



Docket No: 2

Preliminary Docket Information

DATE: July 11, 1979

NARRATIVE:

Note: In 1966 two test wells were drilled in the southern part of the monument. The first, located at NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.14 T45N R4E, had caving problems and had to be abandoned. The second well, located at NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.36 T45N R4E, was abandoned when the bottom 15 feet of the drill stem was sheared off.

Approved by _____

[illegible]

Form 10-174
(Rev. 8-56)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

COMPLETION REPORT OF CONSTRUCTION PROJECT

RESERVOIR REPLACEMENT
PUMP REPLACEMENT
PRIOR CLAMPS ON PIPELINE

REGION Four	AREA Lava Beds National Monument	COUNTY Siskiyou	STATE California
PROJECT OR JOB TITLE			PCP NO.
LOCATION IN AREA		MASTER PLAN NO.	BUILDING NO.
WORKING DRAWING NO. AND TITLE			
APPROPRIATION TITLE AND SYMBOL			WORK ORDER NO. 332.2
CONTRACT NO.		DATE WORK STARTED	DATE WORK COMPLETED
NAME OF CONTRACTOR		ADDRESS	

COST ANALYSIS

CONSTRUCTION ITEMS	QTY.	UNIT COST IN PLACE	TOTAL COST IN PLACE
<u>SUMMARY, CONTRACTS & DAY LABOR PORTIONS</u>			\$
Contract No. 14-10-434-132			\$ 54,054.00
Contract No. 14-10-434-178			<u>6,845.96</u>
TOTAL CONTRACT AMOUNT			<u>60,899.96</u>
PS&S COST <i>July 10 2/59</i> <u>DAY LABOR</u>			9,573.87
Supplies & Material			844.95
Other Direct Expenses			104.25
Facilitating Services			<u>562.00</u>
FISCAL CLEARANCE Roland V. Johnson Regional Accountant Date AUG 5 1959			<u>62,411.16</u>
Total Cost		TOTAL	71,985.03

SUMMARY OF EXPENDITURES

PERSONAL SERVICES	EQUIPMENT	MATERIALS AND SUPPLIES
OTHER		

CHANGE ORDERS

ORIGINAL CONTRACT AMOUNT	FIRST	SECOND	THIRD
FINAL CONTRACT AMOUNT	FOURTH	FIFTH	SIXTH

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

SUBMITTED BY (Name and title) James T. Brooks, Highway Engineer <i>James T. Brooks</i>	DATE April 28, 1959
APPROVED BY (Name and title) <i>Divin Allen - Sup't</i>	DATE July 9-1959

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

Form 10-174
(Rev. 8-56)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
COMPLETION REPORT OF CONSTRUCTION PROJECT

REGION Four	AREA Lava Beds National Monument	COUNTY Siakiyou	STATE California
PROJECT OR JOB TITLE Rehabilitation of Water Supply System for Indian Wells Headquarters Area			PCP NO. U-11
LOCATION IN AREA Headquarters		MASTER PLAN NO. LB-5301-A	BUILDING NO.
WORKING DRAWING NO. AND TITLE NM-LB-3100-A, Water Storage Reservoir			
APPROPRIATION TITLE AND SYMBOL 14 X 1035, Construction NPS			WORK ORDER NO. 58-116
CONTRACT NO. 14-10-434-132		DATE WORK STARTED Oct. 18, 1956	DATE WORK COMPLETED May 7, 1957
NAME OF CONTRACTOR Baldwin Contracting Co., Inc.		ADDRESS 9th & Yuba Streets, Marysville, Calif.	

COST ANALYSIS

CONSTRUCTION ITEMS	QTY.	UNIT COST IN PLACE	TOTAL COST IN PLACE
1. Concrete Reservoir			32,000.00
Extra Work Order No. 1			25.00
2. Bell Clamps			6,474.00
3. Service & Drain Lines			910.00
Extra Work Order No. 3			1,430.00
4. Valves & Valve Box			1,400.00
Extra Work Order No. 2			15.00
5. Pumps			7,300.00
6. Pressure Switch & Cable			4,500.00
CONTRACT TOTAL			54,054.00

SUMMARY OF EXPENDITURES

PERSONAL SERVICES	EQUIPMENT	MATERIALS AND SUPPLIES
OTHER		

CHANGE ORDERS			
ORIGINAL CONTRACT AMOUNT	FIRST	SECOND	THIRD
\$52,610.00	\$25.00	\$15.00	\$1,430.00
FINAL CONTRACT AMOUNT	FOURTH	FIFTH	SIXTH
\$54,054.00			

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

SUBMITTED BY (Name and title) James T. Brooks, Highway Engineer	DATE April 28, 1959
APPROVED BY (Name and title) David W. Keen - Sup't	DATE July 9-1959

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

SEE REPORT ON CONTRACT NO. 14-10-434-178.

BPO 914178

Form 10-174
(Rev. 8-56)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
COMPLETION REPORT OF CONSTRUCTION PROJECT

REGION Four	AREA Lava Beds National Monument	COUNTY Siskiyou	STATE California
PROJECT OR JOB TITLE Rehabilitation of Existing Water System for Indian Wells Headquarters			PCP NO. U-11
LOCATION IN AREA Headquarters		MASTER PLAN NO.	BUILDING NO.
WORKING DRAWING NO. AND TITLE MM-LB-3103, Rehabilitation of Existing Water System			
APPROPRIATION TITLE AND SYMBOL 14 X 1935, Construction NPS			WORK ORDER NO. 58-116
CONTRACT NO. 14-10-434-178		DATE WORK STARTED Aug. 1, 1957	DATE WORK COMPLETED Oct. 9, 1957
NAME OF CONTRACTOR Bernard Gayman		ADDRESS 48 So. Linden Ave., So. San Francisco, Calif.	

COST ANALYSIS

CONSTRUCTION ITEMS	QTY.	UNIT COST IN PLACE	TOTAL COST IN PLACE
1. 4" Bell Joint Clamps	70	46.20	\$3,234.00
2. 3" Joints of EPI-Seal	85	39.00	3,315.00
3. 3" Valve (Change Order No. 1)			290.00
4. Electrical Work (Change Order No. 2)			6.96
CONTRACT TOTAL			6,845.96

SUMMARY OF EXPENDITURES

PERSONAL SERVICES	EQUIPMENT	MATERIALS AND SUPPLIES
OTHER		

CHANGE ORDERS			
ORIGINAL CONTRACT AMOUNT	FIRST	SECOND	THIRD
\$5,530.00	\$724.00	\$6.96	
FINAL CONTRACT AMOUNT	FOURTH	FIFTH	SIXTH
\$6,845.96			

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

SUBMITTED BY (Name and title) James T. Brooks, Highway Engineer	DATE April 28, 1959
APPROVED BY (Name and title) <i>[Signature]</i>	DATE July 7-1959

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

SEE REPORT ON CONTRACT NO. 14-10-434-132.

GPO 514198

NARRATIVE STATEMENT

Construction of Water Storage Reservoir and Rehabilitation of Existing Water System at Lava Beds National Monument.

Description.

This project called for the construction of a 100,000-gallon concrete reservoir and the addition of bell joint clamps to the existing water line to reduce the leakage in it.

Plans and supervision were by WODC with help from the Region Four Office and Monument personnel.

Work Accomplished.

The work included in the contracts was to build a 100,000-gallon concrete reservoir and to install bell clamps on the joints of the existing water pipe and to install a new set of pumps.

