and pea gravel w/minor brown clay	14'		
84-86'		Brown clay	2'		
86-92'		Coarse sand and pea gravel	6'		
92-98'		Brown silty clay	6'		
98-120'		Coarse sand and pea gravel	22'		
120-144'		Sandy clay (red-brown, green-brown, and buff-brown)	24'		
144-160'		Silty clay (red-brown and green-brown)	16'		
160-170'		Pea gravel	10'		
170-188'		Silty clay w/minor fine sand (green-black and green-brown)	18'		
188-198'		Greenish-brown clay	10'		
198'-218'		Red-brown and green-brown clayey sand w/minor pea gravel lenses	20'		
218-223'		Greenish brown clay	5'		
223-236'		Greenish brown clayey sand	13'		
236-240'		Pea Gravel	4'		
240-260'		Whiteish-tan clayey sand w/minor gravel lenses	20'		
260-261'		Pea Gravel	1'		
261-268'		Whiteish-tan clayey sand	7'		
268'-282'		Pea gravel and coarse sand	14'		

OBTAINED BY Peter Stroud DATE 9/19/77 SHEET 1 OF 2

FOR FIELD COPIES USE ALTERNATE LINES

203

FORM 263A
INVESTIGATION

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

SHEET 2

NUMBER SCF-6

WELL LOG

LOCAL DESIGNATION

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% VOIDS	ABSOLUTE VOIDS FEET	TOTAL VOIDS FEET
282-288'		Silty buff clay	6'			
288-310'		Pea gravel and coarse sand	22'			
310-326'		Brown clayey gravel (no water)	16'			
		*Note: There is a 10' section of drill pipe at the bottom of this hole.				

FOR FIELD COPIES USE ALTERNATE LINES

APPLIED GEOLOGICAL ENGINEERING, INC.
8085 CALLISON RD.
NEWCASTLE, CA 95658
(916) 663-2696

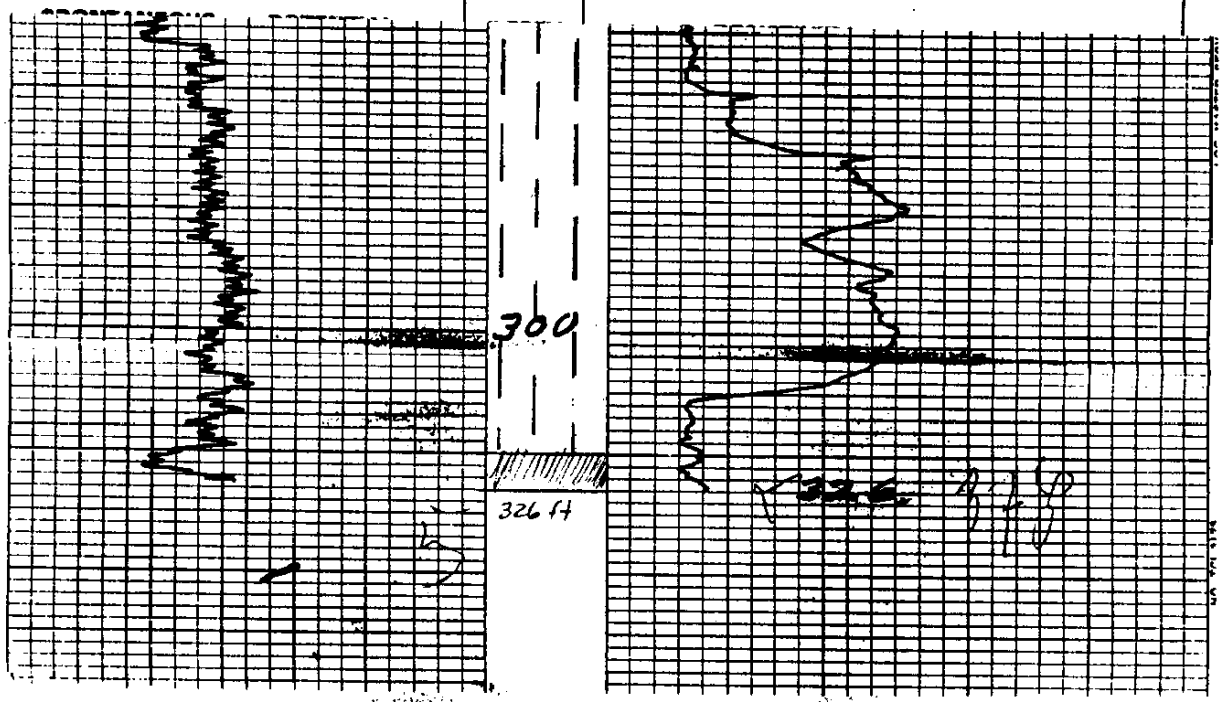
ELECTRICAL WELL LOG

Company CALIFORNIA STATE DIVISION OF WATER RESOUARCE Red Bluff, Dist. Test Hole No. SCF-6

County Glenn State Ca. Elevation 120 Location Sec. 33, T20N, R2 W.

	Run No. 1	Run No. 2
Date	Aug. 24, 1977	
First Reading	10	
Last Reading	326	
Footage Logged	316	
Bottom (Driller)	325	
Casing (From Log)	-	
Casing (Driller)	-	
Casing Size	-	
Bit Size:	10	
Bit Size:		

MUD	Run No. 1	Run No. 2
Nature	Natural + Bentonite	
Density		
Viscosity	40 + @ °F	@ °F
Resistivity	40 @ 72 °F	@ °F
Res. @ BHT	@ °F	@ °F
pH		
Circ. Temp.		
S.H. Temp		
Logged by	Paulsen	
Witnessed by	Lorene, Pearson	



ORIGINAL
File with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E057712

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO. 20N/10W-7
LATITUDE / LONGITUDE
APN/TRS/OTHER

Owner's Well No. 8123
Date Work Began 6/4/2007, Ended 6/18/2007
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW 280-07 Permit Date 5/31/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	10	TOP SOIL
10	40	BROWN CLAY WITH SAND AND GRAVEL
40	130	YELLOW BROWN CLAY WITH SAND STREAKS
130	140	SAND AND GRAVEL
140	250	YELLOW BROWN CLAY WITH SAND STREAKS
250	260	SAND AND GRAVEL
260	310	YELLOW BROWN CLAY WITH SAND STREAKS
310	465	YELLOW BROWN CLAY WITH SAND AND GRAVEL
465	485	SAND AND GRAVEL WITH BLUE CLAY
485	500	SAND AND GRAVEL
500	530	BLUE CLAY WITH SAND
530	625	BLUE AND YELLOW CLAY MIX WITH SAND AND GRAVEL STREAKS
625	700	SAND AND GRAVEL WITH YELLOW AND BLUE CLAY MIX
700	865	YELLOW BROWN AND BLUE CLAY MIX WITH SAND AND GRAVEL
865	1000	GRAY CLAY WITH SAND AND GRAVEL STREAK
1000	1050	SAND AND GRAVEL
1050	1200	SAND AND GRAVEL WITH BLUE GRAY CLAY
1200	1300	YELLOW ORANGE CLAY WITH SAND AND GRAVEL STREAKS
1300	1395	SOFT YELLOW GRAY CLAY WITH SAND AND GRAVEL
1395	1400	HARD ROCK

TOTAL DEPTH OF BORING 1400 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1034 (Feet)

WELL OWNER

WELL LOCATION
Address 50' EOF RD D & .46 MI SOF RD 35
City CA
County GLENN
APN Book 020 Page 210 Parcel 008
Township 20 N Range 3 W Section 7
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if **necessary. PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)
WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED
ESTIMATED YIELD * — (GPM) & TEST TYPE
TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
0	118	16	✓				PVC	2.5	SCH 80	
118	128	16		✓			PVC	2.5	SCH 80	.030
128	138	16	✓				PVC	2.5	SCH 80	
ZONE	2									
0	380	16/14	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	84	✓			SAND SLURRY
84	95		✓		BENTONITE C
95	160			✓	SRI#8 SAND
160	176		✓		BENTONITE C
176	318			✓	SRI#8 SAND
318	352		✓		BENTONITE C

ATTACHMENTS (✓)
— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 WEST KENTUCKY AVE ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP
Signed Mark Damion WELL DRILLER/AUTHORIZED REPRESENTATIVE — 07/06/07 DATE SIGNED — C57 A HIC - 133783 C-57 LICENSE NUMBER

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

OCT 17 2002

Page 1 of 2

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 726740, A

DWR USE ONLY — DO NOT FILL IN
21N/02W-01M
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7448-1

Date Work Began 8/26/2002, Ended 9/6/2002

Local Permit Agency GLENN CNTY HEALTH DEPT.

Permit No. MW-139-02 Permit Date 8/21/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 10	WELL GRADED SAND W/SILT AND FINE GRVL
10 20	WELL GRADED SAND WITH FINE GRAVEL
20 50	POORLY GRADED SAND AND GRAVEL
50 60	POORLY GRADED SND AND GRVL W/TAN CLY
60 70	POORLY GRADED SAND WITH GRAVEL
70 80	POORLY GRADED GRAVEL
80 100	GRAY/BROWN CLAY WITH SAND AND GRAVEL
100 110	POORLY GRADED SAND
110 120	POORLY GRADED SAND WITH FINE GRAVEL
120 150	POORLY GRADED GRAVEL
150 160	GRAVEL AND SAND W/YELLOW STICKY CLAY
160 190	YELLOW CLAY WITH GRAVEL AND SAND
190 200	POORLY GRADED GRAVEL W/SAND AND CLAY
200 230	YELLOW CLAY WITH SAND AND GRAVEL
230 240	YELLOW SILTY CLAY
240 250	YELLOW SILTY CLAY W/SAND AND GRAVEL
250 260	SMALL GRAVEL WITH SAND AND SILTY CLAY
260 270	POORLY GRADED GRAVEL WITH SAND
270 280	POORLY GRADED GRAVEL
280 300	GRAVEL
300 310	GRAVEL WITH FINE SAND
310 340	GRAVEL
340 350	TUSCAN ROCK WITH GRAVEL AND SAND
350 370	TUSCAN ROCK W/SANDSTONE, QUARTZ,
	OTHER METAMORPHICS, TUFF, BASALT, SAND
370 380	COARSE SAND
380 450	TUSCAN AND METAMORPHIC RCK W/SND, CLY
450 460	SILTSTONE WITH GRAVEL, QUARTZ, RED
	CHERT, AND VOLCANICS
460 555	MIXED COLORED CLAY WITH GRAVEL

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 578 (Feet)

WELL LOCATION

Address .25 MI SOF C/R 24 & .75 MI EOF C/R V V

City CA

County GLENN

APN Book 037 Page 360 Parcel 060

Township 22N / 21N Range 2 W Section 15 01

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED

ESTIMATED YIELD * — (GPM) & TEST TYPE

TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE 1									
0 232	12					ACCESS TB	1		
0 547	12/8	✓				SCH 40	2		
547 557	8		✓			SS SCREE	2		.030
557 578	8	✓				SCH 40	2		
ZONE 2									

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 220	✓			SAND SLURRY
220 230		✓		CHIPS
230 385			✓	#8 GRD SAND
385 505	✓			SAND SLURRY
505 600			✓	#8 GRD SAND

OCT 22 2002

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY ADDRESS WOODLAND CITY CA STATE 95695 ZIP

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE

10/03/02 DATE SIGNED

133783-C57A C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 2 of 2

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726740

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7448-1
Date Work Began 8/26/2002, Ended 9/6/2002
Local Permit Agency GLENN CNTY HEALTH DEPT.
Permit No. MW-139-02 Permit Date 8/21/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
555	575	GRAVEL
575	605	MIXED COLORED CLAY W/SAND AND GRAVEL

TOTAL DEPTH OF BORING 600 (Feet)
TOTAL DEPTH OF COMPLETED WELL 578 (Feet)

WELL LOCATION

Address .25 MI SOF C/R 24 & .75 MI EOF C/R V V.
City CA
County GLENN
APN Book 037 Page 360 Parcel 060
Township 22 N Range 2 W Section 15
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	230	12					ACCESS TB	1		
0	297	12	✓				SCH 40	2		
297	307	12		✓			SS SCREE	2		.030
307	318	12	✓				SCH 40	2		

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	220	✓			SAND SLURRY
220	230		✓		CHIPS
230	385			✓	#8 GRD SAND
385	505	✓			SAND SLURRY
505	600			✓	#8 GRD SAND

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

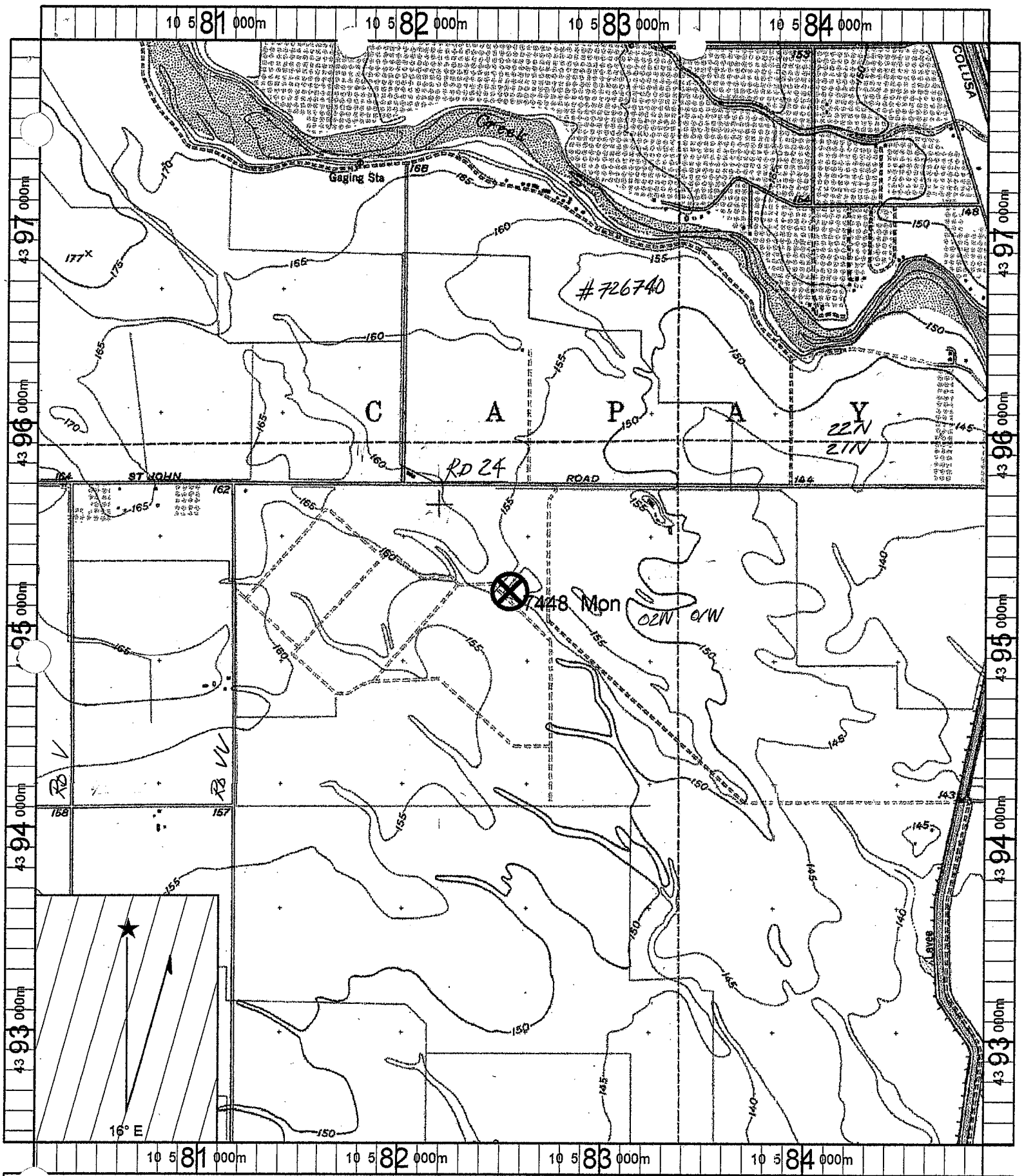
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP

Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE — 10/03/02 DATE SIGNED — 133783-C57A C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: HAMILTON CITY
Date: 8/15/2002
Scale: 1 inch equals 2000 feet

Caption: Glenn Co. (St. Johns Farms)
Job# 7448 Mon
APN: 037-360-06

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ORIGINAL
File with DWR

Page 1 of 2

Owner's Well No. 7448-2

Date Work Began 8/26/2002 Ended 9/6/2002

Local Permit Agency GLENN CNTY HEALTH DEPT

Permit No. MW-139-02 Permit Date 8/21/2002

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726741

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO. / STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL HORIZONTAL ANGLE (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to	Ft.	DESCRIPTION (Describe material, grain size, color, etc.)
0	10	WELL GRADED SAND W/SILT AND FINE GRVL
10	20	WELL GRADED SAND WITH FINE GRAVEL
20	50	POORLY GRADED SAND AND GRAVEL
50	60	POORLY GRADED SND AND GRVL W/TAN CLY
60	70	POORLY GRADED SAND WITH GRAVEL
70	80	POORLY GRADED GRAVEL
80	100	GRAY/BROWN CLAY WITH SAND AND GRAVEL
100	110	POORLY GRADED SAND
110	120	POORLY GRADED SAND WITH FINE GRAVEL
120	150	POORLY GRADED GRAVEL
150	160	GRAVEL AND SAND W/YELLOW STICKY CLAY
160	190	YELLOW CLAY WITH GRAVEL AND SAND
190	200	POORLY GRADED GRAVEL W/SAND AND CLAY
200	230	YELLOW CLAY WITH SAND AND GRAVEL
230	240	YELLOW SILTY CLAY
240	250	YELLOW SILTY CLAY W/SAND AND GRAVEL
250	260	SMALL GRAVEL WITH SAND AND SILTY CLAY
260	270	POORLY GRADED GRAVEL WITH SAND
270	280	POORLY GRADED GRAVEL
280	300	GRAVEL
300	310	GRAVEL WITH FINE SAND
310	340	GRAVEL
340	350	TUSCAN ROCK WITH GRAVEL AND SAND
350	370	TUSCAN ROCK W/SANDSTONE, QUARTZ, OTHER METAMORPHICS, TUFF BASALT, SAND
370	380	COARSE SAND
380	450	TUSCAN AND METAMORPHIC RCK W/SND, CLY
450	460	SILTSTONE WITH GRAVEL QUARTZ, RED CHERT, AND VOLCANICS
460	565	MIXED COLORED CLAY WITH GRAVEL

TOTAL DEPTH OF BORING 125 (Feet)

TOTAL DEPTH OF COMPLETED WELL 124 (Feet)

WELL LOCATION

Address 25 MI SOF C/R 24 & .75 MI EOF C/R V V

City CA

County GLENN

APN Book 037 Page 360 Parcel 050

Township 22 N Range 2 W Section 35

Latitude DEG. MIN. SEC. Longitude DEG. MIN. SEC.

LOCATION SKETCH

NORTH — WEST — EAST — SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
Deepen
Other (Specify)

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
Domestic Public
Irrigation Industrial

MONITORING ✓
TEST WELL
CATHODIC PROTECTION
HEAT EXCHANGE
DIRECT PUSH
INJECTION
VAPOR EXTRACTION
SPARGING
REMEDIATION
OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL (Ft.) & DATE MEASURED

ESTIMATED YIELD * (GPM) & TEST TYPE

TEST LENGTH (Hrs.) TOTAL DRAWDOWN (Ft.)

* May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
0	55	15					ACCESS TB	1		
0	109	15	✓				SCH 40	2		
109	119	15		✓			SS SCREE	2		030
119	124	15	✓				SCH 40	2		
ZONE	2									

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	46	✓			SAND SLURRY
46	80			✓	#8 GRD SAND
80	100		✓		CHIPS
100	119			✓	#6 GRD SAND
119	125		✓		CHIPS

ATTACHMENTS (✓)

Geologic Log
Well Construction Diagram
Geophysical Log(s)
Soil/Water Chemical Analyses
Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W KENTUCKY WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed [signature] 10/03/02 133783 C57A
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 2 of 2

Owner's Well No. 7448-2

Date Work Began 8-26/2002 Ended 9/6/2002

Local Permit Agency GLENN CNTY HEALTH DEPT

Permit No. MW-139-02 Permit Date 8/21/2002

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726741

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL HORIZONTAL ANGLE (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE — DESCRIPTION (Describe material, grain size, color, etc.)

Ft.	to Ft.	Description
555	575	GRAVEL
575	605	MIXED COLORED CLAY W/SAND AND GRAVEL

TOTAL DEPTH OF BORING 125 (Feet)

TOTAL DEPTH OF COMPLETED WELL 124 (Feet)

WELL LOCATION

Address .25 MI SOF C/R 24 & .75 MI EOF C/R V V

City CA

County GLENN

APN Book 037 Page 360 Parcel 060

Township 22 N Range 2 W Section 15

Latitude DEG. MIN. SEC. Longitude DEG. MIN. SEC.

LOCATION SKETCH

NORTH — WEST — EAST — SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
Deepen
Other (Specify)
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
Domestic Public
Irrigation Industrial
MONITORING ✓
TEST WELL
CATHODIC PROTECTION
HEAT EXCHANGE
DIRECT PUSH
INJECTION
VAPOR EXTRACTION
SPARGING
REMEDIATION
OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL (Ft.) & DATE MEASURED

ESTIMATED YIELD * (GPM) & TEST TYPE

TEST LENGTH (Hrs.) TOTAL DRAWDOWN (Ft.)

* May not be representative of a well's long-term yield.

CASING (S)

Depth From Surface Ft.	to Ft.	Bore-Hole Dia. (Inches)	Blank	Screen	Con-ductor	Fill Pipe	Material / Grade	Internal Diameter (Inches)	Gauge or Wall Thickness	Slot Size if Any (Inches)
0	55	15					ACCESS TB.	1		
0	55	15	✓				SCH 40	2		
55	65	15		✓			SS SCREE	2		.030
65	75	15	✓				SCH 40	2		

ANNULAR MATERIAL

Depth From Surface Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	Filter Pack (Type/Size)
0	46	✓			SAND SLURRY
46	80			✓	#8 GRD SAND
80	100		✓		CHIPS
100	119			✓	#8 GRD SAND
119	125		✓		CHIPS

ATTACHMENTS (✓)

Geologic Log
Well Construction Diagram
Geophysical Log(s)
Soil/Water Chemical Analyses
Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

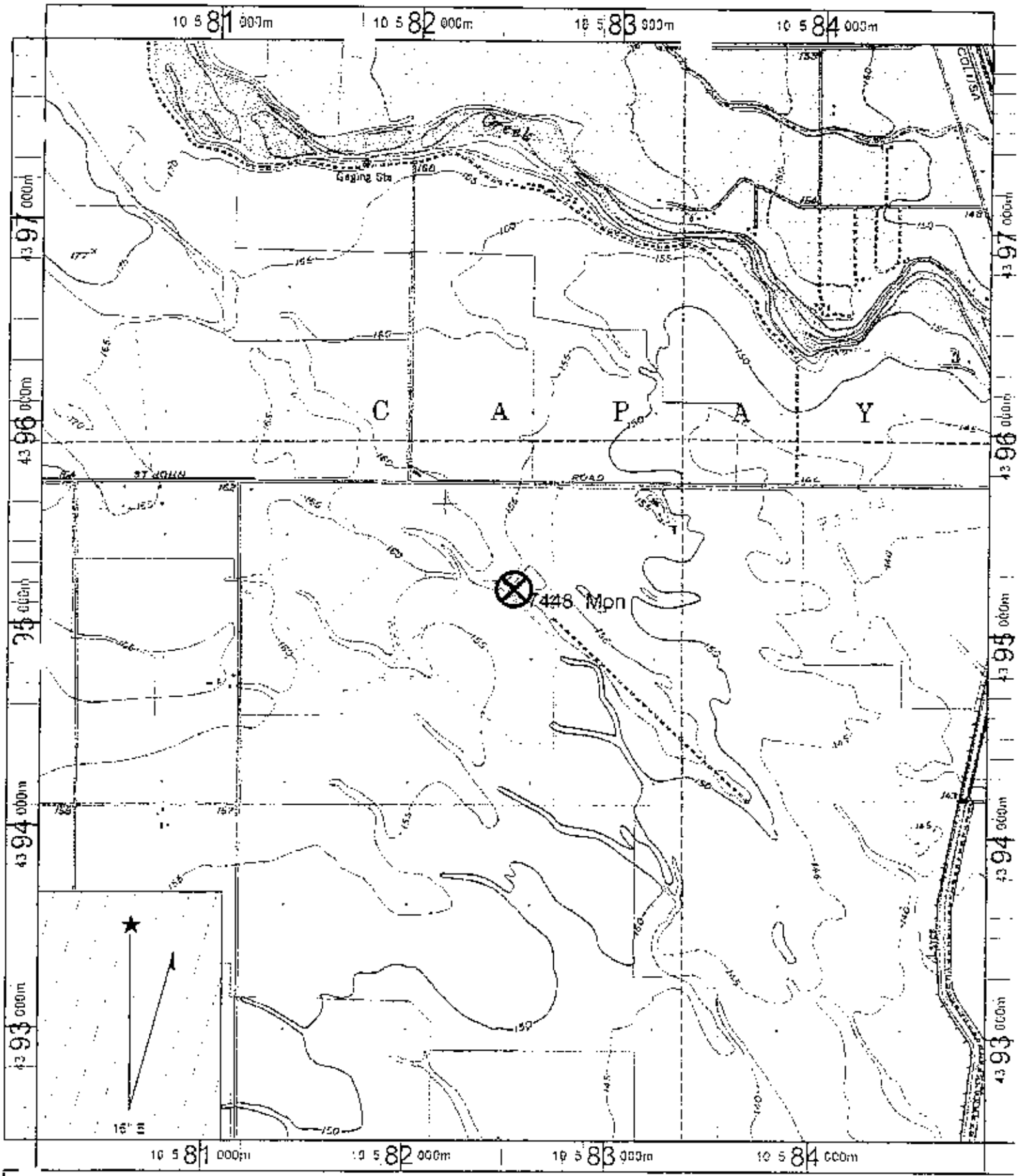
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed [signature] 10/03/02 133793-C57A
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11/97 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: HAMILTON CITY
Date: 8/15/2002
Scale: 1 inch equals 2000 feet

Caption: Glenn Co. (St. Johns Farms)
Job# 7448 Mon
APN: 037-360-06

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ORIGINAL
File with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E044112

DWR USE ONLY --- DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7987

Date Work Began 7/12/2006, Ended 7/28/2006

Local Permit Agency GLENN COUNTY HEALTH DEPT

Permit No. MW248-06 Permit Date 6/14/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	TOP SOIL
3	20	SAND AND GRAVEL
20	110	3/4" GRAVEL WITH YELLOW BROWN CLAY
110	150	YELLOW BROWN CLAY
150	290	YELLOW BROWN CLAY WITH SAND AND GRAVEL
290	330	LOOSE GRAVEL WITH SAND
330	460	SOFT GRAY CLAY WITH SAND AND GRAVEL
460	500	BRITTLE YELLOW AND GRAY CLAY MIX WITH COARSE SAND
500	620	BRITTLE YELLOW CLAY WITH SAND AND GRAVEL
620	920	BRITTLE GRAY CLAY WITH SAND AND GRAVEL
920	1200	SOFT SILTY GRAY CLAY WITH SAND STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)

TOTAL DEPTH OF COMPLETED WELL 948 (Feet)

WELL LOCATION

Address .5 MI SOF RD 24 & .67 MI EOF RD S

City CA

County GLENN

APN Book 023 Page 220 Parcel 005

Township 21 N Range 2 W Section 4 18

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY

___ Domestic ___ Public

___ Irrigation ___ Industrial

MONITORING ✓

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
+2.5	57	14	✓				PVC F480	2.5	SCH 80	
57	67	14		✓			PVC F480	2.5	SCH 80	.030
67	77	14	✓				PVC F480	2.5	SCH 80	
ZONE	2									
+2	165	14	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

Next Page

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analysis

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS | WOODLAND CITY | CA STATE | 95695 ZIP

Signed Mark Damion
WELL DRILLER/AUTHORIZED REPRESENTATIVE

09/05/06 DATE SIGNED

C57 A HIC - 133783 C-57 LICENSE NUMBER

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E044112

DWR USE ONLY --- DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7987

Date Work Began 7/12/2006, Ended 7/28/2006

Local Permit Agency GLENN COUNTY HEALTH DEPT

Permit No. MW248-06 Permit Date 6/14/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	TOP SOIL
3	20	SAND AND GRAVEL
20	110	3/4" GRAVEL WITH YELLOW BROWN CLAY
110	150	YELLOW BROWN CLAY
150	290	YELLOW BROWN CLAY WITH SAND AND GRAVEL
290	330	LOOSE GRAVEL WITH SAND
330	460	SOFT GRAY CLAY WITH SAND AND GRAVEL
460	500	BRITTLE YELLOW AND GRAY CLAY MIX WITH COARSE SAND
500	620	BRITTLE YELLOW CLAY WITH SAND AND GRAVEL
620	920	BRITTLE GRAY CLAY WITH SAND AND GRAVEL
920	1200	SOFT SILTY GRAY CLAY WITH SAND STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)

TOTAL DEPTH OF COMPLETED WELL 948 (Feet)

WELL LOCATION

Address .5 MI SOF RD 24 & .67 MI EOF RD S

City CA

County GLENN

APN Book 023 Page 220 Parcel 005

Township 21 N Range 2 W Section 4

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
165	175	14		✓			PVC F480	2.5	SCH 80	.030
175	269	14	✓				PVC F480	2.5	SCH 80	
269	279	14		✓			PVC F480	2.5	SCH 80	.030
279	289	14	✓				PVC F480	2.5	SCH 80	
ZONE +1.5	3 673.5	14	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	41	✓			SAND SLURRY
41	45		✓		BENTONITE C
45	99			✓	SRI#8 SAND
99	104		✓		BENTONITE C
104	130			✓	SRI#8 SAND
130	135		✓		BENTONITE C

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS WOODLAND CITY CA STATE 95695 ZIP

Signed Mark Damron WELL DRILLER/AUTHORIZED REPRESENTATIVE

09/05/06 DATE SIGNED

C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 11 of 12

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E044112

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7987
Date Work Began 7/12/2006, Ended 7/28/2006
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW248-06 Permit Date 6/14/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	TOP SOIL
3	20	SAND AND GRAVEL
20	110	3/4" GRAVEL WITH YELLOW BROWN CLAY
110	150	YELLOW BROWN CLAY
150	290	YELLOW BROWN CLAY WITH SAND AND GRAVEL
290	330	LOOSE GRAVEL WITH SAND
330	460	SOFT GRAY CLAY WITH SAND AND GRAVEL
460	500	BRITTLE YELLOW AND GRAY CLAY MIX WITH COARSE SAND
500	620	BRITTLE YELLOW CLAY WITH SAND AND GRAVEL
620	920	BRITTLE GRAY CLAY WITH SAND AND GRAVEL
920	1200	SOFT SILTY GRAY CLAY WITH SAND STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 948 (Feet)

WELL LOCATION

Address .5 MI SOF RD 24 & .67 MI EOF RD S
City CA
County GLENN
APN Book 023 Page 220 Parcel 005
Township 21 N Range 2 W Section 4
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ——— (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ——— (Ft.) & DATE MEASURED ———
ESTIMATED YIELD * ——— (GPM) & TEST TYPE ———
TEST LENGTH ——— (Hrs.) TOTAL DRAWDOWN ——— (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
673.5	683.5	14		✓			PVC F480	2.5	SCH 80	.030
683.5	693.5	14	✓				PVC F480	2.5	SCH 80	
693.5	703.5	14		✓			PVC F480	2.5	SCH 80	.030
703.5	713.5	14	✓				PVC F480	2.5	SCH 80	
ZONE +1	4 928	14/8-3/4	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
135	327			✓	SRI#8 SAND
327	335		✓		BENTONITE C
335	647	✓			SAND SLURRY
647	653		✓		BENTONITE C
653	715			✓	SRI#8 SAND
715	736		✓		BENTONITE C

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 20 WEST KENTUCKY AVE CITY WOODLAND STATE CA ZIP 95695
Signed Mark Davison WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 09/05/06
C-57 LICENSE NUMBER C57 A HIC - 133783

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. **E044112**

DWR USE ONLY -- DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7987
Date Work Began 7/12/2006, Ended 7/28/2006
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW248-06 Permit Date 6/14/2006

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	TOP SOIL
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110	150	YELLOW BROWN CLAY
150	290	YELLOW BROWN CLAY WITH SAND AND GRAVEL
290	330	LOOSE GRAVEL WITH SAND
330	460	SOFT GRAY CLAY WITH SAND AND GRAVEL
460	500	BRITTLE YELLOW AND GRAY CLAY MIX WITH COARSE SAND
500	620	BRITTLE YELLOW CLAY WITH SAND AND GRAVEL
620	920	BRITTLE GRAY CLAY WITH SAND AND GRAVEL
920	1200	SOFT SILTY GRAY CLAY WITH SAND STREAKS

TOTAL DEPTH OF BORING 1200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 948 (Feet)

WELL LOCATION

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City CA
County GLENN
APN Book 023 Page 220 Parcel 005
Township 21 N Range 2 W Section 4
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED
ESTIMATED YIELD * — (GPM) & TEST TYPE
TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
928	938	8-3/4		✓			PVC F480	2.5	SCH 80	.030
938	948	8-3/4	✓				PVC F480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
736	902	✓			SAND SLURRY
902	914		✓		BENTONITE C
914	964			✓	SRI#8 SAND
964	977		✓		BENTONITE C
977	1200			✓	NATIVE FILL

ATTACHMENTS (✓)
— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 WEST KENTUCKY AVE (ADDRESS) WOODLAND (CITY) CA (STATE) 95695 (ZIP)
Signed Mark Damron (WELL DRILLER/AUTHORIZED REPRESENTATIVE) 09/05/06 (DATE SIGNED) C57 A HIC - 133783 (C-57 LICENSE NUMBER)

DWR 188 REV. 11-97

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ORIGINAL
File with DWR

WELL COMPLETION REPORT

No. 801406

Glenn

Rotary Mud

0	20	Fine Sand & some coarse sand w/ some gravel
20	30	Sand & Gravel
30	40	Sand & Coarse Sand w/ some gravel
40	45	Clay
45	58	gravelly Sand
58	94	Tan Silty clay
94	98	Clayey gravel
98	122	Tan clay
122	132	gravel
132	139	Tan clay
139	149	Sandy gravelly clay
149	169	Tan clay
169	176	Clayey gravel
176	192	Tan clay
192	202	gravel
202	227	Tan clay
227	232	Clayey Sand & gravel
232	292	Lt. yellow-Brown clay
292	304	Sandy gravel
304	316	Lt yellow-Brown clay
316	342	Gravel & sand with clay
342	344	Sand
344	366	Clayey Sand
366	428	Lt. yellow Brown Clay
428	434	Sand
434	442	Lt. yellow-Brown Clay
442	452	Gravel
452	518	Lt yellow Brown Clay
518	520	Sandy gravel

* Triple Completion well 1=Dep 2=Interside 3=Shallow

520

WELL LOCATION

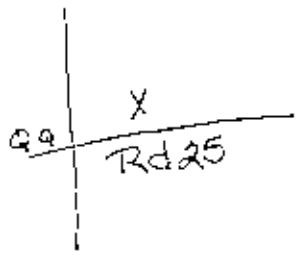
Rd 25 & 00

Glenn

Glenn

023 020 028

LOCATION SKETCH



ACTIVITY

X

PLANNED USES

X

WATER LEVEL & YIELD OF COMPLETED WELL

CASING

*Comp							
1.	473/442	462, Surface	X	Steel	24"	Sch40	
	452	442	X	S.S	24"		0 @ 2"
2.	153/122	132, Surface	X	Steel	24"	Sch40	
	132	122	X	S.S	24"		0 @ 2
3	75, 44	54, Surface	X	Steel	24"	Sch40	
	54	44	X	S.S	24"		0 @ 2

ANNULAR MATERIAL

490	428		# 8 Sand
428	161	X	
161	105		#2 Sand
105	73	X	
73	34		#2 Sand
34	0	X	

ATTACHMENTS

CERTIFICATION STATEMENT

Spectrum Exploration

PO Box 471 Zamora CA 95698

Charlene Borches 4/25/02 542268

Casing

Deep Well

Ft to Ft	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
473 - 452		Blank	Steel	2"	Sch 40	
452 – 442		Screen	Steel	2"	Sch 40	020
442 – –		Blank	Steel	2"	Sch 40	
203 - -		Blank	Steel	1"	Sch 40	

Middle Well

Ft to Ft	Borehole Dia	Type	Material Grade	Internal Dia	Gauge	Slot Size
153 – 132		Blank	Steel	2"	Sch 40	
132 – 122		Screen	Steel	2"	Sch 40	020
122 - -		Blank	Steel	2"	Sch 40	
123 - -		Blank	Steel	1"	Sch 40	

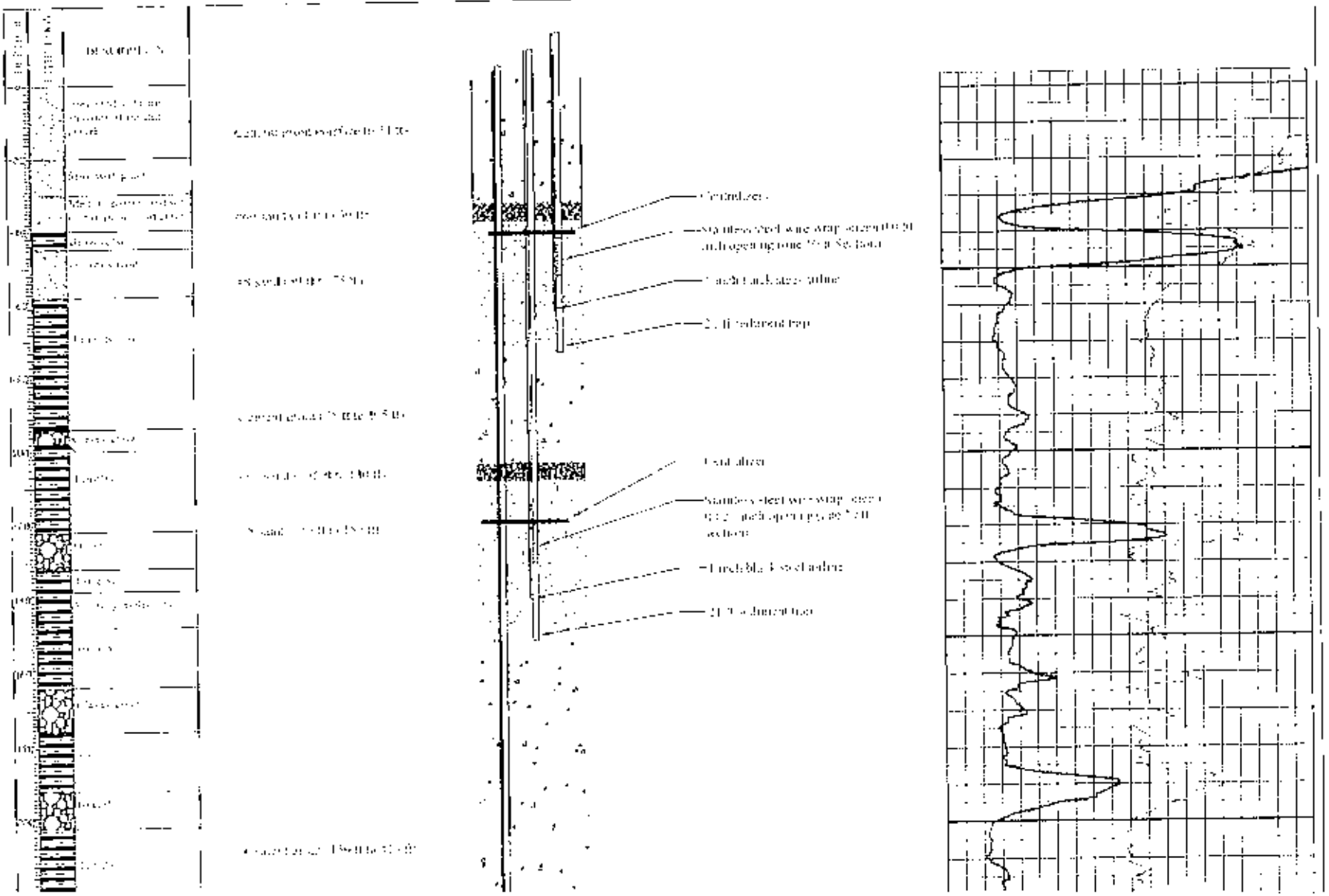
Shallow Well

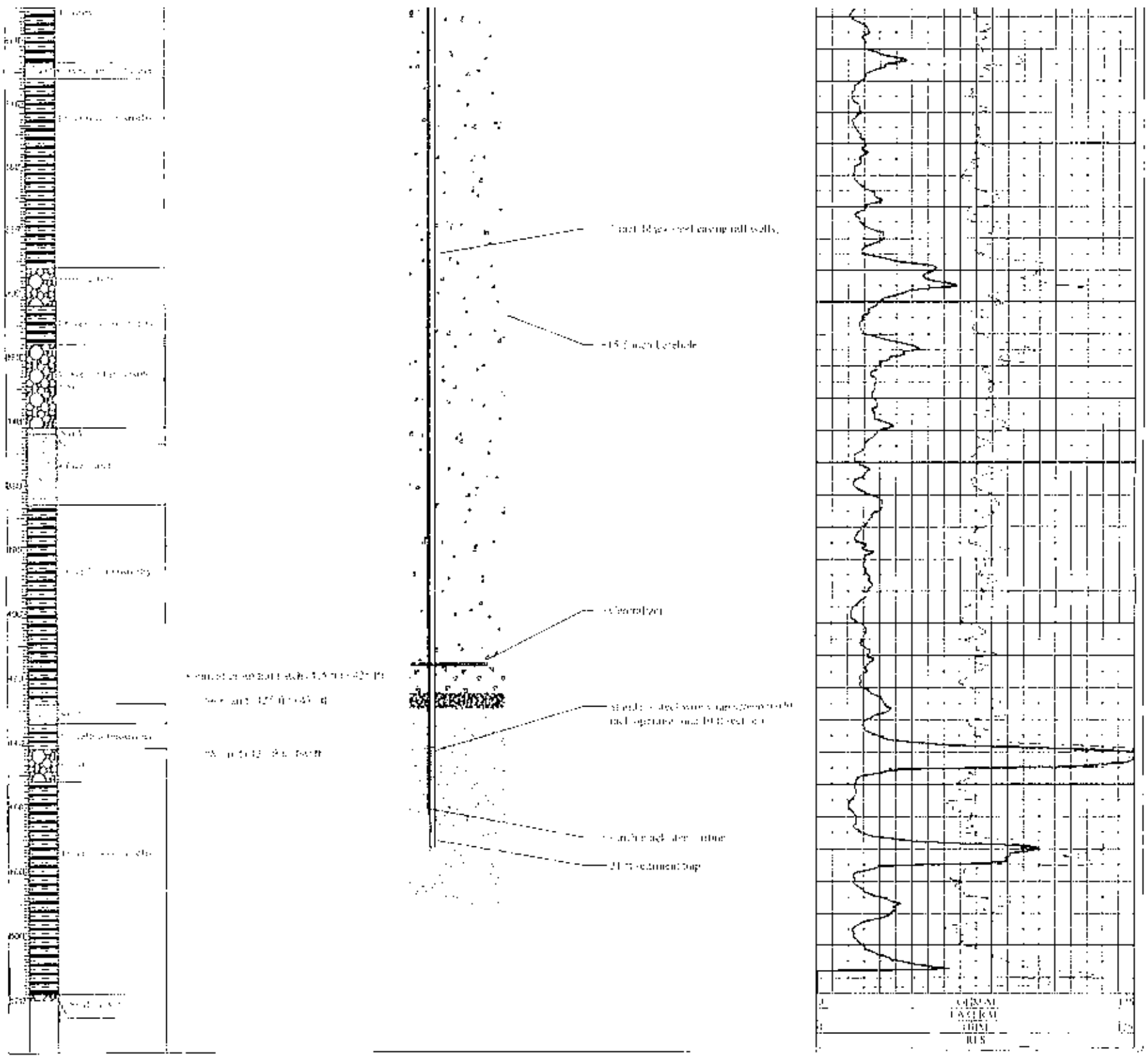
Ft to Ft	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
75 – 54		Blank	Steel	2"	Sch 40	
54 - 44		Screen	Steel	2"	Sch 40	020
44 - -		Blank	Steel	2"	Sch 40	
05 - -		Blank	Steel	1"	Sch 40	

Annular Material

Ft to Ft.	Type

STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHEAST DISTRICT





ORIGINAL
File with DWR

AUG 08 2002

Page 1 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 726724 ~~A,B,C~~ A&C

DWR USE ONLY — DO NOT FILL IN
21N/02W-33M
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7450
Date Work Began 7/11/2002, Ended 7/19/2002
Local Permit Agency GLENN COUNTY HEALTH DEPT.
Permit No. MW134-02 Permit Date 6/25/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	BROWN/YELLOW CLAY
20	36	STICKY BROWN/YELLOW CLAY
36	48	PALE OLIVE CLAY
48	60	DARK YELLOW/BROWN CLAY
60	80	SUBANGULAR TO ROUNDED GRAVEL
80	100	SILTY SANDY CLAY
100	133	SILTY SANDY CLAY WITH ROUNDED GRAVEL
133	160	POORLY GRADED, ROUNDED TO SUBROUNDED GRAVEL
160	190	DUSKY YELLOW/BROWN SILTY CLAY
190	209	DUSKY YELLOW/BROWN SILTY CLAY WITH SIL AND SAND
209	229	MEDIUM BROWN/YELLOW CLAY
229	240	POORLY SORTED GRAVEL WITH VERY COARSE SAND
240	250	GRAVEL
250	260	YELLOW/BROWN CLAY
260	270	BLUE/GREEN CLAY
270	280	GRAVELLY CLAY
280	290	BLUE/GREEN CLAY AND GRAVELLY SAND
290	310	BLUE/GREEN CLAY
310	320	GRAVEL AND CLAY
320	330	BLUE/GREEN SILTY CLAY
330	340	CLAY AND GRAVEL
340	430	BLUE/GREEN CLAY
430	469	BLUE/GREEN CLAY WITH GRAVEL AND SAND
469	529	GREEN/BLUE CLAY
529	549	GRAVEL AND SAND
549	589	VERY STICKY BLUE/GREEN CLAY WITH FINE SA
589	689	BLUE/GREEN CLAY WITH COARSE SAND

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 974.2 (Feet)

WELL LOCATION

Address .4 MI N OF C/R 33 & W OF C/R S
City CA
County GLENN
APN Book 023 Page 190 Parcel 010
Township 21 N Range 2 W Section 33
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ✓
EXTENSOMETE

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
MON	1									
0	161.1	36/18					ACCESS TB	1	SCH 40	
0	140	36/18	✓				BLCK PIPE	2	SCH 40	
140	150	18		✓			STL STEEL	2		.020
150	171.1	18	✓				BLCK PIPE	2	SCH 40	
MON	2									

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	40	✓			SAND SLURRY
0	95.5		✓		HALLIBURTON
95.5	210			✓	#8 GRD SAND
210	507.5		✓		HALLIBURTON
507.5	577			✓	#8 GRD SAND
577	796		✓		HALLIBURTON

AUG 12

A

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 20 W. KENTUCKY CITY WOODLAND STATE CA ZIP 95695
Signed Mark Dawson WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 08/07/02
C-57 LICENSE NUMBER 133783-C57A

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

AUG 08 2002

Page 2 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726724

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7450
Date Work Began 7/11/2002, Ended 7/19/2002
Local Permit Agency GLENN COUNTY HEALTH DEPT.
Permit No. MW134-02 Permit Date 6/25/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
689	705	GRAVEL
705	780	BLUE/GREEN CLAY
780	790	POORLY SORTED GRAVEL AND COARSE SAND
790	850	BLUE/GREEN CLAY
850	870	POORLY SORTED SUBANGULAR TO ROUNDED GRAVEL
870	940	POORLY SORTED GRAVEL WITH PYRITE
940	960	GRAY CEMENTED SILTY CLAY
960	980	DARK GRAY SILT TO FINE SAND
980	1000	GRAY/BLUE CLAY WITH FINE SAND
1000	1020	SAND AND GRAVEL

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 974.2 (Feet)

WELL LOCATION

Address .4 MI N OF C/R 33 & W OF C/R S
City CA
County GLENN
APN Book 023 Page 190 Parcel 010
Township 21 N Range 2 W Section 33
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ✓
EXTENSOMETE

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	328	36/18					ACCESS TB	1	SCH 40	
0	540	36/18	✓				BLCK PIPE	2	SCH 40	
540	550	18		✓			STL STEEL	2		.020
550	571.1	18	✓				BLCK PIPE	2	SCH 40	
EXT	1									
0	869	36/18	✓				BLCK PIPE	4	SCH 40	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
796	929.3			✓	#8 GRD SAND
929.3	1020		✓		25% LIME

AUG 2002

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY ADDRESS WOODLAND CITY CA STATE 95695 ZIP
Signed Mark Davison WELL DRILLER/AUTHORIZED REPRESENTATIVE
08/07/02 DATE SIGNED
133783-C57A C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

AUG 08 2002

Page 3 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726724

DWR USE ONLY --- DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7450
Date Work Began 7/11/2002, Ended 7/19/2002
Local Permit Agency GLENN COUNTY HEALTH DEPT.
Permit No. MW134-02 Permit Date 6/25/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	BROWN/YELLOW CLAY
20	36	STICKY BROWN/YELLOW CLAY
36	48	PALE OLIVE CLAY
48	60	DARK YELLOW/BROWN CLAY
60	80	SUBANGULAR TO ROUNDED GRAVEL
80	100	SILTY SANDY CLAY
100	133	SILTY SANDY CLAY WITH ROUNDED GRAVEL
133	160	POORLY GRADED, ROUNDED TO
		SUBROUNDED GRAVEL
160	190	DUSKY YELLOW/BROWN SILTY CLAY
190	209	DUSKY YELLOW/BROWN SILTY CLAY WITH
		SIL AND SAND
209	229	MEDIUM BROWN/YELLOW CLAY
229	240	POORLY SORTED GRAVEL WITH VERY
		COARSE SAND
240	250	GRAVEL
250	260	YELLOW/BROWN CLAY
260	270	BLUE/GREEN CLAY
270	280	GRAVELLY CLAY
280	290	BLUE/GREEN CLAY AND GRAVELLY SAND
290	310	BLUE/GREEN CLAY
310	320	GRAVEL AND CLAY
320	330	BLUE/GREEN SILTY CLAY
330	340	CLAY AND GRAVEL
340	430	BLUE/GREEN CLAY
430	469	BLUE/GREEN CLAY WITH GRAVEL AND SAND
469	529	GREEN/BLUE CLAY
529	549	GRAVEL AND SAND
549	589	VERY STICKY BLUE/GREEN CLAY WITH FINE SA
589	689	BLUE/GREEN CLAY WITH COARSE SAND

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 974.2 (Feet)

WELL LOCATION

Address .4 MI N OF C/R 33 & W OF C/R S
City CA
County GLENN
APN Book 023 Page 190 Parcel 010
Township 21 N Range 2 W Section 33
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ✓
EXTENSOMETE

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
869	890	18		✓			MILLSLOT	4		
890	974.2	18	✓				BLCK PIPE	4	SCH 40	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	40	✓			SAND SLURRY
0	95.5		✓		HALLIBURTON
95.5	210			✓	#8 GRD SAND
210	507.5		✓		HALLIBURTON
507.5	577			✓	#8 GRD SAND
577	796		✓		HALLIBURTON

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ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

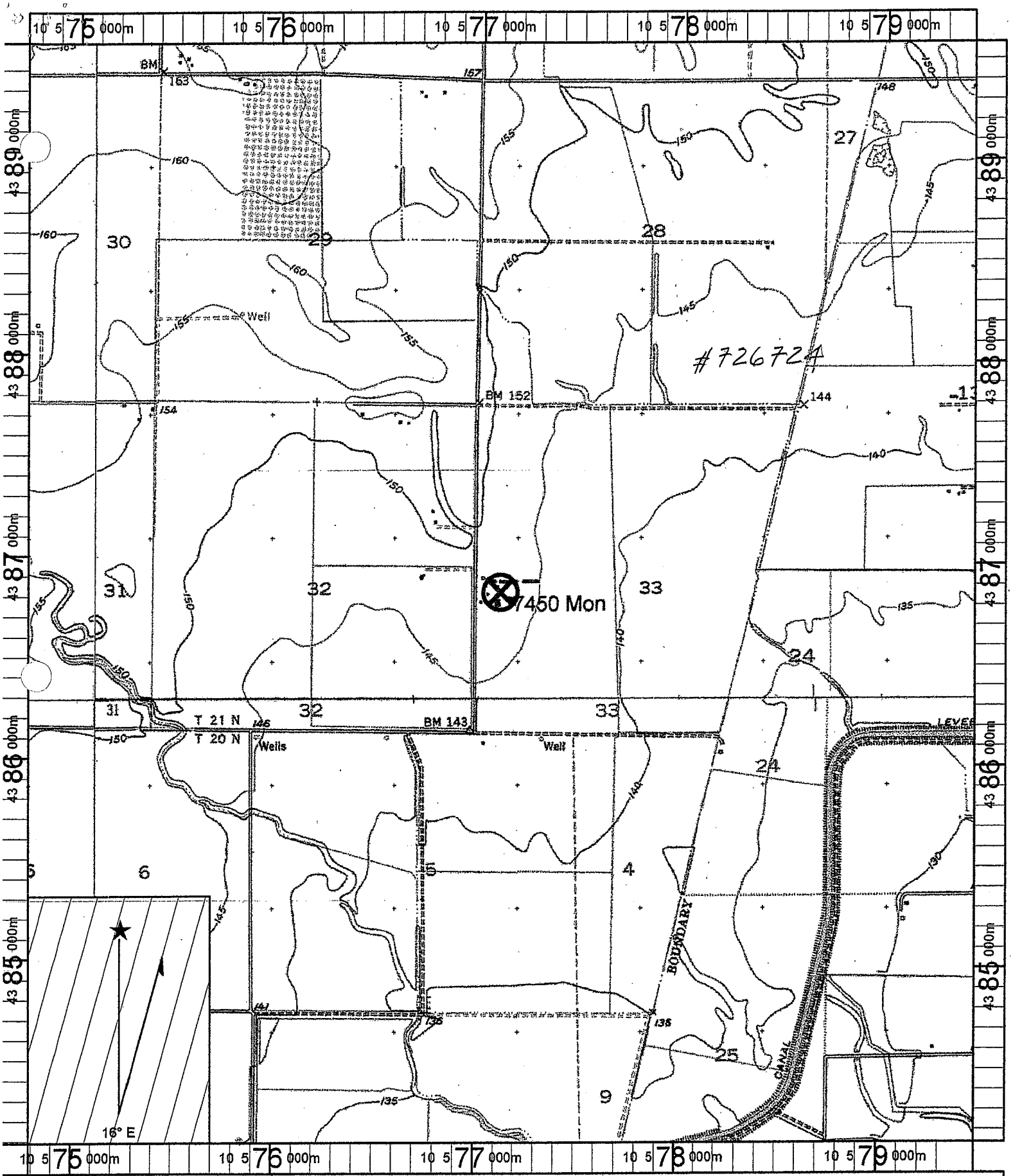
CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY ADDRESS WOODLAND CITY CA STATE 95695 ZIP
Signed Mark Davis WELL DRILLER/AUTHORIZED REPRESENTATIVE
08/07/02 DATE SIGNED
133783-C57A C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: HAMILTON CITY
Date: 8/7/2002
Scale: 1 inch equals 2000 feet

Location: 10 577107 E 4386837 N
Caption: Glenn County
Job# 7450 Mon
APN: 23-19-1

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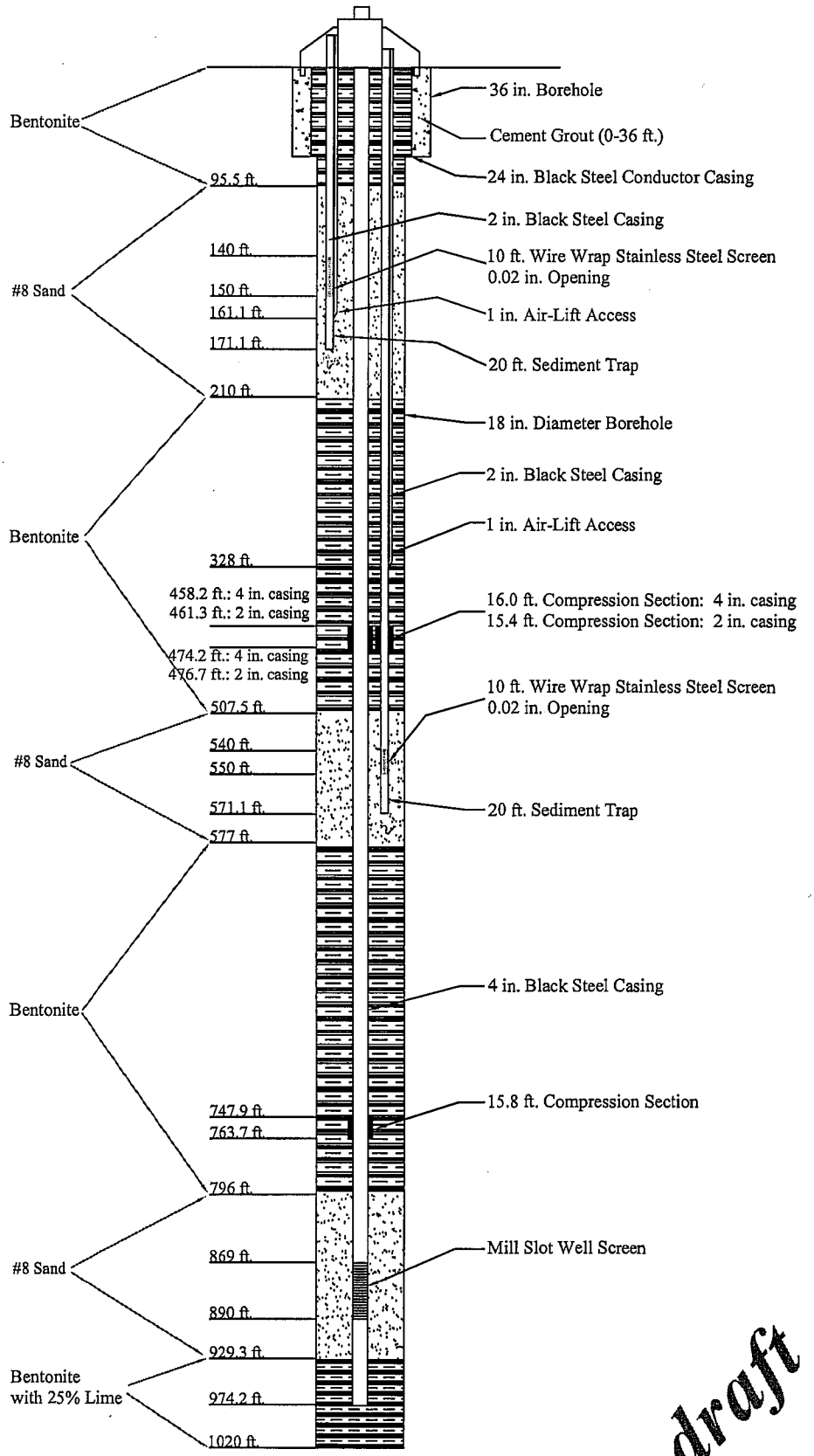
STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

PROJECT	Glenn County AB 303 Monitoring Well Project	HOLE NUMBER	GC_AB 303-1	NUMBER OF COMPLETIONS	3	CONTRACTOR	Eaton Drilling
FEATURE	Extensometer/Triple Completion Monitoring Well	TOTAL DEPTH	1020 ft	TYPE OF HOLE	Reverse Rotary	DRILL FOREMAN	Gary Frost
LOCATION	Glenn County, County Road S and County Road 30	DATE STARTED	7/12/02	TYPE OF RIG		INSPECTED BY	Staton, McManus & Lawrence
UTM COORDINATES	577199, 4387045 NAD 83	DATE COMPLETED	7/24/02	COMMENTS	Test hole drilled to 1020 ft.; well completed to 974.2 ft.		

