

# WARNING

## SENSITIVE RECORD

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- PRIVACY ACT INFORMATION
- ARCHAEOLOGICAL LOCATION COORDINATES OR MAPS
- ATTORNEY / CLIENT DELIBERATIVE PROCESS INFORMATION
- COMMAND INTERNAL RULES AND PRACTICES
- COMMERCIAL TRADE SECRETS OR CONFIDENTIAL COMMERCIAL INFORMATION
- DRAWINGS OF MILITARY STRUCTURES / BUILDINGS OR FEDERAL BUILDINGS
- STREET LEVEL MAP(S) OF MILITARY INSTALLATIONS OR FEDERAL BUILDINGS
- GEOLOGICAL / GEOPHYSICAL INFORMATION / DATA CONCERNING WELLS

**RECORDS OFFICE REMINDER: REVIEW AND SAFEGUARD SENSITIVE INFORMATION CONTAINED IN THE DOCUMENT PRIOR TO PUBLIC ACCESS**

Findings from Record Search Activities  
And  
Visual Inspections  
Of  
Active and Inactive or Destroyed Water Supply Wells  
Former Naval Auxiliary Landing Field (NALF), Crows Landing



February 2002

Southwest Division  
Naval Facilities Engineering Command  
BRAC Operations  
San Diego, California

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And  
Visual Inspections  
Of  
Active and Inactive or Destroyed Water Supply Wells  
Former Naval Auxiliary Landing Field (NALF), Crows Landing

February 2002

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Naval Facilities Engineering Command  
BRAC Operations  
San Diego, California

## Transmittal

Date: 27 Feb 2002

From: Lynn Marie Hornecker  
Code 06CC.LMH

*LMA*

To: Diane Silva  
Code 01LS.DS  
Administrative Record Manager

Subj: **CERCLA ADMINISTRATIVE RECORD MATERIALS**  
NALF Crows Landing

Installation: NALF Crows Landing

UIC Number: N60211

Document Title:

*→ see attached*

Author:

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Recipient:

*James Barton RWQCB*

Record Date:

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*Site 17*

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*N/A*

## **Findings from Record Search Activities And Visual Inspections Of Active and Inactive or Destroyed Water Supply Wells Former Naval Auxiliary Landing Field (NALF), Crows Landing**

Historical records for water supply wells on the former NALF Crows Landing and near the former NALF Crows Landing were initially acquired and reviewed during the spring and summer of 2000. Records from the United States Geological Survey, the California Department of Water Resources (DWR), and historical Navy reports for the environmental restoration program were reviewed and pertinent information has been included with this document. This document is intended as a compilation of information. Evaluations of the information will be or have been presented in separate documents.

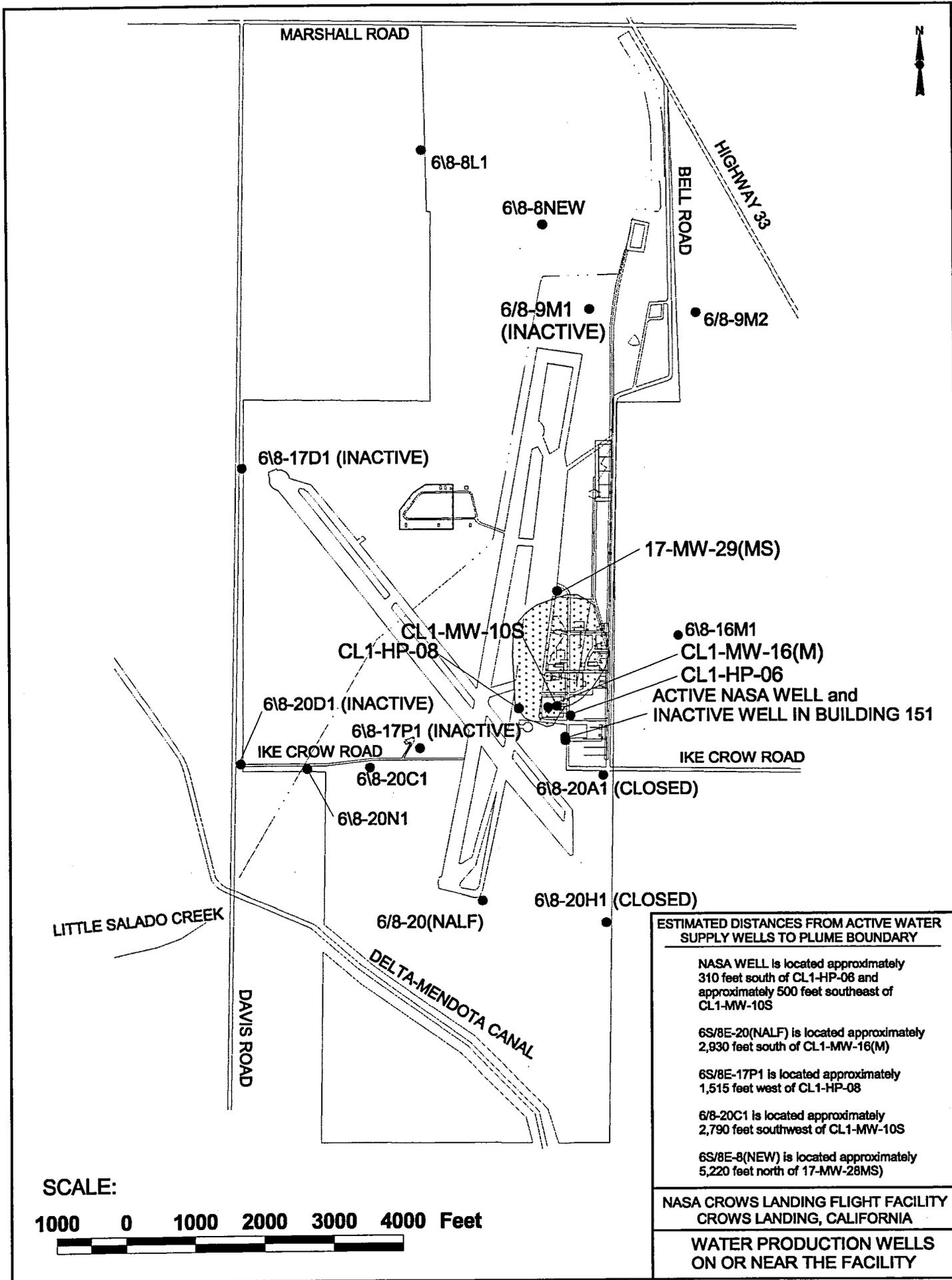
During the year 2001, additional records were acquired from Stanislaus County, the National Aeronautics and Space Administration (NASA), and one of the local water districts in Patterson, California.

Southwest Division, Naval Facilities Engineering Command and the IT Corporation team members (Navy contract N62474-98-D-2076, CTO 4) participated in the collection and review of historical documents and the visual inspections of the well sites.

Monitoring wells and other wells that were constructed in support of the Navy's environmental restoration program (Navy wells) were surveyed by a land surveyor during the years 2000 and 2001. Most of the existing Navy wells were surveyed in October 2000, and well locations were visually inspected at that time. A tabular summary with the State Plane Coordinates and the date of the land survey is included with this document.

This document includes the following information:

- 1) a tabular summary that identifies water supply wells located on the facility and some wells near the vicinity;
- 2) well construction logs and/or other DWR or Stanislaus County well records (these records follow the tabular summary);
- 3) photographs of wells and well sites;
- 4) summary of pumping activities for active irrigation wells at the facility and other historical documentation; and
- 5) land survey records for monitoring wells and selected other wells on the facility property.



**ESTIMATED DISTANCES FROM ACTIVE WATER SUPPLY WELLS TO PLUME BOUNDARY**

- NASA WELL is located approximately 310 feet south of CL1-HP-08 and approximately 500 feet southeast of CL1-MW-10S
- 6S/8E-20(NALF) is located approximately 2,930 feet south of CL1-MW-16(M)
- 6S/8E-17P1 is located approximately 1,515 feet west of CL1-HP-08
- 6/8-20C1 is located approximately 2,790 feet southwest of CL1-MW-10S
- 6S/8E-8(NEW) is located approximately 5,220 feet north of 17-MW-28MS)

NASA CROWS LANDING FLIGHT FACILITY  
CROWS LANDING, CALIFORNIA

**WATER PRODUCTION WELLS  
ON OR NEAR THE FACILITY**

SCALE:



SOUTHWESTNAVFACENGCOM  
Code 06CC.LMH  
(619) 532-0783/Fax (619) 532-0780

File: ciwellinspection2002.doc

PRINTED: FEBRUARY 2002

## TABULAR SUMMARIES AND EXTRACTS FROM DWR OR USGS DOCUMENTS

List of Wells with Information Presented in This Section:

- 6S/8E-8
- 6S/8E-8F1
- 6S/8E-8B1
- 6S/8E-8L1
- 6S/8E-8 NEW
- 6S/8E-9M1
- 6S/8E-9M2
- 6S/8E-16M1
- 6S/8E-17D1
- 6S/8E-17P1
- 6S/8E-20(NALF)
  - 6S/8E-20A1
  - 6S/8E-20C1
  - 6S/8E-20D1
  - 6S/8E-20H1
  - 6S/8E-20N1
  - 6S/8E-20Q1
- NASA Water Supply Well near Building 151
- Inactive Former Water Supply Well at Building 151
- Well on Ike Crow Road, more than 2,000 feet east of Bell Road
- Del Puerto Water District Well near Delta-Mendota Canal and Marshall Road

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Active Well 6S/8E-8 (Thorkelson)</b>	Screened or perforated interval: 350-550 feet bgs	Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.  DWR log is not available.  <b>The well is not located on facility property. The well is located more than 1,000 feet west of UST Cluster 2 and was observed from a distance in July 2000.</b>

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Inactive Well?</b> <b>6S/8E-8F1</b>		<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR log is not available. DWR well data form is available.</p> <p><b>The well is not located on facility property. The well is located more than 1,000 feet west of UST Cluster 2 in the middle of Section 8 according to DWR data form.</b></p>

Component     

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

WELL DATA

Owner G. DAVIS State No. 65/8E-8F1  
 Address \_\_\_\_\_ Other No. 6-8-8D  
 Tenant \_\_\_\_\_ #1  
 Address \_\_\_\_\_

Type of Well: Hydrograph  Key  Index  Semiannual   
 Location: County STANISLAUS Basin DELTA-MENDOTA No. 5-2211

U.S.G.S. Quad. CROWS LANDING Quad. No. 5-3166  
SE 1/4 NW 1/4 Section 8, Twp. 65, Rge. 8E Base & Meridian

Description: NEAR CENTER OF SEC. 8  
2600' S E 2600' E/W NW COR., 30' W/O 6-8-8

Reference Point description PUMP BASE, EAST SIDE

which is 1.2 ft. above land surface. Ground Elevation 133.6 ft.

Reference Point Elev. 134.8 ft. Determined from \_\_\_\_\_

Well Use TRIG. Condition \_\_\_\_\_ Depth 402 R. ft.

Casing, size \_\_\_\_\_ in., perforations 170-330

Measurements By: DWR  USGS  USBR  County  Irr. Dist.  Water Dist.  Cons. Dist.

Chief Aquifer: Name \_\_\_\_\_ Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Type of Material \_\_\_\_\_ Perm. Rating \_\_\_\_\_ Thickness \_\_\_\_\_

Gravel Packed? Yes  No  Depth to Top Gr. \_\_\_\_\_ Depth to Bot. Gr. \_\_\_\_\_

Supp. Aquifer \_\_\_\_\_ Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Driller HANK - CROWS LANDING

Date drilled \_\_\_\_\_ Log, filed USBR 6-8-81 open (1) \_\_\_\_\_ confidential (2) \_\_\_\_\_

Equipment: Pump, type TURB. make PERKINS

Serial No. \_\_\_\_\_ Size of discharge pipe \_\_\_\_\_ in. Water Analysis: Min. (1) \_\_\_\_\_ San. (2) \_\_\_\_\_ H.M. (3) \_\_\_\_\_

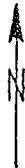
Power, Kind ELEC. Make G.F. Water Levels available: Yes (1) \_\_\_\_\_ No \_\_\_\_\_

H. P. 75 Motor Serial No. \_\_\_\_\_ Period of Record: Begin 1-13-47 End \_\_\_\_\_

Elec. Meter No. \_\_\_\_\_ Transformer No. \_\_\_\_\_ Collecting Agency: \_\_\_\_\_

Yield 900 (est.) G.P.M. Pumping level \_\_\_\_\_ ft. Prod. Rec. (1) \_\_\_\_\_ Pump Test (2) \_\_\_\_\_ Yield (3) \_\_\_\_\_

SKETCH



REMARKS

220' DRAW DOWN  
(8-51) bowl changed to 220'

orig. DTW = 80' (1-47)

perfs: 170-177  
206-245  
314-330

06S/08E-08F01 M

5-22.11 50015

D 1 2 50 6 0134.8 0133.6

2 47 0055.1 01/13/47

Recorded by: S.H. Adams From C.S.B.R. #51

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Inactive Well 6S/8E-8B1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>GRAVEL: 75-76 CLAY: 76-150 GRAVEL: 150-157 CLAY: 157-180 COARSE GRAVEL &amp; SAND: 180-185 WHITE CLAY: 185-228 GRAVEL: 228-239</p>	<p>Well depth 239 feet</p>	<p>Sources of Information: California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>Domestic well constructed in 1944 by Hurd, Patterson (cable tool). Reported to be welded shut (PRC 1993). DWR log is available. USGS well schedule form is available.</p> <p><b>The inactive well is located on facility property. The inactive well appears to be located within 100 feet of the active well 6S/8E-8NEW based upon visual inspection of both wells on 25 July 2000.</b></p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 15 July, 1952 Field No. 4/8-8BL  
Record by Jack Green Office No. \_\_\_\_\_  
Source of data F.I.

1. Location: State California County D-Mendota Stanislaus

Map Crows Landing  
N. 1/4 E. 1/4 sec. 8 T. 6 S. R. 8 E. W.

2. Owner: B.V. Arambel Address: \_\_\_\_\_

Tenant \_\_\_\_\_ Address: \_\_\_\_\_

Driller: Hurd Address Patterson

3. Topography Plain

4. Elevation 129 ft. above 5.4 below

5. Type: Dug, drilled, driven, bored, jetted 4 1944

6. Depth: Rept. 237 ft. Meas. \_\_\_\_\_ ft.

7. Casing: Diam. \_\_\_\_\_ in., to \_\_\_\_\_ in., Type \_\_\_\_\_  
Depth \_\_\_\_\_ ft., Finish \_\_\_\_\_

		X	
		0	
		0	

8. Chief Aquifer \_\_\_\_\_ From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Others \_\_\_\_\_

9. Water level No access ft. rept. \_\_\_\_\_ 19 \_\_\_\_\_ above  
meas. \_\_\_\_\_ below  
which is \_\_\_\_\_ ft. above  
below surface

10. Pump: Type Tur Capacity \_\_\_\_\_ G. M.

Power: Kind Elc - G.E. Horsepower 2

11. Yield: Flow \_\_\_\_\_ G. M., Pump \_\_\_\_\_ G. M., Meas., Rept. Est. \_\_\_\_\_

Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G. M.

12. Use: Dom., Stock, PS., RR., Ind., Irr., Obs. \_\_\_\_\_

Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F

Taste, odor, color \_\_\_\_\_ Sample Yes  
No

Unfit for \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) D.L.

Meter No. \_\_\_\_\_  
Trans. No. \_\_\_\_\_  
Disc. Diam. 1/2" Length 2 ft south to  
Remarks \_\_\_\_\_ pressure tank

100 feet south of north section road  
0.52 mi. east of west section road

8BL

6/8-8B1

CONFIDENTIAL

Water Code Sec. 13752

PEG

Water Code Sec. 13752  
Water Code Sec. 13752

150 Elev. 129

County Stanislaus Owner B. Y. Arambol U.S.B.I. No. 6-8-8B1  
Site Delta Use domestic Local No. 7  
Land Orestimba Driller Murd. Patterson Date April 1944  
Location 1500' S, 2600' W, NE corner

depth  
Surf. Elev. 132' Groundwater ~~at~~ 61' Date April 1944  
Elev. 239 Groundwater elev. Date  
Year Aquifers  
Drainage Artesian head Date  
Casing 3 Sand-gravel

Source of Data Murd's log book Type drill cable tool Diam. hole

		Description	
0-42	9 3/4	dirt	Well Measuring No. 6-8-8C
42-44	9	fine gravel	
44-75	6 6/8	dirt	No perforation log, pump test, or E-log
75-76	6 1/8	gravel	
76-150	6 3/4	clay	
150-157	6 7/8	gravel	Collected by Bingham, Jan. 1951
157-180	6 7/8	clay	
180-185	6 5/8	coarse gravel & sand	
185-228	6 1/2	white clay	
228-239		gravel	

	50	100	200
G	2	1	12
S			
F			
Cl	38	23	
C		68	88
	48	58	100

B A  
G H

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Inactive Well</b>  <b>6S/8E-8L1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>CLAY&amp;GRAVEL: 13-75            CLAY: 75-82            SAND&amp;GRAVEL: 82-88            CLAY: 88-95            GRAVEL: 95-100            HARD, STICKY CLAY: 100-167            GRAVEL: 167-177            CLAY: 177-201            SAND &amp; COBBLE GRAVEL: 201-230            SOFT CLAY: 230-232            GRAVEL: 232-244            CLAY&amp;GRAVEL: 244-255            BLUE CLAY: 255-313            GRAVEL: 313-319            CLAY&amp;GRAVEL: 319-323            GRAVEL: 323-325            CLAY&amp;GRAVEL: 325-402</p>	<p>Perforated intervals (feet bgs):            170-177            206-245            314-330</p>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR records identify irrigation well constructed in approximately 1946 by Howk, Crows Landing (Rotary drill); reported to be welded shut. DWR log is available. USGS well schedule form is available.</p> <p><b>The well is located on facility property (PRC 1993) but location is uncertain. The well appears to be located more than 1,000 feet west of UST Cluster 2 according to the map in the PRC report.</b></p> <p><b>The well was not located and was not inspected on 25 July 2000.</b></p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 15 July 1952 Field No. 618-EM  
Record by: DAV Brown Jack Green Office No. \_\_\_\_\_  
Source of data F. T.

1. Location State California D. Mendota County Stanislaus  
Map Crows Landing  
N.E. 1/4 S.W. 1/4 sec. 8 T. 6 S. R. 8 E. W

2. Owner Davis Bros Address \_\_\_\_\_  
Tenant Plant Address \_\_\_\_\_  
Driller Houk Address Crows Landing

3. Topography \_\_\_\_\_  
4. Elevation 135 ft. above 52 below \_\_\_\_\_

5. Type Dug, drilled, driven (bored) jetted 1944-46  
6. Depth Rept. 110.2 ft. Meas. \_\_\_\_\_ ft.  
7. Casing Diam. \_\_\_\_\_ in. to \_\_\_\_\_ in. Type \_\_\_\_\_  
Depth \_\_\_\_\_ ft. Finish \_\_\_\_\_

	07	
	82	

8. Chief Aquifer Reef From 170-172 ft. to 244-245 ft.  
Others 3M-336

9. Water level No access REP meas \_\_\_\_\_ 10. \_\_\_\_\_ above \_\_\_\_\_ below \_\_\_\_\_  
which is \_\_\_\_\_ ft. above \_\_\_\_\_ below \_\_\_\_\_ surface

10. Pump Type Tr. Peerless Capacity \_\_\_\_\_ G.M.  
Power Kind Ele. G.E. Horsepower 75

11. Yield Flow \_\_\_\_\_ G.M. Pump 940 G.M. Meas. Rept. Est  
Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G.M.

12. Use Dom. Stock, PS, RR, Ind, Irr, Obs. \_\_\_\_\_  
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F  
Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

Unfit for \_\_\_\_\_

14. Remarks (Log, Analyses, etc.) D.L.

861

(Marshall Rd)  
0.51 mi. south of north sec. road  
0.48 mi. east of west sec. road.

P.G. & E. Locat. No. 3967  
Meter No. 32320

Trans. No. \_\_\_\_\_

Disc. Diam. 10' Length 10' west to  
Remarks \_\_\_\_\_ cement + initial standpipe

6/8-821

PEC

100 Elev. 135

CONFIDENTIAL  
Water Control

NO. 100-111  
Area of Reclamation

County Stanislaus Owner Dave's Bros. U.S. No. 4-8-23  
 State Ca. Use Irrigation Local No. Well 11  
 Well Crestline Frigger Hawk, Grange Landing Data 4-46.2  
 Location 2800' N, 2600' E, NW corner

Surf. elev. 412 Groundwater elev. 383 Date 2/17/57  
 Depth 102' Groundwater elev. 383 Date 3/21/52  
 Yields \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Coring No data 5 Sand-gravel

Source of data Hawk's files Type drill Rotary Diam. hole \_\_\_\_\_

Depth	Interval	Description	Remarks
0-13	G 3	topsoil	Well Measuring No. 4-8-23
13-75	G 37/25	clay and gravel	
75-82	G 7	clay	Perforation Log
82-88	G 6	sand and gravel	170-177
88-95	G 7	clay	200-215
95-103	G 5	gravel	314-330
100-167	G 67	hard, sticky clay	
167-177	G 10	gravel	No pump test
177-201	C 23	clay	
201-230		sand and cobble gravel	Present performance estimated
230-232		soft clay ?	by Hawk at 200 gpm at 230'
232-244		gravel	10/26/50
244-255		clay and gravel	
255-313		BLUE CLAY	Collected by Woolf, 8/50
313-314		gravel	
314-323		clay and gravel	Typed by N. Martin 3/52
323-325		gravel	
325-400		clay and gravel	

	50	100	200
G		11	10
C	40	25	
D		14	24
	40	50	100

N L  
N P

2-3-8

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Active Well 6S/8E-8 NEW</b>	<i>Well identified as NEW was videosurveyed by the agricultural tenant (well operator) in March 2001; well is 595 feet deep and was not used in the year 2000. Well can produce 1,500 gpm per EFA-West lease/natural resources manager. IT prepared copies of the video. Perforations are from about 200 feet to 595 feet bgs based upon LMH observation of video.</i>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). Information from lease manager at Engineering Field Activity, West. California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR log is not available.</p> <p>Record of well pumping activities for the year 2001 is available.</p> <p><b>The well is located on facility property, more than 500 feet west of UST Cluster 2.</b></p> <p><b>The well site was inspected on 25 July 2000.</b></p>

## Irrigation Water Supply Well 6S/8E-8(NEW)

### Pumping Activities during the Year 2001

Agricultural Lease Field 3 <b>Well 6S/8E-8 (NEW)</b> Northern section of facility, northwest of UST Cluster 2 <i>[flow: approximately 1,500 gpm]</i> Nearby automated water level indicator at Cluster 2 <i>Well is perforated intervals from approximately 200 to 595 feet below ground surface.</i>
<b><i>Date(s) of Pumping</i></b>
14-20 June 2001
4-9 July 2001
13-20 July 2001
22-31 July 2001
3-10 August 2001
15-20 August 2001
23-31 August 2001
4 – 14 September 2001
17 – 22 September 2001
Total of 73 days of pumping in the year 2001 (with 24 days of pumping in July 2001).

## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Active Irrigation Well 6S/8E-8 (NEW) west of UST Cluster 2 and southwest of Highway 33. Closed well is located in the foreground and active well is located near above-ground tank.

View looking approximately south.

Date of Photograph: July 2000

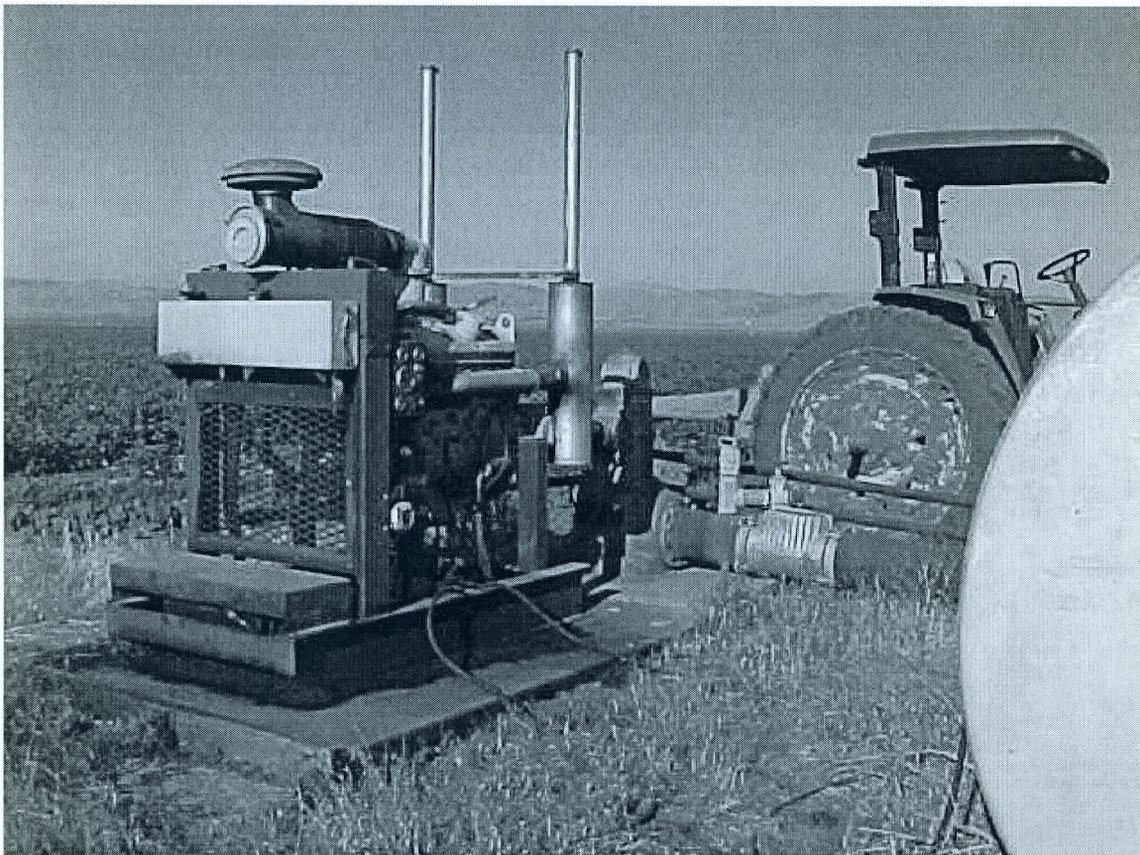


## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Active Irrigation Well 6S/8E-8 (NEW) west of UST Cluster 2 and southwest of  
Highway 33.

View looking approximately south.

Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Active Well</b> <b>6S/8E-9M1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>BLUE CLAY: 257-346 YELLOW CLAY: 346-361 GRAVEL, CLAY STREAKS: 361-368 YELLOW CLAY: 368-375 CEMENTED GRAVEL: 375-391 CLAY&amp;GRAVEL: 391-412 STICKY CLAY: 412-436 CLAY&amp;GRAVEL: 436-460</p>		<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>The well was observed from a distance on 25 July 2000. [DWR records indicate irrigation well is 1,050 feet east of Bell Road; constructed March 1944 by Western, San Jose (rotary drill); Flow is approximately 2,600 gpm. DWR log is available but is confidential. USGS well schedule form is available.</p> <p><b>Well is not located on installation property. Well is located more than 800 feet east of UST Cluster 2. Well was observed from Bell Road during the July 2000 inspection.</b></p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date July 18 1952 Field No. \_\_\_\_\_  
Record by D.W. Brown & Jack Green Office No. \_\_\_\_\_  
Source of data F-1

1. Location. State California County Stanislaus

Map Crows Landing  
NW 1/4 SW 1/4 sec. 9 T. 6 S. R. 8 E

2. Owner Crows Landing Av. Station Address Novato

Tenant \_\_\_\_\_ Address \_\_\_\_\_

Driller Master Address San Jose

3. Topography Plain

4. Elevation 174 ft. above S.L. below \_\_\_\_\_

5. Type Dug, drilled, driven, bored, jetted 10 44

6. Depth. Rept. 6 1/2 ft. Mens. \_\_\_\_\_ ft.

7. Casing. Diam. \_\_\_\_\_ in. to \_\_\_\_\_ in. Type \_\_\_\_\_  
Depth \_\_\_\_\_ ft. Finish \_\_\_\_\_

8. Chief Aquifer Perfr. from 360-366 ft. to 390-400 ft.  
Others \_\_\_\_\_

9. Water level 28.23 ft. reft. July 15 1952 above MP below \_\_\_\_\_  
Access pipe 6" r. of Pulap which is \_\_\_\_\_ ft. above below surface

10. Pump Type Tur. P. in. Neck Capacity \_\_\_\_\_ G. M.

Power Kind EL. C. Horsepower \_\_\_\_\_

11. Yield Flow \_\_\_\_\_ G. M. Pump 2670 G. M. Meas. Rept. Test \_\_\_\_\_

Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G. M.

12. Use Dom. Stock, PS, RR, Ind, Irr, Obs \_\_\_\_\_  
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F

Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

Unit for \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) PL

200' East of Bell Road  
0.34 Miles North of South Section  
Line

Meter No. 10.4 155

Trans. No. \_\_\_\_\_

Disc. Diam. 4" Length 100' to  
construction camp

Remarks \_\_\_\_\_

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Inactive Well</b>  <b>6S/8E-9M2</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>SANDY CLAY: 3-55            FINE GRAVEL&amp;CLAY: 55-70            STICKY CLAY: 70-96            SANDY CLAY: 96-134            FINE SAND: 134-149            SANDY CLAY: 149-159            STICKY CLAY: 159-171            GRAVEL&amp;SAND: 171-192            CLAY: 192-197            GRAVEL, CLAY STREAKS: 197-215            CLAY 215-219            GRAVEL &amp; SAND: 219-260            BLUE CLAY: 260-348            YELLOW CLAY&amp;SAND: 348-360            GRAVEL&amp;CLAY: 360-379            CEMENTED GRAVEL: 379-383            GRAVEL: 383-391            CLAY&amp;GRAVEL: 391-402            GRAVEL: 402-414            CLAY&amp;GRAVEL: 414-460            STICKY DRY CLAY: 460-534            CLAY&amp;GRAVEL: 534-571            STICKY CLAY: 571-606            SAND&amp;CLAY STREAKS: 606-626            CEMENTED SAND,CLAY,GRAVEL: 626-640            GRAVEL&amp;SAND, FINE: 640-666            CLAY: 666-670            GRAVEL&amp;SAND: 670-703</p>	<p>Perforated intervals (feet bgs):</p> <p>76-80            132-148            168-196            200-260            284-294            344-368            380-392            400-416            436-440            480-488            536-572            608-624            640-700</p>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>Former fire protection water supply well with two above-ground water storage tanks. The well was constructed in 1944 and has been out of service for more than 5 years.</p> <p>DWR log is available. USGS well schedule form is available.</p> <p><b>The well is located on facility property, approximately 500 feet from UST Cluster 2. The well was inspected on 25 July 2000.</b></p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 15 July 1952 Field No. 6/8-9172  
Record by D.W. Brown & Jack Green Office No.  
Source of data F. I.