Project Activities.

Work on the contracts began in October 1956 and was completed in October 1957.

Overruns.

Contract No. 14-10-434-132. \$1,444.00 which was mostly used to provide additional 6" pipe to make connections to existing system.

Contract No. 14-10-434-178. \$1,315.96 which was required to provide different pipe clamps and more of them than was called for in the contract.

Day labor charges and facilitating services added \$1,511.20 which was required to provide a sealer to the reservoir to reduce the leakage.

Change Orders.

Contract No. 14-10-434-132.

No. 1, \$25.00. To provide air vents in reservoir.

No. 2, \$15.00. To provide a support under pressure relief valve bypass.

No. 3, \$1,430.00. To provide additional 6" pipe to make connections to existing system.

Contract No. 14-10-434-178.

No. 1, \$724.00. To provide a 3" gate valve and box and to provide spigot and spigot adjustable clamps in place of bell and spigot

clamps as called for in the bid schedule.

No. 2, \$6.96. To provide a water-tight junction box for the power cable at the prefabricated building No. 4.

The work resulted in a usable facility; however, as the reservoir site was hard to get concrete to, it was not poured monolithically as called for in the specifications, but was poured in a number of separate lifts. This resulted in cold joints and some honey comb which leaked when the reservoir was filled. The contractor was called back on the job and did additional work on the reservoir, but this work was not altogether successful in controlling the leaks. The contractor was released of responsibility for the reservoir after he supplied 5 drums of hydralt CL3E sealer and 2 rolls of fabric D13 to the Monument day labor forces who applied the material. This work stopped most of the leaks, and the reservoir is now in use. The pipe lines still have some leaks in them which indicate that the pipe clamps have not stopped all the leaking. The last test made on the water line by WODC Construction Representative Frank L. Brown indicated a leakage from the line of 1.25 gpm.

We believe that the system will be satisfactory for the next 10 years or until such time as additional buildings at headquarters require more fire protection than the existing system will provide. When more fire protection is required, the pipe line system will have to be replaced.

The system as it now stands is barely adequate for present needs and will be entirely inadequate in view of developments now programmed within the next two years.



Irvin D. Kerr
Superintendent

COMPLETION REPORT
REHABILITATION OF WATER SYSTEM AT INDIAN WELLS HEADQUARTERS AREA,
LAVA BEDS NATIONAL MONUMENT, TULELAKE, CALIFORNIA
CONTRACT NO. 14-10-434-132
CONTRACT AMOUNT \$ 52,610.00

SCHEDULE:

Contract Period.....90 days
First Day of Contract Period.....October 18, 1956
Stop Order Issued.....January 7, 1957
Start Order Issued.....April 29, 1957
Final Day of Contract Period.....May 9, 1957

Under the contract, the work to be done consisted of:

- I. The construction of a 100,000 gallon underground concrete water reservoir on the top of Crescent Butte adjacent to the existing 25,000 gallon reservoir.
- II. Repair of the existing 4" C. I. waterline from the reservoirs to the existing pressure reducing valve box by installation of bell joint clamps.
- III. Installation of a pressures switch and underground cable to operate the water system automatically.
- IV. Replacement of the existing deep well pump.

Requests were made by the contractor to make several minor changes to the plans:

- (1) Requested to pour the footing and floor slab in one lift. **(Denied)**
- (2) Change the inside dimensions of the reservoir manholes from 2' x 2' to 3' x 3'. **(Approved)**
- (3) Change the floor drains from long radius 6" 90° elbows to short radius 6" 90° elbows. All of these changes would be at no additional expense to the Government. **(Approved)**

DISC

orig in 660-05

PUMPS
PIPELINES
RESERVOIR

Lava Beds National Monument

FINAL CONSTRUCTION REPORT
IMPROVING WATER SYSTEM AT INDIAN WELL
OP-752-05-196b

Appropriation 14-808/10514 Public Works Administration, Act of 1938
Allotment to Interior, National Park Service, 1938-41

By
J. A. Madden, Asst. Engr.

An original allotment of \$9,900 was made for improving the water system at Indian Well.

Under the project it was proposed to construct a pipe line from the well, drilled under OP-752-05-196a, to Crescent Butte; to construct a reinforced concrete reservoir at Crescent Butte; to construct a distribution system from the reservoir to the Headquarters Area and to the campgrounds; to construct a pump foundation and sump; to purchase and install pumping equipment; to purchase pipe, cement, and other necessary materials for the proposed work.

Reference is made to Drawings NM/LB 5303; 5304; 5306.

Excavation of pipe line trenches started on December 19, 1938. A large crew of men was employed for a short period and work was then discontinued until the following summer. Because of freezing conditions prevalent in the Monument it was necessary to give the pipe a minimum cover of three feet. Excavation was for the most part in rocky formation.

Because of the very great expense involved in trench excavation due to the rock encountered and the depth required, it was decided to do this part of the work by the Civilian Conservation Corps under Job 91-143. This procedure was necessary that sufficient funds would remain for the purchase of pipe, pumps, cement and other materials required for the job and to permit the employment of skilled laborers on a part of the work as required.

Trench excavation was resumed in August, 1939, and continued to completion on March 15, 1940. A very great amount of shooting was required because of excavation in rock. Two compressors were used. Grading operations followed.

Pipe laying operations started on April 2, 1940, starting near the pump and extending toward the Headquarters Area. Four unit cast iron pipe, precast, bell and spigot, was laid. Pipe laying, placing of valves and fittings, continued until April 29, 1940, at which time the pipe laid was filled with water and tested. The pipe line was anchored on the slope and at the bottom of Crescent Butte. Pipe laid approximated 98% of the total.

Remaining to be placed was that portion of the line near the reservoir. Concrete valve boxes were constructed.

Construction of the concrete reservoir, also by Civilian Conservation Corps, under Job 91-145, started in March, 1939, and continued to completion in July 1940. One carpenter was employed on this work. The concrete reservoir has a capacity of 25,000 gallons, two compartments. Overall dimensions 29'-6" x 15'-2" x 12'-6". Footings 2'x2'x12" under all.

Walls were 10" thick. Slab 6". Roof 5". Reinforcing steel throughout. The pour of the footings and walls was monolithic. After the walls and slab were poured metalen was applied to the interior as a further assurance of imperviousness. A high line was constructed to transport materials to the reservoir site.

Pipe line connections were completed in July, 1940.

The last Public Works expenditure for labor was June 20, 1940, carpenter on the concrete reservoir.

Crew: 3 men on pipe laying

Equipment: Truck

Summary of Pipe laying operations:

	Length Used
4" Cast Iron Pipe Sta. 0/15 to Sta. 35/20	3560
3" Cast Iron Pipe Sta. 35/20 to Sta. 41/30)	
3" Cast Iron Pipe Sta. 28/00 to Sta. 34/00)	
3" Cast Iron Pipe Sta. 35/20 to Sta. C2/40)	
3" Cast Iron Pipe Sta. 36/29 to Sta. D0/20) ...	1270
4" Galvanized Steel Pipe, Reservoir Sta. D/15 to Sta. 0/35	20
2 1/2" Galvanized Steel Pipe, Well Sta. 20/70 to Sta. A2/00	200
2" Galvanized Steel Pipe, Reservoir Drain)	
2" Galvanized Steel Pipe, Reservoir Overflow) ..	200
1" Galvanized Steel Pipe, Service Lines	400
4" Valves	5
3" Valves	2
2 1/2" Valve	1
2 1/2" Check Valve	1
2" Valves	2
1" Blow-off	4
1" Stop & Waste	5
3/4" Air Relief Valves	2
1/2" Air Relief Valves	2
1" Relief Valve at Pump	1
4" Pressure Reducing and Regulating Valve	1
Miscellaneous fittings - Tees, Elbs, Bends, Unions, etc.	