#726724



draft

21N/02W-36M

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 315494

ce of Intent No. _____
Local Permit No. or Date B5768

State Well No. _____
Other Well No. 90215-1

(2) LOCATION OF WELL (See instructions): A7
County Glenn Owner's Well Number DMW-2
Well address if different from above _____
Township 21N Range 2W Section 36
Distance from cities, roads, railroads, fences, etc. _____
APN#: 23-08-041

See Attached

WELL LOCATION SKETCH

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

(4) PROPOSED USE:
Domestic [ ]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Municipal [ ]
Other [X]
(Describe) Monitoring

(5) EQUIPMENT:
Rotary [XX] Reverse [ ]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK: Monterey
Yes [X] No [ ] Size 6 x 12
Diameter of bore 12 in.
Packed from 110 ft. to 155 ft.

(7) CASING INSTALLED:
Steel [X] Plastic [ ] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall
0	120	6	3/16
140	145	6	3/16

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

From ft.	To ft.	Slot size
120	140	.050

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 110 ft.
Were strata sealed against pollution? Yes [ ] No [ ] Interval _____ ft.
Method of sealing _____

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

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

(12) WELL LOG: Total depth 155 ft. Completed depth 145 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	15	Brn sandy clay
15	25	Brn sandy clay and gravel
25	34	Grey clay and sand
34	40	Clay
40	55	Clay sand and gravel
55	68	Gravel
68	130	Gravel and clay
130	155	Gravel

Work started 3-22 19 89 Completed 3-24 19 89

WELL DRILLER'S STATEMENT: 153

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief

Signed _____ (Well Driller)
NAME Maggiora Bros. Drilling, Inc. (Person, firm, or corporation) (Typed or printed)
Address 595 Airport Blvd.
City Watsonville, CA ZIP 95076
License No. 249957 Date of this report 6-30-89

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DWR 188 (REV. 12-86) 86 96355

CONFIDENTIAL
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

ORIGINAL
File with DWR

MAR 02 2004

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 726894

Page 1 of 1

DWR USE ONLY — DO NOT FILL IN
21N/03W-01M
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7617 MON

Date Work Began 12/10/2003, Ended 12/17/2003

Local Permit Agency GLENN COUNTY HEALTH DEPT.

Permit No. MW 188-03 Permit Date 12/16/2003

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	2	TOPSOIL
2	70	SAND AND GRAVEL
70	82	YELLOW BROWN CLAY W/SAND AND GRAVEL
82	100	SAND AND GRAVEL
100	190	YELLOW BRWN CLY W/SND AND GRVL STRKS
190	230	BLUE CLAY W/SAND AND GRAVEL STREAKS
230	254	SAND AND GRAVEL
254	324	BLUE CLAY WITH SAND
324	340	SAND AND GRAVEL
340	780	BLUE CLAY W/SAND AND GRAVEL STREAKS
780	800	BLACK SAND AND GRAVEL
800	808	DARK GRAY BRITTLE CLAY
808	830	BLACK SAND AND GRAVEL
830	894	BRITTLE DARK GRAY CLAY WITH SAND
894	920	BLACK SAND AND GRAVEL
920	1038	LIGHT GRAY CLAY W/SAND AND GRVL STRKS
1038	1066	BLACK SAND WITH SMALL GRAVEL
1066	1100	LIGHT GRAY CLAY WITH SAND STREAKS

TOTAL DEPTH OF BORING 1530 (Feet)

TOTAL DEPTH OF COMPLETED WELL 255 (Feet)

WELL LOCATION

Address 50 FT N OF C/R 25 & 3.5 MI E OF I-5

City CA

County GLENN

APN Book 024 Page 020 Parcel 015

Township 21 N Range 3 W Section 1

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	235	6-5/8	✓				PVC	2	SCH 40	
235	245	6-5/8		✓			PVC	2	SCH 40	.030
245	255	6-5/8	✓				PVC	2	SCH 40	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	204	✓			SAND SLURRY
204	263			✓	#8 GRD SAND
263	271		✓		CHIPS
271	360			✓	#8 GRD SAND
360	1530	✓			SAND SLURRY

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY AVE. ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP

Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE — 12/18/03 DATE SIGNED — C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

21N/03W-23

ORIGINAL
File with DWR

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Owner's Well No. WELL A No. 801404A,B,C
Date Work Began 3/20/02 Ended 3/29/02
Local Permit Agency Glenn Co Health Dept.
Permit No. ___ Permit Date 3/12/02

DWR USE ONLY — DO NOT FILL IN
21N03W23D(1-3)M
STATE WELL NO./STATION NO.
TRIPLICATE COMPLETION REPORT
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary FLUID Mud

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	med. to Coarse Sand
20	30	gravel
30	38	gravel w/ fine to coarse Sand
38	39	gravel and Sand
39	40	Clay
40	60	gravel with fine to coarse Sand
60	70	gravel & Sand.
70	80	gravel w/ med. Sand & Clay
80	140	Lt Brown to Tan Clay w/ gravel
140	150	Sand w/ gravel & Clay
150	160	Gravel & Med. to Coarse Sand
160	170	gravel & Tan to Brown Clay
170	180	Tan/Brown Clay w/ gravel
180	190	Clay & Gravel w/ med. Sand
190	220	Gravel w/ tan to Brown Clay
220	320	Clay w/ minor amounts of gravel
320	330	gravel w/ tan/Brown Clay Slightly gravel
330	340	Gravel w/ Tan/Brown Clay
340	360	Clay
360	370	gravel w/ minor amounts of clay & Sand
370	460	Clay w/ minor amounts of gravel
460	500	Clay w/ minor amounts of Sand & gravel

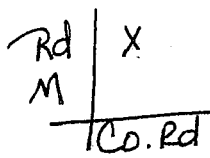
* This well was constructed w/ 3 completions
1 = deep 2 = moderate 3 = Shallow
393.5' 191.5' 93.5'

TOTAL DEPTH OF BORING 420 (Feet) 420'
TOTAL DEPTH OF COMPLETED WELL 393.5 (Feet)

WELL LOCATION

Address Co Road M
City Artois
County Glenn
APN Book 024 Page 050 Parcel 014-9
Township ___ Range ___ Section ___
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH
Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH

NORTH


WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING X
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

Comp.*	DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
1.	393, 363	373, Surface		X				Steel	2"	Sch 40	—
	373	363			X			SS.	2"		0.020
2.	191, 142	160-152, 142, 0		X				Steel	2"	Sch 40	
	170, 152	160, 142			X			S.S.	2"		0.020
3	93, 42	72, Surface		X				Steel	2"	Sch 40	
	72	42			X			S.S.	2"		0.020

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
420	339				#8 Sand
339	200	✓			
200	127				#8 Sand
127	84	✓			
84	33				#8 Sand
33	0	✓			

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Spectrum Exploration Inc (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 471 CITY Zamora STATE CA ZIP 95698
Signed Charlene Borches WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 4/18/02 C-57 LICENSE NUMBER 512268

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Department of Water Resources
Van Tol Deep

801404

Casing

Deep Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
393.5- 373		Blank	Steel	2"	Sch 40	
373 – 363		Screen	Steel	2"	Sch 40	.020
363 – +1'		Blank	Steel	2"	Sch 40	

A

Middle Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
191.5 – 170		Blank	Steel	2"	Sch 40	
170 – 160		Screen	Steel	2"	Sch 40	.020
160 – 152		Blank	Steel	2"	Sch 40	
152 – 142		Screen	Steel	2"	Sch 40	.020
142 - +1.5'		Blank	Steel	2"	Sch 40	

B

Shallow Well

Ft. to Ft.	Borehole Dia.	Type	Material Grade	Internal Dia	Gauge	Slot Size
93.5 – 72		Blank	Steel	2"	Sch 40	
72 – 42		Screen	Steel	2"	Sch 40	.020
42 - +2		Blank	Steel	2"	Sch 40	

C

Annular Material

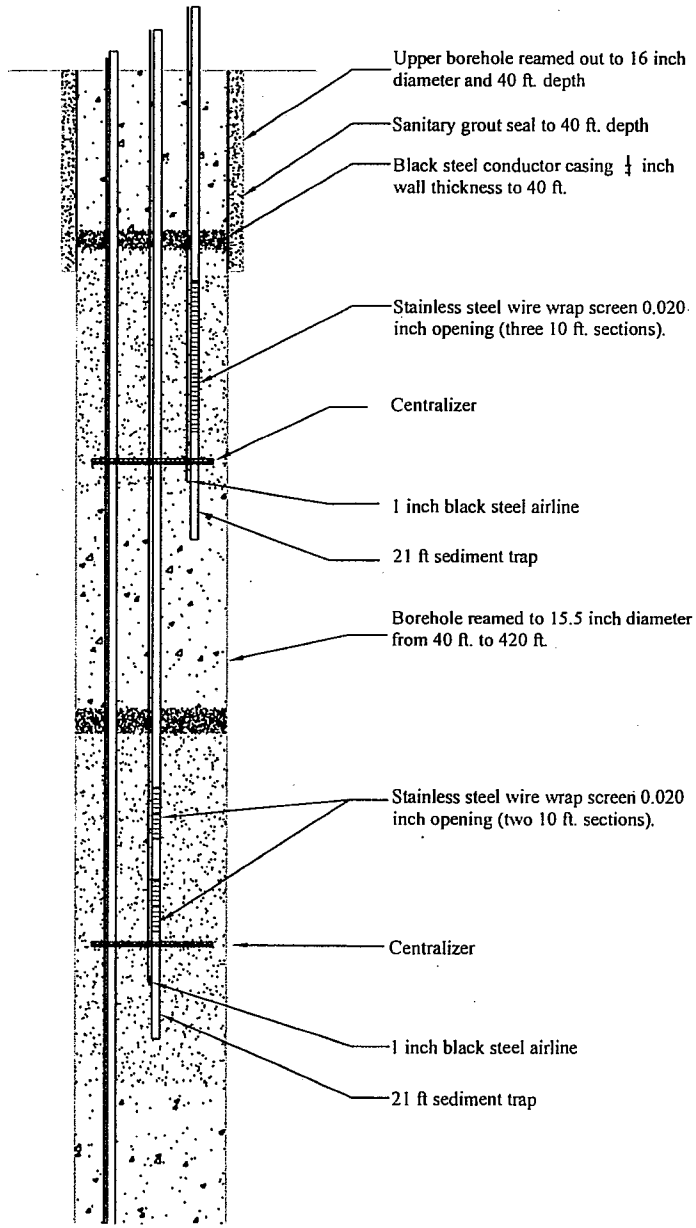
Ft. to Ft.	Type
393.5 - 353	#8 Sand
353 – 345	#60 Sand
345 - Surface	Cement Grout

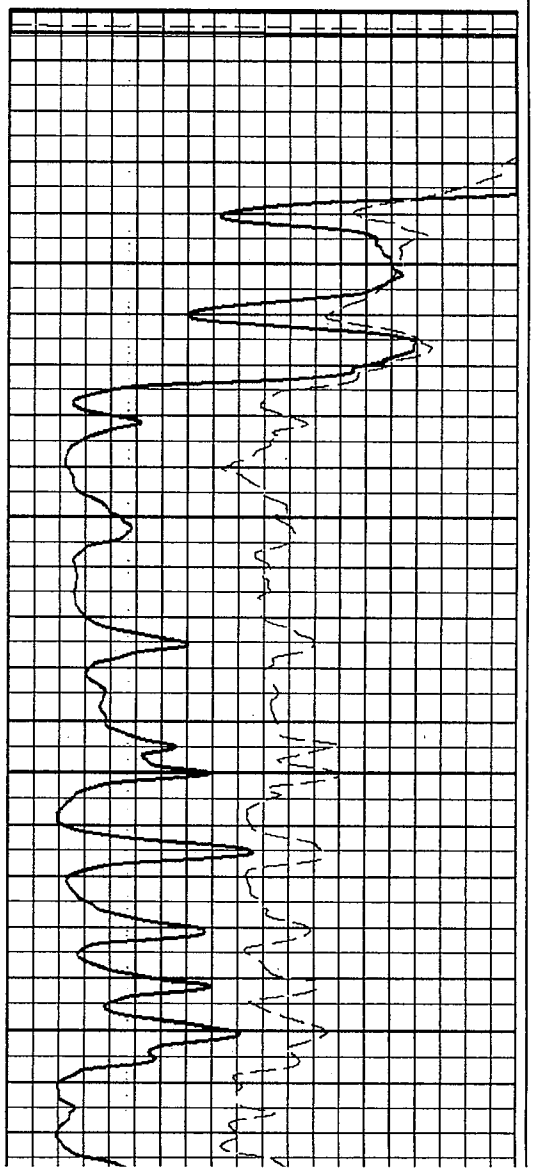
STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

STATE WELL NUMBERS: 21N03W23D01M-Deep Zone
21N03W23D02M-Middle Zone
21N03W23D03M-Shallow Zone

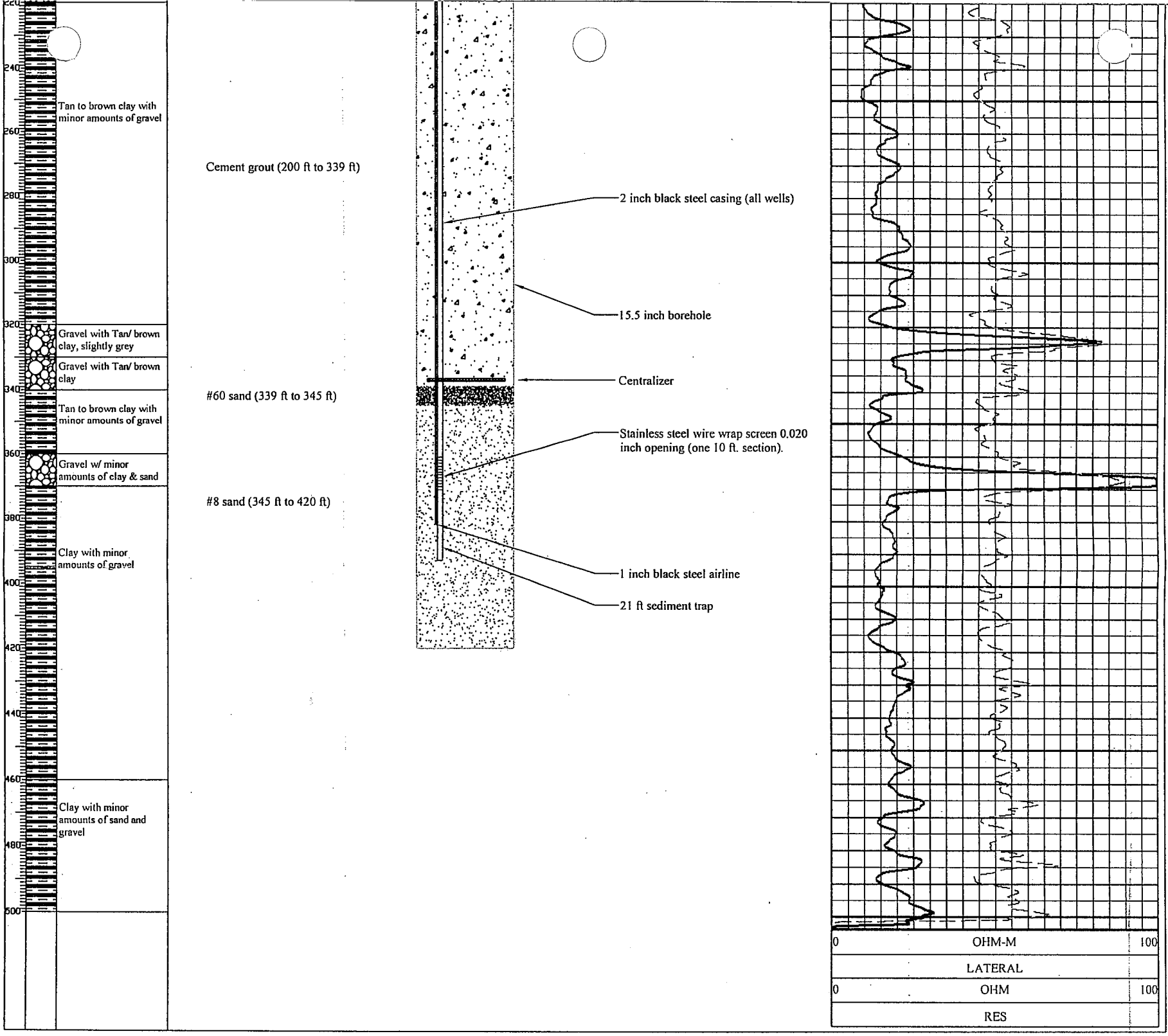
PROJECT	Stony Creek Recharge Pilot Project	HOLE NUMBER	Well A - Van Tol Site	NUMBER OF COMPLETIONS	3	CONTRACTOR	Spectrum Exploration, Inc.
FEATURE	Triple Completion Monitoring Well	TOTAL DEPTH	420 ft	TYPE OF HOLE	Direct Rotary	DRILL FOREMAN	Randy Criner
LOCATION	Glenn County, County Rd 27 and County Rd M	DATE STARTED	3/20/02	TYPE OF RIG	Ingersoll Rand	INSPECTED BY	Kelly Staton
UTM COORDINATES	UTM 10 NAD 83 570561, 4391143	DATE COMPLETED	3/29/02	COMMENTS	Test hole drilled to 500 ft.; well completed to 393 ft.		

DEPTH (ft.)	DESCRIPTION
0	Poorly graded medium sand, sub-angular to sub- rounded
20	Poorly graded gravel with fine to med. sand of metam. origin, sub-angular to sub-rounded clasts
	Gravel and sand
40	Clay
	Gravel with fine to coarse-grained sand
60	Gravel and fine to coarse-grained sand
	Gravel with minor amount of clay and sand
80	
	Lt. brown to tan clay with gravel and sand
100	
120	
140	Sand with gravel and clay
	Gravel and medium to coarse sand
160	Gravel and tan to brown clay
	Tan/brown clay with gravel
180	Tan/brown clay with gravel and med. sand
	Gravel with tan to brown clay
200	
220	





#801694


240
260
280
300
320
340
360
380
400
420
440
460
480
500
Tan to brown clay with minor amounts of gravel
Gravel with Tan/ brown clay, slightly grey
Gravel with Tan/ brown clay
Tan to brown clay with minor amounts of gravel
Gravel w/ minor amounts of clay & sand
Clay with minor amounts of gravel
Clay with minor amounts of sand and gravel
Cement grout (200 ft to 339 ft)
#60 sand (339 ft to 345 ft)
#8 sand (345 ft to 420 ft)
2 inch black steel casing (all wells)
15.5 inch borehole
Centralizer
Stainless steel wire wrap screen 0.020 inch opening (one 10 ft. section).
1 inch black steel airline
21 ft sediment trap
0
OHM-M
100
LATERAL
0
OHM
100
RES

#801404

ORIGINAL
File with DWR

Page 1 of 6 MAY 3 1 2005

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 816224

DWR USE ONLY — DO NOT FILL IN
21N/03W-34
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7786
Date Work Began 3/7/2005, Ended 3/14/2005
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. IRW280-04 Permit Date 11/4/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 6	TOPSOIL
6 – 24	SAND AND SMALL GRAVEL
24 – 33	TAN CLAY
33 – 45	SANDY BROWN CLAY WITH SAND AND GRAVE
	STREAKS
45 – 90	SAND AND GRAVEL WITH BROWN CLAY STREA
90 – 145	SANDY YELLOW CLAY
145 – 152	SAND AND GRAVEL
152 – 210	SANDY YELLOW CLAY
210 – 333	TAN CLAY WITH SAND
333 – 342	SAND AND SMALL GRAVEL
342 – 400	TAN CLAY WITH SAND
400 – 440	TAN CLAY WITH SAND AND GRAVEL STREAKS
440 – 580	TAN CLAY WITH SAND
580 – 585	SAND AND GRAVEL
585 – 620	TAN CLAY WITH SAND
620 – 635	SAND AND GRAVEL
635 – 650	SANDY TAN CLAY
650 – 656	SAND AND GRAVEL
656 – 678	SANDY TAN CLAY
678 – 688	SAND AND GRAVEL
688 – 750	SANDY TAN CLAY
750 – 860	TAN CLAY
860 – 960	SANDY TAN CLAY WITH SAND AND GRAVEL
	STREAKS
960 – 1100	BROWN CLAY WITH HARD CLAY STREAKS
1100 – 1140	BLUE CLAY WITH SAND
1140 – 1170	SAND WITH BLUE CLAY STREAKS
1170 – 1200	BLUE CLAY WITH BRITTLE CLAY STREAKS

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 980 (Feet)

WELL LOCATION
Address 1 MI NOF RD 33 & .4 MI WOF DETOUR RD
City CA
County GLENN
APN Book 024 Page 130 Parcel 009
Township 21 N Range 3 W Section 34
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH
NORTH / WEST / EAST / SOUTH
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE 1									
0 – 60	12	✓				PVC F-480	2.5	SCH 80	
60 – 70	12		✓			PVC F-480	2.5	SCH 80	.030
70 – 80	12	✓				PVC F-480	2.5	SCH 80	
ZONE 2									
0 – 620	12/10	✓				PVC F-480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 40	✓			SAND SLURRY
40 – 45		✓		BENTONITE C
45 – 100			✓	SRI#8 SAND
100 – 105		✓		BENTONITE C
105 – 135	✓			SAND SLURRY
135 – 560			✓	GRAVEL FILL

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY AVE. (ADDRESS) WOODLAND (CITY) CA (STATE) 95695 (ZIP)
Signed Mark Damon (WELL DRILLER/AUTHORIZED REPRESENTATIVE) 05/23/05 (DATE SIGNED) C57 A HIC - 133783 (C-57 LICENSE NUMBER)

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 2 of 6

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 816224

DWR USE ONLY — DO NOT FILL IN
21N/03W-34
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7786
Date Work Began 3/7/2005, Ended 3/14/2005
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. IRW280-04 Permit Date 11/4/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 6	TOPSOIL
6 – 24	SAND AND SMALL GRAVEL
24 – 33	TAN CLAY
33 – 45	SANDY BROWN CLAY WITH SAND AND GRAVE
	STREAKS
45 – 90	SAND AND GRAVEL WITH BROWN CLAY STREA
90 – 145	SANDY YELLOW CLAY
145 – 152	SAND AND GRAVEL
152 – 210	SANDY YELLOW CLAY
210 – 333	TAN CLAY WITH SAND
333 – 342	SAND AND SMALL GRAVEL
342 – 400	TAN CLAY WITH SAND
400 – 440	TAN CLAY WITH SAND AND GRAVEL STREAKS
440 – 580	TAN CLAY WITH SAND
580 – 585	SAND AND GRAVEL
585 – 620	TAN CLAY WITH SAND
620 – 635	SAND AND GRAVEL
635 – 650	SANDY TAN CLAY
650 – 656	SAND AND GRAVEL
656 – 678	SANDY TAN CLAY
678 – 688	SAND AND GRAVEL
688 – 750	SANDY TAN CLAY
750 – 860	TAN CLAY
860 – 960	SANDY TAN CLAY WITH SAND AND GRAVEL
	STREAKS
960 – 1100	BROWN CLAY WITH HARD CLAY STREAKS
1100 – 1140	BLUE CLAY WITH SAND
1140 – 1170	SAND WITH BLUE CLAY STREAKS
1170 – 1200	BLUE CLAY WITH BRITTLE CLAY STREAKS

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 980 (Feet)

WELL LOCATION

Address 1 MI NOF RD 33 & .4 MI WOF DETOUR RD
City CA
County GLENN
APN Book 024 Page 130 Parcel 009
Township 21 N Range 3 W Section 34
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
620 – 630	10		✓			PVC F-480	2.5	SCH 80	.030
630 – 650	10	✓				PVC F-480	2.5	SCH 80	
650 – 660	10		✓			PVC F-480	2.5	SCH 80	.030
660 – 680	10	✓				PVC F-480	2.5	SCH 80	
680 – 690	10		✓			PVC F-480	2.5	SCH 80	.030
690 – 710	10	✓				PVC F-480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
560 – 590	✓			SAND SLURRY
590 – 720			✓	SRI#8 SAND
720 – 900	✓			SAND SLURRY
900 – 1020			✓	SRI#8 SAND

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY AVE. WOODLAND CA 95695
ADDRESS CITY STATE ZIP
Signed Mark L Damion 05/23/05 C57 A HIC - 133783
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 3 of 6

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 816224

DWR USE ONLY — DO NOT FILL IN
21N/03W-34
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7786
Date Work Began 3/7/2005, Ended 3/14/2005
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. IRW280-04 Permit Date 11/4/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 6	TOPSOIL
6 – 24	SAND AND SMALL GRAVEL
24 – 33	TAN CLAY
33 – 45	SANDY BROWN CLAY WITH SAND AND GRAVE
	STREAKS
45 – 90	SAND AND GRAVEL WITH BROWN CLAY STREA
90 – 145	SANDY YELLOW CLAY
145 – 152	SAND AND GRAVEL
152 – 210	SANDY YELLOW CLAY
210 – 333	TAN CLAY WITH SAND
333 – 342	SAND AND SMALL GRAVEL
342 – 400	TAN CLAY WITH SAND
400 – 440	TAN CLAY WITH SAND AND GRAVEL STREAKS
440 – 580	TAN CLAY WITH SAND
580 – 585	SAND AND GRAVEL
585 – 620	TAN CLAY WITH SAND
620 – 635	SAND AND GRAVEL
635 – 650	SANDY TAN CLAY
650 – 656	SAND AND GRAVEL
656 – 678	SANDY TAN CLAY
678 – 688	SAND AND GRAVEL
688 – 750	SANDY TAN CLAY
750 – 860	TAN CLAY
860 – 960	SANDY TAN CLAY WITH SAND AND GRAVEL
	STREAKS
960 – 1100	BROWN CLAY WITH HARD CLAY STREAKS
1100 – 1140	BLUE CLAY WITH SAND
1140 – 1170	SAND WITH BLUE CLAY STREAKS
1170 – 1200	BLUE CLAY WITH BRITTLE CLAY STREAKS

TOTAL DEPTH OF BORING 1020 (Feet)
TOTAL DEPTH OF COMPLETED WELL 980 (Feet)

WELL LOCATION

Address .1 MI NOF RD 33 & .4 MI WOF DETOUR RD
City CA
County GLENN
APN Book 024 Page 130 Parcel 009
Township 21 N Range 3 W Section 34
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE 3									
0 – 930	12/10	✓				PVC F-480	2.5	SCH 80	
930 – 960	10		✓			PVC F-480	2.5	SCH 80	.030
960 – 980	10	✓				PVC F-480	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 40	✓			SAND SLURRY
40 – 45		✓		BENTONITE C
45 – 100			✓	SRI#8 SAND
100 – 105		✓		BENTONITE C
105 – 135	✓			SAND SLURRY
135 – 560			✓	GRAVEL FILL

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY AVE. ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP
Signed Mark Damion WELL DRILLER/AUTHORIZED REPRESENTATIVE — 05/23/05 DATE SIGNED — C57 A HIC - 133783 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

OCT 17 2002

Page 1 of 2

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726739, A

DWR USE ONLY — DO NOT FILL IN
21N/04W-12A
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7449
Date Work Began 8/19/2002, Ended 8/23/2002
Local Permit Agency GLENN CNTY HEALTH DEPT
Permit No. MW133-02 Permit Date 6/25/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	10	WELL GRADED SAND AND GRAVEL
10	20	LIGHT BROWN CLAY
20	30	LIGHT BROWN CLAY W/FINE SAND AND GRVL
30	40	WELL GRADED GRVL W/SND AND LT BRN CLY
40	50	WELL GRADED SND AND GRVL W/SOME CLY
50	60	LIGHT BROWN CLAY WITH SAND AND GRAVEL
60	70	BROWN CLAY WITH SAND AND GRAVEL
70	80	TAN CLAY
80	100	BROWN CLAY
100	110	LIGHT BROWN CLAY
110	120	LIGHT BROWN CLY W/SAND, GRAVEL, SILT
120	130	LT BRN CLY W/FINE SILTSTONE, SAND, GRVL
130	140	LT BROWN CLAY W/FINE SAND AND GRAVEL
140	160	LT BRN CLAY W/SAND, GRAVEL, SILTSTONE
160	170	SAND WITH LIGHT BROWN CLAY
170	190	SILSTONE WITH TAN CLAY AND SAND
190	200	FINE SAND WITH COARSE SAND AND TAN CLY
200	220	LT BRN CLAY W/SILTSTONE, SAND, GRAVEL
220	230	WELL GRADED SAND WITH CLAY
230	250	POORLY GRADED SAND AND GRAVEL
250	260	PPORLY GRADED SAND WITH FINE GRAVEL
260	270	POORLY GRADED SAND WITH CLAY
270	280	WELL GRADED SND W/FINE GRVL, TAN CLAY
280	300	SILSTONE WITH SAND
300	310	SILT WITH SAND AND GRAVEL
310	320	POORLY GRADED SAND WITH CLAY
320	340	WELL GRADED SAND WITH FINE GRAVEL
340	350	WELL GRADED SAND W/SILSTONE, TAN CLAY
350	360	SILT WITH SAND, GRAVEL, AND CLAY
360	400	GRAVEL WITH SILTSTONE

TOTAL DEPTH OF BORING 640 (Feet)
TOTAL DEPTH OF COMPLETED WELL 629 (Feet)

WELL LOCATION

Address SOF C/R 25 & EOF C/R D
City CA
County GLENN
APN Book 024 Page 200 Parcel 210
Township 21 N Range 4 W Section 12
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	1									
0	240	12-1/4					ACCESS TB	1		
0	247	12-1/4	✓				SCH 40	2		
247	257	12-1/4		✓			STL STEEL	2		.030
257	278	12-1/4	✓				SCH 40	2		
ZONE	2									

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	208	✓			SAND SLURRY
208	219		✓		CHIPS
219	323			✓	#8 GRD SAND
323	548	✓			SAND SLURRY
548	559		✓		CHIPS
559	640			✓	#8 GRD SAND

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

OCT 22 2002

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY WOODLAND CA 95695
ADDRESS CITY STATE ZIP
Signed ___ 10/01/02
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED
133783-C57A
C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 2 of 2

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726739

DWR USE ONLY --- DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7449
Date Work Began 8/19/2002, Ended 8/23/2002
Local Permit Agency GLENN CNTY HEALTH DEPT
Permit No. MW133-02 Permit Date 6/25/2002

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
400	510	SILTSTONE, SAND WITH GRAVELS
510	530	COARSE SAND
530	540	GRAVEL
540	550	GRAVEL WITH COARSE SAND
550	560	SILTSTONE WITH GRAVEL AND SAND
560	570	COARSE SAND
570	580	MEDIUM GRAINED SAND
580	640	COARSE SAND AND GRAVEL

TOTAL DEPTH OF BORING 640 (Feet)
TOTAL DEPTH OF COMPLETED WELL 629 (Feet)

WELL LOCATION

Address SOF C/R 25 & EOF C/R D
City CA
County GLENN
APN Book 024 Page 200 Parcel 210
Township 21 N Range 4 W Section 12
Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (inches)
0	240	12-1/4					ACCESS TB	1		
0	598	12-1/4	✓				SCH 40	2		
598	608	12-1/4		✓			STL STEEL	2		.030
608	629	12-1/4	✓				SCH 40	2		

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	208	✓			SAND SLURRY
208	219		✓		CHIPS
219	323			✓	#8 GRD SAND
323	548	✓			SAND SLURRY
548	559		✓		CHIPS
559	640			✓	#8 GRD SAND

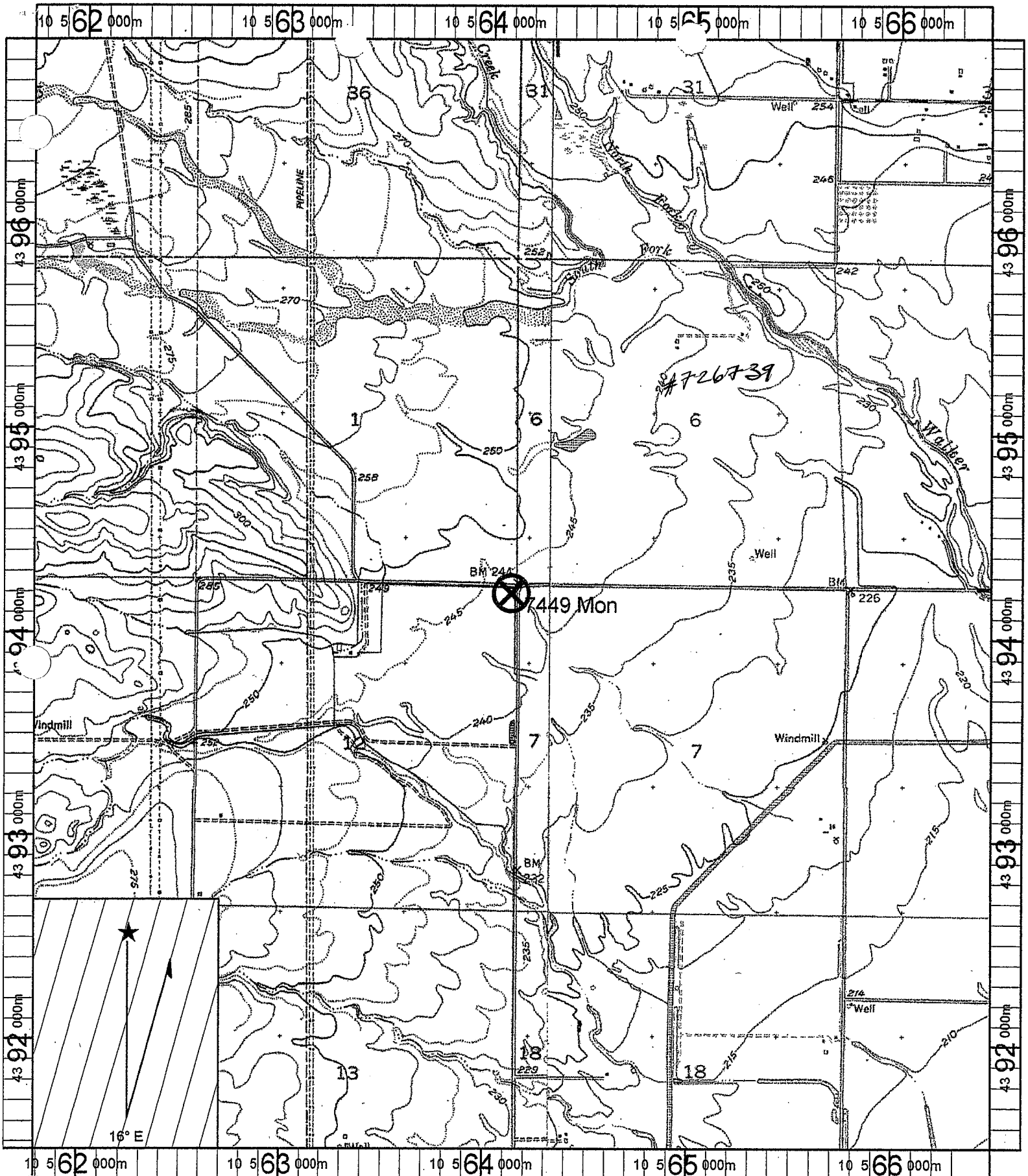
ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 W. KENTUCKY ADDRESS, WOODLAND CITY, CA STATE, 95695 ZIP
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
10/01/02 DATE SIGNED
133783-C57A C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: FRUTO NE
Date: 6/21/2002
Scale: 1 inch equals 2000 feet

Caption: Glenn County
Job# 7449
APN: 24-200-21

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ORIGINAL
File with DWR JAN 0 8 2010

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page 1 of 3

No. E0103388 AB

DWR USE ONLY — DO NOT FILL IN
21N/04W-12
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 8434

Date Work Began 11/23/2009, Ended 12/3/2009

Local Permit Agency Glenn County Health Dept

Permit No. MW 319-09 Permit Date 11/19/2009

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	5	Top soil
5	65	Sand and gravel
65	170	Sandy brown clay
170	180	Sand and gravel
180	230	Sandy brown clay
230	260	Sand and gravel
260	275	Sandy brown clay
275	280	Sand and gravel
280	370	Sandy brown clay
370	380	Sand and gravel
380	515	Sandy blue clay
515	540	Sand with small gravel
540	650	Sandy blue clay with small gravel
650	879	Sandy blue clay
879	900	Small gravel
900	950	Sandy blue clay
950	1080	Black sand

TOTAL DEPTH OF BORING 1080 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1070 (Feet)

WELL LOCATION

Address 70' Sof Road 25 & 70' Wof Road D

City CA

County GLENN

APN Book 024 Page 200 Parcel 021

Township 21 N Range 4 W Section 12 (A 3-4)

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH

BIG. Farms
W
Replacement

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED

ESTIMATED YIELD * — (GPM) & TEST TYPE

TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
Zone	1									
0	520	10-3/4	✓				PVC	2.5	SCH 80	
520	530	10-3/4		✓			PVC	2.5	SCH 80	.030
530	590	10-3/4	✓				PVC	2.5	SCH 80	
590	600	10-3/4		✓			PVC	2.5	SCH 80	.030
600	630	10-3/4	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	265	✓			Sand Slurry
265	285		✓		Bentonite Seal
285	480			✓	SRI#8 Sand
480	496		✓		Bentonite Seal
496	658			✓	SRI#8 Sand
658	675		✓		Bentonite Seal

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS | WOODLAND CITY | CA STATE | 95695 ZIP

Signed Mark Davies WELL DRILLER/AUTHORIZED REPRESENTATIVE | 12/31/09 DATE SIGNED | C57 A HIC - 13378 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

JAN 0 8 2009

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E0103388

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page 2 of 3

Owner's Well No. 8434

Date Work Began 11/23/2009, Ended 12/3/2009

Local Permit Agency Glenn County Health Dept

Permit No. MW 319-09 Permit Date 11/19/2009

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	5	Top soil
5	65	Sand and gravel
65	170	Sandy brown clay
170	180	Sand and gravel
180	230	Sandy brown clay
230	260	Sand and gravel
260	275	Sandy brown clay
275	280	Sand and gravel
280	370	Sandy brown clay
370	380	Sand and gravel
380	515	Sandy blue clay
515	540	Sand with small gravel
540	650	Sandy blue clay with small gravel
650	879	Sandy blue clay
879	900	Small gravel
900	950	Sandy blue clay
950	1080	Black sand

TOTAL DEPTH OF BORING 1080 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1070 (Feet)

WELL LOCATION

Address 70' Sof Road 25 & 70' Wof Road D

City CA

County GLENN

APN Book 024 Page 200 Parcel 021

Township 21 N Range 4 W Section 12

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ——— (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ——— (Ft.) & DATE MEASURED ———

ESTIMATED YIELD * ——— (GPM) & TEST TYPE ———

TEST LENGTH ——— (Hrs.) TOTAL DRAWDOWN ——— (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
630	640	10-3/4		✓			PVC	2.5	SCH 80	.030
640	660	10-3/4	✓				PVC	2.5	SCH 80	
Zone	2									
0	955	10 / 8	✓				PVC	2.5	SCH 80	
955	975	8-3/4		✓			PVC	2.5	SCH 80	.030
975	1030	8-3/4	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
675	870			✓	SRI#8 Sand
870	911		✓		Bentonite Seal
977	1080			✓	SRI#8 Sand

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ———

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE ADDRESS — WOODLAND CITY — CA STATE — 95695 ZIP

Signed ——— WELL DRILLER/AUTHORIZED REPRESENTATIVE — 12/31/09 DATE SIGNED — C57 A HIC - 13378 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

JAN 0 8 2009

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E0103388

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 8434

Date Work Began 11/23/2009, Ended 12/3/2009

Local Permit Agency Glenn County Health Dept

Permit No. MW 319-09 Permit Date 11/19/2009

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	5	Top soil
5	65	Sand and gravel
65	170	Sandy brown clay
170	180	Sand and gravel
180	230	Sandy brown clay
230	260	Sand and gravel
260	275	Sandy brown clay
275	280	Sand and gravel
280	370	Sandy brown clay
370	380	Sand and gravel
380	515	Sandy blue clay
515	540	Sand with small gravel
540	650	Sandy blue clay with small gravel
650	879	Sandy blue clay
879	900	Small gravel
900	950	Sandy blue clay
950	1080	Black sand

TOTAL DEPTH OF BORING 1080 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1070 (Feet)

WELL LOCATION

Address 70' Sof Road 25 & 70' Wof Road D

City CA

County GLENN

APN Book 024 Page 200 Parcel 021

Township 21 N Range 4 W Section 12

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED

ESTIMATED YIELD * — (GPM) & TEST TYPE

TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
1030	1050	8-3/4		✓			PVC	2.5	SCH 80	.030
1050	1070	8-3/4	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

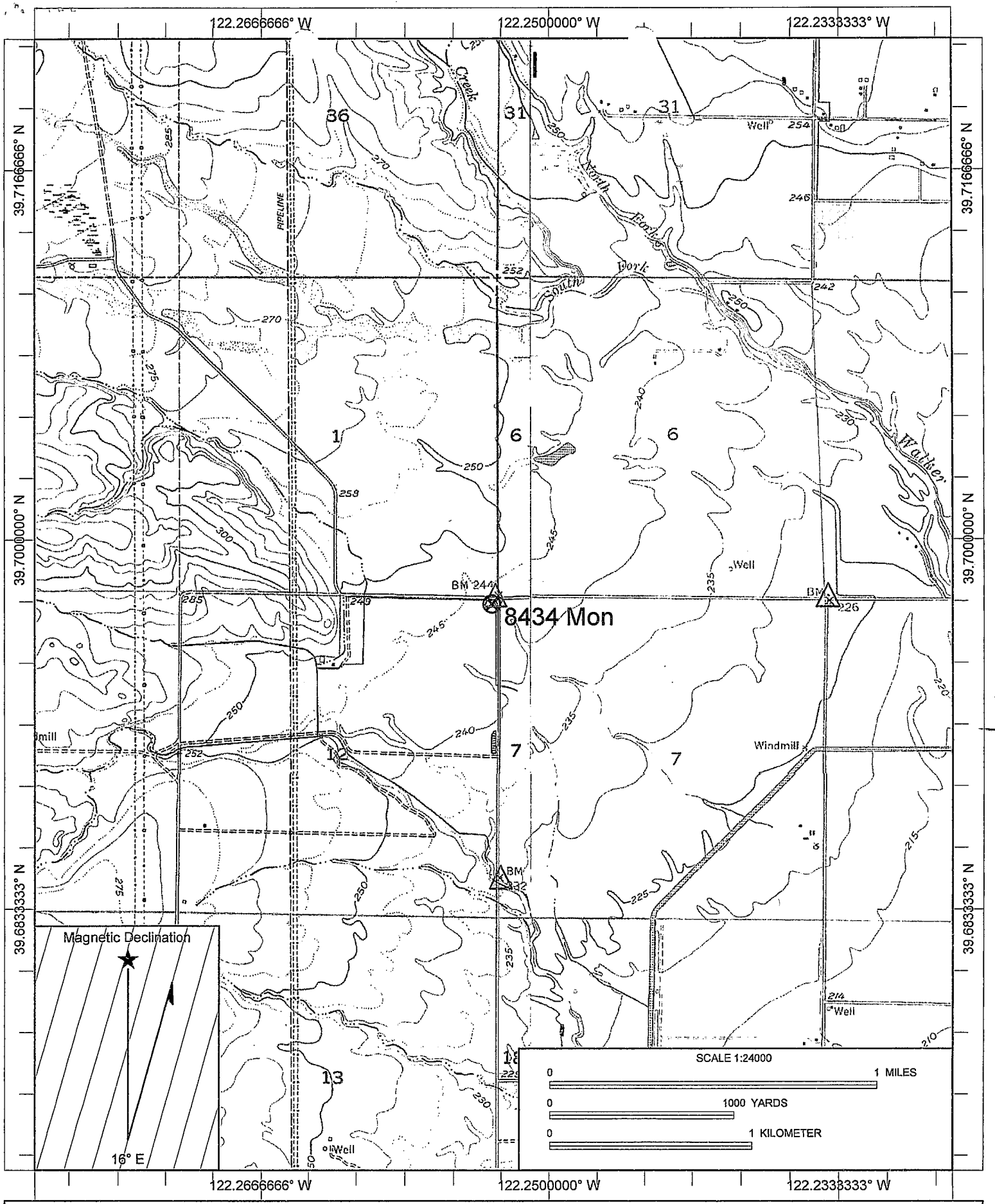
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed _____ 12/31/09 C57 A HIC - 13378
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



Name: FRUTO NE
Date: 11/17/2009
Scale: 1 inch equals 2000 feet

Caption: DWR (Big W) - Job# 8434 Mon
APN: 024-200-021
T21N R4W s12

Copyright (C) 1997, Maptech, Inc.

ORIGINAL
File with DWR

JUN 30 2004

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 726922

DWR USE ONLY — DO NOT FILL IN
22N/02W-30
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page 1 of 3

Owner's Well No. 7677 MON

Date Work Began 5/6/2004, Ended 5/14/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT

Permit No. MW207-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 20	SAND AND GRAVEL
20 – 60	TAN SILTY CLAY
60 – 70	SAND AND GRAVEL
70 – 120	TAN SILTY CLAY
120 – 160	SAND AND GRAVEL
160 – 220	TAN/BROWN SILTY CLAY
220 – 240	MED-CRS SAND
240 – 260	MED-CRS SAND WITH CLAY
260 – 320	TAN SILTY CLAY
320 – 360	POORLY GRD VOLCANIC SAND
360 – 380	POORLY SRTD SAND IN A VOLCANIC ASHY CLY
380 – 400	POORLY GRD SAND AND GRAVEL
400 – 480	POORLY SRTD SAND AND GRAVEL W/CLAY
480 – 520	MED-CRS SAND WITH CLAY
520 – 540	POORLY GRD SAND
540 – 580	TAN CLAY
580 – 620	POORLY GRD SAND AND GRAVEL
620 – 640	TAN/BLUE CLAY W/POORLY GRD GRAVEL
640 – 660	BLUE CLAY W/POORLY GRD SAND
660 – 680	NED-CRS SAND W/METAMORPHIC GRAVEL
680 – 760	BLUE CLAY W/SAND AND GRAVEL
760 – 780	TAN/BROWN CLAY
780 – 800	DARK BLUE/GRAY CLAY W/FINE SAND
800 – 820	MED-CRS SAND W/BLUE CLAY
820 – 900	MED-CRS BLACK SAND AND GRAVEL
900 – 1020	TUSCAN CLAY AND ASH W/SOME FINE SAND

TOTAL DEPTH OF BORING 920 (Feet)

TOTAL DEPTH OF COMPLETED WELL 900 (Feet)

WELL LOCATION

Address 75 FT N OF C/R 18 & .9 MI E OF C/R P

City CA

County GLENN

APN Book 046 Page 310 Parcel 060

Township 22 N Range 2 W Section 30

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE 1									
0 – 45	12	✓				PVC	2.5	SCH 80	
45 – 55	12		✓			PVC	2.5	SCH 80	.030
55 – 60	12	✓				PVC	2.5	SCH 80	
60 – 70	12		✓			PVC	2.5	SCH 80	.030
70 – 80	12	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 31	✓			SAND SLURRY
31 – 88			✓	#8 GRD SAND
88 – 114	✓			SAND SLURRY
114 – 291			✓	#8 GRD SAND
291 – 307	✓			SAND SLURRY
307 – 725			✓	PEA GRAVEL

AUG 17 2004

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY AVE. WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed ___ 06/01/04
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED

C57 A HIC - 133783
C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

IGINAL
e with DWR

Page 2 of 3

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726922

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7677 MON

Date Work Began 5/6/2004, Ended 5/14/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT.

Permit No. MW207-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	SAND AND GRAVEL
20	60	TAN SILTY CLAY
60	70	SAND AND GRAVEL
70	120	TAN SILTY CLAY
120	160	SAND AND GRAVEL
160	220	TAN/BROWN SILTY CLAY
220	240	MED-CRS SAND
240	260	MED-CRS SAND WITH CLAY
260	320	TAN SILTY CLAY
320	360	POORLY GRD VOLCANIC SAND
360	380	POORLY SRTD SAND IN A VOLCANIC ASHY CLY
380	400	POORLY GRD SAND AND GRAVEL
400	480	POORLY SRTD SAND AND GRAVEL W/CLAY
480	520	MED-CRS SAND WITH CLAY
520	540	POORLY GRD SAND
540	580	TAN CLAY
580	620	POORLY GRD SAND AND GRAVEL
620	640	TAN/BLUE CLAY W/POORLY GRD GRAVEL
640	660	BLUE CLAY W/POORLY GRD SAND
660	680	NED-CRS SAND W/METAMORPHIC GRAVEL
680	760	BLUE CLAY W/SAND AND GRAVEL
760	780	TAN/BROWN CLAY
780	800	DARK BLUE/GRAY CLAY W/FINE SAND
800	820	MED-CRS SAND W/BLUE CLAY
820	900	MED-CRS BLACK SAND AND GRAVEL
900	1020	TUSCAN CLAY AND ASH W/SOME FINE SAND

TOTAL DEPTH OF BORING 920 (Feet)

TOTAL DEPTH OF COMPLETED WELL 900 (Feet)

WELL LOCATION

Address 75 FT N OF C/R 18 & .9 MI E OF C/R P

City CA

County GLENN

APN Book 046 Page 310 Parcel 060

Township 22 N Range 2 W Section 30

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL — (Ft.) & DATE MEASURED

ESTIMATED YIELD * — (GPM) & TEST TYPE

TEST LENGTH — (Hrs.) TOTAL DRAWDOWN — (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE	2									
0	130	12	✓				PVC	2.5	SCH 80	
130	140	12		✓			PVC	2.5	SCH 80	.030
140	150	12	✓				PVC	2.5	SCH 80	
150	160	12		✓			PVC	2.5	SCH 80	.030
160	250	12	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
725	789	✓			SAND SLURRY
789	920			✓	#8 GRD SAND

AUG 17 2004

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.