1. Location State California County Stanislaus

Map Crows Landing  
N 41/2 W 5 1/2 sec 9 T 6 N R 8 E

2. Owner Crows Landing Av. Station Address Nevl

Tenant \_\_\_\_\_ Address \_\_\_\_\_

Driller Western Address San Jose

3. Topography Plain

4. Elevation 120 ft. above SW below

5. Type Dug, drilled, driven, bored, jetted Apr 1944

6. Depth: Rept. 170.3 ft. Mens. \_\_\_\_\_ ft.

7. Casing: Diam. \_\_\_\_\_ in. to \_\_\_\_\_ in. Type \_\_\_\_\_

Depth \_\_\_\_\_ ft. Finish \_\_\_\_\_

8. Chief Aquifer Pa. T. From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Others \_\_\_\_\_

9. Water level: 125.7 ft. rept. July 15 1952 above MP below

in access hole west of pump which is \_\_\_\_\_ ft. above surface

10. Pump: Type Tur Peerless Capacity \_\_\_\_\_ G. M.

Power: Kind Ele Horsepower 75

11. Yield: Flow \_\_\_\_\_ G. M. Pump 2400 G. M. Mens. Rept. Est.

Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G. M.

12. Use: Dom. Stock, PS, RR, Ind, Irr, Obs.

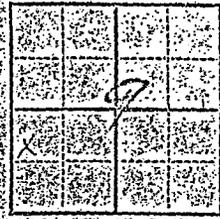
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F

Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

Unfit for \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) DL



9172

1050' East of Ball Road  
0.26 Miles North of South Section line

P.G. & E. Locat. No = 4333

Meter No! 26038

Trans. No. \_\_\_\_\_

Disc. Diam. 10'

Remarks \_\_\_\_\_

Length 12' west to  
cement & metal standpipe

618-9M2

CONFIDENTIAL  
Water Code Sec. 14727

42-359 (Rev. 5-1)  
Bureau of Reclamation

REG

Elev. 120

WELL NO:

( On Carra McCauley property )

County Stanislaus Owner Joseph Bros U.S.B.M. No. 6-8-9 M2 (C.R.S.)  
 Dist. Delta Use Irrigation Local No. Well #3  
 Quad. Grustimba Driller Western, San Jose Date 4/44  
 Location 1400' N, 900' E, SW corner

Surf. Elev. 120 Groundwater elev. 159.8 Date 1/17/45  
 Depth 703 Groundwater elev. 159.9 Date 2/1/51  
 Yield \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Casing No data % Sand-gravel \_\_\_\_\_

Source of data Western's files Type drill Rotary Diam. hole \_\_\_\_\_

Top Elev.	Thick	Description	Well Measuring No. 6-8-9		
0-3		surface soil			
1-25	<u>Co 40/3</u>	sandy clay			
55-72	<u>Co 15</u>	fine gravel and clay			
72-76	<u>G 26</u>	sticky clay	Perforation Log		
96-125	<u>Co 4/2-3</u>	sandy clay			76-80
125-134	<u>Co 9</u>	" "			132-148
134-149	<u>S 15</u>	fine sand			168-196
149-159	<u>Co 10</u>	sandy clay			200-260
159-171	<u>Co 12</u>	sticky clay			284-294
171-182	<u>G 21</u>	gravel and sand		50	100 200
182-187	<u>G 5</u>	clay	G		251
187-188	<u>F 2</u>	gravel, clay streaks	S		15
215-219		clay	F		3
219-238		gravel and sand	G	40	24 56
238-240		gravel and sand, clay streaks	G		26 5
260-348		BLUE CLAY		40 50	100
348-360		yellow clay and sand			
360-379		gravel and clay			
379-383		cemented gravel			No pump test
383-391		gravel			
391-402		clay and gravel			Western estimated 2600 gpm at
402-411		gravel			1801 for summer of 1950
411-460		clay and gravel			
460-534		sticky dry clay			Collected by J. Y. Tucker
534-571		clay and gravel, fine streaks			
571-606		sticky clay			Typed by N. Martin 3/52
606-624		sand and clay streaks			
624-640		cemented sand and clay and gravel			
640-666		gravel and sand, fine			
666-670		clay			
670-702		gravel and sand			
700-703		gravel and sand			

M L  
X  
N P

SWC, 6-8-9

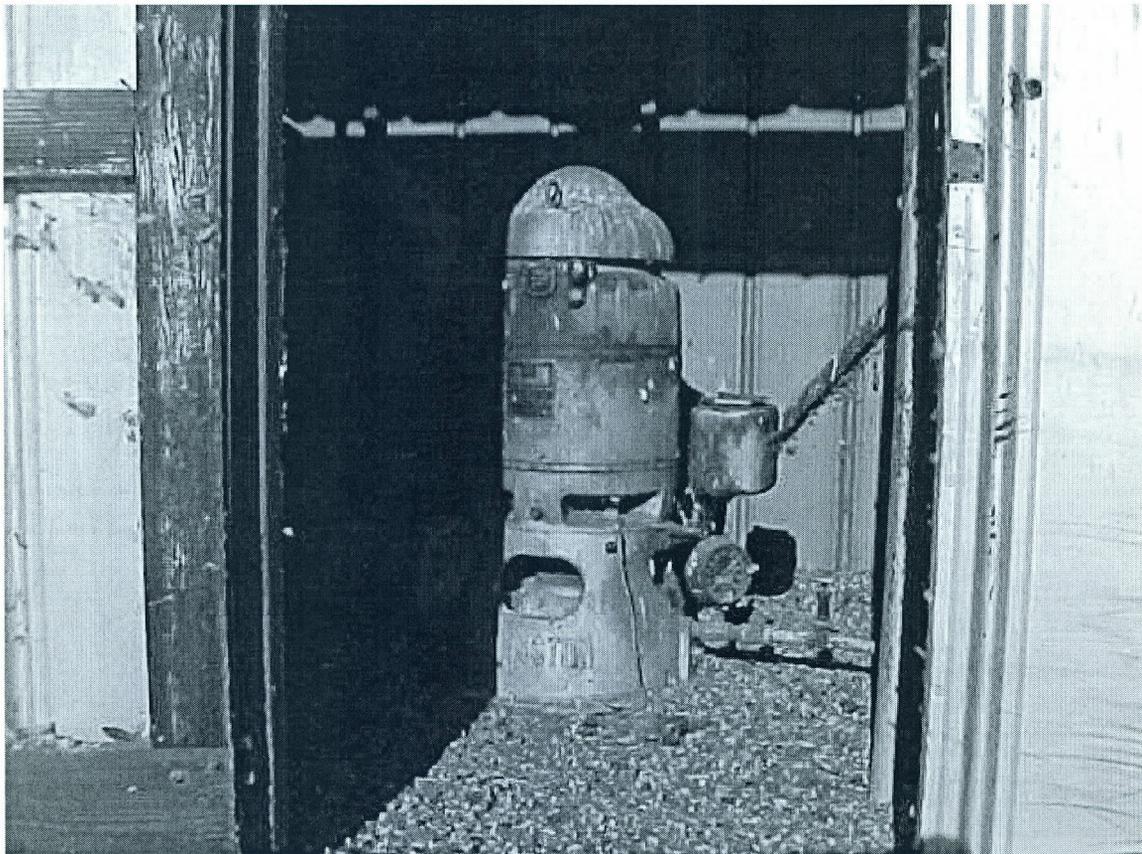
VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER  
NALF CROWS LANDING

Inactive Fire Water Supply Well 6S/8E-9M2 northwest of UST Cluster 2.  
View looking approximately south.  
Date of Photograph: July 2000



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Inactive Fire Water Supply Well 6S/8E-9M2 northwest of UST Cluster 2.  
View looking approximately south.  
Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Active Well 6S/8E-16M1 (Escobar)</b>		<p>Sources of Information: California Department of Water Resources (DWR) data package received by the Navy in July 2000.</p> <p>DWR records identify irrigation well (16-inch casing) constructed in 1943 by Western, San Jose with rotary drill; flows of 1,000 to 2,500 gpm. DWR log is available but is confidential. USGS well schedule form is available.</p> <p><b>Well is not located on facility property. Well is located more than 700 feet from Administration Area Plume.</b></p>

Company EL

Index WELL

State No. 65/8E-16M

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

DETAILED WELL DATA 11111 PFI/FAD CHA.

Owner ANTONIO ESCOBAR State No. 65/8E-16 M1 + USGS  
Address \_\_\_\_\_ Other No. 6-8-16 B USBR  
Tenant \_\_\_\_\_  
Address \_\_\_\_\_

Type of Well: Hydrograph  Key  Index  Semiannual   
Location: County STANISLAUS 5D Basin DELTA-MENDOTA No. 5-22.11

U.S.G.S. Quad. CROWS LANDING Quad. No. 5-316 6  
NW  $\frac{1}{4}$  SW  $\frac{1}{4}$  Section 16, Twp. 6S, Rge. 8E MD  
EP  
R Base & Meridian

Description 2000' N & 700' E / SW COR, 1/4 AC.  
USGS - 0.45 MI N/O IKE CROW RD, 0.1 MI E/O BELL RD.  
USBR - Dues east of flight tower of air field; white pump house with red roof.

Reference Point description BASE OF PUMP, EAST SIDE - 1 1/2" PIPE

which is 0.8 ft. above land surface. Ground Elevation 129.5 ft.

Reference Point Elev. 130.3 ft. Determined from \_\_\_\_\_

Well: Use TRIG 2 Condition 6 Depth 634 R. ft.  
Casing, size \_\_\_\_\_ in., perforations 82-630

Measurements By: DWR  USGS  USBR  County  Irr. Dist.  Water (1)  Cons. Dist.

Chief Aquifer: Name TRIG Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Type of Material \_\_\_\_\_ Perm. Rating \_\_\_\_\_ Thickness \_\_\_\_\_

Gravel Packed? Yes  No  Depth to Top Gr. \_\_\_\_\_ Depth to Bot. Gr. \_\_\_\_\_

Supp. Aquifer \_\_\_\_\_ Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Driller ADAMS, WESTERN, SAN JOSE

Date drilled 1943 Log, filed USBR 6-8-16 M1 open (1) \_\_\_\_\_ confidential (2) \_\_\_\_\_

Equipment: Pump, type TURB. make WESTERN

Serial No. \_\_\_\_\_ Size of discharge pipe 1.0 in. Water Analysis: Min. (1) \_\_\_\_\_ San. (2) \_\_\_\_\_ H.M. (3) \_\_\_\_\_

Power, Kind ELEC Make WESTINGHOUSE Water Levels available: Yes (1) \_\_\_\_\_ No \_\_\_\_\_

H. P. 100 Motor Serial No. \_\_\_\_\_ Period of Record: Begin 1-15-47 End \_\_\_\_\_

Elec. Meter No. 20964 Transformer No. \_\_\_\_\_ Collecting Agency: \_\_\_\_\_

Yield 2500 G.P.M. Pumping level \_\_\_\_\_ ft. Prod. Rec. (1) \_\_\_\_\_ Pump Test (2) \_\_\_\_\_ Yield (3) \_\_\_\_\_

**DESTROYED**

SKETCH



REMARKS

160' DRAWDOWN  
Stig DTW = 721 (1-47)

6S/08E-16M01 M ~~168~~ 5-22.11 5050 1

1 2 50 6 0130.3 0129.5 0634

2 45 0043.2 10/10/60

6S/08E-16M01 M 168 5-22.11 6001 1

1 2 50 6 0130.3 0129.5 0634

2 45 0053.6 03/20/61

Recorded by: SH Adams From 11 SRD #.51

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
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<p><b>Inactive Well 6S/8E-17D1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>CLAY: 15-35            CLAY&amp;GRAVEL: 35-52            CLAY: 52-75            CLAY&amp;GRAVEL: 75-126            GRAVEL&amp;CLAY STREAKS: 126-131            GRAVEL: 131-144            CLAY: 144-148            GRAVEL: 148-155            CLAY: 155-167            GRAVEL: 167-188            CLAY: 188-208            GRAVEL: 208-214            BLUE CLAY: 214-304            GRAVEL: 304-312            CLAY: 312-319            GRAVEL: 319-322            CLAY, GRAVEL STREAKS: 322-338            GRAVEL: 338-343            CLAY: 343-345            GRAVEL: 345-349            CLAY: 349-420            CLAY, GRAVEL STREAKS: 420-430            CLAY&amp;GRAVEL: 430-447</p>	<p>Boring depth 447 feet.</p> <p>DWR log states that perforation log is not available.</p>	<p>Sources of Information: PRC, 1993; California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR records indicate the irrigation well was constructed in approximately 1939 (Howk, Crows Landing, Rotary Drill) and the pump was pulled in 1952; reported to be welded shut.</p> <p>DWR log is available.</p> <p><b>The well is located on facility property in the vicinity of IRP Site 13. The well was inspected on 25 July 2000.</b></p>
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# 6/8-17DI

**CONFIDENTIAL**  
Water Code Sec. 13752

SR-354 (Rev. 5-22)  
Bureau of Reclamation

DEC

SLI: 20

ISO Elev. 151

6/8-17DI (G.S.)

County Stanislaus Corner Nat. Labor U.S.G.P. No. 6-8-17  
 State Calif. Use Irrigation Local No. Well #2  
 Owner Opastimba Driller Hawk Cross Landing Date 1939.2  
 Location 1800' S. 200' E. NE corner

Point Elev. 493 Groundwater elev. 493 Date 2/13/48  
 Point Elev. 447 Groundwater elev. 431.6 Date 2/1/51  
 Point Elev. \_\_\_\_\_ Artesian \_\_\_\_\_  
 Point Elev. \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Point Elev. \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_

Source of data Hawk's files Type Well Rotary \_\_\_\_\_ Diam. hole \_\_\_\_\_

0-15	G 5	Top soil	
15-34	C 20	clay	Well Measuring No. 6-8-17
35-42	G 15	clay and gravel	Pump pulled in Spring 1952
52-75	C 23	clay	No perforation log
75-126	C 51/26	clay and gravel	No pump test
126-131	F 5	gravel & clay streaks	No pump test
131-144	G 13	gravel	
144-148	C 4	clay	No E log
148-155	G 7	gravel	
155-167	C 12	clay	Collected by Jorgensen and Woolfe
167-188	G 21	gravel	10/50
188-208	C 12	clay	
208-214		gravel	Location and identity by Hawk
214-304		BLUE CLAY	
304-312		gravel	Typed by N. Martin 3/25/52
312-319		clay	
319-322		gravel	
322-338		clay, gravel streaks	
338-343		gravel	
343-345		clay	
345-347		gravel	
349-420		clay	
420-430		clay, gravel streaks	
430-447		clay and gravel	

	50	100	200
G			41
S			
F			5
Gg	60	2	
C	20	48	64
	10	50	100

X D C  
E F

6-8-17

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Inactive Well</b>  <b>6S/8E-17P1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>TOPSOIL: 0-13            CLAY&amp;GRAVEL: 13-29            CLAY: 29-34            CLAY&amp;GRAVEL: 34-42            CLAY: 42-49            CLAY, GRAVEL STREAKS: 49-66            SAND&amp;GRAVEL: 66-96            CLAY&amp;GRAVEL: 96-106            CLAY: 106-125            GRAVEL: 125-161            SAND&amp;GRAVEL, CLAY STREAKS: 161-190            SAND&amp;GRAVEL: 190-205            CLAY: 205-210            SAND&amp;GRAVEL: 210-220            CLAY: 220-250            SANDY CLAY (BLUE CLAY??): 250-265            CLAY: 265-280            CLAY&amp;GRAVEL: 280-309            GRAVEL: 309-314            CLAY&amp;GRAVEL: 314-342            CLAY: 342-364            GRAVEL: 364-369            CLAY: 369-375            CLAY&amp;GRAVEL: 375-385            SAND&amp;GRAVEL: 385-402            CLAY: 402-405            CLAY&amp;GRAVEL: 405-413            CLAY: 413-489            SAND&amp;GRAVEL: 489-506            CLAY&amp;GRAVEL: 506-509            CLAY: 509-521            CLAY&amp;GRAVEL: 521-539            CLAY: 539-560            CLAY&amp;GRAVEL: 560-573            GRAVEL: 573-593            INTERBEDDED CLAY&amp;GRAVEL: 593-623</p>	<p>Perforated intervals (feet bgs):</p> <p>188-224</p> <p>278-344</p> <p>362-372</p> <p>380-428</p> <p>476-548</p> <p>572-620</p>	<p>Sources of Information: California Department of Water Resources (DWR) data package received by the Navy in July 2000; visual inspection of Summer 2000; Final Irrigation Practices Technical Memorandum (PRC 1993).</p> <p>Irrigation well constructed (by Howk, Crows Landing with rotary drill) in 1949 in the vicinity of Site 13. DWR records indicate Navy is tenant; owner: Shoemake. Flow: 2,000 gpm.</p> <p>The well site is located on facility property. The site was inspected on 25 July 2000. The well has been welded shut according to PRC 1993.</p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 16 July 1952 Field No. 4/S-17PI  
Record by D.W. Brown Jack Green Office No. \_\_\_\_\_  
Source of data F.I.

1. Location: State California County Stanislaus  
Map Crows Landing

2. Owner: SD Address \_\_\_\_\_  
Tenant: U.S. Navy Address \_\_\_\_\_  
Driller: Heub Address Crows Landing

3. Topography: Plain

4. Elevation: 155 ft. above S.L.

5. Type: Dug, drilled, driven, bored, jetted 1949

6. Depth: Rept 662 ft. Meas. \_\_\_\_\_ ft.

7. Casing: Diam. 16 in. to \_\_\_\_\_ in. Type \_\_\_\_\_  
Depth \_\_\_\_\_ ft. Finish \_\_\_\_\_

8. Chief Aquifer: Perk From 177 ft. to 572 ft.

9. Water level: No access ft. rept. \_\_\_\_\_ 19 \_\_\_\_\_ above \_\_\_\_\_ below \_\_\_\_\_  
meas. \_\_\_\_\_ which is \_\_\_\_\_ ft. above surface \_\_\_\_\_ below surface \_\_\_\_\_

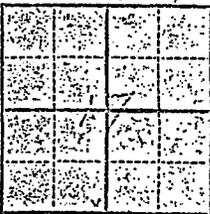
10. Pump: Type 1 1/2" Perkin Capacity \_\_\_\_\_ G.M.  
Power Kind: EL-C-E Horsepower 100

11. Yield: Flow \_\_\_\_\_ G.M. Pump \_\_\_\_\_ G.M. Meas. Est.  
Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G.M.

12. Use: Dom. Stock PS RR. Ind. Irr. Obs. \_\_\_\_\_  
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F  
Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) Perk



1700

0.48 Miles east of Union Road  
150 Ft. north of section line (The Crow Rd.)

P.G. & E. Locat. No. - 3743

Meter No. 13546

Trans. No. \_\_\_\_\_

Disc. Diam. 10" Length 10' south to

Remarks \_\_\_\_\_ cement & metal standpipe

PEC

6/8-17P1

Elev. 159

CONFIDENTIAL  
Water Code Sec. 13732

(CONT.)

On U. S. Navy property

County Stanislaus Owner Shoemaker & Sons U.S.D.R. No. 6-8-17 (G.S.)  
 Dist. Delta Use Irrigation Local No. Well #1  
 Cond. Orestimba Driller Hawk Grounding Date January 1949  
 Location 220' N & 2600' E SW corner

Surf. Elev. 155 Groundwater elev. Not yet measured Date 4/21/52  
 Depth 662 Groundwater elev. \_\_\_\_\_ Date \_\_\_\_\_  
 Yield \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Casing No casing data % Sand-gravel \_\_\_\_\_

Source of data Hawk's files Type drill Rotary Diam. hole \_\_\_\_\_

Depth	Elev.	Thick	Description				
0-13	159	3	Topsoil				
13-29	159	16	clay and gravel				Well Measuring No. <u>6-8-17A</u>
29-34	159	5	clay				
34-42	159	8	clay and gravel				Pump Test
42-49	159	7	clay				3 minute static @ 110 foot
49-65	159	17/160	clay, gravel streaks				1700 gpm from 129'
65-94	159	30	sand and gravel				2000 " " 132'
94-106	159	4/16	clay and gravel				
106-125	159	19	clay				Has an E-log dated 2/2/49
125-161	159	36	gravel				
161-190	159	29	sand and gravel, clay streaks				Collected by Woolfe 8/50
190-205	159	15	sand and gravel				
205-210	159		clay				E-log release obtained from
210-220	159		sand and gravel				Shoemaker by Boyd, 7/51
220-250	159		clay				
250-265	159		sandy clay (220-280 BLUE?? CLAY)				Identity and location by Hawk
265-280	159		clay				
280-309	159		clay and gravel				
309-314	159		gravel				Perforation Log
314-342	159		clay and gravel				138-224
342-364	159		clay	50	100	200	278-344
364-369	159		gravel	G	30	46	362-372
369-375	159		clay	S			380-428
375-385	159		clay and gravel	F		49	476-548
385-402	159		sand and gravel	G	48	20	572-620
402-405	159		clay	C	12	11	
405-413	159		clay and gravel		44	50	100
413-489	159		clay				
489-505	159		sand and gravel				Typed by N. Martin 3/18/52
505-522	159		clay and gravel				
522-529	159		clay				
529-539	159		clay and gravel				
539-560	159		clay				
560-573	159		clay and gravel				
573-591	159		gravel				
591-623	159		interbedded clay and gravel				

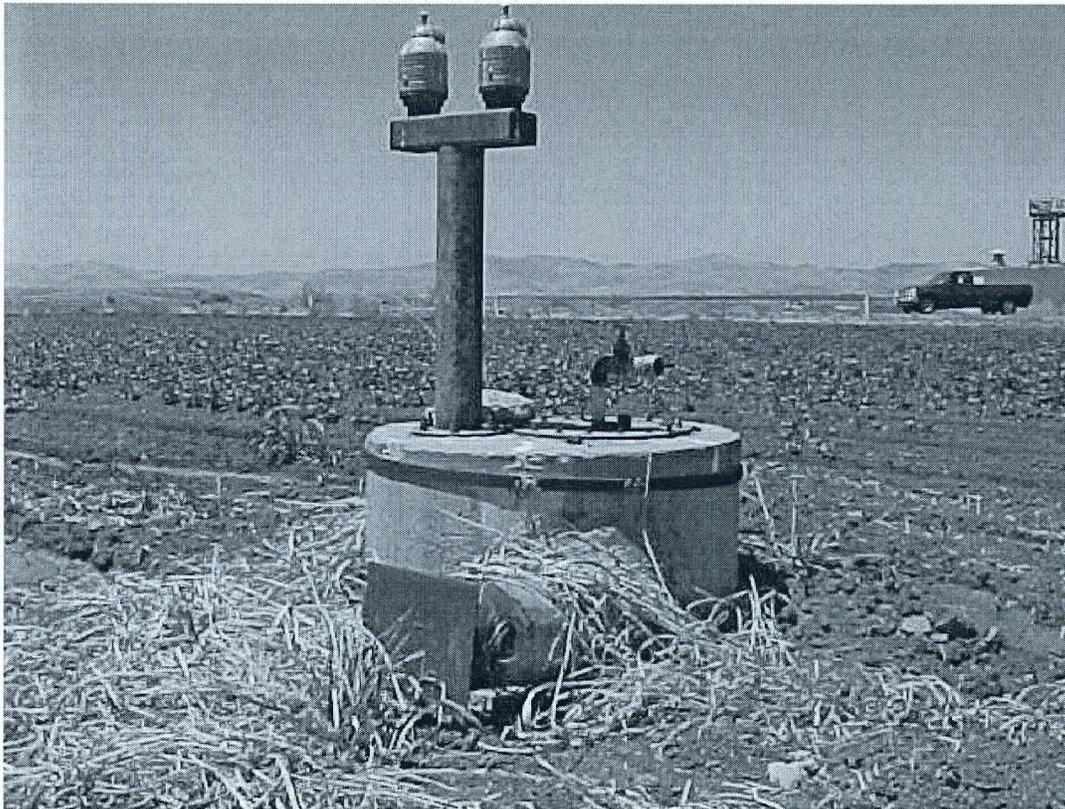
M I  
E P

CONTINUED



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Inactive Irrigation Well 6S/8E-17P1 north of and near Ike Crow Road and north of  
IRP Site 13 (TACAN Transformer Spill Area).  
View looking approximately west.  
Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Active Well</b>  <b>6S/8E-20 (NALF)</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>CLAY: 0-25            SAND: 25-30            CLAY: 30-85            GRAVEL: 85-88            CLAY: 88-92            GRAVEL: 92-95            CLAY: 95-110            FINE SAND: 110-112            CLAY: 112-113            FINE SAND: 113-116            CLAY: 116-125            GRAVEL: 125-134            CLAY: 134-140            GRAVEL: 140-175            GRAVEL STREAKS: 175-180            SAND &amp; GRAVEL: 180-190            SAND STREAKS: 190-195            GRAVEL: 195-205            GRAVEL W/CLAY STREAKS: 205-220            BLUE CLAY: 220-245            FINE BLUE SAND: 245-249            BLUE CLAY: 249-290            CLAY: 290-318            SUPER FINE SAND: 318-323            CLAY&amp;SILT: 323-365            FINE SAND STREAKS: 365-380            CLAY&amp;SILT: 380-440            SAND STREAKS: 440-460            CLAY&amp;SILT: 460-500            SUPER FINE SAND STREAKS: 500-515</p>	<p>Screened interval:            122 - 250 feet            (600-foot boring)</p>	<p>Sources of Information: California Department of Water Resources (DWR) data package received by the Navy in July 2000; visual inspection of Summer 2000; Final Irrigation Practices Technical Memorandum (PRC 1993).</p> <p>The well was owned by the Navy (Western Division, NAVFACENGCOM, San Bruno); constructed under Stanislaus County Permit 92-110 dated 20 May 1992; planned use: irrigation; 16-inch diameter well constructed by Calwater Drilling (Turlock) 1992.</p> <p>Well produces approximately 2,500 gallons and was used for approximately 30 to 60 days during the year (pumping 24 hours per day) per EFA-West lease/natural resources manager.</p> <p>Record of well pumping activities for the year 2001 is available.</p> <p>DWR log (record 498241) is available.</p> <p><b>The well is located on facility property. The well was inspected on 25 July 2000.</b></p>



ORIGINAL  
File with DWR

6/8-20

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.			
LATITUDE		LONGITUDE	
APN/TRS/OTHER			

Page 1 of 1  
 Owner's Well No. \_\_\_\_\_ No. 498241  
 Date Work Began \_\_\_\_\_ Ended June, 1992  
 Local Permit Agency Stanislaus Co. Dept. of Env. Resources  
 Permit No. 92-110 Permit Date 5-20-92

**GEOLOGIC LOG**

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	25	Clay
25	30	Sand
30	85	Clay
85	88	Gravel
88	92	Clay 515 - 520 Tight gravel
92	95	Gravel 520 - 575 Clay/sand streaks
95	110	Clay 575 - 600 Setup gravel
110	112	Fine sand streaks
112	113	Clay
113	116	Fine sand
116	125	Clay
125	134	gravel
134	140	Clay
140	175	Gravel
175	180	Gravel streaks
180	190	Sand and gravel
190	195	Sand streaks
195	205	Gravel
205	220	Gravel w/clay streaks
220	245	Blue clay
245	249	Fine blue sand
249	290	Blue clay
290	318	Clay
318	323	Super fine sand
323	365	Clay and silt
365	380	Fine sand streaks
380	440	Clay and silt
440	460	Sand streaks
460	500	Clay and silt
500	515	Super fine sand streaks

ORIENTATION (∠)  VERTICAL \_\_\_\_\_ HORIZONTAL \_\_\_\_\_ ANGLE \_\_\_\_\_ (SPECIFY)  
 DEPTH TO FIRST WATER \_\_\_\_\_ (FL) BELOW SURFACE  
 Describe material, grain size, color, etc.

**WELL OWNER**

Name Dept. of the Navy, Western Division  
 Mailing Address San Bruno, CA.  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
 WELL LOCATION  
 Address Bell Rd. Crows Indng Naval Airst  
 City Crows Landing, CA.  
 County Stanislaus  
 APN Book \_\_\_\_\_ Page \_\_\_\_\_ Parcel \_\_\_\_\_  
 Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
 Latitude \_\_\_\_\_ NORTH \_\_\_\_\_ WEST \_\_\_\_\_  
 Longitude \_\_\_\_\_ DEG. MIN. SEC. \_\_\_\_\_

**LOCATION SKETCH**

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

**ACTIVITY (∠)**

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

COMPOSITE

DRILLING METHOD Mud rotary FLUID Water  
 WATER LEVEL & YIELD OF COMPLETED WELL  
 DEPTH OF STATIC WATER LEVEL \_\_\_\_\_ (FL) & DATE MEASURED \_\_\_\_\_  
 ESTIMATED YIELD\* \_\_\_\_\_ (GPM) & TEST TYPE \_\_\_\_\_  
 TEST LENGTH \_\_\_\_\_ (Hrs.) TOTAL DRAWDOWN \_\_\_\_\_ (FL.)  
 \* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE	ANNULAR MATERIAL				
		TYPE (∠)				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)		GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Ft.	to Ft.	BLANK	SERLIN	CIN. CON.	DUCLOR			FILL PIPE			Ft.	to Ft.	CE-MENT (∠)
0	122	26"	X				Steel	16"	1/2"				
122	250	"	X				"	"	"			1/2 X .012	
250	270	"	X				.020% Copper bearing metal					Doerr Metal	gravel pack

**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 Calwater Drilling Co., Inc.  
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
300 S. Kilroy Turlock, CA. 95380  
 ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
 Signed Wendee Chandler, Bkkr. 7-8-92 321252  
 WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Inactive Well 6S/8E-20A1</b>	Unknown	<p>Sources of Information: Stanislaus County records and California Department of Health Services, Office of Drinking Water correspondence. California Department of Water Resources data package received by the Navy in July 2000.</p> <p>The well was used by the Navy for domestic water supply, however, the period of operation is not known. Correspondence from 1993 indicates that this well may have been closed</p> <p>DWR well data form available.</p> <p><b>The well is located on facility property. The well was located near the intersection of Bell Road and Ike Crow Road according to historical correspondence. The well site vicinity was visually inspected in July 2000.</b></p>



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Location of Former Irrigation Well 6S/8E-20A1 located near corner of Bell Road  
and Ike Crow Road.