Cast iron pipe, galvanized steel pipe, valves and fittings were

furnished under contract. quantities and unit costs follow:

3770 ft. 4" cast iron pipe, per foot	\$0.50
1400 ft. 3" cast iron pipe, per foot	0.43
40 ft. 4" galvanized steel pipe, per foot	0.6227
60 ft. 3" galvanized steel pipe, per foot	0.4111
340 ft. 2½" galvanized steel pipe, per foot	0.3338
100 ft. 2" galvanized steel pipe, per foot	0.20
100 ft. 2" galvanized steel pipe, per foot	0.1879
10 ft. 1½" galvanized steel pipe, per foot	0.116
10 ft. 1½" galvanized steel pipe, per foot	0.20
400 ft. 1" galvanized steel pipe, per foot	0.0918
600 ft. 1½" galvanized steel pipe, per foot	0.1022
30 ft. 3/4" galvanized steel pipe, per foot	0.0833
10 ft. 1/2" galvanized steel pipe, per foot	0.049

The concrete pump bases and sump were constructed in December, 1939, concrete poured December 7th. The base for the deep well pump was 7'-3" x 5'-6" x 1'-0". The base for the booster pump 2'-2½" x 1'-10" x 1'-0". The sump was 5' x 4' x 6" inside. Walls and slab were six inches thick, reinforced and metalon was applied to the walls to insure imperviousness.

Bids for pumping equipment were received October 12, 1939. Deming pumps were furnished under contract I-lp-13889 by Simonds Machinery Co., San Francisco, California. The deep well pump, Deming heavy duty, 18" stroke, 3" drop column and 1" x 1-7/8" rod, 750 feet; 7½ HP Motor, starter, installed (freight excluded) . . . \$2,841.00
The Booster Pump, Deming Duplex, 1-1/8 x 2, V-belt drive, 1½ HP motor, starting switch, float control \$ 191.10

The pumps and equipment were shipped to Merrill, Oregon, arriving January 2, 1940. Materials were hauled to Indian Well by the government.

Installation of pumps started January 4, 1940, and was completed January 6th. Tests were made on January 8th. The pumps were operated for a period of twenty-six hours. Further tests were considered imperative, these to be made upon completion of the water system and concrete reservoir. A temporary wooden structure was erected to house the deep well pump. The booster was removed.

Since completion of the water system difficulty in the operation of the deep well has developed. The matter has been taken up with the Contractor and adjustments will be handled under maintenance of the water system.

Total man days on actual construction of the water system under PWA only were 447.

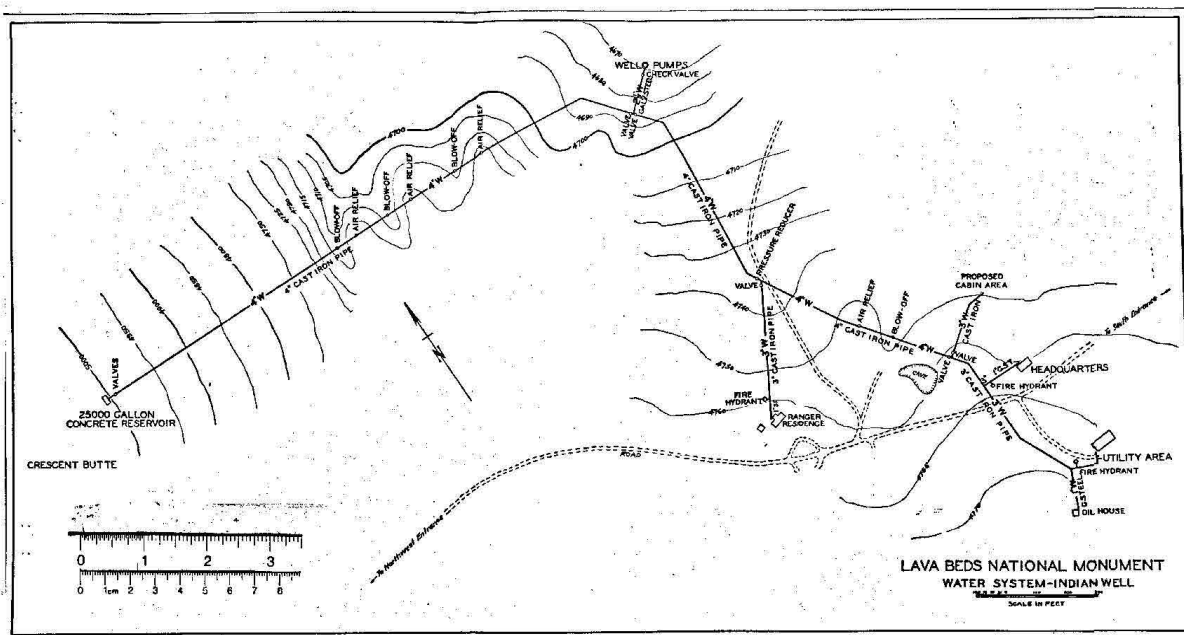
A summary of costs is included in the report.

Lava Beds National Monument

**IMPROVING WATER SYSTEM AT INDIAN WELL
Project QP-752-05-196b**

**COMPLETION ESTIMATE
Public Works funds only**

<u>LABOR - Common</u>		
Trench excavation	1577.83	
<u>LABOR - Skilled</u>		
Pipe laying	477.00	
Pump foundations and sump	115.20	
Bunkers - Gravel Pit	472.30	
Reservoir - Forms; reinf. steel	216.00	
Office work - clerical	505.20	3,363.52
<u>MATERIALS AND SUPPLIES</u>		
Powder and caps - excavation	772.00	
Drills and bits - excavation	62.14	
Cast Iron Pipe and Fittings	2,844.86	
Galv. Steel Pipe and Fittings	564.07	
Fire Hydrants	184.50	
Manhole frame & cover - sump	8.50	
Reinf. Steel - Sump, V. Boxes	36.09	
Screens, iron - Bunkers, Gravel Pit	160.63	
Reinforcing Steel - Reservoir	203.97	
Tie wire	23.49	
Manhole frames & covers - Reservoir	22.50	
Metalon - reservoir	76.83	
Miscellaneous	130.02	5,089.60
<u>INDIRECT CHARGES</u>		
Telephone and telegraph	41.96	
Office rent - Medford	125.89	
Freight	190.15	
Equipment rental	105.92	
Tests - cinders & sand	36.50	
Blueprints	12.07	512.49
<u>CONTRACT PAYMENTS</u>		
Pumps	3,076.23	3,076.23
TOTAL CONSTRUCTION COSTS		\$12,041.84
Technical Engineering		1,552.14
Cost of Project		\$13,693.98
Original Allotment	\$9,900.00	
Change Outline 1/31/40 increase	2,008.97	
Change Outline 7/24/40 increase	149.15	\$12,058.12
Technical Engr. Orig. Allotment	1,100.00	
Change Outline 4/29/40 increase	474.48	
Change Outline 6/5/40 increase	77.66	1,652.14
Total Allotment		\$13,710.26
Balance		16.28



Lava Beds National Monument

IMPROVING WATER SYSTEM AT INDIAN WELL

Work Organization CCC Form 7, Job 91, Class. 143 & 145

Excavation of pipe line trenches started December 19, 1938 by PWA and discontinued shortly thereafter, was resumed August 1, 1939 by the Civilian Conservation Corps. Trench excavation was for the most part in rocky formation. Length of trench in the main system was about fifty-six hundred and fifty feet. Rough work was completed April 1, 1940, followed by grading and pipe laying, the latter was by PWA skilled labor. Pipe was distributed by the CCC. Backfill immediately followed the pipe laying with joints remaining exposed until tested.

