

August 29, 2012

L54(2380)
ELMA/General

Memorandum

To: Superintendent, El Malpais National Monument

From: Larry Martin, Hydrogeologist, Aquatic Systems Branch (ASB)

Subject: Hydrogeology and potential for water well construction at Bandera Crater and the Ice Caves

Summary: The National Park Service hopes to acquire most of the private property south of Hwy 53, including Bandera Crater and the Ice Caves. A request for funding from the LWCF to purchase these properties has been forwarded for possible inclusion in the FY14 budget. If these properties are acquired, then potable water will be needed for NPS facilities at those sites. The first priority will be to inventory existing water-supply wells to determine if they might be suitable as public water supplies. Otherwise a new well will need to be constructed to provide water. In either case, it will benefit the park to know the source of groundwater and which geologic formations in the area are good aquifers. If construction of a new well is required, the information contained in this report will help guide the park to site the well at a location where it is likely to obtain water.

Discussion:

Bandera Crater and the Ice Caves are south of Hwy 53, approximately 25 miles southwest of Grants, NM and 15 miles east of El Morro National Monument (Figure 1). The crater and Ice Caves are on the southwestern flank of the Zuni Uplift.

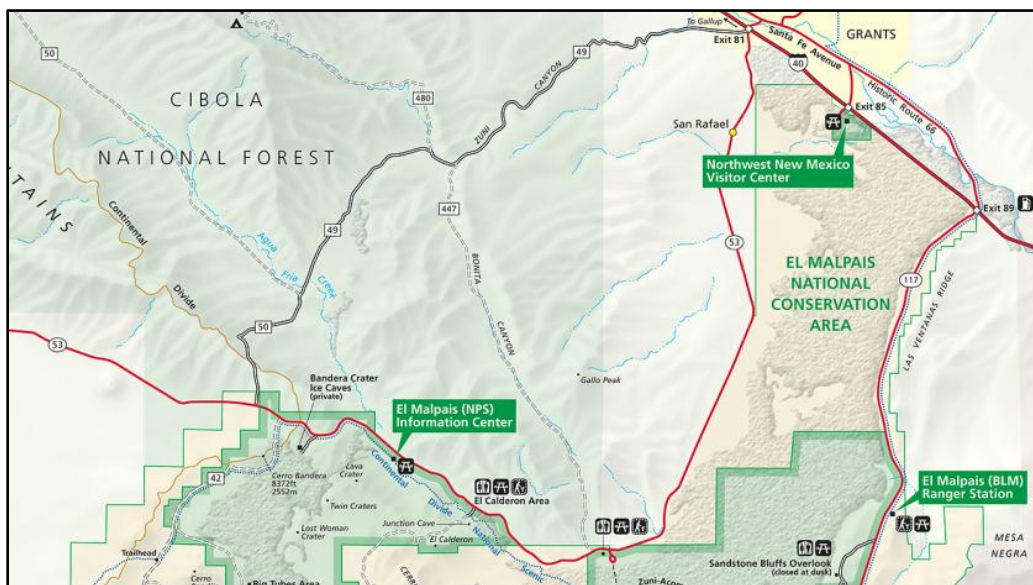


Figure 1. Map showing location of Bandera Crater and Ice Caves at El Malpais NM

The Zuni Mountains, or Zuni Uplift is a northwest-southeast trending geologic structure that extends about 60 miles from southeast of Gallup to southwest of Grants. The uplifted area is about 40 miles across. Geologically, the Zuni Uplift has a core of PreCambrian granitic and metamorphic rocks, surrounded by younger sedimentary rock layers. El Malpais National Monument covers much of the southeastern part of the uplift and the lava flows beyond the uplift (Figure 2).