View looking approximately south parallel to Bell Road.

Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Active Well</b>  <b>6S/8E-20C1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>SANDY LOAM: 3-24            SANDY CLAY: 24-56            CEMENTED CLAY&amp;GRAVEL: 56-70            CLAY: 70-80            GRAVEL: 80-90            SANDY CLAY: 90-100            CLAY: 100-134            CLAY&amp;GRAVEL: 134-144            CEMENTED GRAVEL: 144-150            CLAY&amp;GRAVEL: 150-158            GRAVEL&amp;CLAY STREAKS: 158-172            CEMENTED GRAVEL&amp;CLAY: 172-180            GRAVEL&amp;CLAY STREAKS: 180-194            CEMENTED CLAY&amp;GRAVEL: 194-212            SANDY BLUE CLAY: 212-290            SANDY CLAY: 290-308            CEMENTED GRAVEL: 308-315            SANDY CLAY: 315-364            HARD CLAY&amp;GRAVEL: 364-385            CEMENTED CLAY&amp;GRAVEL: 385-405            STICKY CLAY: 405-455            SANDY CLAY: 455-467            CEMENTED GRAVEL: 467-470            CLAY: 470-482            SAND &amp; GRAVEL: 482-509            CLAY: 509-520            STICKY GRAVEL&amp;CLAY: 520-530            HARD CEMENTED CLAY: 530-534            BOULDERS: 534-538            CLAY&amp;GRAVEL: 538-550            GRAVEL&amp;CLAY STREAKS: 550-599            CEMENTED GRAVEL: 599-603            STICKY CLAY: 603-614            ROCK: 614-619</p>	<p>Perforations (feet bgs):</p> <p>144-208            306-312            384-408            480-512            528-540            552-600</p>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>Constructed 1945 (Rotary Drill, 16-inch diameter casing) by Western, San Jose. One DWR log identifies Navy as tenant and no owner identified; one DWR log identifies Beltram Brothers as owners</p> <p>Record of well pumping activities for the year 2001 is available.</p> <p>Well produces approximately 1,200 gallons and was used for approximately 10-15 days during the year 2000 (pumping 24 hours per day) per EFA-West lease/natural resources manager.</p> <p><b>The well is located west of Site 13 on facility property. The well was observed in operation on 25 July 2000.</b></p>



9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 16 June 1952 Field No. 46-2001  
Record by D.W. Brown Jack Green Office No. \_\_\_\_\_  
Source of data E.I.

1. Location: State California County Stanislaus  
Map Greens Landing  
N.E. 1/4 N.W. 1/4 sec. 20 T. 6 N. R. 8 E

2. Owner California Address \_\_\_\_\_  
Tenant U.S. Navy Address \_\_\_\_\_  
Driller Western Address San Jose

3. Topography Plain  
4. Elevation 160 ft. above 57 ft. below

5. Type: Dug, drilled, driven, bored, jetted 2-10-45  
6. Depth: Rept. 397 ft. Meas. \_\_\_\_\_ ft.

7. Casing: Diam. 16 in. to 12 in. Type \_\_\_\_\_  
Depth 600 ft. Finish \_\_\_\_\_

8. Chief Aquifer Perf. From 523-67 ft. to \_\_\_\_\_ ft.  
Others \_\_\_\_\_

9. Water level Na access ft. rept. \_\_\_\_\_ 19 \_\_\_\_\_ above  
meas. \_\_\_\_\_ below  
which is \_\_\_\_\_ ft. above  
below surface

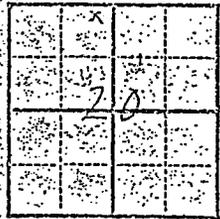
10. Pump: Type Trip Perfor Capacity \_\_\_\_\_ G.M.  
Power: Kind Ele. G.M. Horsepower 75

11. Yield: Flow \_\_\_\_\_ G.M. Pump \_\_\_\_\_ G.M. Meas. Rept. Est. \_\_\_\_\_  
Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G.M.

12. Use: Dom., Stock, PS., RR., Ind.  (Ir.) Obs. (Unused) 68  
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F  
Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) D.I.



2001

0.35 Mi. east of Davis Road  
75 Ft. south of north section line  
(also Green Rd)

P.G. & E. Locat. No. - 3734  
Meter No. 54027

Trans. No. \_\_\_\_\_

Disc. Diam. 10'

Remarks \_\_\_\_\_

Length 10' south to  
cement + metal standpipe

WL = 90' (27)

PEG 6/8-20C1

CONFIDENTIAL

FD-259 (Rev. 5-11)  
Bureau of Reclamation

WELL LOG

Well Elev. 162

(CONT.)

County Stanislaus Owner Beltram Bros. U.S.B.M. No. 6-8-20 C 10 31  
 Dist. Delta Use Irrigation Local No. Well #2  
 Land. Orestimba Driller Western, San Jose Date Feb. 1945  
 Location 120' S and 1800' E, NW corner

Surf. Elev. 160 Groundwater elev. 455.8 Date 2/18/47  
 Depth 700' Groundwater elev. 425.3 Date 2/1/51  
 (See) \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Casing 300', 16" D-12 (Sand-gravel)  
 300', 12" D-12 Diam. hole - 350'-30" 250'-26"  
 Source of logs Western's files Type drill Rotary Diam. hole \_\_\_\_\_

Depth	Thick.	Description	Notes
0-3		surface soil	
3-24	G 14	sandy loam	Well Measuring No. 6-8-20
24-56	G 26/6	sandy clay	
56-70	G 14	cemented clay and gravel	Perforation Log
70-80	C 10	clay	144-208
80-90	G 10	gravel	306-312
90-100	G 10	sandy clay	384-408
100-134	G 34	clay	480-512
134-144	G 10	clay and gravel	528-540
144-150	G 6	cemented gravel	552-600
150-158	G 8	clay and gravel	
158-172	F 14	gravel and clay streaks	No pump test available
172-194	G 8	cemented gravel and clay	
180-194	F 14	gravel and clay streaks	Collected by Wolfe 9/50
194-212	G 6	cemented clay and gravel	
212-240		SANDY BLUE CLAY	Located by Boyd 8/22/51
240-308		sandy clay	well #2
308-315		cemented gravel	
315-368		sandy clay	Test Bore #5
368-385		hard clay and gravel	
385-405		cemented clay and gravel	No E log
405-455		sticky clay	
455-467		sandy clay	
467-470		cemented gravel	Typed by N. Martin 3/22/52
470-482		clay	
482-509		sand and gravel	
509-520		clay	
520-530		sticky gravel and clay	
530-534		hard cemented clay	
534-538		boulders	
538-550		clay and gravel	
550-579		gravel and clay streaks	
579-603		cemented gravel	
603-624		sticky clay	
624-629		rock	
629-629		cemented gravel	

	50	100	200
G		1/6	
S			
F			1/8
SL	40	30	30
C		10	3/4
	40	50	101

X  
D C  
E F

CONTINUED

6/8-2001

2

Revised (10-51)  
Means of Reclamation

WELL LOG

(CONT.)

County Stanislaus Corner Beltram Bros U.S.G.S. No. 6-8-20 01  
 Dist. Delta Use Irrigation Loc. No. Well #2  
 Quad. Orestimba Driller Western, San Jose Date February 1945  
 Location 100' S and 1800' E, NW corner

Surf. Elev. 760 Groundwater elev. \_\_\_\_\_ Date \_\_\_\_\_  
 Depth 700' Groundwater elev. \_\_\_\_\_ Date \_\_\_\_\_  
 Yield \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Casing \_\_\_\_\_ & Sand-gravel \_\_\_\_\_

Source of data Western's files Type drill Rotary Diam. hole \_\_\_\_\_

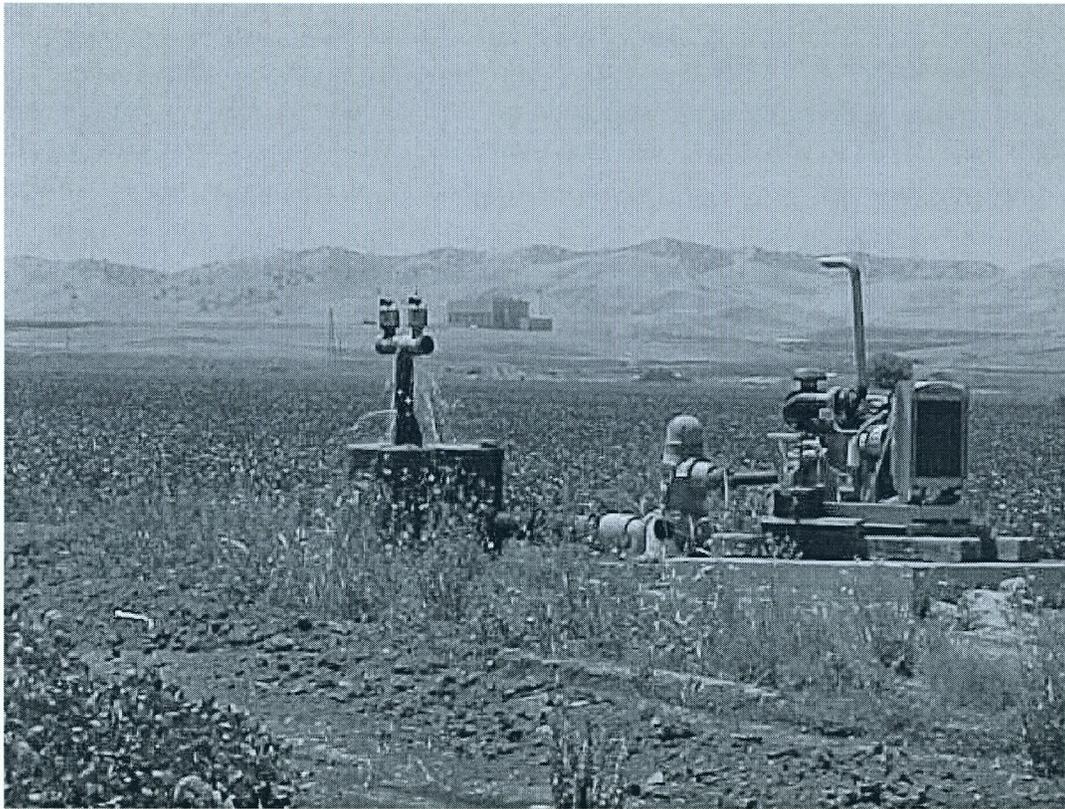
Depth	Elev.	Thick	Description
629-635			rock
635-643			"
643-647			"
647-678			sandy clay and gravel, sticky
678-700			" " " " "

	X
D	C
E	P

## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Active Irrigation Well 6S/8E-20C1 south of and adjacent to Ike Crow Road.  
The well is located more than 2,000 feet west-southwest of the western boundary  
of the Administration Area Plume. View looking southwest.

Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Inactive Well 6S/8E-20D1</b>	Perforations (feet bgs):  218-242 290-346 353-358 418-480 490-538 550-562 595-600 610-658	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>Constructed in 1948 on former Navy property. DWR log identifies 1,350 gpm during pump test. Well boring was 721 feet deep.</p> <p>DWR log is available.</p> <p><b>The well is located on facility property, more than 3,000 feet west of the southern section of the Administration Area Plume. The well was inspected during July 2000.</b></p>

*Confront*

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

WELL DATA

Owner <u>M.S. BRINKLAW</u>	State No. <u>65/8E-20D1</u>
Address _____	Other No. <u>6-8-20 B</u>
Tenant _____	<u>#1</u>
Address _____	

Type of Well: Hydrograph  Key  Index  Semiannual

Location: County STANISLAUS Basin DELTA-MENDOTA No. 5-22-11

U.S.G.S. Quad. CROWS LANDING Quad. No. 5-316 b

NW 1/4 NW 1/4 Section 20, Twp. 6 S., Rge. 8 E <sup>MD</sup> Base & Meridian

Description 0.20 mi S. E 80' E/0 NW Cor., 1/4 P.H., 50' S/0 PAVED RD  
TO AIRFIELD  
50' E/0 West sect. road (Davis Rd)  
50' S/0 North sect. line (Eke Crow Rd)

Reference Point description T.O.C.

which is 0.5 ft. above land surface. Ground Elevation 170.5 ft.

Reference Point Elev. 171.0 ft. Determined from \_\_\_\_\_

Well: Use Dom. Condition \_\_\_\_\_ Depth 721 R. ft.

Casing, size 1 1/2 in., perforations 218-658

Measurements By: DWR  USGS  USBR  County  Irr. Dist.  Water Dist.  Cons. Dist.

Chief Aquifer: Name \_\_\_\_\_ Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Type of Material \_\_\_\_\_ Perm. Rating \_\_\_\_\_ Thickness \_\_\_\_\_

Gravel Packed? Yes  No  Depth to Top Gr. \_\_\_\_\_ Depth to Bot. Gr. \_\_\_\_\_

Supp. Aquifer \_\_\_\_\_ Depth to Top Aq. \_\_\_\_\_ Depth to Bot. Aq. \_\_\_\_\_

Driller HAWK - CROWS LANDING

Date drilled JAN - 1948 Log, filed U.S.B.R. 6-8-20D1 open (1) \_\_\_\_\_ confidential (2) \_\_\_\_\_

Equipment: Pump, type PRESSURE make Peerless

Serial No. \_\_\_\_\_ Size of discharge pipe 10 in. Water Analysis: Min. (1) \_\_\_\_\_ San. (2) \_\_\_\_\_ H.M. (3) \_\_\_\_\_

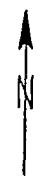
Power, Kind \_\_\_\_\_ Make \_\_\_\_\_ Water Levels available: Yes (1) \_\_\_\_\_ No \_\_\_\_\_

H. P. 100 Motor Serial No. \_\_\_\_\_ Period of Record: Begin 3-21-52 End \_\_\_\_\_

Elec. Meter No. 74813 Transformer No. \_\_\_\_\_ Collecting Agency: \_\_\_\_\_

Yield 1350 G.P.M. Pumping level \_\_\_\_\_ ft. Prod. Rec. (1) \_\_\_\_\_ Pump Test (2) \_\_\_\_\_ Yield (3) \_\_\_\_\_

SKETCH



REMARKS

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

065/08E-20D01 M 5-22.11 5001 5

R 1 1 2 50 6 0171.0 0170.5  
 2 52 0028.0 03/21/52

Recorded by: S.H. ADAMS From USBR #51  
 Date 9-17-62

# 6/8-2001

①

U.S. Geol. Surv.  
Bureau of Reclamation

PEG

1972 Elev. 192

CONFIDENTIAL

WELL LOG

(CONT.)

(On Mary Bacon Ranch)

County Stanislaus Owner Crillylaw U.S.P.M. No. 6-B-2001 (G.S.)  
 Dist. Delta Use Irrigation Local No. Well #1  
 Quad. Oraylega Driller Hove, Crews Landing date Jan. 1948  
 Location 50' S, 50' E, NW corner

Surf. Elev. 572 Groundwater ~~XXXX~~ 143' Date 3/21/52  
 Depth 721 Groundwater elev. \_\_\_\_\_ Date \_\_\_\_\_  
 Yield \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Drawdown \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Casing No data available 1 Sand-gravel

Source of data Hove's files Type drill Rotary Diam. hole \_\_\_\_\_

Depth Elev. Thick Description

Depth	Elev.	Thick	Description				
0-8			top soil				
8-14		6	sandy clay				Well Measuring No. 6-8-208
14-20		6	clay and gravel				
20-59		39	clay				Perforation Log
59-62		3	clay and gravel				218-242
62-70		8	sand and gravel				290-346
70-80		10	clay				353-358
80-82		2	gravel				418-480
82-100		18	clay		G	50	100 200
100-109		9	gravel		S		46
109-128		19	clay		F		10
128-145		17	gravel		G	10	3 14
145-155		10	gravel, clay streaks		C	30	37 36
155-169		14	sand and gravel			48	50 10
169-183		14	clay and gravel				Pump Test
183-200		17	BLUE CLAY				1350 gpm at 210'
200-297		97	clay, gravel streaks				Static Water Level 155'
297-311		14	clay and gravel				Collected by Jorgensen and Woolfo
311-320		9	clay				10/26/50
320-338		18	clay and gravel				
338-367		29	clay				No R Log
367-373		6	clay and gravel				
373-426		53	clay				Location and Identity by Hove
426-430		4	clay and gravel				
430-475		45	sand and gravel				
475-478		3	gravel				Typed by N. Martin 3/19/52
478-493		15	clay and gravel streaks				
493-511		18	clay and gravel streaks				
511-519		8	gravel				
519-527		8	clay, gravel streaks				
527-536		9	gravel				
536-550		14	clay				
550-552		2	sand and gravel				
552-554		2	clay				
554-560		6	sand and gravel				
560-569		9	clay and gravel				

CONTINUED

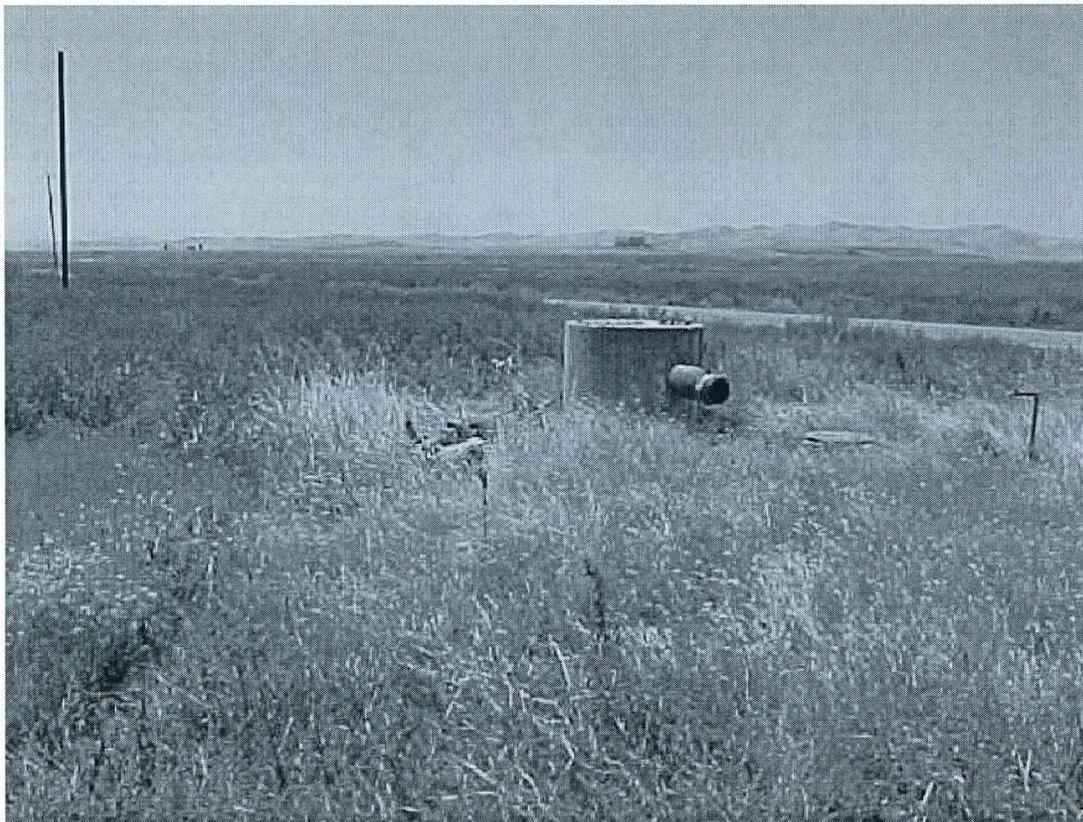
D	C
E	P



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Location of Former Irrigation Well 6S/8E-20D1 located near the corner of Davis Road and Ike Crow Road (not located on former NALF Crows Landing property).  
The well is located more than 5,000 feet west of Bell Road.

Date of Photograph: July 2000



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Closest residence located west of the facility (near irrigation well 6S/8E-20D1), more than 5,000 feet west of Bell Road at the northwest corner of Ike Crow Road and Davis Road (with Ike Crow Road at center of photograph).

View looking west.

Date of Photograph: 23 May 2001



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Inactive Well</b>  <b>6S/8E-20H1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>0 - 18 topsoil and sediment            18 - 22 yellow sand            22 - 61 " clay            61 - 63 sandstone and clay            63 - 70 small gravel and sand stone            70 - 74 clay and sandstone            74 - 95 clay, hard            95 - 103 sand and gravel, fair            103 - 117 clay            117 - 119 clay and gravel            119 - 138 hard clay            138 - 139 clay and sandstone            139 - 150 hard clay            150 - 162 small loose gravel, sand            162 - 178 medium gravel, sand            178 - 188 large gravel            188 - 193 medium gravel            193 - 198 clay and gravel            198 - 208 large gravel            208 - 213 large gravel            213 - 224 large gravel            224 - 226 clay and gravel            226 - 255 sticky gray clay            255 - 260 medium loose gravel            260 - 297 blue clay            297 bottom</p>	<p>Perforated intervals (feet bgs):</p> <p>170 - 225            255 - 270?</p>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR records indicate that the well was constructed in 1949; depth of 620 feet; 16-inch casing to 264 feet and 14-inch casing to bottom of well; flow: 2,000 gpm. Well was located near Bell Road and south of Ike Crow Road on facility property (per DWR sketch).</p> <p>The well was used by the Navy according to DHS correspondence dated 1993. DHS correspondence is available.</p> <p><b>The well was located on facility property. The location of the former well was inspected in July 2000.</b></p>

9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date July 13, 1952 Field No. \_\_\_\_\_  
Record by D.W. Brown & Jack Green Office No. \_\_\_\_\_  
Source of data: OTHER # 1

6/8-2041

1. Location: State California D. Mandote County Stanislaus

Map Census Landings  
S.E. 1/4 NE 1/4 sec. 20 T. 6 N. R. 8 E. 1/2

2. Owner: Census Landings Air Station - Navy Address \_\_\_\_\_

Tenant \_\_\_\_\_ Address \_\_\_\_\_

Driller Alcub Address Census Landings

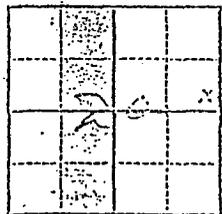
3. Topography Plain

4. Elevation 154 ft. above S.L. below

5. Type: Dug, drilled, driven, bored, jetted 1943

6. Depth: Rept. 297 ft. Meas. \_\_\_\_\_ ft.

7. Casing: Diam. 12 in., to \_\_\_\_\_ in., Type \_\_\_\_\_  
Depth \_\_\_\_\_ ft., Finish \_\_\_\_\_



8. Chief Aquifer Psst From 120-125 ft. to 250-255 ft.

Others \_\_\_\_\_

9. Water level Pump house locked ft. 19 above 1 below  
\_\_\_\_\_ which is \_\_\_\_\_ ft. above 1 below surface

10. Pump: Type Tur Capacity \_\_\_\_\_ G. M.

Power: Kind Elec. Horsepower \_\_\_\_\_

11. Yield: Flow \_\_\_\_\_ G. M., Pump 450 @ 125 117 G. M., Meas. (Rept. Est.)

Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G. M.

12. Use: Dom., Stock, PS., RR., Ind., Irr., Obs.

Adequacy, permanency \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F.

Taste, odor, color \_\_\_\_\_ Sample: Yes \_\_\_\_\_ No \_\_\_\_\_

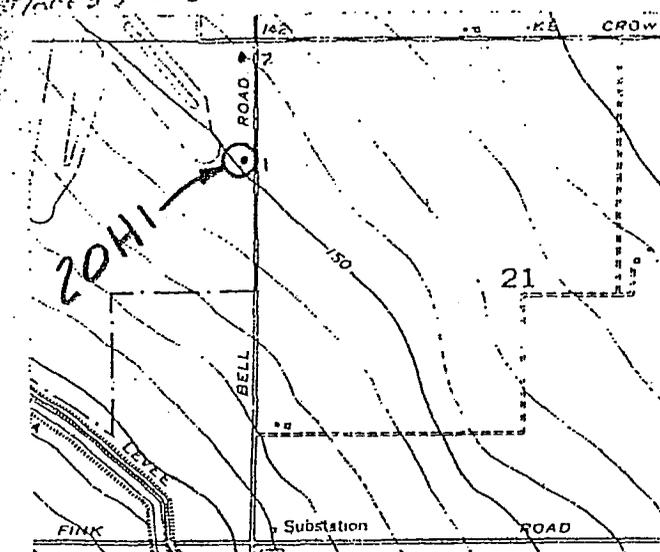
Unfit for \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) D.L.

6/8-2041

2041

0.4 mile south of Iko Cross Road  
2 1/2 miles east of Bell Road



Disc. Diam. 6" Length 70'

Remarks Water system

WL = 90' ('67)

# 6/8-2041

LSD Elev. 154

CONFIDENTIAL  
Water Control Act 1952

27-305 (Rev. 6-1)  
Bureau of Reclamation

PEO

WELL LOG

6/8-2041 (G.S.)

County Stanislaus Owner Cross Landing Air Sta. U.S.R.R. No. 6-2041  
 Dist. 50th Use domestic? Local No. None assigned  
 Sec. 09th 1/4th Driller Hawk Date March 1, 1945  
 Location 1200' N, 1200' S, NE corner

Surf. Elev. 2160 Groundwater Elev. Not yet measured Date 4/21/52  
 Depth 297' Groundwater elev. Date -  
 Yield Aquifers  
 Drawdown Artesian head Date  
 Dia. 12" x 12" zone 7 % Sand-gravel

Source of data Driller Type drill. Rotary Diam. hole

Depth	Dist.	Thick.	Description			
0	18	8	Topsoil & sediment			
18	22	4	yellow sand	Well Measuring No. 6-8-20B		
22	61	39/11	" clay			
61	63	2	sandstone and clay			
63	70	7	small gravel and sand stone			
70	74	4	clay and sandstone			
74	95	21	clay, hard			
95	103	8	sand and gravel, fair			
103	117	14	clay			
117	119	2	clay and gravel			
119	138	19	hard clay			
138	139	1	clay and sandstone	G	50	100
139	150	11	hard clay	S	4	5
150	162	12	small loose gravel, sand	F	7	7
162	178	16	medium gravel, sand	C	4	6
178	188	10	large gravel	C	28	32
188	193	5	medium gravel		40	50
193	198	5	clay and gravel, frac streaks			100
198	208	10	large gravel, frac			
208	213		" " tight			
213	221		" " frac			
221	226		clay and gravel			
226	255		sticky gray clay			
255	260		medium loose gravel			
260	297		BLUE CLAY			
297			bottom	Collected by L. G. Woolfe, Feb. 1952		

Perforation log Located by Hawk, February 1952  
 0-170 blank  
 170-225 perf. No log run  
 225-255 blank  
 255-297 perf. Typed by N. Martin 3/52

Pump Test  
 150 GPM - 123  
 250 " 117  
 static 100' 110+ hrs. test run

U	A
O	R

MEZ, 6-8-20

6/8-20H/1

JANUARY 1949

(CONT.)



PHILIPPINE ISLANDS

100-105	clay and gravel	570-580	clay and gravel
105-110	clay	580-590	clay and gravel
110-115	clay and gravel	590-600	clay
115-120	clay	600-610	clay
120-125	clay and gravel	610-620	clay
125-130	clay and gravel	620-630	clay
130-135	clay and gravel	630-640	clay
135-140	clay and gravel	640-650	clay
140-145	clay and gravel	650-660	clay
145-150	clay and gravel	660-670	clay
150-155	clay and gravel	670-680	clay
155-160	clay and gravel	680-690	clay
160-165	clay and gravel	690-700	clay
165-170	clay and gravel	700-710	clay
170-175	clay and gravel	710-720	clay
175-180	clay and gravel	720-730	clay
180-185	clay and gravel	730-740	clay
185-190	clay and gravel	740-750	clay
190-195	clay and gravel	750-760	clay
195-200	clay and gravel	760-770	clay
200-205	clay and gravel	770-780	clay
205-210	clay and gravel	780-790	clay
210-215	clay and gravel	790-800	clay
215-220	clay and gravel	800-810	clay
220-225	clay and gravel	810-820	clay
225-230	clay and gravel	820-830	clay
230-235	clay and gravel	830-840	clay
235-240	clay and gravel	840-850	clay
240-245	clay and gravel	850-860	clay
245-250	clay and gravel	860-870	clay
250-255	clay and gravel	870-880	clay
255-260	clay and gravel	880-890	clay
260-265	clay and gravel	890-900	clay
265-270	clay and gravel	900-910	clay
270-275	clay and gravel	910-920	clay
275-280	clay and gravel	920-930	clay
280-285	clay and gravel	930-940	clay
285-290	clay and gravel	940-950	clay
290-295	clay and gravel	950-960	clay
295-300	clay and gravel	960-970	clay
300-305	clay and gravel	970-980	clay
305-310	clay and gravel	980-990	clay
310-315	clay and gravel	990-1000	clay

PERFORATION LOG

0-168	blank
168-224	perforated
224-278	blank
278-324	perforated
324-362	blank
362-372	perforated
372-380	blank
380-428	perforated
428-476	blank
476-548	perforated
548-572	blank
572-620	perforated
0-280	100% / 100% casing
280-320	100% / 100% casing
320-360	100% / 100% casing
360-400	100% / 100% casing
400-440	100% / 100% casing
440-480	100% / 100% casing
480-520	100% / 100% casing
520-560	100% / 100% casing
560-600	100% / 100% casing
600-640	100% / 100% casing
640-680	100% / 100% casing
680-720	100% / 100% casing
720-760	100% / 100% casing
760-800	100% / 100% casing
800-840	100% / 100% casing
840-880	100% / 100% casing
880-920	100% / 100% casing
920-960	100% / 100% casing
960-1000	100% / 100% casing

location 6/8-20H/1



6/8-20H1

②

(CONT.)

Report No. \_\_\_\_\_

Owner AMUEL AIR

Pump No. \_\_\_\_\_

Meter No. \_\_\_\_\_

Region \_\_\_\_\_; County ADAMS

Township 65 Range 9E, Section 31E, 1/4 B&M,

3200 ft. north, 500 ft. west from southeast corner of Section.