CCC assisted in constructing the bunkers at the gravel plant and screened the aggregate for the concrete work.

Because of possible scar the landscape by the construction of a road to the reservoir site at Crescent Butte, the alternative of high line construction was adopted. "A" frames were constructed, cables strung and a Hyster Hoist, tractor mounted, was secured for the work. Operations were by CCC. The highline was placed in operation May 22nd and materials for the reservoir transported to the site.

Excavation of the storage pit, approximately thirty-four by eighteen by twelve feet deep, was completed in April. Form work started on May 22 followed by pouring of concrete footings and walls on June 7th. The final pour, the roof slab, was completed on July 3rd. The concrete storage reservoir, capacity twenty-five thousand gallons, required sixty-one cubic yards of concrete and approximately six thousand pounds of reinforcing steel.

Trench backfill operations continued during the months of June and July, 1940.

Nineteen concrete valve boxes were constructed aggregating about twenty cubic yards of concrete.

An extension of the water system to serve the campground area was started in August 1940. The extension consisted of twelve hundred and twenty-five feet of one and one-half inch galvanized steel pipe and four hundred and sixty feet of one inch pipe, including valves and fittings. Length of trench approximately seventeen hundred feet. The work was completed on October 16, 1940 with backfilling operations after the pipe had been tested.

A summary of CCC participation is included in the report.

Lava Beds National Monument

IMPROVING WATER SYSTEM AT INDIAN WELL

Work Organization CCC Form 7, Job 91, Class. 143 & 145

LABOR

Trench excavation & backfill	9170 M/D at 2.00	18,340.00	
Foremen		1,890.70	
Pipe distribution	100 M/D at 2.00	200.00	
Pipe laying (Campgr. Extension)	90 M/D at 2.00	180.00	
Sump & Valve Boxes	90 M/D at 2.00	180.00	
Reservoir, Gravel Plant, Highline	780 M/D at 2.00	1,560.00	
Foremen	-	310.00	22,660.70

EQUIPMENT

Stake Trucks - Excavation	300 days at 4.00	1,200.00	
Dump Trucks - Fill	15 Days at 5.00	75.00	
Compressors - Excavation	210 days at 3.00	630.00	
Tractor - Excavation	40 days at 8.00	320.00	
Stake Trucks - Pipe	10 Days at 4.00	40.00	
Semi-Truck - Pipe	1 day at 6.00	6.00	
Dump Truck - Sump	1 day at 5.00	5.00	
Concrete Mixer Sump & Valve Box	2 days at 2.00	4.00	
Stake Trucks - Reservoir, etc.	40 days at 4.00	160.00	
Dump Trucks & Reservoir	12 days at 5.00	60.00	
Semi-Truck - Highline	1 day at 6.00	6.00	
Hyster Hoist - Highline	12 days at 10.00	120.00	
Concrete Mixer Reservoir	4 days at 2.00	8.00	2,634.00

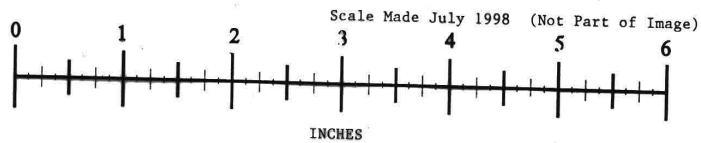
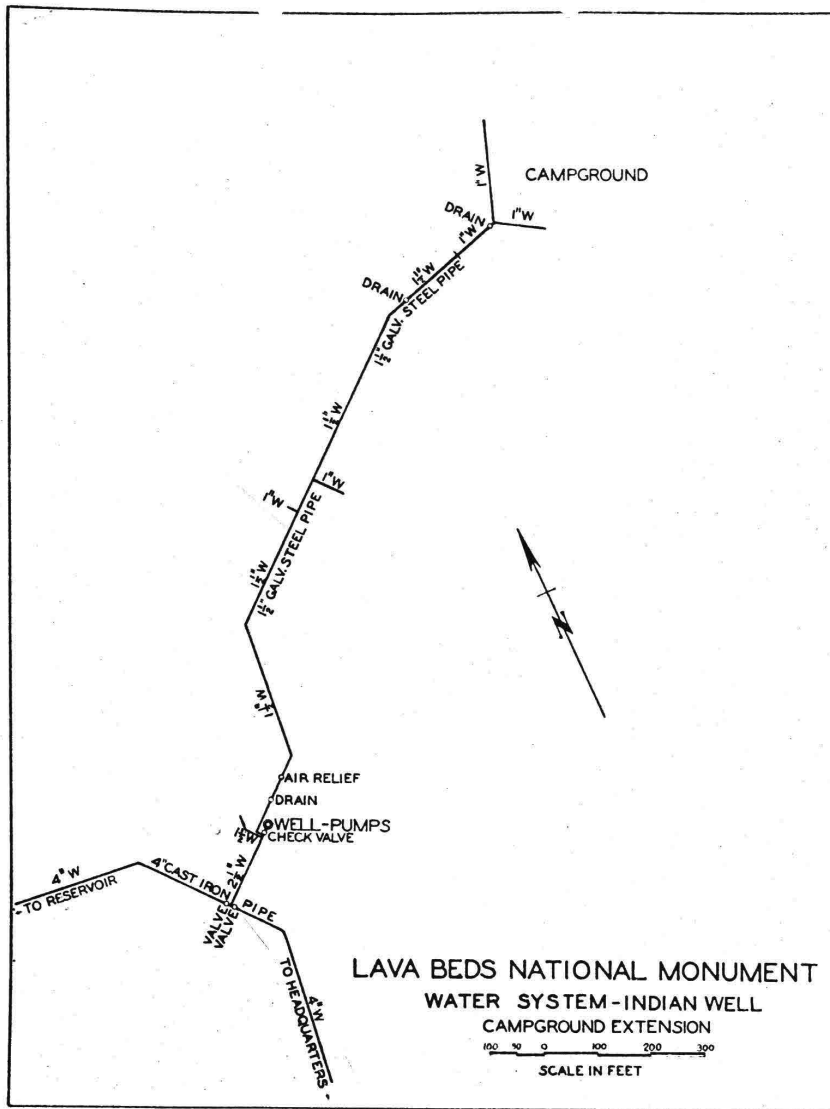
MATERIALS

Galvanized Steel Pipe and Fittings			
Campground Extension		341.48	341.48

Estimated cost CCC participation			\$25,636.18
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Materials

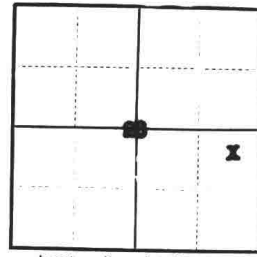
1260 feet	1-1/2 inch Galv. Steel Pipe & couplings at \$0.1321
780 feet	1 inch Galv. Steel Pipe & couplings at 0.0816



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

RECORD OF WELL

1. Location: State California County Madison
Nearest P. O. Tule Lake Direction from P. O. South
22 1/4 sec. 28, T. 15N, R. 12E, MOBAY.