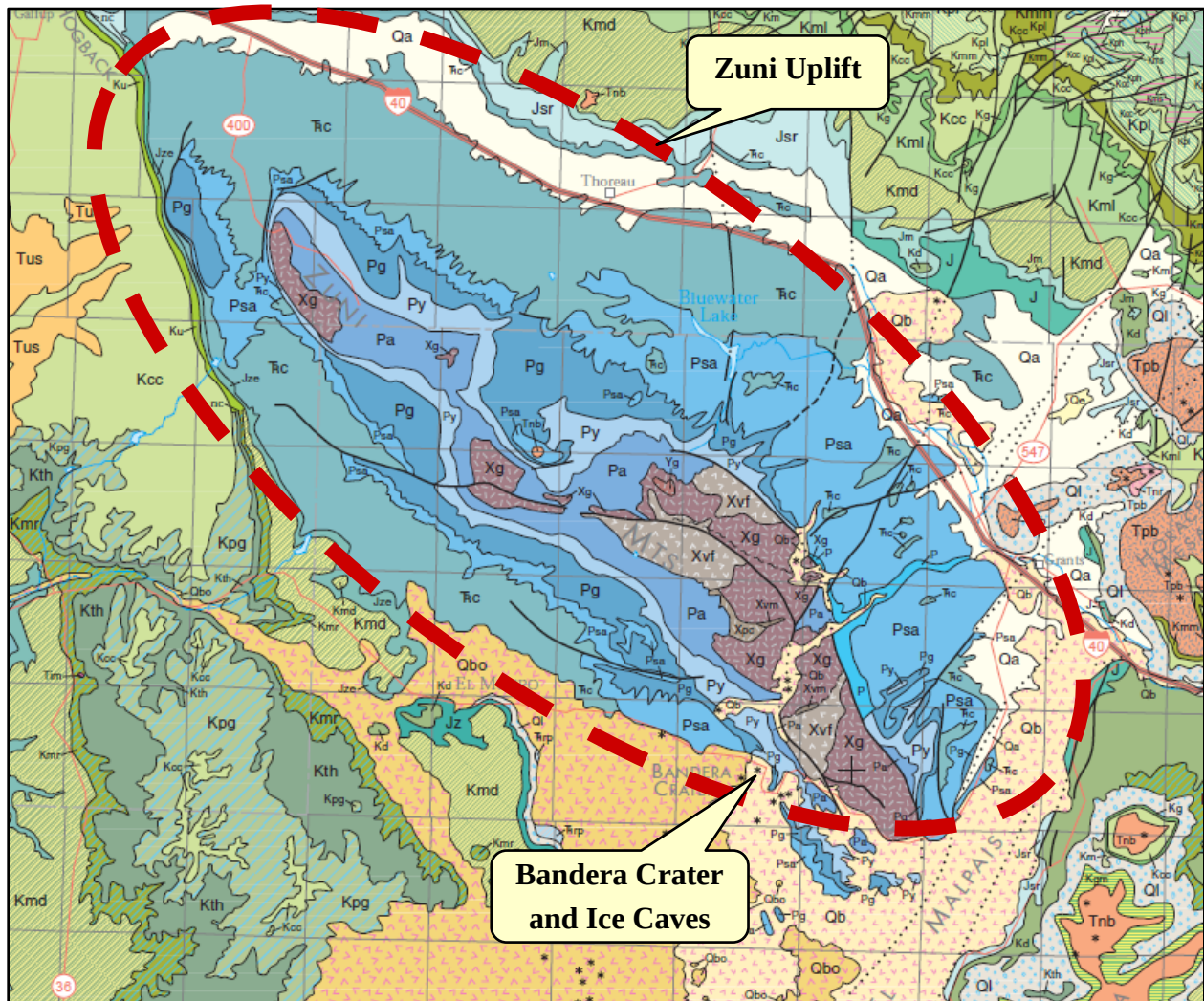


Figure 2. A portion of the New Mexico 1:500,000 scale geologic map showing the Zuni Uplift.

Figure 3 provides a more detailed view of that portion of the geologic map in the vicinity of Bandera Crater and the Ice Caves.

Figure 4 shows a simple southwest-northeast cross-section through the Bandera Crater and Ice Caves area depicting the relationship of geologic formations in the area.