SKETCH



AIR BASE

RED WHITE SHACK →



BELL RD

FINK RD

DESCRIPTION OR REMARKS

Checked by Ron Cesar

Date Apr 27 1959

## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Inactive Irrigation Well 6S/8E-20H1.  
The well is located along Bell Road, south of Ike Crow Road.  
View looking approximately southwest.  
Date of Photograph: July 2000



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Inactive Well 6S/8E-20N1</b>	Well depth is approximately 465 feet	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>The well was constructed in 1952.</p> <p>DWR log is available.</p> <p><b>The well is located near the western boundary of the facility, more than 2,000 feet west of the southern section of the Administration Area Plume. The well site was observed during July 2000.</b></p>

STATE OF CALIFORNIA DEPARTMENT OF WATER RESOURCES

WELL DATA

Owner BELTRAN BROS. (U.S. GOV'T.?)
Address
Tenant
Address

State No. 65/8E-20N1
Other No. 6-8-20

Type of Well: Hydrograph [ ] Key [ ] Index [ ] Semiannual [ ]
Location: County STANISLAUS Basin DELTA - MENDOTA No. 522.11

U.S.G.S. Quad. CROWS LANDING Quad. No. 5-3166

SW 1/4 SW 1/4 Section 20, Twp. 6S, Rge. 8E, Base & Meridian

Description 0.8 MI. W & 0.15 MI. N/O FINK & BELL RDS., 40' S/O CORR. IRON GARAGE, 30' E/O FARM RD. NEXT TO FOUNDATION FOR PRESSURE TANK BY CONCRETE SLAB.

Reference Point description T. O. C.

which is 0.5 ft. above land surface. Ground Elevation 191.0 ft.

Reference Point Elev. 196.5 ft. Determined from

Well: Use DOM. Condition Depth 4.65 ft.

Casing, size 14 in., perforations

Measurements By: DWR [X] USGS [ ] USBR [X] County [ ] Irr. Dist. [ ] Water Dist. [ ] Cons. Dist. [ ]

Chief Aquifer: Name Depth to Top Aq. Depth to Bot. Aq.

Type of Material Perm. Rating Thickness

Gravel Packed? Yes [ ] No [ ] Depth to Top Gr. Depth to Bot. Gr.

Supp. Aquifer Depth to Top Aq. Depth to Bot. Aq.

Driller

Date drilled Log, filed open (1) confidential (2)

Equipment: Pump, type TURB. make WESTERN

Serial No. 3309 Size of discharge pipe 5 in. Water Analysis: Min. (1) San. (2) H.M. (3)

Power, Kind ELEC Make ROSENDIN Water Levels available: Yes (1) No

H. P. 5 Motor Serial No. F47758 Period of Record: Begin End

Elec. Meter No. 144038 Transformer No. 51966 Collecting Agency:

Yield G.P.M. Pumping level ft. Prod. Rec. (1) Pump Test (2) Yield (3)



REMARKS

065/08E-20N01 M / 5-22.11 5001 5
X 1 2 50 6 0191.5 0190.4

2 41 0065.9 12/30/41

Recorded by: S.H. ADAMS From DWR 173

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
---------	--	------------------------------------

<p><b>Inactive Well?</b>  <b>6S/8E-20Q1</b></p> <p>Geological information was extracted and transcribed from the DWR record for this well.</p> <p>CLAY: 50-60          CLAY&amp;GRAVEL: 60-73          HARD CLAY: 73-86</p> <p>BLUE CLAY: 218-242</p> <p>COBBLE GRAVEL: 352-356</p>	<p>Perforated intervals (feet bgs):</p> <p>170-215          280-290          310-320          340-355          385-400          420-450          475-535</p>	<p>Sources of Information: Final Irrigation Practices Technical Memorandum (PRC 1993). California Department of Water Resources (DWR) data package received by the Navy in July 2000 and visual inspection of Summer 2000.</p> <p>DWR records indicate construction date prior to 1946 (drilled by Howk, Crows Landing with rotary drill); flow of 900 gpm. The well is located along the Delta-Mendota Canal and appears to be located on facility property. The agricultural tenant does not use this well.</p> <p>DWR log is available.</p> <p><b>The well is located more than 5,000 feet south of the Administration Area Plume.</b></p> <p>The well was not observed on 25 July 2000.</p>
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9-185  
(October 1950)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 16 July, 1952 Field No. 48-20Q1  
Record by D.W. Brown Jack Green Office No. \_\_\_\_\_  
Source of data F.I.

1. Location: State California County Stanislaus

Map Crows Landing  
S. 14 T. 6 R. 8 E. 1  
sec. 70

2. Owner: Claree Rice Ranch Address \_\_\_\_\_  
Tenant \_\_\_\_\_ Address \_\_\_\_\_  
Driller Houk Address Crows Landing

3. Topography Plain

4. Elevation 178 ft. above Sea level

5. Type: Dug, drilled, driven, bored, jetted Drilled

6. Depth: Rept. 597 ft. Meas. \_\_\_\_\_ ft.

7. Casing: Diam. \_\_\_\_\_ in. to \_\_\_\_\_ in. Type \_\_\_\_\_

Depth \_\_\_\_\_ ft. Finish \_\_\_\_\_

8. Chief Aquifer: Part 170-215, 250-290, 310-320, 340-355  
225-4ca From 420-450 ft. to 475-525 ft.

Others \_\_\_\_\_

9. Water level Access ft. rept. \_\_\_\_\_ 10. \_\_\_\_\_ above  
meas. \_\_\_\_\_ below

10. Pump: Type Tur - Peerless Capacity \_\_\_\_\_ G. M.

Power: Kind Elc - U.S. Horsepower 75

11. Yield: Flow \_\_\_\_\_ G. M., Pump 900 G. M., Meas. 900 Rept. Est. \_\_\_\_\_

Drawdown \_\_\_\_\_ ft. after \_\_\_\_\_ hours pumping \_\_\_\_\_ G. M.

12. Use: Dom. Stock PS, RR, Ind. Ag Obs. \_\_\_\_\_

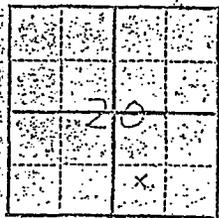
Adequacy, permanence \_\_\_\_\_

13. Quality \_\_\_\_\_ Temp \_\_\_\_\_ °F

Taste, odor, color \_\_\_\_\_ Sample Yes \_\_\_\_\_ No \_\_\_\_\_

Unfit for \_\_\_\_\_

14. Remarks: (Log, Analyses, etc.) D.I.



20 Q1

0.35 Mi. west of Bell Road.  
0.23 Mi. north of Truck Road.

P.G. & E. Localt. No. = 4545

Motor No. 45386

Trans. No. \_\_\_\_\_

Disc. Diam. 8"

Remarks \_\_\_\_\_

Length 10' South to  
cement standpipe

PEG 6/8-2001

①

LSD Elev. 178

WELL LOG

(CONT.)

Nat Z. Tabor

County San Mateo Owner (Claire Ross Ranch) U.S.B.R. No. 6-8-2001 (G.S.)  
 State California Use Irrigation Local No. Well #1  
 City Gratiola Driller Howk, Cross Landing Date Pre-1946  
 Location 280' x 4650' W. SE corner

Surf. Elev. 178 Groundwater elev. Not yet measured Date 4/21/52  
 Depth 342 Groundwater elev. \_\_\_\_\_ Date \_\_\_\_\_  
 Yield \_\_\_\_\_ Aquifers \_\_\_\_\_  
 Direction \_\_\_\_\_ Artesian head \_\_\_\_\_ Date \_\_\_\_\_  
 Coring No data available % Sand-gravel \_\_\_\_\_

Source of data Howk's files Type drill Rotary Diam. hole \_\_\_\_\_

Depth (Feet)	Thickness (Feet)	Description	Notes
0-15	3	top soil	Wall Measuring No. 6-8-200
15-30	15	clay	
30-50	20	sand and gravel	Perforation Log
50-60	10	clay	170-215
60-73	13	clay and gravel	280-290
73-85	12	hard clay	310-320
85-95	10	sand and gravel	340-355
95-122	27	pebbly clay	385-400
122-127	5	sand and gravel	420-450
127-131	4	clay	475-535
131-132	1	gravel	
132-133	1	clay and gravel	Pump Test (1946)
133-134	1	sand and pebbles	900 gpm from 180'
134-138	4	clay and gravel	
138-142	4	BLUE CLAY	No E log
142-147	5	sandy clay	
147-181	34	clay	Collected by Woolfa 8/50
181-184	3	clay and gravel	
184-185	1	hard clay	Location and identity by Howk
185-186	1	pebble gravel	Typed by N. Martin 3/19/52
186-187	1	clay	
187-189	2	clay and gravel	
189-192	3	soft clay	
192-193	1	clay and gravel	
193-196	3	cobble gravel	
196-198	2	clay and gravel	
198-199	1	soft clay	
199-200	1	pebble gravel	
200-201	1	clay	
201-202	1	cobble gravel	
202-203	1	hard clay	
203-207	4	clay and gravel	
207-208	1	clay	
208-231	23	tight gravel	
231-232	1	clay	
232-233	1	clay and gravel	

	50	100	200
G	51	10	61
S			
F			
C	5	17	35
	15	23	4
	40	50	100

CONFIDENTIAL  
 Water Code Sec. 13752

K J  
 Q R

CONTINUED

6/8-2001

2

FD-304 (Rev. 5-1)  
Bureau of Reclamation

WELL LOG

(CONT.)

Nat Z. Tabor

County Stanislaus Owner (Cleiro Rose Ranch) U.S.B.R. No. 6-2-2001  
Dist. Delta Use Irrigation Local No.  
Quad. Crossierba Driller Hawk, Crows Landing Date  
Location 1000' N & 1650' W, SE corner

Surf. Elev. 478 Groundwater elev. Date  
Depth 592 Groundwater elev. Date  
Yield Aquifers Date  
Drawdown Artesian head Date  
Casing % Sand-gravel

Source of data Hawk's files Type drill Rotary Diam. hole

Depth	Elev.	Thick	Description
452-468			clay
468-474			clay and gravel
474-484			gravel
484-491			pebbly gravel
491-572			sand and gravel
572-575			gravel
575-592			clay, sand streaks

K	J
H	B

### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<p><b>Active Well</b>  <b>NASA Water Supply Well</b></p> <p>(Also known as Well #3)</p> <p>Geological information was extracted and transcribed from the log.</p> <p>0 - 3 top soil            3 - 19 clay            19 - 27 fine sand            27 - 29 clay            29 - 32 sand            32 - 150 clay and sand streaks            150 - 158 fine sand            158 - 163 clay            163 - 167 fine sand            167 - 195 clay            195 - 210 gravel and fine sand            210 - 229 gravel and coarse sand            229 - 255 clay            255 -328 blue clay</p>	<p>Depth: 235 feet bgs</p> <p>Screened interval:            210-235 feet bgs</p>	<p>Well Construction Log from Stanislaus County, Environmental Resources office.</p> <p>Well is located south of Building 151.</p> <p>Well construction log is available.</p> <p>Water quality data from NASA's sampling program and the Navy environmental restoration program is available.</p> <p><b>The well is located on facility property, within 500 feet of the southern section of the Administration Area Plume. The well was inspected in July 2000.</b></p>
<p><b>Inactive Well</b>  <b>Former water supply well</b></p>	<p>Depth: approximately 438 feet (according to Navy measurements collected during the Fall 2000) (approximately)</p>	<p>Sources of Information: Visual inspections of Summer and Fall 2000; videographic survey results. Well is located inside of Building 151.</p> <p>Videographic survey conducted by the Navy in mid-November 2000. Perforations were not visible in videotape of survey.</p> <p>DWR log is not available.</p> <p><b>The well is located on facility property, within 500 feet of the southern section of the Administration Area Plume. The well was inspected during July 2000.</b></p>

### TABULAR SUMMARY

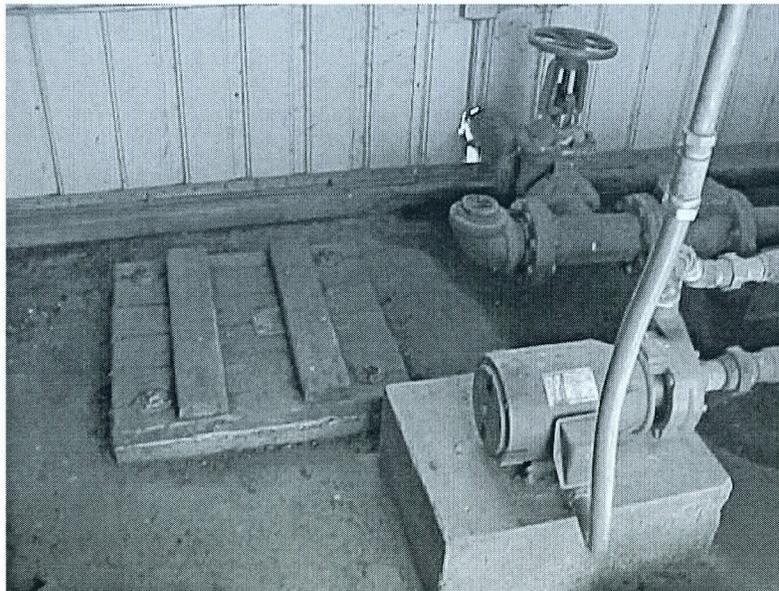
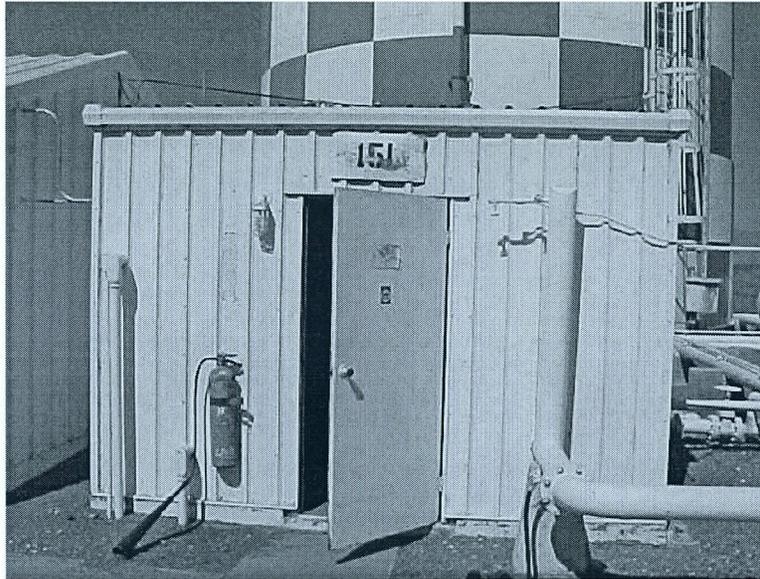
Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Well Near Delta - Mendota Canal and Marshall Road</b>		The well is operated periodically by the Del Puerto Water District. The well is located more than 5,000 feet from the Facility boundary.  Water quality data was provided by the Water District.

## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Inactive Water Supply Well inside of Building 151. The well is located within 500 feet of the southern boundary of the Administration Area Plume.

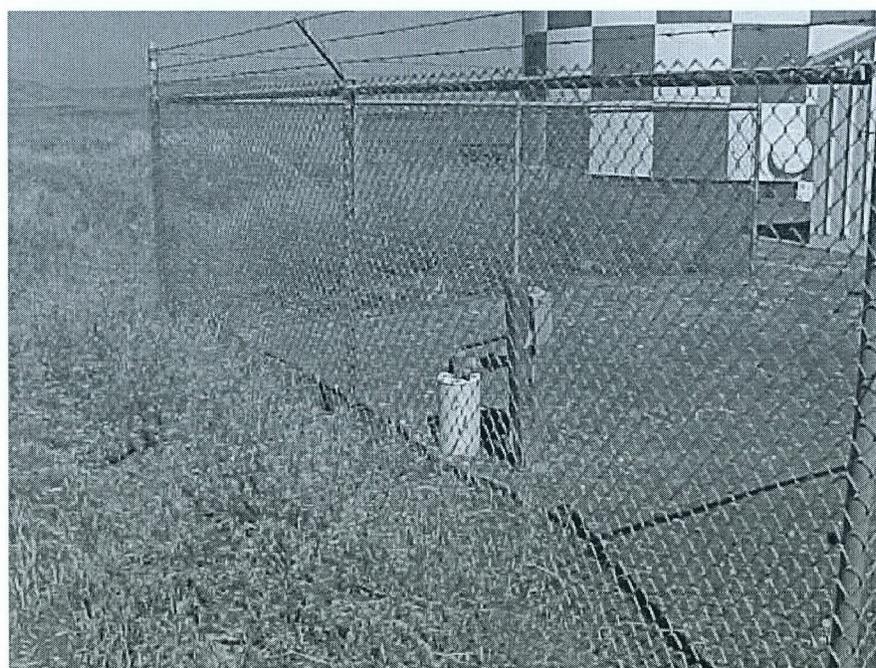
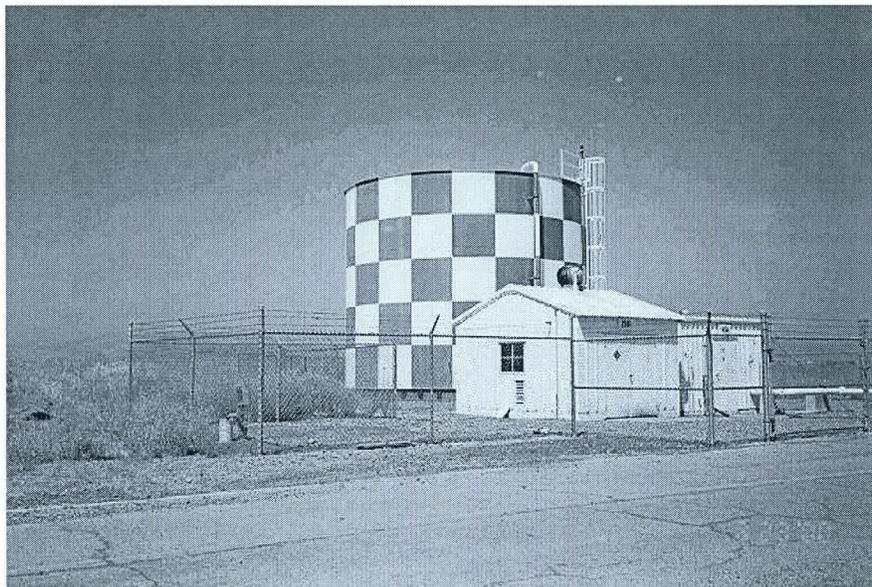
Date of Photographs: July 2000



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

NASA Fire Protection System Water Supply Well, Building 151, and Water Storage Tank. The well, shown at the center of the lower photograph, is located within 500 feet of the southern boundary of the Administration Area Plume.

Date of Photographs: July and August 2000



FOR DEPT USE	
Date	Wup

**STANISLAUS COUNTY**  
**DEPARTMENT OF ENVIRONMENTAL RESOURCES**  
 1716 Morgan Road, Modesto, CA 95351  
 525-4154

Permit No. 6  
 Date Issued 8-23-91

**APPLICATION FOR WELL CONSTRUCTION OR PUMP PERMIT**

THIS PERMIT EXPIRES 1 YEAR FROM DATE ISSUED  
 (Complete in Triplicate)

Application is hereby made to the Stanislaus County Department of Environmental Resources for a permit to construct and/or install the work herein described. PLEASE NOTIFY THIS DEPARTMENT (USING PERMIT #) WHEN WELL AND/OR PUMP WORK IS COMPLETED.

JOB ADDRESS/LOCATION BELL City    
 Owner's Name U.S. Environmental Resources Phone 415 708 388  
 Address P.O. Box 100 City/State    
 Contractor's Name Howe License # 471018 Phone 529 411

TYPE OF WORK (CHECK):  
 NEW WELL  DEEPEN  RECONDITION  DESTRUCTION   
 PUMP INSTALLATION (NEW WELL)  PUMP REPAIR  PUMP REPLACEMENT   
 OTHER  

DISTANCE TO NEAREST:  
 SEPTIC TANK   SEWER LINES   PIT PRIVY    
 OTHER WELL   SEWAGE DISPOSAL FIELD   CESSPOOL/SEEPAGE PIT    
 OTHER  

INTENDED USE	TYPE OF WELL	CONSTRUCTION SPECIFICATIONS
<input type="checkbox"/> Industrial	<input checked="" type="checkbox"/> Cable Tool	Dia. of Well Excavation <u> </u>
<input type="checkbox"/> Domestic/private	<input type="checkbox"/> Drilled	Dia. of Well Casing <u> </u>
<input type="checkbox"/> Domestic/public	<input type="checkbox"/> Driven	Gauge of Casing <u> </u>
<input type="checkbox"/> Irrigation	<input type="checkbox"/> Gravel Pack	Depth of Grout Seal <u> </u>
<input checked="" type="checkbox"/> Other <u>Fill</u>	<input type="checkbox"/> Rotary	Type of Grout <u> </u>
	<input type="checkbox"/> Other	Other Information <u> </u>

PUMP INSTALLATION: Contractor Howe  
 Type of Pump   H.P.  

PUMP REPLACEMENT:  State Work to be Done ABANDON WELL

PUMP REPAIR:  State Work to be Done  

DESTRUCTION OF WELL: Well Diameter 12"Ø Approx. Depth 300  
 Describe Material and Procedure GROUT AND FILL  
DEPTH OF WELL

ATT PLAN: Show on reverse side.

FOR DEPARTMENT USE ONLY:  
 Permit Issued by [Signature] Date 8/23/91  
 Permit Denied by   (See separate date)  
 Inspected by   Date  

PP-ES-8



## DEPARTMENT OF HEALTH SERVICES

Division of Drinking Water and Environmental Management

31 East Channel Street Room 270

Folsom, CA 95202



October 28, 1993

Shelly B. Navarro  
NASA Ames Research Center  
System No. 50700  
MS NAS-19-01  
Moffett Field, CA 94035-1000

## ANNUAL INSPECTION OF DOMESTIC WATER SYSTEM

Humayun Ali, Sanitary Engineer, inspected the NASA Crows Landing Flight Center domestic water system on September 2, 1993. Numerous deficiencies were noted during the inspection of the system and the review of the Department's files for the NASA Crows Landing Flight Center.

The deficiencies are summarized in a memorandum prepared by Mr. Ali at the conclusion of his inspection. I have enclosed a copy of the document for your information. Please review the memorandum and provide the Department with a written response that outlines a plan and schedule for correcting the deficiencies. Your response should be forwarded to the Department by November 15, 1993.

The Department considers water quality monitoring to be a high priority regulatory requirement. Therefore, the NASA Crows Landing Flight Center's monitoring deficiencies are an important concern to this office. A water quality monitoring plan must be developed to outline the future monitoring requirements for the well for the next 5 years. Such a plan should assist your staff in meeting due dates applicable to the regulatory monitoring requirements.

The contamination of the water supply with nitrates is a primary health concern because of the acute nature of the health impact of nitrates on young infants. Until treatment is provided or a better source of water is developed to assure continuous compliance with all applicable potable water Maximum Contaminant Levels (MCLs), notification of the contamination of the water with nitrates must be provided to all persons that may be able to obtain water from the NASA-Crows Landing water system. Enclosed is a sheet that provides specific language regarding the nitrate contamination that must be provided to every person employed or otherwise authorized to be present at the Crows Landing facility. In addition, the nitrate contamination notification must be posted at enough various locations on the facility to reasonably assure that anyone entering the facility will be made aware of the nitrate contamination of the domestic water. Since it is

unlikely that NASA will be able to provide a safe source of domestic water within a short period of time, all taps from which water can be obtained must be posted with signs that state "DANGER. THIS WATER IS CONTAMINATED WITH NITRATES. DO NOT DRINK". To overcome the hazard associated with language barriers that may exist among people that may visit the facility, the Department concurs with your suggestion that the signs also include the international symbol that signifies that the water is unsafe to drink. The symbolic notice that you faxed to me on October 9, 1993 will be satisfactory for this part of the warning signs. Please design the notification signs that you propose to use and forward a copy, in the full scale proposed for use, to the Department for approval before producing and posting the signs. The signs must be provided at each water faucet, drinking fountain, bathroom faucet, hose bibb, and other outlet from which water can be obtained from the water system. Since NASA intends to disconnect much of the piping that delivers water to a number of buildings where domestic water will no longer be needed as a result of NASA's planned use of the buildings that exist at Crows Landing, expedient completion of that task will minimize the number of water delivery points for which warning signs will be necessary.

Mr. Ali's memorandum also notes that abandoned Well No. 1 is not properly sealed and may be a conduit for contamination to reach the underground aquifers penetrated by the well. Since the wells are reasonably close to each other, it is possible that contamination entering Well No. 1 may be responsible for the bacteriological contamination currently being experienced in Well No. 2. This possibility should be investigated as part of the possible significant rise investigation being conducted in conjunction with the recent failure of the total coliform rule. If NASA has some future purpose for Well No. 1, it should be capped with a seal that will assure that no contamination can enter the well. If NASA has no use for Well No. 1, the well should be destroyed in conformance with the Stanislaus County well ordinance to protect the ground water aquifers in the area.

Earlier in October, you requested guidance regarding the applicability of the Federal lead and copper regulations to the NASA-Crows Landing facility. It is my understanding that noncommunity water systems are subject to the Federal lead and copper monitoring requirements. Noncommunity systems are those water systems that serve at least 25 nonresident individuals daily at least 60 days of the year, but not more than 24 yearlong residents. Therefore, NASA must evaluate the number of days when flight operations, baseball games, National Guard training exercises, or other operations at the Crows Landing facility may be expected to result in a total nonresident population of 25 or more at the facility. These projections must be compared to the 60 day criterion in the definition of a noncommunity system to facilitate a determination of the Federal lead and copper rule to the Crows Landing facility.

The Department looks forward to receiving plans for improvements in the water source and for assuring that the water system is operated by trained personnel in a way that will assure the future safety of the domestic water supply at the Crows Landing Flight Center. If you have any questions regarding the inspection findings or other matters concerning the Crows Landing facility, contact me at 209-948-3816.

*Joseph O. Spano*

Joseph O. Spano, P.E.  
District Engineer  
Drinking Water Field Operations Branch

Enclosures

A:\50700\ANINSLTR.093

# Memorandum

To : Joseph O. Spano

Date: October 27, 1993

From : Humayun M. Ali *HA*

Subject : Annual Inspection of Crows Landing Flight Facility Water System

The water system at Crows Landing Flight facility (Facility), System No. 5010700, operated by the National Aeronautics and Space Administration (NASA), was inspected on September 2, 1993 with the assistance of Shelly Navarro, Environmental Assessor. An Annual inspection report was prepared following the inspection.

Following are the deficiencies, noticed during the inspection and upon subsequent review of system files, and necessary corrective actions required by the Facility.

1. The Facility's only source of water, Well No. 2, is contaminated with nitrates in excess of the MCL. Notification requirements under Section 64464.3(a)(1) of Title 22, Code of Regulations, require the Facility to notify its consumers of the nitrate violation. Per the requirements of Subsections 64464.3(b)(2)(C) and (D) the facility is required to notify its consumers by Method 6 (Expedited Hand Delivery) and Method 7 (Continuous Posting) as mentioned in Section 64464.1(a). The regulations further require repeat notice of water quality failure to be hand delivered every three months. The Facility should hand deliver the notice of nitrate violation at least once every three months, to all personnel and authorized visitors of the Facility, as long as the nitrate violation continues. A copy of each quarterly notice should be submitted to the Department immediately after the consumer notification. To comply with the continuous posting of notice requirement, under Method 7, the Facility should post a Department approved notice at all water delivery points. As a long-term solution to the nitrate problem the Facility should consider either treatment of the Well No. 2 water for the removal of nitrates or a new source of potable water.

8. The facility should provide a fence around Well No. 2 and the ground level storage tank to provide restricted access to these facilities.
9. Since the Facility provides disinfection treatment (hypochlorination) of the water it distributes, the water system should be provided with a State certified water treatment plant operator.
10. The Facility's existing emergency notification plan (copy enclosed) is outdated due to personnel changes in the department. Further, the plan is incomplete since the section on "Notification Plan", provided on the form is not filled out. Enclosed is a new emergency notification form that needs to be submitted to the Department. The Form includes the day and evening telephone numbers for the contact persons at the Department. It is necessary to fill out the form completely in order to be acceptable.
11. Department records indicate that the distribution system bacteriological monitoring was not conducted for the month of December, 1992. If such monitoring was conducted, a Monthly Report of Distribution System Bacteriological Monitoring Summary should be submitted. If the monitoring was not conducted, the failure to monitor must be reported to the Department.

A:\50700\93ANNINS.MEM

Copy to Attn of:

DQH 218-1

January 4, 1994

Mr. Joseph Spano  
Department of Health Services  
Division of Drinking Water  
31 East Channel St., Room 270  
Stockton, CA 95202

RECEIVED  
OFFICE OF DRINKING WATER  
STOCKTON

JAN 7 1994

Re: Non-Potable Water System Plan Revisions

Dear Mr. Spano:

Attached is a revised Non-Potable Water System plan. The revisions were made based on verbal requirements stated in a December 13, 1993 conversation between yourself and Shelly Navarro. The following is a list of your requested revisions. The items listed below are numbered to match the attached Non-Potable Water System plan. You will find that the revisions to the plan have been made in italics.

2. Indicate why building 109 is not included on the map as having water.
3. Indicate that the map reveals the operational water lines, and not the inoperable lines.
- 7.3 Revise the warning sign to include a statement indicating that the water system may be contaminated with E. coli bacteria at levels that exceed the State of California's maximum contaminant level.  
  
DHS requested that NASA delete the second paragraph of attachment B1 that indicates the health effects of E. coli. NASA's legal counsel has requested that we keep this paragraph for the warning sign.
- 7.4 State that DHS approved warning signs will be posted and maintained at all operational hose bibs.
9. Clarify that the chlorine monitoring will occur once per week at the holding tank and the truck fill pipe. Indicate that there will be a weekly rotation of chlorine monitoring from the fire hydrants.
10. Describe the sequence of events that follows a phone call to (415) 604-0920 in the event the chlorinator pump is not working. What happens next?
- 14.3 A DHS approved warning sign will be posted and maintained at the hose bib in the ball field.

Listed below is the revised non-potable water plan. Note that the revisions have been made in italics.