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le with DWR

Page 3 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 726922

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 7677 MON
Date Work Began 5/6/2004, Ended 5/14/2004
Local Permit Agency GLENN COUNTY HEALTH DEPT
Permit No. MW207-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	SAND AND GRAVEL
20	60	TAN SILTY CLAY
60	70	SAND AND GRAVEL
70	120	TAN SILTY CLAY
120	160	SAND AND GRAVEL
160	220	TAN/BROWN SILTY CLAY
220	240	MED-CRS SAND
240	260	MED-CRS SAND WITH CLAY
260	320	TAN SILTY CLAY
320	360	POORLY GRD VOLCANIC SAND
360	380	POORLY SRTD SAND IN A VOLCANIC ASHY CLY
380	400	POORLY GRD SAND AND GRAVEL
400	480	POORLY SRTD SAND AND GRAVEL W/CLAY
480	520	MED-CRS SAND WITH CLAY
520	540	POORLY GRD SAND
540	580	TAN CLAY
580	620	POORLY GRD SAND AND GRAVEL
620	640	TAN/BLUE CLAY W/POORLY GRD GRAVEL
640	660	BLUE CLAY W/POORLY GRD SAND
660	680	NED-CRS SAND W/METAMORPHIC GRAVEL
680	760	BLUE CLAY W/SAND AND GRAVEL
760	780	TAN/BROWN CLAY
780	800	DARK BLUE/GRAY CLAY W/FINE SAND
800	820	MED-CRS SAND W/BLUE CLAY
820	900	MED-CRS BLACK SAND AND GRAVEL
900	1020	TUSCAN CLAY AND ASH W/SOME FINE SAND

TOTAL DEPTH OF BORING 920 (Feet)
TOTAL DEPTH OF COMPLETED WELL 900 (Feet)

WELL LOCATION

CITY
Address 75 FT N OF C/R 18 & .9 MI E OF C/R P
City CA
County GLENN
APN Book 046 Page 310 Parcel 060
Township 22 N Range 2 W Section 30
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH
NORTH / WEST / EAST / SOUTH
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL (Ft.) & DATE MEASURED
ESTIMATED YIELD * (GPM) & TEST TYPE
TEST LENGTH (Hrs.) TOTAL DRAWDOWN (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
250	260	12		✓			PVC	2.5	SCH 80	.030
260	275	12	✓				PVC	2.5	SCH 80	
ZONE	3									
0	850	12/10	✓				PVC	2.5	SCH 80	
850	880	10		✓			PVC	2.5	SCH 80	.030
880	900	10	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	31	✓			SAND SLURRY
31	88			✓	#8 GRD SAND
88	114	✓			SAND SLURRY
114	291			✓	#8 GRD SAND
291	307	✓			SAND SLURRY
307	725				PEA GRAVEL

AUG 1

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
WOODLAND CA 95695

JUN 30 2004

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le with DWR

Page 1 of 3

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726923

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./ STATION NO. 22N/03W-24

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7678 MON

Date Work Began 5/17/2004, Ended 5/27/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT.

Permit No. MW208-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 10	POORLY GRD SAND
10 20	SAND AND GRAVEL
20 40	GRAVEL W/CRS SAND
40 50	MED-CRS SAND W/GRAVEL
50 60	MED-CRS SAND
60 70	LARGE GRAVEL W/FINE-CRS SAND
70 80	MED-CRS SAND W/GRAVEL
80 120	TAN SILTY CLAY
120 130	TAN SILTY CLAY W/SAND AND GRAVEL
130 140	MED SAND W/SILTY TAN CLAY
140 150	MED SAND
150 250	MED-CRS SAND W/GRAVEL
250 270	TAN SILTY CLAY
270 280	TAN SILTY CLAY W/MED-CRS SAND
280 300	TAN SILTY CLAY
300 310	TAN SILTY CLAY W/MED-CRS SAND
310 320	TAN SILTY CLAY
320 340	TAN SILTY CLAY W/MED SAND
340 350	TAN SILTY CLAY W/CRS-FINE SAND AND GRVL
350 360	TAN SILTY CLAY W/MED SAND
360 380	SAND
380 410	TAN SILTY CLAY
410 420	MED SAND W/CLAY, HARD SPOT @ 420 FT
420 440	TAN SILTY CLAY W/MED-CRS SAND
440 460	TAN SILTY CLAY
460 490	MED-CRS SAND
490 520	TAN STICKY CLAY
520 540	MED SAND W/SOME GRAVEL
540 590	TAN STICKY CLAY
590 630	TAN/BLUE CLAY

TOTAL DEPTH OF BORING 860 (Feet)

TOTAL DEPTH OF COMPLETED WELL 840 (Feet)

WELL LOCATION

Address 125 FT N OF HWY 32 & 1000 FT E OF C/R N

City CA

County GLENN

APN Book 046 Page 150 Parcel 036

Township 22 N Range 3 W Section 24

Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial

MONITORING ✓
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ——— (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ——— (Ft.) & DATE MEASURED ———

ESTIMATED YIELD * ——— (GPM) & TEST TYPE ———

TEST LENGTH ——— (Hrs.) TOTAL DRAWDOWN ——— (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
ZONE 1									
0 50	12	✓				PVC	2.5	SCH 80	
50 60	12		✓			PVC	2.5	SCH 80	.030
60 70	12	✓				PVC	2.5	SCH 80	
ZONE 2									
0 130	12	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 30	✓			SAND SLURRY
30 80				#8 GRD SAND
80 99				CHIPS
99 225			✓	#8 GRD SAND
225 248		✓		CHIPS
248 625			✓	#8 GRD SAND

AUG 17 2004

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. KENTUCKY AVE. WOODLAND CA 95695
ADDRESS CITY STATE ZIP

Signed Matt Eaton 06/01/04
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED

C57 A HIC - 133783
C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

...GINAL
...e with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726923

DWR USE ONLY -- DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7678 MON

Date Work Began 5/17/2004, Ended 5/27/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT

Permit No. MW208-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
630	640	MED SAND
640	650	BLUE CLAY W/MED-CRS SAND
650	690	BLUE CLAY
690	700	MED-CRS SAND
700	710	BLUE/TAN CLAY
710	740	MED SAND
740	800	BRITTLE BLUE CLAY
800	820	MED-CRS SAND
820	880	BRITTLE BLUE CLAY
880	900	MED SAND
900	950	BLUE CLAY
950	1020	VOLCANIC ASH AND CLAY

TOTAL DEPTH OF BORING 860 (Feet)

TOTAL DEPTH OF COMPLETED WELL 840 (Feet)

WELL LOCATION

Address 125 FT N OF HWY 32 & 1000 FT E OF C/R N

City CA

County GLENN

APN Book 046 Page 150 Parcel 036

Township 22 N Range 3 W Section 24

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY

___ Domestic ___ Public

___ Irrigation ___ Industrial

MONITORING ✓

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
130	150	12		✓			PVC	2.5	SCH 80	.030
150	170	12	✓				PVC	2.5	SCH 80	
170	180	12		✓			PVC	2.5	SCH 80	.030
180	195	12	✓				PVC	2.5	SCH 80	
ZONE 0	3 800	12/10	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
625	772	✓			SAND SLURRY
772	860			✓	#8 GRD SAND

AUG 17 2004

ATTACHMENTS (✓)

___ Geologic Log

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

IGINAL
le with DWR

Page 3 of 3

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 726923

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 7678 MON

Date Work Began 5/17/2004, Ended 5/27/2004

Local Permit Agency GLENN COUNTY HEALTH DEPT.

Permit No. MW208-04 Permit Date 5/3/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 10	POORLY GRD SAND
10 20	SAND AND GRAVEL
20 40	GRAVEL W/CRS SAND
40 50	MED-CRS SAND W/GRAVEL
50 60	MED-CRS SAND
60 70	LARGE GRAVEL W/FINE-CRS SAND
70 80	MED-CRS SAND W/GRAVEL
80 120	TAN SILTY CLAY
120 130	TAN SILTY CLAY W/SAND AND GRAVEL
130 140	MED SAND W/SILTY TAN CLAY
140 150	MED SAND
150 250	MED-CRS SAND W/GRAVEL
250 270	TAN SILTY CLAY
270 280	TAN SILTY CLAY W/MED-CRS SAND
280 300	TAN SILTY CLAY
300 310	TAN SILTY CLAY W/MED-CRS SAND
310 320	TAN SILTY CLAY
320 340	TAN SILTY CLAY W/MED SAND
340 350	TAN SILTY CLAY W/CRS-FINE SAND AND GRVL
350 360	TAN SILTY CLAY W/MED SAND
360 380	SAND
380 410	TAN SILTY CLAY
410 420	MED SAND W/CLAY, HARD SPOT @ 420 FT
420 440	TAN SILTY CLAY W/MED-CRS SAND
440 460	TAN SILTY CLAY
460 490	MED-CRS SAND
490 520	TAN STICKY CLAY
520 540	MED SAND W/SOME GRAVEL
540 590	TAN STICKY CLAY
590 630	TAN/BLUE CLAY

TOTAL DEPTH OF BORING 860 (Feet)

TOTAL DEPTH OF COMPLETED WELL 840 (Feet)

WELL LOCATION

Address 125 FT N OF HWY 32 & 1000 FT E OF C/R N

City CA

County GLENN

APN Book 046 Page 150 Parcel 036

Township 22 N Range 3 W Section 24

Latitude ___ DEG. ___ MIN. ___ SEC. ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY

___ Domestic ___ Public

___ Irrigation ___ Industrial

MONITORING ✓

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
800 820	10		✓			PVC	2.5	SCH 80	.030
820 840	10	✓				PVC	2.5	SCH 80	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 30	✓		✓	SAND SLURRY
30 80			✓	#8 GRD SAND
80 99		✓		CHIPS
99 225		✓		#8 GRD SAND
225 248			✓	CHIPS
248 625			✓	#8 GRD SAND

AUG 17 2004

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO

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Appendix 4B

Colusa Subbasin 2020 Groundwater Quality Monitoring Network Wells

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Table 4B-1. Groundwater Quality Monitoring Network Wells				
County	Well ID	Agency	Latitude [a]	Longitude
Glenn	**1100404-001[b]**	**Del Oro Water Company – Black Butte District**	**39.75970**	**-122.22526**
Glenn	1100405-001	Black Butte Mobile Home Park	39.75373	-122.21006
Glenn	**1110001-001**	**City of Orland**	**39.73808**	**-122.17203**
Glenn	1110001-002	City of Orland	39.73808	-122.17203
Glenn	1110001-005	City of Orland	39.73820	-122.19538
Glenn	1110001-008	City of Orland	39.73977	-122.17549
Glenn	1110001-009	City of Orland	39.75348	-122.19639
Glenn	1110001-017	City of Orland	39.75399	-122.19034
Glenn	1100413-002	Country Leisure Mobile Estates	39.74592	-122.13595
Glenn	1100444-001	Orland Estates Mobile Home Park	39.74015	-122.20960
Glenn	1100444-002	Orland Estates Mobile Home Park	39.74012	-122.20972
Glenn	1100445-002	Orland Mobile Home Park	39.73423	-122.19709
Glenn	1100436-002	Orland Oaks Mobile Home Park	39.75274	-122.21581
Glenn	1100452-001	Shady Oaks Trailer Park	39.76262	-122.19667
Glenn	1100254-003	Voyles Trailer Park	39.53352	-122.19526
Glenn	1100237-003	Willows Mobile Home Community & RV Park	39.52326	-122.23170
Glenn	1100203-001	Artois Community Service District	39.61738	-122.19492
Glenn	**1100203-002**	**Artois Community Service District**	**39.62235**	**-122.19494**
Glenn	1110003-003	Cal-Water Service Company - Willows	39.51426	-122.19905
Glenn	1110003-006	Cal-Water Service Company - Willows	39.53016	-122.20706
Glenn	**1110003-007**	**Cal-Water Service Company - Willows**	**39.50981**	**-122.19533**
Glenn	1110003-008	Cal-Water Service Company - Willows	39.52162	-122.21130
Glenn	1110003-009	Cal-Water Service Company - Willows	39.51903	-122.18713
Glenn	0600013-001	Colusa County Water Works District #2 – Princeton	39.40283	-122.01008
Glenn	**0600013-002**	**Colusa County Water Works District #2 – Princeton**	**39.40916**	**-122.00992**
Colusa	**0610003-003**	**Maxwell Public Utility District**	39.27650	-122.18944
Colusa	**0610002-002**	**City of Colusa**	**39.21073**	**-122.01404**
Colusa	0610002-003	City of Colusa	39.20768	-122.01175
Colusa	0610002-004	City of Colusa	39.20114	-122.02074
Colusa	0610002-005	City of Colusa	39.20293	-122.00906
Colusa	0610002-006	City of Colusa	39.21461	-122.01429
Colusa	**0610004-004**	**City of Williams**	**39.15214**	**-122.14661**
Colusa	0610004-009	City of Williams	39.15742	-122.13924
Colusa	0610004-011	City of Williams	39.15203	-122.13548
Colusa	**0600008-001**	**Colusa County Water Works District #1 – Grimes**	**39.07209**	**-121.89445**
Colusa	0610001-001	Arbuckle Public Utility District	39.01261	-122.05584
Colusa	0610001-002	Arbuckle Public Utility District	39.01677	-122.06172
Colusa	**0610001-004**	**Arbuckle Public Utility District**	**39.01997**	**-122.05846**
Colusa	0610001-005	Arbuckle Public Utility District	39.01662	-122.07124
Colusa	**0605011-001**	**Del Oro Water Company – Arbuckle District**	**39.00503**	**-122.06048**
Glenn	**25A1M**	**California Rice Commission [c]**	**39.56459**	**-122.02759**
Glenn	**32J1M**	**California Rice Commission**	**39.54292**	**-122.09912**
Glenn	**23E1M**	**California Rice Commission**	**39.49160**	**-122.05584**
Glenn	**25E1M**	**California Rice Commission**	**39.47299**	**-122.16428**
Glenn	**25R1M**	**California Rice Commission**	**39.47080**	**-122.13686**
Glenn	**12G2M**	**California Rice Commission**	**39.42900**	**-122.03237**
Colusa	**14G1M**	**California Rice Commission**	**39.28179**	**-122.17190**
Colusa	**35M1M**	**California Rice Commission**	**39.18317**	**-122.07808**
Colusa	**03E1M**	**California Rice Commission**	**39.14835**	**-122.07927**
Colusa	**16R1M**	**California Rice Commission**	**39.71070**	**-122.10610**
Glenn	**SVWQC00005**	**Sacramento Valley Water Quality Coalition [d]**	**39.01040**	**-122.06760**
Colusa	**SVWQC00019**	**Sacramento Valley Water Quality Coalition**	**39.37720**	**-122.01330**
Colusa	**SVWQC00021**	**Sacramento Valley Water Quality Coalition**	**38.96060**	**-122.01810**
Colusa	**SVWQC00006**	**Sacramento Valley Water Quality Coalition**	**39.75970**	**-122.22526**

(a) Latitude and longitude are reported in North American Datum of 1983 (NAD 83), decimal degrees.

(b) Bolded wells are those that were selected to be included in the representative groundwater quality monitoring network. The representative groundwater quality monitoring network and its corresponding wells are discussed more in Section 4.2.5 of this GSP.

(c) Central Valley Regional Water Quality Control Board. 2016.

(d) Luhdorff and Scalmanini. 2019.

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Appendix 5A

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Records of Decision for Sustainable Management Criteria

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INTRODUCTION

This appendix documents the decision-making process and adoption of the Colusa Subbasin Sustainable Management Criteria (SMC) by the Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees (referred to as the Joint TAC).

A record of decision is provided for each of the sustainability indicators applicable to the Colusa Subbasin (Subbasin):

1. Chronic Lowering of Groundwater Levels
2. Reduction of Groundwater Storage
3. Seawater Intrusion (not applicable to the Colusa Subbasin)
4. Degraded Water Quality
5. Land Subsidence
6. Depletions of Interconnected Surface Water

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #1: CHRONIC LOWERING OF GROUNDWATER LEVELS

Decision Record

At their joint meeting on May 13, 2021, the Colusa Groundwater Authority (CGA) Technical Advisory Committee (TAC) and Glenn Groundwater Authority (GGA) TAC each voted unanimously to recommend to their respective boards the criteria listed below for setting quantitative Sustainable Management Criteria (SMC) for groundwater Sustainability Indicator #1: Chronic Lowering of Groundwater Levels. These actions were taken in relation to Agenda Item 4.a.i. with the roll call vote documented in the meeting minutes.

The SMC for Chronic Lowering of Groundwater Levels will be calculated and conditioned as follows. The calculation will be made individually for each of the 48 representative monitoring wells comprising the Groundwater Level monitoring network. Water levels are defined as the depth to groundwater below ground surface.

1) Minimum Thresholds will be set equal to the lower of the following two calculated water levels:
    a. 50 percent of the historical range in observed water levels below the observed low water level, AND,
    b. The 20th percentile depth of domestic wells in the Thiessen polygon represented by each monitoring well. This means that 20 percent of the domestic wells are shallower and 80 percent deeper than the 20th percentile depth.
2) Measurable Objectives will be calculated as the average of the most recent five (5) years of available groundwater levels. The calculated water level is fixed and is not a running average that changes over time.
3) An Undesirable Result will be detected when water levels in 25 percent or more (at least 12) of the 48 representative monitoring wells fall below their respective Minimum Thresholds continuously for 24 months. The 12 wells must be the same subset of wells, not any combination of 12 wells.
4) To ensure operational compatibility with adjoining subbasins, the Minimum Thresholds and Measurable Objectives for monitoring wells near subbasin boundaries will be reviewed and adjusted, as needed, in consultation with representatives of adjoining subbasin Groundwater Sustainability Agencies.

Adoption Record

The TAC decisions were presented to and adopted by their respective Boards as follows:

- CGA: Approved May 25, 2021
- GGA: Approved June 16, 2021

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #2: REDUCTION OF GROUNDWATER STORAGE

Decision Record

At their joint meeting on April 23, 2021, the Colusa Groundwater Authority (CGA) Technical Advisory Committee (TAC) and Glenn Groundwater Authority (GGA) TAC the Consultant Team recommended to the TACs that Sustainable Management Criteria (SMC) for groundwater Sustainability Indicator #2: Reduction of Groundwater Storage be addressed using Sustainability Indicator #1: Groundwater Levels as a proxy indicator, as allowed under DWR's Groundwater Sustainability Plan regulations.

The CGA TAC and GGA TAC each voted unanimously to recommend to their respective boards that SMC for groundwater Sustainability Indicator #2: Reduction of Groundwater Storage be addressed by proxy as described above. These actions were taken in relation to Agenda Item 4.b.i. with the roll call vote documented in the meeting minutes.

Supporting Rationale

The Consultant Team explained that the freshwater aquifers in the Colusa Subbasin are deep relative to existing well infrastructure and the Measurable Objectives (MOs) and Minimum Thresholds (MTs) under consideration for Sustainability Indicator #1: Groundwater Levels. Large volumes of fresh groundwater would remain in storage even if MTs were reached. Therefore, the MTs and MOs adopted for Groundwater Levels are protective of Groundwater Storage.

Adoption Record

The TAC decisions were presented to and adopted by their respective Boards as follows:

- CGA: Approved May 25, 2021
- GGA: Approved May 10, 2021

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #3: SEAWATER INTRUSION

Seawater intrusion is not considered to be an applicable sustainability indicator for the Colusa Subbasin. Thus, SMC were not established for seawater intrusion.

Seawater intrusion is not currently occurring in the Subbasin, and is not likely to occur due to the substantial distance between the Subbasin and the Pacific Ocean, bays, deltas, or inlets.

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #4: DEGRADED WATER QUALITY

Decision Record

At their joint meeting on April 9, 2021, the Colusa Groundwater Authority (CGA) Technical Advisory Committee (TAC) and Glenn Groundwater Authority (GGA) TAC each voted to recommend to their respective boards to adopt a policy not to adopt quantitative Sustainable Management Criteria (SMC) for groundwater Sustainability Indicator #4: Degraded Water Quality, and instead to improve the water quality monitoring network and adopt quantitative SMC in the 2027 Groundwater Sustainability Plan (GSP) update.

Subsequent to the April 9 meeting, additional information became available causing the Consultant Team to reconsider its earlier advice to the TACs. The new information included an opinion provided by GGA counsel and results of the Department of Water Resources evaluations of GSPs prepared for other groundwater subbasins. Based on this additional information, the Consultant Team changed its approach and recommended to the TACs at their June 11, 2021, meeting that quantitative SMC for water quality be developed for Sustainability Indicator #4.

At the June 11, 2021, Joint TAC meeting, each TAC voted unanimously, with Ben King of the CGA TAC abstaining, to recommend to their respective boards the criteria listed below for setting quantitative SMCs for Sustainability Indicator #4. These actions were taken in relation to Agenda Item 4.a.i. with the roll call vote documented in the meeting minutes.

The SMCs for Degraded Water Quality pertain to salinity only, applicable to each of 23 representative monitoring wells, are as follows:

1) The Minimum Threshold will be 900 µS/cm[1] (the recommended California Secondary Maximum Contaminant Level) OR the pre-2015 historical maximum measured salinity.
2) The Measurable Objective will be 700 µS/cm (corresponding to an agricultural water quality objective providing for no yield reduction for crops commonly grown in the Colusa Subbasin).
3) An Undesirable Result will be detected when salinity (as indicated by electrical conductivity) in 25 percent of the representative monitoring wells (6 of 23 monitoring wells) exceeds the Minimum Threshold for two (2) consecutive years.

[1] µS/cm stands for micro Siemens per centimeter, a measure of the electrical conductivity (EC) of water. 1,000 µS/cm is equal to approximately 640 parts per million of total dissolved solids in water.

Clarifying Points

The foregoing SMC were established with the TACs' understanding that 23 representative monitoring wells are not sufficient for long-term, sustainable management of the Colusa Subbasin and that additional new or existing wells will need to be added to the monitoring network over time. Additionally, the TACs acknowledge that the SMC will need to be reviewed and evaluated, and potentially refined, as additional monitoring wells are added, and additional data is collected and analyzed.

Adoption Record

The TAC decisions were presented to and adopted by their respective Boards as follows:

- CGA: Approved July 8, 2021
- GGA: Approved June 16, 2021, and approved as amended July 12, 2021

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #5: LAND SUBSIDENCE

Decision Record

At their joint meeting on April 9, 2021, the Colusa Groundwater Authority (CGA) Technical Advisory Committee (TAC) and Glenn Groundwater Authority (GGA) TAC each voted unanimously to recommend to their respective boards the criteria for setting quantitative Sustainable Management Criteria (SMCs) for groundwater Sustainability Indicator #5: Land Subsidence. These actions were taken in relation to Agenda Item 4.b.ii. with the roll call vote documented in the meeting minutes.

In September 2021, the Consultant Team prepared revised recommendations for the land subsidence SMCs to bring those SMCs into closer alignment with neighboring subbasins. Revisions to the quantitative SMCs for groundwater Sustainability Indicator #5: Land Subsidence were presented to and adopted by the CGA and GGA Boards in September and October 2021. During this process, the GGA Board recommended one additional revision regarding the process used to determine whether undesirable results have occurred.

The GGA Board voted unanimously to adopt the amended land subsidence SMCs listed below at their Board meeting on October 11, 2021. These actions were taken in relation to Agenda Item 9.e. with the roll call vote documented in the meeting minutes.

The CGA voted unanimously to adopt the amended land subsidence SMCs at their Board meeting on September 28, 2021, and amended again at the Board meeting on October 26, 2021.[2] These actions were taken in relation to Agenda Item 5 (September 28, 2021) and Agenda Item 7 (October 26, 2021) with the roll call vote documented in the corresponding meeting minutes.

The SMCs for Land Subsidence are as follows. The SMCs are applicable to each of 63 land subsidence monitoring benchmarks belonging to the Sacramento Valley Height Modernization Project.

1) The Minimum Threshold (MT) rate of subsidence at all 63 land subsidence benchmarks is 0.5 feet per five years.
2) The Measurable Objective (MO) rate of subsidence at all 63 land subsidence benchmarks is 0.25 feet per five years.
3) An Undesirable Result is considered to occur when the MT is exceeded at 20 percent (13 of 63) of the land subsidence monitoring benchmarks.

[2] The CGA adopted the revised land subsidence SMCs recommended by the Consultant Team as presented at their September 28, 2021 Board meeting. The CGA later adopted the land subsidence SMCs as revised by the GGA and presented at their October 26, 2021 CGA Board meeting.

Additionally, the GSAs will evaluate adding subsidence monitoring benchmarks, especially in areas of concern and will review InSAR data annually (regulations do not require subsidence reporting in annual reports).

Supporting Rationale and Clarifying Points

1) The SMCs will be reviewed and adjusted to account for potential changes in subsidence rates brought about by implementation of PMAs and future groundwater resource development. The extent of subsidence-prone areas, which may be underlain by sediments that have greater susceptibility to subsidence due to groundwater withdrawal, will continue to be delineated as data gaps are filled through the ongoing subsidence monitoring programs (using data from benchmarks, extensometers and InSAR surveys) and subsidence-prone sediments are characterized during drilling for well construction, extensometer installation or other subsurface investigations needed for the development of specific PMAs.
2) The GSAs expect that projects and management actions would be implemented before the MT rates are reached.
3) DWR reports that the probable error in the subsidence values reported for the monitoring benchmarks is ±0.17 feet, meaning that for any reported value, the actual subsidence value is likely to fall in a range between plus or minus 0.17 feet of the reported value. The selected MO subsidence rate of 0.25 feet per five year is deliberately greater than the reported probable error of ±0.17 feet as a means of avoiding false exceedance of the MO.

Adoption Record

The revised SMC were presented to and adopted by their respective Boards as follows:

- CGA: Approved April 27, 2021, and approved as amended September 28, 2021, and October 26, 2021
- GGA: Approved May 10, 2021, and approved as amended October 11, 2021

Colusa Groundwater Authority and Glenn Groundwater Authority Technical Advisory Committees Record of Decision

SUSTAINABILITY INDICATOR #6: DEPLETIONS OF INTERCONNECTED SURFACE WATER

Decision Record

At their joint meeting on May 19, 2021, the Colusa Groundwater Authority (CGA) Technical Advisory Committee (TAC) and Glenn Groundwater Authority (GGA) TAC each voted to recommend to their respective boards certain criteria for setting quantitative Sustainable Management Criteria (SMCs) for groundwater Sustainability Indicator #6: Depletions of Interconnected Surface Water. The vote of the GGA TAC was unanimous. The vote of the CGA TAC was "yes" for all members except Bill Vanderwaal who voted no. These actions were taken in relation to Agenda Item 4.a.i. with the roll call vote documented in the meeting minutes.

Subsequent to the TACs' May 19 decisions, the CGA Board acted to adopt the CGA TAC's recommendation with a certain modification of the Undesirable Result (UR) criteria. Additionally, the Consultant Team conducted additional analyses to better understand the connectivity of Stony Creek surface water to underlying groundwater, and to address surface water depletion in the Colusa Basin Drain. (Prior surface water depletion discussions had only addressed Stony Creek and the Sacramento River.) The modified UR criteria and results of these additional analyses along with associated recommendations were presented by the Consultant Team to the TACs at their joint meeting on June 11, 2021.

At the June 11, 2021, joint TAC meeting, each TAC voted unanimously to recommend to their respective boards the criteria listed below for setting quantitative Sustainable Management Criteria (SMCs) for groundwater Sustainability Indicator #6: Depletions of Interconnected Surface Water. These actions were taken in relation to Agenda Item 4.a.ii. with the roll call vote documented in the meeting minutes.

The SMCs for Depletions of Interconnected Surface Water will be set or calculated and conditioned as follows. The calculation will be made individually for each of the 12 representative monitoring wells comprising the surface water depletion monitoring network. Water levels are defined as the depth to groundwater below ground surface.

1) Minimum Thresholds will be calculated as the Fall 2015 observed water level minus 10 feet, with the observed Fall 2015 water level being the level recorded closest to October 15, 2015.
2) Measurable Objectives will be calculated as the average of the most recent five (5) years of available, measured groundwater levels. The calculated water level is fixed and is not a running average that changes over time.
3) An Undesirable Result will be detected when water levels in 25 percent of the representative monitoring wells (3 of 12 monitoring wells) fall below their respective Minimum Thresholds continuously for 24 months. The 3 wells must be the same subset of wells, not any combination of 3 wells.

4) To ensure operational compatibility with adjoining subbasins, the Minimum Thresholds and Measurable Objectives for monitoring wells near subbasin boundaries will be reviewed and adjusted, as needed, in consultation with representatives of adjoining subbasin Groundwater Sustainability Agencies.

The foregoing SMCs were established with the TACs' understanding that 12 representative monitoring wells are not sufficient for long-term, sustainable management of the Colusa Subbasin and that additional new or existing wells will need to be added to the monitoring network over time. Additionally, the TACs acknowledge that the SMCs will need to be reviewed and evaluated, and potentially refined, as additional wells are added, and additional data is collected and analyzed.

Adoption Record

The TAC decisions were presented to and adopted by their respective Boards as follows:

- CGA: Approved June 22, 2021
- GGA: Approved June 16, 2021

Appendix 5B

Process and Rationale for Setting Minimum Thresholds and Measurable Objectives for Groundwater Levels and Depletions of Interconnected Surface Waters

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Specialists in Agricultural Water Management
Serving Stewards of Western Water since 1993

Technical Memorandum

To: Colusa Groundwater Authority and Glenn Groundwater Authority

From: Davids Engineering and Woodard & Curran

Date: November 30, 2021

Subject: **Process and Rationale for Setting Minimum Thresholds and Measurable Objectives for Groundwater Levels and Depletions of Interconnected Surface Waters**

Introduction

Sustainable Management Criteria (SMC) for the Colusa Subbasin (Subbasin) have been established in consultation with the Technical Advisory Committees of the two groundwater sustainability agencies in the Subbasin, those being the Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA). SMC consist of the following: the Sustainability Goal adopted for the Subbasin; Undesirable Results describing significant and unreasonable effects to be avoided; quantitative Minimum Thresholds (MTs) that define conditions that, if exceeded, may cause Undesirable Results; and quantitative Measurable Objectives (MOs) to achieve the Sustainability Goal of the Subbasin. Undesirable results, MTs, and MOs are all established in relation to the six sustainability indicators referenced in the GSP Emergency Regulations, five of which are applicable in the Colusa Subbasin.

This Technical Memorandum (TM) documents the process and rationale for setting MTs and MOs for two specific sustainability indicators: Chronic Lowering of Groundwater Levels (Groundwater Levels), and Depletions of Interconnected Surface Water (Streamflow Depletion). As specified in 23 CCR 354.28(c)(6), Streamflow Depletion MTs and MOs shall be based on "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." However, the regulations also allow the use of groundwater levels as a proxy for streamflow rates or volumes. Because the location and accuracy of existing stream gages on the Sacramento River and its tributaries are not sufficient to directly analyze streamflow accretions and depletions with respect to the Colusa Subbasin, water levels were used as a proxy. Analyses of streamflow depletions in the Colusa Subbasin are described in the GSP and in Appendix 3G of the GSP. Thus, both of the sustainability indicators addressed in this TM involve groundwater levels and are therefore related. In particular, for representative monitoring network wells that are included in the monitoring networks for both indicators, there are two MTs and MOs. Both are valid with respect to their associated indicator but operationally the shallower MTs and MOs will govern.

The discussion of MOs and MTs for Groundwater Levels and Streamflow Depletion follow, preceded by a brief description of the outreach process used for SMC development (not just for Groundwater Levels and Streamflow Depletion, but also for other sustainability indicators and other GSP development tasks), and brief statements of the Sustainability Goal and Undesirable Results for the two sustainability indicators addressed here.

Outreach and Public Involvement Process

Outreach and public involvement in support of SMC development in the Colusa Subbasin were achieved primarily through a series of public meetings with the Technical Advisory Committees (TACs) formed by the Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA), respectively. The meetings were publicly noticed on the CGA and GGA websites, with agendas noting action items posted in advance of each meeting, and minutes prepared following each meeting. The technical topics and content for each meeting were developed by the Colusa Subbasin GSP Technical Team led by Davids Engineering, with Woodard & Curran serving as the lead SMC subconsultant. The TACs met together, with the meetings referred to as Joint TAC meetings.

Joint TAC meetings were held approximately monthly, with a total of 13 meetings held between May 8, 2020, and June 11, 2021. SMC were addressed at nine of the 13 meetings, and at all of the seven meetings held between January 8 and June 11, 2021. TAC members engaged in a very thorough, thoughtful, and constructive manner, giving consideration to all interests in the Subbasin involved with or affected by groundwater use and management, including domestic well users, disadvantaged communities, small disadvantaged communities, California Native American Tribes, and environmental beneficial uses and users. This engagement process and consideration for these stakeholders is documented in Chapter 2 of the GSP, as well as meeting minutes and related materials available online.[1] SMC were ultimately vetted and approved by both the CGA and GGA Boards at open Board meetings. Public notice was given in advance of those meetings. The decision records for the SMC are documented in Appendix 5A of the GSP.

Members of the public were welcome to attend the Joint TAC and open Board meetings and were encouraged to express their opinions, suggestions, and comments on the SMC, as well as other aspects of the GSP. Members of the public attended and participated in most Joint TAC meetings, including those in which SMC were discussed.

Sustainability Goal

The Sustainability Goal for the Colusa Subbasin as accepted by the TACs and adopted by the CGA and GGA is:

> *…to maintain, through a cooperative and partnered approach, locally managed sustainable groundwater resources to preserve and enhance the economic viability, social well-being and culture of all Beneficial Uses and Users, without experiencing undesirable results.*

Undesirable Results

The undesirable results statements proposed for Groundwater Levels and Streamflow Depletion, respectively, are as follows:

- The undesirable result for the chronic lowering of groundwater levels is a result that would cause significant and unreasonable reduction in the long-term viability of beneficial uses and users over the planning and implementation horizon of this GSP.

[1] CGA meeting materials are available at: https://colusagroundwater.org/meetings/.
GGA meeting materials are available at: https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/glenn-groundwater-authority/gga.

- The undesirable result for the depletion of interconnected surface water is a result that causes significant and unreasonable adverse effects on beneficial uses and users of interconnected surface waters within the Colusa Subbasin over the planning and implementation horizon of this GSP.

Additional consideration for undesirable results is discussed in Chapter 5 of the GSP.

Measurable Objectives

MOs represent the desired conditions for sustainable operation of the Subbasin while MTs define conditions that are to be avoided because of the risk that Undesirable Results could occur if the MTs are exceeded. For both sustainability indicators addressed in this TM, the MOs were set as the numerical average of all recorded groundwater levels over the most recent five years of record available for each well. For all but four wells, the most recent five years of record ends in Spring 2020. Setting MOs in this manner reflects the GSAs' intention to operate the Subbasin without persistent declines below recent historical groundwater levels, consistent with the Sustainable Groundwater Management Act (SGMA).

Minimum Thresholds

The rationale and parameters considered in establishing MTs for Groundwater Levels and Streamflow Depletion are discussed below in respective sections.

Groundwater Levels

The primary parameters and general objectives considered in establishing Groundwater Levels MTs were:

1. Avoiding significant and unreasonable impacts to shallow (primarily domestic) wells: setting MT groundwater levels shallow enough to be reasonably protective of a majority of existing domestic wells.
2. Avoiding significant and unreasonable effects on groundwater dependent ecosystems (GDEs): setting MT groundwater levels shallow enough to be reasonably protective of GDEs and potential GDEs.
3. Avoiding significant and unreasonable impacts to (constraints on) conjunctive management of Colusa Subbasin surface water and groundwater supplies: setting MT groundwater levels deep enough to allow a range of operational flexibility that ensures adequate water supply reliability over variable, wet and dry hydrologic conditions.

Available GDE mapping was analyzed and GDE areas ranked with regard to their likelihood of actually being dependent on groundwater as opposed to being sustained by streamflow or applied irrigation water. However, due to lack of reliable shallow groundwater elevation data, the analysis was inconclusive[2] and objectives 1 and 3, above, became the primary focus for setting Groundwater Level MTs. However, GDEs were still considered in the selection of Streamflow Depletion SMC and monitoring sites (see below). To reconcile potential conflicts between objectives 1 and 3, setting MTs involved striking balance and compromise between them to reasonably protect domestic well users while also supporting ongoing conjunctive management of the Subbasin.

[2] The lack of shallow groundwater data is identified as a data gap and will be addressed along with other data gaps during plan implementation.

For each of the 48 wells in the Groundwater Level representative monitoring network, Thiessen polygons were drawn around each well and the depths of all domestic wells expressed as an exceedance function. For example, the 20 percent exceedance for the domestic wells in any given polygon is the depth at which 20 percent of the wells are shallower and 80 percent deeper, meaning 80 percent of the wells would be protected and 20 percent would be subject to potential stranding if groundwater levels fell to the 20 percent exceedance depth. Information about existing domestic well infrastructure in the Colusa Subbasin was obtained from Well Completion Reports (WCR) available in DWR's database[3]. The WCR database generally includes all historical wells that have been reported in the system, which may include old wells that are no longer operational, have been refurbished, or have been dewatered for many years, long preceding conditions in 2015. The data is self-reported, and some data entries are incomplete. As such, the domestic well inventory for the Subbasin is incomplete and will be addressed with other data gaps in the Subbasin to support GSP implementation (see Chapters 4, 6 and 7). The analysis to support setting MT was developed considering these limitations.

The analyses of well completion depths conducted to support the MT development process is conservative and protective of beneficial uses because it included domestic wells that were shallower than the historic low groundwater level in each polygon. As documented in Appendix 5C, for the Subbasin as a whole, approximately 46 percent of the domestic wells in the WCR database are shallower than the pre-2015 historical groundwater levels as defined by the Groundwater Level representative monitoring network. Many of these shallow wells may no longer be used or they may have been deepened because they would have otherwise been dry at times prior to 2015. Including these shallow, and potentially unused or deepened wells in the well depth analysis, resulted in Groundwater Level MTs that are shallower than they would have been if the wells had been excluded.

As described in Chapter 4 of the GSP, data gaps related to domestic wells will be addressed in future GSP updates, and this analysis may be refined with new information. Based on the available information at the time of GSP development, technical team analysis, and TAC discussion, a 20 percent exceedance threshold emerged as being reasonable for protection of existing domestic well infrastructure.

For the same 48 representative monitoring wells, historical water levels, generally for the period from spring 2000 to spring 2020 (subject to availability for any particular well), were reviewed and analyzed as a basis for understanding how groundwater levels have fluctuated and when historical minimum groundwater levels have occurred. In particular, the magnitude of the range of historical fluctuation was regarded as an indicator of how the well has behaved over wet and dry hydrologic periods, and whether there are any persistent upward or downward trends. For many wells, especially those relatively far from streams, groundwater levels have trended downward since approximately the mid-2000s and record low groundwater levels were observed in the fall of 2015 following back-to-back critically dry years. These observations led to the approach of alternatively setting MTs at historical low levels plus some percentage of the observed groundwater level range to allow for conjunctive operation of the Subbasin during droughts. The TACs considered 20 percent and 50 percent of historical range as the increment to add to the observed historical low groundwater level. After careful review of the 48 well records, 50 percent of historical range below the historical low was selected as an MT that would allow the range of fluctuation necessary to manage through future dry periods while avoiding undesirable results. To support evaluation of Groundwater Level MTs, the technical team developed an economic analysis of the costs (additional pumping costs, domestic well replacement costs) and benefits (avoided costs of other projects and management actions) associated with the proposed MTs. The analysis illustrated the direct monetary cost-benefit tradeoffs of setting MTs at different levels. The central

[3] Available at: https://data.cnra.ca.gov/dataset/well-completion-reports

conclusion was that the additional cost of raising the MT for most monitoring wells was substantially greater than the additional benefit to groundwater users in the Subbasin. Results of this analysis were presented to the TAC at a public meeting held on May 13, 2021 and are described in more detail in Appendix 5C of the GSP.

Hydrographs for the 48 wells in the Groundwater Level representative monitoring well network are provided in Attachment A illustrating both possible MTs: one based on the 20th percentile domestic well depth exceedance and the other on 50 percent of historical range below the historical low. The two MTs are shown in relation to available historical data for each well. For 13 of the wells, the lower of the MTs is represented by the 50 percent of range below the historical low with the lower MT for the remaining 35 wells represented by 20th percentile domestic well depth exceedance. Based on the information in these graphs and supporting analysis by the technical team, the technical team recommended, and the TACs accepted, adopting the lower of the two MTs as the governing threshold.

For the 13 wells with MTs based on 50 percent of historical range below the historical low, it was possible that more than 20 percent of domestic wells would be shallower than the MT, and therefore would be at risk of dewatering. An additional analysis was developed to quantify the share of domestic wells that could potentially be affected under the selected MT. The inventory of domestic wells for each polygon was screened to remove wells that were shallower than the historical low groundwater level observed prior to January 1, 2015. These wells would have been dewatered based on historical groundwater levels that occurred in the Subbasin prior to the implementation of SGMA. The proportion of the remaining wells that are shallower than the proposed MT was calculated for each polygon. In aggregate, less than 20 percent of domestic wells are shallower than the proposed MT. This was viewed as an acceptable balance between avoiding significant and unreasonable impacts to domestic (and other shallow) wells and allowing sufficient flexibility for conjunctive management of Subbasin surface and groundwater supplies, given the uncertainty of available information on domestic wells in the WCR database. As described in Chapter 4 of the GSP, data gaps related to domestic wells will be addressed in future GSP updates, and this analysis may be refined with new information.

It is important to emphasize that groundwater levels will be managed for MOs, which are generally set substantially above MTs. MTs define the levels that would not be exceeded to avoid Undesirable Results. However, recognizing the importance of protecting domestic wells in the Subbasin, the GSP includes a potential management action in which the GSAs would develop a domestic well mitigation program[5]. This would provide an additional safety net for domestic well users by providing potential compensation for impacts to domestic wells that are associated with GSP implementation.

A hydrograph series showing the selected MT relative to historical water levels at each representative monitoring well is presented in Attachment B.

Streamflow Depletion

As explained in the Introduction, Streamflow Depletion MTs are based on groundwater levels as a proxy for streamflow depletion volume or rate. The basic rationale postulated, evaluated, and recommended by the Environmental Defense Fund (EDF) in support of using groundwater levels as a proxy for depletion volumes or rates is that adverse impacts to surface water uses and users can be avoided if

[5] See Chapter 6, Section 6.5.2 of the GSP.

groundwater gradients and levels near interconnected streams are maintained at levels that existed when implementation of the SGMA began in 2015[6].

Only 12 wells could be identified that were considered to reasonably represent groundwater levels near the three major, potentially interconnected streams in the Subbasin, based on an assessment of their proximity to the streams and the depth to the bottom of their screened interval. The 12 wells were selected based on the following criteria developed using recommendations in the EDF report:

- Located greater than 2,000 feet and not more than 5 miles from an interconnected stream
- Depth to bottom of screened interval less than or equal to 200 feet

The three streams are: Stony Creek, which borders the Subbasin to the north; the Sacramento River, which mostly borders the Subbasin to the east but also runs through a portion of the Subbasin (approximately between Princeton and Colusa); and, the Colusa (Basin) Drain, which originates in and flows southward out of the Subbasin at the Colusa-Yolo Subbasin boundary (county line). The 12 wells are not considered adequate for long-term sustainable groundwater management but are determined to be the best available monitoring sites at this time for evaluating streamflow depletion. Additional dedicated near-stream shallow monitoring wells are needed and will be designed and installed during GSP implementation.

Nevertheless, quantitative MTs were established for these wells as described below. These MTs are considered to be provisional pending additional data collection and analysis and updating and refining the C2VSim FG-Colusa model.

Three *alternative* MTs were evaluated for the 12 wells currently in the Streamflow Depletion representative monitoring network, as follows:

1. The observed Fall 2015 groundwater level (on the date closest to October 15), OR
2. 20 percent of the historical range in groundwater levels below the observed Fall 2015 groundwater level (depth to water), OR
3. 10 feet below the observed Fall 2015 groundwater level (on the date closest to October 15).

The first MT is consistent with the EDF recommendation that aims to avoid or minimize incremental post-SGMA effects on stream depletions but prevents any opportunity for exercising groundwater storage, such as might be needed during prolonged droughts. The second MT is based on a similar concept as that used for Groundwater Levels, where the MT is set at 20 percent of the historical range below the observed Fall 2015 water level. However, historical water levels in most near-stream wells are generally stable and do not fluctuate much. Thus, the historical range is typically small, and the resulting MT was still very constraining on the ability to exercise groundwater storage when needed. Finally, due to concerns among TAC members regarding overly constrained groundwater operations, a third MT was introduced defined as 10 feet deeper than the Fall 2015 groundwater level at each well.

A series of hydrographs showing all three alternative MTs in relation to historical groundwater levels at each of the 12 wells is presented in Attachment C. For all wells, the highest MT is represented by the Fall 2015 water level. The lowest MT is represented by the 10 feet deeper than Fall 2015 groundwater level at 10 of the 13 wells. For the three wells where the 20 percent of historical range below the

[6] Environmental Defense Fund, (EDF), 2018, Addressing Regional Surface Water Depletions in California: A Proposed Approach for Compliance with the Sustainable Groundwater Management Act. Available online at http://edf.org/california-surface-water-report.

observed Fall 2015 groundwater level is the deepest MT, the margin between the two deepest MTs is typically small.

Based on careful consideration of the alternative Streamflow Depletion MTs and evaluation of historical groundwater levels at the wells, the TAC selected the MT defined as 10 feet deeper than the observed Fall 2015 water level. A series of hydrographs showing the selected MT relative to historical groundwater levels is presented in Attachment D.

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Appendix 5C

Economic Analysis of Groundwater Level Minimum Thresholds

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Technical Memorandum

To: Glenn and Colusa County Groundwater Authorities

From: ERA Economics

Date: November 24, 2021

Subject: Economic Benefit-Cost Analysis of Potential Groundwater Level Minimum Thresholds

Introduction

Sustainable Management Criteria (SMC) for the Colusa Subbasin (Subbasin) were established in consultation with the Technical Advisory Committees (TACs) of the Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA). SMCs consist of the following: the Sustainability Goal adopted for the Subbasin; Undesirable Results describing significant and unreasonable effects to be avoided; quantitative Minimum Thresholds (MTs) that define conditions that, if exceeded, may cause Undesirable Results; and quantitative Measurable Objectives (MOs) to achieve the Sustainability Goal of the Subbasin. Undesirable Results, MTs, and MOs are all established in relation to the six sustainability indicators referenced in the GSP Emergency Regulations, five of which are applicable in the Subbasin.

Subbasin MTs were developed with substantial public and technical team input. A total of 13 joint meetings of the TACs were held between May 8, 2020, and June 11, 2021, and SMCs were addressed at 9 of the 13 meetings. This included all 7 meetings held between January 8 and June 11, 2021. Several technical analyses were developed to evaluate potential MTs. This appendix describes an economic analysis of MTs that was developed and presented to the TAC at the June 11, 2021 meeting.

The Subbasin MTs are described in detail in Chapter 5 and Appendices 5A and 5B. The general approach to setting MTs for Groundwater Levels was developed with consideration for both the historical groundwater levels at each well and the distribution of shallow (primarily domestic) well depths in the area surrounding the well. Potential MTs were considered based on a percent margin below historical lows or domestic well depths. These were set to balance avoiding significant and unreasonable impacts to domestic wells while also allowing sufficient flexibility for conjunctive management of Subbasin surface and groundwater supplies.

To support evaluation of MTs, an economic analysis was developed to assess whether it would be cost-effective to set MTs higher (or lower) than the MTs based on the lower of 50 percent below the historical low groundwater level or 20th percentile of domestic well depths.

This appendix describes the economic analysis, assumptions, and results considered for evaluating potential Groundwater Level MTs. The reconnaissance-level economic analysis was based on the data available for GSP development and the simplifying assumptions described in the sections below. Important assumptions include: (i) the analysis was developed for MTs, not MOs that the Subbasin will be managed for and are substantially higher than MTs, (ii) only a subset of costs and benefits (pumping cost, well replacement cost, avoided costs of projects and management actions (PMA)) associated with PMA implementation and potentially dewatered domestic were considered, and (iii) the example PMA considered was demand management (reducing pumping). The analysis can be refined and expanded as GSP data gaps are addressed and additional information

becomes available. It is also noted that the GSP includes additional potential actions for monitoring potential impacts to domestic wells, as described in Section 6.5.2.1, Domestic Well Mitigation Program.

Economic Analysis Overview

A benefit-cost analysis was developed to monetize and compare the benefits and costs to groundwater users in the Subbasin under the Groundwater Level MTs. It was developed as a reconnaissance-level assessment to establish preliminary costs and benefits associated with different level MTs. There are additional benefits and costs associated with MTs that relate to four other sustainability indicators defined in the GSP Emergency Regulations that are applicable to the Subbasin that were not considered in this analysis. The analysis could be refined in the future to support updates to the GSP or additional consideration of threshold levels. The information presented in this appendix is developed to illustrate the general magnitude of costs, benefits, and the associated tradeoff.

The benefit of higher MTs is the avoided cost of replacing dewatered domestic wells and the avoided energy cost of additional pumping lifts from lower groundwater levels. Dewatered domestic well costs would fall on individual domestic well owners. Additional pumping costs would fall on Subbasin groundwater users in the vicinity of the monitoring well (defined by Thiessen polygons). In contrast, the incremental cost of setting higher MTs is due to more rapid (and larger scale) implementation of projects and management actions. For example, preventing additional declines in groundwater levels may require larger recharge projects, and these projects would need to be implemented more rapidly. This imposes additional costs on groundwater users in the Subbasin.

The benefit-cost ratio is calculated from the monetized benefits and costs over the relevant planning horizon (in this case, the 20-year GSP implementation period). When the benefit-cost ratio is greater than 1, the benefits are at least as large as the cost, suggesting it could be cost-effective to make the MTs shallower in selected areas.

The following costs were considered in the economic analysis of groundwater level MTs:

1. Capital cost of replacing or refurbishing potentially dewatered domestic wells. For the purposes of this analysis, a domestic well is defined as dewatered, and completely replaced when the groundwater level MT is below the total well depth. In practice, pumping impacts would occur earlier depending on the screened interval of the well and other aquifer- and well-specific characteristics. The domestic well inventory in the Subbasin is based on DWR's Well Completion Report (WCR) data (see GSP Chapter 3).
    a. The capital cost of well replacement is set at $40,000 per well based on costs for domestic well replacement used in other GSPs[1] and adjusted for inflation. These costs generally include drilling at $40 per foot, a sanitary seal for $2,500, and a pump for $5,000. This does not include permit costs. Actual costs will vary based on the costs of materials and supply and demand for well drilling services.

[1] Madera Joint GSP. Technical Appendix 3C: Economic Analysis and Framework for Potential Domestic Well Mitigation Program.

2. Additional energy costs caused by additional pumping lifts that would affect all groundwater users in the Subbasin. Lower groundwater levels increase the energy cost to pumpers (domestic and agriculture) in the Subbasin.

    a. Agricultural pumping energy cost depends on lift, pump efficiency, and the power rate which varies by time of use and size of load. For purposes here, the analysis used an average over several 2021 PG&E agricultural power rates to get a total variable pumping cost of about $0.52 per acre-foot per foot of lift.

The following benefits (avoided costs) were considered in the economic analysis of groundwater level MTs:

1. Cost of demand management (reducing pumping) to prevent additional declines in groundwater levels. The cost of demand management is used instead of the cost of specific projects because demand management could be implemented more rapidly than most projects (there is no construction required). It is noted that demand management is not a planned PMA in the Subbasin, and these costs are used as a proxy for the costs of other projects. Chapter 6 Appendix 6B describes the cost of demand management in the Subbasin. The costs include the direct cost of land idling only, and do not include any additional indirect costs or administrative costs to set up and implement a demand management program.

Existing domestic well infrastructure in the Subbasin is based on WCR available in DWR's database[2]. The WCR data generally include all historical wells that have been reported in the system, which may include old wells that are no longer operational or have been refurbished. The domestic well inventory for the Subbasin will be addressed with other data gaps in the Subbasin to support GSP implementation (see Chapter 3).

An analysis was developed to evaluate the WCR data regarding well depths for the wells in the inventory. For each well in a Thiessen polygon, the reported well depth was compared to the historical low groundwater level recorded prior to January 1, 2015. The purpose of the analysis was to establish what share of domestic wells in the WCR database may have been previously dewatered and/or are no longer used. Wells that were shallower than the historic low were flagged, counted, and compared to the total domestic wells for each Thiessen polygon. In total, approximately 46 percent of the domestic wells in the WCR database for the Subbasin show a total depth that is shallower than the historic groundwater level low. The results of the analysis for each Thiessen polygon are summarized in Table 1.