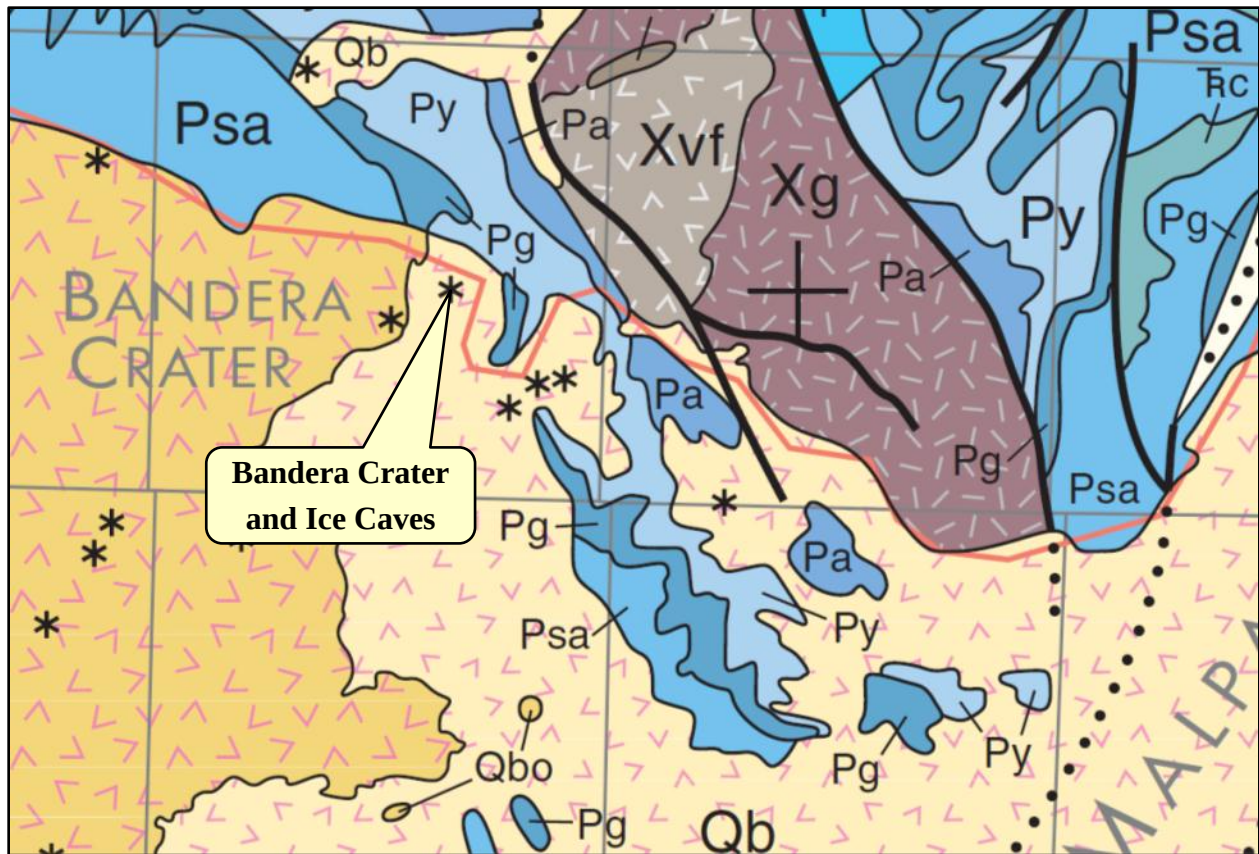


Figure 3. Detailed view of the Bandera Crater area from the 1:500,000 scale state geologic map.

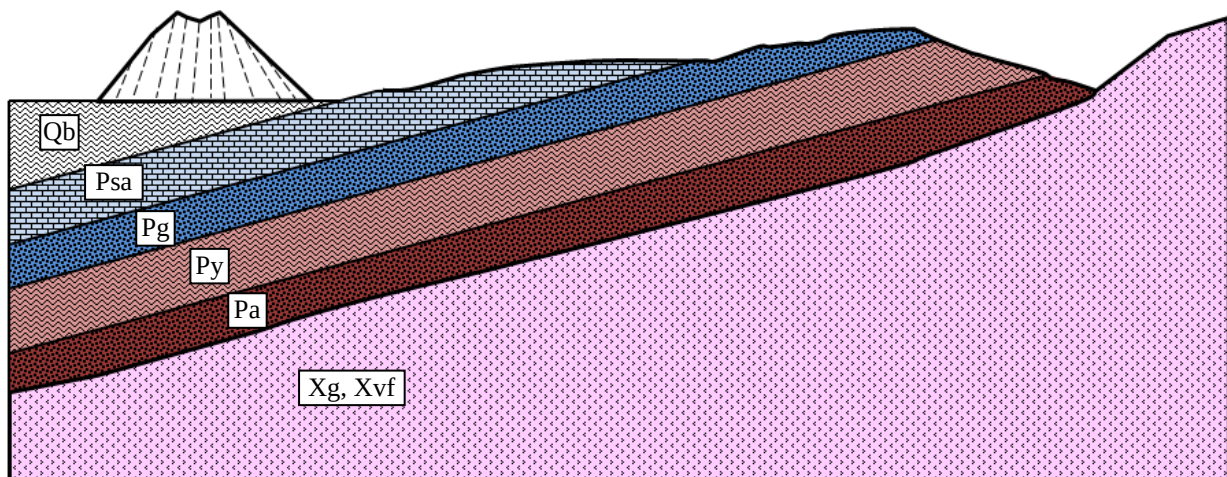


Figure 4. General southwest-northeast geologic cross section through the Bandera Crater area.

