

SUMMARY

INTRODUCTION

The following is a brief summary of the various documents and test reports submitted on the vertical water well drilled for County Service Area No. 49 (Apple Valley), San Bernardino County, California. Copies of the reports submitted are at the conclusion of this text.

SECTION I WELL DRILLERS REPORT

Report No. 80190 August 22, 1972

1. 18-inch diameter hole, 756 feet deep, 10 3/4-inch casing.
2. Gravel packed 3/8-inch pea gravel.
3. Perforations from 456 feet to 756 feet; 1/8-inch by 2 1/2-inch; 24 perforations per row; 4 rows per foot.
4. Static water level = 497 feet.
5. Yield = 190 gpm with drawdown to 568 feet.
6. Fifty feet of 20-inch diameter conductor casing was installed and sealed with a cement grout.

SECTION II WELL TEST PUMP REPORT

24-Hour Pump Test Performed October 6, 1972

Static Water Level = 492 feet

At 70 gpm	508 feet; clear; no air.
At 100 gpm	520 feet; clear; no air.
At 150 gpm	527 feet; clear; no air..
At 160 gpm	535 feet; clear; no air.
At 170 gpm	542 feet; clear; no air.
At 180 gpm	560 feet; clear; no air.
At 190 gpm	568 feet; clear; some air.
At 200 gpm	580 feet; clear; some air.

1.4
83
200

SECTION III CHEMICAL ANALYSIS OF WELL WATER

Report No. 721010-A (Concentration in Milligrams per Liter)

<u>Parameter</u>	<u>CSA #49 Well</u>	<u>Recommended PHS Standards (Maximum Values)</u>
Calcium	40	
Magnesium	10	
Sodium	35	
Potassium	2	
Alkalinity as HCO ₃	143	
Sulfate	58	250
Chloride	34	250
Nitrate	5	45
Fluoride (90°F)	0.40	0.80
Boron	0.10	1.00
Iron	0.06	0.30
Manganese	0.00	0.05
Total Dissolved Residue	300	500
Hardness as CaCO ₃	140	

SECTION IV ELECTRIC LOG REPORT ON WELL

On August 8, 1972 when the 7-inch test well had been drilled to a depth of 700 feet, the well was electric logged to aid in determining what yield might be expected from the well and as to whether the well should be drilled deeper. A copy of the Electric Log Report and the analysis of the log by "Go International," the company that performed the test, is enclosed.

Fifty pounds of salt was added to the driller's mud and circulated through the well before the test was made to aid in interpreting the results.

Based on the well driller's log of the hole and the Electric Log Report, the well depth was extended to 757 feet, terminating in a hard green clay.

SECTION V CALIPER LOG REPORT

After the well was reamed out to the 18-inch diameter, a Caliper Log of the well was made on September 13, 1972 to determine the

actual diameter of the well. A copy of this log is included. The top 50 feet of the well is reamed to 24 inches in diameter for the conductor casing.

SECTION VI GRAVEL PACK

A copy of the sieve analysis of the pea gravel used for gravel packing the well is provided.

SECTION VII MAPS AND FIGURES

1. General Location Map.
2. Detail Location Map.
3. Well Plan and Profile.

SECTION VIII CHEMICAL ADDITIVE

Thirty gallons of SE-200 chemical was added to the well along with 3,000 gallons of water to force the chemical back into the aquifer. This chemical tends to dissolve muds and clays and should increase the yield of a well where some clays are found in the aquifer. The well was left inactive with this chemical in it for about a week before test pumping commenced to allow the chemical to react with the clays.

APPENDIX 1
COUNTY SERVICE AREA NO. 49
SAN BERNARDINO COUNTY
CALIFORNIA

GENERAL INFORMATION
DOMESTIC WATER WELL
DRILLED
AUGUST, 1972

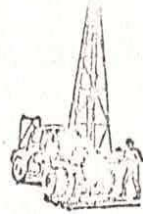
SECTION I
WELL DRILLERS REPORT

SECTION II

WELL TEST PUMP REPORT

HOWARD PUMP CO.