[2] Available at: https://data.cnra.ca.gov/dataset/well-completion-reports

Table 1. Benefit-Cost Analysis of an Incremental Increase in MT (by 5 feet bgs)

Monitoring Well #	Total Domestic Wells	Wells Shallower than Historic low before 1/2015	Share
13N02W20H002	180	28	0.16
14N02W22A002	16	NA	-
14N03W24C001	26	8	0.31
14N03W14Q003	23	14	0.61
16N02W25B002	368	2	0.01
15N03W08Q001	56	0	0.00
16N04W02P001	24	0	0.00
16N03W14H003	45	0	0.00
15N03W20Q001	85	4	0.05
17N03W32H001	43	0	0.00
14N02W29J001	97	5	0.05
13N01W07G001	181	34	0.19
13N01W22P002	52	0	0.00
12N01E06D004	7	NA	-
16N02W05B001	32	0	0.00
14N02W13N001	20	0	0.00
13N02W15J001	196	43	0.22
13N02W12L001	61	6	0.10
14N01W04K003	117	7	0.06
13N01E11A001	8	0	0.00
13N01W13P001	8	0	0.00
14N01E35P001	26	0	0.00
15N02W19E001	201	1	0.00
20N02W18R005	71	3	0.04
20N03W07E001	94	41	0.44
19N04W14M002	265	1	0.00
17N03W08R001	80	0	0.00
17N02W09H002	38	2	0.05
21N02W33M001	50	39	0.78
21N02W01F001	40	3	0.08
21N03W34Q002	173	121	0.70
21N03W23D001	118	101	0.86
21N03W01R002	109	24	0.22
21N02W04G002	69	18	0.26
21N04W12A004	636	591	0.93
15N01W05G001	111	6	0.05
18N02W36B001	107	2	0.02
19N02W33K001	108	2	0.02
18N02W18D001	41	0	0.00

Monitoring Well #	Total Domestic Wells	Wells Shallower than Historic low before 1/2015	Share
20N02W33B001	52	0	0.00
19N02W08Q001	176	2	0.01
17N02W30J002	10	0	0.00
22N03W24E001	1,677	1,589	0.95
20N02W25F001	105	0	0.00
22N02W30H002	173	168	0.97
21N02W36A002	97	38	0.39
20N02W11A001	56	0	0.00
21N02W05M001	36	22	0.61
Total	6,364	2,925	0.46

Economic Analysis of Subbasin MTs

The economic analysis considers the Subbasin groundwater level MTs. It is important to note that the Subbasin will be managed to meet MOs, which are set substantially higher than MTs. The costs and benefits described in this TM are generally conservative, corresponding to Groundwater Level MTs that are lower than current groundwater levels, MOs, and observed historical levels in many areas.

Figure 1 illustrates the aggregate annual cost curve for an example Thiessen polygon (21N03W01R002) in the Subbasin. The same calculations are repeated for the other 47 polygons. A range of groundwater depths including the MT (155 feet bgs) specified in the GSP are evaluated. Costs increase as depth to groundwater increases. The capital cost of replacing dewatered domestic wells is annualized using a discount rate of 5 percent over a 30-year economic life. Pumping costs are the additional annual energy cost of pumping from a lower depth in that year. The total cost is the sum of the pumping cost and well replacement cost. All costs are additional (incremental) costs in addition to the current pumping costs at current groundwater depths.

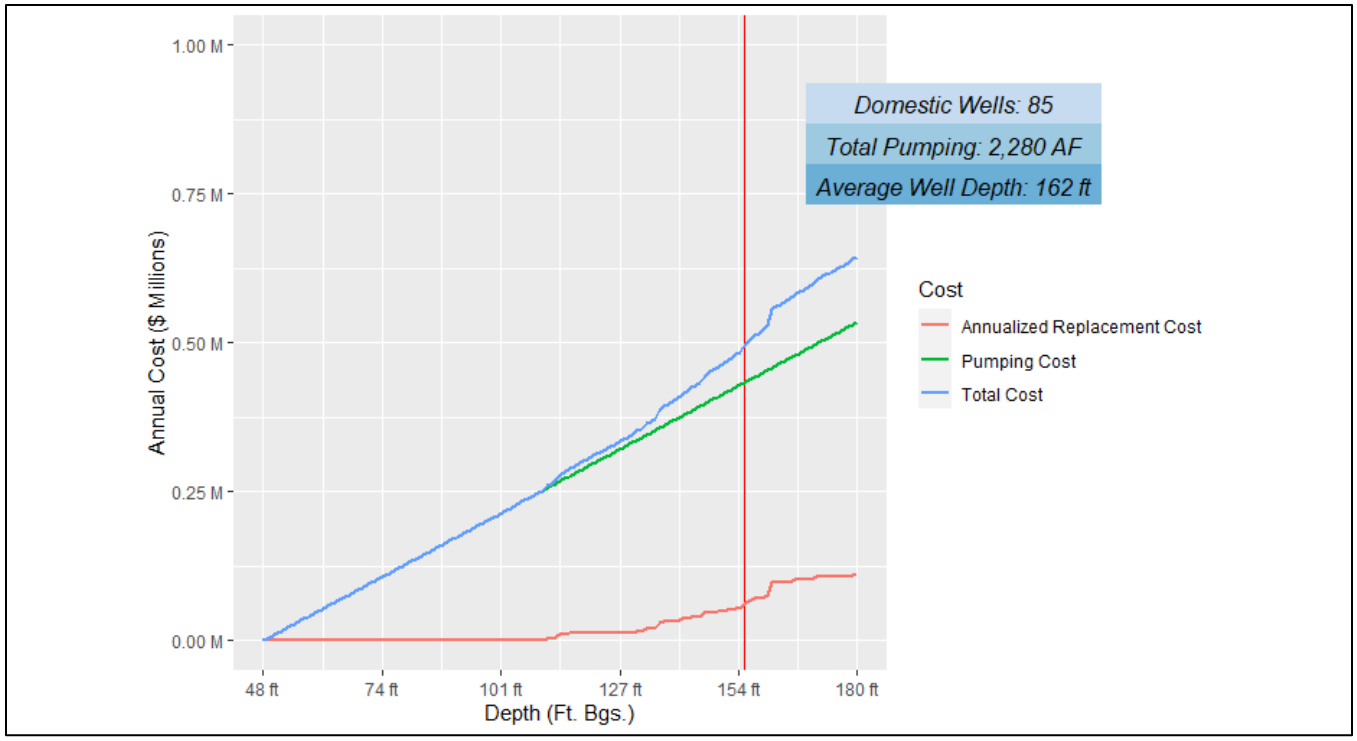
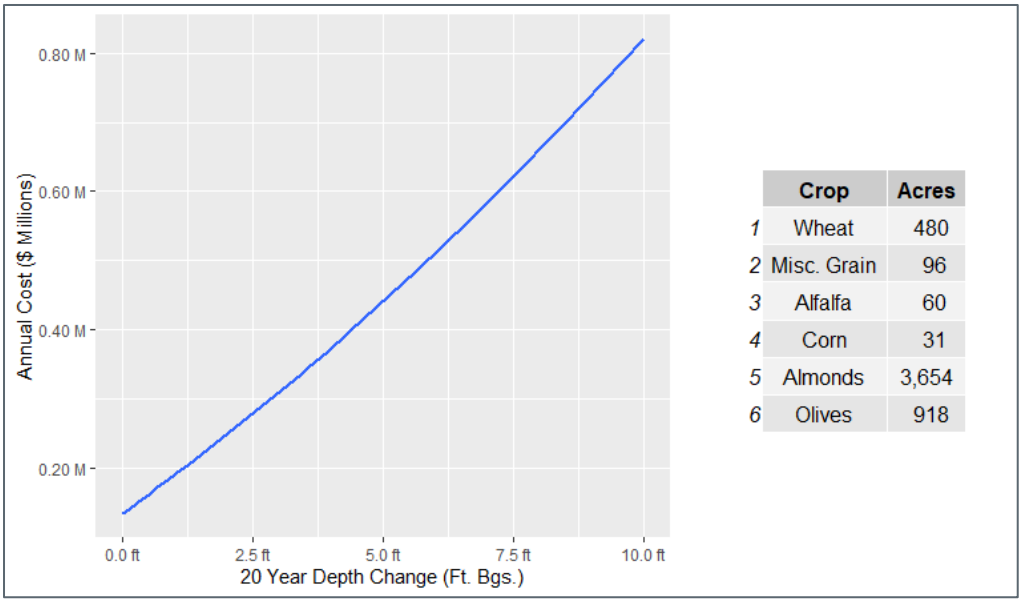


Figure 1. Colusa Subbasin Incremental Annual Cost by Depth to Groundwater

Figure 2 illustrates the benefit (avoided cost) of a change in the MT for the same example Thiessen polygon (21N03W01R002) in the Subbasin (1 of 48 total polygons). In contrast to the static pumping and well replacement costs shown in Figure 1, the benefit is an avoided cost and is therefore expressed as a change in depth to groundwater. The irrigated acreage within the Thiessen polygon is also shown in the figure. The mix of crops grown affects the cost of demand management. The example polygon is predominantly planted to permanent crops (almonds and olives), which are costly to idle due to higher net return relative to other annual crops and the substantial capital investment required to establish orchards. A range of projects and management actions that are specified in the GSP could be implemented to achieve a change in groundwater levels across the Subbasin (see Chapter 6). As described above, the cost of demand management to reduce pumping is used to develop the aggregate cost curve shown in Figure 2 (and the individual cost curves for each polygon). The change is shown over the full GSP implementation timeline (20 years).



	Crop	Acres
1	Wheat	480
2	Misc. Grain	96
3	Alfalfa	60
4	Corn	31
5	Almonds	3,654
6	Olives	918

Figure 2. Colusa Subbasin Incremental Demand Management Cost by Depth to Groundwater

As described in Chapter 5 and Appendices 5A and 5B, the MT for groundwater levels is set based on the lower of 50 percent below the historical low groundwater level or the 20th percentile of the domestic well depth within each of the 48 Thiessen polygons corresponding to the 48 monitoring wells. The benefit-cost analysis evaluates whether an incremental change in the MT would result in a positive benefit-cost ratio in each polygon. The analysis is developed for an incremental increase in the MT of 5 feet.

Table 2 summarizes the benefit-cost analysis of an incremental (defined as 5 feet) increase in the MT. This illustrates the central economic tradeoff: whether a change in the MT (in this case an increase in the MT level by 5 feet) would generate economic benefits for the Subbasin that are greater than the costs that would be incurred. The table summarizes each polygon and the annual benefits, costs, and net benefits. Since the analysis evaluates an incremental increase in the MT, the benefits are defined as the avoided pumping and well replacement cost. Costs are defined as the additional cost of idling land (demand management) to achieve the 5-foot increase in MT. The net benefit shows the absolute difference between benefits and costs, and the final column shows the associated benefit-cost ratio. A benefit-cost ratio greater than 1 shows benefits are greater than costs, implying that a 5-foot shallower MT would generate benefits greater than costs. The aggregate benefit-cost ratio over all polygons is 0.33 (each dollar of cost returns only 33 cents in benefits). There are five polygons where the benefit-cost ratio is slightly greater than 1 (between 1.0 and 2.1). However, the total annual net benefit across these five polygons is $70,000, which is less than 1 percent of the estimated -$3,800 thousand (-$3.8 million) in total annual net benefits across the Subbasin.

Table 2. Benefit-Cost Analysis of an Incremental Increase in MT (by 5 feet bgs)

Effect of Raising Groundwater Level MT 5 feet Relative to Proposed Groundwater Level MT				
Monitoring Well Polygon	**Pump + Well Cost Saving (Annual Benefit in thousands)**	**Idling Cost (Annual Cost in thousands)**	**Net Benefit (thousands)**	**B/C Ratio**
13N02W20H002	$25	$579	($554)	0.0
14N02W22A002	$42	$57	($15)	0.7
14N03W24C001	$30	$48	($18)	0.6
14N03W14Q003	$20	$469	($449)	0.0
16N02W25B002	$159	$170	($11)	0.9
15N03W08Q001	$2	$111	($109)	0.0
16N04W02P001	$9	$91	($82)	0.1
16N03W14H003	$13	NA	-	0.0
15N03W20Q001	$17	$167	($150)	0.1
17N03W32H001	$5	$157	($152)	0.0
14N02W29J001	$27	$52	($25)	0.5
13N01W07G001	$65	$65	$0	1.0
13N01W22P002	$41	$70	($29)	0.6
16N02W05B001	$47	$79	($32)	0.6
14N02W13N001	$45	$59	($14)	0.8
13N02W15J001	$39	$66	($27)	0.6
13N02W12L001	$13	$30	($17)	0.4
14N01W04K003	$117	$145	($28)	0.8
13N01E11A001	$8	$36	($28)	0.2
13N01W13P001	$28	$120	($92)	0.2
14N01E35P001	$38	$42	($4)	0.9
15N02W19E001	$45	$123	($78)	0.4
20N02W18R005	$75	$57	$18	1.3
20N03W07E001	$52	$277	($225)	0.2
19N04W14M002	$41	$198	($157)	0.2
17N03W08R001	$11	$399	($388)	0.0
17N02W09H002	$70	$388	($318)	0.2
21N02W33M001	$41	$45	($4)	0.9
21N02W01F001	$57	$43	$14	1.3
21N03W34Q002	$59	$69	($10)	0.9
21N03W23D001	$33	$73	($40)	0.5
21N03W01R002	$31	$29	$2	1.1

Effect of Raising Groundwater Level MT 5 feet Relative to Proposed Groundwater Level MT				
Monitoring Well Polygon	**Pump + Well Cost Saving (Annual Benefit in thousands)**	**Idling Cost (Annual Cost in thousands)**	**Net Benefit (thousands)**	**B/C Ratio**
21N02W04G002	$35	$31	$4	1.1
21N04W12A004	$100	$287	($187)	0.3
15N01W05G001	$79	$130	($51)	0.6
18N02W36B001	$64	$96	($32)	0.7
19N02W33K001	$50	$314	($264)	0.2
18N02W18D001	$25	NA	-	0.0
20N02W33B001	$20	NA	-	0.0
19N02W08Q001	$47	NA	-	0.0
17N02W30J002	$1	NA	-	0.0
22N03W24E001	$2	$65	($63)	0.0
20N02W25F001	$44	$184	($140)	0.2
22N02W30H002	$6	$38	($32)	0.2
21N02W36A002	$61	$29	$32	2.1
20N02W11A001	$4	$33	($29)	0.1
21N02W05M001	$11	$26	($15)	0.4
Total	$1,854	$5,547	($3,799)	0.33

Notes: "NA" or missing values reflect polygons with zero acreage or insufficient data to support the benefit-cost calculations.

Discussion

The results indicate that the cost of raising the MT would not be cost effective from a Subbasin-wide perspective, or for most individual polygons. The aggregate benefit-cost ratio of 0.33 shows each dollar of cost from setting MTs incrementally higher returns only 33 cents in benefits across the entire Subbasin. The avoided costs (fewer domestic wells requiring replacement and reduced pumping lifts) would be modest ($1.9 million) relative to the cost of lost agricultural net return from demand management ($5.5 million). The general conclusions are robust to the assumptions used – that is, results are not sensitive to reasonable ranges in key assumptions, including the loss in net return per acre-foot of demand management, additional pumping costs, or the cost of replacing a domestic well. The analysis is developed to support long-run planning for setting MTs. PMAs needed to support higher MTs require time to develop and implement and cannot be implemented rapidly in response to severe, unprecedented drought. The short-run costs of wells running dry during severe drought events can include other cost factors that were not explicitly analyzed. For example, in the crisis of a severe drought, local drilling capacity and well repair services can be limited, which can result in higher cost or increased wait times. This can place additional financial stress on households with domestic wells.

There are five polygons that show a benefit-cost ratio slightly greater than 1, indicating that benefits would be slightly greater than the costs. The total net benefit is $70,000 across these five polygons. The benefit-cost ratio for these polygons is between 1.1 and 2.1. These occur in polygons 21N02W36A002, 21N02W04G002,

21N03W01R002, 21N02W01F001, and 20N02W18R005.The total annual net benefit of $70,000 is less than 1 percent of the estimated -$3,800 thousand (-$3.8 million) in total annual net benefits across the Subbasin. In addition, the cost of setting higher MT includes the direct cost of demand management only, and does not include other program administrative costs, or potential third-party impacts that may occur in the Subbasin. Including these costs would push the benefit-cost ratio below one in these areas. Finally, it is noted that the inventory of domestic wells for each polygon includes all wells in the DWR WCR database. Many wells are shallower than the historical low groundwater level observed prior to January 1, 2015. These wells would have been dewatered based on historical groundwater levels that occurred in the Subbasin prior to the implementation of SGMA. Removing these wells from the database would reduce the benefit of increasing MT, further reducing the benefit-cost ratio in all polygons.

The conclusion of the economic analysis is that it would not be cost-effective from a Subbasin or polygon-wide perspective to raise Groundwater Level MTs in the Subbasin. Therefore, the proposed MTs were viewed as an acceptable balance between avoiding significant and unreasonable impacts to domestic (and other shallow) wells and allowing sufficient flexibility for conjunctive management of Subbasin surface and groundwater supplies. In addition, as summarized in Table 1 and described in Appendices 5A and 5B, a substantial share of domestic wells in the WCR database appear to be shallower (total depth) than the observed low groundwater levels in each of the Thiessen polygons.

It is important to emphasize again that groundwater levels will be managed for MOs, which are set substantially above MTs. MTs are set below where the Subbasin is expected to be operated, defining the levels that would not be exceeded to avoid increasing risk of Undesirable Results. However, recognizing the importance of protecting domestic wells in the Subbasin, the GSP includes a potential management action in which the GSAs would develop a domestic well impact mitigation program (see Chapter 6). This would provide an additional safety net for domestic well users by providing potential compensation for impacts to domestic wells that are associated with GSP implementation.

Appendix 5D

Electrical Conductivity Historical Trends, Minimum Thresholds, and Measurable Objectives

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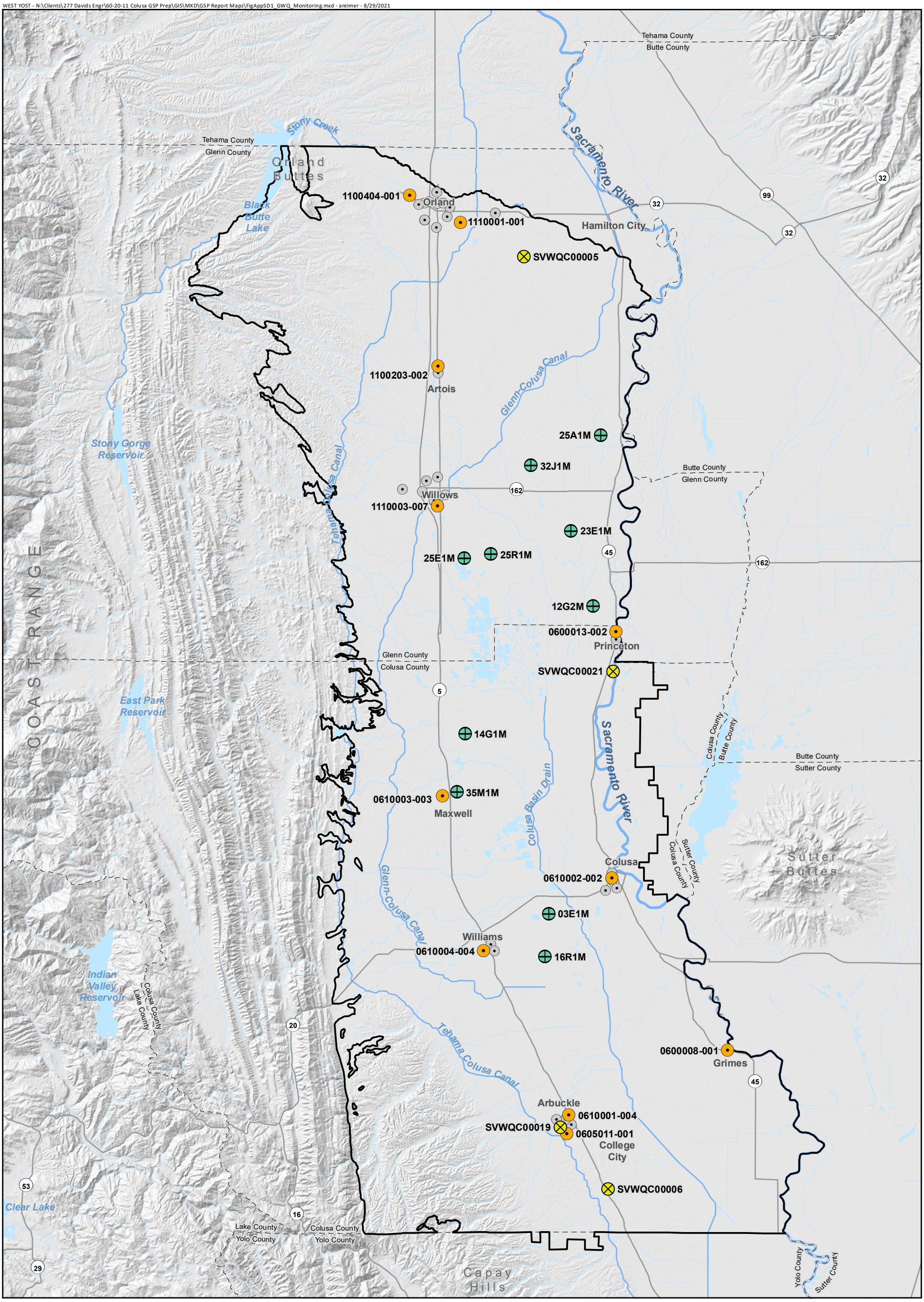
WEST YOST - N:\Clients\277 Davids Engr\60-20-11 Colusa GSP Prep\GIS\MXD\GSP Report Maps\FigApp5D1_GWQ_Monitoring.mxd - areimer - 8/29/2021



Colusa Subbasin

Active Public Water Supply Well

Representative Groundwater Quality Monitoring Network Well

Representative Public Water Supply Well

Representative California Rice Commission Groundwater Monitoring Well

Representative Sacramento Valley Water Quality Coalition Groundwater Monitoring Well

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

N

0 2.5 5

Scale in Miles

Figure 5D-1

Representative Groundwater Quality Monitoring Network

Colusa Groundwater Authority and Glenn Groundwater Authority

Colusa Subbasin

Groundwater Sustainability Plan

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Figure 5D-2. Del Oro Water Company - Black Butte District Representative Well: Well 1100404-001 (Well 1)

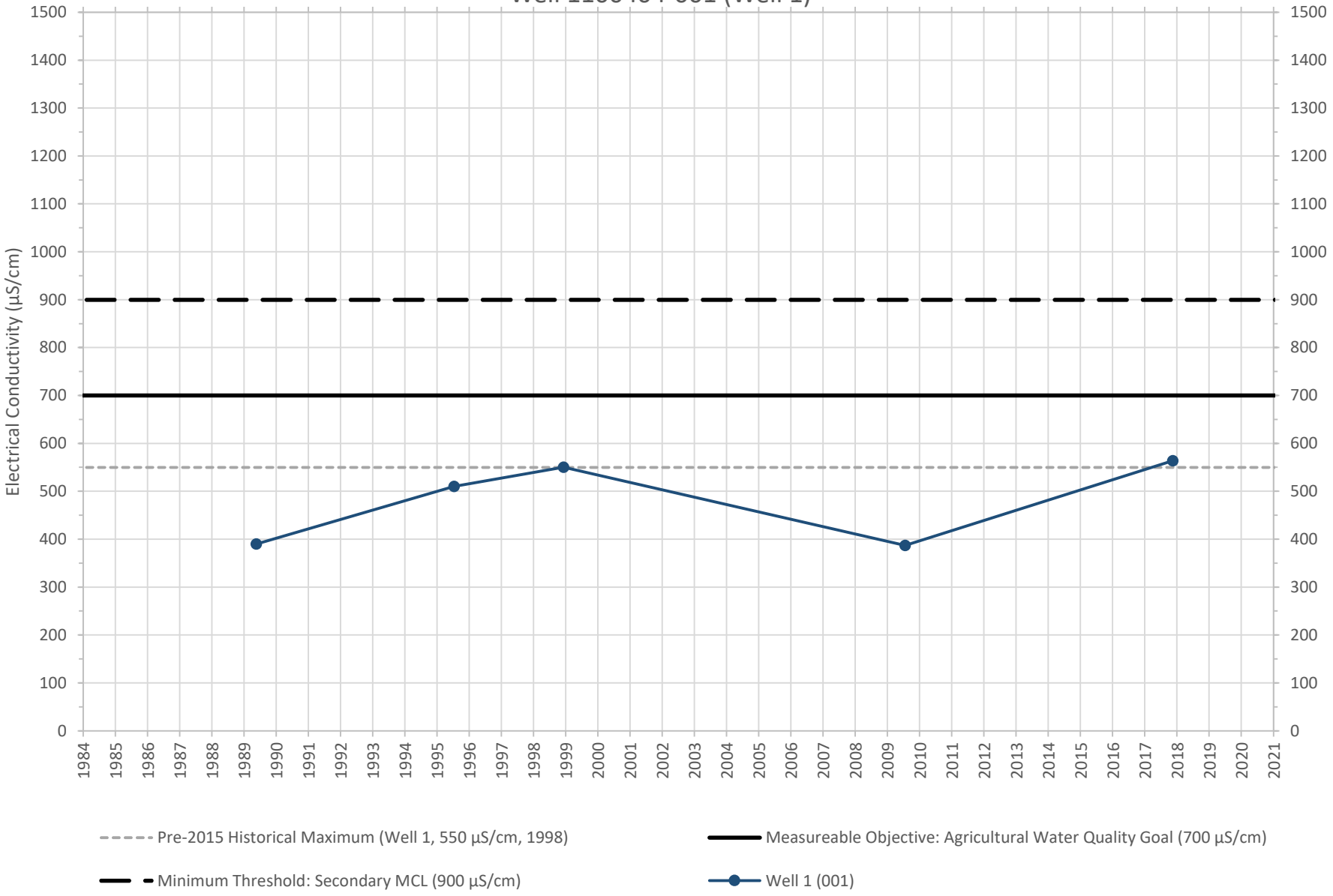


Figure 5D-3. City of Orland Representative Well:
Well 1110001-001 (Lely Aquatic Park Well)

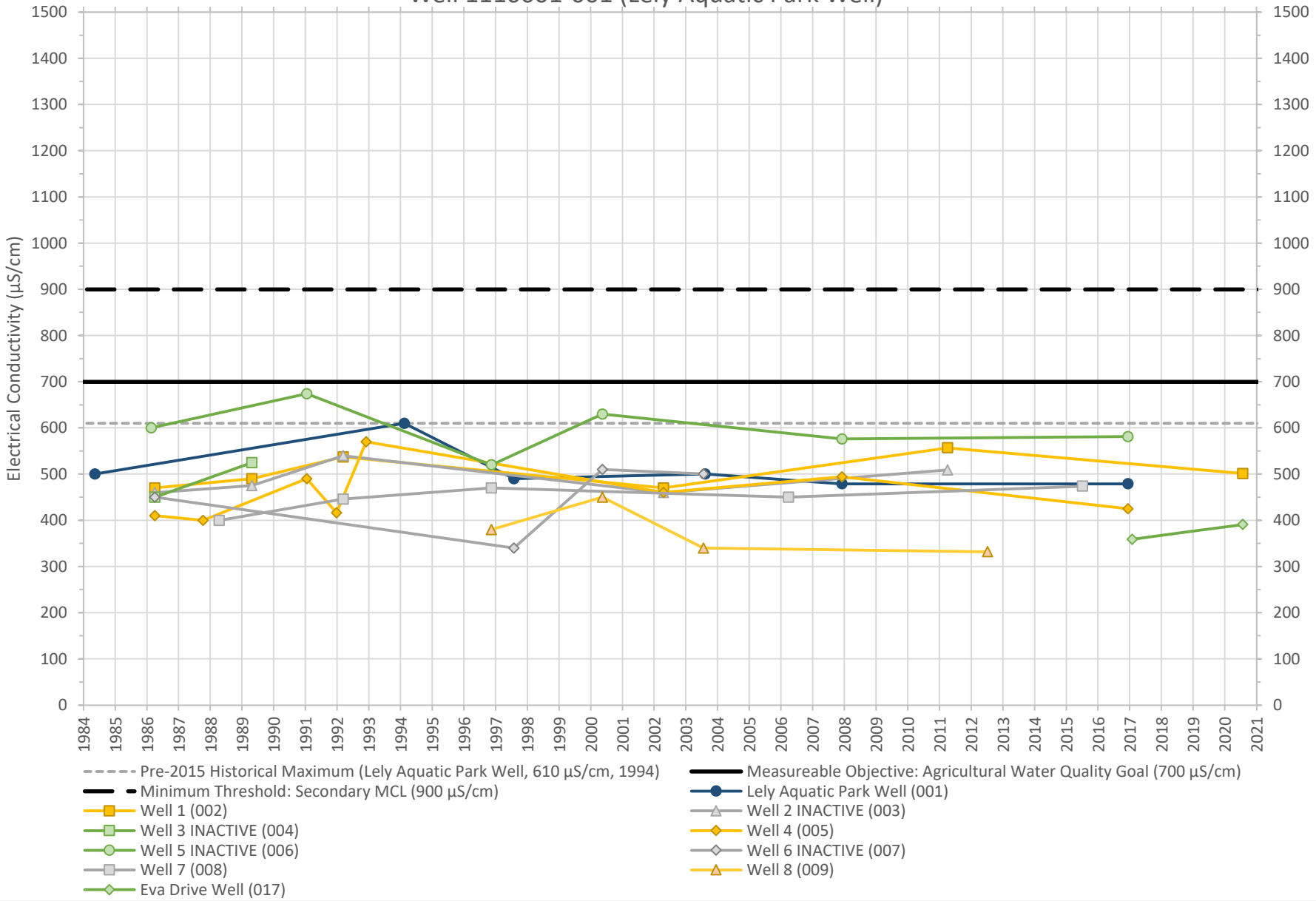


Figure 5D-4. Artois Community Service District Representative Well:
Well 1100203-002 (North Well)

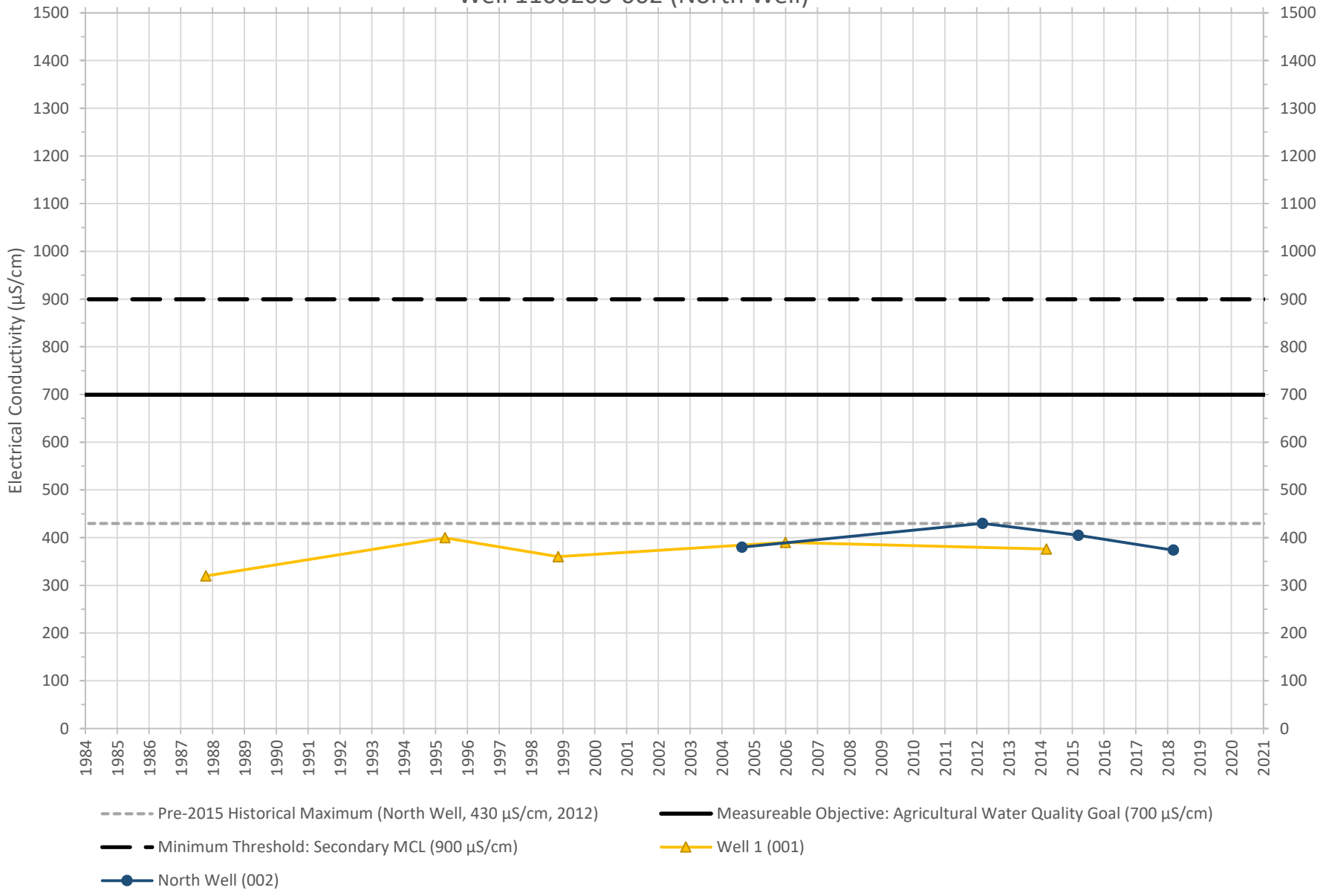


Figure 5D-5. Cal-Water Service Company - Willows Representative Well: Well 1110003-007 (Well 8)

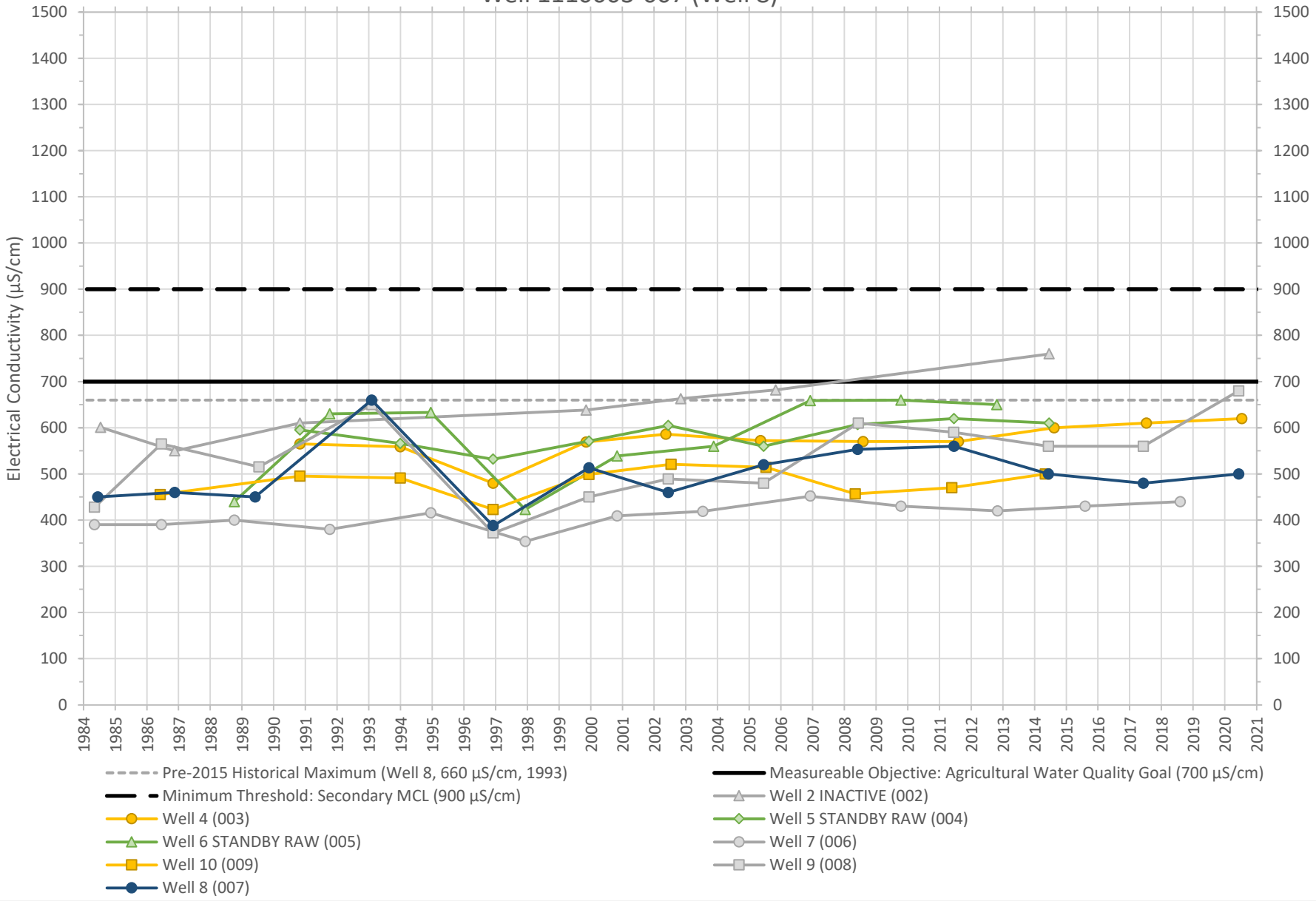


Figure 5D-6. Colusa County WWD #2 - Princeton Representative Well: Well 0600013-002 (Well 2)

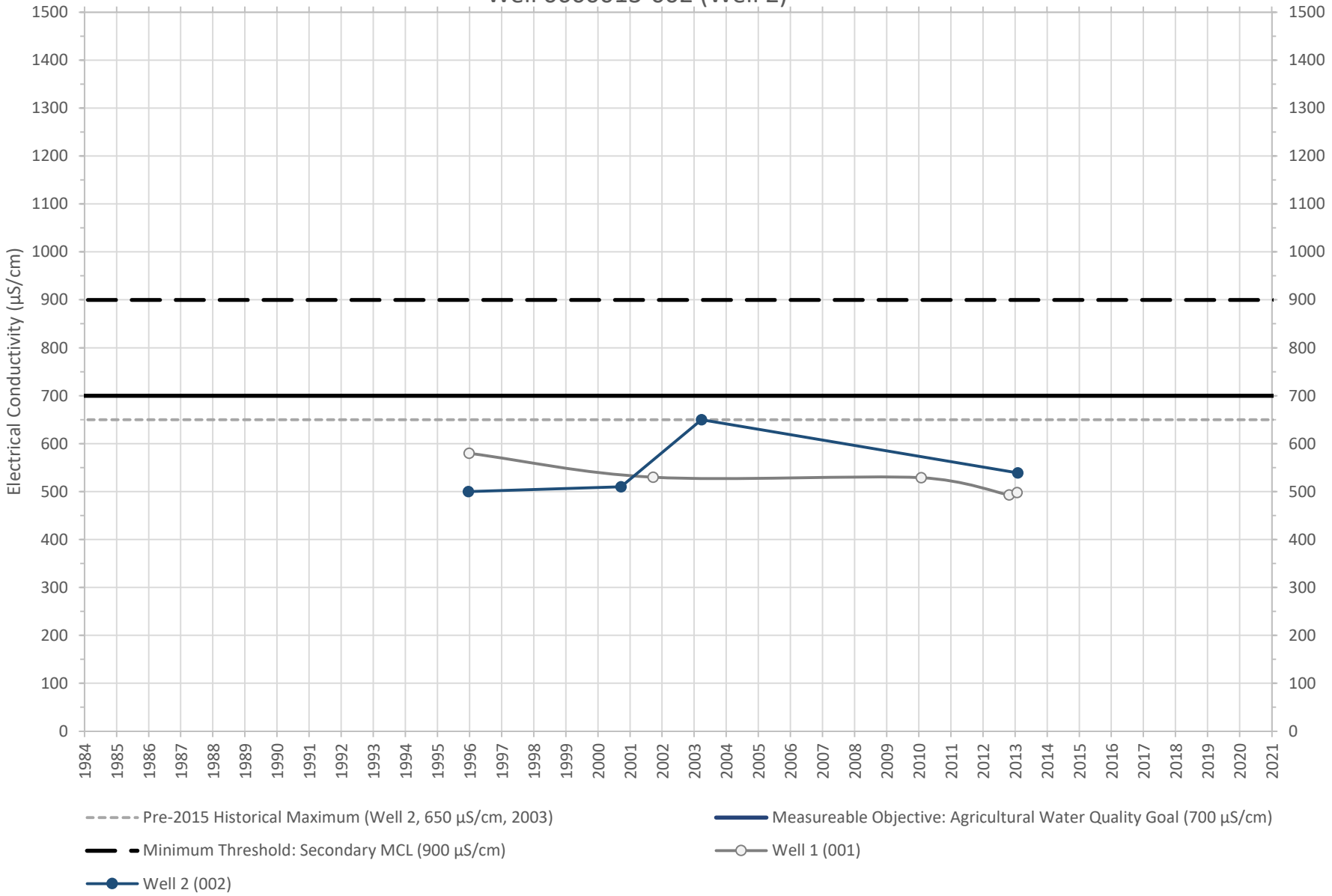


Figure 5D-7. Maxwell Public Utility District Representative Well:
Well 0610003-003 (Well 4)

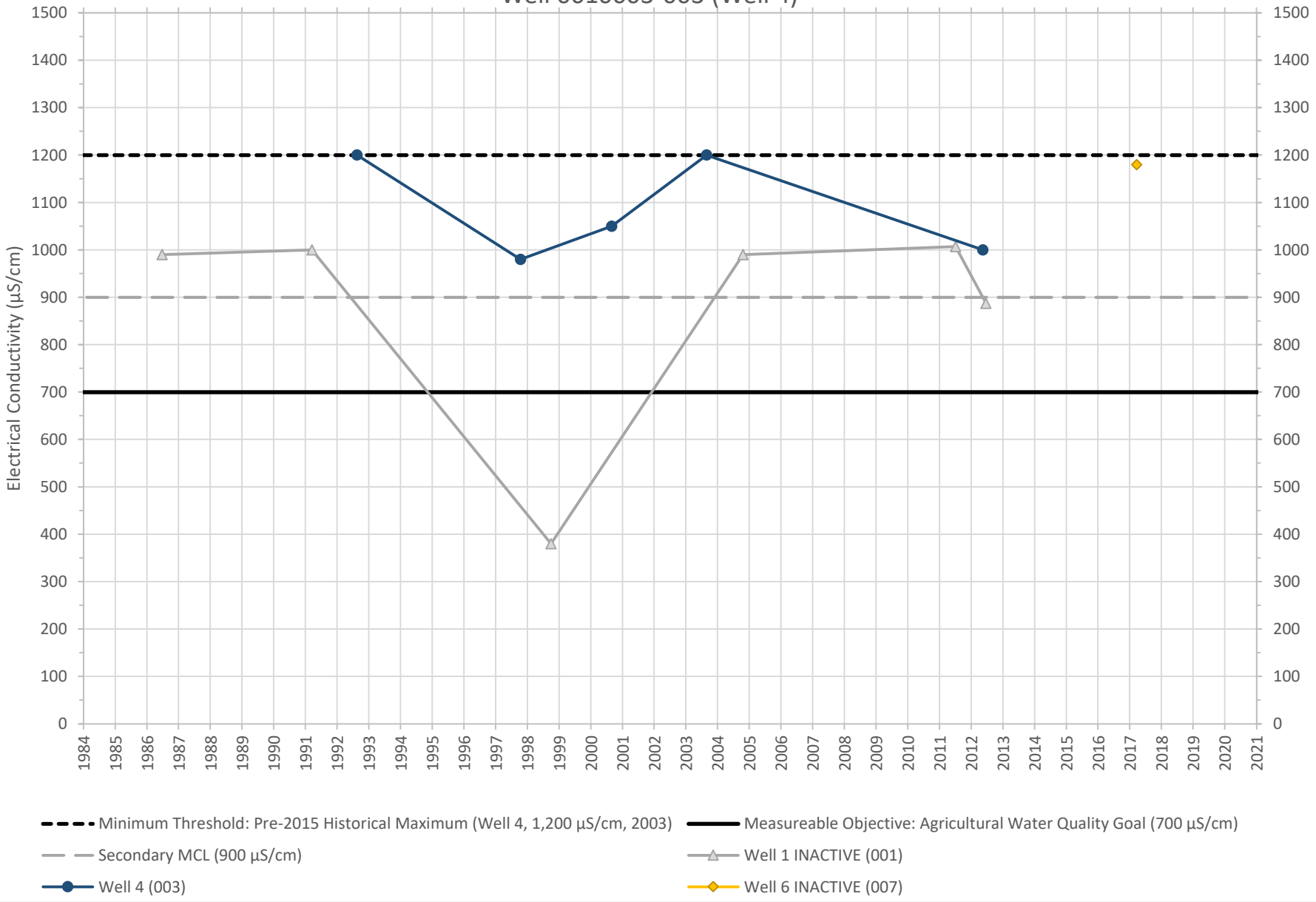


Figure 5D-8. City of Colusa Representative Well:
Well 0610002-002 (Well 2)

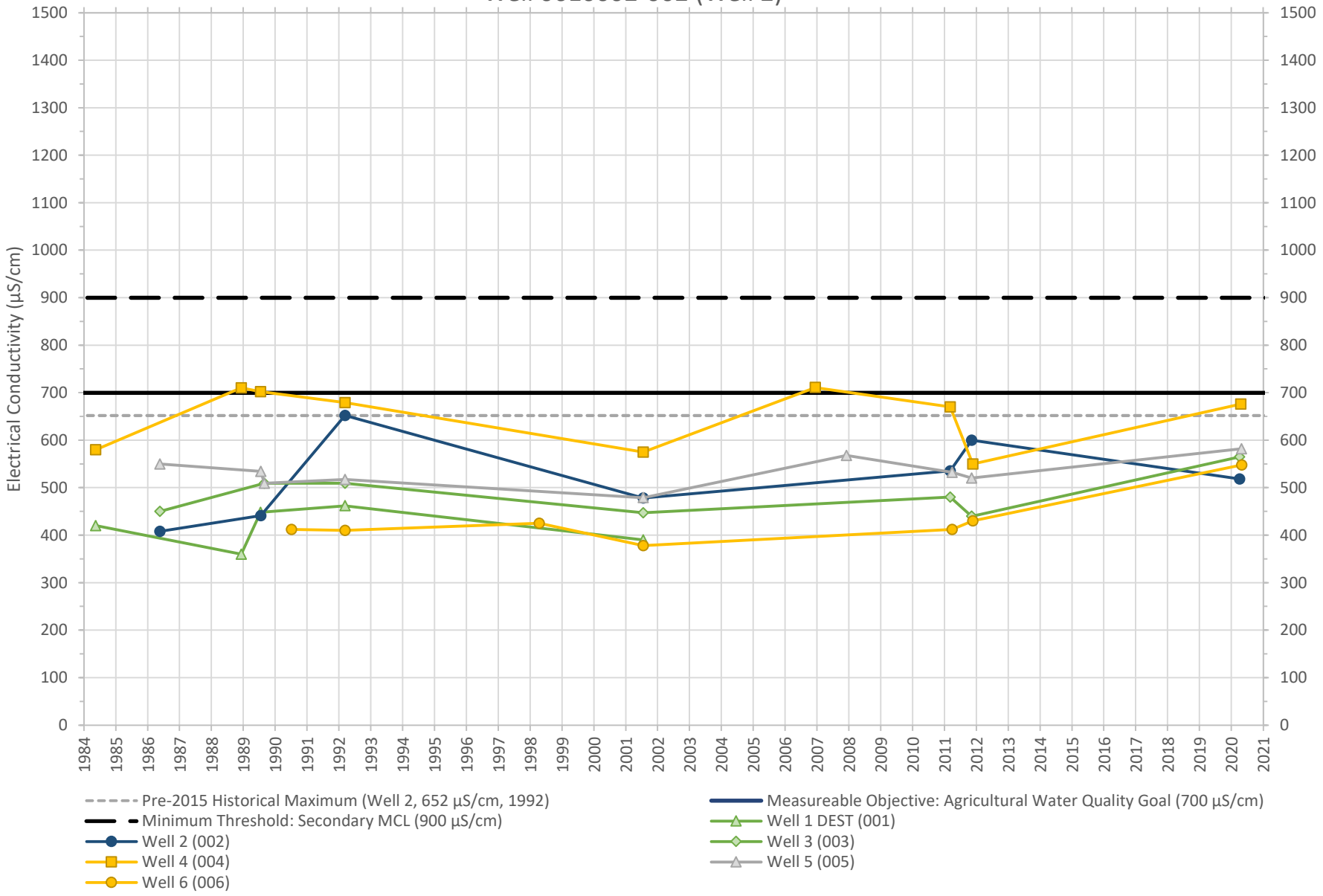


Figure 5D-9. City of Williams Representative Well:
Well 0610004-004 (Well 8)

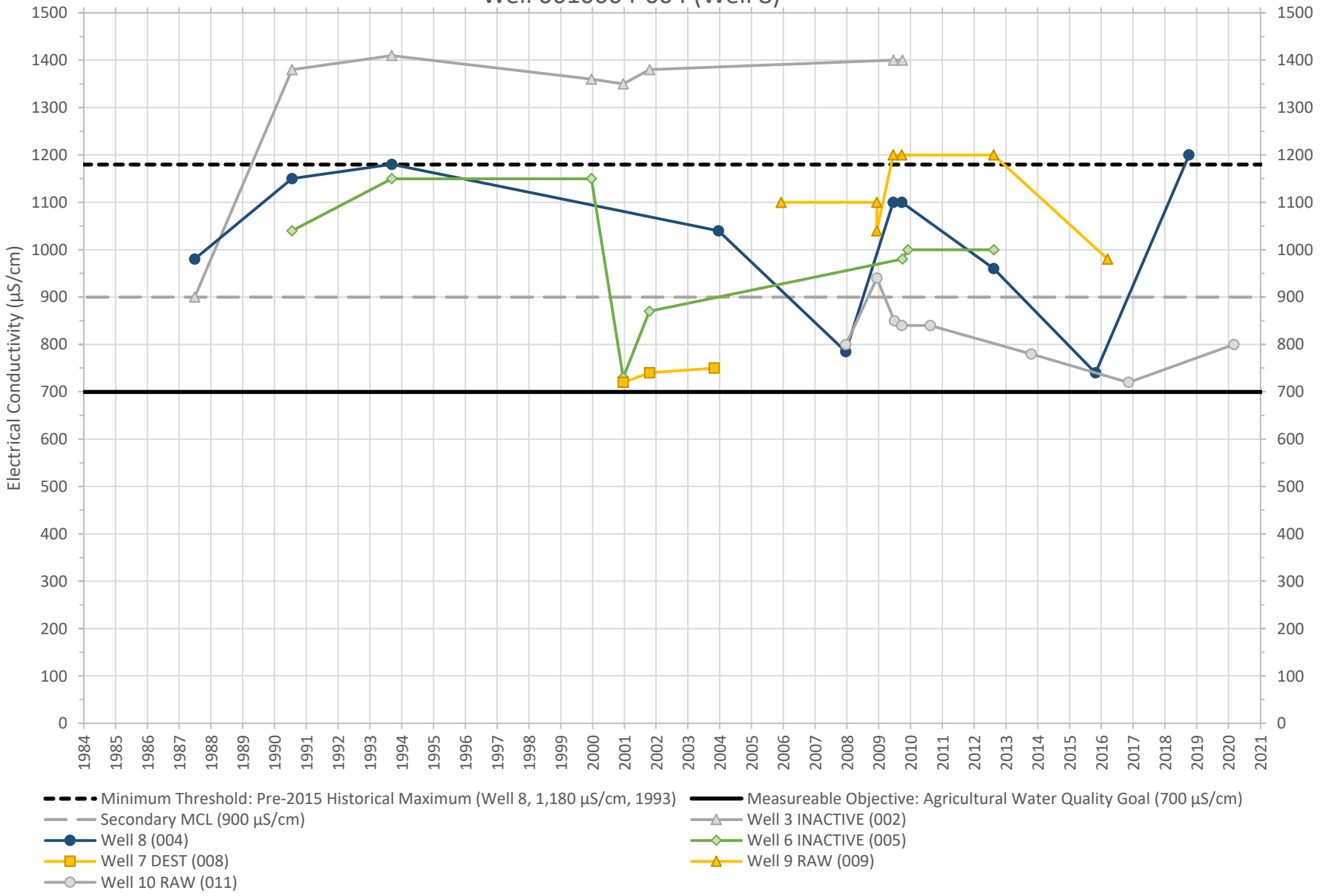


Figure 5D-10. Colusa County WWD #1 - Grimes Representative Well: Well 0600008-001 (Well 1)

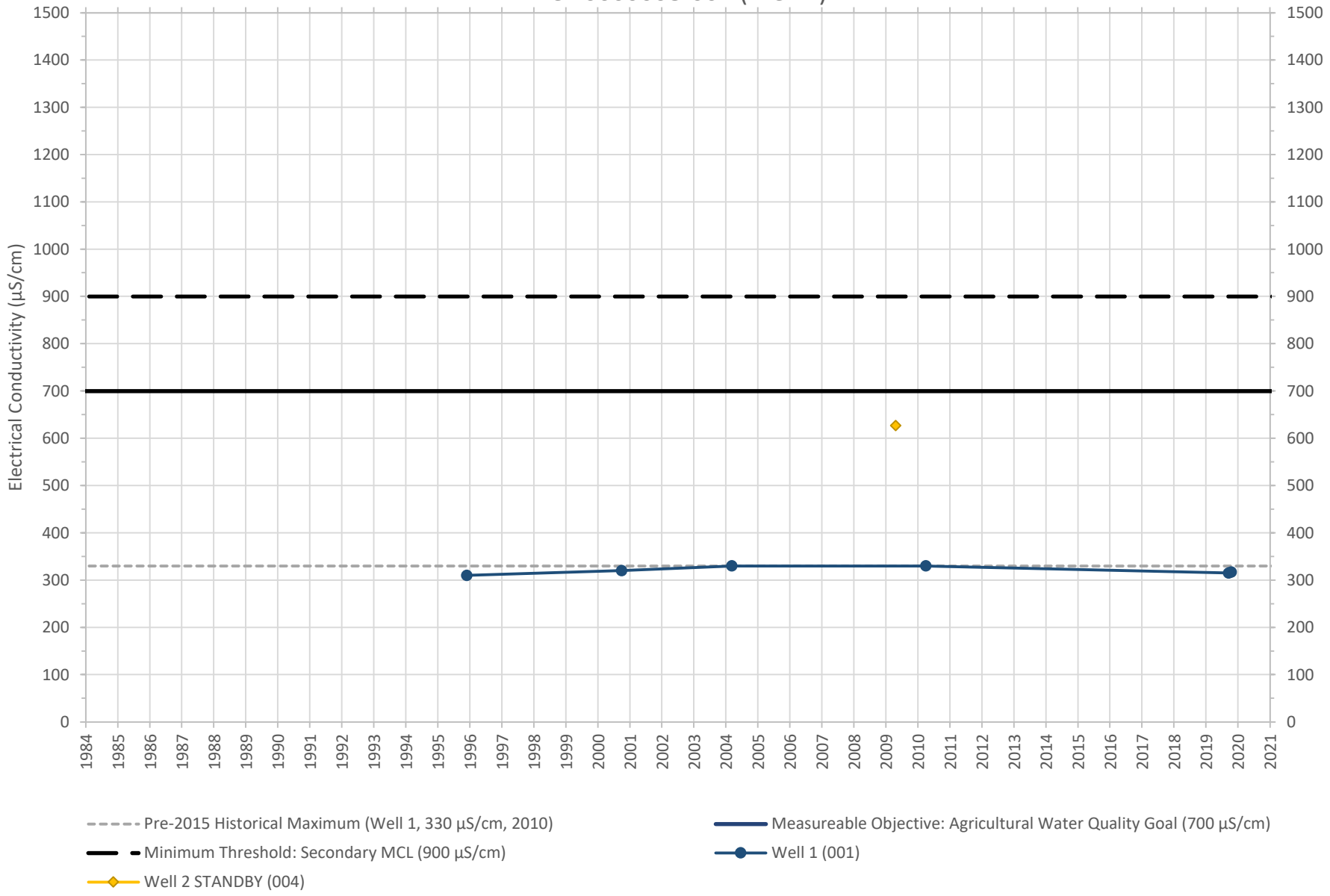


Figure 5D-11. Arbuckle Public Utility District Representative Well: Well 0610001-004 (Well 3A)