1. The system must have less than 5 service connections. A service connection may be defined as a building. Hose bibs will be handled separately.  
Crows Landing will operate building 101 Control Tower, 109 Administration, 144 Public Works and 2 NASA trailers for a total of 5 service connections. Building 109 Administration will not have water going to the building until some plumbing modifications have been made.
2. Provide a map indicating the operable water lines and their corresponding buildings. See attached item A. *Building 109 will be added onto this map at a later date. There are some plumbing modifications to be made.*
3. Provide a map indicating the closed water lines. See attached item A. *The closed or inoperable lines have not been specifically noted, but more importantly, the operational lines are noted.*
4. NASA must be able to provide a commitment that the water system will serve less than 25 people per day including permanent employees, temporary employees, fire personnel and visitors. The City of Patterson personnel who will be using the ballfield will be counted separately.  
NASA will make reasonable efforts within the scope of our operations to service less than 25 employees at Crows Landing, excluding the City of Patterson use of the ball field. Under normal circumstances, Crows Landing has one (1) City of Patterson Police Officer, three (3) personnel from Air National Guard and six (6) NASA research personnel.
5. Provide potable water for drinking purposes and make provisions to provide potable water for hand washing.  
Potable water is being provided for drinking and hand washing.
6. Propose that the uses of non-potable water will be limited to toilets, irrigation/landscape, and fire suppression.  
The non-potable water will only be used for toilet flow, fire suppression and limited irrigation.
7. Conditions to use non-potable water include:
  - 1) disconnect all fixtures (sinks, showers)  
All fixtures will be disconnected by December 31, 1993 to include sinks, showers and hose bibs. Three hose bibs will remain functional - one at Bldg 135 Transportation, one at Crows Nest and the one at the ballfield. These operable hose bibs will be secured with a lock box.
  - 2) post warning notices regarding the use of non-potable water in toilets.  
Signs should warn of nitrates exceeding the MCL. Signs to be posted above all operable toilets. Signs to be approved by DHS prior to posting. Please review the attached sign item B. This sign will contain an English and Spanish translation for bacteria and nitrate warnings as well as the international sign for do not drink the water. If this sign is approved by DHS, a sign will be made of permanent material and will be posted by all operable water outlets.

- 3) provide signs with universal symbol of DO NOT DRINK WATER  
Please review the attached item B sign . If this sign is approved by DHS, it will be posted by all operable water outlets.
  - 4) all functioning hose bibs must be secured (lock box). Warning signs must be posted by all functioning hose bibs.  
All hose bibs will be removed and capped. There are three hose bibs described in item 7.1 that will remain open, but will be secured against unauthorized use. *The approved DHS warning signs will be posted at the operable hose bibs.*
  - 5) landscape /fire/maintenance personnel must be trained in hazards of using non-potable water. Provide a description of training to DHS.  
See attached employee training guidance item C. NASA will not have any landscape personnel that will utilize the water. There will be a need to clean the street sweeper by hosing. This person will be trained as to the hazards of non-potable water use.
8. NASA must make commitment to chlorinate the water system from the well throughout the distribution at 2 ppm.  
NASA will maintain chlorination in the water system between 2 and 3 ppm. The chlorinator will remain functioning, and routine chlorine monitoring of the distribution system will take place. Records of the chlorine monitoring will be kept on file
  9. Propose chlorine monitoring of the system at once (1X) per week. Records of monitoring should be kept on file for review.  
Chlorine will be monitored once per week at the holding tank, the truck fill pipe and some of the fire hydrants. *The holding tank and the truck fill pipe will be monitored once every week and there will be a rotation of sampling from the fire hydrants. An example of a record log for chlorine monitoring is attached for your review (item D).*
  10. Procedures to follow in the event that low chlorine levels are detected during routine monitoring. The procedures to include flushing, adding chlorine, equipment maintenance.  
See attached flow diagram, item E, titled "Chlorine Testing Procedures." This diagram depicts the event to follow in the event the chlorine levels drop below 2 ppm.
  11. Maintain chlorine in the water system. Make sure adequate supplies of chlorine are available for personnel to add if needed.  
NASA will maintain the chlorination system. The chlorinator will be appropriately filled with calcium hypochlorite powder (HTH).
  12. Contingency plan if chlorinator pump fails.  
In the event the chlorinator pump fails, a manual chlorination of the holding tank will occur until the chlorinator has either been repaired or replaced. If chlorination must be accomplished manually, then liquid sodium hypochlorite will be added to the holding tank. Emergency procurement procedures will be implemented to ensure that chlorine purchases are accomplished in a timely manner.
  13. Address sanitary showering issue. State if showers are to be provided.  
Sanitary showers will not be provided.

14. Requirements for the recreational use of ball field:

An agreement between NASA and the City of Patterson to use the ballfield has not been finalized to date. NASA understands that the items below are a concern to DHS. If an agreement is made between NASA and the City of Patterson, the following items will be addressed.

- 1) close all fixtures in bathrooms at ball field. Board the bathroom doors. NASA will close the fixtures in the bathrooms at the ball field even if an agreement is not made. The bathrooms will be secured to prevent unauthorized access.
- 2) get commitment from City of Patterson to provide portable toilets.
- 3) place warning signs at any operational water outlets (sprinklers, hoses) One hose bib will remain operational at the ballfield. This hose bib will be secured with a lock box. *The DHS approved warning sign will be posted and maintained at the hose bib.*
- 4) arrange with the City of Patterson to provide water for hand washing.
- 5) get an estimate of the max number of people to use ball field at any one time.

15. Close the inoperable well #1.

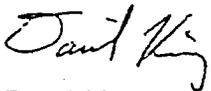
The US Navy is responsible for the closure of this inoperable well. Questions regarding the specifics of well closure and the proposed closure date should be directed to Lt. Susanne Openshaw at (415) 404-6544.

16. Monitor the well #2 one time per quarter for bacteria.

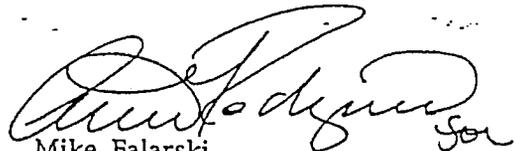
NASA will, at a minimum, maintain quarterly bacteria monitoring of Well #2 .

If you have any questions regarding this letter, please contact Shelly Navarro at (415) 604-0926. If we do not receive a written response from DHS by January 24, 1994 then NASA will assume that Crows Landing facility meets the requirements to be reclassified as a non-potable water system.

Sincerely,



David King  
Industrial Hygiene  
Program Manager



Mike Falarski  
Moffett Field Development  
Program Manager

cc: C. Burrous  
S. Brisbin  
S. Olliges  
S. Navarro  
R. Airing

Attachments



Item B

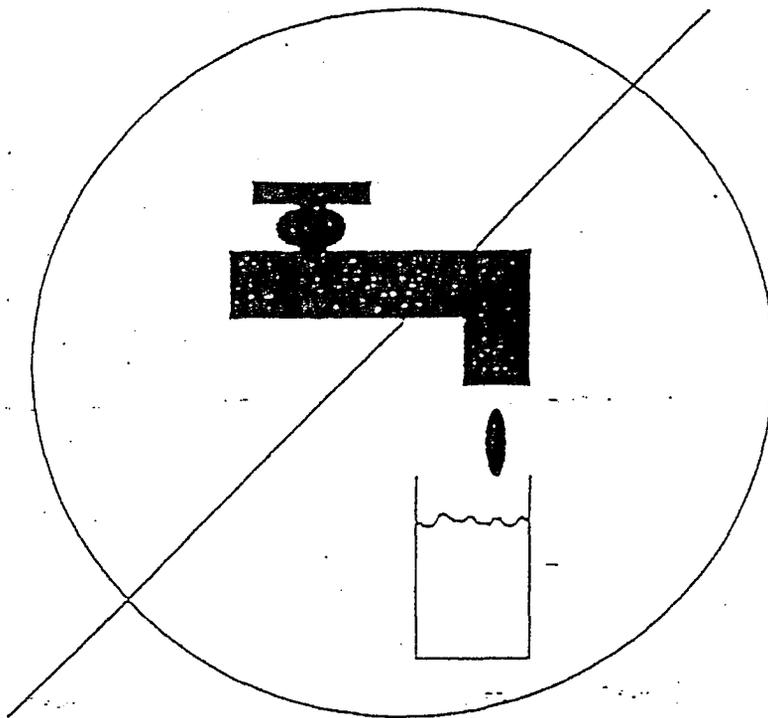
English translation of attached  
sign labeled B1

Spanish translation of attached  
sign labeled B1

International sign for do not drink water.  
See attached sign labeled B2.

English verbage only

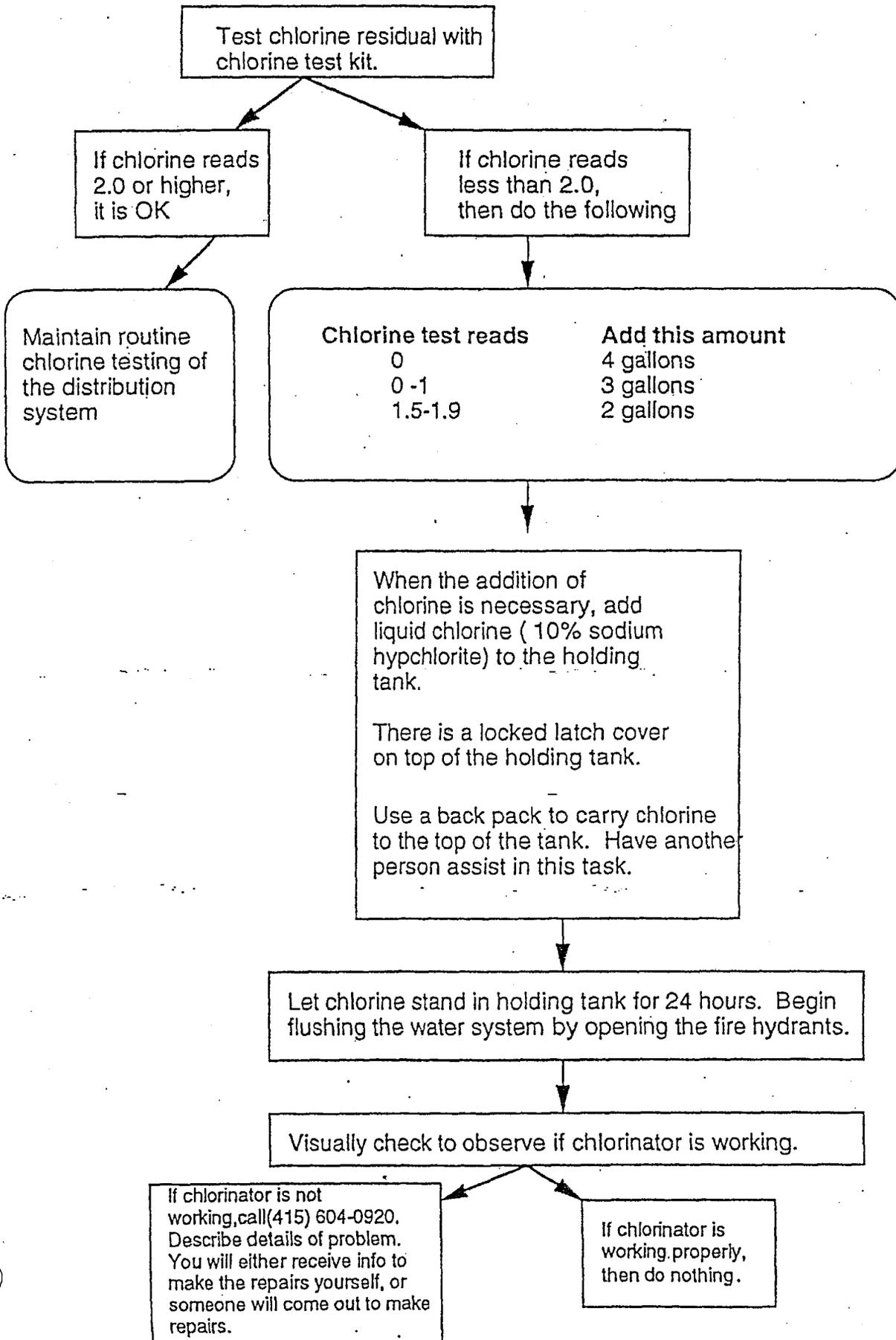
NON POTABLE WATER  
DO NOT DRINK OR TOUCH  
WATER



WATER EXCEEDS THE STATES  
MAXIMUM CONTAMINANT  
LEVEL FOR NITRATES,  
COLIFORM AND E. COLI



# Chlorine Testing Procedures





October 13, 1993

Sandy Olliges  
Environmental Program Manager  
NASA AMES Research Center  
Mailstop NAS-19-01  
Moffett Field, CA 94035-1000

#### Total Coliform Maximum Contaminant Level Violation

This is to acknowledge the conversation of October 12, 1993, with Shelly Navarro of your staff, in which she informed the Division of Drinking Water and Environmental Management (Department) of the Crows Landing Flight Facility's (Facility) failure to meet the bacteriological quality standards for the month of October 1993.

As a result of the violation the Crows Landing Flight Facility is required to comply with all the following items:

#### A. PUBLIC NOTIFICATION

Pursuant to requirements of Sections 64426 and 64464.3, Title 22, California Code of Regulations (CCR) (Enclosure A), the Facility is required to notify its consumers of its failure to meet the bacteriological water quality standards. Enclosure B (Section 64464.1) lists the methods of public notification. The Facility is required to notify its consumers by Method 6 (Expedited Hand Delivery), and by Method 7 (Continuous Posting) pursuant to requirements of Section 64464.3(b)(1)(C). Enclosure C is a sample of a public notification that you may wish to use to fulfill the notification requirements.

In addition, Section 4028(f) of the California Health and Safety Code states that the contents of your public notice must be reviewed and approved by the Department before it is issued. The public notification may be faxed to the Department to expedite the notification approval. The Department fax number is (209) 948-7451. After the issuance of the notification, you need to provide the Department with a copy of the notification and details regarding methods of notifications used and evidence of the dates on which notification was given.

The law (Section 4028(g) of the Health and Safety Code) requires the Facility to inform its employees of their obligation to provide a copy of the appropriate notification

to other users such as visiting friends and family, NASA visitors, all new employees, etc.

#### B. INVESTIGATION

The Facility should immediately initiate an investigation, per the requirements of Section 64426(b)(2), of the physical works and operating procedures which may have caused the elevated bacteriological findings and submit the investigation report to the Department. The investigation shall include, but not be limited to:

- 1) Current operating procedures that are or could potentially be related to the increase in bacterial count;
- 2) Any interruptions in the treatment process, if a treatment is used;
- 3) System pressure loss to less than 5 psi;
- 4) Vandalism and/or unauthorized access to facilities;
- 5) Physical evidence indicating the bacteriological contamination of the facilities;
- 6) Analytical results of any additional samples collected including source samples; and
- 7) Community illness suspected of being waterborne.

If the investigation concludes that a problem exists in the water system that could lead to bacteriological contamination, the facility must inform the Department immediately, either verbally or by fax, of the conclusions. Upon receiving the investigation conclusions, the Department may require the Facility to implement emergency notification. Regardless of the findings, a written investigation report must be sent to the Department, within 15 days of the investigation, documenting the findings of the investigation.

#### C. MITIGATION

To alleviate the bacteriological contamination problem, the Facility is required to implement the following measures:

- 1) Disinfect Well No. 2 using an approved potable water disinfectant. An adequate amount of the disinfectant should be poured into the well, through a plastic tube (inserted through the well sounding hole) extending all

the way to the surface of the water, to result in a disinfectant residual of about 4 ppm. After a contact time of about 24 hours flush the well thoroughly.

- 2) Disinfect the 0.15 MG steel storage tank by adding adequate amount of an approved potable water disinfectant to result in a residual of about 3 ppm in the tank water. Flush the entire distribution system with the tank water by opening the fire hydrants and the hosebibbs. Following the flushing operation test the tank and the distribution system weekly for bacteriological contamination until at least three consecutive weekly samples show absence of bacteriological contamination.
- 3) Replenish the 100 lbs capacity hypochlorite tank with a new stock of calcium hypochlorite solution. Further, assure adequate and continuous operation of the agitator (mixer) to prevent settlement of undissolved calcium hypochlorite granules on the bottom of the hypochlorite tank. Furthermore, set the hypochlorinator feed rate to pump adequate amounts of disinfectant that would result in a free chlorine residual of about 0.2 mg/l to 0.5 mg/l at the farthest point in the distribution system. Check the free chlorine residual on a weekly basis.
- 4) In addition to the routine distribution system sampling, the Facility shall monitor the Well No. 2 water for bacteriological contamination. The well water samples shall be collected at a point prior to chlorine injection. The well monitoring shall be continued until at least eight consecutive weekly samples show absence of bacteriological contamination. Monitoring results shall be reported to the Department as they become available.

If you have any questions regarding this matter, please call Humayun Ali at (209)-948-3881.

*Prabhakar Somavajpu*

*for* Joseph O. Spano P.E.,  
District Engineer  
Division of Drinking Water and Environmental Management

Enclosures

A:\50700\93-10BCT.VLN

**Hornecker, Lynn M (EFDSW)**

---

**From:** Donald Chuck [dchuck@mail.arc.nasa.gov]  
**Sent:** Monday, March 05, 2001 5:31 AM  
**To:** HorneckerLM@efds.w.navy.mil  
**Subject:** Fwd: Crows well data



CrowsTable.xls

Lynn,

Here's sampling data for the drinking water well at Crows Landing. NASA only sampled for coliform and nitrates.

Don

X-Sender: sbnavarro@mail.arc.nasa.gov  
X-Mailer: QUALCOMM Windows Eudora Pro Version 4.1  
Date: Fri, 02 Mar 2001 10:06:33 -0800  
To: dchuck@mail.arc.nasa.gov  
From: Shelly Navarro <sbnavarro@mail.arc.nasa.gov>  
Subject: Crows well data  
Cc: sbnavarro@mail.arc.nasa.gov

Hi Don, -

I have attached a table for the Crows Landing well#3 analytical results. I completed this table at home and did not bring the 2001 data with me. I'll update the 2001 data on Tuesday.

Let me know if you have any questions.

Shelly

Crows Landing Well #3 Analytical Results

Date Sampled	Coliform	Nitrates (mg/L)
10/31/95	Absent	not analyzed
12/12/95	Absent	not analyzed
1/25/96	Absent	not analyzed
2/23/96	Absent	not analyzed
3/26/96	Absent	not analyzed
5/30/96	Absent	65
7/30/96	Absent	70
9/11/96	Absent	not analyzed
10/15/96	Absent	69
11/12/96	Absent	70
1/7/97	Absent	68
2/11/97	Absent	66
3/18/97	Absent	75
4/22/97	Absent	65
5/20/97	Absent	92
6/11/97	Absent	67
7/23/97	Absent	95
8/19/97	Absent	69
9/17/97	Absent	69
10/14/97	Absent	64
11/12/97	Absent	69
12/9/97	Absent	66
1/13/98	Absent	63
2/18/98	Absent	67
3/24/98	Absent	72
4/14/98	Absent	73
5/12/98	Absent	67
6/9/98	Absent	65
7/14/98	Absent	58
8/11/98	Absent	62
9/16/98	Absent	66
10/13/98	Absent	67
12/15/98	Absent	70
1/12/99	Absent	61
2/17/99	Absent	63
3/16/99	Absent	61

Crows Landing Well #3 Analytical Results

Date Sampled	Coliform	Nitrates (mg/L)
4/20/99	Absent	68
5/11/99	Absent	59
6/8/99	Absent	69
7/18/99	Absent	62
9/21/99	Absent	72
10/20/99	Absent	62.3
11/23/99	Absent	79
12/14/99	Absent	66
1/11/00	Absent	63
2/15/00	Absent	71
4/18/00	Absent	64
6/6/00	Absent	70
7/11/00	Absent	69
10/18/00	Absent	76
11/22/00	- Absent	76
12/12/00	Absent	77
1/1/01	waiting for results	
2/1/01	waiting for results	

INACTIVE WATER SUPPLY WELL ON IKE CROW ROAD  
EAST OF FACILITY

NO DWR LOG AVAILABLE

VISUAL INSPECTION AND PHOTOGRAPHIC RECORD FOLLOW

## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Corrugated steel maintenance building and pump house at well site along Ike Crow Road. California Department of Water Resources did not have a well log for this well. View looking west along Ike Crow Road (with road at left side of photograph). Buildings are located approximately 2,000 feet east of Bell Road.

Date of Photograph: 23 May 2001



## VISUAL INSPECTION OF WATER SUPPLY WELLS AT AND NEAR THE FORMER NALF CROWS LANDING

Pump house at well site along Ike Crow Road. View looking west along Ike Crow Road (with road at the left side of the photograph). Pump house is located more than 2,000 feet east of Bell Road.

Date of Photograph: 23 May 2001



### TABULAR SUMMARY

Information collected during record search activities and visual inspections of various water supply well sites on and near former NALF Crows Landing

Well ID	Depth of Boring and Perforated Interval(s)	Notes and Source(s) of Information
<b>Well Near Delta - Mendota Canal and Marshall Road</b>		The well is operated periodically by the Del Puerto Water District. The well is located more than 5,000 feet from the Facility boundary.  Water quality data was provided by the Water District.



P.O. Box 1596 Patterson Ca. 95363

Ph: (209) 892-4470 FAX: (209) 892-4469

VIA FACSIMILE

TO: Lynn Hornecker  
Project Manager  
Ph. 619 532-0783  
Fax 619 532-0780

FROM: John Hansen, Water Operations Manager

SUBJECT: Water Quality

DATE: Dec. 20, 2001

Lynn,

Attached is a well test near the old Crows Landing Navy Base. The location of this well is on the north side of Marshall road 1/8 mile east of the Delta Mendota Canal bridge. There are quite a few other ag wells in the general area but I have no quality information to pass on.

A handwritten signature in black ink, appearing to be "John Hansen", is written over the text of the message.

# BSK ANALYTICAL LABORATORIES

## AMENDED REPORT

John Hansen  
Del Puerto Water Dist  
P.O. Box 1596  
Patterson, CA 95363-1596

### Certificate of Analysis ELAP Certificate #1180

Report Issue Date: 04/30/2001

BSK Submission #: 2001040716

BSK Sample ID #: 10445Z

Project ID:

Project Desc: GW Pumping Into Delta-Mendots

Submission Comments:

Sample Type: Liquid

Date Sampled: 04/16/2001

Sample Description: Pacific Sod. 43.24L

Time Sampled: 0942

Sample Comments:

Date Received: 04/17/2001

#### Inorganics

Analyte	Method	Result	Units	PQL	Dilution	DLR	Prep Date	Analysis Date
Arsenic (As)	EPA 200.8	ND	mg/L	0.002	1	0.002	04/18/2001	04/24/2001
Boron (B)	EPA 200.7	0.60	mg/L	0.1	1	0.1	04/18/2001	04/25/2001
Chloride (Cl)	EPA 300.0	96	mg/L	1	10	10	04/18/2001	04/18/2001
Conductivity - Specific (EC)	SM 2510-B	910	µmho/cm	1	1	1	04/17/2001	04/17/2001
Manganese (Mn)	EPA 200.7	0.020	mg/L	0.01	1	0.01	04/18/2001	04/25/2001
Nitrate (NO3-N)	EPA 300.0	7.7	mg/L	0.2	10	2.0	04/18/2001	04/18/2001
Selenium (Se) - Total	SM 3114-B	0.0030	mg/L	0.002	1	0.002	04/18/2001	04/19/2001
Sulfate (SO4)	EPA 300.0	280	mg/L	2	10	20	04/16/2001	04/18/2001
Total Dissolved Solids (TDS)	SM 2540-C	810	mg/L	5	1	5	04/23/2001	04/25/2001

mg/L: Milligrams/Liter (ppm)  
mg/Kg: Milligrams/Kilogram (ppm)  
µg/L: Micrograms/Liter (ppb)  
µg/Kg: Micrograms/Kilogram (ppb)  
%Rec: Percent Recovered (surrogates)

PQL: Practical Quantitation Limit  
DLR: Detection Limit for Reporting  
: PQL × Dilution  
ND: None Detected at DLR

H: Analyzed outside of hold time  
P: Preliminary result  
S: Suspect result. See Cover Letter for comments.  
E: Analysis performed by External laboratory.  
See External Laboratory Report attachments.

Report Authentication Code: [Barcode]

4 of 7

1414 Stanislaus Street Fresno, CA 93706-1623 Phone 559-497-2888, In CA 800-877-8310 Fax 559-485-6935

SOUTHWESTNAVFACECOM  
Code 06CC.LMH  
(619) 532-0783/Fax (619) 532-0780

File: clwellinspection2002.doc

PRINTED: FEBRUARY 2002

## MISCELLANEOUS HISTORICAL INFORMATION

REC'd  
July 2000

Dear Lynn Marie:

In response to your faxed request of July 14, I have enclosed copies from our files of well driller logs along with our in-house well data forms for wells in Sections 7, 8, 9, 16, 17, 18, 19, 20, and 21 of Township 6 South, Range 8 East. I've also enclosed water quality information available for that area.

If you have any questions in this regard, please call me.



Carlynn J. Mayer  
Water Management Section  
Ground Water Data Unit

Department of Water Resources  
San Joaquin District  
3374 East Shields Avenue, Room A7  
Fresno, CA 93726-6913

(559) 230-3305  
FAX (559) 230-3301  
cjmayer@water.ca.gov

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES  
SAN JOAQUIN DISTRICT

Mineral Analyses of Ground Water

Date Time	County Temp	FpH LpH	FEC DO	TH Ca	Mg Na	K T Alk	SO4 Cl	NO3 F	B TURB	SiO2	Constituents in Milligrams per Liter		
											TDS LEC	Sampler Lab	
<b>06S08E07A01M</b>													
06/28/1967	Stanislaus		1,425	447	72.00								
1200	22.0	7.9		61.0	175.0	86.0	77.0					1,610	
06/11/1969	Stanislaus		1,966	19	3.00								
		8.4		2.7	448.0	172.0	87.0					1,940	
<b>06S08E20D01M</b>													
07/08/1963	Stanislaus								1.30			1,580	5000
	19.4				240.0							1,980	5000
06/08/1964	Stanislaus								0.74			1,130	5000
					140.0							1,460	5000
07/15/1965	Stanislaus								0.67			1,130	5000
					150.0							1,470	5000
06/28/1967	Stanislaus		1,485	586	82.00				0.70				
1600	21.5	8.5		100.0	170.0	117.0	72.0					1,730	
05/01/1968	Stanislaus			620	81.00	2.20	730.0	16.00	0.60	26.0			
0850	19.0	7.9		115.0	152.0	128.0	60.0	0.60				1,720	
08/21/1990	Stanislaus		2,200	717	100.00	3.20	896.0	29.00	1.30			1,700	5050
1124	22.0	8.2		122.0	266.0	186.0	66.0					2,230	5050
<b>06S08E21N01M</b>													
07/13/1967	Stanislaus		1,290	551	72.00				0.30				
1545	19.5	8.0		101.0	121.0	76.0	82.0					1,560	
06/11/1969	Stanislaus		1,424	530	63.00								
		8.4		108.0	122.0	134.0	78.0					1,400	
<b>06S08E21R01M</b>													
02/24/1950	Stanislaus											600	5000
					58.0							850	5000

## WATER QUALITY ANALYSIS ABBREVIATIONS

### Abbreviations Common to Two or More Types of Analyses

D	Dissolved concentrations
DIS	Dissolved concentrations
DISCH	Flow in cubic feet per second
DO	Dissolved oxygen content in milligrams per litre
EC	Specific electrical conductance in micromhos per centimetre adjusted to 25° Celsius
F	Field determination
G.H.	Gage height of water surface in feet above an established datum
L	Laboratory determination
LAB	Laboratory making analysis
PH	Measure of acidity or alkalinity of water
Q	Flow in cubic feet per second
SAT	Percent of dissolved oxygen saturation of water
T	Total concentration
TEMP	Water temperature at time of sampling in degrees Fahrenheit (F) and Celsius (C)
TURB	Turbidity: A = Hach; B = Colorimeter; C = Candle; E = Hellige (also see Miscellaneous Analysis Abbreviations)
REM	Remarks:

- C Indicates the laboratory electrical conductivity divided by the EC-EPM factor (or if absent, 100) is not within 20 percent of the average of the cation sum and anion sum for a complete analysis.
- E Total dissolved solids value is not within the range of 0.35 to 0.70 of the specific electrical conductance.
- E Indicates the field EC was not available; therefore the laboratory EC has been substituted (for Minor Element Analyses only).
- P Indicates the field pH was not available; therefore the laboratory pH has been substituted.
- S The anion and cation sums are not within the prescribed tolerance of ±5 percent.
- T Total dissolved solids and the calculated sum of constituents are not within 20 percent of each other.
- X Indicates the field electrical conductivity and the laboratory electrical conductivity are not within 20 percent of each other.