28753 Highway 58 • Telephone (714) 256-8996
BARSTOW, CALIFORNIA 92311



TEST PUMP REPORT

for

SAN BERNARDINO COUNTY SERVICE AREA NO. 49

Date: October 6, 1972

Starting Time: 8:00

Static Water Level: 492'

<u>TIME</u>	<u>PUMPING LEVEL</u>	<u>G.P.M.</u>	<u>REMARKS</u>
8:00	Develop	100	Drill Mud Sc200 - no sand
8:05	"	100	Looks & Smells more like clay than drill mud
8:10	530'	100	"
8:15	520'	140	Real fine Sand - Can't feel it but it is in discharge
8:50	520'	150	"
9:00	Develop	150	"
9:15	Surge	150	"
9:30	Develop	180	Dirty w/fine sand & mud or clay (dark gray color w/Sc200
9:45	580'	180	"
10:00	Surge	170	Clearing up some light brown (now w/sand & Sc200) after surge pumping same rpm.
10:15	Surge	170	"
10:30	Surge	170	Still discolored w/sand & SC200 - seems to be pumping some air.
10:45	Develop	170	Clearing after surge, clouded up more for about 10 min then back to same color
11:00	580'	200	Clearing pretty nicely still has some sand - but no SC 200.
11:35	570'	190	Sand but no Sc200
12:30	542'	170	I dropped gpm to 70 for 1/2 hr. then will give a try for maximum. (10:45) well cleared & wouldn't dirty w/surges.

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October 6, 1972

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<u>TIME</u>	<u>PUMPING LEVEL</u>	<u>G.P.M.</u>	<u>REMARKS</u>
1:30	542'	170	"
1:45	542'	170	"
2:15	542'	170	Pumping at same rpm - clean w/some air
2:30	542'	170	"
3:00	542'	170	Clean with air
3:30	"	170	Clean before and after surge
4:00	535'	160	Clouded some with surges - still fine sand
4:30	535'	160	Clean with very little fine sand
5:00	535'	160	After surging 4 times set for 20 min then surged 3 more times and resumed running.
5:30	535'	160	
6:00	535'	160	
October 9/72			
8:00		100	Surge 3 times then run
8:15	508'	100	Discharge rusty colored surge 2
8:20	512'	110	Clearing up - Surge 2
8:30	Develop.	110	No change - still clear surge 2
8:40	Surge	250	Surge after 10 min run hard
8:45	No drawdown Test	250	Surge after 5 min - work hard - Sand and drill mud some cleared up right away - off white in color. Clearing up some - sand after surge.
9:00	"	210	"
9:15	"	230	"
9:45	"	160	Wait 5 min. after surge & resume run some Sc200 - yet pumping pretty good.
9:50	air	210	Dirtyies some after surge - clear right up.
10:00	air	210	Surged 2 times - stayed clean w/some SC 200 - still some sand - a little more course now.
10:30	develop	200	Clear w/some sand & SC200
10:55	547'	180	Same rpm clear w/no SC200 in discharge - very small amount of sand

San Bernardino County Service Area No. 49

October 6, 1972

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<u>TIME</u>	<u>PUMPING LEVEL</u>	<u>G.P.M.</u>	<u>REMARKS</u>
11:15	560'	190	Same rpm clear w/no Sc200 in discharge - very small amount of sand.
12:00	560'	180	"
12:20	560'	180	"
12:40	560'	180	"
1:00	560'	180	Clear w/no sand & no Sc200 at same rpm
1:20	560'	180	"
2:00	560'	180	"
2:30	568'	190	Clear and holding
3:00	568'	190	Clear
3:30	568'	190	Clear
4:00	568'	190	Clear
4:30	568'	190	Clear
5:00	568'	190	Clear - Holding
5:30	568'	190	Clear - Holding
6:00	569'	190	Clear - Holding
7:00	569'	190	Clear - Holding
7:30	569'	190	Clear - Holding
8:00	569'	190	Clear - Holding
8:30	569'	190	Clear - Holding
9:00	569'	190	Clear - Holding

FINAL CHECK:

508	70	Clear - no air
520	100	Clear - no air
527	150	Clear - no air
535	160	Clear - no air
542	170	Clear - no air
560	180	Clear - no air
568	190	W/some air
580	200	w/some air

SECTION III

CHEMICAL ANALYSIS OF WELL WATER

ESTABLISHED 1906

EDWARD S. BABCOCK & SONS

P. O. BOX 432
RIVERSIDE, CALIFORNIA 92502



PHONE 684-1881
AREA CODE 714

LABORATORIES
3215 CHICAGO AVE.