Explanation of map units for the geologic map and cross-section

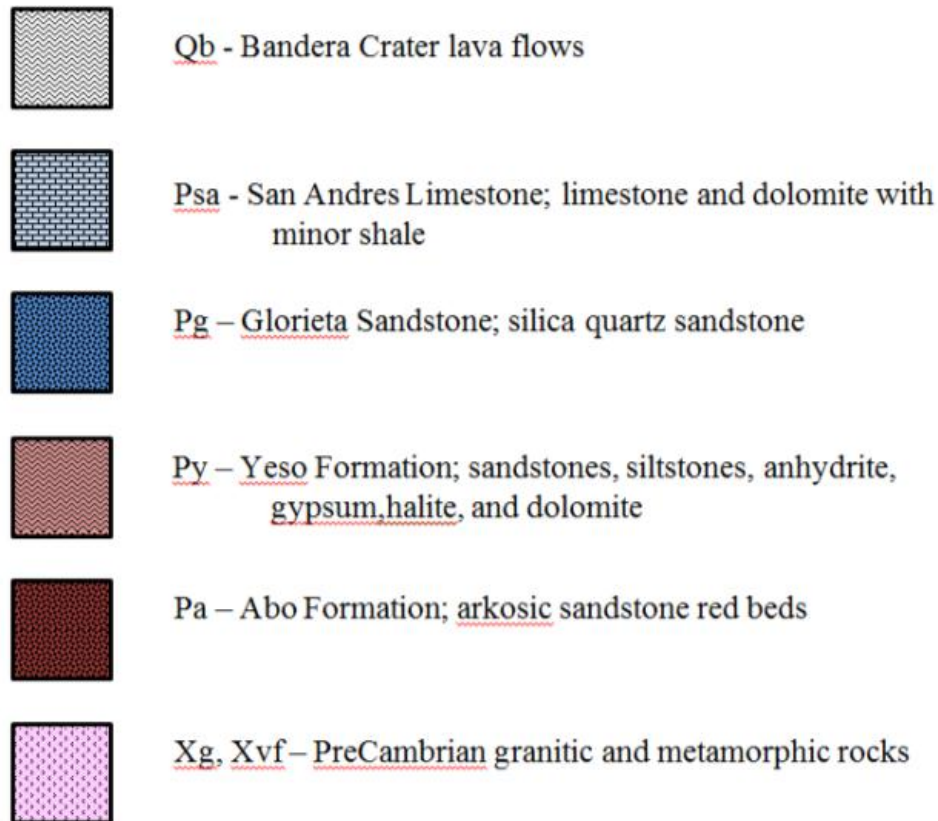


Figure 5 shows the stratigraphic sequence of rock units in the southern part of the Zuni Mountains. At Bandera Crater and the Ice Caves, erosion has removed all of the rock units overlying the San Andres Limestone prior to the eruption of lava flows from Bandera Crater

The Geologic Resources Division of NPS has developed a digital overlay of the geologic map for viewing with GoogleEarth. The kml and associated files can be downloaded from ([hyperlink to GoogleEarth kml file of geologic map overlay for El Malpais](#)). There are several files contained in the zip file. To view the map as an overlay in GoogleEarth; download the zip file, unzip it, and double click the .kml file. This should open GoogleEarth (GoogleEarth needs to be already installed on the computer). This will allow viewing the geologic map as a 3-D overlay and viewing it from various angles and elevations, including rotating the map on the screen.

Figure 6 provides a view toward the west-northwest of the geologic map draped over the topography in GoogleEarth. The geologic formations overlying the PreCambrian granitic and metamorphic rocks are dipping downward toward the southwest (left side of Figure 6).

All of these rock units have been removed
by erosion in the vicinity of the Ice Caves