### Mineral Analysis Abbreviations

ASAR	Adjusted sodium adsorption ratio (effect of carbonate and bicarbonate)	NA	Sodium
B	Boron	NCH	Noncarbonated hardness
CA	Calcium	NO3	Nitrate
CAC03	Total alkalinity (dissolved)	SAR	Sodium adsorption ratio
CL	Chloride	SI02	Silica
F	Fluoride	S04	Sulfate
K	Potassium	SUM	Summation of analyzed constituents
MG	Magnesium	TDS	Total dissolved solids
		TH	Total hardness

### Nutrient Analysis Abbreviations

A.H. P04	Dissolved acid hydrolyzable phosphate	NO2	Nitrite as N
CO2	Carbon dioxide	NO3	Nitrate as N
NH3	Ammonia as N	O-P04	Orthophosphate as P
NH3+ORG N	Ammonia plus organic nitrogen as N (total Kjeldahl)	ORG N	Organic nitrogen as N
		P-ALK	Phenolphthalein alkalinity
		TOT P	Total phosphate as P

### Miscellaneous Analysis Abbreviations

BOD	Biochemical oxygen demand: A = 4 days; B = 5 days; C = 6 days; D = 7 days; E = 100 days; F = other
CA EXT	Carbon alcohol extract
CC EXT	Carbon chloroform extract
CHLOR	Field determination of residual chlorine
COD	Chemical oxygen demand
COLOR	True color in color units
DOC	Dissolved organic carbon
MBAS	Methylene blue active substance (a test for detergent surfactants): L = linear alkylate sulfonate; A = alkyl benzene sulfonate
O+G	Oil and grease
SET S	Settleable solids
SULF	Sulfides
SUS S	Suspended solids: 5 = 105° Celsius; 8 = 180°
T+L	Tannin and lignin as tannic acid
TOC	Total organic carbon
T ODOR	Threshold odor number at 60° Celsius
TURB	Filtered turbidity: A = Hach; E = Hellige; N = other Nephelometric; O = other
V SUS S	Volatile suspended solids

TOXICS IN GROUNDWATER STUDY FALL 1989

WELL NUMBER: 6/8-16H1

DATE SAMPLE: 11/14/89

WELL ID: ST38

PAGE 1

COMPOUNDS	RESULTS	UNITS	MDL	METHOD	LAB CODE
-----Inorganic-----					
Alkalinity as CaCO <sub>3</sub>	NR	mg/L	--		
Arsenic(As)	ND	mg/L	0.005	EPA 7861	A
Barium(Ba)	0.026	mg/L	0.005	EPA 6010	A
Bicarbonate(HCO <sub>3</sub> )	245	mg/L	5	EPA 310.1	A
Boron (B)	0.78	mg/L	0.05	EPA 6010	A
Cadmium(Cd)	ND	mg/L	0.005	EPA 6010	A
Calcium(Ca)	49	mg/L	1	EPA 6010	A
Carbonate(CO <sub>3</sub> )	ND	mg/L	5	EPA 310.1	A
Chloride(Cl)	38	mg/L	2	SM 407A	A
Chromium(Cr)	0.007	mg/L	0.005	EPA 6010	A
Chromium, hexavalent (Cr+6)	ND	mg/L	0.02	SM 312B	A
Copper(Cu)	ND	mg/L	0.005	EPA 6010	A
Fluoride (F)	0.53	mg/L	0.1	EPA 340.2	A
Iron(Fe)	0.02	mg/L	0.05	EPA 6010	A
Lead(Pb)	ND	mg/L	0.02	EPA 6010	A
Magnesium(Mg)	16	mg/L	1	EPA 6010	A
Manganese(Mn)	ND	mg/L	0.005	EPA 6010	A
Mercury(Hg)	ND	mg/L	0.0005	EPA 7471	A
Molybdenum(Mo)	NR	mg/L	NR		
Nitrate(NO <sub>3</sub> )	745	mg/L	0.20	EPA 553.3	A
pH	7.71		0-14	EPA 150.1	A
Potassium(K)	7	mg/L	1	EPA 6010	A
Selenium(Se)	ND	mg/L	0.002	EPA 7740	A
Silica(SiO <sub>2</sub> )	32	mg/L	1	EPA 6010	A
Silver(Ag)	ND	mg/L	0.01	EPA 6010	A
Sodium(Na)	94	mg/L	1	EPA 6010	A
Specific Conductance (EC) at 25°C	744	µmhos/cm	0.1	EPA 120.1	A
Sulfate(SO <sub>4</sub> )	147	mg/L	2	EPA 375.3	A
Zinc(Zn)	0.11	mg/L	0.02	EPA 6010	A

ANALYTICAL DATA IN GROUNDWATER STUDY FALL 1989

WELL NUMBER: 6/8-16H1  
 TEST SAMPLE: 11/14/89  
 TEST 3738

PAGE 2

COMPOUNDS	RESULTS	UNITS	MDL	METHOD	LAB CODE
-----Organic-----					
Acetone	NR	ug/L			
BCP	ND	ug/L	0.05	EPA 504	B
DBP	ND	ug/L	0.05	EPA 504	B
1,1,1-trichloroethane	ND	ug/L	0.05	EPA 601	B
1,1,2-tetrachloroethane	ND	ug/L	0.05	EPA 601	B
1,1,2-trichloroethane	ND	ug/L	0.05	EPA 601	B
1,1-dichloroethane	ND	ug/L	0.1	EPA 601	B
1,1-dichloroethene	ND	ug/L	0.2	EPA 601	B
1,2-dichloroethane	ND	ug/L	0.05	EPA 601	B
1,2-dichloropropane	ND	ug/L	0.05	EPA 601	B
2-chloroethylvinyl ether	ND	ug/L	0.2	EPA 601	B
Bromodichloroethane	ND	ug/L	0.1	EPA 601	B
Bromoform	NR	ug/L	--	EPA 601	B
Bromoethane	NR	ug/L	--	EPA 601	B
Carbon Tetrachloride	ND	ug/L	0.2	EPA 501	B
Chlorobenzene	ND	ug/L	0.5	EPA 601	B
Chloroethane	ND	ug/L	0.5	EPA 601	B
Chloroform	ND	ug/L	0.5	EPA 601	B
Chloroethene	ND	ug/L	0.5	EPA 601	B
cis-1,2-dichloroethane	ND	ug/L	0.1	EPA 601	B
cis-1,3-dichloropropene	ND	ug/L	0.5	EPA 601	B
Dibromochloroethane	ND	ug/L	0.1	EPA 601	B
Dichlorodifluoroethane	ND	ug/L	2	EPA 601	B
Methylene chloride	ND	ug/L	1	EPA 601	B
Tetrachloroethane	ND	ug/L	0.05	EPA 601	B
trans-1,2-dichloroethane	ND	ug/L	0.1	EPA 601	B
trans-1,3-dichloropropene	ND	ug/L	0.4	EPA 601	B
Trichloroethane	ND	ug/L	0.2	EPA 601	B
Trichlorofluoroethane	ND	ug/L	0.5	EPA 601	B
Vinyl chloride	ND	ug/L	0.5	EPA 601	B
1,2-dichlorobenzene	ND	ug/L	0.2	EPA 602	B
1,3-dichlorobenzene	ND	ug/L	0.4	EPA 602	B
1,4-dichlorobenzene	ND	ug/L	0.3	EPA 602	B
Benzene	ND	ug/L	0.2	EPA 602	B
m-Xylene	ND	ug/L	0.2	EPA 602	B
o-Xylene	ND	ug/L	0.2	EPA 602	B
p-Xylene	ND	ug/L	0.2	EPA 602	B
Toluene	ND	ug/L	0.2	EPA 602	B

TOXICS IN GROUNDWATER STUDY FALL 1989

WELL NUMBER: 6/B-16H1

SAMPLE: 11/14/89

ID: ST38

PAGE 3

COMPOUNDS	RESULTS	UNITS	MDL	METHOD	LAB CODE
-----Organic-----					
2,4,6-trichlorophenol	ND	ug/L	5	EPA 604	A
2,4-dichlorophenol	ND	ug/L	5	EPA 604	A
2,4-dimethylphenol	ND	ug/L	5	EPA 604	A
2,4-dinitrophenol	ND	ug/L	13	EPA 604	A
2-chlorophenol	ND	ug/L	5	EPA 604	A
2-methyl-4,6-dinitrophenol	ND	ug/L	16	EPA 604	A
2-nitrophenol	ND	ug/L	5	EPA 604	A
4-chloro-3-methylphenol	ND	ug/L	5	EPA 604	A
4-nitrophenol	ND	ug/L	5	EPA 604	A
Pentachlorophenol	ND	ug/L	7	EPA 604	A
Phenol	ND	ug/L	5	EPA 604	A
Alachlor	ND	ug/L	0.05	EPA 608	A
Aldrin	ND	ug/L	0.05	EPA 608	A
Alpha BHC	ND	ug/L	0.05	EPA 608	A
Alpha Endosulfan	ND	ug/L	0.05	EPA 608	A
Benefin	ND	ug/L	0.05	EPA 608	A
Beta BHC	ND	ug/L	0.05	EPA 608	A
Beta Endosulfan	ND	ug/L	0.05	EPA 608	A
Captan	ND	ug/L	0.05	EPA 608	A
Carbophenthion	ND	ug/L	0.05	EPA 608	A
C dane	ND	ug/L	0.05	EPA 608	A
Chlorthal	ND	ug/L	0.05	EPA 608	A
Delta BHC	ND	ug/L	0.05	EPA 608	A
Dieldrin	ND	ug/L	0.05	EPA 608	A
DMPA	ND	ug/L	0.05	EPA 608	A
Endosulfan-sulfate	ND	ug/L	0.05	EPA 608	A
Endrin	ND	ug/L	0.05	EPA 608	A
Endrin Aldehyde	ND	ug/L	0.05	EPA 608	A
Heptachlor	ND	ug/L	0.05	EPA 608	A
Heptachlor Epoxide	ND	ug/L	0.05	EPA 608	A
Lindane	ND	ug/L	0.05	EPA 608	A
Methoxychlor	ND	ug/L	0.05	EPA 608	A
Nitrofen	ND	ug/L	0.05	EPA 608	A
o,p DDE	ND	ug/L	0.05	EPA 608	A
o,p DDT	ND	ug/L	0.05	EPA 608	A
o,p DDE	ND	ug/L	0.05	EPA 608	A
p,p DDE	ND	ug/L	0.05	EPA 608	A
p,p DDT	ND	ug/L	0.05	EPA 608	A
p,p DDE	ND	ug/L	0.05	EPA 608	A
PCNB	ND	ug/L	0.05	EPA 608	A
Toxaphene	ND	ug/L	0.05	EPA 608	A

TOXICS IN GROUNDWATER STUDY FALL 1989

WELL NUMBER: 6/B-16H1

DATE SAMPLE: 11/14/89

WELL ID: ST38

PAGE 4

COMPOUNDS	RESULTS	UNITS	MDL	METHOD	LAB CODE
-----Organic-----					
2,4,5-T	ND	ug/L	0.5	EPA 615	A
2,4,5-TP	ND	ug/L	0.5	EPA 615	A
2,4-D	ND	ug/L	0.5	EPA 615	A
2,4-DB	ND	ug/L	0.5	EPA 615	A
2,4-DP	ND	ug/L	0.5	EPA 615	A
Dicamba	ND	ug/L	0.5	EPA 615	A
DNBP	ND	ug/L	1	EPA 615	A
Ametryn	ND	ug/L	0.05	EPA 619	A
Atraton	ND	ug/L	0.05	EPA 619	A
Atrazine	ND	ug/L	0.05	EPA 619	A
Proneton	ND	ug/L	0.05	EPA 619	A
Pronetryn	ND	ug/L	0.05	EPA 619	A
Propazine	ND	ug/L	0.05	EPA 619	A
Sisazine	ND	ug/L	0.05	EPA 619	A
Sisetryn	ND	ug/L	0.05	EPA 619	A
Terbutylazine	ND	ug/L	0.05	EPA 619	A
Terbutryn	ND	ug/L	0.05	EPA 619	A
Aldicarb	ND	ug/L	1	EPA 632	A
Aminocarb	ND	ug/L	1	EPA 632	A
Barban	ND	ug/L	1	EPA 632	A
methyl	ND	ug/L	1	EPA 632	A
Carbaryl	ND	ug/L	1	EPA 632	A
Carbofuran	ND	ug/L	1	EPA 632	A
Chlorpropham	ND	ug/L	5	EPA 632	A
Diuron	ND	ug/L	1	EPA 632	A
Fenuron	ND	ug/L	1	EPA 632	A
Elyonetryn	ND	ug/L	1	EPA 632	A
Linuron	ND	ug/L	1	EPA 632	A
Methiocarb	ND	ug/L	1	EPA 632	A
Methoamyl	ND	ug/L	1	EPA 632	A
Mexacarbate	ND	ug/L	5	EPA 632	A
Monuron	ND	ug/L	1	EPA 632	A
Neburon	ND	ug/L	1	EPA 632	A
Oxamyl	ND	ug/L	1	EPA 632	A
Propham	ND	ug/L	5	EPA 632	A
Propoxur	ND	ug/L	1	EPA 632	A
Siduron	ND	ug/L	1	EPA 632	A

ND = none detected at or above the method detection limit (MDL)

NR = not run

FILE

NOTICE TO CUSTOMERS OF THE  
CROWS LANDING COMMUNITY SERVICES DISTRICT  
of the Project Feasibility Meeting to be held  
August 12, 1992 at the Crows Landing Firehouse at 7:30 p.m.

SUBJECT: PROPOSED CAPITAL IMPROVEMENTS TO THE CROWS LANDING  
COMMUNITY SERVICES DISTRICT WATER SYSTEM TO BRING  
THE SYSTEM TO MINIMUM DOMESTIC WATER SUPPLY STANDARDS.

The Crows Landing Community Services District's water well #1 presently exceeds the maximum concentration level set by the state for nitrate. This well also exceeds the maximum concentration level for trihalomethanes. Water Well #3 also exceeds the maximum concentration level for nitrates. It is proposed that two new wells be constructed. The estimated cost of this project is \$452,625.

The District has qualified for funding of this project with the California Safe Drinking Water Bond Law funds, administered by the State Department of Water Resources. Before accepting such funding a Project Feasibility Meeting is necessary to demonstrate that the project is understood, and that the funding is acceptable to the District's water users.

The proposed funding would include a construction grant of \$400,000 (does not need to be repaid), and a construction loan in the estimated amount of \$52,625 (balance of estimated project cost plus States 5% administrative fee, which is required by law) with a 20 year repayment period at a 3.1775% interest rate. Semi-annual payments will be about \$1,877.00 and an additional accumulation of about \$188 semiannually will be required during the first 10 years to build up a loan repayment reserve. District revenue needs to service such a loan at present water rate charges should be sufficient, but the possibility exists that current rates may need to be increased to service this loan.

All District water users, and any other interested persons, are invited to attend this meeting at the Crows Landing Firehouse, 22012 G Street, Crows Landing, California or to provide written comments addressed to the Crows Landing Community Services District, P. O. Box 537, Crows Landing, California 95313, five days before the meeting. It is anticipated that representatives of the Department of Health Services or County public health officials will be present to answer any questions. Any person present can ask any questions regarding all subjects discussed at the meeting.

Information describing the project is available for review by all interested persons at the District's office 21925 Hwy 33; Crows Landing, California.



**CLEAN**

**Contract Number N62474-88-D-5086**

**Contract Task Order 0111**

**Navy Engineer-in-Charge: Camille Garibaldi**

**PRC Project Manager: Neil Bingert**

**NOTE:**  
The 11"x17" figures in this  
technical memorandum have  
been reduced to 8.5"x11".

**NAVAL AUXILIARY LANDING FIELD  
CROWS LANDING**

**FINAL IRRIGATION PRACTICES  
TECHNICAL MEMORANDUM**

Prepared by

**PRC ENVIRONMENTAL MANAGEMENT, INC.**  
1099 18th Street, Suite 1960  
Denver, Colorado 80202  
303/295-1101

December 8, 1993

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## 1.0 INTRODUCTION

This report presents the preliminary results of an investigation of possible irrigation effects on water table elevations in the vicinity of Naval Auxiliary Landing Field (NALF) Crows Landing. PRC Environmental Management, Inc. (PRC) completed this project as part of Contract Task Order (CTO) 0111 under Comprehensive Long-term Environmental Action Navy (CLEAN) contract number N62474-88-D-5086.

This project was undertaken because a facility-wide assessment of groundwater flow directions has not previously been completed at NALF Crows Landing. Several groups of monitoring wells at the facility had been surveyed for elevation at various times, possibly to different survey benchmarks. Anomalous flow directions, sometimes opposite the expected regional flow direction, have been reported when water level elevation measurements from single groups of wells were considered. It had been speculated that the anomalous flow directions were a result of nearby irrigation well pumping or the percolation of irrigation water.

The scope of this project included surveying all existing groundwater monitoring wells at NALF Crows Landing for elevation and horizontal location, obtaining water level elevation measurements, and researching local irrigation practices including the location and uses of local water wells. The following sections discuss background and setting information at NALF Crows Landing, the results of the irrigation practices research, and recent water level elevation measurement findings. In addition, preliminary conclusions regarding the effects of local irrigation practices on the water table elevations are discussed.

## 2.0 BACKGROUND AND SETTING

This section describes background and setting information for NALF Crows Landing pertinent to this study. This information includes a description of the facility location, surface-water features, regional geology and hydrogeology, and regional water-level fluctuation and groundwater movement characteristics.

## 2.1 LOCATION

NALF Crows Landing is located in Stanislaus County, California, approximately 80 miles southeast of San Francisco (Figure 1). It covers approximately 1,500 acres in the northwestern part of the San Joaquin River Valley between the towns of Patterson and Crows Landing. Previously, NALF Crows Landing was used as a practice field for Navy planes from Naval Air Station (NAS) Moffett Field, NAS Lemoore, and NAS Alameda. Recently, the National Aeronautics and Space Administration (NASA) has taken over operation of the facility from the U.S. Navy. The facility consists of two runways and several support structures including a control tower, administration building, a club and exchange building, motor pool and public works shops, storage facilities, and a NASA research center.

The area immediately surrounding NALF Crows Landing is used exclusively for agricultural purposes. The climate is hot and dry in the summer, mild and moderately damp in the winter. Average annual precipitation is approximately 10 to 12 inches, occurring primarily from November to May (Soil Conservation Service 1992). The average annual frost-free period exceeds 250 days. This permits a variety of crops to be produced and also allows more than one crop per year to be grown. Irrigation is necessary to produce nearly all crops.

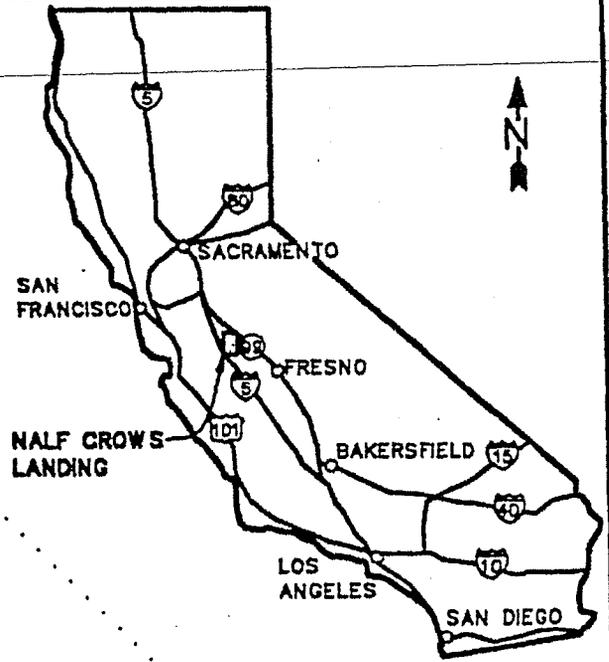
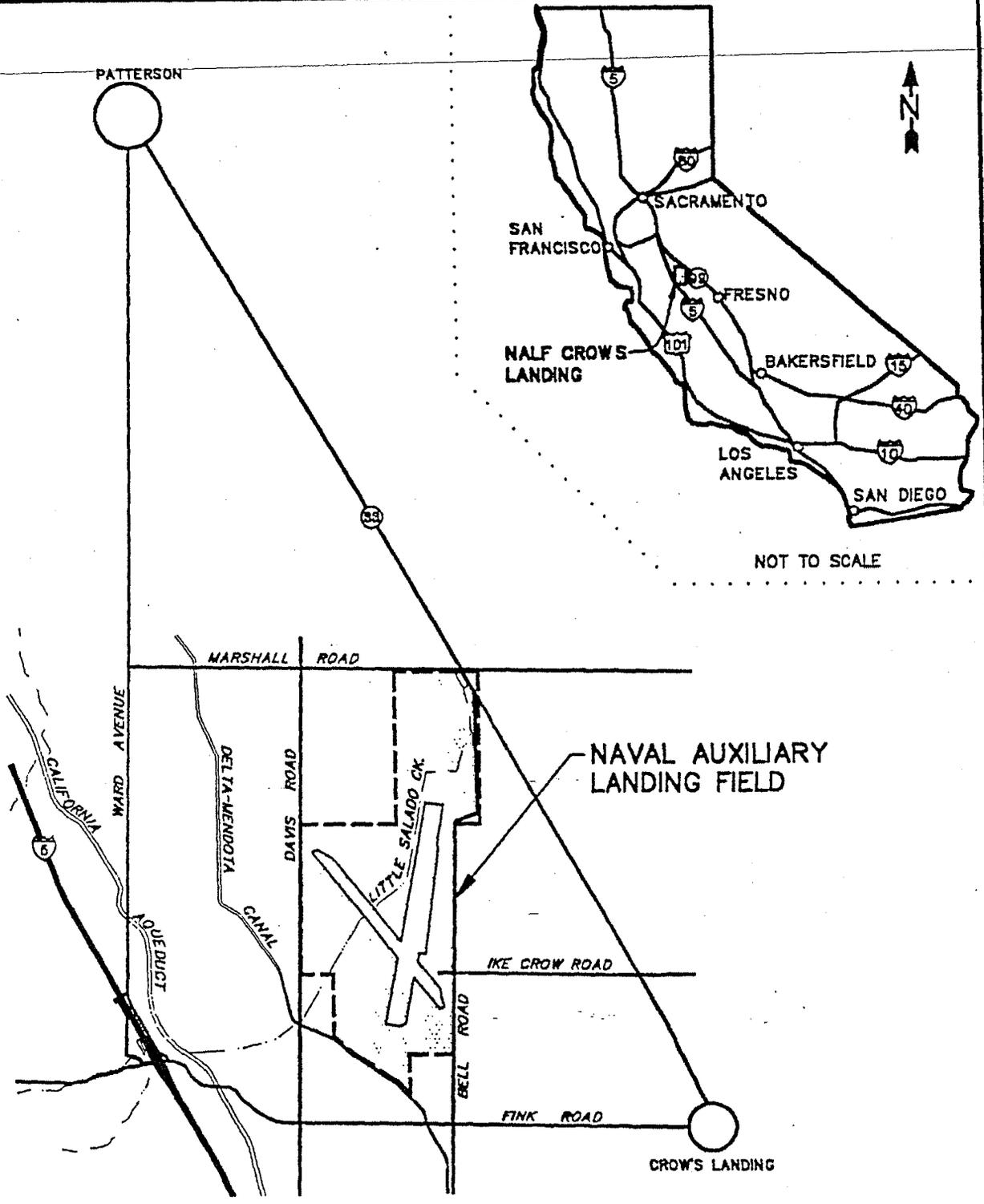
## 2.2 SURFACE WATER

The nearest surface water body to NALF Crows Landing is Little Salado Creek (Figure 1). Little Salado Creek flows to the north-northeast through the facility to a collection pond located immediately north of the main runway. The creek begins as a natural drainage in the foothills west of NALF Crows Landing. The creek has been channelized through the facility and is used to carry irrigation runoff as well as natural drainage. The collection pond is used to reduce the suspended sediment content of the irrigation runoff. Water from the collection pond is reused to irrigate cropland north of the facility or is discharged to the San Joaquin River (McElhiney 1993).

Other nearby surface water bodies include the Delta-Mendota Canal, California Aqueduct, and the San Joaquin River (Figure 1). At closest approach, the Delta-Mendota Canal and California Aqueduct are located 0.25 mile and 1 mile southwest, respectively, from the main runway. Both the canal and the aqueduct are concrete-lined structures used to transport water from the Sacramento and San Joaquin River delta area to central and southern California. The San Joaquin River is located approximately 4 miles northeast of the facility.

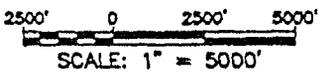
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PATTERSON



NOT TO SCALE

FIGURE 1  
HALF CROWS LANDING  
LOCATION MAP



## 2.3 REGIONAL GEOLOGY AND HYDROGEOLOGY

NALF Crows Landing is located in the northwestern portion of the San Joaquin Valley. The San Joaquin Valley is a topographic and structural basin bounded on the east by the Sierra Nevada and on the west by the Coast Ranges. The valley is filled with a thick sequence of marine and continental sedimentary rocks overlying a basement complex of Sierra Nevada granite rocks on the east and metamorphosed sediments and igneous rocks of the Franciscan Formation on the west. The thickness of sediments is thought to exceed 12,000 feet in the west-central part of the valley, which includes the area beneath NALF Crows Landing (Hotchkiss and Balding 1971).

The geologic units comprising the groundwater reservoir in the NALF Crows Landing area include surficial alluvial deposits of Pleistocene and Holocene age and the underlying Tulare Formation of Pliocene and Pleistocene age (Hotchkiss and Balding 1971). The alluvial deposits are primarily overlapping alluvial fans composed of interbedded clay, silt, sand, and gravel derived from the Coast Ranges to the west. The alluvial deposits are thought to be a maximum of 100 feet thick in the NALF Crows Landing area (Hotchkiss and Balding 1971). The base of the alluvial deposits, however, cannot be distinguished from the top of the underlying Tulare Formation in the subsurface.

The Tulare Formation is composed of beds and lenses of clay, sand, and gravel derived from both the Coast Ranges to the west and the Sierra Nevada to the east. The upper half of the Tulare Formation includes the distinctive Corcoran Clay Member. The Corcoran Clay is a lacustrine deposit which underlies much of the San Joaquin Valley. The unit is also referred to as the E-Clay in some areas or as the "blue clay" in many local well driller's reports. The Corcoran Clay acts as a confining bed separating a primarily unconfined aquifer above from a confined aquifer below.

The thickness of the Tulare Formation is thought to be about 500 to 600 feet in the NALF Crows Landing area (Hotchkiss and Balding 1971). The base of the formation cannot easily be distinguished from underlying units but is generally considered to coincide with the base of the fresh groundwater reservoir. The top of the Corcoran Clay is about 230 to 270 feet below ground surface (bgs) and averages about 65 feet thick in the NALF Crows Landing area.

For this report, descriptions of the groundwater reservoirs beneath the Crows Landing area will follow the designations established by Hotchkiss and Baldwin (1971). These groundwater reservoirs include a lower, confined water-bearing zone contained in the Tulare Formation below the Corcoran Clay, and an upper, semiconfined to unconfined water-bearing zone contained in the Tulare Formation and alluvial deposits above the Corcoran Clay.

Recharge to the water-bearing zones is from a combination of seepage of water from streams flowing into the area from the Coast Ranges, seepage from the canals, and irrigation deep percolation losses. Recharge from natural precipitation is thought to be minimal due to the generally deficient soil moisture characteristic of the northwestern part of the San Joaquin Valley (Hotchkiss and Balding 1971). Most creeks from the Coast Ranges are intermittent and do not flow across the valley to the San Joaquin River. It has been estimated that 60 to 80 percent of the stream flow percolates to groundwater, the rest being lost to evaporation and transpiration (Hotchkiss and Balding 1971). Near NALF Crows Landing, this stream percolation to groundwater is probably greatest to the west of the facility, where coarse gravel deposits are prevalent near the mountain front (McElhiney 1993). Belitz and Heimes (1990), however, contend that percolation of irrigation water past crop roots greatly exceeds and has replaced percolation of intermittent streamflow as the primary mechanism of recharge.

#### 2.4 REGIONAL WATER-LEVEL FLUCTUATIONS AND GROUNDWATER MOVEMENT

Prior to extensive agricultural development, wells completed in the lower water-bearing zone flowed at the surface in many areas of the San Joaquin Valley (Hotchkiss and Balding 1971). Following extensive agricultural development, the potentiometric head in the lower water-bearing zone eventually dropped below the water table surface elevation of the upper water-bearing zone. Historically, northwestern San Joaquin Valley water levels in both water-bearing zones have fluctuated in the short term in response to seasonal agricultural pumping. A general, long-term decline in water levels in both zones was evident prior to 1951. By 1951, the Delta-Mendota canal was completed and imported surface water began to replace some of the groundwater used for irrigation purposes. In general, water levels began to stabilize or rise throughout much of the northwestern part of the San Joaquin Valley after 1951.

The general trend of horizontal groundwater movement in both the upper and lower water-bearing zones in the northwestern part of the San Joaquin Valley is east to northeast, from the Coast Ranges to the San Joaquin River. Pumping has resulted in localized depressions in the water table surface and some areas of gradient reversal. Historically, none of these depressions or areas of gradient reversal have been recognized near NALF Crows Landing. Groundwater mounding has also been recognized due to irrigation water percolation to the upper water-bearing zone. A groundwater divide paralleling the Coast Ranges has been recognized in the western part of the San Joaquin Valley in an area south of NALF Crows Landing (Belitz and Heimes 1990). The groundwater divide separates an

area of normal east to northeast flow from a narrow band of west-trending flow. The divide is caused by the mounding of percolating irrigation water in fine-grained sediments distant from the mountain front, and depression of the water table due to pumping from coarse-grained sediments near the mountain front. In general, the combination of percolation and pumping has also resulted in a downward component of groundwater flow in the upper water-bearing zone throughout the western part of the San Joaquin Valley.

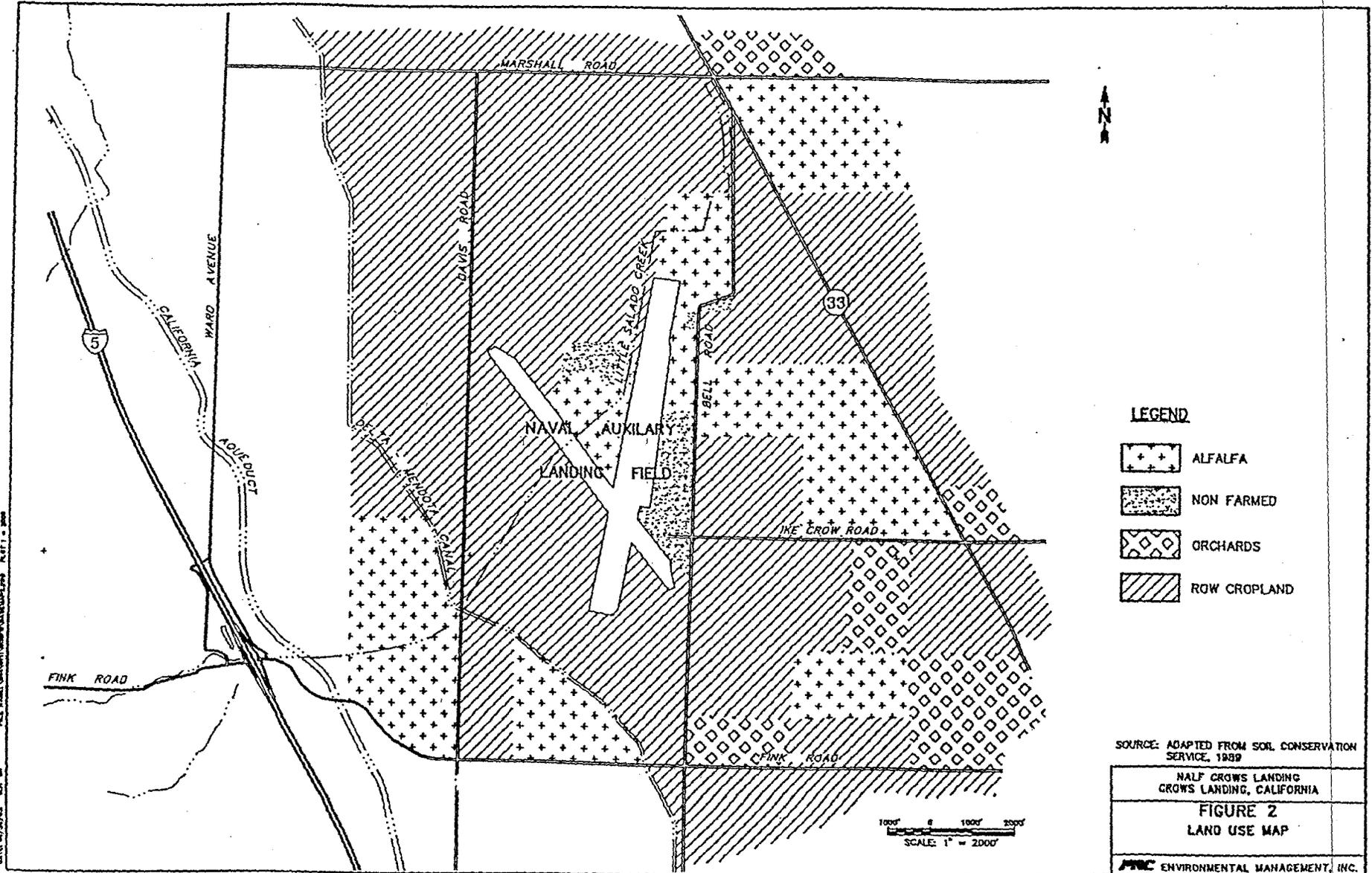
### 3.0 IRRIGATION PRACTICES

The following discussion of irrigation practices in the NALF Crows Landing area is divided into land use and local water wells. The discussion of land use identifies the crops and irrigation practices typical of the NALF Crows Landing area. The discussion of local water wells describes the irrigation and domestic use wells within approximately a 1-mile radius of NALF Crows Landing.