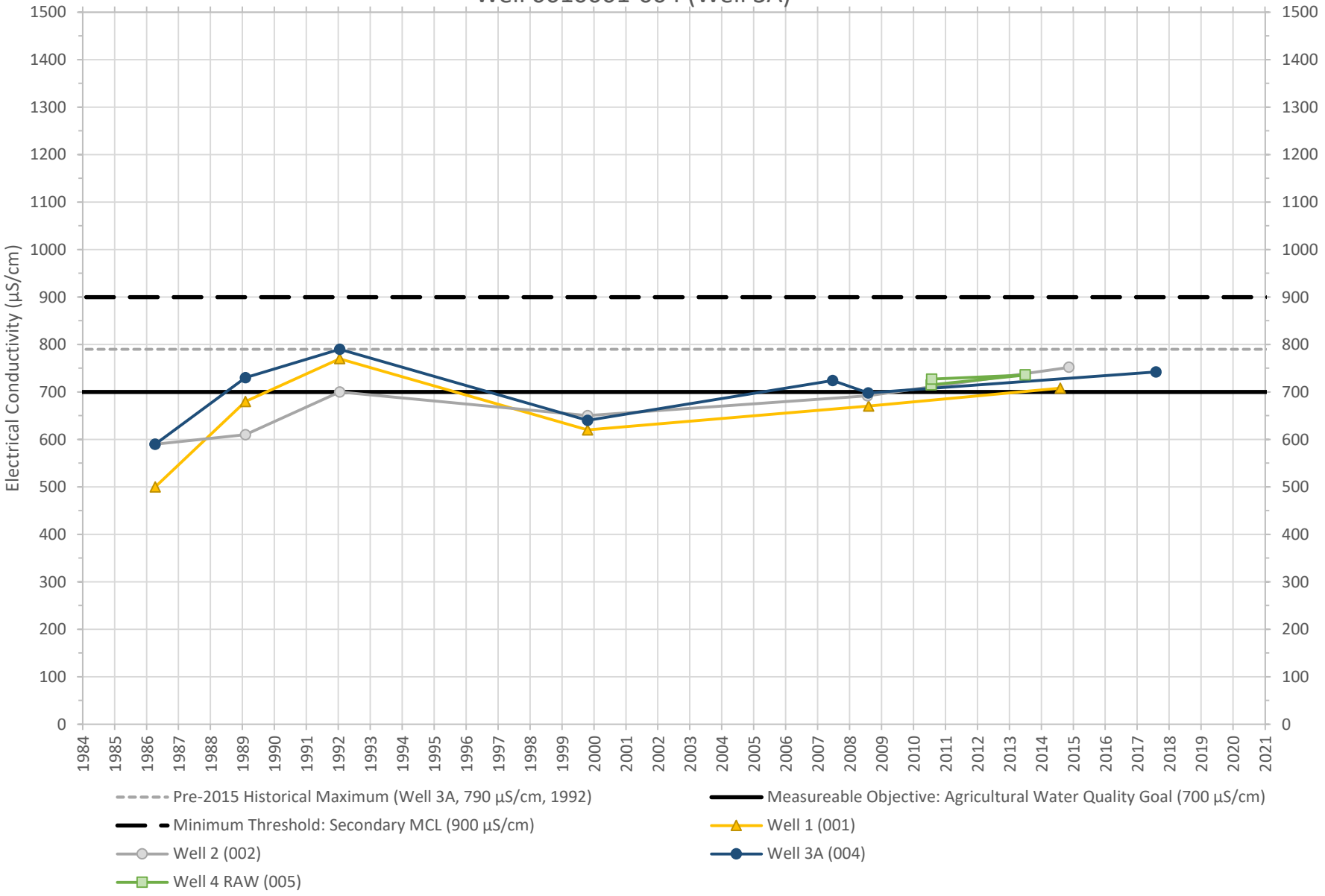


Figure 5D-12. Del Oro Water Company - Arbuckle District Representative Well: Well 0606011-001 (Well 1)

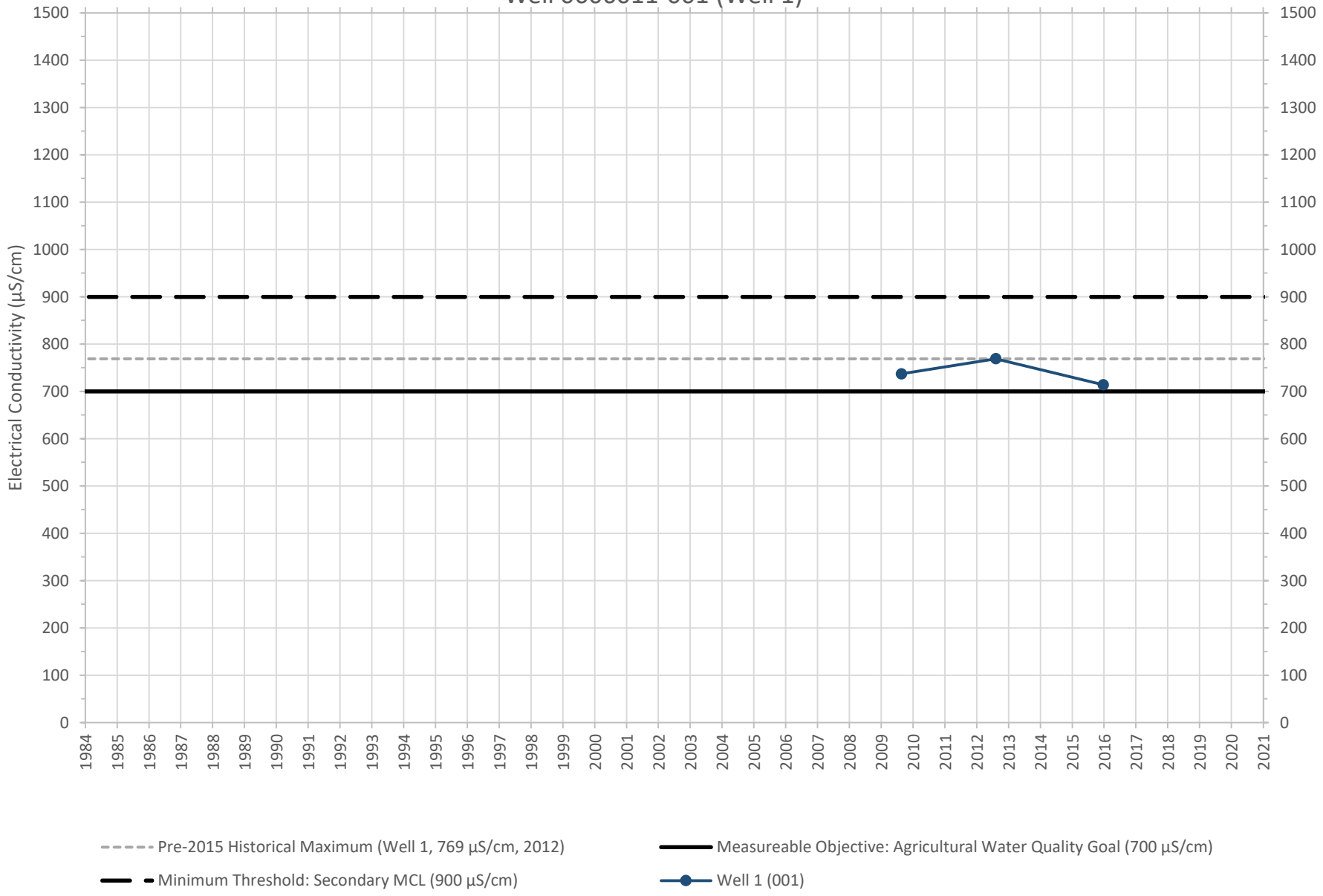


Figure 5D-13. Electrical Conductivity: CRC Well 25A1M (Screened Depth: 25-30 ft)

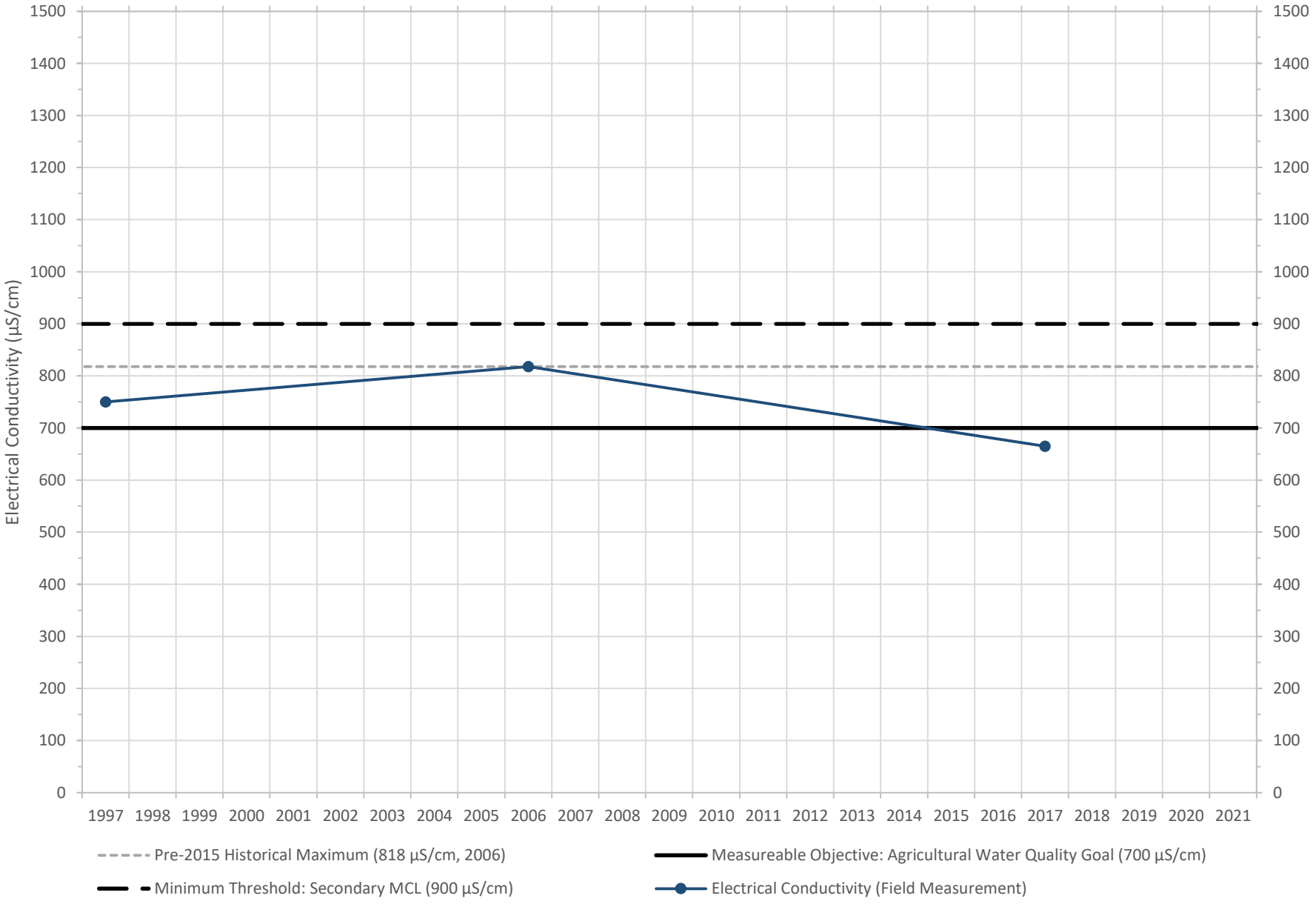


Figure 5D-14. Electrical Conductivity: CRC Well 32J1M (Screened Depth: 25-30 ft)

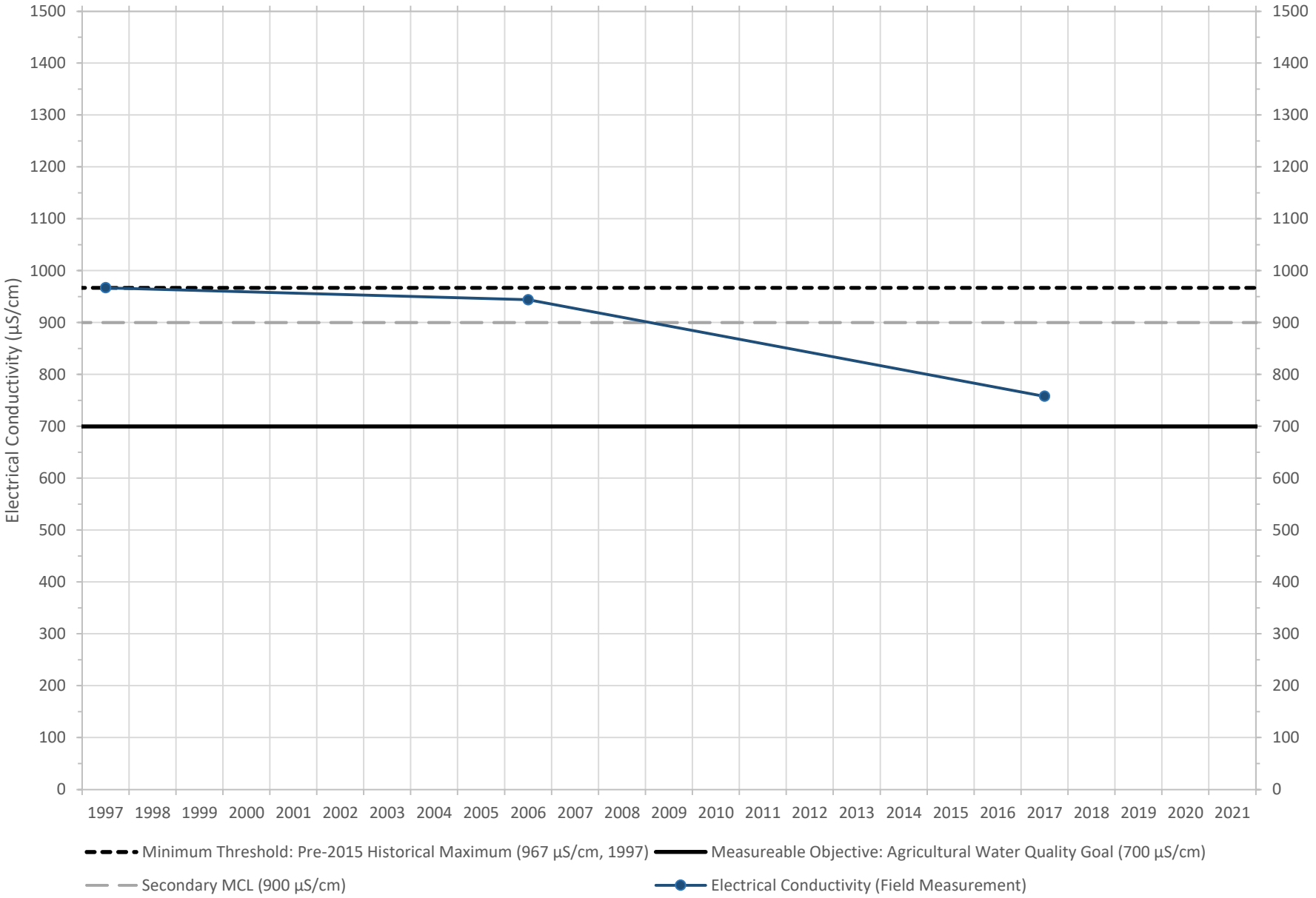


Figure 5D-15. Electrical Conductivity: CRC Well 23E1M (Screened Depth: 25.5-30.5 ft)

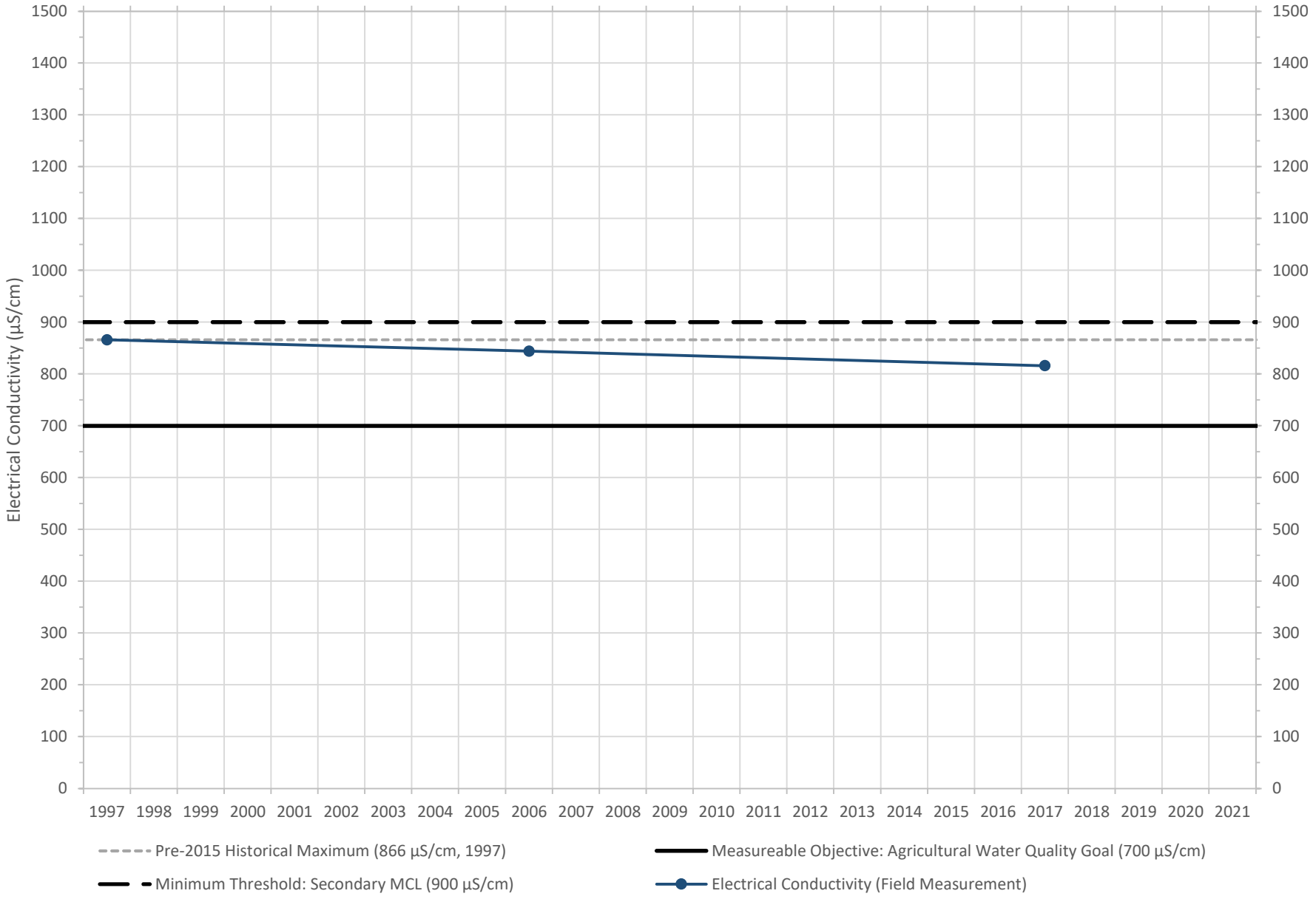


Figure 5D-16. Electrical Conductivity: CRC Well 25E1M (Screened Depth: 25-30 ft)

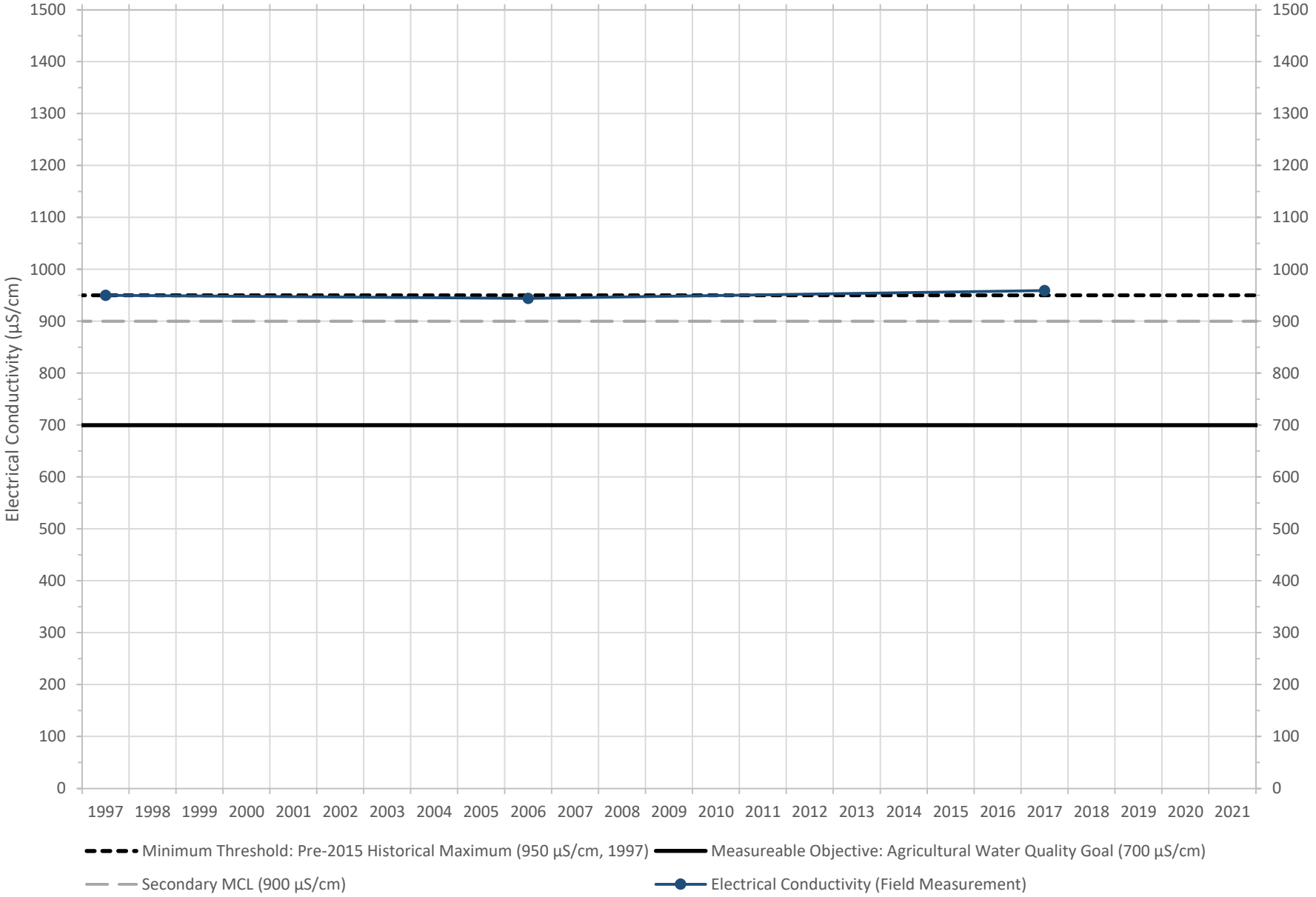


Figure 5D-17. Electrical Conductivity: CRC Well 25R1M (Screened Depth: 28.5-33.5 ft)

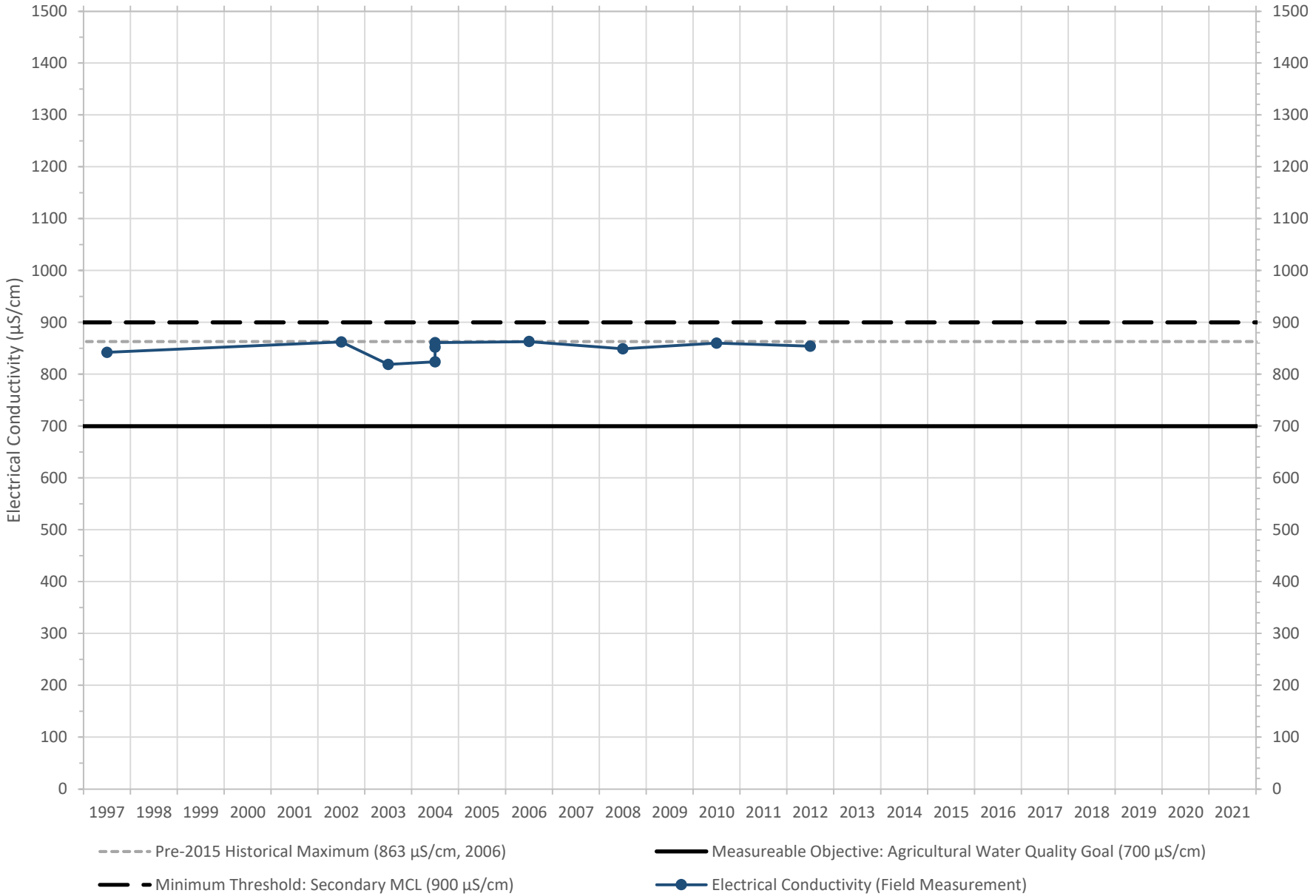


Figure 5D-18. Electrical Conductivity: CRC Well 12G2M (Screened Depth: 25-30 ft)

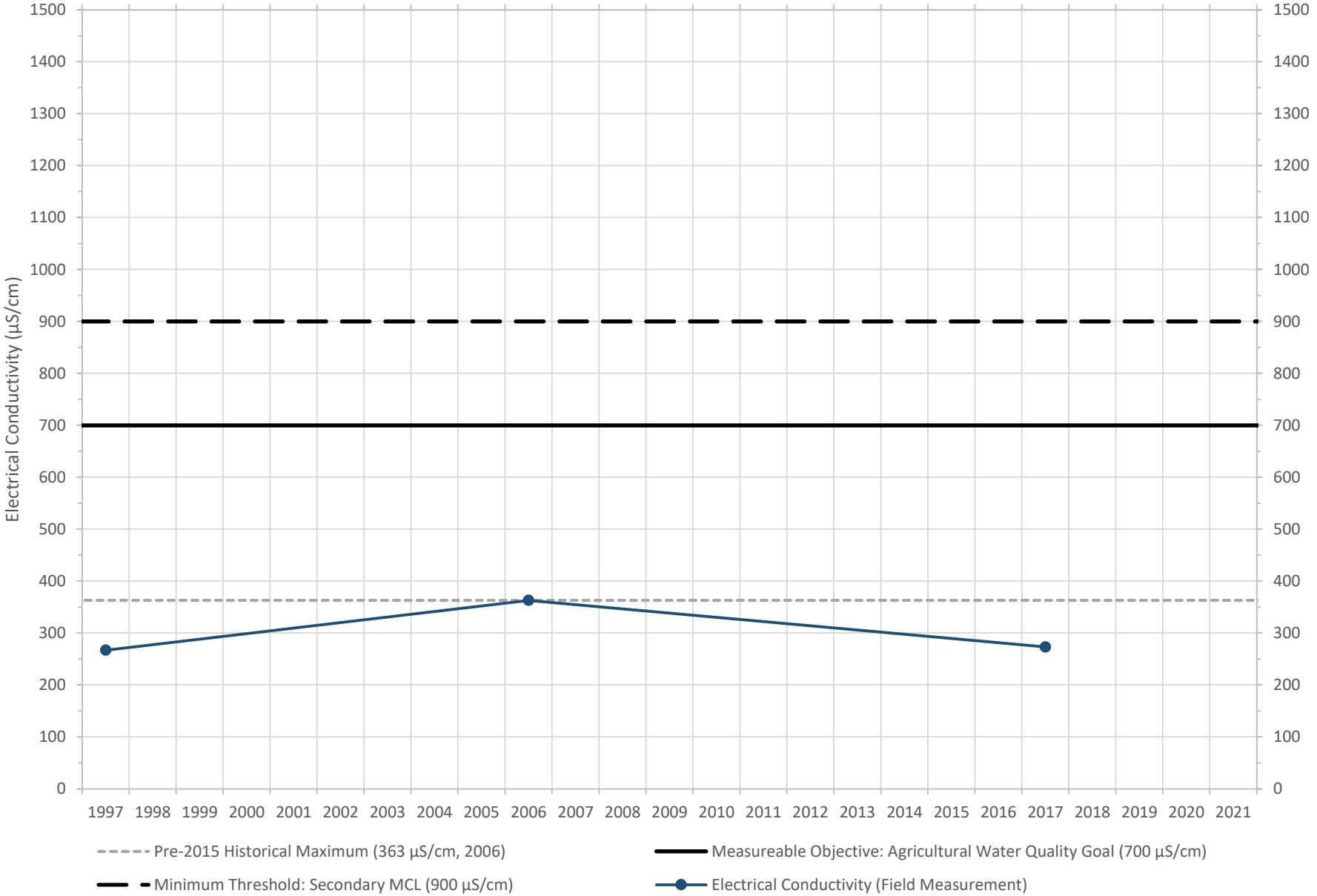


Figure 5D-19. Electrical Conductivity: CRC Well 14G1M (Screened Depth: 25-30 ft)

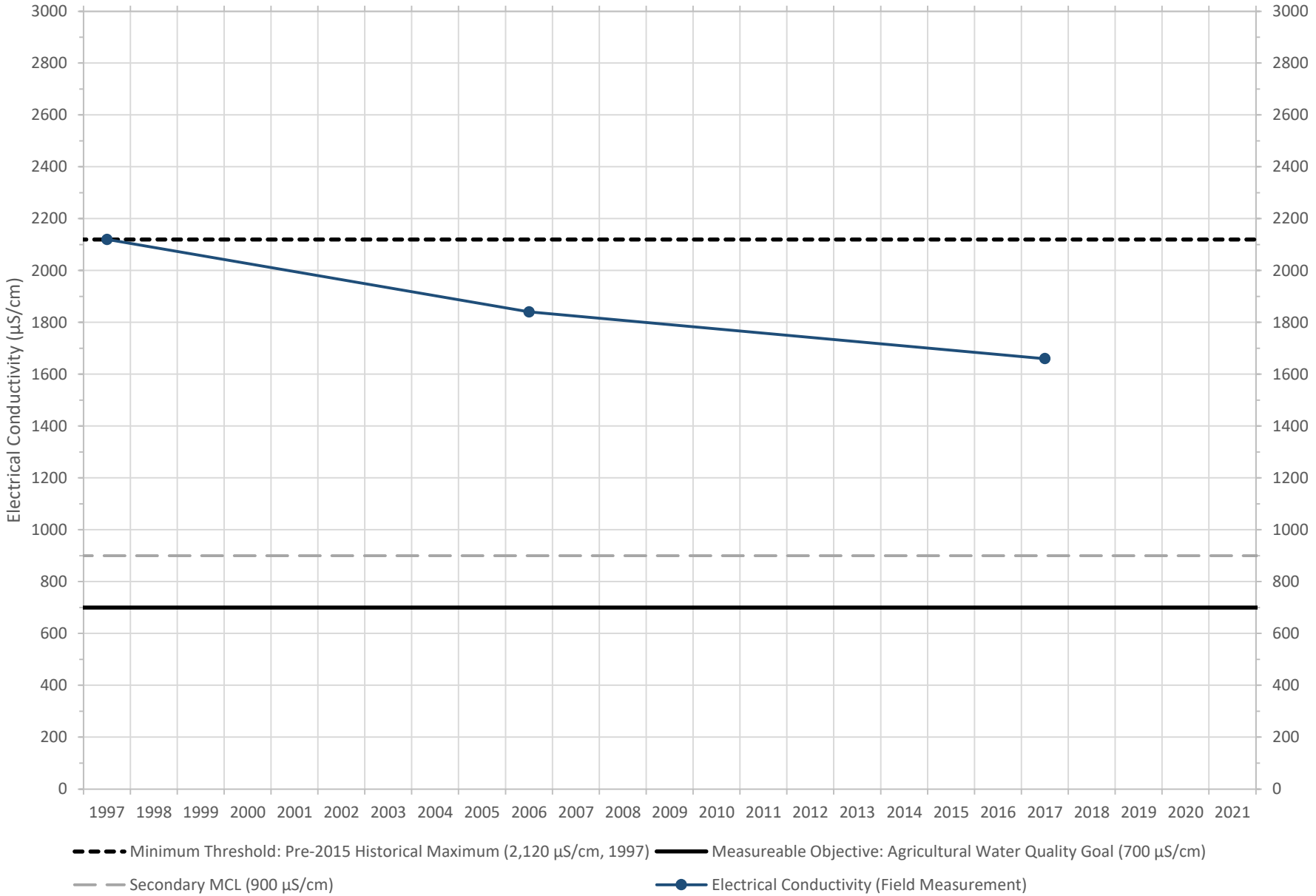


Figure 5D-20. Electrical Conductivity: CRC Well 35M1M (Screened Depth: 25-30 ft)

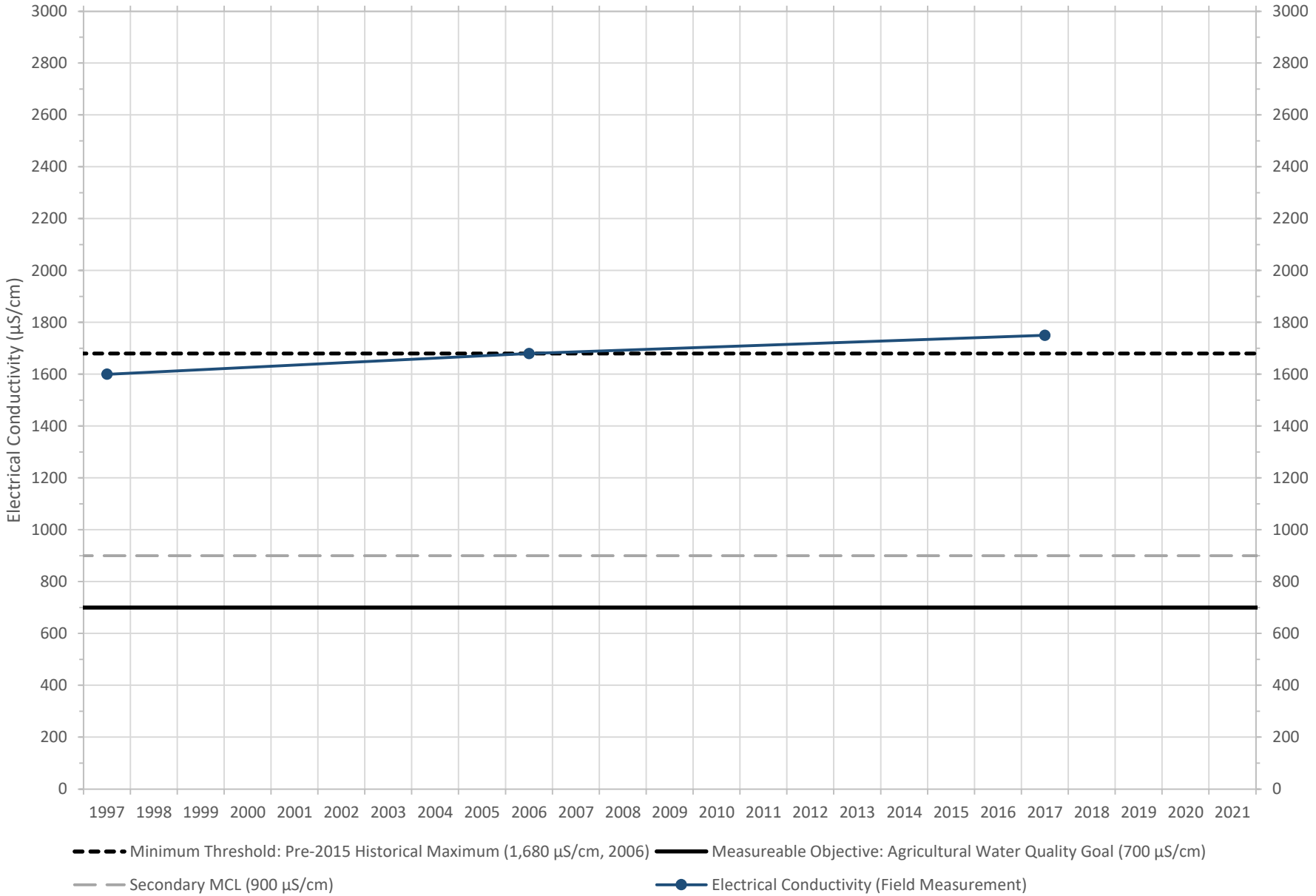


Figure 5D-21. Electrical Conductivity: CRC Well 03E1M (Screened Depth: 25-30 ft)

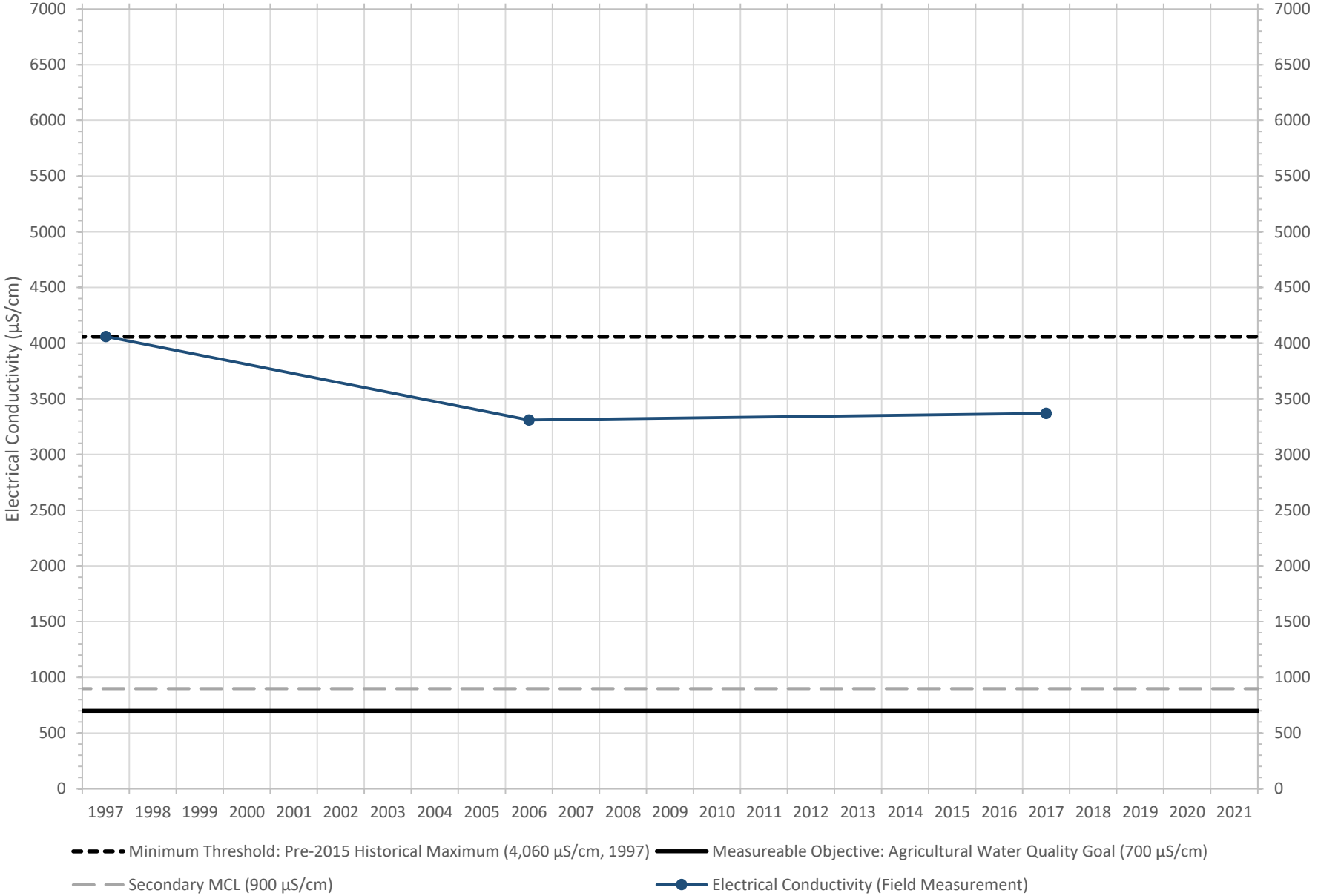


Figure 5D-22. Electrical Conductivity: CRC Well 16R1M (Screened Depth: 25-30 ft)

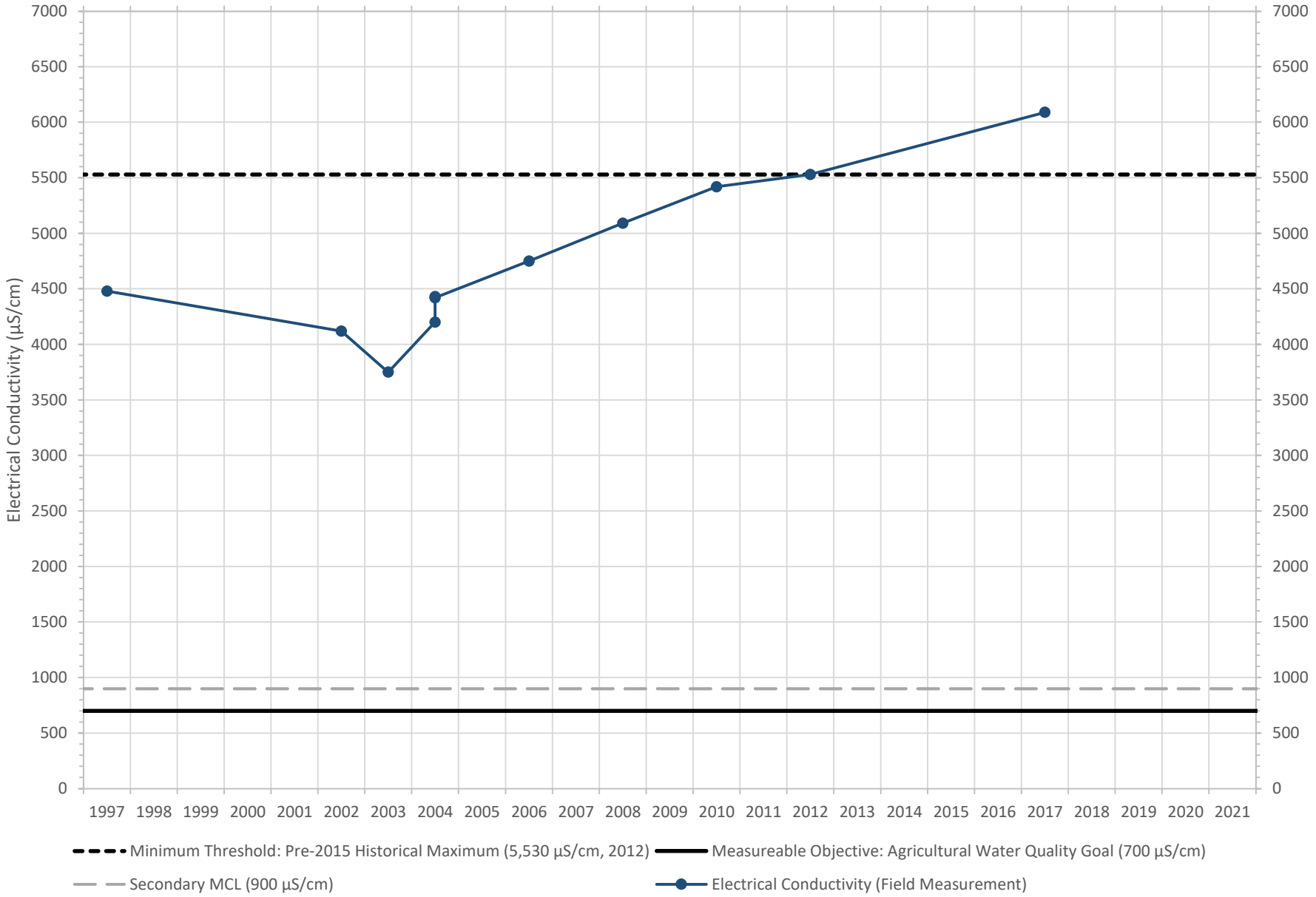


Figure 5D-23. Electrical Conductivity: SVWQC Well SVWQC00005 (Screened Depth: 145-225 ft)

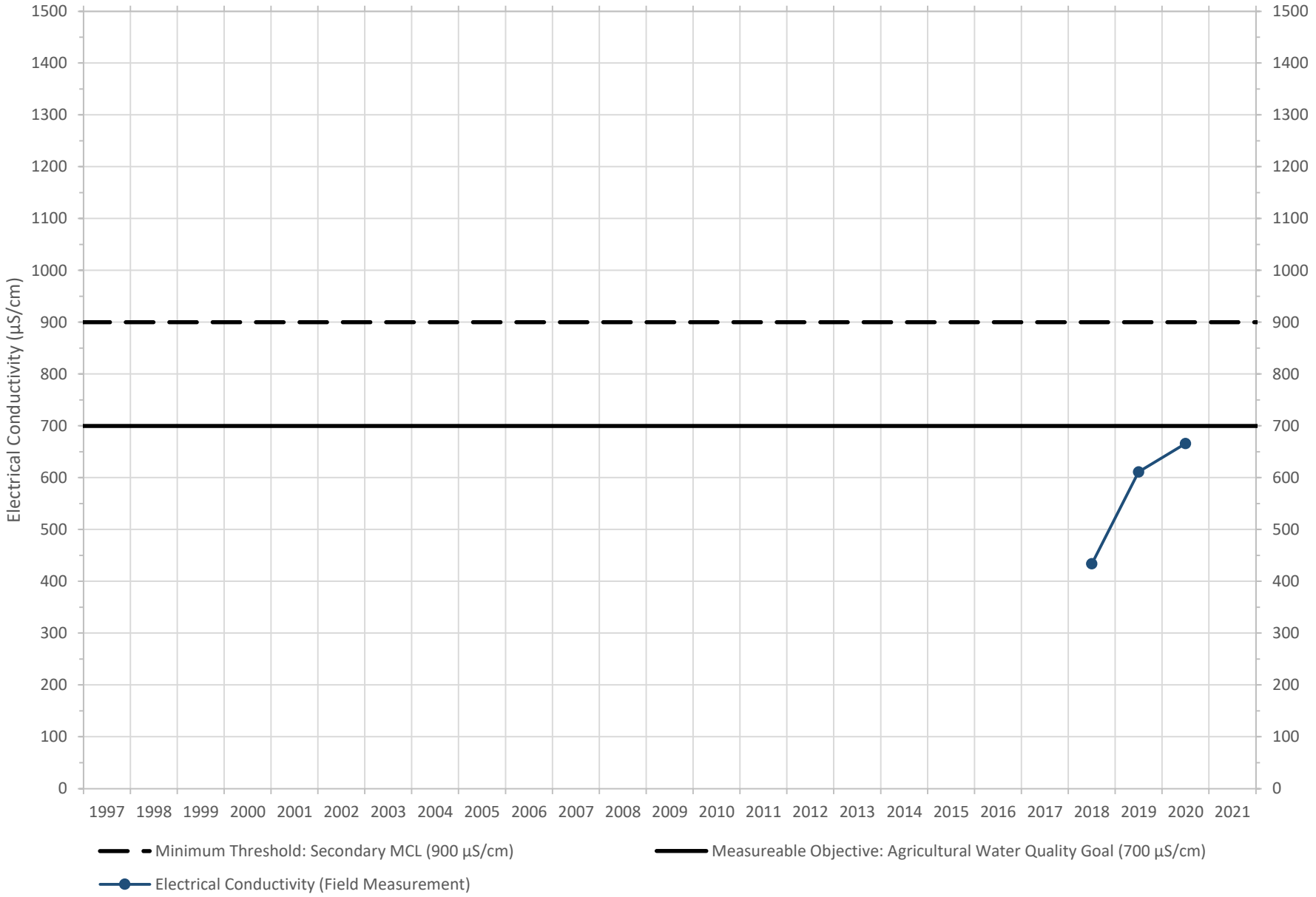


Figure 5D-24. Electrical Conductivity: SVWQC Well SVWQC00021 (Screened Depth: 90-120 ft)

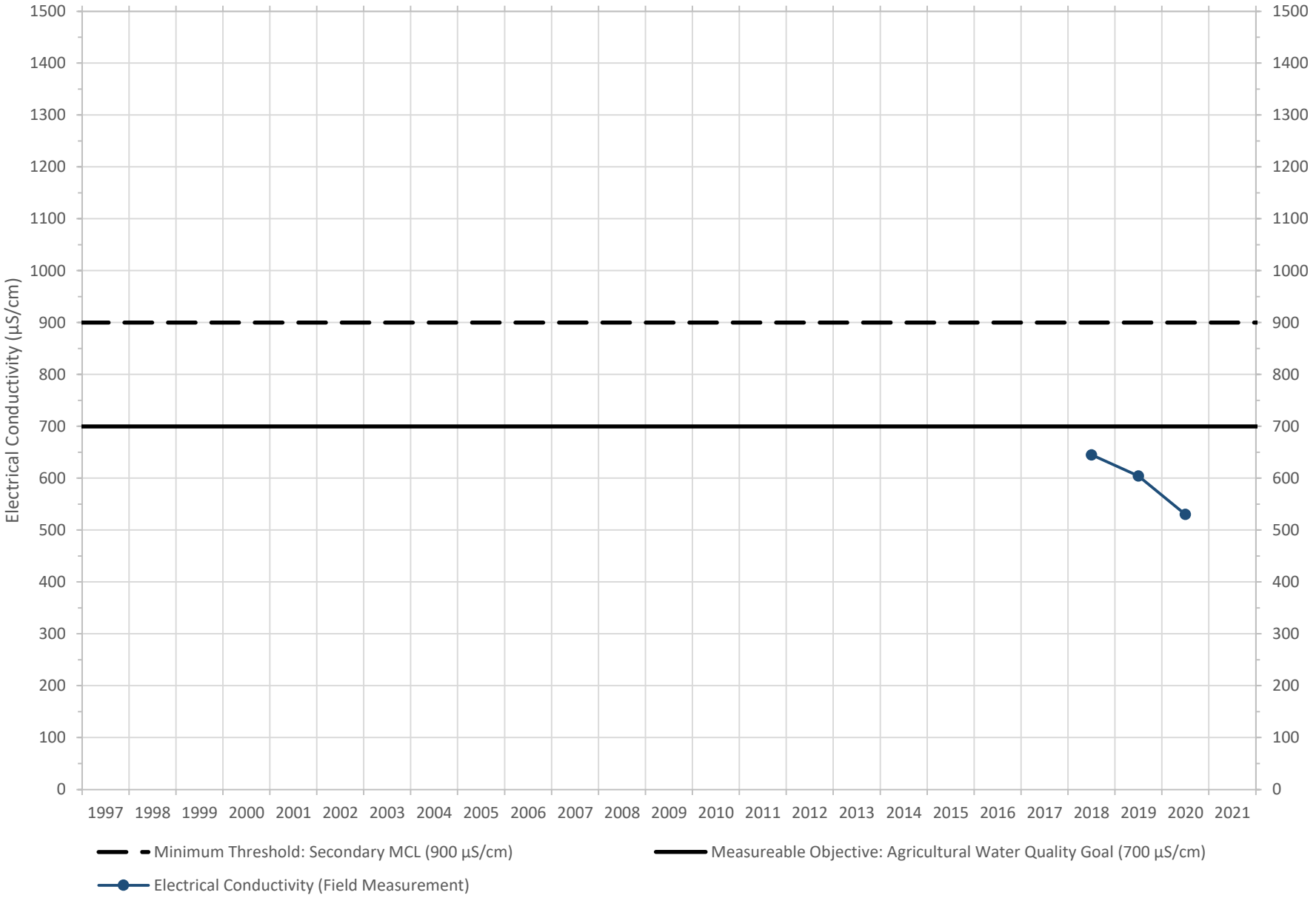


Figure 5D-25. Electrical Conductivity: SVWQC Well SVWQC00019 (Screened Depth: <126 ft)