2. Owner: National Park Service Address Lava Beds Natl. Mon., Tulelake, Calif.
Driller: C. V. Eales Address Klamath Falls, Oregon
Site selected by: Geologist, N.P.S. Address _____

3. Situation: Is well on upland, in valley, or on hillside? Plateau Elev. 1672

4. Type of well: Drilled; kind of drilling rig used Solid Tool
(Dug, driven, bored, or drilled) (Solid tool, jetting, rotary, etc.)

5. Depth of well: 758 ft.; year in which well was finished 1939 - June & July
Does well enter rock? Yes; if so, at what depth? 758 ft.; kind of rock Basalt

6. Depth to water: 682 ft.; Amount water rose above level where first struck 12 to 14 ft.

7. Diameter: At top 12 1/2 inches; at bottom 7-5/8 I.D. inches.

8. Principal water bed: Volcanic Sand
(Gravel, sand, clay, or rock. If rock, state kind)
Depth to principal water bed 682 ft.; thickness of bed 76 ft.
If other water supplies were found, give depth to each _____

9. Casings: Kind Casing; size 12 1/2"; length 18 ft.; between depths of 0 and 15 ft.
Kind "; size 10"; length 305 ft.; between depths of 15 and 350 ft.
Kind "; size 7-5/8"; length 100 ft.; between depths of 350 and 758 ft.

Packers (if any): Depth at which packers were used _____; kind _____

Screen or Strainer: Was well finished with screen or perforated pipe? Per. P.; kind of screen _____;
length of screen _____ ft.; diameter _____ inches; size of openings _____
perforated pipe; size of perforations _____; How were perforations made; burned, drilled? drill

10. Head: Does well at present overflow without pumping? No; did it overflow when new? No;

11. Pump: Is the well pumped? Yes; kind of pump Pumping Triplex;
size or capacity of pump 8 H.P.M.; kind of power Electric 220V 3ph. 60 cy.

12. Yield: Natural flow at present (if any) _____ gallons per minute; original flow _____ gallons per minute;
well has been pumped at 8 gallons per minute continuously for 30 hours;
quantity of water ordinarily obtained from well 8 gallons per minute

13. Use: For what purpose is the water used? Domestic

14. Quality of the water: Slight Hardness; is there an analysis? No
(Hard or soft, fresh or salty, etc.)

Name of person filling blank H. L. Crowley, Regional Engineer.

Date August 6, 1947 Address 601 Sheldon Building, San Francisco 5, California.

On the back of this sheet give the record of the beds through which the well passes and any other facts not given above.

LOG OF WELL

[illegible]

8620

Other Supporting Information

March 9, 1960

D5039

u Rld/y
D5039
Hitts
Smith
Smith

Memorandum

To: Superintendent, Lava Beds
From: Regional Chief of Operations, Region Four
Subject: Pumping and Leakage Tests, Headquarters Water System,
Lava Beds National Monument

Attached are data sheets showing the results of a well pumping test and leakage tests of the pipeline and reservoir conducted by Hydraulic Engineer Spaulding on February 24 and 25. Also attached is a summary sheet comparing leakage rates with those measured by Construction Representative Frank Brown in 1958.

The pumping test was made to provide data required by WODC as discussed in Supervisory Engineer Smith's memorandum of February 20, 1959 and as recently discussed with you in this office.

The well test confirmed that the present pumps are capable of delivering 11.4 gallons per minute (16,400 gallons per day) to the reservoir. When pumped continuously for 30-1/2 hours the level of water in the well showed practically no drawdown indicating that the well is capable of supplying much more than 11.4 GPM. We believe that the well is adequate for all future development but that larger capacity pumps may be needed.

Leakage tests, as detailed on the attached sheets, show that the system leaks at an excessive rate. It is estimated that of about 4800 gallons drawn from the reservoir on February 25, 700 gallons were used by park personnel and visitors while 4100 gallons were lost through leaks in the system. The leakage appears to be equally divided between the reservoir, the 4 inch main from the reservoir to the pumphouse (Section 1) and the 4 inch main and smaller lines from the pumphouse to the office and residences (Sections 2-6). A sketch map (DWG HMLB 2102) is attached which shows the water system and the sections tested.

The attached sheet comparing leakage rates with those measured March 18-21, 1958 indicates that coating the reservoir has reduced its leakage from 3.90 GPM to 0.85 GPM (5621 gallons per day to 1224 gpd). Leakage in the 4 inch cast iron main from the pumphouse to the reservoir (Section 1) apparently has continued at the rate of about 1 gallon per minute (1440 GPD) over the last two years. Comparisons of leakage with previous rates were not obtained for the rest of the system.

The present total leakage rate of 2.85 GPM means that the pumps must operate an average of 6 hours per day pumping to waste. The waste is costing about

Maintenance costs may make the total cost caused by leakage amount to about \$800 annually. The cost of the waste indicates that corrective measures costing up to \$11,000 may be economically justified provided leakage could be thereby reduced 90%. (\$11,000 is 90% of the present value of \$800 yearly for 30 years at 5% interest.)

To try to find the main leaks we suggest the following measures. First, we believe it would be helpful to install one or more water meters on the pipeline to determine actual usage. As a start, we propose purchasing a meter to be installed on the 4 inch main near the vault containing pressure reducing valves (near valve 4). Secondly, we suggest that further leakage tests be conducted at a time when lines to the campground and to the trailer area can be checked. We also believe it would be worth while to again check the lines with a leak detector using a different type than the Globe Geophone used by Mr. Brown in February 1958 with which he found no leaks. Lastly, we suggest that the interior of the reservoir be carefully inspected to check the condition of the fabric and asphalt coating. This would have to be done at a time when the reservoir can be drained and entered. We believe it would be proper to pay the costs of additional tests and installation of meters from maintenance funds. Hydraulic Engineer Spaulding will be available to assist you in making additional leakage tests and to check the lines with a leak detector.

(SGD) JOHN B. WOSKY

Regional Chief of Operations

Attachments

Copy to: Director (2)(with attachments)
Chief, WOBC (2)(with two sets of attachments)



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Lava Beds National Monument
Tulelake, California

May 11, 1959

L 54

Memorandum

To: Regional Director, Region Four
From: Superintendent, Lava Beds National Monument
Subject: Water Resources, Headquarters Area, Lava Beds

Handwritten signatures: Hank, D.E. Lee, D. Lee

DIV. OF DESIGN AND CONSTRUCTION	
MAY 21 1959	
Vint	
Merrill	
Mason	
Scott	
W. H. H. H.	<i>Ms</i>
X	<i>H. H. H.</i>

This will acknowledge receipt of your memorandum of May 5 concerning this subject.

It is very doubtful if the present water supply will be adequate to serve future needs. This subject was brought up in connection with comments which I made in memorandum to Chief, WJDC, February 11, in commenting on Working Drawing No. NM-18-3105-C, Extension and Replacement of Water Line, Headquarters Area.