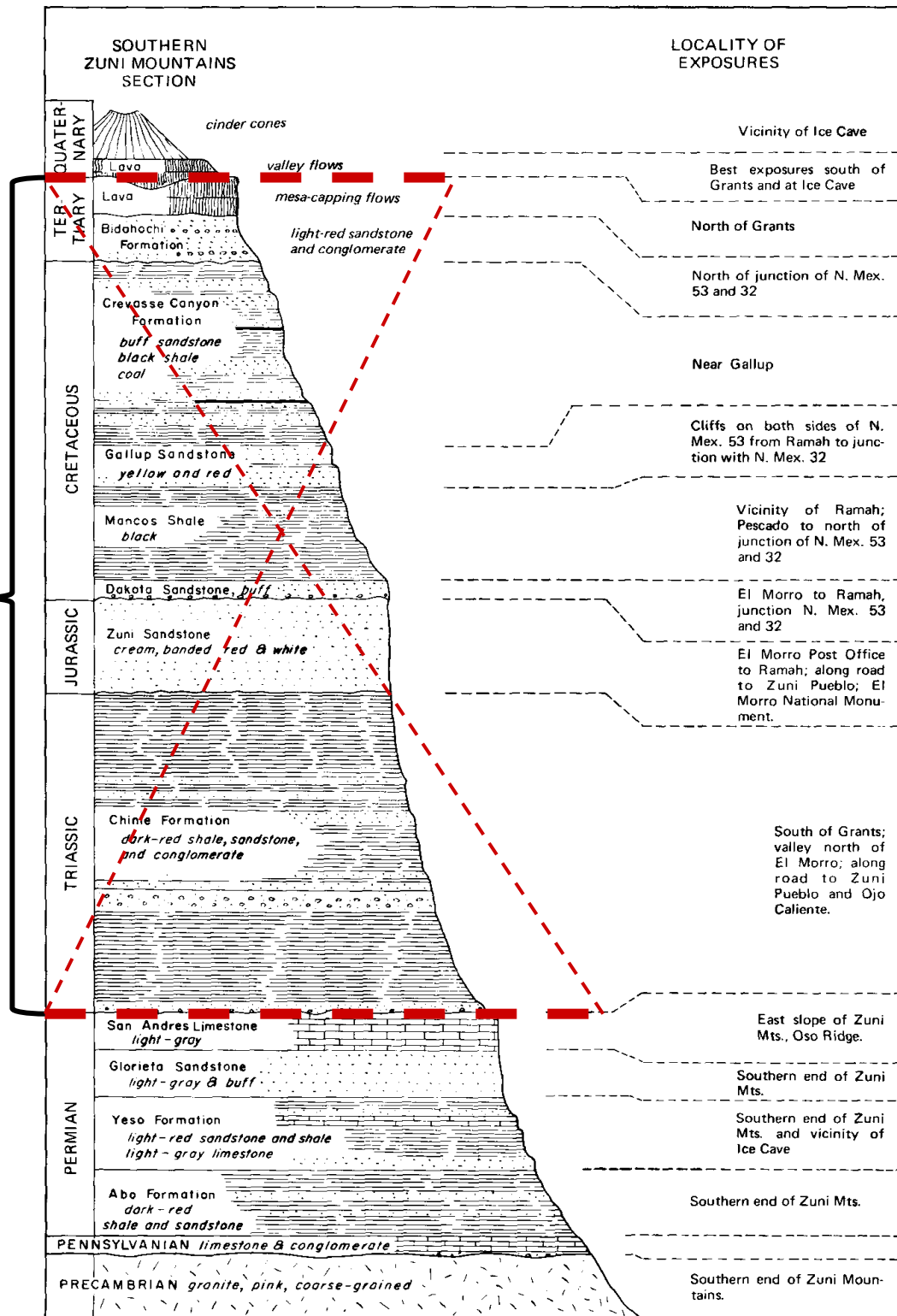


Figure 5. Rock sequence in southern Zuni Mountains

(from Foster, 1971)