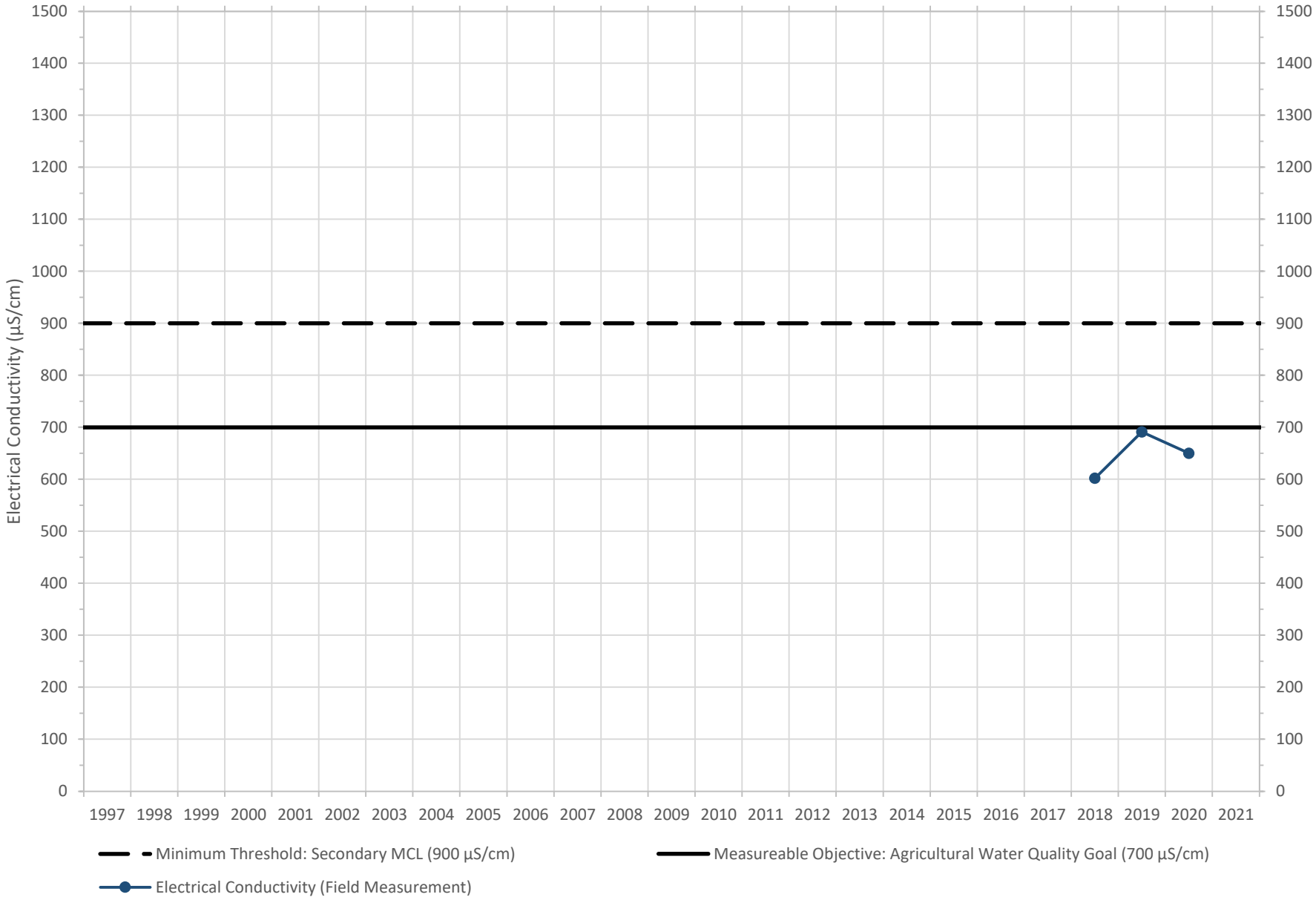
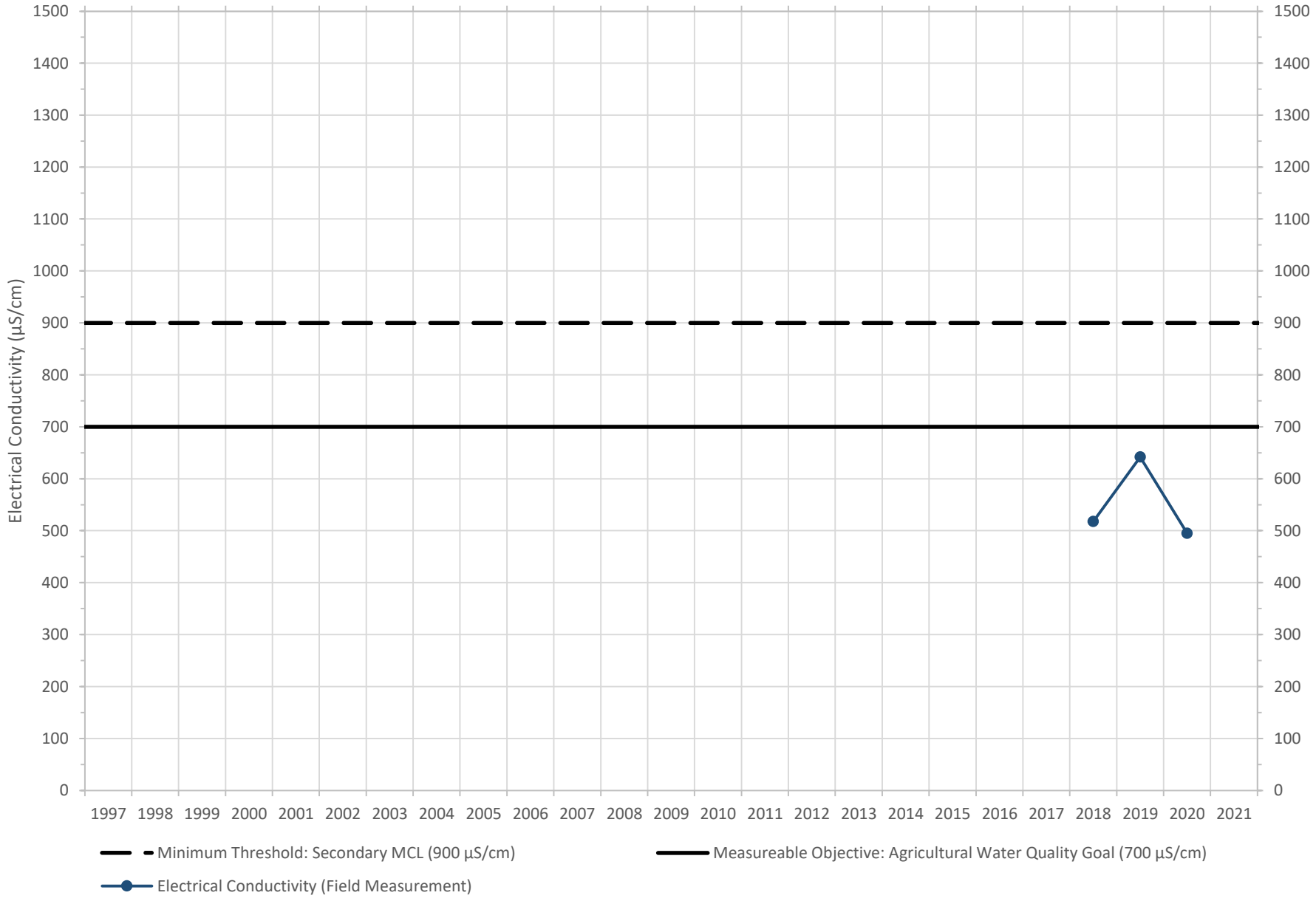


Figure 5D-26. Electrical Conductivity: SVWQC Well SVWQC00006 (Screened Depth: 180-260 ft)



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Appendix 6A

Surface Water Available for Recharge and Financial Incentives in the Colusa Subbasin

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Technical Memorandum

To: Glenn and Colusa Groundwater Authorities

From: Davids Engineering and ERA Economics

Date: July 1, 2021

Subject: **Surface Water Available for Recharge and Financial Incentives**

Purpose

More than 30 projects and management actions (PMAs) are included in the Colusa Subbasin GSP to achieve and maintain sustainable groundwater management. Five of the PMAs are on track for implementation, six are ongoing, with the remaining PMAs being in various stages of investigation and evaluation. The five projects on track for implementation are all groundwater recharge projects involving the use of surface water for direct or in-lieu recharge. Three of the five projects are substantial in-lieu recharge projects, meaning that they will require regulated surface water sources available on an irrigation demand schedule. All three projects are planning to acquire all or most of the required surface water through transfers of Central Valley Project (CVP) water supplies that are surplus to the needs of other CVP water supply contractors or Sacramento River Settlement Contractors (Settlement Contractors).

All three in-lieu recharge projects on track for implementation include incentivizing landowners to utilize existing CVP supplies. CVP supplies in some years are surplus to CVP contractor needs in some cases because contractors are still building out their systems and acreage over time to use the CVP water, but in other cases, the cost of CVP supply is too high to be competitive with groundwater pumping or other local transfers. Growers currently using groundwater also benefit from the convenience of having a clean, reliable, on-demand supply from their pumps and not having to order water for delivery through local district conveyance.

This appendix serves two purposes. First, it summarizes the three in-lieu recharge projects and the potential sources of surface water available for irrigation use to enable reduction of groundwater pumping. Second, it provides an overview of the current costs of CVP water, how those costs are changing, and provides a discussion of financial incentives to increase use of those supplies for some contractors in some years. The description uses information for two districts, Orland-Artois Water District and Colusa County Water District, but the concept could be applied to other districts as well.

Colusa Subbasin In-Lieu Recharge Projects On-track for Implementation

The three substantial in-lieu groundwater recharge projects that are on track for implementation are described below.

Colusa County Water District In-Lieu Groundwater Recharge

Colusa County Water District (CCWD) has a total service area of approximately 46,000 acres of which 39,875 are currently irrigable with existing district infrastructure. This area is planted to predominantly permanent crops. The district delivers surface water to approximately 35,000 acres, with the remaining acres being idle or irrigated with privately pumped groundwater. CCWD has a CVP water supply contract that provides a maximum

of 62,200 acre-feet (AF) annually. The district also holds a CVP contract water supply for 5,666 AF that was part of a Colusa County subcontract assigned to CCWD in 2006. Both contracts are subject to curtailments determined by the Bureau of Reclamation (Reclamation) each year based on Sacramento River watershed hydrologic conditions and planned CVP operations.

Additionally, CCWD typically transfers in additional CVP water supplies to augment water available under its CVP contract. Historical transfers have been primarily from Westside Water District and, more recently, from Reclamation District 108 (RD108) under a five-year pilot transfer agreement that ends in 2022. Despite the availability of district surface water, some CCWD growers choose to pump groundwater because is it less expensive than surface water (and because groundwater requires less screening and filtering compared to district surface water).

Under the CCWD In-Lieu Groundwater Recharge project, the district will acquire additional surface water and incentives will be put in place to make the cost of surface water the same or less expensive than pumped groundwater, thereby incentivizing growers who would otherwise use groundwater to use surface water. The additional surface water is expected to be acquired under long-term water transfer agreements with other CVP contractors, including Sacramento River Settlement Contractors, and potentially other sources. The plan is to acquire and deliver 30,000 acre-feet per year (AF/yr) except in Shasta Critical years[1] when groundwater banked through in-lieu recharge in prior years would be used. It is estimated that the average additional surface water use over the long term would be approximately 27,000 AF/yr.

Colusa Drain MWC In-Lieu Groundwater Recharge

The Colusa Drain Mutual Water Company (CDMWC) encompasses approximately 46,000 acres of agricultural land and environmental habitat located adjacent to the Colusa Basin Drain (Drain) in the Colusa Subbasin (Subbasin). Shareholders in CDMWC divert water for summer irrigation from the Drain under a combination of appropriative water rights held individually by the shareholders, a long-term water supply agreement with Reclamation, and annual and multi-year transfer agreements with neighboring Sacramento River Settlement Contractors. Historically, many CDMWC diverters use both groundwater and surface water for irrigation because flow in the Drain is often insufficient and unreliable to fully satisfy all irrigation requirements on a timely basis.

For the period 1990 through 2015, average surface water diversions from the Drain were estimated to be 48,000 AF/yr while groundwater pumping during the same period was estimated to be 40,000 AF/yr. It is estimated that approximately 70 percent of the historical groundwater pumping can be eliminated through the provision of additional surface water, provided that the surface water cost is approximately equal to the cost of groundwater. The cost comparison of surface and groundwater would include the full cost of each source (e.g., filtering, system costs, and other on-farm costs in addition to the delivery charge per AF of surface water and variable cost to pump groundwater). The potential in-lieu recharge is estimated to be 28,000 AF/yr on average across all years, and 31,000 AF in Shasta Non-Critical years. The planned source of additional surface water is primarily upstream Sacramento River Settlement Contractors that can discharge water into the Drain for use downstream by CDMWC shareholders.

Orland-Artois Water District Land Annexation and Groundwater Recharge

Orland-Artois WD (OAWD) has an existing service area of about 29,000 acres and delivers water to district landowners through 110 miles of pipelines and 300 metered deliveries. Surface water delivered by the district is available under a CVP water supply contract with Reclamation and through short- and long-term transfer

[1] In general, Shasta Critical conditions are declared when the forecast inflow to Lake Shasta for a particular water year is equal to or less than 3.2 million AF.

agreements with other CVP water contractors and Sacramento River Settlement Contractors. The district's water supply contract provides a maximum of 53,000 AF/yr, subject to curtailments determined by Reclamation each year based on Sacramento River watershed hydrologic conditions and planned CVP operations. Historically, water transfers have been from Maxwell Irrigation District, Princeton-Codora-Glenn Irrigation District, and others.

The district is working with a group of neighboring, non-district landowners to annex approximately 12,000 acres of groundwater-dependent agriculture into the district. Additional surface water for the annexed lands would be secured through multi-year purchase or transfer agreements with willing sellers, conveyed through the existing Tehama-Colusa Canal[2] (TCC), and distributed to the annexed lands through new distribution facilities. Potential transferors include CVP water supply contractors and Sacramento River Settlement Contractors. The plan is to acquire and deliver 25,000 AF/yr of surface water to the annexed lands except in Shasta Critical years when groundwater banked through in-lieu recharge in prior years would be used. It is estimated that the average additional surface water use, and thus in-lieu groundwater recharge, over the long term would be about 23,000 AF/yr.

Sources of Surface Water for In-Lieu Recharge

The aggregate volume of water needed for the three in-lieu recharge projects described above is 86,000 AF/yr, in Shasta Non-Critical years, as summarized in Table 1.

Table 1. Proponents and Water Needs Associated with Colusa Subbasin In-Lieu Groundwater Recharge Projects on Track for Implementation

Project	Average Additional Surface Water Needed in Shasta Non-Critical Years (acre-feet)
Colusa County Water District	30,000
Colusa Basin Drain Mutual Water Company	31,000
Orland Artois Water District	25,000
Total	86,000

Potential surface water sources to meet these requirements are discussed below:

Full use of Available CVP Contract Water

In recent years, both CCWD and OAWD have not used all the water available under their respective CVP water supply contracts, due primarily to the high cost of the upper two price tiers according to Reclamation pricing policy. The cost of CVP water is determined by CVP pricing policy and cost allocation. Up until recently, all CVP water contracts in the Tehama-Colusa Service Area were Water Service Contracts, and the water price was calculated using three[3] components: The O&M (operations and maintenance) charge, the capital component

[2] The Tehama-Colusa Canal has a maximum capacity of approximately 2,530 cubic feet per second at the canal inlet (Stene, 1994), and a capacity of approximately 1,700 cubic feet per second at the southern end of the canal. Considering historical canal operations, it is likely that conveyance capacity is available to facilitate such a program, subject to certain conditions (see Attachment A).

[3] Contractors also pay for power use and a restoration charge, which is currently about $11 per AF.

(paid back without interest), and the full cost rate that includes O&M and capital plus interest. The sum of the O&M and capital components is called the cost of service rate. Some or all of the rate's capital component could be removed as "ability-to-pay" relief, and many of the area contractors have received this in the past. The resulting contract rate (cost of service potentially reduced by ability-to-pay relief) applies to the first 80 percent of the contract maximum. The full cost rate includes cost of service plus interest on the capital component and is generally substantially greater than the cost of service rate. In 2020 for example, OAWD's contract rate (cost of service) was about $60 per AF and its full cost rate was about $218 per AF, calculated according to section 205(a)(3) of the Reclamation Reform Act. According to federal law (the CVP Improvement Act of 1992), CVP irrigation (and M&I) water supply contracts required payment of tiered water rates for contractual water entitlements, which are summarized as follows:

- Tier 1: The Cost of Service water rate developed through the federal water rate setting process. The Tier 1 rate applies to the first 80% of the delivered contractual water entitlement.
- Tier 2: The rate is the numerical average of the Tier 1 rate and the Tier 3 rate. The Tier 2 rate applies to the next 10% of the delivered contractual water entitlement.
- Tier 3: This rate is the full cost rate developed through the federal water rates setting process. Tier 3 applies to the last 10% of the delivered contractual water entitlement.

Even when blended with Tier 1 water, using Tier 2 and Tier 3 water resulted in excessive water cost, and so some or all of the Tier 2 and Tier 3 water went unused.

Incentivizing Utilization of CVP Supplies

As of 2021, Tehama-Colusa Canal (TCC) CVP water service contractors have converted their contracts to repayment contracts, thus paying off and removing the capital component from their CVP water rates. The new repayment rates (not including restoration charges and other power charges) are $23.43 per AF for CCWD and $26.67 per AF for OAWD. Under the revised rates, these contractors intend to use all of their CVP contract water. The additional CVP water (the difference between what OAWD and CCWD would have used under their old rate structure versus under their new repayment rate) can fulfill a portion of the in-lieu recharge quantities shown.

Repayment of CVP capital required the contractors to borrow money that they will be paying off over the next 15 years or more. Contractors vary in how they recover that fixed cost. Some, like OAWD, have acreage assessments on lands in the district. Others, like CCWD, include more fixed costs in their water rate, so when CVP delivery goes down, the water rates must go up to cover the fixed costs. Due to critical drought conditions, the CVP has announced no contract deliveries to the Tehama Colusa Service Area in 2021. As a result, CCWD's announced water rate for 2021 is currently estimated to be $288 per AF, though this may change as conditions and availability of water transfers change.

OAWD has estimated that its water rate after conversion to the repayment contract would be about $42 per AF under conditions of full CVP supply and $62 per AF with a 50 percent supply.[4] CCWD has estimated that its water rate after conversion to the repayment contract would be in the range of $70 per AF under conditions of full CVP supply.[5]

Depending on the relative costs of district supply versus groundwater, under the repayment contracts, the districts' rates may be low enough already to encourage full use of CVP supply. However, if groundwater pumping remains a lower cost alternative to CVP water for some growers, incentivizing their use of CVP water in lieu of pumping would require paying at least the difference between district surface supply and the variable

[4] According to a Proposition 218 informational presentation to the OAWD Board in August 2020.

[5] This is a rough estimate based on personal communication with CCWD Manager, Shelly Murphy, June 30, 2021.

cost of pumping groundwater. Other advantages of groundwater over delivered surface water include the growers' convenience of having a clean, reliable, on-demand supply from their pumps. Some groundwater users also may need to incur some on-farm water distribution costs to take surface water.

A program to incentivize CVP use would be specific to individual districts. Therefore, a full evaluation was not developed for the GSP. It is anticipated that an economic analysis to establish incentives and program design would be completed as part of GSP implementation activities. The economic analysis would generally include the following components:

- The initial evaluation would include estimating the incentive payments needed to achieve greater or full use of CVP contract water. The payments should compensate for the difference between CVP water cost (full cost as delivered by the district) and variable cost of groundwater pumping in areas receiving the in-lieu recharge, plus the value of any additional advantages or cost savings of groundwater over surface water.
- Estimate the projected total annual cost of the incentive payments, considering the payments per AF (which may vary by area) and the expected additional amounts of CVP water purchased and used in lieu of pumping. The estimate should account for variability in CVP supply by year and the costs of other supplies or activities related to that variability. In addition, economic benefits should be quantified and assigned to project beneficiaries.
- Estimate the recharge benefits to the GSA or to subareas within the GSA, considering avoided pumping costs and/or cost of other PMAs that could be avoided by this action. This would include an assessment and assignment of economic benefits that accrue to different parties and over time.
- Consider and evaluate other policies that may be used to assure that increased use of CVP water is effective as in-lieu groundwater recharge and does not simply enable expansion of irrigated area with little or no effect on groundwater recharge.
- Using the results of the cost and benefits calculations developed in the economic analysis described above, develop a method for assigning (if necessary) project costs in proportion to benefits received.

It is important to note that the switch to repayment contracts could provide alternative ways to incentivize use of CVP supplies with districts. An economic analysis could develop strategies to shift and restructure district charges to lower the effective cost of CVP water. This would generally include recovering a greater proportion of fixed costs as land-based charges rather than through variable water rates. For example, OAWD's recent approval of an acreage assessment to recover costs of its CVP capital conversion loan effectively reduces the per AF cost of CVP water. As a result, its water rate is substantially lower than before it converted to a repayment contract. This approach could be explored by other districts if they find that their water rate discourages full use of available CVP supply.

Transfers of Other Unused CVP Contract Project Water

Other CVP water contractors (not Sacramento River Settlement Contractors) within and outside the Colusa Subbasin, including members of the Tehama Colusa Canal Association served by the TCC, also have contract water available for transfer in some years. Historically, some but not all of this water has been transferred under the provisions of Section 3405(a) of the Central Valley Project Improvement Act (CVPIA) (Title 34 of Public Law 102-575).

Transfers of Available Settlement Contract Water

There are 127 Sacramento River Settlement Contractors. The total surface water supply quantities associated with each settlement contract have a "base supply" component and a "project water" component[6]. In general, project water can be transferred in-basin under the provisions of CVPIA Section 3405(a) and base supply cannot[7].

There are 17 Sacramento River Settlement Contractors with total contract supplies of 10,000 AF or more (Table 2). The aggregate base supply for these entities is approximately 1.7 million AF, and the project water supply is about 296,000 AF. The 110 remaining, smaller Settlement Contractors, have aggregate base supplies of about 92,000 AF and project water supplies of about 34,000 AF. Thus, the total quantity of project water under the settlement contracts is about 330,000 AF.

It is estimated that in Shasta Non-Critical years about 25 percent of this volume, or approximately 83,000 AF, is available for transfer. Glenn Colusa Irrigation District and RD108, the two largest Settlement Contractors, estimate that they could provide approximately 40,000 AF and 14,000 AF of project water for transfer in Shasta Non-Critical years, respectively. The combined quantity of 54,000 AF constitutes roughly two-thirds of the estimated 83,000 AF of project water available for transfer.

[6] Base supply is intended to replace water that could have been diverted under each entity's underlying, senior water right(s), while project water is an additional amount negotiated as part of the settlement to supply supplemental water during the summer that might not have been available under the underlying rights. All settlement contracts have a base supply component and most, but not all, also have a project water component.

[7] Base supply can be transferred to the extent its use is reduced by land fallowing, groundwater substitution, or conservation.

Table 2. Sacramento River Settlement Contractors with Total Supplies of 10,000 AF or More

Name	Contract Number	Base Supply	Project Supply	Total Supply
Glenn-Colusa Irrigation District	14-06-200-855A-R-1	720,000	105,000	825,000
Sutter Mutual Water Company	14-06-200-815A-R-1	169,500	56,500	226,000
Reclamation District No. 108	14-06-200-876A-R-1	199,000	33,000	232,000
Natomas Central Mutual Water Company	14-06-200-885A-R-1	98,200	22,000	120,200
Reclamation District No. 1004	14-06-200-890A-R-1	56,400	15,000	71,400
Princeton-Codora-Glenn Irrigation District	14-06-200-849A-R-1	52,810	15,000	67,810
Meridian Farms Water Company	14-06-200-838A-R-1	23,000	12,000	35,000
Sycamore Family Trust	14-06-200-2146A-R-1	22,000	9,800	31,800
Anderson-Cottonwood Irrigation District	14-06-200-3346A-R-1	121,000	7,000	128,000
Maxwell Irrigation District	14-06-200-6078A-R-1	11,980	6,000	17,980
Provident Irrigation District	14-06-200-856A-R-1	49,730	5,000	54,730
Redding, City of	14-06-200-2871A-R-1	17,850	3,150	21,000
Pleasant Grove-Verona Mutual Water Company	14-06-200-5520A-R-1	23,790	2,500	26,290
Bardis, Christo D., et al. (Broomieside Farms)	14-06-200-1286A-R-1	8,070	2,000	10,070
Pacific Realty Associates, L.P. (M&T Chico Ranch)	14-06-200-940A-R-1	16,980	976	17,956
Conaway Preservation Group, LLC	14-06-200-7422A-R-1	50,190	672	50,862
River Garden Farms Company	14-06-200-878A-R-1	29,300	500	29,800
	Total	1,669,800	296,098	1,965,898

Summary

There are three in-lieu groundwater recharge projects on track for implementation in the Colusa Subbasin with a combined surface water requirement of approximately 86,000 AF in Shasta Non-Critical years. Each project intends to acquire the necessary surface water primarily via water transfers from other entities with available CVP contract supplies and CVP Settlement Contract project water under the provisions of CVPIA Section 3405(a). Transfer of available project water supplies under settlement contracts alone would nearly meet these needs, with full use of existing contract supplies (CCWD and OAWD only) and potential transfers of surplus CVP contract supplies adding to that amount.

It is recognized that the actual feasibility of acquiring the water is subject to the willingness of both buyers and sellers, and the negotiation of mutually acceptable contract terms. These negotiations have been initiated informally and will be continued as the projects move toward implementation.

A key element of all three projects will be creating incentives for growers to use the surface water made available rather than pumping groundwater. The preliminary analysis presented in this appendix suggests that the variable cost to pump groundwater may already be greater than the district rate under the new repayment contracts in some districts. In other districts, the water rate is around $10 to $25 per AF greater than the variable cost to pump groundwater. These are just the variable costs of water supply, and do not include additional on-farm costs associated with each source. As described above, incentivizing use of surface water can be accomplished by developing an incentive program funded by the beneficiaries of such a program, or through adjustments to the district water rate structure. It is anticipated that these specific incentive structures would be evaluated and developed as part of project implementation.

It is also noted that the in-lieu recharge volumes referred to above are maximum quantities. Based on monitoring of project performance and groundwater conditions, it may be possible to operate the Subbasin within its sustainable yield with less than the maximum in-lieu recharge quantities described above.

References

Stene, E.A. 1994. Sacramento River Diversion, Central Valley Project. United States Bureau of Reclamation.

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Attachment A. Personal Communication with J. Sutton Regarding the Tehama-Colusa Canal Capacity.

From: Jeffrey P. Sutton (Tehama-Colusa Canal Authority)
Sent: Tuesday, August 10, 2021, 4:55 PM
To: Grant Davids (Davids Engineering, Inc.)
Cc: Katherine Klug (Davids Engineering, Inc.)
Subject: RE: TCC Capacity

Grant,

Caveated with the following first blush comments (reserve the right to add to this list), I respond:

1. TCCA will not be responsible for providing the subject water rights or water supply that is diverted for this purpose.
2. TCCA will not be responsible for any permits, mitigation, or other regulatory responsibilities associated with such a program.
3. CCWD and OAWD will be responsible for any and all charges, contracting, Warren Act or other fees and/or costs associated with such a program.
4. TCCA will be paid appropriate conveyance charges pursuant to the rates in the TCCA JPA Agreement that CCWD and OAWD currently pay or other rates as agreed.

I respond to your question as follows: Currently, it is my opinion that under most (in fact all that I currently think of) scenarios experienced, there would be plenty of pumping/diversion capacity (currently maxed out at 2000 cfs) and conveyance capacity in the TC Canal (2500 cfs at the top of the canal, 2100 cfs at Funks Reservoir, 1700 cfs at the south end of the canal) to facilitate such a program. However, historical operations are not always a good predictor of future conditions. In a typical year, we typically divert/convey a maximum amount of water of around 1300-1500 cfs. I would also add that I have not yet discussed particulars details of such a program (because I have not been provided such details until this time) with my Board of Directors. Bill Vanderwaal and Emil Cavagnolo did generally outline the recharge concept being explored at my last meeting, which the Board was generally supportive of - notwithstanding the need to hear the details. However, I anticipate that this water would have to somewhat take a second tier position in the atypical case of a conflict over the available diversion/conveyance capacity.

I hope this is helpful Grant, sorry for the long caveated answer. But I don't want to give the misimpression of complete acquiescence or create a reliance on a simple statement of "sure we have capacity" until all of the details are more fully vetted and the necessary terms have been contemplated. I will leave it to your discretion on how you wish to articulate capacity availability in the Colusa GSP based on the foregoing.

Jeffrey P. Sutton

General Manager
Tehama-Colusa Canal Authority

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Appendix 6B

Economic Analysis of Demand Management and Conceptual Allocation Approaches

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Technical Memorandum

To: Glenn and Colusa County Groundwater Authorities

From: ERA Economics

Date: November 19, 2021

Subject: **Economic Analysis of Demand Management and Conceptual Allocation Approaches**

Introduction

More than 30 projects and management actions (PMAs) are included in the Colusa Subbasin GSP to achieve and maintain sustainable groundwater management. Five projects are on track for implementation, which are all groundwater recharge projects that use surface water for direct and/or in-lieu recharge. Recognizing that projects can take several years to develop, and in light of the current severe drought conditions across the Colusa Subbasin (Subbasin) and state, the GSP includes two "backstop" demand management actions that could be implemented relatively quickly, primarily because they do not require construction of new infrastructure. These management actions include a targeted demand management program that would incentivize temporary pumping reductions (and/or local water transfers) in periods of extreme drought, and a broader demand management program that would incentivize pumping reductions, if necessary, due to future groundwater conditions in the Subbasin.

Demand management can be implemented fairly quickly and can be included as part of a cost-effective mix of PMAs to achieve and maintain sustainable groundwater conditions. This appendix describes the direct economic costs of demand management in the Subbasin. It also describes considerations for, and the process of setting, a groundwater allocation. It is noted that a groundwater allocation is not required to implement the demand management programs included in the GSP, but it does generate incentives to manage demand and increase supply. To provide some context for the costs of demand management, a general summary of agricultural water use, economic values, and Subbasin conditions is presented first. This is followed by a summary of an economic analysis of the direct costs associated with two example demand management programs: one targeted to specific areas with groundwater sustainability concerns, and another targeted more broadly across the Subbasin. The allocation discussion is presented last.

Economic Value of Agriculture in the Colusa Subbasin

Glenn and Colusa County agriculture includes a diverse mix of rice, nut crops, seed, feed, and other field and row crops. Farming activities to raise these crops support jobs, income, and economic activity for a range of transportation, processing, manufacturing, and retail industries in the Subbasin. These activities support the local tax base as well as jobs and income in businesses not directly related to agriculture. Changes in the cost and availability of water under the PMAs included in the GSP, as well as potential demand management programs, can have important implications for the local economies and communities in the Subbasin. This section describes the current contribution of agriculture to the Subbasin economies.

The Subbasin spans most of Glenn and Colusa counties. The annual economic activity, measured as value-added, across all industries (including agriculture) in the counties is around $7.4 billion. These industries support around 26,000 full-time equivalent (FTE) jobs, mostly for individuals that both live

and work in the counties. Table 1 summarizes the top ten industry sectors by value, and the direct jobs associated with each industry. Eight of the top 10 industry sectors are agriculture and related industries. Notable exceptions include local government industries and the wholesale trade sector. However, wholesale trade includes warehousing and storage industries that are closely linked to the agricultural sector.

Table 1. Top 10 Industries, Glenn, and Colusa Counties

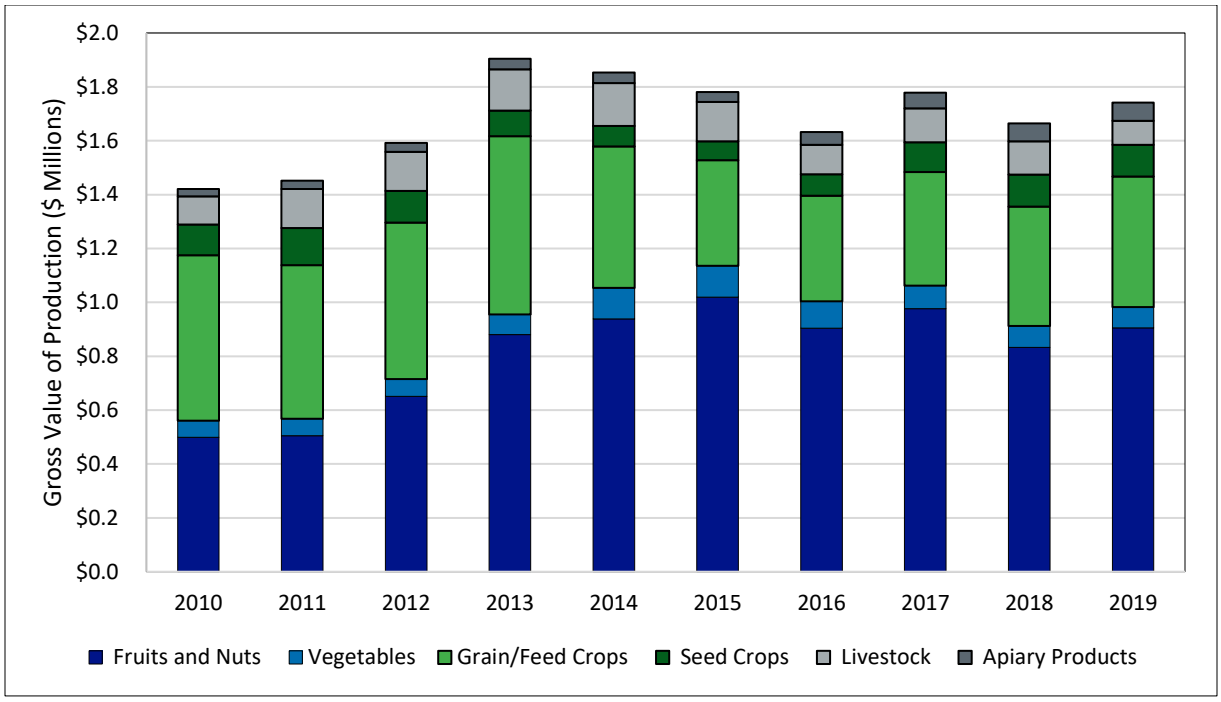
Rank	Industry	Annual Value Added ($ in Millions)	Direct FTE Jobs
1	Tree nut farming	$965	2,790
2	Rice milling	$750	450
3	Local government	$625	3,750
4	Grain farming	$500	405
5	Wholesale trade	$475	1,620
6	Canned fruits and vegetables manufacturing	$470	695
7	Vegetable and melon farming	$180	630
8	Dairy cattle and milk production	$160	155
9	Support activities for agriculture and forestry	$145	1,690
10	Other animal food manufacturing	$145	70

Source: IMPLAN 2014 R3 multipliers, current USDA crop prices and returns, current 2021 dollars

A substantial share of local economic activity is directly or indirectly related to farming. A conservative analysis using the IMPLAN model data shows that at least one in three jobs depend on farming activities in the Subbasin. Similarly, a substantial share of local wage income for employees, value added, and gross output are a result of farming-related industries in the Subbasin.

The primary crops produced in the Subbasin include rice, walnuts, and almonds. The total rice acreage footprint has been largely steady for several years, with annual fluctuations in planted acreage based on rice market conditions and water availability in the Sacramento and San Joaquin Valleys. On average, Colusa and Glenn counties produce around 45 percent of California's annual rice crop. The share of acreage planted to almonds and walnuts has been steadily increasing, driven by favorable market conditions and consistent with trends across the state. Relative to annual crops, these permanent plantings require a substantial capital investment to establish and require consistent irrigation in all years. This has led to hardening of irrigation water demand in areas with increasing permanent plantings.

Figure 1 illustrates recent trends in the gross value of production by crop type in Glenn and Colusa Counties. The gross output value of the crops produced in the Subbasin is around $1.75 billion per year, with fruit and nut crops accounting for more than half of the total value in recent years. Fruit and nut crops accounted for around 30 percent of gross value in 2010, increasing to nearly 60 percent by 2015.



Source: Glenn and Colusa County Crop Reports

Figure 1. Trends in Gross Value of Crop Production, 2010 – 2019

The trends in crop acreage and value in Glenn and Colusa counties are consistent with trends in other parts of the state. Robust export demand for California almonds and walnuts through the mid-2010's supported strong prices and profitability. This led to increasing plantings that are continuing across the state. However, new plantings of nut trees have slowly leveled-off in response to softer prices caused by increasing supply (production) in California and other regions (e.g., Australia) and a weaker export market (e.g., tariffs and macroeconomic conditions including a stronger U.S. dollar). Groundwater concerns in Critically Overdrafted subbasins in the San Joaquin Valley may continue to push permanent plantings north into the Sacramento Valley, and as such this general trend appears likely to continue in Glenn and Colusa Counties for the next several years.

The agricultural industries in the Subbasin create a substantial share of local jobs, business, and economic activity. Demand management programs can be structured in ways to minimize the economic costs to growers and the regional economy. The following section quantifies the direct costs of potential demand management programs in the Subbasin.

Demand Management Costs

Demand management generally refers to actions that reduce the net consumptive use of water, which in turn reduces net groundwater pumping[1] in the Subbasin, or selected areas of the Subbasin. Areas selected for demand management would be determined by the GSAs in consideration of local groundwater conditions and sustainability indicators.

This appendix summarizes the results of an analysis that establishes the potential costs of demand management in the Subbasin. The results of the analysis can be used for multiple purposes. Demand management costs can be compared to the cost of potential projects to support developing a cost-effective portfolio of PMAs. In addition, demand management costs are interpreted as the minimum willingness to accept payment to forgo irrigation, which can be used to structure potential incentives to reduce groundwater pumping under applicable PMAs.

To illustrate the cost of demand management, two scenarios are developed. The cost of a specific demand management program will ultimately depend on the location, scale, and market conditions at the time the program is implemented. The outputs summarized in this report are intended to support PMA development for the GSP, and comparison of demand management with other projects and management actions. These cost estimates would be refined in the future and would be specific to each PMA. The final section in this appendix describes the general steps for this future analysis.

The cost of demand management depends on the location, scale, and timing of the program. For the purposes of this analysis, it was assumed that the timing of the program would be the GSP implementation period (2022 – 2042). The scale of the program (i.e., total volume of demand management achieved in each year) was developed over a range consistent with preliminary changes in groundwater storage shown in the initial GSP water budgets (see Chapter 3). Lastly, two alternatives were developed for the location of the program. The first alternative would apply Subbasin-wide and the second would target demand management to specific areas of concern near the Orland and Arbuckle areas in the Subbasin (as generally defined below).

The direct cost of demand management is estimated here as the loss of net return to irrigated lands and is expressed on a per acre-foot (AF) basis for comparison to other PMA costs. Costs were established in the Subbasin using a standard economic analysis that considers the water budget (e.g., quantity of water applied and consumed by Subbasin crops), costs and returns to farming, and current market conditions for major Subbasin crops. The results of the analysis show how the cost of demand management changes over an increasing scale of a potential program, and how those costs vary across different areas.

Reduced net return from crop production may, in turn, lead to secondary losses to other sectors within the local economy. The extent of such losses would depend on how irrigated agriculture on other lands changes. For example, if production shifts to other lands within the same regional economy (e.g., the broader Sacramento Valley), then regional secondary effects on input suppliers, trucking, processing, farm labor, and other businesses may be small. But if this does not occur, then secondary economic impacts may warrant more analysis and quantification. These secondary impacts have not been quantified in this appendix. In addition, this analysis does not quantify any additional administrative costs for the GSAs to develop and administer a demand management program. These indirect costs would be assessed as part of demand management program design in the future.

[1] Net groundwater pumping would be defined as part of the demand management program. In general, it would include crop ETAW plus any unrecoverable return flows.

Methods

The cost of demand management fundamentally depends on supply and demand for irrigation water. Examples of factors that affect supply include annual water year conditions, carry-over storage, CVP allocation, GSA costs, water supply costs, and other GSP implementation (e.g., PMAs). Examples of factors that affect demand include export and domestic market conditions for California crops that affect returns to farming and willingness to pay for water.

An economic model of the Subbasin was applied to evaluate the supply and demand for water and establish the cost of demand management. It reflects the local water supplies and uses, financial data on returns to farming, and current crop market conditions for Sacramento Valley crops. This includes current crop prices and yields. Production costs are representative averages based on University of California Cooperative Extension crop budgets. The model is calibrated to the GSP water budget (applied water and evapotranspiration of applied water) and geospatial land use data described in Chapter 3 of the GSP. A technical description of the economic calibration method is beyond the scope of this technical appendix. The method applied is a standard, peer-reviewed economic analysis approach that is widely applied for valuation of water supply and water supply projects in California[2]. This same technical approach was applied for calibration of an economic optimization model of the Subbasin.

The model quantifies the effect of changes in water supply availability and cost on farm income (e.g., net income and gross farm revenues) and simulates how the agricultural sector would respond to changes in water availability and cost. Responses include switching to higher value and/or lower water use crops, adjusting input use, and idling land. The decision to switch crops and/or idle land depends on agricultural market conditions simulated by the model under increasing levels of a range of (hypothetical) demand management. The economic analysis quantifies the direct economic cost of changing crops and idling land under implementation of demand reduction. For this technical appendix, costs are expressed on a per acre-foot basis for comparability to other PMAs in the GSP.

The analysis reflects average water supply conditions. That is, the results of the analysis are the incremental cost of demand management in an average water supply year, not under critical drought conditions, or conversely, years with above-average supplies. The framework can be extended to evaluate these factors as part of future program design.

The economic model is developed on a geospatial scale that can be refined to evaluate Subbasin-wide demand management and demand management in specific areas. Two “areas of concern” were defined in the model. Figure 2 illustrates areas of concern and crop types[3] in the economic model for the Subbasin. Areas of concern are more precisely defined based on hydrogeologic conditions that are described in Chapter 3 of the GSP. Areas shown below include two broad regions: North (around Orland) and South (between Williams and Arbuckle).

[2] See the following references for example:

Department of Water Resources. Water Plan Update. 2009. Data and Tools Technical Appendix. Economic Modeling of Agriculture and Water in California using the Statewide Agricultural Production Model.

U.S. Bureau of Reclamation. 2019. CVP Long Term Operations EIS. Appendix 12A: Statewide Agricultural Production Model (SWAP) Documentation.

[3] Crop types are aggregated into seven groups for map display purposes. The economic analysis has 20 crop types that better reflect the unique costs, returns, and markets for each crop.

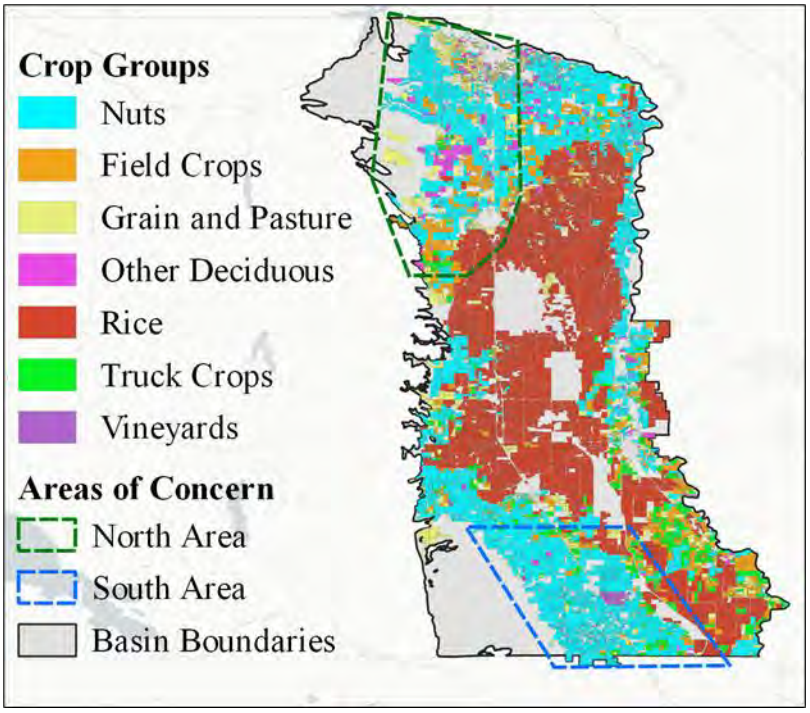


Figure 2. Colusa Subbasin Crops

Colusa Subbasin Demand Management Costs

This section summarizes the direct cost of demand management for the following alternatives:

- **Colusa Subbasin-wide demand management**. This assumes demand management would occur across the entire Subbasin. That is, demand management is not targeted to specific areas. The implicit assumption is that water can be moved (exchanged, conveyed, in-lieu) across the Subbasin.
- **Targeted demand management**. This assumes demand management would occur in specific areas defined as the North and South areas of concern.

For each alternative, the cost of demand management was estimated as the mix of crops that could be idled at the lowest loss in net return. This is based on the aggregate supply of the crops produced in the Subbasin evaluated as part of the economic analysis (i.e., the lowest net return is not a static accounting measure of the least profitable crop). This is the minimum cost of the demand management program, defined by the opportunity cost of water for the crops that would be idled (the net return that the water would have provided on those crops).

Costs of Demand Management Applied to Entire Colusa Subbasin

This section summarizes the results of the demand management costs for the scenario where demand management is applied broadly to the entire Subbasin.

Figure 3 illustrates the range of demand management costs over a program scale of 2,500 and 25,000 AFY reduction in irrigation water demand. The cost ranges from around $120 per AF at 2,500 AFY of demand management to $210 per AF at 25,000 AFY. These are the direct cost of idling land, inclusive of groundwater pumping cost. The analysis estimates that the lowest net return lands and crops would idle first (hence the low cost for the smallest scale program), with higher net return lands included as the program scale increases.

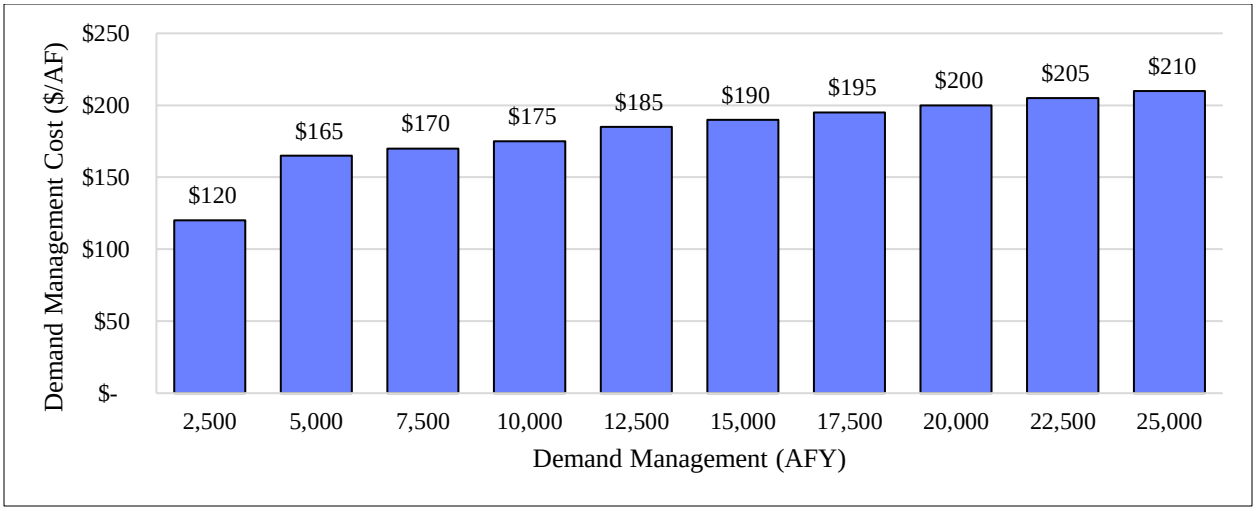


Figure 3. Costs of Demand Management Applied to Entire Subbasin

Costs of Demand Management Targeted to Areas of Concern

This section summarizes the results of the demand management costs for the scenario where demand management is targeted to two areas of concern. The specific lands are not identified. Rather, the demand management program is broadly defined for the general region.

Figure 4 illustrates the range of demand management costs for a demand management program between 1,250 and 12,500 AFY. The demand management volumes are specific to each region (e.g., 1,250 AFY in the north area and south area, separately). A smaller scale program for each region (up to 12,500 rather than 25,000 AFY) is shown because the total level of demand management is independent in each region. The cost ranges from $115 to $185 per AF in the north area of concern and $115 to $250 per AF in the south area of concern. These higher values reflect the crop mix in these areas – more permanent crops with less flexible water demand and higher-value annual crops. These are the direct cost of idling land, inclusive of groundwater pumping cost.

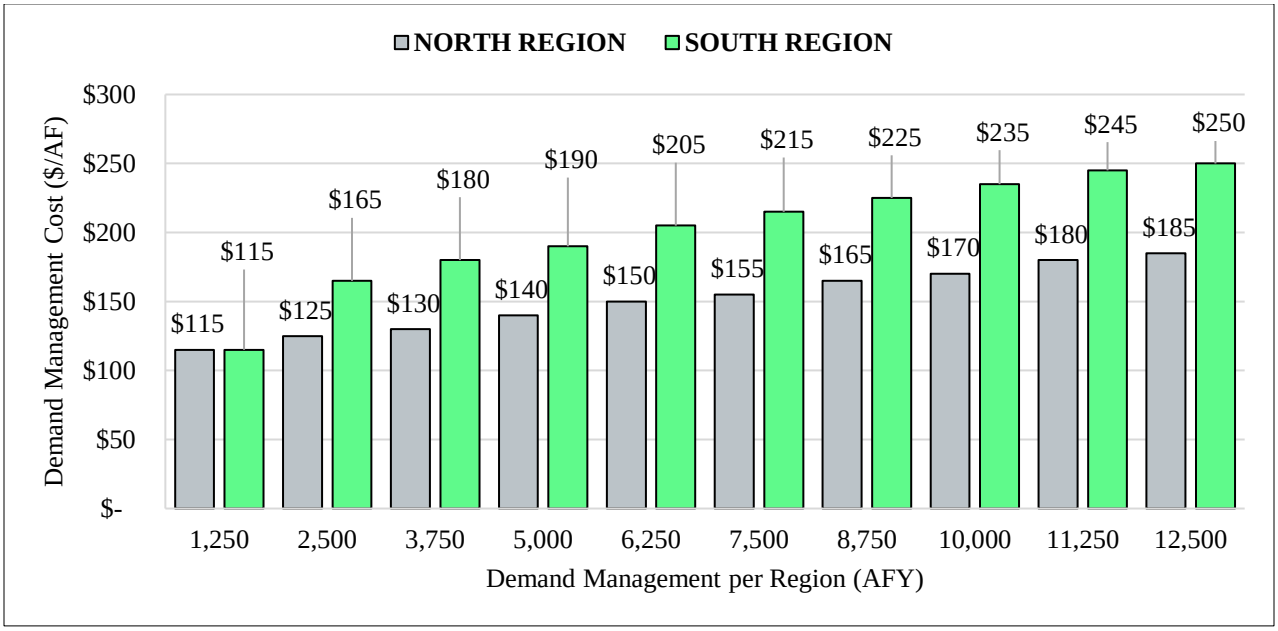


Figure 4. Costs of Demand Management Targeted to Areas of Concern

Groundwater Allocation Concepts

Demand management can be achieved without a groundwater allocation, so long as the program is able to quantify and verify the program demand management targets are achieved. However, an allocation can support implementation of a demand management program. It can also provide incentives for other PMAs (e.g., recharge) by defining the amount of groundwater available, and the additional quantities that would be associated with the development of new projects.

This section provides an overview of concepts and approaches related to allocation of groundwater in a Subbasin with diverse water users, water rights, and sources of recharge. It is not an allocation plan for the Subbasin, it is a discussion of the analysis that would be completed to set an allocation at a future date, if the GSAs decide to do so, either separately or together.

Introduction and Definitions

A groundwater allocation specifies quantities of groundwater available to groundwater pumpers, which for the purposes of GSP development would include irrigators in the Subbasin. According to the Sustainable Groundwater Management Act (SGMA) and its regulations, *de minimis* pumpers (defined as less than two AF per year) would not be limited by an allocation. This section provides a general overview of allocation approaches, technical considerations, and summary of economic implications of alternative approaches. It is not an allocation plan for the Subbasin and it does not address all necessary considerations for defining and implementing an allocation. Developing a specific allocation would require careful analysis of the legal, hydrogeologic, economic, and engineering implications, and would require vigorous and informed discussions with stakeholders.

Allocation involves setting an overall amount of permissible net groundwater extraction for the subbasin and the apportionment of that overall amount among pumpers. It is important to note that implementing an allocation does not necessarily result in reducing groundwater use. For example, if the allocation is greater than historical use and it is apportioned in a way that all pumpers receive more than their historical use, then the allocation would not constrain groundwater users and would not result in less consumptive groundwater use. In the context of GSP implementation, the first step – the overall allocation – is typically tied to the sustainable yield (defined below) of the Subbasin. The second step – apportioning the allocation among users – can be based on different factors related to, for example, land use, recent water use, location, and other policy goals. Apportionment of the overall allocation can be made to individual wells, parcels, farming operations, or other defined entities. When the sustainable yield (including yield of other PMAs like recharge projects) is less than current pumping, the effect of an allocation is an overall reduction in net groundwater use.

Allocation based on sustainable yield often considers the various components of the subbasin water balance that contribute to sustainable yield. This is useful because the components vary geographically across the basin, under future conditions, and PMAs may affect those components over time. Defining the different types of groundwater and components of sustainable yield typically involves substantial data, modeling, and stakeholder input. Sources of groundwater that can be included in the allocation can include native/natural recharge, percolation of water developed and imported into the basin, other intentional recharge, and net subsurface groundwater flow into the basin from/to adjacent areas. Some concepts used in discussing allocation are defined below:

- **Native/natural recharge**. Native or natural recharge is recharge that is from deep percolation of precipitation or losses through natural water ways and channels in the Subbasin. These are sources of groundwater recharge that do not rely on the action of any individual entity within the basin, although certain actions (e.g., conversion of native land to urban uses) can affect their quantity.