Mr. P. L. Smith, in his memorandum of February 20, in answering the comments and questions raised in my memorandum of February 11, stated that the present pumps would not be adequate to meet the demand for the complete development of the area. He also said that they had not been able to find out if the present pump capacity is also the capacity of the well.

In view of the above I would appreciate assistance in the matter. Also, in view of the fact that we propose a development near Captain Jack's Stronghold which will require water, would it also be possible to include that area in the proposal you mention?

(Sgd) Irvin L. Kerr

Irvin D. Kerr
Superintendent

Copy to: Director
Chief, WJDC (2)

*Reg. 1000. The suggested development investigation in 1960
will also be completed for the area.
(D) 7/1*



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

In reply refer to:
L54-L

Mantey BFM
Crowley 12/18

January 31, 1954
Sent cc W.O. 2/8/54 BFM

File in Water Rights
Lava Beds - Docket 1

Memorandum

To: Regional Director, Region Four
From: Acting Superintendent, Lava Beds National Monument
Subject: Transmittal of Water Right Assembly Docket No. 1, Lava Beds

The following information is to be included in the Water Right Assembly Docket No. 1.

Northwest Entrance Well

Water system supplies one permanent employee residence year round and two temporary, seasonal use buildings. (One of the latter is a ten-man buckhouse.) One hydrant, one standpipe and two water fountains utilize this system.

Indian Well Water System

Three permanent employee year round residences, one campground, one seasonal use comfort station, two seasonal use residences, and one garage shop utilize the water system facilities. The campground serves fifteen (15) individual camp sites and temporary facilities for fifteen (15) picnic groups.

Raymond G. Knox
Raymond G. Knox
Acting Superintendent

Water Right Copy

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
REGION FOUR
SAN FRANCISCO 5 CALIFORNIA
601 Sheldon Building

February 4, 1947.

MEMORANDUM for the Director.

Reference is made to Mr. Dunn's memorandum of December 30, 1946, in which he asks for information with regard to the water supply at Bear Paw Cave in the Merrill Tract addition to Lava Beds National Monument.

Enclosed are copies of memoranda from Custodian Fisher of Lava Beds National Monument, January 7, and from Superintendent Leavitt of Crater Lake National Park, January 24, in which both advise us that the pump and pipe line are no longer in existence or use.

With regard to Patent No. 602422 obtained by Charles Henry Merrill on October 1, 1917, the only copy this region has knowledge of is the photostatic copy which was secured from the (then) General Land Office by former Chief Counsel Moskey and transmitted to the Superintendent, Crater Lake, with his memorandum of May 19, 1942. The last record we have of it is that it was forwarded to the Director's Office on March 24, 1944, along with deeds, affidavits, abstract of title, etc., in compliance with Chief Counsel Mallady's memorandum of March 17, 1944, and that all of these papers were on April 26, 1944, submitted to the Attorney General by the Assistant Secretary of the Interior in connection with the institution of condemnation proceedings. We do not know if the patent and other papers were retained by the Attorney General's Office or not. We therefore assume it will be necessary to inquire of the Bureau of Land Management as to the nature of the patent, particularly whether it was a Desert Land Patent requiring proof of water right for perfection.

(cc) O. A. TOMLINSON
O. A. Tomlinson,
Regional Director.

Enclosure 68.

Lava Beds National Monument
Tulelake, California

January 7, 1947

MEMORANDUM for the REGIONAL DIRECTOR,
Region Four.

In reply to your memorandum dated January 6, concerning the pump and pipe in Bear Paw cave, please be advised that both were removed when Mr. Merrill left the area.

In reply to the second question concerning the patent. I never saw the patent, but think perhaps this information could be secured by consulting the records in the county court house at Yreka, Calif.


Custodian.

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
CRATER LAKE NATIONAL PARK
MEDFORD, OREGON

OFFICE OF THE SUPERINTENDENT

January 24, 1947.

MEMORANDUM for the Regional Director,
Region Four.

Referring to Mr. Maier's memorandum of January 6th enclosing one from Mr. A. Van V. Dunn, Chief of the Water Division, concerning water rights on the Charles Henry Merrill land in the Lava Beds National Monument, all of our files on this Merrill Estate land were sent to the Regional Office at the time that jurisdiction of the area was transferred from Crater Lake and there is very little information that I can give Mr. V. Dunn.

I do recall, however, that we obtained a copy of Patent #602422, but whether it is a desert land patent or otherwise, I do not know.

The water in the cave on this property was used in early days by the installation of a pump and pipe line, but it has not been used since the Merrills abandoned their tourist service business many years ago, so far as I know.

Custodian Don C. Fisher, who was right on the ground and who has full knowledge of the subject, will probably be able to give more pertinent information.

E. P. Leavitt,
Superintendent.

cc: Custodian Fisher.



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
CHICAGO, ILLINOIS 54

ADDRESS ONLY
THE DIRECTOR, NATIONAL PARK SERVICE

December 30, 1946.

MEMORANDUM for the Regional Director, Region Four.

In order to complete our records of water rights appurtenant to the Merrill Tract, Deed 4, at Lava Beds National Monument, please advise us as to whether the pump and pipe line for the use of the Pool in Bear Paw Cave are still in existence and use, or have been removed. It would also be well to know whether it is planned to use this source of supply in the future.

We note, too, that Mr. Charles Henry Merrill started using the water about 1888 and obtained Patent No. 602422 to the SE $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 19, and SW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 20, T. 45 N., R. 4 E., M.D.M., on October 1, 1917. If Mr. Leavitt or Mr. Fisher ever saw the patent, we should like to know whether it was a Desert Land Patent which required proof of water right for perfection. If this information is not readily available, we can obtain it from the Bureau of Land Management. For this reason, no research is necessary at this time.

W. V. D. S. H.
Chief, Water Division.

AvVD:sh.

In triplicate.



eddy

January 16, 1940

Memorandum for the Regional Director:

Enclosed is the report of engineer J. A. Madden on the installation of the pumping equipment at the Lava Beds National Monument. The results of these tests are briefed as follows:

The first test of the deep-water pump showed $7\frac{1}{2}$ gal. per minute, whereas the contract specified a minimum of 8 to 9 gallons per minute. On the second check the test showed 8 gallons per minute, meeting the specifications. This was no doubt due to the swelling of the leather washers in the cylinder.

The depth to which the pump was set (the pumping level) was 691.2. This seemed to be the best place at which to set the pump, leaving a fairly good supply of water above it and sufficient room below the pump to allow for filtering in of sand, etc.

If it should be necessary to lower the pump further to prevent pumping off the head, it would be necessary to have additional rod and tubing cut to a length of about 10 feet as a full length of rod and tubing would carry too close to the bottom. If necessary, this short rod and tubing could be put in the first time the rods are pulled; however, I am inclined to believe this will not be necessary because a test of 24 hours of pumping did not appreciably reduce the depth of the water in the well. However, there is no adequate and easy method of measuring the depth of water and it has been suggested that an air gauge which would show the water level at all times, costing approximately \$75.00, might be installed. The Simonds Machinery Company have suggested the installation of this air gauge and if it meets with the approval of the Regional Office these two items can be ordered from that company.

The booster pump could be given only a fair test because the reservoir and pipeline which would provide a head against which this booster pump would be checked, were not completed; therefore, the pump was not given a fair test and did not measure up to the specifications called for. Before final payment is made, a statement in writing from the Simonds Machinery Company might be secured to the effect that if the pump does not conform to the specifications under proper test that they will remedy the condition. However, as they have a guarantee in their contract, these guarantees of satisfactory operation should be sufficient to protect the government. The reservoir and pipeline will not be completed until sometime early next summer because of bad weather which made it necessary to

abandon this work until next spring.