TO Neste, Brudin & Stone
P.O. Box 902
San Bernardino, CA

SAMPLE MARKED C.S.A. 49

Laboratory No. 721010-A

Cations	Milligrams per liter (ppm)	Milli equivalents per liter	Anions	Milligrams per liter (ppm)	Milli equivalents per liter
Calcium (Ca)	40	2.00	Alkalinity as Hydroxide (OH)	0	----
Magnesium (Mg)	10	0.80	Carbonate (CO ₃)	0	----
Sodium (Na)	35	1.52	Bicarbonate (HCO ₃)	143	2.35
Potassium (K)	2	0.05	Sulfate (SO ₄)	58	1.21
Ammonium (NH ₄)			Chloride (Cl)	34	0.95
			Nitrate (NO ₃)	5	0.08
			Phosphate (PO ₄)		
		437			459
Conductivity, ECx10 ⁶ @ 25 ° C.		450			Milligrams per liter (ppm)
Percent Sodium		35			
Hydrogen-ion activity (pH)		7.6	Total Hardness calculated as CaCO ₃		140
Color		0	Total Dissolved Residue (180° C)		300
Odor T O N		0	Fluoride (F)		0.4
Turbidity		0	Boron (B)		0.1
			Iron (Fe)		0.06
			Manganese (Mn)		0.00

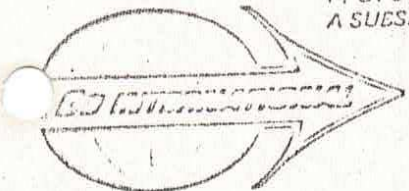
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Edward S. Babcock & Sons, INCORPORATED
NESTE BRUDIN & STONE

Sherman G. Babcock

SECTION IV

ELECTRIC LOG REPORT ON WELL



August 14, 1972

Mr. Norman A. Howard
Howard Pump Company
28753 Highway 58
Barstow, California

Dear Norm,

After checking the log run on your County Service Area #49 Water Well in San Bernardino County, I am still not too enthused over the chances of this well making enough water to satisfy the demands of the County, though I don't know what these may be. I am basing my opinion strictly on log readings since I am not familiar with the geological structure around there. I am also using the wafer value obtained from the sample from the nearby well and assuming that any water from your well will be of the same value. Since the nearby well failed to encounter water until 500' was reached I am assuming the high resistivity sands in the upper portion of your well are the same and are also dry. If not they have much lower porosities than the lower sands which doesn't seem right.

In my calculations of porosity I am using the formula $F=R_o/R_w$ to find the Formation Factor F which is then run through the charts to determine porosity. I believe that the zones with abnormally high porosity readings probably contain lot's of clay. These occur in the zones with lower resistivity readings which also is a good indication of clay. The Driller's Log tends to confirm this theory. Whether the clay is of such nature to hinder water production I don't know.

As I said before, the S.P. curve is generally used in trying to determine fresh water zones as it tends to deflect to the right (positive) across from zones containing fresher waters than the drilling fluid. In this case the drilling fluid was almost the same value of that in the formation so we failed to get the desired positive deflection. The S.P. curve is also used to determine the resistivity of the fluid in the formations. In this case we have a sample from a nearby well and it should be a representative sample of R_w in this well. I think this assumption is okay since the two wells are close together, so we can do away with all the extensive calculations used to find R_w .

I am also using the maximum 16" Normal reading in each zone as R_o (resistivity of the zone when 100% saturated with water of resistivity R_w) and 20 ohms for R_w (the resistivity of the water in the formation), which may not be correct in all cases, depending on the sand grain size etc.

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The fluid level at time of logging was 150' so any log values above this depth are not valid since the voltage electrodes are not making good contact.

150'-472' The 16" Normal averages 150 to 175 ohm-meters; therefore $F=R_o/R_w=150/20$ and $175/20$ or 7.5 to 8.75 and porosities from 32% to 29%. These porosities are probably low.

472'-484' The 16" Normal averages about 70 ohms; $F=3.5$; $\phi=45\%$. This zone could test some water if not affected by clay.

484'-493' The 16" Normal averages 92 ohms; $F=4.6$; $\phi=40\%$. This zone may also have some water present.

493'-565' The 16" Normal averages about 65 ohms; $F=3.25$; $\phi=48\%$. This zone could test water if not too much clay present. The Driller's log shows lot's of clay present.

565'-605' The 16" Normal averages 35 ohms; $F=1.75$; $\phi=80\%$ which is much too high so probably mostly clay.

605'-615' The 16" Normal reads 60 ohms; $F=3$; $\phi=48\%$. This zone could have water if not too much clay present.

615-618' Clay

618'-622' Thin sand zone. $16''=60$; $F=3$; $\phi=48\%$.