- **Imported/developed water recharge**. Imported or developed sources of groundwater recharge are a result of investments by specific entities in the subbasin. For example, groundwater recharge from unlined canals developed, and paid for, by a district to import and deliver surface water rights. This is considered separately from native/natural recharge because it would not have contributed to groundwater recharge in the Subbasin without the investments of the district. A substantial amount of the developed water recharge is percolation from applied irrigation of developed water supply, some occurs during conveyance of the developed water, and some is the result of projects designed specifically to recharge groundwater, either in dedicated recharge areas, spread over lands during uncropped or dormant periods of the season (Flood MAR)[4]. Another kind of recharge, in-lieu recharge, does not increase percolation but rather reduces or avoids the net extraction of groundwater by providing a replacement supply.
- **Net subsurface flow.** Groundwater flows laterally across the Subbasin boundaries to and from adjacent areas outside the subbasin, driven by the gradients resulting from groundwater elevation differences. Many subbasins have groundwater flowing both in from some adjacent areas and out to other adjacent areas. The net flows change over time according to changes in precipitation, land use, and groundwater management both in the subbasin and in adjacent areas.
- **Transitional pumping**. Transitional pumping is also referred to as planned depletion of groundwater storage. SGMA provides for GSAs to transition to sustainable yield over a period of twenty years. In areas where current groundwater extraction is greater than the sustainable yield, an allocation will need to be less than current groundwater use. PMAs typically require time to implement, during which time growers subject to an allocation must reduce pumping, for example, by switching crops or idling land. A gradual time path for adjustment helps lessen the economic costs of this type of adjustment. Transitional water is effectively an overdraft that, consistent with SGMA and the GSP, decreases to zero over time as extraction is brought into balance with recharge.

Time Dimension of Allocations

Allocation quantities are typically defined on an annual basis using long-run average components of the current and projected water balances. However, an allocation need not be the same every year; it can include transitional water that declines over time or it can be reduced or increased annually according to conditions, so long as on average it follows the path to sustainability laid out in the GSP. For example, the allocation can be increased in drought years to allow better conjunctive use of surface and groundwater, and then reduced in non-drought years to offset the increases in pumping in drought years. The yearly pattern of allocation could vary by subregion within the GSA (or subbasin) according to the situation. For example, lands fully dependent on groundwater may do better on a more consistent allocation, whereas lands with access to both ground and surface water might benefit from a variable allocation.

Another option to implement and manage a groundwater allocation is to allow growers to carryover some or all of their assigned allocation. The ability to carryover unused allocation may vary by different components. For example, unused natural recharge allocation may be carried over and used in subsequent years, but transitional pumping may not. In addition, carryover could be limited to a not-to-exceed amount each year, limited in the number of years an allocation carryover can be used, or even subject to annual "losses". The ability to "borrow" current pumping against next year's allocation could

[4] These sources of developed recharge are typically part of GSP PMAs, which can be included as separate categories of recharge under an allocation, but are discussed jointly here.

be considered. Essentially a carryover could be implemented like a bank account, where growers take responsibility to manage their account over time within the rules defined by the GSA.

The allocation can be and probably will be adjusted over time. Transitional allocation has already been described above. In addition, periodic reassessment of quantities will be made as more current data is acquired (e.g., as data gaps are filled), changes in hydrologic conditions (e.g., climate change) are observed, and PMAs are implemented.

Spatial Dimension of Allocations

An overall allocation is typically developed initially at a subbasin, or GSA-level based on the water balance. It is also possible to subdivide the GSA into smaller subareas or zones based on important variations in the components of an allocation, and with respect to groundwater conditions. For example, some zones may receive percolation from imported surface water that is included in their allocation, whereas other zones do not. Or some smaller areas may support and pay for a recharge project to boost their allocation while another zone does not need to do this. These kinds of differences can be easier to understand and manage if the allocation is built up from components rather than a single, annual amount.

Another possible rationale for subregional differences can involve sustainability criteria other than groundwater elevation. Groundwater dependent ecosystems, streamflow effects, and subsidence are examples of other conditions that may be considered in subregional allocations.

Apportionment of the Allocation

After the components of groundwater are defined and the overall allocation is determined (either for the entire GSA or for subareas), the next step in groundwater allocation is defining how to apportion the allocation among the irrigators in the subbasin.

Some important considerations include:

- **Allocation eligibility**. Once the volume for different components of a groundwater allocation is defined, it is necessary to determine which lands and users are eligible for an allocation and how specific volumes are assigned. This could vary by groundwater component. For example, native recharge could be allocated on a per acre basis to all eligible parcels in the subbasin. Transitional water could be allocated in the same manner, or it could be allocated based on historical use. The yield from a recharge project could be assigned according to proportionate contributions to the cost of the project. Allocations may also consider other non-consumptive uses, such as habitat benefits.
- **Non-irrigated parcels**. A topic of much discussion during development of many GSPs (and GSP implementation in Critically Overdrafted subbasins) is whether and how non-irrigated lands are included in the allocation. Non-irrigated parcels can include parcels that were never irrigated and parcels that were previously irrigated but are not currently irrigated. Never irrigated parcels may not be economically feasible to develop into irrigated agriculture, whereas currently unirrigated parcels may have been temporarily retired for various reasons. An allocation typically includes defining a point in time where a parcel is defined as non-irrigated (e.g., if it has not been irrigated since a specific date). Non-irrigated parcels may be eligible for some components of the groundwater allocation. This may include portions of the sustainable yield, but typically does not include any transitional water. Additional considerations may include lands near sensitive habitat areas.

Additional Considerations and Analysis

Developing a groundwater allocation should include consideration of legal, economic, engineering, hydrogeologic, and political considerations. In areas with both ground and surface water supplies, the ability to use them conjunctively can provide sufficient water (from delivered surface water and groundwater allocation) during droughts.

In areas where the groundwater allocation is less (and in some cases substantially less) than current groundwater use, there can be important economic implications for different allocation design approaches. An analysis to inform allocation development typically includes quantifying the economic implications of alternative groundwater allocation design approaches. This includes evaluating financial impacts to individual groundwater users (e.g., growers) as well as the regional economic implications.

Assigning quantities of groundwater available to individual pumpers can incentivize them to think about the costs and benefits of reducing their water use or developing new recharge opportunities. An allocation effectively creates a scarcity of groundwater, whereby the value of groundwater is driven by the economic value (net return) it can produce. Economic effects of an allocation depend on many factors, including: the size of the allocation relative to crop water demand (how limiting is the allocation); the sources, costs, and distribution of current and prospective surface supplies; and the flexibility allowed to growers in how they manage their allocation.

A strict allocation and apportionment are a rigid method for implementing demand management. They effectively limit water use on a well, parcel, or operation basis. Economic analysis can illustrate the advantages, both to individual growers and to the regional economy, of increasing the flexibility of allocations. Allowing growers to move their allocated groundwater freely (subject to some review) is one step to increase flexibility. Rather than allocating pumping to each well or parcel, a grower can make choices about distributing allocation among fields and crops, in maximize return, and reduce the costs of demand management. A more ambitious step is to allow growers to buy and sell allocation among themselves, using either short-term or long-term agreements. A number of other GSAs in California are currently evaluating and pilot-testing groundwater trading markets for this purpose.

Administering an Allocation

If a GSA, or subbasin, decides to adopt an allocation and defines the mechanism to calculate how to assign allocation to different individuals, entities, or wells, it must then monitor pumping and enforce the allocation. If carryover across years is allowed, the GSA must also track that and incorporate it in the annual water budget accounting. Most groundwater management entities outside the state use some form of measurement, including wellhead metering, to track allocations. In California, many GSAs are proposing or considering direct measurement or using crop type and/or ET calculations to estimate water use and groundwater pumping. Estimation versus measurement is a GSA policy decision that can have important effects on the cost and its ability to manage the allocation effectively.

Summary of Steps in Considering and Implementing an Allocation

1. Develop the key components of the GSP – baseline conditions, water budgets, criteria and thresholds, and PMAs.
2. Determine if an allocation is necessary and useful to achieve targets and implement PMAs, particularly demand management actions, effectively.

3. If an allocation is warranted, use data and analysis to evaluate, compare, and select allocation amounts and other characteristics that best meet the needs of the GSA.
4. Monitor conditions and pumping over time to verify the effectiveness of the allocation and to modify as needed.

Discussion

This appendix summarized an analysis of the cost of demand management for two hypothetical programs: one covering the entire Subbasin, and another targeted to two areas of concern. The cost of demand management is estimated as the loss in net return to farming. It does not include program administrative costs or any secondary impacts, and it does not consider what the market price for water would be under a local groundwater market. Secondary economic impacts should be considered in future iterations of this analysis to support implementation of PMAs.

Implementing an annual allocation can provide a strong impetus for growers to adopt demand management and may be a prerequisite for effective demand management in some cases. It is not clear that an allocation is warranted at this time for the Subbasin, though it may become more useful in the future. Developing a specific allocation would require careful analysis of the legal, hydrogeologic, economic, and engineering implications, and would require vigorous and informed discussion with stakeholders.

Future analysis of demand management program costs and allocation design would be specific to the program being considered in the Subbasin. For example, under the "targeted demand management" PMA summarized under Chapter 6 Section 6.5.2, the economic analysis would be developed for the regions that would participate in the program (both buyer and seller regions). This would define incentives to participate in the program. The general steps to define a demand management program costs include:

1. Define the location, scale, and timing of the program. Prepare economic data specific to the program areas and define any program-specific conditions that would affect participation.
2. If a groundwater allocation will be included, define the groundwater allocation approach and specify the allocation to lands/entities in the Subbasin. Prepare an economic analysis and hydrogeologic analysis of the impacts of alternative groundwater allocation designs.
3. Use the general method described above to quantify the direct cost of demand management in each area. The analysis would additionally consider the opportunity cost of water in other, non-farming, uses, such as a local or regional water transfer market. Market prices can exceed the values in irrigated agriculture in some years and would drive demand management program costs in these years.
4. Evaluate potential secondary economic impacts, and to whom those impacts may occur. Also consider any benefits associated with the program, and to whom those benefits accrue. For example, this may include broader groundwater level benefits in the area, and regions down-gradient. Monetize any anticipated secondary economic impacts and benefits.
5. Use the results of the steps above to develop an appropriate incentive structure (accounting of costs and benefits) that would support demand management program design. See Section 6.5.2 of GSP Chapter 6 for a summary of different types of potential demand management programs.

Appendix 6C

Overview of Projects and Management Actions

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Specialists in Agricultural Water Management

Technical Memorandum

To: Glenn and Colusa County Groundwater Authorities

From: Davids Engineering

Date: November 19, 2021

Subject: **Overview of Projects and Management Actions**

Introduction

More than 30 projects and management actions (PMAs) are included in the Colusa Subbasin GSP to achieve and maintain sustainable groundwater conditions in the Colusa Subbasin (Subbasin). PMAs are categorized and presented in this appendix according to the current status of implementation and development:

- **Planned Projects and Management Actions** are PMAs that the GSAs or other project proponents are working to implement that will support sustainable groundwater management in the Subbasin, and mitigate historical and current drought effects. Five projects are currently planned for implementation, all of which are groundwater recharge projects that use surface water for direct and/or in-lieu recharge.
- **Ongoing Projects and Management Actions** are PMAs that are ongoing and will support sustainable groundwater management in the Subbasin. In accordance with 23 CCR §354.44(a), these are PMAs that would allow GSAs to achieve the sustainability goal for the Subbasin and avoid reaching the minimum thresholds defined in this GSP under future, changing conditions. Six PMAs are currently ongoing in the Subbasin.
- **Potential Projects and Management Actions** are PMAs that may be implemented if necessitated by groundwater conditions in the Subbasin. These may have been studied by the project proponent or in earlier regional water planning documents, but most project design, cost estimates, and planning work have yet to be completed, and would only be initiated if the project is eventually triggered for implementation as a result of continued monitoring of groundwater conditions. There are more than 20 potential PMAs proposed for the Subbasin.

Each of the PMAS are designed to support the long-term sustainability of groundwater resources of the Subbasin. The information currently available for each of these PMAs is provided in Tables 1 through 6 below. These tables summarize the following information:

- Table 1. Brief Description of all Projects and Management Actions
- Table 2. Project Type, Category, Proponent, and Location for all Projects and Management Actions.
- Table 3. Implementation Criteria, Notice Process, Permitting and Regulatory Process, and Timeline for all Projects and Management Actions.
- Table 4. Anticipated Benefits of all Projects and Management Actions.
- Table 5. Benefit Evaluation and Water Source for all Projects and Management Actions.

- Table 6. Legal Authority Requirements, Estimated Cost, and Potential Funding Sources for all Projects and Management Actions.

The fields in these tables have been designed to meet the requirements for PMAs as described in the California Code of Regulations (CCR); when applicable, a reference to a specific CCR location is provided as the first row of each table.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Planned	
Colusa County Water District (CCWD) In-Lieu Groundwater Recharge	CCWD will utilize up to an additional 30 thousand acre-feet (taf) of surface water for irrigation in all years but Shasta Critical years for in-lieu recharge (an average of 27 taf per year). The additional surface water will be made available through full use of the CCWD's existing CVP contract and annual and multi-year water purchase and transfer agreements. The additional water will be conveyed through the existing Tehama-Colusa Canal (TCC) and CCWD facilities. It is expected to be used on existing district lands, though as an optional component of this project CCWD is considering relatively small annexations of lands adjoining the district and supplying surface water to these lands (currently dependent on groundwater, requiring additional infrastructure for surface water delivery), resulting in in-lieu groundwater recharge through reduction of groundwater pumping.
Colusa Drain MWC (CDMWC) In-Lieu Groundwater Recharge	CDMWC encompasses approximately 46,000 acres of agricultural land and environmental habitat adjacent to the Colusa Basin Drain (Drain). Shareholders in CDMWC divert water for summer irrigation from the drain under a combination of appropriative water rights held individually by the shareholders, a long-term service supply agreement with USBR and annual and multi-year transfer agreements with neighboring USBR settlement contractors. Historically, many CDMWC diverters use both groundwater and surface water for summer irrigation because physical supplies of water in the Colusa Drain are often unreliable and insufficient to satisfy those irrigation requirements. This project would provide additional surface supplies averaging approximately 28 taf per year, allowing CDMWC diverters to increase their diversions of surface water from the Drain to provide in-lieu groundwater recharge and decrease groundwater pumping by an equal amount.
Colusa Subbasin Multi-Benefit Groundwater Recharge	The Nature Conservancy (TNC) is partnering with growers and the Colusa and Glenn Groundwater Authorities for an on-farm, multi-benefit groundwater recharge incentive program. Program objectives are to benefit disadvantaged communities and other communities in the Subbasin by replenishing critical domestic and agricultural water supplies, growers economically through incentive payments, migratory shorebirds through the creation of critical winter habitat on farms, and groundwater conditions (via groundwater recharge). Surface water from the Sacramento River, subject to availability, is conveyed to and applied to flood and maintain ponds on selected fields using existing diversion, conveyance, and on-farm infrastructure. The pilot program was initiated in Colusa County in 2018 and concluded in the spring of 2021, with plans to expand and continue into the future. DWR will be participating in the Colusa Subbasin Multi-Benefit Groundwater Recharge project as it is expanded into a larger program.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Orland-Artois Water District (OAWD) Land Annexation and Groundwater Recharge	OAWD is working with a group of neighboring non-district landowners to annex approximately 12,000 acres of groundwater-dependent agriculture into the district. Surface water for the annexed lands would be secured through multi-year purchase or transfer agreements with willing sellers, conveyed through the existing TCC, and distributed to the annexed lands through new distribution facilities. It is estimated that a long-term average of approximately 23 taf per year of surface water would be available, reducing groundwater pumping by 23 taf per year. Additionally, certain annexed lands with high infiltration characteristics would be configured for direct recharge by surface spreading, primarily using Section 215 water. Preliminary project design shows seven proposed recharge areas totaling 371 acres in the project. OAWD is evaluating recharge potential and will refine these estimates. The direct recharge capacity has not yet been estimated. This project will address an area within the Subbasin where groundwater levels have been in decline in recent years due to drought and increasing water demands being met through increasing groundwater pumping.
Sycamore Slough Groundwater Recharge Pilot Project	Proctor and Gamble (P&G) and Davis Ranches have entered into a cooperative agreement to implement a 10-year groundwater recharge pilot project. The project will apply surface water diverted from the Sacramento River to a 66-acre field on Davis Ranches for groundwater recharge and to provide habitat for migrating shorebirds for 30 to 45 days during the fall or winter each year. The timing of the project may be targeted to provide fall and winter habitat for migratory shorebirds, in addition to groundwater recharge benefits. However, the precise timing of the project is flexible to accommodate changes in water availability and other factors between years. Sacramento River water is available to Davis Ranches under riparian rights and a Sacramento River settlement contract with Reclamation. If the project starts before November 1, settlement contract water would be used. Otherwise, riparian water rights would be exercised for beneficial use (habitat). The goal is to recharge 5,000 af over the 10-year study period and to revegetate a portion of Sycamore Slough. Monitoring of groundwater conditions will be done in eight existing groundwater wells, including dedicated monitoring wells and production wells. If the project is successful and cost effective, it could be continued in perpetuity to sustain long-term groundwater recharge and environmental benefits. Subject to acquisition of funding, an expansion of the project is planned for recharge and revegetation in the neighboring Sycamore and Dry Sloughs.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Ongoing	
Reclamation District 108 (RD 108) and Colusa County Water District (CCWD) Agreement for Five-Year In-Lieu Groundwater Recharge Project	CCWD (and Dunnigan Water District [DWD] located in the Yolo Groundwater Subbasin) purchase surface water from RD108 for distribution within their service areas under a five-year agreement, expiring after 2022. Under the five-year agreement, 10,000 af is purchased by and transferred to CCWD and DWD, with 80 percent to CCWD and 20 percent to DWD. This project supplies additional surface water to CCWD and DWD that provides in-lieu recharge to meet water demands that otherwise would be met through groundwater pumping.
Glenn-Colusa Irrigation District (GCID) Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	GCID holds a 1999 water right permit to divert Sacramento River water for irrigation and rice straw decomposition between November 1 and March 31; water used under the permit is referred to as "winter water." The potential exists to increase the groundwater recharge and habitat enhancement benefits of winter water use by increasing winter use for rice straw decomposition, winter irrigation, and frost control provided that certain constraints can be alleviated. Under this project, working in collaboration with partners within the subbasin and with environmental advocacy groups, GCID will investigate opportunities to increase winter water use by alleviating these constraints.
Sycamore Marsh Farm Direct Recharge Project	Sycamore Marsh Farm has been in process of developing a groundwater recharge plan to store water in our aquifer by several different methods. The plan provides for 205 acres of year-round recharge basins and 163 additional acres of winter recharge areas.
Glenn-Colusa Irrigation District (GCID) Expansion of In-Basin Program for In-lieu Groundwater Recharge	In cooperation with Reclamation, GCID has developed temporary arrangements to supply district surface water to neighboring non-district agricultural lands that primarily use groundwater. These temporary arrangements were implemented under agreements that recently expired in 2020. There is interest in continuing and expanding this in-basin surface water use. GCID is currently working in cooperation with Reclamation to renew these agreements and expand this program for the purpose of reducing groundwater pumping and in-lieu groundwater recharge.
Orland Unit Water Users Association (OUWUA) Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	Continue the modernization of the association's southside irrigation conveyance and distribution system; these improvements are expected to result in more reliable and flexible farm deliveries that will provide incentive for growers to use more surface water and less groundwater.
Urban Water Conservation in Willows	California Water Service - Willows District is implementing urban water conservation measures through water waste prevention ordinances, metering, conservation pricing, public education and outreach, programs to assess and manage distribution system real loss, water conservation program coordination and staffing support, and other demand management measures. These are described in greater detail in Chapter 9 of the 2020 UWMP for California Water Service - Willows District.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Potential	
Colusa County Public Water System Water Treatment Plant	Construct a water treatment plant on the Sacramento River between Colusa and Grimes to provide fresh drinking water to public water supply systems in Colusa and possibly Sutter and Yolo Counties.
Delevan Pipeline Colusa Basin Drain Intertie	Construct an intertie between the proposed Delevan Pipeline component of the Sites Reservoir Project and the Colusa Basin Drain. Currently, the only proposed intertie is the Dunnigan intertie. This intertie will provide a connection to downstream water users to utilize surface water storage from Sites Reservoir, improve conjunctive use, and potentially decrease groundwater pumping. This intertie will also provide protection for the ecosystems upstream of the proposed Dunnigan intertie and redundancy in case the TCC becomes inoperable due to subsidence or earthquake damage.
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	Restoration of portions of Sycamore Slough through voluntary landowner participation in a multi-benefit recharge project. The recharge site will be hosted by Davis Ranches, a participating landowner within the Sycamore Mutual Water Company service. Water would be sourced from the Sacramento River during high flows in the system. The Sycamore Mutual Water Company is a Sacramento River Settlement Contractor, and could use a portion of its settlement contract water supplies for recharge if the project is initiated prior to November 1. If the project is initiated after November 1, water could be accessed using existing riparian water rights exercised for beneficial use (habitat). Field flooding would provide recharge, restoration, and multi-benefits such as winter floodplain habitat for migrating shorebirds/waterfowl, or habitat restoration for monarch butterflies and other pollinator species. Excess flows in winter could be diverted from the Colusa Basin Drain for recharge, and restoration could include a multi-benefit focus with environmental benefits such as habitat restoration for monarch butterfly or other pollinator species.
Tehama-Colusa Canal (TCC) Trickle Flow to Ephemeral Streams	The TCC has existing gates that are used to dewater sections of the canal. The gates discharge into ephemeral streams that intersect the canal. Water could be discharged from the TCC into these streams at a rate where they do not flow out of the subbasin, but recharge the groundwater system. Flow measurement devices would need to be added to the gates. Surface water for recharge would be Sacramento River available water under existing Bureau of Reclamation water supply contracts held by TCC contractors, existing water rights settlement contracts, and annual Section 215 contracts.
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	There are a number of ephemeral streams that originate in the Coastal Range to the west of the Subbasin and flow eastward into the Subbasin. During periods of flow in the winter and spring, a portion of these flows could be diverted for either (1) off-stream storage and subsequent use for irrigation or (2) direct groundwater recharge through Flood-MAR, dedicated recharge basins, or modified stream beds.
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	Removal of invasive, non-native plant species (i.e., arundo donax, eucalyptus, tamarisk, etc.) from riparian corridors, and other areas they may be present, will provide both a reduction in evapotranspiration from shallow groundwater and native ecosystem restoration.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Enhanced Infiltration of Precipitation on Agricultural Lands	Current cultural practices, particularly in almond orchards, tend to reduce infiltration and increase runoff of precipitation. Development and adoption of on-farm cultural practices to reduce precipitation runoff and increase infiltration would result in increased storage of precipitation in the crop root zone, thereby reducing irrigation water requirements. Additionally, to the extent that infiltrated precipitation percolates through the root zone, this would result in direct groundwater recharge. This project is proposed as a potential research management action, for example, a collaborative initiative between the GSAs and other interested organizations.
Colusa Subbasin Flood-MAR	The CGA and GGA, in coordination with landowners and other agencies, would investigate, develop, and implement a program to divert flood waters within the Subbasin, when available, for spreading across agricultural lands or other working landscapes for direct groundwater recharge.
Reclamation District 108 "Boards In" Program	RD108 would institute a voluntary or financially incentivized program in which landowners leave their spill board in place during the winter to capture rainfall and hold it on the fields for recharge.
Glenn-Colusa Irrigation District (GCID) In-lieu Groundwater Recharge	Despite GCID having highly reliable surface water supplies, a small percentage of district lands rely primarily on groundwater for irrigation supply. GCID will investigate, develop, and implement measures to incentivize associated growers to utilize surface water supplied by GCID, which will provide in-lieu recharge through reduced groundwater pumping.
Glenn-Colusa Irrigation District (GCID) Water Transfers to TCCA CVP Contractors	GCID is exploring the possibility of transferring surface water to Central Valley Project (CVP) contractors served by the Tehama Colusa Canal to provide in-lieu groundwater recharge and reduce groundwater pumping. Transferred water would be diverted into the TCC at the Red Bluff Pumping Plant and Fish Screen facility rather than at the GCID pumping plant and fish screen facility north of Hamilton City.
Orland-Artois Water District (OAWD) Direct Groundwater Recharge	OAWD would directly recharge groundwater through Managed Aquifer Recharge (MAR) on agricultural land to improve aquifer conditions, especially in the groundwater cone of depression to the west of Artois. A pilot project for MAR was conducted in 2017 on the VanTol site using water from a Section 215 Temporary Water Contract from USBR. Section 215 water is low-cost, but is only available during high flow conditions in rivers and streams.
Orland Unit Water Users Association (OUWUA) Flood Water Conveyance	During periods of high flow and reservoir release on Stony Creek, divert water at OUWUA's south diversion and convey it to various locations for direct recharge within the OUWUA service area.
Sites Reservoir	The Sites Project would utilize existing infrastructure to divert unregulated and unappropriated flow from the Sacramento River at Red Bluff and Hamilton City and convey water to a new off stream reservoir west of the town of Maxwell. New and existing facilities would move water into and out of the reservoir. Depending on project operation and yield, there is potential for groundwater benefits to accrue to the Subbasin using water from Sites Reservoir.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Colusa Subbasin In-lieu Recharge & Banking Program	Incentivize landowners to take surplus contract surface water in-lieu of pumping groundwater. A predetermined portion of the additional water brought into the districts would be dedicated to contributing to local groundwater sustainability and some portion of the remaining quantities would be available for delivery, directly or by exchange, to South Valley members in the San Joaquin Valley.
Sycamore Marsh Farm In-lieu Recharge Project	Sycamore Marsh Farm is in the process of developing an in-lieu groundwater recharge plan. Sycamore Marsh Farm encompasses approximately 420 acres in the Colusa Drain Mutual Water Company (CDMWC) and has an additional 449 acres that could potentially be annexed into the CDMWC, allowing for diversion of surface water from CDMWC.
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	TCCA Contractors would construct off-stream surface reservoirs along the western edge of the Subbasin and up-slope from the TCC diverting surplus Sacramento River flows (e.g., Section 215 water) into these storage reservoirs. Stored water would be released into the TCC for irrigation supply to enable reduction of groundwater pumping (i.e. in-lieu groundwater recharge). New facilities on the TCC and new storage impoundments would need to be planned, designed and constructed subject to a determination of economic and environmental feasibility.
Domestic Well Mitigation Program	Groundwater level measurable objectives (MOs) adopted for sustainable management of the Subbasin operation should be highly protective of domestic water supply wells. However, it is possible that in certain portions of the Subbasin, groundwater levels will fall. Projects and management actions will be implemented for recovery of groundwater levels, but some domestic wells may go dry. To mitigate the effects of domestic well stranding due to groundwater level decline, the CGA and GGA will investigate implementing domestic well mitigation programs in their respective portions of the subbasin.
Strategic Short-Term Demand Management	The program would be focused in specific local areas with sustainability challenges and would provide GSAs with a voluntary, flexible, short-run response to alleviate impacts of drought. It would be voluntary and provide financial incentives (payments) to encourage participation. Payment terms and other conditions would be specified as part of program design. Two potential structures for the program are idling lands in drought-affected areas of the subbasin with groundwater sustainability challenges or idling lands in participating surface water-using portions of the Subbasin and conveying the saved surface water to the drought-affected areas with groundwater sustainability challenges.
Long-Term Demand Management Action	Demand management broadly refers to any water management activity that reduces the consumptive use of irrigation water. A demand management action is one that incentivizes, enables, or possibly requires water users to reduce their consumptive use.
Well Abandonment Outreach and Funding Program	The CGA and GGA will coordinate with Colusa and Glenn counties, respectively, to create a program providing outreach and education to landowners regarding the proper procedures for well decommissioning and abandonment, as well as a funding source to assist landowners with these procedures. This program is anticipated to improve the subbasin well inventory and potentially have water quality benefits, as improperly abandoned wells are a potential point source for water quality contaminant transport from the ground surface to the underlying groundwater system.

Table 1. Brief Description of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(a)
Project/Management Action Name	**Brief Project Description**
Preservation of Lands Favorable for Recharge	The CGA and GGA will coordinate with those agencies having authority over land use planning in and Glenn counties, respectively, to investigate, design, and implement a program providing incentives to landowners with lands favorable to groundwater recharge to preserve them as agricultural or undeveloped lands on which groundwater recharge will be possible in perpetuity.
Review of County Well Permitting Ordinances	Review and revise the county well permitting processes in the Subbasin to ensure that future well permitting aligns with the Subbasin sustainability goal and that future changes to well permitting are reviewed by the GSAs. The GSAs would work with the counties to review and suggest revisions to ordinances (these are outside of the jurisdiction of the GSAs).
Drought Contingency Planning for Urban Areas	The CGA and GGA will coordinate with cities, towns and other municipal and industrial water suppliers, which are all fully dependent on groundwater in the Subbasin, to encourage drought contingency planning and drought preparedness in a manner consistent with sustainable groundwater management according the GSP.
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	Evaluate and develop a dedicated network of shallow monitoring wells specifically planned and sited for monitoring conditions in areas of the Subbasin where GDEs are most likely to be found. This action is also expected to incorporate biological monitoring to inform the location of new shallow monitoring wells and monitor whether GDEs are being impacted by changing groundwater conditions

Table 2. Project Type, Category, Proponent, and Location for all Projects and Management Actions.

CCR § 354.44				
Project/Management Action Name	**Project Type**	**Project GSP Category (Planned, Ongoing, or Potential)**	**Project Proponent**	**Project Location**
Planned				
Colusa County Water District In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	Planned	CCWD	CCWD
Colusa Drain MWC In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	Planned	CDMWC	CDMWC
Colusa Subbasin Multi-Benefit Groundwater Recharge	Direct Groundwater Recharge	Planned	CGA, GGA and TNC	Colusa County
Orland-Artois Water District Land Annexation and Groundwater Recharge	Direct and In-lieu Groundwater Recharge	Planned	OAWD	OAWD
Sycamore Slough Groundwater Recharge Pilot Project	Direct Groundwater Recharge	Planned	Davis Ranches	Sycamore Slough
Ongoing				
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	In-lieu Groundwater Recharge	Ongoing	RD108 and CCWD	CCWD
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Direct and In-lieu Groundwater Recharge	Ongoing	GCID	GCID
Sycamore Marsh Farm Direct Recharge Project	Direct Groundwater Recharge	Ongoing	Sycamore Marsh Farm	Sycamore Marsh Farm
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	Ongoing	GCID	GCID and Neighboring Areas

Table 2. Project Type, Category, Proponent, and Location for all Projects and Management Actions.

CCR § 354.44				
Project/Management Action Name	**Project Type**	**Project GSP Category (Planned, Ongoing, or Potential)**	**Project Proponent**	**Project Location**
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	In-lieu Groundwater Recharge	Ongoing	OUWUA	OUWUA
Urban Water Conservation in Willows	Management Action	Ongoing	California Water Service - Willows District	Willows
Potential				
Colusa County Public Water System Water Treatment Plant	In-lieu Groundwater Recharge	Potential	Ben King (stakeholder)	Colusa County
Delevan Pipeline Colusa Basin Drain Intertie	Direct and In-lieu Groundwater Recharge	Potential	Ben King (stakeholder)	Intersection of Colusa Basin Drain and Proposed Delevan Pipeline
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	Direct Groundwater Recharge	Potential	Ben King (stakeholder)	Sycamore Slough (Davis Ranches)
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	Direct Groundwater Recharge	Potential	Bill Vanderwaal (RD 108)	At TCC and ephemeral stream crossings
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	Direct and In-lieu Groundwater Recharge	Potential	CGA and GGA	Colusa and Glenn Counties
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	Reduce Groundwater Demand	Potential	CGA and GGA	Subbasin-wide
Enhanced Infiltration of Precipitation on Agricultural Lands	Direct Groundwater Recharge	Potential	CGA and GGA	Subbasin-wide
Colusa Subbasin Flood-MAR	Direct Groundwater Recharge	Potential	CGA and GGA	Subbasin-wide

Table 2. Project Type, Category, Proponent, and Location for all Projects and Management Actions.

CCR § 354.44				
Project/Management Action Name	**Project Type**	**Project GSP Category (Planned, Ongoing, or Potential)**	**Project Proponent**	**Project Location**
Reclamation District 108 "Boards In" Program	Direct Groundwater Recharge	Potential	Bill Vanderwaal (RD 108)	RD108 / Subbasin-wide
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	Potential	GCID	GCID
Glenn-Colusa Irrigation District Water Transfers to TCCA CVP Contractors	In-lieu Groundwater Recharge	Potential	GCID	Participating TCCA CVP Contractors
Orland-Artois Water District Direct Groundwater Recharge	Direct Groundwater Recharge	Potential	OAWD	OAWD
Orland Unit Water Users Association Flood Water Conveyance	Direct Groundwater Recharge	Potential	OUWUA	OUWUA
Sites Reservoir	Direct and In-lieu Groundwater Recharge	Potential	Sites Project Authority	Antelope Valley (to west of Colusa Subbasin)
Colusa Subbasin In-lieu Recharge & Banking Program	In-lieu Groundwater Recharge	Potential	South Valley Water Resources Authority	Within any districts willing to participate
Sycamore Marsh Farm In-lieu Recharge Project	In-lieu Groundwater Recharge	Potential	Sycamore Marsh Farm	Sycamore Marsh Farm
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	Potential	TCCA Contractors	Participating TCCA CVP Contractors
Domestic Well Mitigation Program	Management Action	Potential	CGA and GGA	Subbasin-wide
Strategic Short-Term Demand Management	Management Action	Potential	CGA and GGA	Subbasin-wide
Long-Term Demand Management Action	Management Action	Potential	CGA and GGA	Subbasin-wide
Well Abandonment Outreach and Funding Program	Management Action	Potential	CGA and GGA	Subbasin-wide

Table 2. Project Type, Category, Proponent, and Location for all Projects and Management Actions.

CCR § 354.44				
Project/Management Action Name	**Project Type**	**Project GSP Category (Planned, Ongoing, or Potential)**	**Project Proponent**	**Project Location**
Preservation of Lands Favorable for Recharge	Management Action	Potential	CGA and GGA	Subbasin-wide
Review of County Well Permitting Ordinances	Management Action	Potential	CGA and GGA	Subbasin-wide
Drought Contingency Planning for Urban Areas	Management Action	Potential	CGA, GGA, and cities (GSA member agencies)	Subbasin-wide
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	Management Action, Closing Data Gaps	CGA and GGA	CGA and GGA	Subbasin-wide

Table 3. Implementation Criteria, Notice Process, Permitting and Regulatory Process, and Timeline for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(1)(A)	CCR §354.44(b)(1)(B)	CCR §354.44(b)(3)	CCR §354.44(b)(4)		
Project/Management Action Name	**Implementation and Termination Timing/Criteria for Implementation**	**Public and/or Inter-Agency Notice Process**	**Required Permitting and Regulatory Process or Status of Permitting**	**Current Status (Ongoing, Planned, Potential or Concept)**	**Anticipated Start Date (Year)**	**Anticipated Completion Date (Year)**
Planned						
Colusa County Water District In-Lieu Groundwater Recharge	Planning currently ongoing; no construction of new facilities needed.	See Note 2 below	See Note 4 below	Planned	2022	See note 6 below
Colusa Drain MWC In-Lieu Groundwater Recharge	Planning currently ongoing	See Note 3 below	See Note 5 below	Planned	See Note 6 below	See Note 6 below
Colusa Subbasin Multi-Benefit Groundwater Recharge	Planning currently ongoing	See Note 2 below	See Note 4 below	Planned (pilot project complete)	2021	See Note 6 below
Orland-Artois Water District Land Annexation and Groundwater Recharge	Planning currently ongoing; intent is to proceed expeditiously to design and construction of new facilities	See Note 2 below	See Note 4 below	Planned	2020	2025
Sycamore Slough Groundwater Recharge Pilot Project	See Note 1 below	See Note 3 below	See Note L2 below	Planned	See Note 6 below	See Note 6 below
Ongoing						
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	See Note 1 below	See Note 3 below	See Note 5 below	Ongoing and Planned	See Note 6 below	See Note 6 below
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Currently ongoing	See Note 2 below	See Note 4 below	Ongoing	2021	See Note 6 below
Sycamore Marsh Farm Direct Recharge Project	Currently ongoing	See Note 2 below	See Note 4 below	Ongoing	2020	See Note 6 below

Table 3. Implementation Criteria, Notice Process, Permitting and Regulatory Process, and Timeline for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(1)(A)	CCR §354.44(b)(1)(B)	CCR §354.44(b)(3)	CCR §354.44(b)(4)		
Project/Management Action Name	**Implementation and Termination Timing/Criteria for Implementation**	**Public and/or Inter-Agency Notice Process**	**Required Permitting and Regulatory Process or Status of Permitting**	**Current Status (Ongoing, Planned, Potential or Concept)**	**Anticipated Start Date (Year)**	**Anticipated Completion Date (Year)**
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	Currently ongoing	See Note 2 below	See Note 4 below	Ongoing	2021	See Note 6 below
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	See Note 1 below	See Note 3 below	See Note 5 below	Ongoing	See Note 6 below	See Note 6 below
Urban Water Conservation in Willows	Currently ongoing	See Note 2 below	See Note 4 below	Ongoing	2016	See Note 6 below
Potential						
Colusa County Public Water System Water Treatment Plant	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Delevan Pipeline Colusa Basin Drain Intertie		See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project		See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams		See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below

Table 3. Implementation Criteria, Notice Process, Permitting and Regulatory Process, and Timeline for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(1)(A)	CCR §354.44(b)(1)(B)	CCR §354.44(b)(3)	CCR §354.44(b)(4)		
Project/Management Action Name	**Implementation and Termination Timing/Criteria for Implementation**	**Public and/or Inter-Agency Notice Process**	**Required Permitting and Regulatory Process or Status of Permitting**	**Current Status (Ongoing, Planned, Potential or Concept)**	**Anticipated Start Date (Year)**	**Anticipated Completion Date (Year)**
Enhanced Infiltration of Precipitation on Agricultural Lands	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Colusa Subbasin Flood-MAR	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Reclamation District 108 "Boards In" Program	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Glenn-Colusa Irrigation District Water Transfers to TCCA CVP Contractors	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Orland-Artois Water District Direct Groundwater Recharge	See Note 1 below	See Note 2 below	See Note 4 below	Concept (pilot project complete)	See Note 6 below	See Note 6 below
Orland Unit Water Users Association Flood Water Conveyance	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Sites Reservoir	See Note 1 below	See Note 3 below	See Note 5 below	Concept, developing funding	See Note 6 below	See Note 6 below
Colusa Subbasin In-lieu Recharge & Banking Program	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Sycamore Marsh Farm In-lieu Recharge Project	See Note 1 below	See Note 2 below	See Note 4 below	Concept	See Note 6 below	See Note 6 below
Westside Offstream Reservoir and In-Lieu Groundwater Recharge	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Domestic Well Mitigation Program	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Strategic Short-Term Demand Management	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below

Table 3. Implementation Criteria, Notice Process, Permitting and Regulatory Process, and Timeline for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(1)(A)	CCR §354.44(b)(1)(B)	CCR §354.44(b)(3)	CCR §354.44(b)(4)		
Project/Management Action Name	**Implementation and Termination Timing/Criteria for Implementation**	**Public and/or Inter-Agency Notice Process**	**Required Permitting and Regulatory Process or Status of Permitting**	**Current Status (Ongoing, Planned, Potential or Concept)**	**Anticipated Start Date (Year)**	**Anticipated Completion Date (Year)**
Long-Term Demand Management Action		See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Well Abandonment Outreach and Funding Program	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Preservation of Lands Favorable for Recharge	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Review of County Well Permitting Ordinances	See Note 1 below	See Note 3 below	See Note 5 below	Concept	See Note 6 below	See Note 6 below
Drought Contingency Planning for Urban Areas	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	See Note 1 below	See Note 3 below	See Note 5 below	Potential	See Note 6 below	See Note 6 below

Notes:

1. This project is currently in the early conceptual stage. Thus the implementation and termination dates have yet to be determined. Criteria for implementation may, among other factors, be linked to the measurable objectives and provided in annual reports.
2. Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
3. Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
4. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: the California Department of Water Resources (DWR), the California State Water Resources Control Board (SWRCB), the California Department of Fish and Wildlife (CDFW), the Central Valley Flood Protection Board (Flood Board), Regional Water Boards, the United States Bureau of Reclamation (Reclamation or USBR), the United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Local Agency Formation Commissions (LAFCO), the Counties of Colusa and/or Glenn, and the California Air Resources Board (CARB).
5. Required permitting and regulatory review will be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USBR, USACE, USFWS, NMFS, LAFCO, Counties of Colusa and/or Glenn, and CARB.
6. This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in annual reports when known.

Table 4. Anticipated Benefits of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)			
Project/Management Action Name	**Measurable Objectives Expected to Benefit**	**Multi-Benefits Expected**	**Serves Disadvantaged Community (If so, which one?)**	**Expected Yield**
Planned				
Colusa County Water District In-Lieu Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	27,000 af/year
Colusa Drain MWC In-Lieu Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	28,000 af/year
Colusa Subbasin Multi-Benefit Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Ponded habitat for migratory birds	See Note 1 below	5,200 af/year
Orland-Artois Water District Land Annexation and Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	23,000 af/year
Sycamore Slough Groundwater Recharge Pilot Project	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Ponded habitat for migratory birds	See Note 1 below	5,000 af over 10 years
Ongoing				
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	8,000 af/year
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Increased ponded habitat for migratory birds and improved air quality through reduced rice straw burning	See Note 1 below	See Note 2 below

Table 4. Anticipated Benefits of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)			
Project/Management Action Name	**Measurable Objectives Expected to Benefit**	**Multi-Benefits Expected**	**Serves Disadvantaged Community (If so, which one?)**	**Expected Yield**
Sycamore Marsh Farm Direct Recharge Project	Groundwater levels, groundwater storage, depletions of interconnected surface water, land subsidence, and potentially groundwater quality	Ponded habitat for migratory birds	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Urban Water Conservation in Willows	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	2 af/year
Potential				
Colusa County Public Water System Water Treatment Plant	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Improved drinking water quality; Arbuckle and Dunnigan face loss of well supply; Grimes and Princeton have drinking well arsenic contamination; Williams has elevated salinity (TDS) levels	See Note 1 below	See Note 2 below
Delevan Pipeline Colusa Basin Drain Intertie	Groundwater levels, groundwater storage, depletions of interconnected surface water, and land subsidence (to the extent that project yield is dedicated to recharge projects)		See Note 1 below	See Note 2 below

Table 4. Anticipated Benefits of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)			
Project/Management Action Name	**Measurable Objectives Expected to Benefit**	**Multi-Benefits Expected**	**Serves Disadvantaged Community (If so, which one?)**	**Expected Yield**
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Ponded habitat for migratory birds, along with other environmental benefits	See Note 1 below	See Note 2 below
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	Groundwater levels, groundwater storage, depletions of interconnected surface water, land subsidence	Reduced flood impacts to the extent that diversions reduce the severity of downstream flooding	See Note 1 below	Dependent on scale of implementation; between roughly 1,000 to 16,000 af/year
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Decreased ET; increased native vegetation / habitat; decreased sediment trapping	See Note 1 below	See Note 2 below
Enhanced Infiltration of Precipitation on Agricultural Lands	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Increased groundwater recharge	See Note 1 below	See Note 2 below
Colusa Subbasin Flood-MAR	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Reclamation District 108 “Boards In” Program	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Possible ponded habitat for migratory birds	See Note 1 below	Dependent on scale of implementation; estimated 1,800 af/year (if 20% of rice fields in RD108 participate)
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below

Table 4. Anticipated Benefits of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)			
Project/Management Action Name	**Measurable Objectives Expected to Benefit**	**Multi-Benefits Expected**	**Serves Disadvantaged Community (If so, which one?)**	**Expected Yield**
Glenn-Colusa Irrigation District Water Transfers to TCCA CVP Contractors	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Orland-Artois Water District Direct Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water	Possible ponded habitat for migratory birds depending on timing of flooding	See Note 1 below	See Note 2 below
Orland Unit Water Users Association Flood Water Conveyance	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Sites Reservoir	Groundwater levels, groundwater storage, depletions of interconnected surface water, and land subsidence (to the extent that project yield is dedicated to recharge projects).	Increased local, regional, and statewide water supply reliability, climate change resiliency, recreation, increased cold water pool for endangered salmon	See Note 1 below	See Note 2 below
Colusa Subbasin In-lieu Recharge & Banking Program	Groundwater levels, groundwater storage, depletions of interconnected surface water, land subsidence, and potentially groundwater quality		See Note 1 below	See Note 2 below
Sycamore Marsh Farm In-lieu Recharge Project	Groundwater levels, groundwater storage, depletions of interconnected surface water, land subsidence, and potentially groundwater quality		See Note 1 below	See Note 2 below
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Domestic Well Mitigation Program	None		See Note 1 below	None

Table 4. Anticipated Benefits of all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)			
Project/Management Action Name	**Measurable Objectives Expected to Benefit**	**Multi-Benefits Expected**	**Serves Disadvantaged Community (If so, which one?)**	**Expected Yield**
Strategic Short-Term Demand Management	Groundwater levels, groundwater storage, and depletions of interconnected surface water in areas with potential sustainability challenges	Yes, potential for multi-benefits on temporarily idled lands, depending on program design	See Note 1 below	See Note 2 below
Long-Term Demand Management Action	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Well Abandonment Outreach and Funding Program	Water quality		See Note 1 below	None
Preservation of Lands Favorable for Recharge	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Review of County Well Permitting Ordinances	Potentially: groundwater levels, groundwater storage, depletions of interconnected surface water, land subsidence, and groundwater quality		See Note 1 below	See Note 2 below
Drought Contingency Planning for Urban Areas	Groundwater levels, groundwater storage, and depletions of interconnected surface water		See Note 1 below	See Note 2 below
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	Groundwater levels, groundwater storage, and depletions of interconnected surface water	GDEs, riparian habitat	See Note 1 below	See Note 2 below

Notes:

1. The majority of the areas within the Colusa Subbasin are classified as either Severely Disadvantaged Communities, Disadvantaged Communities, or Economically Distressed Areas.
2. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in annual reports when known.

Table 5. Benefit Evaluation and Water Source for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)	CCR §354.44(b)(6)	
Project/Management Action Name	**Benefit Evaluation Methodology**	**Water Source**	**Water Source Reliability**
Planned			
Colusa County Water District In-Lieu Groundwater Recharge	See Note 1 below	Sacramento River through CCWD's existing CVP contract and annual and multi-year water purchases and transfer agreements	Water purchases and transfers in all but Critical years
Colusa Drain MWC In-Lieu Groundwater Recharge	See Note 2 below	Sacramento River through CDMWC contractual rights with USBR together with annual and multi-year transfer agreements with USBR settlement contractors utilizing the Colusa Basin Drain.	To be determined
Colusa Subbasin Multi-Benefit Groundwater Recharge	See Note 1 below	Sacramento River under a variety of water rights, contracts, and water purchase and transfer agreements	Uncertain at this time
Orland-Artois Water District Land Annexation and Groundwater Recharge	See Note 1 below	Sacramento River through annual and multi-year water purchases and transfer agreements for in-lieu recharge, and Section 215 water for direct recharge	Water purchases and transfers in all but Critical years; Section 215 water subject to hydrology and river system conditions
Sycamore Slough Groundwater Recharge Pilot Project	See Note 2 below	Sacramento River	Uncertain at this time
Ongoing			
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	See Note 2 below	Sacramento River water available to RD108 through contractual rights under Sacramento River Settlement Contract 14-06-200-876A between RD108 and the Bureau of Reclamation	Settlement contract water supply subject to 25% reductions in Shasta critical years
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	See Note 1 below	Appropriative water right for diversion and use of "winter water" from November 1 through March 31 each year	Appropriative winter water supplies subject to availability and curtailments according to water right Term 91

Table 5. Benefit Evaluation and Water Source for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)	CCR §354.44(b)(6)	
Project/Management Action Name	**Benefit Evaluation Methodology**	**Water Source**	**Water Source Reliability**
Sycamore Marsh Farm Direct Recharge Project	See Note 1 below	Colusa Basin Drain	To be determined
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	See Note 1 below	Sacramento River under GCID's contractual and appropriative rights	Supplies potentially available only in Shasta Non-Critical years; reliable during those years
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	See Note 2 below	Stony Creek water available to the OUWUA under the Angle Decree	Highly reliable with significant shortages historically occurring once every 10 to 20 years on average
Urban Water Conservation in Willows	See Note 1 below	N/A	N/A
Potential			
Colusa County Public Water System Water Treatment Plant	See Note 2 below	Sacramento River under new appropriative water rights	Uncertain at this time
Delevan Pipeline Colusa Basin Drain Intertie	See Note 2 below	Sacramento River under new appropriative water rights (conveyed to Sites Reservoir and through Delevan Pipeline)	Uncertain at this time
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	See Note 2 below	Sacramento River (settlement contracts before November 1; riparian rights at other times)	Expected to be reliable, but the precise volume of available water is uncertain at this time
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	See Note 2 below	Sacramento River (conveyed through TCC)	Uncertain at this time
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	See Note 2 below	Westside Streams: Willow Creek, Logan Creek, Hunters Creek, Funks Creek, Stone Corral Creek, Salt Creek, and potentially smaller streams	Only available during periods of runoff occurring during heavy precipitation events or wet years
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	See Note 2 below	N/A	N/A

Table 5. Benefit Evaluation and Water Source for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)	CCR §354.44(b)(6)	
Project/Management Action Name	**Benefit Evaluation Methodology**	**Water Source**	**Water Source Reliability**
Enhanced Infiltration of Precipitation on Agricultural Lands	See Note 2 below	Precipitation	Variable
Colusa Subbasin Flood-MAR	See Note 2 below	To be determined	To be determined
Reclamation District 108 "Boards In" Program	See Note 2 below	Precipitation	Variable
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	See Note 2 below	Sacramento River under GCID's contractual rights according to its Sacramento River Water Right Settlement contract and under an appropriative water right for diversion and use of "winter water" from November 1 through March 31 each year.	Settlement contract water supplies subject to 25% reductions in Shasta Critical years; appropriative winter water subject to availability and curtailments according to water right Term 91
Glenn-Colusa Irrigation District Water Transfers to TCCA CVP Contractors	See Note 2 below	Sacramento River under GCID's contractual rights according to its Sacramento River Water Right Settlement contract	Settlement contract water supply subject to 25% reductions in Shasta Critical years
Orland-Artois Water District Direct Groundwater Recharge	See Note 1 below	Sacramento River Section 215 water	Highly variable; available only during periods of high flow in Sacramento River and tributaries
Orland Unit Water Users Association Flood Water Conveyance	See Note 2 below	Stony Creek flood releases that cannot be held in Stony Creek reservoirs	Highly variable year to year depending on hydrology
Sites Reservoir	See Note 2 below	Sacramento River under new appropriative water rights	New water rights would have junior priority and therefore would be subject to senior rights and water right Term 91
Colusa Subbasin In-lieu Recharge & Banking Program	See Note 2 below	To be determined	To be determined
Sycamore Marsh Farm In-lieu Recharge Project	See Note 1 below	Colusa Basin Drain	To be determined

Table 5. Benefit Evaluation and Water Source for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(5)	CCR §354.44(b)(6)	
Project/Management Action Name	**Benefit Evaluation Methodology**	**Water Source**	**Water Source Reliability**
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	See Note 2 below	Sacramento River Section 215 water	Highly variable; available only during periods of high flow in Sacramento River and tributaries
Domestic Well Mitigation Program	See Note 2 below	N/A	N/A
Strategic Short-Term Demand Management	See Note 2 below	N/A	N/A
Long-Term Demand Management Action	See Note 2 below	N/A	N/A
Well Abandonment Outreach and Funding Program	See Note 2 below	N/A	N/A
Preservation of Lands Favorable for Recharge	See Note 2 below	N/A	N/A
Review of County Well Permitting Ordinances	See Note 2 below	N/A	N/A
Drought Contingency Planning for Urban Areas	See Note 2 below	N/A	N/A
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	See Note 2 below	N/A	N/A

Notes:

1. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. These analyses may include: flow measurement consistent with SBx7-7 (23 CCR §931-938), ET analysis, reductions in GW use, well monitoring, determination of infiltration rates, water balance analysis, as-built drawings and stream gaging. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
2. Evaluation of benefits is based on analysis of pre- and post-project measurements supported by modeling. These analyses may include: flow measurement consistent with SBx7-7 (23 CCR §931-938), ET analysis, reductions in GW use, well monitoring, determination of infiltration rates, water balance analysis, as-built drawings and stream gaging. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.

Table 6. Legal Authority Requirements, Estimated Cost, and Potential Funding Sources for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(7)	CCR §354.44(b)(8)	
Project/Management Action Name	**Legal Authority Required**	**Estimated Cost**	**Potential Funding Sources**
Planned			
Colusa County Water District In-Lieu Groundwater Recharge	As a water district formed under state law, CCWD has the legal authority to annex land into the district and provide water service to annexed lands	Under development; 10% design and capital cost estimate expected August 2021.	See Note 2 below
Colusa Drain MWC In-Lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	$1,725,000	See Note 2 below
Colusa Subbasin Multi-Benefit Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	Under development	See Note 2 below
Orland-Artois Water District Land Annexation and Groundwater Recharge	As a water district formed under state law, OAWD has the legal authority to annex land into the district and provide water service to annexed lands	$20 million estimated capital cost; $2.63 million per year (water supply cost and other O&M cost)	See Note 2 below
Sycamore Slough Groundwater Recharge Pilot Project	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Ongoing			
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Sycamore Marsh Farm Direct Recharge Project	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below

Table 6. Legal Authority Requirements, Estimated Cost, and Potential Funding Sources for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(7)	CCR §354.44(b)(8)	
Project/Management Action Name	**Legal Authority Required**	**Estimated Cost**	**Potential Funding Sources**
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Urban Water Conservation in Willows	GSAs, Districts and individual project proponents have the authority to plan and implement projects	Cost covered by rate structure of Cal Water - Willows Division	See Note 2 below
Potential			
Colusa County Public Water System Water Treatment Plant	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Delevan Pipeline Colusa Basin Drain Intertie	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Enhanced Infiltration of Precipitation on Agricultural Lands	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Colusa Subbasin Flood-MAR	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Reclamation District 108 “Boards In” Program	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below

Table 6. Legal Authority Requirements, Estimated Cost, and Potential Funding Sources for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(7)	CCR §354.44(b)(8)	
Project/Management Action Name	**Legal Authority Required**	**Estimated Cost**	**Potential Funding Sources**
Glenn-Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Glenn-Colusa Irrigation District Water Transfers to TCCA CVP Contractors	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Orland-Artois Water District Direct Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Orland Unit Water Users Association Flood Water Conveyance	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Sites Reservoir	GSAs, Districts and individual project proponents have the authority to plan and implement projects	$5.2 billion	See Note 2 below
Colusa Subbasin In-lieu Recharge & Banking Program	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Sycamore Marsh Farm In-lieu Recharge Project	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Domestic Well Mitigation Program	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Strategic Short-Term Demand Management	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Long-Term Demand Management Action	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Well Abandonment Outreach and Funding Program	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Preservation of Lands Favorable for Recharge	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below

Table 6. Legal Authority Requirements, Estimated Cost, and Potential Funding Sources for all Projects and Management Actions.