Please review the report on these pumping units and advise of the decision made with respect to the additional purchases and when we are authorized to make payment to the Simonds Machinery Company as they have already rendered their bills for their work in accordance with the contract.

E. P. Leavitt
Superintendent

cc Director
(with copy of report)

1 Enclosure

ORIGINAL 600 03

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
CRATER LAKE NATIONAL PARK
~~MINNESOTA~~
Crater Lake, Oregon

OFFICE OF THE SUPERINTENDENT

AUG 25 1939	
ROUTING	INITIALS DATE
Regional Director	
Assoc. Reg. Director	
Asst. R.D. (P & H)	
Asst. M. (Admin.)	
Personnel Records	
Finance	
Labor Relations	
Legal	
Project Control	
Equipment	
Information	
Travel Bureau	
Scientific Study	
Engineering	
Landscape	
Architecture	
Library	
Industry	
History	
Wildlife	
FILE	

August 22, 1939

Memorandum for the Regional Director:

Mr. Austin E. Jones, Geologist and Inspector at the Lava Beds National Monument well, submitted his final report on the well drilling job on August 10th. The following statistics will be of interest:

Depth - 758 $\frac{1}{2}$ feet. In the well are: 48 ft. of 12 $\frac{1}{2}$ " casing; 305'4" of 10" casing and 715'3" of 7-5/8" casing.

The bottom of the 7-5/8" casing is believed to rest on lava rock at about 708 to 709 ft. depth; about 40" of the casing has been taken up by screw threads. The top of the casing stands 3'2" above the ground. The well has been properly capped so there will be no danger of unauthorized persons removing the cap or dropping anything into the well. The perforation of the casing at the upper water-bearing sands was carried out with four rows of perforations in the casing placed at a depth of 676 feet to 687 feet. These perforations start 2 feet below the water table and go down 11 feet.

The 8-hour bailing test yielded approximately 5 gallons of water per minute. There was almost no sand, gravel or drillings and the 8-hour test did not show any appreciable draw-down of water. The water at the bottom of the well is quite clear, only the top being colored by rust washed down the inside of the casing. A quart sample of the water was secured; it tasted sweet and has been placed in the hands of Park Naturalist Doerr. Analysis and other tests of this sample of water will be made.

The well-drilling job is considered complete and appears to be satisfactory in all respects. The drilling contractor has removed his drilling apparatus and gone to work on other business; however, he still has the job of cleaning up the area and has promised to do this in a very short time.

E. P. Leavitt

E. P. Leavitt,
Superintendent.



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
REGION FOUR
SAN FRANCISCO, CALIFORNIA
July 14, 1939

Memorandum for the Regional Director:

The Well at Lava Beds National Monument

Indian Well Headquarters

Geologic Conditions Affecting Completion

Upon receipt of the information that water had been reached in the well at Lava Beds National Monument, the problems that arise in connection with the anticipated completion of the well in the near future, some of which involve the overlapping fields of engineering and geology, were discussed at the Regional Office with Regional Engineer Waterhouse, who was about to leave for the northwest and planned to return via Lava Beds, perhaps about the time the desired final depth of the well is reached.

I then visited the Lava Beds on July 7, 1939, with Park Naturalist Doerr, of Crater Lake National Park, Engineer Madden, of Crater Lake, and A. E. Jones, Geologist, who is sampling and recording the log of the well. The well was visited and the drilling records, the log, and the samples were examined and discussed, with special reference to the procedure that should be followed in the completion of the well.

.

The water table at 675 feet, revised measurement, lies in an accumulation of porous volcanic cinders of unknown thickness. At 20 feet below the surface of saturation the drilling continued in the same formation.

The quality of the water still remains largely unknown. Apparently it is not notable saline, for the finest dust-like particles of the drill cuttings remain in suspension for several days; also this mud imparts the only taste thus far detected. Clear uncontaminated samples of the water, suitable for chemical and sanitary analysis, can be obtained only after extended bailing or pumping.

The quantity of water available also is unknown. If the further drilling continues through the same porous fragmental materials, or even if porous lava beds are found, such as are interlaminated at intervals among the cinders at higher levels, the conditions would appear to be

favorable for an adequate supply; but the lateral extent of such open formations and whether or not they are open to the free inflow of ground water still remain unknown. In the final analysis only the pump can establish the presence of an adequate supply.

The straightness of the hole has not yet been determined. The casing is said to follow down readily of its own weight when the drill is penetrating fragmental materials; also when the casing is lifted it is said to move freely and to be easily turned in the hole. These conditions suggest that the hole may be nearly straight, so that perhaps a pump of the plunger type might be installed, if desired, without the necessity for guides or incurring the wear and friction losses due to contacts of the plunger rod with the casing.

The completion of the well must be determined largely on the basis of engineering considerations, especially the storage capacity and the rate of inflow from the aquifers, or water-bearing formations. These in turn depend on the geologic conditions, which are discussed in the following paragraphs.

Storage and inflow are controlled by the effective grain size and the porosity of the aquifer. As the diameter of the casing at the water table is only 7 5/8 inches its sump capacity will be almost negligible even if this size can be carried down to the final completion depth. The principal storage therefore must lie outside of the well, in the saturated ground between the water table and the draw-down surface that will be established by continuous pumping. The available amount of such storage and how quickly it will be exhausted can be determined only by a pumping test.

The capacity of the well under continuous pumping depends on the inflow from this reduced depth of the water, after the ground storage has been exhausted and the draw-down surface has been stabilized. As to requirements, it may safely be assumed that the needs for the headquarters area and for the campground and the picnic grounds will increase to many times those of the present; also provision must be made for protection against fire, including the constant threat of grass fires and forest fires.

It is highly desirable therefore to make available a considerable thickness of the aquifer, or saturated formation, from which to draw the supply to meet this increasing demand and to assure proper protection. A great thickness is the more urgent inasmuch as the Monument lies on the slope of a great volcano. Accumulations of such eruptive materials are notoriously erratic, and a part, perhaps even the greater part, of the aquifer that seems to promise abundant yield actually may lie high and dry above the water table.

The final depth of the well therefore is a matter of fundamental

importance, particularly with the view to fire protection and the increased demands anticipated in the future. The drill cuttings, as recovered from the hole by the bailer, do not provide enough information about the porosity and the effective grain size of the water-bearing materials to permit a reliable estimate of the yield. Therefore an actual test is necessary in order to determine the capacity of the well at any particular depth.

The completion depths of the wells in the vicinity are shown in the following table, the last column showing the depths penetrated below the water table. Omitting the two wells that are wholly in the lake beds, as not being comparable, it will be observed that 6 wells in volcanic materials extend 50 feet or more below the water table, and two of these were drilled 163 feet and 187 feet, respectively, below the water table. Of these two, the one at Dry Lake, with 163 feet of water, formerly supplied a CCC camp; the other, at Shaw Lumber Company's mill, with 187 feet of water, supplies the steam boilers at the mill and also the domestic requirements of a considerable community.