622'-628' Mostly clay.

628'-638' Sand and clay streaks.

638'-651' A hard sand. The 16" Normal reads 175 ohms; $F=8.75$; $\phi=9\%$.

651'-658' The 16" Normal reads 65 ohms; $F=3.25$; $\phi=48\%$. This zone could have lot's of clay present.

658'-665' Sand. 16" Normal reads about 95 ohms; $F=4.75$; $\phi=39\%$. This zone could test some water.

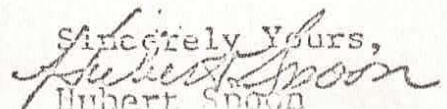
665'-675' Probably mostly clay with porosity of 50% or better.

675-681' Hard sand. 16" Normal reads 220 ohms; $F=11$; $\phi=26\%$. There is probably a very hard streak right at bottom of this zone.

681'-694' A series of sand and shale(clay) streaks.

694'-702' Hard sand. 16" Normal = 110 ohms; $F=5.5$; $\phi=36\%$. Could test some water.

I hope the above figures are of some help to you. If I can be of further service please feel free to call me at anytime. I am enclosing some literature on water well logging that you may find interesting. Please look at the log example page 254 as it shows a reversed S.P.

Sincerely Yours,

 Hubert Spoon

APPENDIX 3

LEGAL DESCRIPTION OF RESERVOIR SITES

A. Initial Reservoir Site

South 200' of $E\frac{1}{2}$, $SE\frac{1}{4}$, $NE\frac{1}{4}$, $SE\frac{1}{4}$, Sec 29 T4NR2W

B. Future Reservoir Site

North 200' of $W\frac{1}{2}$, $NE\frac{1}{4}$, $NW\frac{1}{4}$, $NE\frac{1}{4}$, Sec. 28 T4NR2W

DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

No. 001102x

ORIGINAL
File with DWR

State Well No. _____

Other Well No. _____

(1) OWNER: County Service Area No. 49
Name c/o Neste Prudin & Stone
Address 350 W. Fifth Street
San Bernardino, California 92402

(2) LOCATION OF WELL:
County San Bernardino Owner's number, if any _____
Township, Range, and Section DW 1/4 Sec. 22, Twn 4 N, Rng. 2
Distance from cities, roads, railroads, etc. W, 300 Westerly of an
existing Well.

(11) WELL LOG:

Total depth	ft.	Depth of completed well	ft.
Formation: Describe by color, character, size of material, and structure			
0 - 2 feet		Clay	
2 - 91 feet		Sand, Gravel, Small Boulder	
91 - 160 feet		Sand	
160 - 230 feet		Sand, Small Boulders	
230 - 386 feet		Hard Sand	
386 - 475 feet		Sandy, Clay	
475 - 497 feet		Clay	
497 - 628 feet		Sandy, Clay	
628 - 734 feet		Hard Sand	
734 - 756 feet		Green Clay	

(3) TYPE OF WORK (check):
New Well Deepening Reconditioning Destroying
If destruction, describe material and procedure in Item 11.

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

(5) EQUIPMENT:
Rotary
Cable
Other

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE DOUBLE

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	756	10 3/4	1/4	18"	0	756

Size of shoe or well ring: _____ Size of gravel: 3/8 Pea.

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
456	756	24	4	1/8 x 2 1/2

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes No To what depth 50 ft.
Were any strata sealed against pollution? Yes No If yes, note depth of strata _____
From _____ ft. to _____ ft.
From _____ ft. to _____ ft.
Method of sealing Cement

(9) WATER LEVELS:
Depth at which water was first found, if known 497 ft.
Standing level before perforating, if known _____ ft.
Standing level after perforating and developing _____ ft.

(10) WELL TESTS:
Was pump test made? Yes No If yes, by whom? H. P. I.
Yield: 190 gal./min. with 568 ft. drawdown after 24 hrs.
Temperature of water _____ Was a chemical analysis made? Yes No
Was electric log made of well? Yes No If yes, attach copy

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NESTE, BRUDIN & STONE
INCORPORATED

Work started 8/72, Completed 8/22/72

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Howard Pump, Inc.
(Person, firm, or corporation) (Typed or printed)

Address 28753 W. Hwy. 58, Barstow, California

[SIGNED] _____ (Well Driller)

License No. 193628 Dated 11/3/72, 19__

SKETCH LOCATION OF WELL ON REVERSE SIDE

OVER