CCR § 354.44	CCR §354.44(b)(7)	CCR §354.44(b)(8)	
Project/Management Action Name	**Legal Authority Required**	**Estimated Cost**	**Potential Funding Sources**
Review of County Well Permitting Ordinances	GSAs, Districts and individual project proponents have the authority to plan and implement projects, and Counties have the authority to review and modify county well permitting ordinances	See Note 1 below	See Note 2 below
Drought Contingency Planning for Urban Areas	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	GSAs, Districts and individual project proponents have the authority to plan and implement projects	See Note 1 below	See Note 2 below

Notes:

1. This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known.

Potential funding sources are being evaluated as project planning continues; they include, but are not limited to, the following: grants, loans, bonds, assessment fees, and cost-sharing programs. Potential funding sources will be reported in GSP annual reports and five-year updates when known.

Appendix 6D

Development of Modeling Parameters for Simulating Projects and Management Actions in the Colusa Subbasin

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Specialists in Agricultural Water Management
Serving Stewards of Western Water since 1993

Technical Memorandum

To: Colusa Groundwater Authority and Glenn Groundwater Authority

From: Davids Engineering

Date: July 14, 2021

Subject: **Development of Modeling Parameters for Simulating Projects and Management Actions in the Colusa Subbasin**

Introduction

The Groundwater Sustainability Plan (GSP) emergency regulations, described in 23 CCR §354.44[1], require Groundwater Sustainability Agencies (GSAs) to describe projects and management actions (PMAs) that will achieve the sustainability goal for the basin and respond to changing conditions in the basin. Among other required information, GSAs must describe the benefits that are expected to be realized from the PMAs and how those benefits will be evaluated (23 CCR §354.44(b)(5)). The development and description of PMAs must be supported by the best available information and best available science (23 CCR §354.44(c)).

This technical memorandum (TM) describes the modeling approach and model inputs that were used to simulate the expected benefits of planned PMAs in the Colusa Subbasin (Subbasin) using the C2VSimFG-Colusa model (model). The model inputs reflect the anticipated volume and timing of surface water supply available through specific PMAs for direct and in-lieu groundwater recharge. The model inputs also characterize where that water would be beneficially used within the Subbasin.

In addition to the model inputs, this memorandum summarizes model results from the PMA simulations that represent the quantitative benefits of these PMAs on projected future groundwater conditions in the Subbasin. At the time of GSP development, the model is considered to provide the best available information on groundwater conditions in the Subbasin, and the accuracy of this information is generally sufficient to support GSP preparation, including description of PMA benefits.

[1] California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2 Groundwater Sustainability Plans, Article 5, Section 354.28 Minimum Thresholds.

Overview of Modeled PMAs

There are five planned projects described in the Colusa Subbasin GSP that are on track for implementation. Three of those projects were selected for simulation in the model in order to gain initial insights into the magnitude of impacts from these projects. These three projects are substantial recharge projects that could have large effects on groundwater conditions relative to other PMAs. Model inputs and model results for the three modeled projects are the focus of this TM. However, the modeling approach and inputs described for these projects can be adapted to simulate other similar projects.

General background on the three modeled projects is provided below. Additional information about these PMAs and others is included in Chapter 6 of the Colusa Subbasin GSP, Projects and Management Actions.

Colusa County Water District In-Lieu Groundwater Recharge

Colusa County Water District (CCWD) has a total service area of approximately 46,000 acres, of which 39,875 acres are currently irrigable with existing District infrastructure. The majority of irrigated land is used to cultivate permanent crops. CCWD delivers surface water to approximately 35,000 acres, with the remaining acres being idle or irrigated with privately pumped groundwater. Currently, CCWD has access to Central Valley Project (CVP) water supplies through its own contracts and through transfers primarily from Westside Water District and, more recently, from Reclamation District 108 (RD108). Despite the availability of surface water, some CCWD growers choose to pump groundwater because it is less expensive than surface water and because groundwater requires less screening and filtering compared to district surface water.

Under the CCWD In-Lieu Groundwater Recharge project, CCWD will acquire additional surface water and will establish incentives to make the cost of surface water the same or less than the cost of pumping groundwater, thereby incentivizing growers who would otherwise use groundwater to use surface water. The additional surface water is expected to be acquired under long-term water transfer agreements with other CVP contractors, including Sacramento River Settlement Contractors (settlement contractors), and potentially other sources. The plan is to acquire and deliver 30,000 acre-feet per year (AF/yr) except in Shasta Critical years (approximately one in 10 years[2]) when groundwater stored through in-lieu recharge in prior years would be used.

Orland-Artois Water District Land Annexation and In-Lieu Groundwater Recharge

Orland-Artois Water District (OAWD) has an existing service area of about 29,000 acres and delivers water to district landowners through 110 miles of pipelines and 300 metered delivery points. Surface water delivered by OAWD is available under a CVP water supply contract with the United States Bureau of Reclamation (Reclamation) and through short- and long-term transfer agreements with other CVP water contractors and settlement contractors. Historically, water transfers have been from Maxwell Irrigation District, Princeton-Codora-Glenn Irrigation District, and others.

As part of the OAWD Land Annexation and In-Lieu Groundwater Recharge project, OAWD is working with a group of neighboring non-district landowners to annex approximately 12,000 acres of groundwater-dependent agricultural land into the district. Additional surface water for the annexed lands would be secured through multi-year purchase or transfer agreements with willing sellers, conveyed through the existing Tehama-Colusa (TC) Canal, and distributed to the annexed lands through

[2] Over the 50-year period from 1966-2015, five years were declared “Shasta Critical.”

new distribution facilities. Potential transferors include CVP water supply contractors and settlement contractors. The plan is to acquire and deliver 25,000 AF/yr of surface water to the annexed lands except in Shasta Critical years (approximately one in 10 years) when groundwater banked through in-lieu recharge in prior years would be used.

Colusa Subbasin Multi-Benefit Groundwater Recharge

The Colusa Groundwater Authority (CGA) and The Nature Conservancy (TNC) collaborated in a multi-benefit pilot project from 2018 through 2021 to demonstrate the project benefits to direct groundwater recharge and creation of habitat for migrating shorebirds. In the pilot project, multi-benefit recharge was conducted by recharging groundwater through normal farming operations at strategic times of year in order to provide critical wetland habitat for shorebirds migrating along the Pacific Flyway, and potential ancillary benefits for water levels near disadvantaged communities in the Subbasin. The pilot project concluded that multi-benefit recharge is feasible and does generate the intended recharge and habitat benefits, serving as an example of how the Subbasin-wide program could work.

The planned Colusa Subbasin Multi-Benefit Groundwater Recharge project would expand on the pilot project to identify and contract with willing landowners who will participate in the program, and to develop program incentives and funding opportunities that will encourage enrollment, especially in areas that are most suitable for multi-benefit recharge. Each year, multi-benefit recharge would be implemented by applying surface water to participating fields and maintaining a shallow depth (4 inches maximum) for typically four to six weeks in the late summer and early fall (July 15 to October 15) and/or spring (March 15 to April 15),) when migratory bird habitat is needed.

While the actual location and scale of the project will depend on voluntary landowner participation, areas in the Subbasin that are potentially favorable for multi-benefit recharge have already been identified through preliminary mapping based on:

- Land use and crop characteristics that are suitable for recharge and could accept flooding in late summer and early fall (the period prioritized for modeling), with minimal impacts to crops and farming operations
- Soil characteristics that are suitable for recharge, using the Soil Agricultural Groundwater Banking Index (SAGBI[3]) rating
- Availability of surface water supplies for field-flooding during prime periods when migratory bird habitat is needed
- Proximity to the Sacramento River, as those lands are expected to have the greatest positive impact on streamflows

[3] SAGBI is a suitability index indicating the potential for groundwater recharge on agricultural land, determined according to five main factors: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. SAGBI ratings for lands in California are developed by the California Soil Resource Lab at UC Davis and UC-ANR, and are available online at: https://casoilresource.lawr.ucdavis.edu/sagbi/.

Analytic Approach

Modeling Approach

The quantitative benefits of the three modeled projects to groundwater conditions in the Subbasin were evaluated using the C2VSimFG-Colusa model (model), an integrated hydrologic flow model for the Subbasin. Development and refinement of this model to support GSP development is described in Appendix 3D. The C2VSimFG-Colusa model was adapted from the Fine Grid California Central Valley Groundwater-Surface Water Simulation Model (C2VSimFG).

The model simulates inflows and outflows between the Subbasin surface water system and groundwater system in a grid of land elements, stream nodes, and groundwater nodes that span and surround the Subbasin. The model calculates a water budget for each element and node on a monthly timestep for different historical, current, and projected (future) scenarios described in the GSP. Results of these element and node-level water budgets are aggregated to quantify the historical, current, and projected water budgets for the entire Subbasin, as required in the GSP regulations.

Among their many functions, user-defined model inputs are used to determine when, where, and how much water is applied to lands and ultimately recharges the groundwater system. Key water budget parameters that were evaluated to quantify the groundwater recharge benefits of the three modeled projects include:

- Surface Water Diversions: Surface water diverted from a stream node and delivered to elements. Surface water diversions are a user-defined model input, and are summarized to describe the average annual surface water volume diverted for the PMA.
- Groundwater Pumping: Groundwater pumped to meet water demand in elements. For these projects, groundwater pumping is calculated by the model to meet the remaining irrigation demand after surface water is applied.
- Seepage: For these projects, seepage represents water that is lost from streams, canals, or conveyance systems, flowing through the soil and to the groundwater system. Seepage is a component of groundwater recharge, and is calculated by the model.
- Deep Percolation: For these projects, deep percolation represents the fraction of water applied to fields that flows through the soil and to the groundwater system. Deep percolation is a component of groundwater recharge, and is calculated by the model.

Additional information about how the model operates, its inputs, and assumptions are provided in the model documentation and Appendix 3D.

Modeled Project Areas

Three project areas were explicitly defined in the C2VSimFG-Colusa model to quantify the effects and benefits of PMAs on the Subbasin water budget, specifically those related to groundwater conditions. These project areas, shown in Figure *1*, include:

1) **Planned CCWD Project Area**: a group of elements that approximately represents the CCWD service area
2) **Planned OAWD Project Area**: a group of elements that approximately represents the existing OAWD service area and the 12,000 acres that OAWD plans to annex

3) **Multi-Benefit Recharge Project Area:** a group of elements that represents a hypothetical selection of potential recharge areas, containing fields identified through the process described later in this TM

Each project area is represented by a group of elements that approximately represents the areas in which specific projects are expected to occur. Model inputs developed for the three modeled PMAs were applied and simulated in the elements represented in each project area.

The C2VSimFG-Colusa model calculates the water budget for each model element for each monthly timestep, including the elements in each project area. For all elements in each project area, the element-level water budget results were summed to aggregate project area water budget results.

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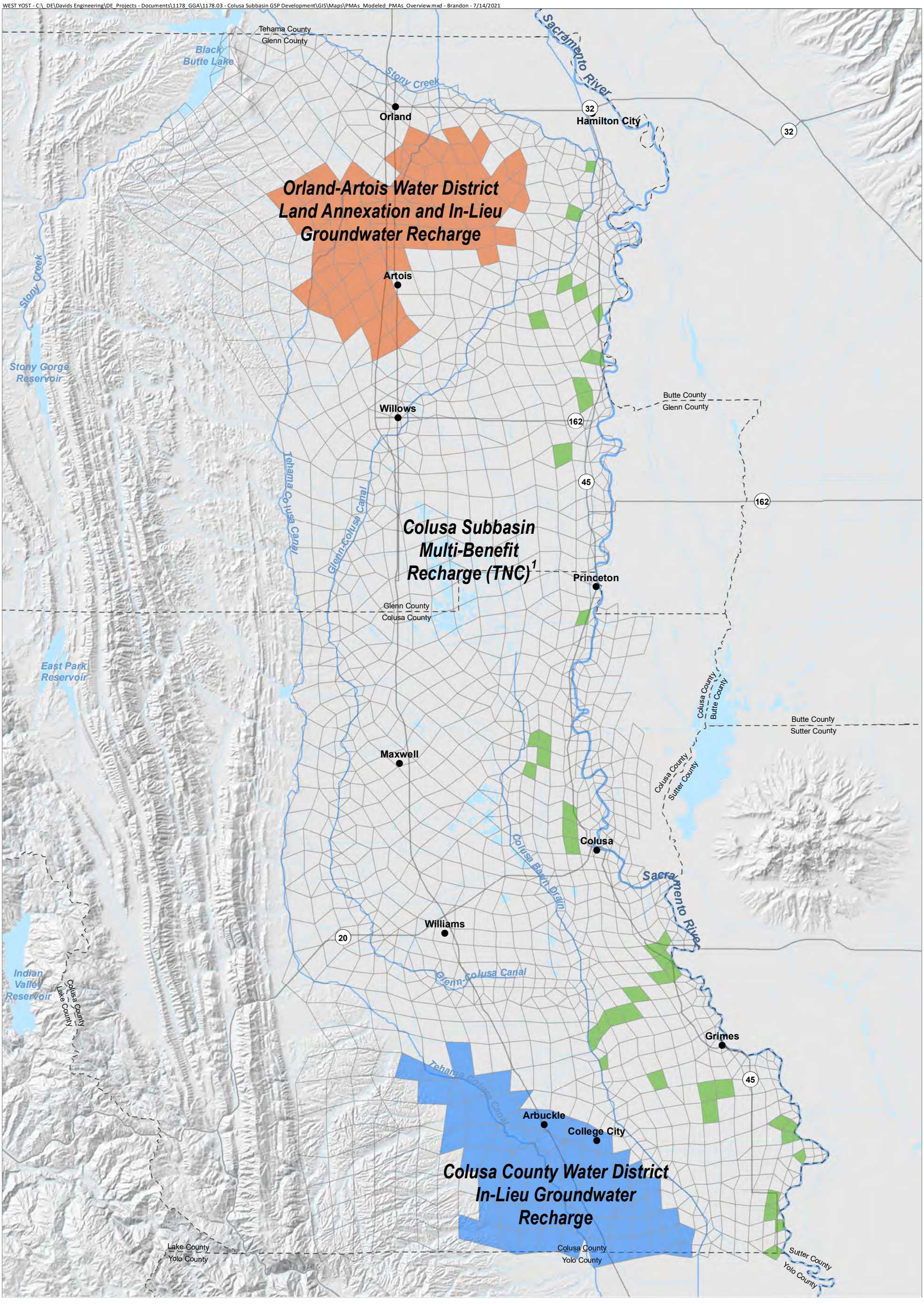

Planned CCWD PMA Project Area
Multi-Benefit Recharge PMA Project Area
Planned OAWD PMA Project Area
Model Elements Without Modeled PMAs
Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:
1. Multi-benefit recharge locations will depend on grower enrollment and could be anywhere within the Colusa Subbasin where surface water supplies are available and recharge conditions are favorable. For purposes of modeling project impacts, elements were selected based on lands with cropping schedules that allow for flooding during bird migration periods and total roughly 4,000 acres.

N

0 2.5 5

Scale in Miles

Figure 1

Modeling Projects and Management Actions

Colusa Groundwater Authority and Glenn Groundwater Authority
Colusa Subbasin
Groundwater Sustainability Plan

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Model Scenarios

Two model scenarios were considered for quantifying the effects and benefits of PMAs on the Subbasin:

- **Without-Projects Scenario**—Projected Future Conditions with 2070 Climate Change and without Projects. This is the projection of future conditions over the 50-year period from 2016 through 2065, assuming climate change effects are occurring, but that no groundwater recharge or other types of projects are implemented. Climate change adjustments were made to the precipitation, evapotranspiration, and surface water supply model inputs to reflect the estimated effects of climate change based on the 2070 Central Tendency climate change datasets provided by DWR to support GSP development.[4] The main effect of these adjustments is an estimated increase in future crop water requirements, which result in the need for increased groundwater pumping.
- **With-Projects Scenario**—Projected Future Conditions with 2070 Climate Change and with Projects. This is the same as the "without-projects" scenario, except that it is assumed that the three modeled projects are in operation during the full duration of the 50-year simulation.

Hereinafter, for convenience, these model scenarios are referred to as the "without-project" and "with-project" scenarios, respectively. The model inputs differ only due to projects; thus, differences in model results between these scenarios are due entirely to the effects of the projects.

The analysis period and assumptions about hydrology, land use, and water supplies associated with each model scenario are summarized in **Table 1**. Projected future water supplies and land use are expected to vary depending on Shasta watershed hydrologic conditions and related CVP operations plans prepared by Reclamation. Water supplies and flows through the Subbasin may be reduced in hydrologic years designated by Reclamation as Shasta Critical[5], such as 2015, resulting in reduced cropped acreage in those years. In Shasta Non-Critical years, water supplies and land use are expected to be similar to current conditions in recent non-drought years, such as 2013. In the future analysis period (2016-2065), future years are mapped to a series of historical years that were selected to represent historical hydrology as the baseline for estimating future hydrology (23 CCR §354.18(c)(3)). The Shasta Critical or Non-Critical designation of those historical years was also mapped to the corresponding future years.

Additional information on these scenarios is provided in Chapter 3, Section 3.3, of the Subbasin GSP.

[4] Climatological, hydrological, and water operations datasets, change factors, and the DWR Climate Change Resource Guide are available at: https://data.cnra.ca.gov/dataset/sgma-climate-change-resources.

[5] In general, Shasta Critical conditions are declared when the forecast inflow to Lake Shasta for a particular water year is equal to or less than 3.2 million AF. Conversely, Shasta Non-Critical conditions are declared when the forecast inflow to Lake Shasta for a particular water year exceeds 3.2 million AF. Between 1966-2015, five years were "Shasta Critical," or approximately 1 in 10 years.

Table 1. Summary of Water Budget Assumptions Used for the Without-Projects Scenario and With-Projects Scenario

Model Scenario	Analysis Period[1]	Hydrology	Land Use	Water Supplies
Without-Projects Scenario: Projected Future Conditions with 2070 Climate Change and without Projects	2016 to 2065	Historical (1966 to 2015), adjusted based on 2070 Central Tendency climate change datasets	Current (2013 and 2015) used for Shasta Non-Critical and Shasta Critical, respectively	Same as Current (see above), adjusted for 2070 Central Tendency climate change
With-Projects Scenario—Projected Future Conditions with 2070 Climate Change and with Projects.	2016 to 2065	Historical (1966 to 2015), adjusted based on 2070 Central Tendency climate change datasets	Current (2013 and 2015) used for Shasta Non-Critical and Shasta Critical, respectively	Same as Current (see above), adjusted for 2070 Central Tendency climate change

[1] Results over the analysis period are summarized by water year (October 1 through September 30)

Model Inputs for PMAs

As described above, model inputs for the three modeled PMAs reflect the anticipated volume and timing of surface water supply available through the PMAs for direct and in-lieu groundwater recharge. The model inputs also characterize where that water is beneficially used within the Subbasin. Model inputs developed for each of the three modeled PMAs are described below.

Colusa County Water District In-Lieu Groundwater Recharge

Under the CCWD In-Lieu Groundwater recharge project, CCWD plans to acquire and deliver 30,000 AF/yr of additional surface water except in Shasta Critical years (approximately one in 10 years[6]).

For modeling, it was assumed in the with-project scenario that an additional 30,000 AF/yr will be delivered to all irrigated agricultural land in model elements that approximately represent the CCWD service area (Figure *1*) during Shasta Non-Critical years in the 2016-2065 analysis period. The 30,000 AF is in addition to surface water supplies delivered in the without-project scenario. In Shasta Critical years, no additional surface water is delivered to those elements.

Orland-Artois Water District Land Annexation and Groundwater Recharge

As part of the OAWD Land Annexation and In-Lieu Groundwater Recharge project, OAWD plans to annex approximately 12,000 acres of groundwater-dependent agricultural land into the district. OAWD also plans to acquire and deliver 25,000 AF/yr of surface water to the annexed lands except in Shasta Critical years (approximately one in 10 years).

For modeling, it was assumed in the with-project scenario that an additional 25,000 AF/yr will be delivered to all irrigated agricultural land in the OAWD project area (Figure *1*) during Shasta Non-Critical years in the 2016 to 2065 analysis period. The OAWD project area contains model elements that approximately represent the OAWD service area as well as the 12,000 acres that OAWD plans to annex. The 25,000 AF/yr is in addition to surface water supplies delivered in the without-project scenario. In

[6] Over the 50-year period from 1966-2015, five years were declared "Shasta Critical."

Shasta Critical years, no additional surface water is delivered to the OAWD service area and groundwater is the sole irrigation supply source for the annexed area.

Colusa Subbasin Multi-Benefit Groundwater Recharge

In the Colusa Subbasin Multi-Benefit Recharge project, voluntarily participating growers will apply surface water to fields and maintain a shallow depth (4 inches maximum) for typically four to six weeks in the late summer and early fall (July 15 to October 15) and/or spring (March 15 to April 15),) when migratory shorebird habitat is needed.

For modeling the multi-benefit groundwater recharge project, key assumptions and analyses were developed to identify one hypothetical project configuration as a "bookend" scenario, in which maximal grower participation occurs in areas with the greatest multi-benefit groundwater recharge potential. In practice, the actual location and scale of the project will depend on voluntary landowner participation from year to year. The assumptions and analyses underpinning the with-project scenario model inputs were formulated to estimate:

- Where the greatest potential combination of multi-benefits could occur (considering groundwater recharge potential, habitat creation suitability, and other factors of interest)
- When the project would be implemented (on a monthly and annual basis)
- How much voluntary participation could occur (assuming, at a maximum, that all lands with the greatest potential combination of multi-benefits will participate each year water is available)

The specific approach and assumptions are as follows:

- A geospatial analysis was completed to identify all "potential recharge areas" in the Subbasin. All lands with the following characteristics were identified as potentially suitable for multi-benefit groundwater recharge, and were assumed to enroll in the program in the with-project scenario:
    - Location:
        - Within the service area of a surface water supplier (Lands were assumed to have access to surface water supplies)
        - Within six miles of the Sacramento River (Lands were considered to allow maximum mitigating effects on streamflow depletion, a factor of interest to modeling; this may not necessarily be a factor in actual program implementation)
    - Soil characteristics: Soils that are suitable for groundwater recharge (indicated by a SAGBI rating of "moderately good," "good," or "excellent")
    - Land use: Crops that are suitable for recharge and could accept flooding in late summer and early fall (the period prioritized for modeling), with minimal impacts to crops and farming operations (excluded lands include: non-agricultural land uses (urban, native vegetation, riparian), permanent crops, ponded crops, and other crops with growing seasons incompatible with flooding between August-October)

- Minimum size of 25 acres

  A total of 4,122 acres were found to satisfy these criteria, and are located within the model elements identified in Figure *1*. These "potential recharge areas" were assumed to all participate in multi-benefit groundwater recharge.

- For all potential recharge areas, it was assumed that:
  - Shasta Non-Critical years: Multi-benefit groundwater recharge would occur and lands would be flooded with surface water for 30 days (during the month of September)
  - Shasta Critical years: Normal farming and irrigation practices would continue, without multi-benefit groundwater recharge due to likely surface water shortages in those years.
- For all potential recharge areas, model inputs for the with-project scenario were changed from the without-project scenario as follows:
  - Crop assignment: In Shasta Non-Critical years, lands were classified as non-ponded crops planted in March or April and harvested by August. In Shasta Critical years, lands remained in their original crop assignment.
  - Soil characteristics: In September, target soil moisture (TSM) was set equal to the total porosity of the soil to simulate ponding. In other months, TSM was estimated as the weighted average TSM of all lands identified from the geospatial analysis.
  - Irrigation period: Set to March or April through September in all years.
  - Crop evapotranspiration: In Shasta Non-Critical years, crop evapotranspiration was estimated as the weighted average evapotranspiration of all lands identified from the geospatial analysis, with adjustment for idle lands that are typically unirrigated. In Shasta Critical years, crop evapotranspiration returned to the original crop assignment.
  - Diversions:
    - In Shasta Non-Critical years: Additional diversions to potential recharge areas were estimated based on a simulation of average additional water demand in project area elements in September of Shasta Non-Critical years. The additional diversions were then specified as new supply from the Sacramento River, and applied to project area elements.
    - In Shasta Critical years: No additional diversions were specified.

Model Results for PMAs

This section compares the model results in the with-projects and without-projects scenarios. The difference between the without-project and with-project model results represents the net effect of the project on those water budget parameters.

Results for Each Modeled Project Area

The tables below summarize key results of the without-project and with-project model scenarios for each of the three modeled PMAs. Results are averaged over the entire 2016 to 2065 projected future period, including Shasta Critical years (approximately 10 percent of all years) when it is expected that

additional surface water supplies will be unavailable for projects. The results are aggregated from the water budgets of elements in the project areas identified in Figure *1*.

The average net benefit to the groundwater system of each modeled project is reported as "net recharge from the surface water system," calculated as the sum of all groundwater recharge (seepage and deep percolation) minus the sum of all groundwater extraction (groundwater pumping) in the project area and model scenario. Positive values indicate that more recharge is occurring, on average, while negative values indicate that more extraction is occurring.

On average across all years, the CCWD In-Lieu Groundwater Recharge project is expected to provide approximately 27,000 AF/yr of additional surface water to the CCWD project area, offsetting a similar volume of groundwater pumping (**Table 2**). The average net benefit to the groundwater system of the CCWD project is estimated to be approximately 27,000 AF/yr.

The OAWD Land Annexation and In-Lieu Groundwater Recharge project is expected to provide approximately 22,500 AF/yr of additional surface water to the OAWD project area, offsetting a similar volume of groundwater pumping on average across all years (**Table 3**). The average net benefit to the groundwater system of the OAWD project is estimated to be approximately 22,500 AF/yr.

The Colusa Subbasin Multi-Benefit Groundwater Recharge project is expected to provide approximately 11,500 AF/yr (2.8 AF per acre [AF/ac]) of surface water to potential recharge areas for field flooding (**Table 4**). A portion of this water results in deep percolation (approximately 4,000 AF/yr, or 1.0 AF/ac) or additional seepage (approximately 900 AF/yr, or 0.2 AF/ac). The average net benefit to the groundwater system of the OAWD project is estimated to be approximately 5,200 AF/yr (1.25 AF/ac).

Table 2. Key Model Results from the Colusa County Water District In-Lieu Groundwater Recharge Project (Average AF/yr, 2016 to 2065)

Scenario	Surface Water Diversions	Groundwater Pumping	Seepage	Deep Percolation	Net Recharge from the Surface Water System[1]
Without-Project	65,859	63,314	0	48,460	-14,854
With-Project	92,901	36,140	0	48,403	12,263
Difference (With-Project – Without-Project)	27,042	-27,174	0	-57	27,117

[1] Net Recharge from the Surface Water System = Seepage + Deep Percolation – Groundwater Pumping

Table 3. Key Model Results from the Orland-Artois Water District Land Annexation and In-Lieu Groundwater Recharge Project (Average AF/yr, 2016 to 2065)

Scenario	Surface Water Diversions	Groundwater Pumping	Seepage	Deep Percolation	Net Recharge from the Surface Water System[1]
Without-Project	48,026	62,067	0	45,324	-16,742
With-Project	70,534	39,520	0	45,307	5,788
Difference (With-Project – Without-Project)	22,509	-22,547	0	-17	22,530

[1] Net Recharge from the Surface Water System = Seepage + Deep Percolation – Groundwater Pumping

Table 4. Key Model Results from the Colusa Subbasin Multi-Benefit Groundwater Recharge Project (Average AF/yr, 2016 to 2065)

Scenario	Surface Water Diversions	Groundwater Pumping	Seepage	Deep Percolation	Net Recharge from the Surface Water System[1]
Without-Project	34,151	7,521	5,037	7,565	5,081
With-Project	45,683	7,212	5,924	11,540	10,252
Difference (With-Project – Without-Project) (AF/yr)	11,533	-308	886	3,976	5,171
Difference (With-Project – Without-Project) (AF/ac[2])	2.8	-0.1	0.2	1.0	1.25

[1] Net Recharge from the Surface Water System = Seepage + Deep Percolation – Groundwater Pumping

[2] Calculated assuming 4,122 acres of "potential recharge area" will participate in multi-benefit groundwater recharge.

Results for the Colusa Subbasin

The tables below summarize key results of the without-projects and with-projects model scenarios for the entire Subbasin. Results are averaged over the entire 2016 to 2065 projected future period, including Shasta Critical years (approximately 10 percent of all years) when it is expected that additional surface water supplies will be unavailable for projects. The results are aggregated across all model elements in the Subbasin.

Table 5 summarizes the water budget results for the Subbasin surface water system. On average across all years, all three modeled projects are expected to reduce groundwater pumping by approximately 49,000 AF/yr and increase the total surface water inflows to the Subbasin by approximately 27,000 AF/yr. Stream gains from groundwater are also expected to increase by nearly 15,000 AF/yr

compared to the without-projects scenario.[7] Deep percolation in the with-projects scenario is expected to slightly increase (approximately 4,000 AF/yr), while seepage is expected to slightly decrease (approximately 10,000 AF/yr) compared to the without-projects scenario.

Table 6 summarizes the water budget results for the Subbasin groundwater system. In the without-projects scenario, the average annual change in groundwater storage across all years is expected to be approximately -7,000 AF/yr, indicating an average net decline in groundwater storage. When all three modeled projects are in effect, the average annual change in groundwater storage across all years is expected to be approximately 0 AF/yr, indicating no net decrease in groundwater storage.

These model results suggest that planned projects in the Subbasin are sufficient to support sustainable management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater storage during other periods (23 CCR §354.44(b)(9)).

[7] A more detailed assessment of projected streamflow accretion-depletion is presented in Appendix 3-G. The analysis considers the Sacramento River, Stony Creek, and the Colusa Drain individually and collectively, and evaluates temporal accretion-depletion patterns over the 50-year simulation period.

Table 5. Without-Projects and With-Projects Surface Water System Water Budget Results for the Entire Colusa Subbasin (Average AF/yr, 2016 to 2065)

Component	Without-Projects	With-Projects	Difference (With-Projects – Without-Projects)
Inflows			
Surface Water Inflows	12,714,561	12,741,210	26,649
Sacramento River Diversions	1,195,939	1,255,291	59,352
Stony Creek Diversions	90,707	90,707	0
Sacramento River Inflows	11,335,460	11,302,757	-32,703
Other Inflows from Boundary Streams	92,455	92,455	0
Precipitation	1,257,503	1,257,503	0
Groundwater Pumping	558,561	509,702	-48,859
Agricultural	515,996	466,936	-49,059
Urban and Industrial	10,098	10,098	0
Managed Wetlands	32,467	32,668	201
Stream Gains from Groundwater	322,713	337,389	14,676
Total Inflow	**14,853,338**	**14,845,804**	**-7,534**
Outflows			
Evapotranspiration	1,900,935	1,902,885	1,949
Agricultural	1,596,222	1,597,393	1,171
Urban and Industrial	28,407	28,410	3
Managed Wetlands	73,292	73,292	0
Native Vegetation	167,144	167,146	2
Canal Evaporation	35,869	36,643	774
Deep Percolation	411,004	415,312	4,308
Precipitation	156,055	157,003	947
Applied Surface Water	158,089	170,370	12,281
Applied Groundwater	96,859	87,940	-8,919
Seepage	400,727	391,052	-9,675
Streams	252,897	242,325	-10,572
Canals and Drains	147,829	148,727	898
Surface Water Outflows	12,140,789	12,136,608	-4,180
Precipitation Runoff	59,795	60,180	384
Applied Surface Water Return Flows	90,012	91,563	1,551
Applied Groundwater Return Flows	20,352	20,096	-256
Sacramento River	11,186,667	11,156,439	-30,227
Colusa Basin Drain	773,816	786,947	13,130
Colusa Weir to Sutter Bypass	0	0	0
Other Outflows to Boundary Streams[1]	10,146	21,384	11,238
Total Outflow	**14,853,455**	**14,845,858**	**-7,597**
Change in Storage (Inflow - Outflow)	**-117**	**-53**	**63**
Stream gains minus seepage	-78,014	-53,663	24,351

Table 6. Without-Projects and With-Projects Groundwater System Water Budget Results for the Entire Colusa Subbasin (Average AF/yr, 2016 to 2065)

Component	Without-Projects	With-Projects	Difference (With-Projects – Without-Projects)
Inflows			
Subsurface Water Inflows	208,855	196,891	-11,964
Deep Percolation	411,004	415,312	4,308
Precipitation	*156,055*	*157,003*	947
Applied Surface Water	*158,089*	*170,370*	12,281
Applied Groundwater	*96,859*	*87,940*	-8,919
Seepage	400,727	391,052	-9,675
Streams	*252,897*	*242,325*	-10,572
Canals and Drains	147,829	148,727	898
Total Inflow	**1,020,586**	**1,003,255**	**-17,330**
Outflows			
Subsurface Water Outflows	146,626	156,416	9,790
Groundwater Pumping	558,561	509,702	-48,859
Agricultural	547,769	498,906	-48,862
Urban and Industrial	10,098	10,098	0
Managed Wetlands	34,672	34,870	198
Stream Gains from Groundwater	322,713	337,389	14,676
Total Outflow	**1,027,899**	**1,003,507**	**-24,392**
Change in Storage (Inflow - Outflow)	**-7,314**	**-252**	**7,062**

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Appendix 7A

Funding, Financing, and Cost Allocation

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Technical Memorandum

To: Glenn and Colusa County Groundwater Authorities

From: ERA Economics

Date: November 19, 2021

Subject: **Funding and Financing Mechanisms and Cost Allocation Overview for the Colusa Subbasin**

Introduction

Development of the Colusa Subbasin GSP was primarily funded through a Proposition 1 Sustainable Groundwater Planning Grant. Additional funding for Glenn and Colusa Groundwater Authorities (GGA and CGA) activities to support GSP development was from fees collected under rate studies covering the five-year period spanning fiscal years 2019/20 through 2023/24. These were prepared as property-related fees for water service under Proposition 218[1]. The rate study fees supported GSP development, which was estimated to cost approximately $465,000 per year in the CGA and $450,000 to $550,000 per year in the GGA. The fee is up to approximately $1.09 and $1.60 per assessable acre in the CGA and GGA in the current fiscal year (actual fees are less than the max).

After submission of the GSP to Department of Water Resources (DWR), CGA and GGA activities will shift from GSP development to GSP implementation[2]. Implementation of the GSP will be a substantial undertaking, encompassing continuing activities for GSP development (e.g., outreach and coordination) as well as new activities to support implementation (e.g., projects and management actions and addressing data gaps in the Subbasin). Implementation will likely require GSAs and other local entities to fund these required activities. As described in Chapter 7 of the GSP, total GSP implementation costs are estimated to increase from approximately $1.5 million to around $9.5 million per year at full implementation of planned projects and management actions (including annualized capital costs).

GSAs and other local entities implementing projects and management actions will develop a GSP financing plan that will likely include a combination of fees, assessments, and taxes, as well as additional outside funding, grants, and low interest borrowing. The financing plan will, among other items, identify funding and financing sources for components of GSP implementation. This will include consideration of allocation of those costs to different entities—and ultimately water users—in the subbasin. This technical memorandum/appendix to the GSP describes options for GSP funding and financing and introduces cost allocation concepts and approaches that may be considered.

[1] Fee Study for the Glenn Groundwater Authority. May 2019.

Fee Study for the Colusa Groundwater Authority. May 2019.

[2] There is substantial overlap between development activities covered under the existing rate study and implementation activities. For example, GSA administration and technical development work, to support refinements to the GSP, are largely the same.

Colusa Subbasin GSP Implementation Costs

The total cost of GSP implementation is approximately $9.5 million per year once planned projects and management actions are fully implemented. GSP implementation costs are broken into the following four categories, which are appropriate for different funding and financing mechanisms:

- **GSA Administration and Studies**. These include general GSA administrative and operating costs for management of the GSP, GSA coordination, other coordination with local entities, annual and five-year reports, and management of technical tasks. Studies include technical work that the GSAs will do to support GSP implementation. Total costs are around $1 million per year. GSA administration and studies are annual costs that are typically covered under local assessments.
- **Project and Management Action Capital Repayment**. Projects and management action (PMAs) capital repayment costs are estimated at approximately $1 million. The total capital outlay is around $20 million, which is primarily attributed to the Orland-Artois Water District (OAWD) land annexation and in-lieu recharge project. Project capital costs may be funded under future bond funding opportunities and other grant solicitations. Low interest borrowing options may be used to finance project capital.
- **Other PMA Capital and Studies**. These include project and management action development technical studies and non-debt financed capital. The estimated cost is $0.4 to $1 million per year. Project capital and studies may be eligible for some sources of grants but are typically paid on a pay-go basis.
- **Project Operations and Maintenance**. Annual O&M for projects is approximately $4 to $6.7 million per year. These are annual costs for the project. A substantial share of project O&M costs are attributed to water purchases for in-lieu recharge projects providing approximately 84,000 acre-feet (af) of benefits at full implementation.

Figure 1 illustrates the estimated costs over the first five years of GSP implementation. The largest single component is the cost to purchase water included in the PMA O&M estimate. The timing of costs may vary from what is shown on Figure 1. For example, some projects and management actions may be implemented more (less) rapidly resulting in accelerated (delayed) costs associated with capital and project operations and maintenance. The financing plan for GSP implementation would be updated to reflect these changes over time.

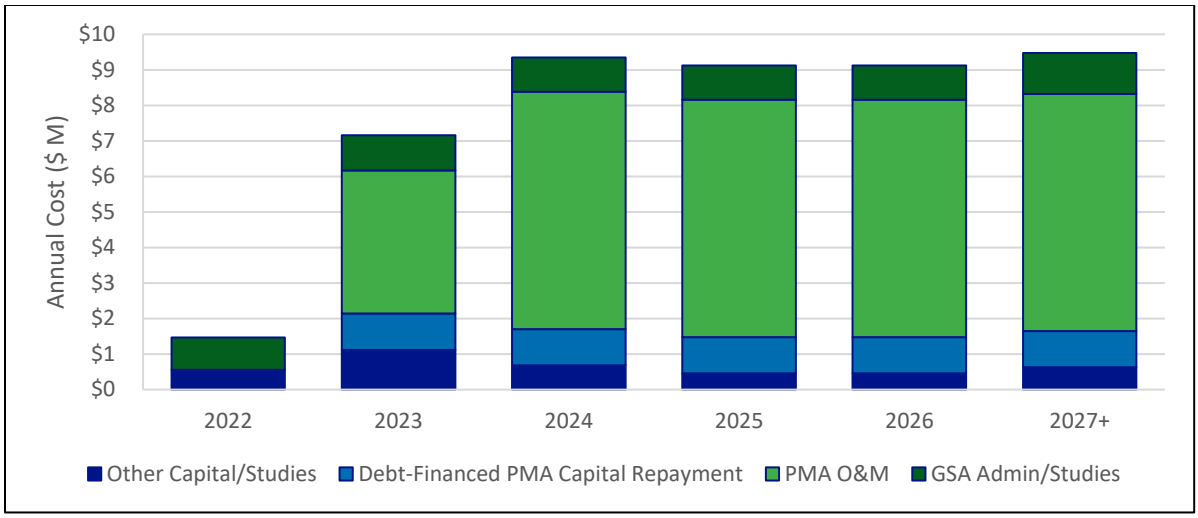

Figure 1. Colusa Subbasin GSP Implementation Cost Summary

Funding and Financing Mechanisms

Administering the GSP, groundwater monitoring, reporting, and project and management action implementation is projected to cost approximately $9.5 million per year across the Colusa Subbasin (Subbasin). GSA annual budgets and GSP implementation costs will be reviewed, revised if needed, and updated by the GSAs based on subbasin conditions, actual expenditures, and the immediate future needs. Expected costs will be adjusted over time as the GSP implementation costs are better understood through sustainable management activities and guidance from DWR on the submitted GSP and subsequent reporting.

Covering the costs of PMAs and general GSP implementation requires evaluating both financing and funding mechanisms. Financing relates to identifying sources of capital (typically state/federal grants, bonds, and bank loans) to pay for project capital expenses. Funding relates to sources of money required to cover capital repayment (pay back the debt-financed projects) as well as project O&M, GSA administration, and other annual expenses.

The agencies in the Subbasin have the powers and authority to impose fees and assessments and pursue other financing sources for capital projects and funding sources for repayment of debt, operations, and other ongoing expenses. The GSAs also have explicit fee authorities under Sustainable Groundwater Management Act (SGMA) legislation (Water Code §10730 and §10730.2). Table 1 summarizes potential financing and funding sources that may be used by GSAs for GSP implementation.

Table 1. Potential Funding and Financing Sources for GSP Implementation

Capital Financing	Considerations
State (DWR) Grants (Prop. 68 and future bonds)	Solicitations are typically targeted to general types of projects and specific benefits that are in the State's interest
US Bureau of Reclamation WaterSmart Grants	Project-specific funding that can support planning studies (e.g., water market strategy grants)
Other targeted potential grant programs (e.g., AB 252)	Potential for multi-benefit projects
Local bond issuance	Local borrowing based on agency authority
Private borrowing	Current low interest rate environment may make these options attractive
State or Federal low interest loans	This could include future bond-funded loan programs
Funding Sources	**Considerations**
Fee – General	General options for legal authority pre- and post-GSP development: Prop. 26, Prop. 218, Water Code §10730, Water Code §10730.2
Regulatory Fee	Typically, pre-GSP fee that is related to regulatory cost. Prop. 26 and Water Code §10730
Service Fee	Related to cost of service. Prop 218 and Water Code §10730.2. Subject to majority protest vote
Special Tax	Subject to 2/3 majority approval vote
Special Benefit	Special benefit assessment subject to majority protest vote

Capital Financing

Capital financing options include a mix of grants and low interest loans. There are typically limits on what costs can be covered by the funding source, or what specific benefits can be paid for. These can be specified in statute or defined by agencies administering the programs.

State opportunities for project capital funding under voter-authorized bonds are a common source of cost share for project capital. For example, Proposition 68, the Parks and Water Bond Act of 2018, bonds support the California DWR Sustainable Groundwater Management (SGM) Grant Program Implementation Grants. Project funding applications are submitted in a competitive process under grant proposal solicitation packages (PSP) administered by DWR. PSP guidelines define the requirements for project applications, eligibility for funding, and the desirable public benefits provided by the proposed project. The 2020 PSP for GSP implementation focused heavily on recharge opportunities and benefits to local disadvantaged communities. Planned GSP projects should be reviewed in advance and positioned for eligibility for future PSPs.

Multi-benefit projects have received increasing attention as part of GSP development and for state grant opportunities. The Governor's Executive Order N-10-19 directed state agencies to work together to prepare a "water resilience portfolio that meets the needs of California's communities, economy, and the environment through the 21st century" and prioritizes multi-benefit projects/policies. The 2020 DWR SGM PSP provided explicit definition of multi-benefit types, minimum requirements for grant eligibility, and weights assigned to project scoring.

Other opportunities for multi-benefit project funding are related to SGMA implementation. For example, AB 252 Department of Conservation: Multi-benefit Land Repurposing Program outlines a potential program for providing state grants to support agricultural land repurposing under GSP implementation[3]. The Governor's May Revise budget included a proposal for a similar $500 million program for drought support administered by the Department of Conservation for "Multi-Benefit Land repurposing[4]" in collaboration with the Department of Food and Agriculture. The program concept is to "prioritize ecosystem-based strategies that are implemented with landowners" to support land repurposing from irrigated agriculture to other uses. While the program would primarily be targeted to the Critically Overdrafted Subbasins, potential multi-benefit recharge projects included in the Colusa Subbasin GSP (see Chapter 6) may be eligible under this or similar programs.

Grant funding opportunities can define specific public benefits that are eligible. Various state and federal laws have established some benefit types as public eligible for public funding. For example, Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014, defined five public benefit categories eligible for funding under the Water Storage Investment Program. Flood control benefits have often been considered to include a mix of public (state or federal) and private (local) benefits, so a cost share approach is common. Ecosystem benefits that accrue to the entire state are considered public benefits.

Grants and low interest loans are expected to be an important option for reducing the cost of SGMA to local communities. The Colusa Subbasin GSAs will continue to pursue these opportunities to help fund planning studies, projects, and other GSA activities. However, grants and low-interest loans are not expected to cover most GSA operating costs for GSP implementation or annual operating and maintenance costs of projects. In addition, these rely on relatively unpredictable funding (e.g., state general obligation bonds that require voter approval) and are subject to changing rules and requirements.

Funding Sources

Example funding methods that are available to GSAs to fund projects, studies, and operations were reviewed. Groundwater extraction fees and groundwater permit fees are specifically included in the SGMA legislation (California Wat Code 10730 et seq), but other methods may be available to a GSA, depending on the agency's authorities under law. All methods adopted must comply with the requirements of statute and the California Constitution. The following summary includes many common funding methods but is not necessarily comprehensive.

Assessments based on costs of service or special benefits under Proposition 218 could include a per-acre (or per-parcel) charge to cover GSA costs, or other fees under Proposition 26. For example, benefits of a recharge project might accrue differentially across the Subbasin. The assessment could be calculated in proportion to the special benefit received (by subarea and/or user class), as calculated in the reports supporting the rate study. For cost-based fees and charges (including extraction and permit fees), the report would calculate the cost of providing the service to each parcel or to categories of parcels. Categories would be based on costs imposed on the program and could be based on location, level of use, or other characteristics related to costs.

Another option for funding GSP implementation is taxes. Taxes do not have to be directly tied to the cost or benefit of the service provided. Potential taxes could include general property related taxes that are not directly related to the benefits or costs of a service (ad valorem and parcel taxes), or special taxes imposed for specific purposes related to GSA activities. Based on an initial review of GSA funding

[3] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB252

[4] May Revised Budget. Submitted 5/14/2021.

approaches in Critically Overdrafted Subbasins, this is not a common funding mechanism for GSP implementation.

Other fees and charges may include permitting fees for new wells or development, transaction fees associated with contemplated groundwater markets, or commodity-use fees, all directed at aiding with sustainability objectives. Depending on the justification and basis for a fee, it may be considered a property-related fee subject to voting requirements of Article XIII D of the California Constitution (passed by voters in 1996 as Proposition 218) or a regulatory fee exempt from such requirements.

Some of the potential funding approaches can affect the cost of water for specific uses in the Subbasin. For example, districts supplying surface water recognize that recovering GSP related costs as part of their surface water charge can be counter-productive by disincentivizing surface water use. All agencies are concerned that any fees, charges, or assessments will affect business (farm) income and, if large, may affect cropping decisions and farming practices in the Subbasin. Based on groundwater monitoring, land use changes, and other future conditions, the GSAs will reconsider or adjust fees/assessments as needed to achieve sustainability.

Funding and Financing Mechanisms in Example GSAs

A brief review of some GSA funding approaches was developed to illustrate examples of the different bases for their fee or assessment structure. Most of the rate studies were for GSP development. This includes studies stating that the GSA is exempt from voting requirements (see the Kings River East GSA below).

- McMullin Area GSA

  McMullin Area GSA is in central Fresno County within the Kings Subbasin. It adopted a property-based fee to fund GSA costs, calculated as the annual cost of service divided by the number of acres served. The adopted fee excludes parcels that are less than two acres, which it determines are “de minimis” groundwater users under SGMA. The resulting annual fee of $19 per acre was adopted as a water service fee under Proposition 218 after a public hearing at which a majority of land subject to the fee did not protest. The rate study suggested that the agency may consider converting some or all of its fee to a volumetric basis in the future but did not at the time have the information to do so.

- South Fork Kings GSA

  The South Fork Kings GSA is in the Tulare Lake Subbasin. It adopted an annual charge to fund its costs, following requirements for a public hearing and protest vote. Its charge was authorized for five years, beginning at up to $9.80 per acre for 2019 (the first year after the rate study). The amount per acre is calculated as the costs of specified implementation and administrative costs divided by assessable acres within the boundaries of the GSA, except for the City of Lemoore. A separate amount is calculated annually for the City of Lemoore by negotiated agreement. The GSA generally refers to the proposed charge as an assessment and describes the process for justifying a benefit assessment apportioned among parcels according to special benefit received. However, it also describes the fee as apportioned among parcels according to cost of providing the service.

- Kings River East GSA

  The Kings River East GSA is in the Kings Subbasin. It prepared a groundwater fee study to calculate and justify a volumetric fee per af pumped. It used a cost-of-service approach to determine appropriate fees for different areas and jurisdictions within its boundaries. The agency argued that, under Proposition 26, the fee is a regulatory fee that covers the cost of compliance with SGMA, and therefore it is exempt from the public voting requirement. Fees were calculated according to area, land use, and water use. Some areas were not charged a volumetric fee because of their "lack of deep groundwater pumping from the alluvium"; they were only charged a nominal, fixed annual fee to cover a share a share of fixed administrative costs. Other areas were charged $1.45 per af of estimated pumping. Pumping is not currently metered in the area, so the fee was based on land use and a water balance calculation to estimate pumping.

Cost Allocation and Cost Recovery for GSP Implementation

The fee and assessment methods summarized in the previous section allow (and in most cases require) agencies to consider the relative benefits and costs, and to whom they accrue, in setting rates or amounts.

Cost allocation is a multi-step process that determines how costs of implementation components will be spread among and recovered from entities and areas covered by the GSP. The implementation plan includes several categories of activities that must be paid for: administration, projects and management actions, monitoring, and studies. The categories may have their costs spread in different ways (among different entities and areas) depending on discussions and policy decisions about issues like: who is responsible for a cost, who benefits from an activity, what is fair, what is legally allowed or possible, what are the requirements for determining and justifying a cost allocation?

An initial step in cost allocation is to determine which agency (or agencies) are responsible for financing and funding. This may vary based on fairness and equity concerns, and across different GSP PMAs. For example, the lead agency for a specific GSP project may work to secure financing and explore funding mechanisms. Alternatively, the GSA could lead some of these activities and in turn recover costs from the lead agency (or agencies). Under both approaches, the cost allocation would consider the share of benefits received from the project. Using the four GSP cost categories defined above, example considerations for each category include:

- **GSA Administration and Studies**. General GSA administrative costs and required studies to support GSP implementation (e.g., address data gaps) generally provide a benefit to the entire Subbasin. This could be viewed as a basis for allocating costs broadly across all groundwater users. However, some areas may receive a disproportionate share of benefits from the actual implementation of the GSP and this could be reflected in how general costs are allocated. Potentially, some areas could be judged as not responsible for groundwater issues or benefitting from groundwater management.
- **Project and Management Action Capital Repayment**. Projects typically have a single project proponent that has specific financing and funding options available. Project benefits may primarily accrue to the proponent. However, under SGMA requirements for subbasin-wide sustainability, other entities and areas may derive some potential indirect benefits of sustainability. In addition, there may be direct project-related benefits (e.g., higher groundwater elevations that reduce pumping costs or reduce stream depletions) that accrue to other parties.

- **Other PMA Capital and Studies**. Project capital costs that will not be debt-financed and project study costs could be treated similar to PMA capital costs. However, the GSA may initiate studies to support GSP implementation and cover a portion of costs. Some of these studies have been initiated under GSP development (e.g., subbasin conditions, data management system, and data gaps).
- **Project Operations and Maintenance**. Specific PMA O&M costs could be paid by the project proponent. A portion of costs could be allocated to other parties that receive direct or indirect benefits from the project, or to the entire Subbasin for general SGMA benefits.

Cost allocation for a GSP that incorporates many agencies may occur at multiple levels, perhaps including basin-wide, within a GSA, or within an individual entity such as a water district or other local agency. The general steps in cost allocation are:

- Determine costs of implementation activities and when they are to be incurred. Generally, the different cost components of an activity need to be aggregated in a consistent way to allow for a fair and objective allocation. This is especially important if cost components (e.g., capital costs versus annual O&M) may be paid by different parties. A life-cycle cost approach is commonly used, in which all costs over the life of the activity are adjusted for when they occur (using standard financial discounting) and expressed as an annual or lump-sum amount.
- Based on stakeholder discussions and technical support, make decisions about which costs apply across the entire GSA versus apply to subareas or specific agencies. For GSP activities that serve the entire GSA (perhaps GSA administration or certain monitoring costs), the GSA would lead the discussions and policy decisions; for projects proposed by or to be developed by a specific member agency, that agency could take the lead. Discussions and decisions may also address which groups or users will be included in the cost allocation for a particular activity – for example, the discussion could consider a group's past or current use of groundwater.
- Develop information to support the actual calculations needed to allocate and recover costs, which may include cost of service and benefit information. This step is based on the policy decisions and will help determine who pays for the GSP activity. Defensible information is required to meet legal requirements. An open and fair process is essential for the political support needed to implement activities and recover costs.

Allocating and recovering costs involve policy decisions and technical analysis and must follow a process that meets legal requirements. Costs of projects and activities that serve large areas and multiple groups are typically allocated using cost-of-service principles, whereby the total project cost is split based on each area or group's demonstrated proportional split of total cost. Costs can also be allocated based on benefits received (for example the California Constitution allows for assessments to be based on special benefits received). Ultimately, decisions about cost allocation must involve meaningful input from affected parties so that the outcome is viewed both as fair and technically justified.

Summary

Cost allocation and repayment are important and difficult decisions that require ongoing and open discussions. The GSAs are already implementing financing mechanisms to pay for their administrative costs. Development of a financing plan will require making further decisions with stakeholders and member agencies using a timely process that supports the subbasin sustainability goal and GSP implementation schedule.

This memorandum/appendix provides a general overview of funding and financing methods available to Subbasin agencies. Methods generally allow agencies to consider the distribution of costs and benefits when setting a fee or assessment. An analysis to establish a financing plan for the Subbasin would:

- Review specific issues that affect the distribution of costs and benefits within the subbasin. This would include establishing potential project costs and beneficiaries. It would also consider the agency (or agencies) that would be responsible for recovering the costs of different activities.
- Listen to different groups' perspectives on fairness, contribution to groundwater issues, and benefits from groundwater management.
- Coordinate with GSA legal counsel and agency legal counsel to evaluate fee and assessment options.
- Prepare technical analyses to support cost allocation and repayment. This potentially can include some options or examples that illustrate different allocations of fees/assessments, for a specific project or management action with multiple payers and beneficiaries to demonstrate how fees can be calculated when benefits or costs are assigned to different areas and/or customer groups.

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