#### 3.1 LAND USE

In western Stanislaus County (location of NALF Crows Landing), more than 70 percent of the total land area is used for irrigated row and field crops and over 20 percent is used for irrigated orchards (Soil Conservation Service 1992). The row and field crops are primarily furrow irrigated and are typically grown in 2- to 8-year crop rotations. Most row crops are double cropped each growing season. The most common row crops include dry and green beans, peas, tomatoes, broccoli, cauliflower, spinach, and sugar beets. At any given time, 25 percent of the row and field crops acreage is in alfalfa, the most common field crop. The major orchard crops include almonds, walnuts, and apricots. Less predominant orchard crops include cherries, apples, peaches, nectarines, pears, and plums. Irrigation practices in the orchards include both furrow and sprinkler methods, roughly equally divided. A summary of current land uses in the immediate vicinity of NALF Crows Landing appears in Figure 2.

Irrigation water for western Stanislaus County is obtained from four sources: the Delta-Mendota Canal, California Aqueduct, San Joaquin River, and groundwater wells (Soil Conservation Service 1992). No information was reviewed during the course of this study that indicated the relative percentage of irrigation water obtained from each source. The facility agriculture lessee, however, reported that irrigation water used at the facility is roughly evenly divided between canal and groundwater (Michelena 1993). The source of irrigation water used in a particular field depends on whether a groundwater well or canal water access point is more convenient. The canal water is primarily distributed through underground pipelines described by the facility agriculture lessee as "old



**LEGEND**

-  ALFALFA
-  NON FARMED
-  ORCHARDS
-  ROW CROPLAND

SOURCE: ADAPTED FROM SOIL CONSERVATION SERVICE, 1989

NALF CROWS LANDING  
CROWS LANDING, CALIFORNIA

**FIGURE 2**  
**LAND USE MAP**

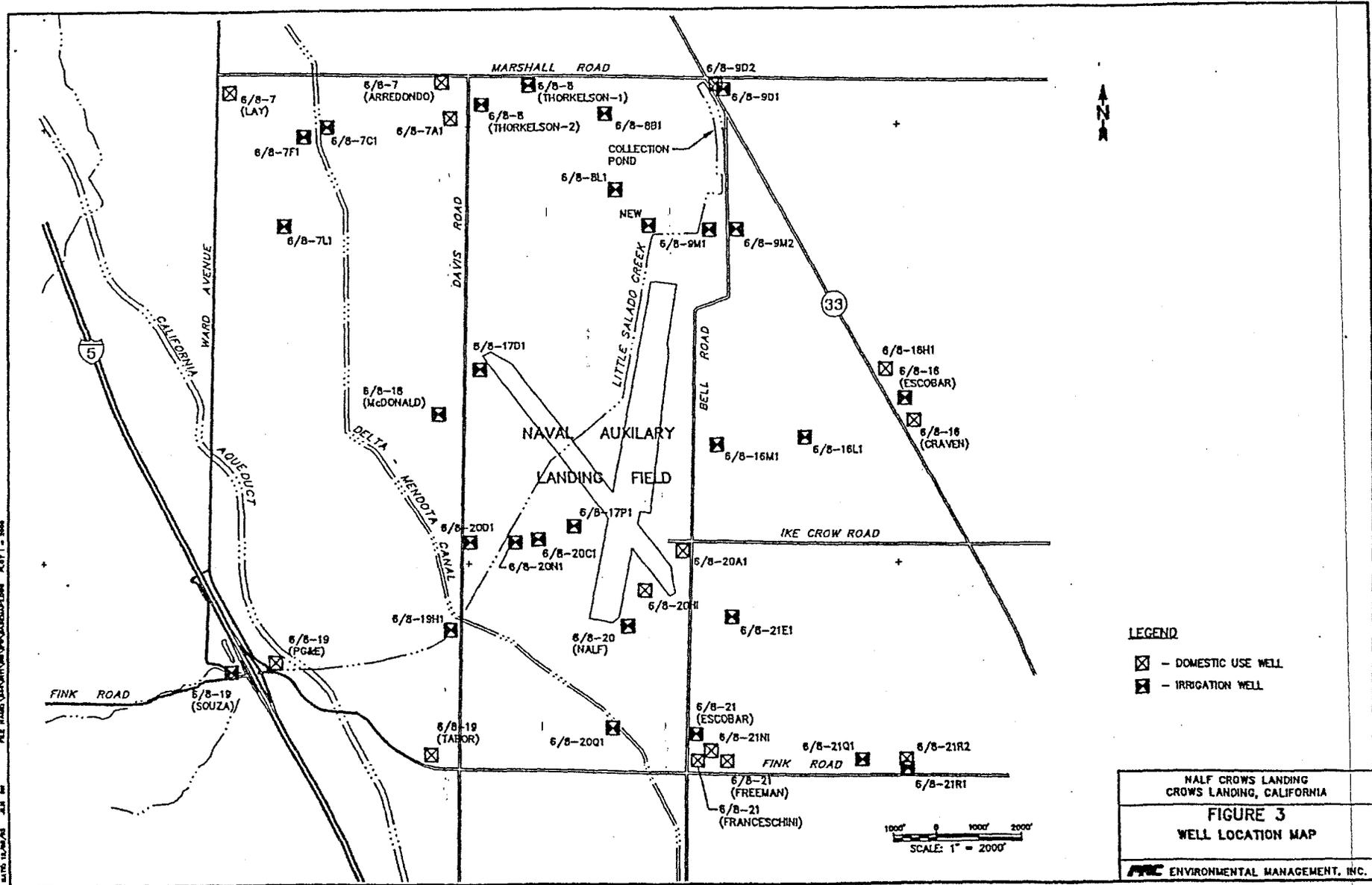
**EMC** ENVIRONMENTAL MANAGEMENT, INC.

and possibly leaky" (Michelena 1993). Tomatoes are typically the most water-intensive crop grown in the area, requiring 3.9 acre-feet per acre (ac-ft/ac) of water annually (Soil Conservation Service 1989). Other high water-use crops include alfalfa (3.7 ac-ft/ac) and walnuts (3.6 ac-ft/ac). Lower water-use crops include beans (2.9 ac-ft/ac) and almonds (2.8 ac-ft/ac). As noted previously, most row and field crops and about half of the orchard acreage are irrigated using furrow irrigation methods. The Soil Conservation Service is attempting to persuade growers to switch to more efficient sprinkler or drip irrigation methods to reduce irrigation-induced erosion and resultant nonpoint source sediment pollution problems in the San Joaquin River (Soil Conservation Service 1992).

### 3.2 LOCAL WATER WELLS

Approximately 42 water wells are located within 1 mile of NALF Crows Landing. This total is based on the number of well logs identified by the California Department of Water Resources (DWR) for the NALF Crows Landing area (Williams 1993) and does not include the monitoring wells installed at the facility. Of the 42 wells identified, 27 are irrigation wells, 13 are for domestic use, one was identified as a cathodic protection well, and one was identified as a fire suppression well. Figure 3 depicts the locations of the local water wells. A summary of the well identification, designated use, date completed, perforated zone, and comments appears in Table 1. It should be noted that the location and summary information shown for most of the local water wells is based strictly on the DWR records. Only those wells within the NALF Crows Landing property boundary have been recently field checked to verify locations and current uses (Gould 1993). Ten wells were identified on base; eight are irrigation wells (three currently in use), one is a fire suppression well (in use), and two are domestic wells (one currently in use).

All of the domestic use wells identified are perforated in the upper water-bearing zone. Most of the irrigation wells are perforated in both the upper and lower water-bearing zones, although most newer irrigation wells (completed in the 1980s or 1990s) are perforated only in the lower water-bearing zone. Most of the wells perforated in the upper water-bearing zone are perforated beginning at least 100 feet bgs down to the top of the Corcoran Clay. Completion details are not available for most wells; however, of those with completion information, nine are gravel-packed to within 20 feet bgs and two are gravel-packed to within 50 feet bgs. This information indicates that although the local water wells tend to be perforated at depths greater than the NALF Crows Landing monitoring wells (completed at depths ranging between approximately 39 and 58 feet bgs), at least some of the local water wells are gravel packed at depths coinciding with the facility's monitoring wells.



**LEGEND**

- ☒ - DOMESTIC USE WELL
- ☒ - IRRIGATION WELL

HALF CROWS LANDING  
CROWS LANDING, CALIFORNIA

**FIGURE 3**  
**WELL LOCATION MAP**

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TABLE 1

**NALF CROWS LANDING  
OFF-SITE WELL SUMMARY<sup>1</sup>**

Well Identification	Designated Use	Date Completed	Perforated Zone <sup>2</sup>	Comments
6/8-7A1	Domestic	1947 (?)	Upper	
6/8-7C1	Irrigation	3/45	Upper and lower	
6/8-7F1	Irrigation	9/47	Lower	
6/8-7L1	Irrigation	1945	Upper and lower	Historic water level trend variable
6/8-7 (Lay)	Domestic	4/91	Upper	Uncertain location
6/8-7 (Arredondo)	Domestic	5/77	Upper	Uncertain location
6/8-8B1	Irrigation	4/44	Upper	Inside facility boundary, in use (Gould 1993)
6/8-8L1	Irrigation	1946	Upper and lower	Inside facility boundary, welded shut (Gould 1993)
6/8-8 (Thorkelson-1)	Irrigation	1/91	Lower	Uncertain location
6/8-8 (Thorkelson-2)	Irrigation	7/89	Lower	Uncertain location
6/8-9D1	Irrigation	1947	Upper and lower	Historic water level trend generally increasing
6/8-9D2	Domestic	6/50	Upper	
6/8-9M1	Fire Suppression	7/50	Upper and lower	Inside facility boundary, in use (Gould 1993)
6/8-9M2	Irrigation	4/44	Upper and lower	
6/8-16H1	Domestic (?)	2/45	Upper	Historic water level trend generally consistent
6/8-16L1	Irrigation	1/44	Upper and lower (?)	
6/8-16M1	Irrigation	12/43	Upper and lower	Historic water level trend generally increasing
6/8-16 (Escobar)	Irrigation	6/77	Upper and lower	
6/8-16 (Craven)	Domestic	4/78	Upper	
6/8-17D1	Irrigation	1939 (?)	Not reported	Inside facility boundary, welded shut (Gould 1993)
6/8-17P1	Irrigation	1/49	Upper and lower	Inside facility boundary, welded shut (Gould 1993)
6/8-18 (McDonald)	Irrigation	4/91	Lower	
6/8-19H1	Irrigation	2/48	Lower	Historic water level trend variable

TABLE 1 (Continued)

**NALF CROWS LANDING  
OFF-SITE WELL SUMMARY<sup>1</sup>**

Well Identification	Designated Use	Date Completed	Perforated Zone <sup>2</sup>	Comments
6/8-19 (Souza)	Irrigation	4/80	—	Located in foothills west of valley, outside of Corcoran Clay area
6/8-19 (PG&E)	Cathodic protection	9/89	—	Located in foothills west of valley, outside of Corcoran Clay area
6/8-19 (Tabor)	Domestic	4/73	Upper	
6/8-20A1	Domestic	—	—	Inside facility boundary, in use (Gould 1993)
6/8-20C1	Irrigation	2/45	Upper and lower	Inside facility boundary, to be closed (Gould 1993)
6/8-20D1	Irrigation	1/48	Lower	Historic water level trend generally increasing
6/8-20H1	Domestic	2/45	Upper	Inside facility boundary, to be closed (Gould 1993)
6/8-20N1	Irrigation	1952 (?)	Upper and lower	Location uncertain, historic water level trend variable
6/8-20Q1	Irrigation	Pre-1946	Upper and lower	Location uncertain
6/8-20 (NALF)	Irrigation	6/92	Upper	Inside facility boundary, in use (Gould 1993)
6/8-21E1	Irrigation	3/44	Upper and lower	Historic water level trend generally increasing
6/8-21N1	Domestic	4/47	Upper	
6/8-21Q1	Irrigation	2/44	Upper and lower	
6/8-21R1	Irrigation (?)	4/44	Not reported	Historic water level trend generally increasing
6/8-21R2	Domestic	7/48	Upper	Historic water level trend generally increasing
6/8-21 (Escobar)	Irrigation	6/90	Lower	
6/8-21 (Franceschini)	Domestic	2/90	Upper	
6/8-21 (Freeman)	Domestic	7/80	Upper	
New	Irrigation	—	—	Inside facility boundary, in use (Gould 1993)

<sup>1</sup> This information has been summarized from well logs and water level information supplied by the California DWR (Williams 1993). The well logs are not for public dissemination and have not been reproduced in this report at the request of the California DWR.

<sup>2</sup> Upper - indicates well is perforated above the Corcoran Clay.  
Lower - indicates well is perforated below the Corcoran Clay.

Historic water-level information was obtained for 10 of the water wells in the NALF Crows Landing area (Williams 1993). The historic water level information for most of the wells is from 1958 through at least 1969 with some information included through 1992. Most of the water levels were measured twice per year, usually in the spring (March) and fall (October). In general, water levels are usually higher in spring than in fall. In addition, water levels have tended to increase over time at most wells (see Table 1). This is consistent with the regional observations noted in Section 2.4. Most of the wells for which historic water level information is available are perforated in both the upper and lower water-bearing zones. Consequently, differences in water levels between the upper and lower water-bearing zones are not evident in the NALF Crows Landing area.

#### 4.0 WATER LEVEL MEASUREMENTS

Twenty-seven groundwater monitoring wells have been completed at NALF Crows Landing. Most of the monitoring wells are in closely spaced groups in various areas at the facility. The wells have been completed at depths ranging between approximately 39 and 58 feet bgs. All of the monitoring wells were installed as part of various environmental assessment efforts between 1988 and 1992. All of the wells were surveyed to a common datum on April 5, 1993. Water level measurements were then obtained from all wells on April 7, August 11, and November 8, 1993.

Floating immiscible oil phases were not detected in any of the monitoring wells during the water level measurement efforts. Petroleum odors, however, were evident in several monitoring wells, particularly in the MW117-series wells clustered around the former location of underground storage tank 117.

A summary of the water table elevation information obtained from the April 7, August 11, and November 8, 1993 water level measurements appears in Table 2. Figures 4, 5, and 6 are water table elevation maps constructed using the April 7, August 11, and November 8, 1993 water level elevation information. All three water table elevation maps were constructed using computer-based contouring software. The effect of computer contouring is to average water level elevation measurements in the monitoring well groups. Consequently, the water table elevation maps are contoured based on essentially four data points: the MW109, MW117, and MW11 series wells, and a fourth data point consisting of the MW-4, MW-5, and MW-6 cluster of wells.

TABLE 2

**NALF CROWS LANDING  
WATER ELEVATION SUMMARY**

Site	Well Number	Measuring Point Elevation (Above msl*)	Total Depth (Below Measuring Point)	Water Level (Below Measuring Point)			Water Level Elevation (Above msl)			Previous Water Level (Date Obtained)	Comments
				4/7/93	8/11/93	11/8/93	4/7/93	8/11/93	11/8/93		
Cluster 1	MW1	143.44	45.12	Dry	Dry	Dry	--	--	--	105.1 (10/90)	
	MW2	144.45	45.16	Dry	Dry	Dry	--	--	--	104.5 (10/90)	Petroleum odor in bottom sediment
	MW3	144.18	47.08	Dry	Dry	Dry	--	--	--	104.7 (10/90)	
Cluster 2	MW4	121.88	44.75	31.89	33.77	33.36	89.99	88.11	88.52	97.8 (10/90)	
	MW5	122.73	44.64	32.67	34.06	34.05	90.06	88.67	88.68	98.1 (10/90)	
	MW6	122.06	44.92	32.29	34.03	33.66	89.77	88.03	88.40	98.0 (10/90)	
Tank 109	MW109-1	134.20	45.44	43.74	43.65	44.61	90.46	90.55	89.59	95.77 (05/92)	
	MW109-2	133.69	46.22	43.43	43.16	44.29	90.26	90.53	89.40	96.10 (05/92)	
	MW109-3	135.15	45.94	44.69	44.74	45.68	90.46	90.41	89.47	95.76 (05/92)	
	MW109-4	134.92	48.88	44.50	44.54	45.44	90.42	90.38	89.48	95.79 (05/92)	
	MW109-5	134.28	48.34	43.86	43.77	44.75	90.42	90.51	89.53	95.80 (05/92)	
	MW109-6	134.60	48.60	44.16	44.15	45.08	90.44	90.45	89.52	95.78 (05/92)	
	ERM-2	134.74	39.00	Dry	Dry	Dry	--	--	--	108.20 (12/89)	Petroleum odor in bottom sediment
Tank 117	MW117-1	140.87	50.44	50.15	Dry	Dry	90.72	--	--	95.70 (05/92)	Oily Sediment on bottom
	MW117-2	141.50	52.12	50.80	51.64	51.94	90.70	89.86	89.56	95.61 (05/92)	Petroleum odor

TABLE 2 (Continued)

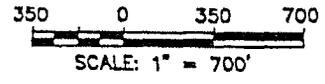
NALF CROWS LANDING  
WATER ELEVATION SUMMARY - APRIL 7, 1993

Site	Well Number	Measuring Point Elevation (Above msl*)	Total Depth (Below Measuring Point)	Water Level (Below Measuring Point)			Water Level Elevation (Above msl)			Previous Water Level (Date Obtained)	Comments
				4/7/93	8/11/93	11/8/93	4/7/93	8/11/93	11/8/93		
Tank 117 (continued)	MW117-3	139.58	55.14	48.85	49.65	50.00	90.73	89.93	89.58	95.58 (05/92)	Petroleum odor
	MW117-4	137.57	54.70	46.93	47.49	47.94	90.64	90.08	89.63	95.38 (05/92)	
	MW117-5	141.74	54.14	51.02	51.84	52.18	90.72	89.90	89.56	95.73 (05/92)	Petroleum odor
	MW117-6	139.62	55.65	48.94	49.80	50.08	90.68	89.82	89.54	95.60 (05/92)	
	MW117-7	139.88	54.84	49.17	49.84	50.23	90.71	90.04	89.65	95.55 (05/92)	Petroleum odor
	MW117-8	141.10	53.62	50.31	51.10	51.47	90.79	90.00	89.63	95.68 (05/92)	Petroleum odor
	ERM-1	142.02	43.62	Dry	Dry	Dry	—	—	—	109.32 (12/89)	
Site 11	11-MW-01	138.85	51.66	47.52	49.59	48.86	91.33	89.26	89.99	96.54 (08/91)	
	11-MW-02	140.67	52.32	49.43	51.58	50.82	91.24	89.09	89.85	96.50 (08/91)	
Site 12	12-MW-01	143.76	52.89	Dry	Dry	Dry	—	—	—	98.64 (08/91)	
Site 16	16-MW-01	144.67	54.50	Dry	Dry	Dry	—	—	—	98.84 (08/91)	
Fire Fighting School	ERM-3	145.37	41.02	Dry	Dry	Dry	—	—	—	111.93 (12/89)	

Note: All measurements are in feet.  
msl\* Mean sea level

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NAVAL AUXILIARY LANDING FIELD

LITTLE SALADO CREEK

BELL ROAD



MW11-02 91.24    MW11-01 91.33

MW-4 89.89  
MW-5 89.06  
MW-8 89.77

MW109-5 90.42  
 MW109-2 90.26  
 ERM-2 (DRY)  
 MW109-4 90.42  
 MW117-4 90.84  
 MW117-8 90.79  
 MW117-7 90.71  
 MW117-1 90.72  
 MW12-01 (DRY)  
 MW-2 (DRY)  
 MW-1 (DRY)  
 MW-3 (DRY)  
 MW18-01 (DRY)  
 ERM-3 (DRY)

MW109-1 90.48  
 MW109-8 90.44  
 MW109-5 90.48  
 MW117-8 90.88  
 MW117-2 90.70  
 ERM-1 (DRY)  
 MW117-5 90.72

MW117-3 90.73  
 MW117-4 90.84  
 MW117-8 90.79  
 MW117-7 90.71  
 MW117-1 90.72  
 MW12-01 (DRY)

91.1

91.0

90.9

90.8

90.7

90.6

90.5

90.4

90.3

90.2

90.1

90.0

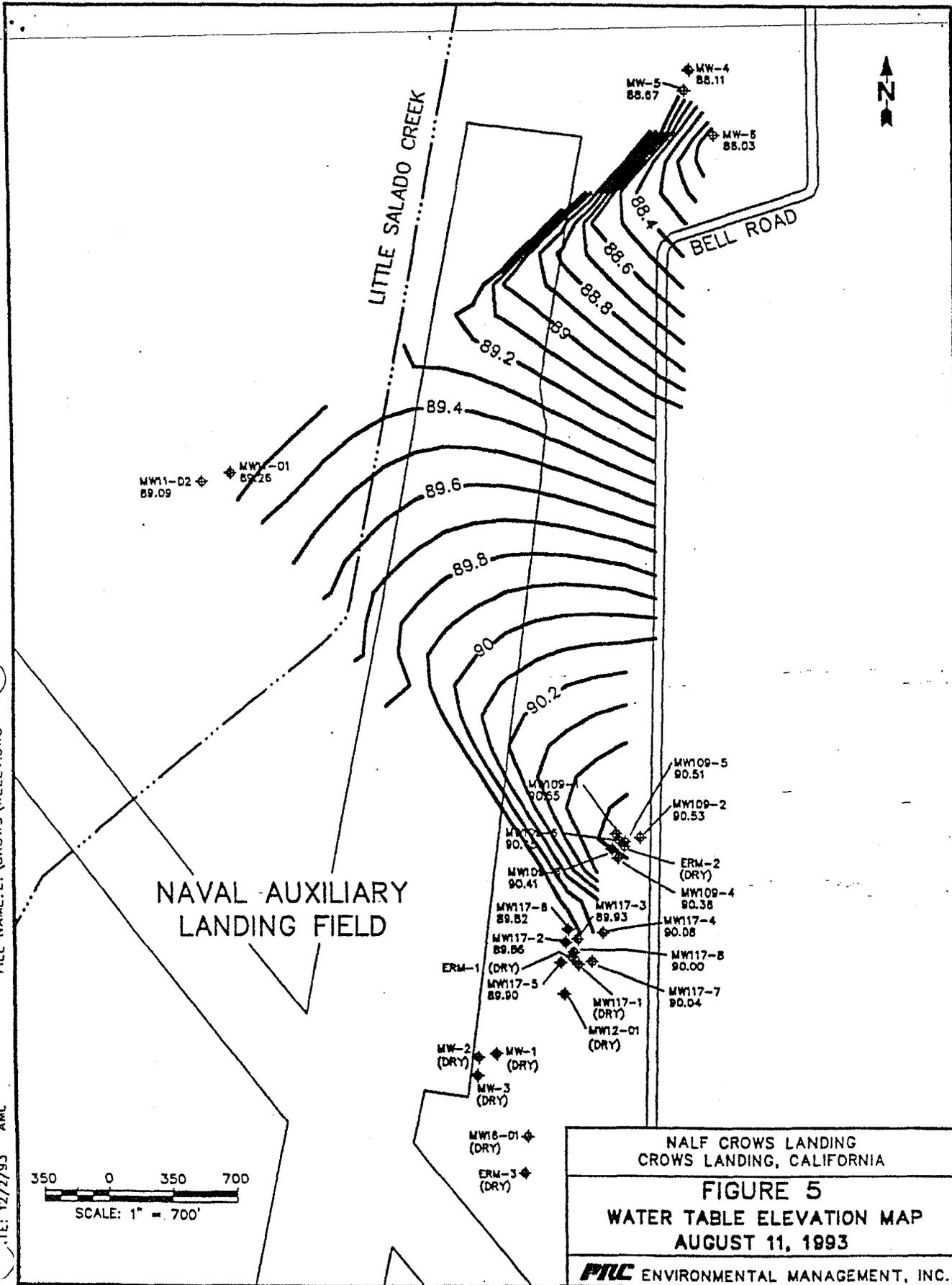
NALF CROWS LANDING  
 CROWS LANDING, CALIFORNIA

**FIGURE 4**  
**WATER TABLE ELEVATION MAP**  
**APRIL 7, 1993**

**PRC** ENVIRONMENTAL MANAGEMENT, INC.

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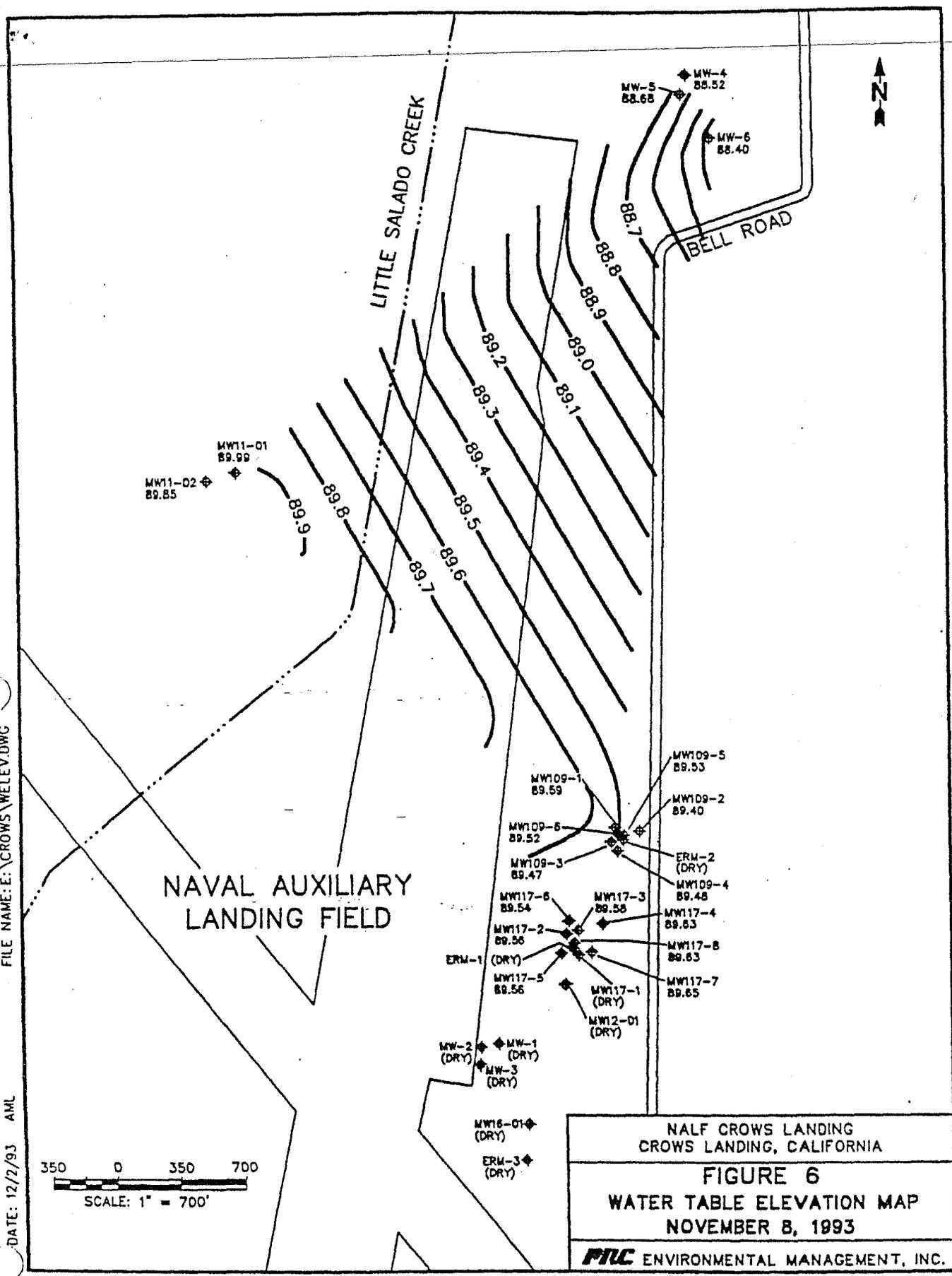
HALF CROWS LANDING  
 CROWS LANDING, CALIFORNIA

**FIGURE 5**  
**WATER TABLE ELEVATION MAP**  
**AUGUST 11, 1993**

**PIC ENVIRONMENTAL MANAGEMENT, INC.**

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DATE: 12/7/93 AML



HALF CROWS LANDING  
CROWS LANDING, CALIFORNIA

**FIGURE 6**  
WATER TABLE ELEVATION MAP  
NOVEMBER 8, 1993

**EMC** ENVIRONMENTAL MANAGEMENT, INC.

The April 7, 1993 water table elevation map (Figure 4) illustrates a consistent, east-northeast trending groundwater flow direction that coincides with the expected regional flow direction. The water table surface depicted is apparently unaffected by groundwater pumping or irrigation water percolation. This apparent lack of any irrigation effects coincides with information from the facility agriculture lessee, who stated that irrigation did not begin in 1993 until about May 1 (Michelena 1993). The water table gradient calculated from the April 7, 1993 water table elevation map is approximately 0.00053 feet per foot or 2.8 feet per mile.

The August 11, 1993 water table elevation map (Figure 5) appears to show the effects of local irrigation practices. In particular, groundwater mounding is apparent near the MW109 series wells. This groundwater mounding probably results from the percolation of irrigation water. This conclusion is supported by the observation of an irrigation water diversion structure located on the east side of Bell Road opposite the MW109 series well locations. The diversion structure appears to be used to divert canal water from an underground pipeline to an irrigation ditch that parallels Bell Road and supplies water to fields extending east from Bell Road. Water accumulating in the irrigation ditch and irrigated fields east of Bell Road apparently is percolating down to the water table resulting in the groundwater mound.

The November 8, 1993 water table elevation map (Figure 6) shows a return to a northeast trending groundwater flow direction coincident with the expected regional flow direction. Some groundwater mounding, however, is still evident near the MW109 series well locations, although not as pronounced as was observed on the August 11, 1993 water level elevations map (Figure 5). This return to groundwater flow characteristics more coincident with expected regional patterns corresponds to information supplied by the facility agriculture lessee, who indicated that irrigation in most fields stopped about October 1, 1993 (Michelena 1993).