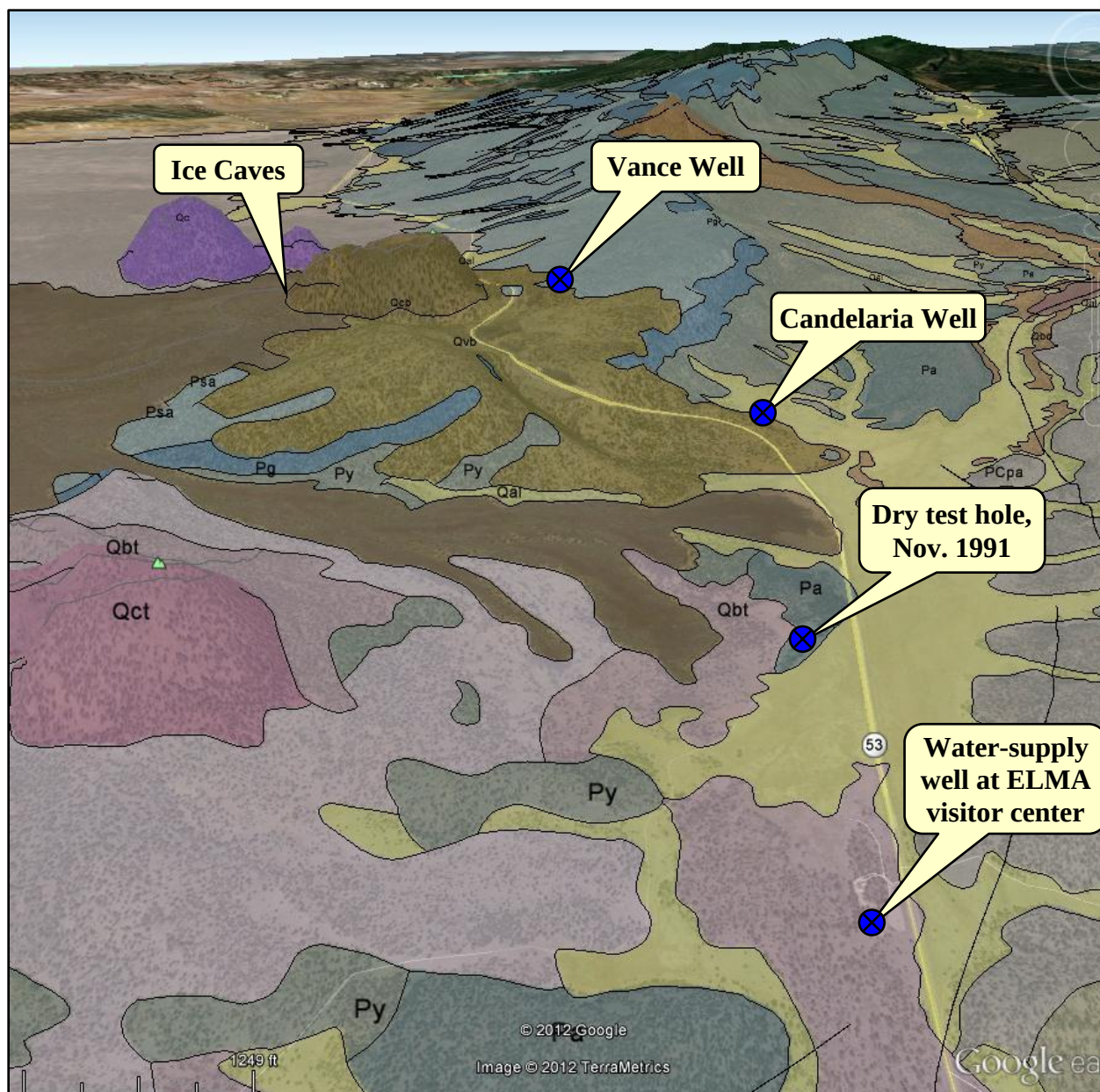


Figure 6. Three-D view of a geologic map overlaid on topography in GoogleEarth.
View is toward the west-northwest.

Explanation of geologic units

- Qal – Alluvial sediments filling valleys
- Qc, Qcb, Qct, Qvb, etc – Cinder cones and lava flows
- Psa – San Andreas Limestone; light gray limestone
- Pg – Glorieta Sandstone; light gray & buff medium-grained sandstone
- Py – Yeso Formation; light red sandstone and shale
- Pa – Abo Formation; dark red shale and sandstone
- Pcpa – PreCambrian granitic rock

Hydrogeology of the Ice Caves and Bandera Crater area

A water-supply well in the vicinity of the Ice Caves and Bandera Crater would pass through;

1. Basalt lava flows
2. San Andres Limestone
3. Glorieta Sandstone
4. Yeso Formation
5. Abo Formation
6. PreCambrian granitic and metamorphic rocks

Lava flows in the vicinity of Bandera Crater are unlikely to be a source of groundwater. The lava flows are highly fractured and broken and therefore too porous to retain groundwater in the local area. Groundwater in the lava flows will easily flow downgradient to lower elevations.

In Cibola County the San Andres Limestone and Glorieta Sandstone are considered to be a single aquifer because of the gradational contact and the probable hydraulic connection between the two formations (Baldwin and Rankin, 1995). The aquifer outcrops on the southwest flank of the Zuni Uplift where it receives recharge from infiltration of precipitation and snowmelt. Outcrops occur to the southeast and northwest of Bandera Crater, along the strike of the formations. Records from the New Mexico Office of the State Engineer include several wells along and south of Hwy 53, west of Bandera Crater, that are completed in the San Andres-Glorieta aquifer. Generally these wells are reported to produce from 10+ to 100 gpm or more.

The Yeso Formation is a clayey sandstone and siltstone. The fine-grained character of the sediments comprising the formation cause it to have low permeability and therefore it is not a productive aquifer in this area.

The Abo Formation is a reddish-brown sandstone and siltstone. Previous test drilling at a nearby site in 1991 showed it to be devoid of groundwater in the immediate vicinity of the Ice Caves. Drillers logs for some of the wells further north (near Paxton Springs) might be interpreted as indicating groundwater availability in the Abo Formation in that area.

Obtaining groundwater from PreCambrian bedrock is dependent on intersecting water-bearing fracture zones. The location for the water-supply well at the NPS El Malpais Information Center was selected based on the presence of fault zones and associated fractures. There are no mapped faults in the vicinity of Bandera Crater, and therefore no reason to believe that a well drilled into the PreCambrian bedrock would intersect a fracture zone. Additionally, the PreCambrian will be very deep (much more than 1000 feet) in this area.

If a new well is desired at the Ice Caves, it can be located anywhere that is convenient near the developed area. Location is not critical to the geologic conditions that will be encountered during drilling. A well at the Ice Caves would like penetrate several hundred (perhaps 500) feet of lava flows. Drilling would then be through several hundred feet of San Andres Limestone and several hundred feet of Glorieta Sandstone. A well would likely need to be more than 1,000 feet deep, perhaps 1,500 feet deep, before it would have penetrated sufficient saturated thickness and porous sedimentary rock to produce a good yield of water. The static water level may be as much

as 1,000 feet below ground surface, requiring a large pump/motor and considerable electricity to pump water.