Completion Depths of Wells in the Vicinity
of Lava Beds National Monument

Name and Location	Elevation Well site	Elevation Water table	Depth below Water table
Lava Beds Hqrs., Indian Well	4672	3997	- - -
Robinson, 14 mi. N 17 W	4450*	4010*	11
Fleener, 7 " N 38 W	4270	4020*	50*
Elvy, 14 " N 18 W	4177	4017*	35*
Macmillan 16 " N 36 E	4200*	4079*	13
Harter, 14 " N 44 E	4100*	4053*	61
Reed, 11 " N 76 E	4250*	4080*	18
Criss, 10 " N 81 E	4200*	4074*	26
Dalton, 12 " N 88 E	4285	4039	50
Dry Lake, 12 " S 86 E	4220	4066	163
Adams, 7 " S 55 E	4325*	4016* (Not completed)	
Shaw, 9 " S 57 E	4370	4010	187
Timber Mt. 13 " S 57 E	4390	4015	55

The following penetrate only lake beds of Tule Lake basin:

CCC Camp 9 mi. N 22 W	4072	4006	153
Biol. Surv. 17 mi. N 12 W	4059	4009	170

*Approximate

Suggestions and Recommendations. With the view to arriving at the most satisfactory completion possible under the existing conditions, which are known only in part, I offer the following suggestions and recommendations:

1. That the well be drilled to the depth of 800 feet, if the porous water-bearing beds are found to continue to that depth, whether unconsolidated sands (cinders, pumice, etc.) or lava flows or alternating beds of these or other aquifers.

2. Where the hole perforates lava flows or other solid formations it should be under-reamed so as to permit the same 7 5/8 inch casing to follow down to the final completion depth, thus avoiding the necessity of still further reducing the diameter of the hole.

The 800 foot depth is desirable in order to provide reasonable assurance of adequate inflow in case some or all of the aquifers penetrated should be limited to small lateral extent or should lie in part in the dry zone above the water table. Furthermore this depth will provide a little sump storage and will permit for a longer time the settling of sand that may enter through the perforations, thus avoiding immediate interference with the operation of the pump.

3. In case an impervious formation should be encountered before reaching the depth of 750 feet, I recommend that the hole be drilled to that depth anyway, on the probability that additional aquifers will be found beneath the impervious formation. In this case the suggestions in (1) and (2) above would still apply.

4. If an impervious bed is found at or below the depth of 750 feet I suggest that the drill be stopped, at least temporarily, and that the casing be set on the impervious rock and thoroughly perforated from the depth of 685 feet (ten feet below the water table) to the bottom.

5. When the 800 foot depth is reached, under conditions named in (1), (2), and (3) above, or when drilling is suspended at a shallower depth, as suggested in (3) and (4) above, I recommend that the bailer then be run continuously for at least 10 hours. If this operation lowers the level of the water in the well and continues to lower it during the ten hours, continue the test until a stable level is established and at least two hours afterward.

6. In all stages of the bailing test an accurate record should be kept of the time and the amount of water removed from the well. The bailer should be dumped each time into a vessel or container so marked as to give an accurate measurement of the number of gallons.

7. In case no permanent water level is established during the bailing, the test should be continued until the bottom is reached. Such an unfavorable outcome is not anticipated.

The bailing should serve to clear the well of drill cuttings and much of the finer sand that may at first enter through the perforations. Also it should help to remove the contamination due to the water that has been dumped into the hole during the drilling operations. The movement of the ground water will eventually remove all such contamination from the vicinity of the well; but this movement is an exceedingly slow seepage, and it may take months, or even years, to remove it beyond the "circle of influence" from which water will be drawn by continuous pumping.

8. On account of the exceeding slowness of this movement and also because diffusion has spread the contaminating water downward and laterally in every direction during the months of drilling, the safety of the well should be assured by sanitary analysis before any water is pumped from it into the reservoir and distribution system.

9. The bailing test may give little information about the capacity of the well. In view of the depth, the small size of the hole, and the small capacity of the bailer used with the light drilling rig, it may not be possible to raise, on the average, more than two gallons a minute; therefore a draw-down of several feet during the operation would give warning of inadequate capacity, and steps should be taken immediately to increase it. This might be accomplished by one of the following methods:

(a). Deepening the well, if further depth of porous water-bearing formation is available. If the casing has been set on an impervious bed at the bottom, then this formation should be penetrated at least 25 feet, in the expectation that this depth would pass through the impervious bed into another aquifer beneath it. Failing in this the following alternative is recommended:

(b). "Shooting" the well by firing a charge of high explosive (say 20 pounds of 60 percent dynamite) at the bottom. This would shatter the surrounding rock and might open cracks that would admit water into the well. If the first shot fails, a second or third, with increased charge might succeed.

10. Following the effort to increase the capacity, the bailing test should be repeated and the results awaited before anticipating any further remedial measures that might be indicated.

11. Samples for analysis. When a satisfactory sanitary analysis is obtained the water may safely be pumped into the reservoir and distributed for use. Samples for chemical analysis, however, should not be taken before the pump has been operated at least 24 hours continuously.

It is hopefully anticipated that the bailing test will lower the water but little and that this pumping test therefore will yield the first authentic information about the capacity of the well.

San Francisco
California
July 13, 1939

J. Volney Lewis
Regional Geologist

EDWARD HYATT, STATE ENGINEER
CHIEF OF DIVISION

FRANK F. MERRIAM
GOVERNOR OF CALIFORNIA

EARL LEE KELLY
DIRECTOR

STATE OF CALIFORNIA
Department of Public Works

DIVISION OF WATER RESOURCES
PUBLIC WORKS BUILDING

SACRAMENTO

REC'D MAR 6 1937

March 2, 1937.

Mr. Albert L. Johnson,
Associate Attorney,
Branch of Land Acquisition and Regulation,
Legal Division,
National Park Service,
110 Sutter Street,
San Francisco, California.

Dear Mr. Johnson:

We have for acknowledgment your letter of February 25th relative to development of a water supply for the Lava Beds National Monument. It is understood that this contemplates a supply from wells. This office does not have jurisdiction over the appropriation of percolating water.

Very truly yours,



STATE ENGINEER

F. LE COPY

February 25, 1937.

Mr. Edward Hyatt,
Chief of Division,
Division of Water Resources,
Department of Public Works,
401 Public Works Bldg.,
Sacramento, California.

Dear Mr. Hyatt:

With reference to Lava Beds National Monument, this office has determined that there is no present need for making any application for the appropriation of water therein, but because of the fact that the National Park Service has an existing well in this national monument, and later proposes another well there, we desire to give your department some notice of our water usage there.

Lava Beds National Monument is an uninhabited region near the northeastern boundary of the State, and our supervision thereof is directed by the Superintendent of Crater Lake National Park in Oregon. We are therefore following the Oregon custom of giving a notice of Federal appropriation of water.

Our existing well is located in the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 18, Township 46 North, Range 4 East, M. D. B. & M. This well includes a small reservoir at the northwest entrance to the monument. We later propose a well in the NE $\frac{1}{4}$ of Section 28, Township 45 West, Range 4 East, M. D. B. & M., at Indian Wells, where there is seeping water in a cave. The existing well does not furnish more than 25,000 to 30,000 gallons per day.

We do not anticipate any conflict with private development or private appropriations there in such a sparsely settled region, and because of the fact that our usage is made from underground sources by means of wells upon Government lands, we understand that any attempt to make an appropriative filing would not be encouraged by your office in any event.

However, this notice is given for your files, in case you wish it for future reference.

Yours very truly,

Albert L. Johnson,
Associate Attorney.

ALJ:SH