Anomalous water level measurements are evident within the closely spaced monitoring well groups during the April 7, August 11, and November 8, 1993 measurement events. For example, the water level measured in well MW117-8 was anomalously high relative to the rest of the MW117 series wells when measured on April 7, 1993. In addition, water levels in wells MW11-01 and MW11-02 were reversed relative to what is expected given a northeast trending regional flow direction during all three measurement events completed in 1993. The anomalous water level measurements within closely spaced monitoring well groups are less than 1/10 of a foot different from the water levels expected. It is not clear whether the anomalous measurements are real, representing small-scale perturbations in the water table surface, or if the anomalies result from minor elevation survey errors or field water level measurement errors.

A review of information presented in Table 2, the water elevation summary, indicates that water levels measured between April 7 and November 8, 1993 have dropped since previous water level measurement events. For most of the wells at NALF Crows Landing, only one previous record of water level measurement was available prior to 1993. These previous water level measurements were taken either during December 1989, October 1990, August 1991, or May 1992. Since October 1990, water levels have dropped approximately 10 feet. Since May 1992, water levels have dropped approximately 5 feet. Overall, water levels dropped an average of 1.12 feet between April 17 and November 8, 1993. Currently, nine of the 27 monitoring wells at NALF Crows Landing are dry.

These dropping water levels are in contrast to overall increasing water level trends evident in some local wells since the early 1950s. However, it is not surprising given the drought conditions that persisted in the San Joaquin Valley for approximately 5 years prior to the winter of 1992 and 1993. This recent decrease in water levels is also evident in local water wells 6/8-19H1 and 6/8-21R2. Sufficient water level elevation information is not available to determine if any rebound in water levels occurred in response to the increased levels of precipitation during the winter of 1992 and 1993.

## 5.0 SUMMARY AND RECOMMENDATIONS

The area immediately surrounding NALF Crows Landing is used exclusively for agricultural purposes. Irrigated row and field crops and irrigated orchards are the predominant agricultural uses. The row and field crops are primarily furrow irrigated, while the orchards may be either furrow or spray irrigated. Most row crops are double cropped each growing season.

Irrigation water may be obtained from four sources: the Delta-Mendota Canal, California Aqueduct, San Joaquin River, or groundwater wells. At NALF Crows Landing, the source of irrigation water is approximately evenly divided between the canals and groundwater wells.

Approximately 42 water wells are located within 1 mile of NALF Crows Landing. Twenty-seven are irrigation wells, 13 are for domestic use, one is a cathodic protection well, and one is a fire suppression well. All of the domestic use wells are perforated in the upper water-bearing zone. Most of the irrigation wells are perforated in both the upper and lower water-bearing zones. Local wells that are producing from the upper water-bearing zone are perforated at depths greater than the monitoring wells at NALF Crows Landing. These local wells, however, tend to have gravel packs extending up to the depths monitored at the facility.

The results of facility-wide water level measurement efforts completed April 7, August 11, and November 8, 1993, indicate that groundwater mounding and gradient reversals are occurring during the irrigation season. The mounding and flow reversal probably results from the percolation of irrigation water. In addition, it has been observed that groundwater levels at NALF Crows Landing have continued to drop since the first monitoring wells were installed at the facility in 1988.

Water level elevations should continue to be monitored periodically to confirm the apparent seasonal affect recognized in this study. The groundwater flow characteristics observed must be considered when defining the extent of groundwater contaminant plumes or predicting future groundwater plume migration. Finally, additional piezometer locations should be considered to further define the groundwater flow characteristics, especially west of the MW109 and MW117 series well locations. Several currently dry monitoring wells at NALF Crows Landing may also need to be replaced if water levels do not rebound in the future.

## 6.0 REFERENCES

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## LAND SURVEY DATA

**PRELIMINARY TABLE OF WELLS LOCATED AT  
 NASA CROWS LANDING**

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
<b><u>UST Site 109</u></b>				
109-VB-01	1972915.37	6386404.62	134.63	1/31/01
109-VB-02	1972928.15	6386395.03	134.78	1/31/01
109-VB-03	1972937.12	6386401.98	134.37	1/31/01
109-VB-04	1972947.75	6386405.53	134.27	1/31/01
109-BV-01	1972913.20	6386403.63	135.29	10/02/00
109-BV-02	1972971.39	6386408.74	134.66	10/02/00
109-BV-03	1972928.69	6386408.89	134.71	10/02/00
109-BV-04	1972945.90	6386407.63	134.59	10/02/00
109-BV-05	1972925.41	6386394.41	135.28	10/02/00
109-BV-06	1972941.17	6386394.66	134.92	10/02/00
109-MP-01	1972915.09	6386399.75	134.85	10/02/00
109-MP-02	1972918.60	6386409.03	134.59	10/02/00
109-MP-03	1972921.22	6386397.23	134.41	10/02/00
109-MP-04	1972928.57	6386406.73	134.59	10/02/00
109-MP-05	1972926.68	6386412.57	134.40	10/02/00
109-MP-06	1972931.39	6386413.91	134.30	10/02/00
109-MP-07	1972927.81	6386400.99	134.85	10/02/00
109-MP-08	1972939.18	6386402.32	134.61	10/02/00
109-MP-09	1972937.40	6386394.39	134.60	10/02/00
109-MP-10	1972944.64	6386404.23	134.51	10/02/00
109-MP-11	1972957.75	6386410.96	134.61	10/02/00
109-MP-12	1972967.07	6386411.15	134.47	10/02/00
109-MW-01	1972923.90	6386410.07	134.22	10/02/00
109-VB-1P	1972914.63	6386406.36	134.81	10/18/01
109-VB-2P	1972926.78	6386396.01	134.40	10/18/01
109-VB-3P	1972937.58	6386400.77	134.19	10/18/01
109-VB-4P	1972949.65	6386406.32	134.31	10/18/01
<b><u>UST Site 117</u></b>				
117-EX-01	1972316.92	6386131.03	142.02	10/02/00
117-EX-02	1972316.03	6386127.63	142.10	10/02/00
117-MP-01	1972307.58	6386130.25	142.26	9/27/00
117-MP-02	1972316.38	6386145.90	141.12	10/02/00
117-MP-03	1972308.99	6386107.64	142.50	01/04/01
117-MW-01	1972173.77	6386032.00	142.76	9/27/00
117-MW-02	1972354.95	6386123.51	142.00	10/02/00

Crows Landing  
Compiled in October 2001

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
117-MW-03	1972341.17	6386130.31	141.74	9/27/00
117-MW-03MS	1972341.22	6386130.38	141.78	01/04/01
117-MW-04	1972300.54	6386292.63	139.31	9/27/00
117-MW-05	1972460.83	6386191.69	138.41	10/02/00
117-MW-06	1972362.78	6386098.91	142.07	10/02/00
117-MW-07	1972474.91	6386199.75	137.96	9/27/00
117-MW-08	1972462.88	6386415.42	136.46	9/27/00
117-MW-09	1972448.64	6386414.82	136.97	9/27/00
117-MW-10MD	1972351.26	6386180.68	140.26	9/27/00
117-MW-10MS	1972351.25	6386180.91	140.29	9/27/00
117-MW-10S	1972351.43	6386180.74	140.25	9/27/00
117-MW-11MD	1972290.82	6386079.57	142.05	9/27/00
117-MW-11MS	1972290.58	6386079.71	142.09	9/27/00
117-MW-11S	1972290.50	6386079.36	141.99	9/27/00
117-MW-12D	1972291.78	6386066.02	142.44	01/04/01
MW117-4	1972459.44	6386298.57	137.57	10/02/00
117-HP-03	1972308.85	6386162.30	141.01	6/11/01
117-HP-01	1972454.57	6386399.10	137.13	6/11/01
117-HP-02	1972454.95	6386395.92	137.12	6/11/01
117-HP-05A	1972448.76	6386487.85	136.63	7/10/01
117-HP-04	1972453.20	6386486.95	136.62	7/10/01
117-HP-05	1972450.69	6386486.75	136.70	7/10/01
<b><u>IRP Site 11</u></b>				
11-MW-03	1974894.83	6384015.61	141.35	9/27/00
11-MW-04	1974909.21	6384428.61	138.31	9/27/00
11-MW-05	1974342.16	6383765.19	144.01	9/27/00
11-MW-06	1974609.66	6383753.68	142.36	9/27/00
<b><u>IRP Site 17</u></b>				
17-MP-01A	1972550.30	6385709.17	141.87	9/27/00
17-MP-01B	1972550.34	6385709.23	141.89	9/27/00
17-MP-01C	1972550.55	6385709.48	141.99	9/27/00
17-MP-01D	1972550.22	6385709.45	141.97	9/27/00
17-MP-02A	1972539.19	6385731.80	141.83	9/27/00
17-MP-02B	1972539.07	6385731.46	141.93	9/27/00
17-MP-02C	1972539.09	6385731.20	141.99	9/27/00
17-MP-02D	1972539.35	6385731.53	141.79	9/27/00
17-MP-03A	1972570.98	6385725.07	141.83	9/27/00
17-MP-03B	1972571.04	6385725.32	141.70	9/27/00
17-MP-03C	1972570.87	6385725.38	141.81	9/27/00

Crows Landing  
 Compiled in October 2001

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
17-MP-03D	1972570.68	6385725.14	141.86	9/27/00
17-MP-04A	1972519.78	6385729.96	141.67	9/27/00
17-MP-04B	1972519.71	6385730.30	141.72	9/27/00
17-MP-04C	1972519.95	6385730.29	141.81	9/27/00
17-MP-04D	1972519.53	6385730.25	141.85	9/27/00
17-MP-05A	1972564.11	6385639.51	141.14	9/27/00
17-MP-05B	1972564.30	6385639.40	141.15	9/27/00
17-MP-05C	1972564.45	6385639.28	141.11	9/27/00
17-MP-05D	1972564.62	6385639.49	141.25	9/27/00
17-MP-06A	1972521.58	6385812.43	141.99	9/27/00
17-MP-06B	1972521.61	6385812.65	141.98	9/27/00
17-MP-06C	1972521.41	6385812.59	141.97	9/27/00
17-MP-06D	1972521.37	6385812.85	142.09	9/27/00
17-MW-01	1972783.05	6385818.40	142.48	9/27/00
17-MW-02	1972505.47	6385708.42	142.02	9/27/00
17-MW-03	1972512.89	6385708.42	142.09	9/27/00
17-MW-04	1972407.51	6386022.45	142.18	9/27/00
17-MW-05	1972408.76	6386028.13	141.61	9/27/00
17-MW-06	1972713.28	6385513.38	140.73	9/27/00
17-MW-07	1972711.66	6385522.66	140.77	9/27/00
17-MW-08	1973195.87	6385795.64	138.45	9/27/00
17-MW-09	1973185.81	6385794.66	138.16	9/27/00
17-MW-10	1972934.03	6385933.91	138.77	9/27/00
17-MW-11	1972810.73	6386237.74	135.90	9/27/00
17-MW-12	1972044.80	6385738.52	143.92	9/27/00
17-MW-13	1972054.40	6385738.48	144.00	9/27/00
17-MW-14	1972503.48	6385679.81	141.43	9/27/00
17-MW-15	1972474.93	6385711.47	141.86	9/27/00
17-MW-16	1972737.36	6385352.62	141.08	9/27/00
17-MW-17	1972735.81	6385369.23	141.28	9/27/00
17-MW-18	1973450.66	6385760.91	137.57	9/27/00
17-MW-19	1973426.07	6385759.66	137.48	9/27/00
17-MW-20A	1972667.51	6385760.97	140.40	9/27/00
17-MW-20B	1972667.37	6385761.23	140.69	9/27/00
17-MW-20C	1972667.66	6385761.10	140.77	9/27/00
17-MW-21	1972040.75	6385728.99	143.78	9/27/00
17-MW-22	1972052.23	6385726.11	143.65	9/27/00
17-MW-23MD	1972381.73	6385656.05	141.88	01/04/01
17-MW-23MS	1972381.71	6385656.58	141.81	01/04/01

Crows Landing  
 Compiled in October 2001

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
17-MW-23S	1972381.65	6385656.34	141.81	01/04/01
17-MW-25	1973102.98	6386499.59	133.33	03/19/01
17-SP-01A	1972546.27	6385718.72	141.82	9/27/00
17-SP-01B	1972546.17	6385718.46	142.10	9/27/00
17-SP-01C	1972546.12	6385718.56	141.80	9/27/00
17-SP-02A	1972501.06	6385717.16	142.19	9/27/00
17-SP-02B	1972500.59	6385717.51	142.12	9/27/00
17-SP-02C	1972500.71	6385717.54	141.79	9/27/00
17-SP-03A	1972514.14	6385749.87	141.68	9/27/00
17-SP-03B	1972514.12	6385749.93	141.87	9/27/00
17-SP-03C	1972513.89	6385750.23	141.72	9/27/00
17-SV-01	1972551.26	6385720.24	141.61	9/27/00
17MW03	1972512.90	6385708.51	142.07	9/27/00
17MW12	1972044.77	6385738.48	144.07	9/27/00
17-EX-01	1972490.43	6385702.14	142.17	01/04/01
17-HP-03	1973369.56	6385764.12	137.76	6/12/01
17-HP-04	1973367.73	6385764.16	138.09	6/12/01
17-HP-07	1972764.39	6386135.94	136.90	6/12/01
17-HP-02	1973308.77	6386090.89	135.24	6/12/01
17-HP-01	1973305.34	6386089.42	135.47	6/12/01
17-HP-06	1972728.18	6385388.43	141.38	6/12/01
17-HP-05	1972725.23	6385388.10	141.38	6/12/01
17-HP-10	1972794.93	6385260.85	141.64	7/10/01
17-HP-11	1972793.77	6385260.12	141.53	7/10/01
17-HP-12	1973522.94	6385783.02	137.41	7/10/01
17-HP-13	1973521.82	6385782.86	137.31	7/10/01
17-HP-08	1973269.30	6386415.12	133.57	7/10/01
17-HP-09	1973265.94	6386414.40	133.69	7/10/01
17-MW-25 (MS)	1972440.29	6386488.18	134.89	9/18/01
17-MW-25-S	1972445.99	6386488.38	135.09	9/18/01
17-MW-24-MS	1973112.75	6386500.30	132.98	9/18/01
17-MW-26-MS	1974999.28	6386528.53	128.85	9/18/01
17-MW-26-(S)	1974992.47	6386528.57	128.90	9/18/01
<b>Background Monitoring Wells</b>				
BG-MW-01	1968624.91	6383868.28	167.68	9/27/00
BG-MW-02	1971305.97	6381221.76	171.59	9/27/00
BG-MW-03	1975531.59	6381305.01	155.10	10/18/01

Crows Landing  
 Compiled in October 2001

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
<b>UST Cluster 1</b>				
CL1-EX-01	1971774.68	6385604.51	144.40	2/27/01
CL1-MW-01	1971814.28	6385427.92	145.07	9/27/00
CL1-MW-02S	1971821.34	6385641.97	144.75	9/27/00
CL1-MW-03	1971815.64	6385648.19	144.24	9/27/00
CL1-MW-03MS	1971815.60	6385648.17	144.25	9/27/00
CL1-MW-04	1971716.97	6385860.44	144.12	9/27/00
CL1-MW-06	1971446.21	6385424.50	146.55	9/27/00
CL1-MW-07	1971805.18	6385624.31	144.95	9/27/00
CL1-MW-08	1971814.61	6385414.47	144.99	9/27/00
CL1-MW-09MS	1972169.09	6385770.56	143.14	9/27/00
CL1-MW-10MD	1971759.09	6385750.63	145.45	9/27/00
CL1-MW-10MS	1971758.83	6385750.36	144.89	9/27/00
CL1-MW-10S	1971758.92	6385750.81	145.88	9/27/00
CL1-MW-11MD	1972005.73	6385522.61	143.79	9/27/00
CL1-MW-11MS	1972005.40	6385522.51	143.96	9/27/00
CL1-MW-11S	1972005.85	6385522.32	143.92	9/27/00
CL1-MW-12MD	1971748.05	6385563.03	145.75	9/27/00
CL1-MW-12MS	1971748.17	6385562.80	146.24	9/27/00
CL1-MW-13MD	1971813.80	6385401.09	144.62	9/27/00
CL1-MW-14MS	1971815.27	6385304.18	144.82	9/27/00
CL1-MW-14S	1971815.03	6385304.52	144.81	9/27/00
VW3S	1971833.53	6385587.78	147.04	7/26/00
VW3M	1971833.90	6385587.87	146.97	7/26/00
VW3D	1971835.01	6385585.66	144.26	7/26/00
VW7D	1971814.38	6385552.56	145.94	7/26/00
VW7M	1971814.58	6385552.50	145.51	7/26/00
VW13D	1971782.90	6385536.16	146.78	7/26/00
VW13M	1971782.87	6385535.76	146.67	7/26/00
VW23D	1971796.43	6385495.09	147.10	7/26/00
VW24D	1971736.35	6385493.43	147.24	7/26/00
VW25D	1971699.23	6385526.38	146.56	7/26/00
VW18S	1971711.54	6385563.11	146.44	7/26/00
VW18D	1971712.02	6385563.36	144.44	7/26/00
VW12D	1971786.67	6385579.98	144.35	7/26/00
VW12S	1971785.41	6385583.07	146.57	7/26/00
VW12M	1971785.89	6385582.81	144.64	7/26/00
VW2D	1971835.86	6385627.49	144.41	7/26/00
VW2S	1971833.48	6385629.80	144.42	7/26/00
VW2M	1971833.33	6385629.43	144.47	7/26/00
VW6D	1971798.47	6385621.57	144.38	7/26/00

Crows Landing  
 Compiled in October 2001

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
VW6M	1971798.87	6385621.63	144.29	7/26/00
VW11D	1971766.44	6385616.15	144.13	7/26/00
VW11S	1971764.36	6385617.64	144.07	7/26/00
VW11M	1971764.08	6385617.82	145.84	7/26/00
VW15D	1971728.39	6385603.33	144.18	7/26/00
VW15M	1971726.04	6385605.61	145.92	7/26/00
VW15S	1971726.17	6385606.02	146.94	7/26/00
VW16D	1971692.27	6385606.82	145.83	7/26/00
VW16M	1971691.97	6385606.63	145.82	7/26/00
VW20M	1971657.83	6385614.29	146.16	7/26/00
VW20S	1971657.67	6385614.75	146.54	7/26/00
VW19D	1971667.96	6385642.02	143.64	7/26/00
VW19S	1971666.61	6385644.63	143.09	7/26/00
VW19M	1971667.00	6385644.75	144.06	7/26/00
VW14D	1971714.85	6385634.77	145.64	7/26/00
VW14M	1971714.35	6385635.03	146.57	7/26/00
MP14D	1971717.10	6385639.30	148.14	9/27/00
MP14S	1971717.38	6385639.68	146.26	9/27/00
VW10D	1971765.21	6385652.23	143.75	9/27/00
VW10S	1971762.95	6385654.21	143.82	7/26/00
VW10M	1971762.59	6385654.28	143.80	7/26/00
VW5D	1971797.44	6385663.39	143.96	7/26/00
VW5M	1971797.35	6385662.96	143.93	7/26/00
VW01D	1971833.46	6385667.73	144.36	7/26/00
VW1S	1971833.13	6385668.00	144.30	7/26/00
VW22D	1971871.99	6385668.96	143.81	7/26/00
VW21D	1971844.67	6385707.17	143.56	7/26/00
VW4D	1971804.00	6385705.26	143.73	7/26/00
VW4M	1971803.86	6385705.76	143.58	7/26/00
VW9D	1971766.08	6385684.36	142.95	7/26/00
VW9M	1971764.27	6385687.77	142.64	7/26/00
VW9S	1971764.31	6385687.40	142.66	7/26/00
VW8D	1971755.06	6385716.45	143.48	7/26/00
VW8S	1971752.83	6385718.24	143.44	7/26/00
VW8M	1971752.73	6385717.94	143.47	7/26/00
VW17D	1971743.09	6385530.30	146.68	7/26/00
VW17M	1971743.55	6385530.50	147.08	7/26/00
SP16M	1971767.96	6385559.64	144.50	7/26/00
SP16D	1971768.18	6385560.03	144.62	7/26/00
SP16S	1971768.26	6385560.15	144.61	7/26/00
SP8M	1971729.97	6385556.55	144.81	7/26/00
SP8S	1971730.47	6385556.22	144.75	7/26/00
SP26D	1971693.81	6385552.68	144.77	7/26/00

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<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Top of Casing Elevation</u>	<u>Date of Survey</u>
SP26M	1971693.23	6385552.50	144.85	7/26/00
SP26S	1971693.33	6385551.85	144.83	7/26/00
SP27D	1971711.55	6385598.41	144.78	7/26/00
SP27M	1971711.64	6385598.34	144.82	7/26/00
SP27S	1971711.88	6385598.24	144.84	7/26/00
SP9M	1971743.43	6385583.55	144.61	7/26/00
SP9S	1971743.34	6385582.96	144.55	7/26/00
SP15S	1971777.36	6385592.39	144.81	7/26/00
SP15M	1971777.43	6385592.70	144.82	7/26/00
SP15D	1971777.95	6385592.97	144.82	7/26/00
SP20S	1971853.79	6385628.01	144.69	7/26/00
SP20M	1971853.68	6385628.13	144.71	7/26/00
SP20D	1971853.63	6385628.70	144.75	7/26/00
SP3S	1971821.29	6385636.29	144.66	7/26/00
SP3M	1971821.39	6385636.11	144.67	7/26/00
SP14D	1971787.36	6385626.54	144.40	7/26/00
SP14S	1971787.20	6385626.38	144.43	7/26/00
SP14M	1971787.19	6385625.75	144.49	7/26/00
SP10M	1971753.77	6385615.01	144.23	7/26/00
SP10S	1971753.75	6385615.54	144.16	7/26/00
SP28S	1971723.87	6385636.36	144.17	7/26/00
SP28M	1971723.89	6385636.57	144.22	7/26/00
SP28D	1971724.09	6385637.06	144.28	7/26/00
SP11M	1971762.83	6385648.63	144.02	7/26/00
SP11S	1971762.73	6385649.06	144.03	7/26/00
SP13D	1971796.57	6385658.64	144.28	7/26/00
SP13M	1971796.50	6385659.09	144.34	7/26/00
SP13S	1971796.60	6385659.18	144.28	7/26/00
SP19M	1971868.07	6385665.29	144.32	7/26/00
SP19S	1971868.00	6385665.59	144.31	7/26/00
SP19D	1971867.99	6385665.92	144.32	7/26/00
SP2M	1971830.57	6385665.29	144.38	7/26/00
SP2S	1971830.30	6385665.54	144.38	7/26/00
SP29S	1971732.66	6385673.20	144.10	7/26/00
SP29M	1971732.41	6385673.37	144.11	7/26/00
SP29D	1971732.31	6385673.32	144.11	7/26/00
SP12S	1971772.89	6385683.22	143.86	7/26/00
SP12M	1971773.05	6385683.16	143.85	7/26/00
SP1S	1971806.86	6385693.69	143.94	7/26/00
SP1M	1971806.67	6385693.88	143.85	7/26/00
SP18S	1971842.18	6385703.07	144.01	7/26/00
SP18M	1971842.17	6385703.48	144.01	7/26/00
SP18D	1971842.08	6385703.85	144.01	7/26/00

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SP17D	1971797.55	6385723.62	143.62	7/26/00
SP17S	1971797.55	6385723.49	143.62	7/26/00
SP17M	1971797.58	6385722.90	143.57	7/26/00
SP30D	1971764.86	6385710.11	143.23	7/26/00
SP30M	1971764.89	6385709.92	143.28	7/26/00
SP30S	1971765.09	6385709.44	143.16	7/26/00
CL1MW02	1971821.36	6385641.97	144.72	7/26/00
CL1MW05	1972173.13	6385196.84	142.92	01/04/01
CL1MW09S	1972168.71	6385770.74	143.10	01/04/01
CL1MW10S	1971759.02	6385750.70	145.94	7/26/00
CL1MW12S	1971747.60	6385563.16	146.75	01/04/01
CL1MW16	1971742.57	6385628.71	144.21	01/04/01
CL1SV01C	1971754.28	6385570.03	144.67	7/26/00
CL1SV01B	1971754.28	6385569.76	144.58	7/26/00
CL1SV01A	1971754.05	6385569.96	144.27	7/26/00
CL1VP01A	1971758.22	6385566.77	144.48	7/26/00
CL1VP01B	1971757.82	6385566.72	144.38	7/26/00
CL1VP01C	1971757.81	6385566.40	144.39	7/26/00
CL1VP02B	1971763.56	6385577.74	144.49	7/26/00
CL1VP02A	1971763.78	6385577.54	144.35	7/26/00
CL1VP02C	1971763.89	6385577.46	144.30	7/26/00
CL1VP03A	1971731.65	6385590.35	144.64	7/26/00
CL1VP03B	1971731.55	6385590.23	144.59	7/26/00
CL1VP03C	1971731.65	6385590.25	144.74	7/26/00
CL1-HP-03	1971986.86	6386050.13	143.22	6/12/01
CL1-HP-02	1971984.97	6386048.87	143.06	6/12/01
CL1-HP-01	1971623.96	6385937.43	143.48	6/12/01
CL1-HP-05	1972036.51	6386339.42	140.94	7/10/01
CL1-HP-04	1972036.83	6386335.88	140.90	7/10/01
<b>UST Cluster 2</b>				
CL2-BV-01	1976955.11	6386843.32	125.91	10/02/00
CL2-BV-02	1976974.85	6386847.35	125.89	10/02/00
CL2-BV-03	1976966.72	6386809.61	125.80	10/02/00
CL2-BV-04	1977060.18	6386869.75	125.46	10/02/00
CL2-MP-04A	1976935.35	6386892.14	125.47	10/02/00
CL2-MP-04B	1976935.46	6386892.49	125.46	10/02/00
CL2-MP-05A	1976979.36	6386906.89	125.64	10/02/00
CL2-MP-05B	1976979.81	6386906.91	125.15	10/02/00
CL2-MP-06A	1976963.32	6386791.58	126.12	10/02/00
CL2-MP-06B	1976963.23	6386791.83	126.11	10/02/00
CL2-MP-07A	1976981.81	6386901.52	125.10	10/02/00

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CL2-MW-02	1976981.92	6386857.79	122.61	10/02/00
CL2-MW-04	1977020.23	6386742.89	123.17	10/02/00
CL2-MW-05	1976978.37	6386871.69	122.16	10/02/00
CL2-MW-06A	1976884.17	6386915.57	125.70	10/02/00
CL2-MW-06B	1976883.69	6386915.65	125.68	10/02/00
CL2-MW-07A	1977022.59	6386937.83	125.16	10/02/00
CL2-MW-07B	1977022.68	6386937.83	125.20	10/02/00
CL2-SP-01	1976957.48	6386844.85	125.45	10/02/00
CL2-SP-02	1976966.22	6386813.36	125.43	10/02/00
CL2-SP-03	1976971.23	6386859.95	125.90	10/02/00
CL2-SP-04	1976943.40	6386867.83	125.45	10/02/00
CL2-SP-05	1976973.88	6386885.24	125.88	10/02/00
CL2-SP-06	1976957.48	6386897.98	125.61	10/02/00
CL2-SP-07	1976931.05	6386914.58	125.41	10/02/00
CL2-SP-08	1976972.13	6386936.43	125.48	10/02/00
CL2-MW-01	1976941.56	6386957.64	121.89	01/04/01
CL2-MW-03	1977063.55	6386978.74	121.55	01/04/01
CL2-MP-01A	1976957.98	6386837.53	125.75	04/12/01
CL2-MP-01B	1976957.54	6386837.66	125.86	04/12/01
CL2-MP-02A	1976957.29	6386860.44	125.58	8/20/01
CL2-MP-02B	1976957.50	6386859.87	125.69	8/20/01
CL2-MP-03A	1976934.24	6386844.46	125.65	8/20/01
CL2-MP-03B	1976934.00	6386844.66	125.57	04/12/01
CL2-HP-02	1977127.13	6386939.00	122.05	6/12/01
CL2-HP-01	1977165.08	6386955.74	121.87	6/12/01
<b>OFFSITE IRRIGATION &amp; DOMESTIC WELLS</b>				
6\8-7 LAY	1981601.85	6375503.96	195.73	01/31/01
6\8-7L1	1980270.41	6376087.41	195.17	01/31/01
6\8-19 TABOR	1965742.36	6380110.28	202.60	01/31/01
6\8-19 TABOR2	1965754.80	6379458.80	203.87	01/31/01
6\8-19 TABOR3	1965516.33	6379381.91	209.74	01/31/01
6\8-19H1	1968833.22	6380501.08	183.32	01/31/01
6\8-20D1	1970942.11	6381252.52	171.51	01/31/01
6\8-20C1	1970883.14	6383091.94	161.15	01/31/01
6\8-17P1	1971163.21	6383812.33	152.99	01/31/01
6\8-17D1	1975195.93	6381289.77	155.76	01/31/01
6\8- 18MCDONALD	1974079.42	6380947.80	160.16	01/31/01

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6\8-7	1981513.71	6381210.76	151.11	01/31/01
6\8-7C1	1978935.50	6378698.15	174.61	01/31/01
6\8-8L1	1979708.45	6383873.21	125.53	01/31/01
?	1978846.57	6383916.05	134.48	01/31/01
6\8-902	1981437.63	6387062.30	113.34	01/31/01
6\8-901	1981388.83	6387239.18	111.28	01/31/01
6\8-16M1	1972765.73	6387474.15	128.22	01/31/01
6\8-16L1	1973761.71	6389303.96	119.50	01/31/01
6\8-21E1	1969168.24	6387528.97	138.36	01/31/01
6\8-21E1	1969205.16	6387528.97	144.35	01/31/01
6\8-21	1966779.90	6387491.37	158.33	01/31/01
6\8- 21FREEMAN	1965780.27	6386816.32	161.39	01/31/01
6\8- 21FREEMAN	1965780.17	6386796.28	167.37	01/31/01
6/8-21N1	1966003.33	6386556.31	168.73	01/31/01
6/8- 21FRANC	1965733.85	6386504.64	170.28	01/31/01
6/8-21Q1	1965720.30	6388974.23	151.57	01/31/01
6/8-21Q1	1965996.18	6391402.95	126.81	01/31/01
6/8-21R2	1966011.25	6391403.08	132.59	01/31/01
6/8-21R1	1965581.46	6391253.81	129.99	01/31/01
6/8- 16CRAVEN	1973580.87	6391841.97	103.53	01/31/01
6/8-16H1	1977858.07	6390164.77	102.54	01/31/01
6/8-9M2	1977388.70	6387744.48	114.03	01/31/01
6/8-Q0	1968972.41	6384698.55	160.73	01/31/01