Summary of existing water-supply wells near the Ice Caves

Online records of the New Mexico State Engineer Office (NMOSE) were accessed to gain information about other wells in the vicinity of the Ice Caves. The general search area was approximately a 4-mile radius from the Ice Caves, including Sections 7-36 in T9N-R12W and Sections 17-20 and 29-32 in T9N-R11W. Table 1 contains a summary of the information regarding the existing wells within the search area.

Table 1. Well permits in the vicinity of the Ice Caves

WR File Nbr	Owner	quarters are smallest to largest						Depth	Yield	Depth to Water
		Q-64	Q-16	Q-4	Section	Twp	Rge	feet	gpm	feet
B-1232	National Park Service	NW	NW	SE	19	9N	11W	298	60+	116
G-2822	Nancy Wettach	SE	SE	SE	7	9N	12W	600	0.06	520
B-1798	Randall & Lejean Goslar	NE	NW	SE	10	9N	12W	938	40+	640
G-1400	Thomas & Judith Nurenberg	NE	SE	NE	10	9N	12W	730	10	632
B-383	David Candelaria	NE	NE	NE	11	9N	12W	Agua Fria Spring		--
B-1328	Dave & Joanne Webster	NW	SE	NE	11	9N	12W	360	20	300
B-1745	David Candelaria	NW	NW	SW	13	9N	12W	560	20	510
B-1094	William Vance	NW	NW	SW	14	9N	12W	1033	10+	--
G-823	Ernest Davis	NW	SE	NE	16	9N	12W	1210	100	1000
G-1273	John & Christina Blankfield	SE	NE	NE	17	9N	12W	1165	100	880
G-1792	Richard Sheets	NE	SW	NE	18	9N	12W	900	--	--
G-2184	Sheri McWethy-Kennedy	SW	NE	NE	18	9N	12W	900	10	720
G-1864	Winfried Friedrichs	SE	NE	NW	19	9N	12W	1375	100	1152
G-2839	Karen Foster	NW	NW	NE	19	9N	12W	1300	100+	804
G-1008	Ann Cunningham	NE	NE	NW	20	9N	12W	1110	200	860

Source: New Mexico Office State Engineer water rights database

<http://nmwrrs.ose.state.nm.us/nmwrrs/wellSurfaceDiversion.html>

The first well in the table (B-1232, National Park Service) is a couple of miles east of the Ice Caves and was drilled into the granitic bedrock underlying the lava flows in the valley. The hydrogeologic setting at that locale is different than at the Ice Caves, so it does not provide a good indication of expected conditions in the vicinity of the Ice Caves.

The next five wells listed in the table are in Sections 7, 10, and 11 and are generally located more toward the core of the uplift and therefore are in environments that are hydrogeologically different from that of the Ice Caves area.

The last nine wells listed in the table are closer to the Ice Caves and in environments that are hydrogeologically similar to what would be expected if a well was drilled at the Ice Caves. Interpretation of the driller's logs and depth and location of these wells leads to the conclusion

that most of these wells obtain groundwater from the San Andres Limestone-Glorieta Sandstone aquifer. The wells generally yield more than 10 gpm, with many of them producing more than 100 gpm. The NMOSE database contains no information regarding water quality or water chemistry.

Previous Well Construction by NPS

In 1991-92, two test holes were drilled to locate a groundwater supply for the NPS El Malpais Information Center (Figures 6 and 7). The first hole was drilled through the Abo Formation and into the underlying PreCambrian granite to a depth of 400 feet. No groundwater was encountered.

The second hole was drilled in the valley of Agua Fria Creek, passing through lava flows to a depth of 138 feet and then granitic rocks to the total depth of 320 feet. The borehole encountered a fracture zone at 270-275 feet, which produced abundant groundwater of good quality. The borehole was completed as a well and test pumped at 46 gpm for 24 hours, resulting in drawing down the water level from the static level of 112 feet to a pumping level of 208 feet below ground surface. Several other wells in the general area, e.g., Water Right File Number B-1745 which was owned by David Candelaria, also produce water from fractures in granitic bedrock.

Thus, it can be concluded that the Abo Formation is not an aquifer in this area and that groundwater can be obtained from the granitic bedrock if fracture zones are encountered during drilling.

Water supply for the Ice Caves (Candelaria)

An affidavit signed by David Candelaria is included in the records of the NMOSE for a water appropriation at Aqua Fria Spring, about 3½ miles northeast of the Ice Caves. The affidavit states that water was hauled from Aqua Fria Spring to the Ice Caves until 1966, when a pipeline was built. Candelaria also constructed a well north of the highway in 2008 (Figures 6 and 7). The well reportedly produced 20 gpm. No other information was found regarding the use of water from this well, whether it might have been used as a source of water for the Ice Caves. David Candelaria also made an application to drill a well adjacent to Aqua Fria Spring. There is no documentation to indicate whether that well was constructed.

With a little imagination, one can “see” the trace of a path from the well going across country toward the Ice Caves on GoogleEarth. Apparently, water from Aqua Fria Spring and the well was piped to a storage tank on the hill north of the cinder quarry (north of Hwy 53 at the entrance road to the Ice Caves). From there water flowed by gravity to facilities at the Ice Caves. The property with the spring, well and water system have not been purchased by NPS and that system is not available for future NPS facilities at the Ice Caves.

Wells west of the Ice Caves

The NMOSE database includes records for nine private domestic wells in the area generally along or south of Hwy 53 and within 4 miles west of Bandera Crater (Figures 7 and 8). These wells generally range from about 1000-1200 feet deep and produce between several tens to several hundred gallons per minute. Interpretation of the driller’s logs indicates that the wells are probably obtaining water from the San Andres-Glorieta aquifer. These wells provide a good

indication of conditions that would be encountered if a water-supply well was drilled at the Ice Caves.

The Vance Well (B-1094) is of particular interest because it is on property that is now owned by NPS. The Vance Well is 1033 feet deep with the main water-bearing zone in fractured rock from 1018 to 1029 feet. The well reportedly produced 10+ gpm. The well record does not provide information on the depth to water in the well. A copy of the well record on file with NMOSE is attached to this report.

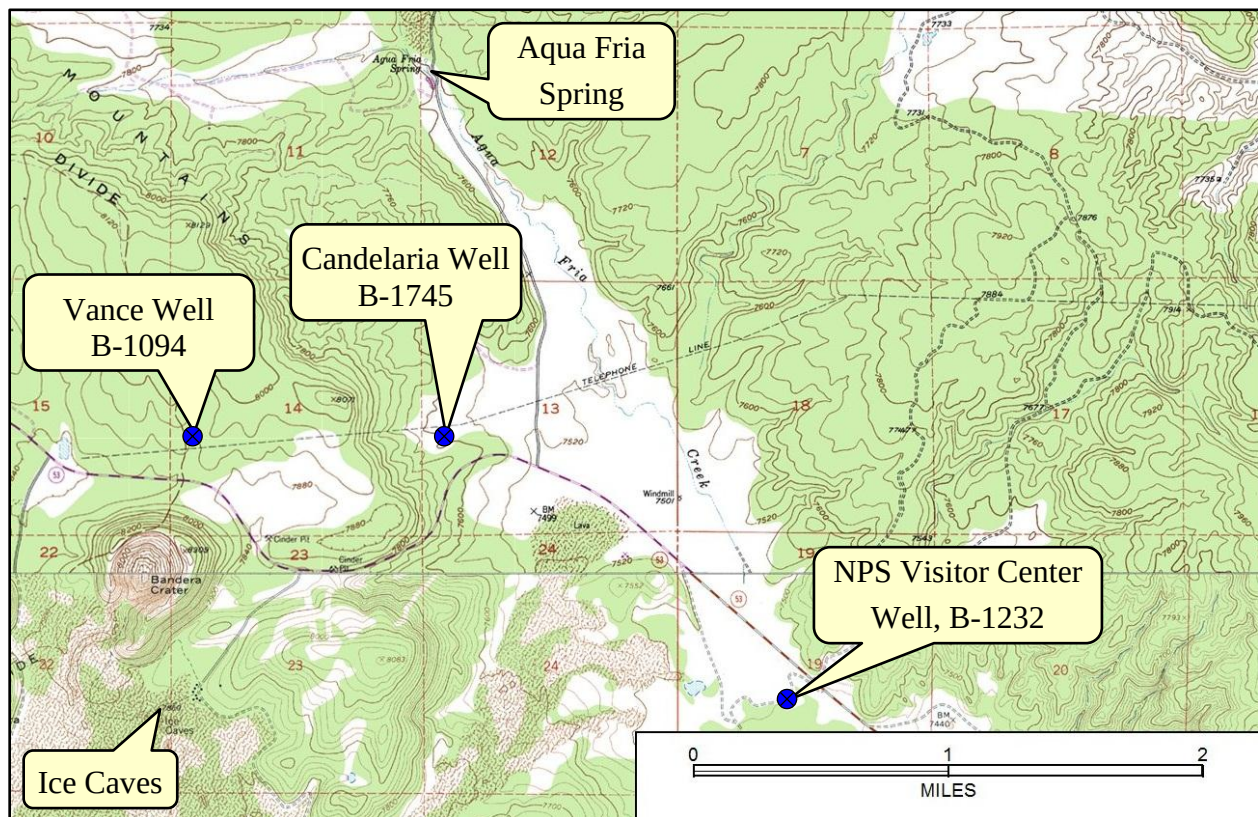


Figure 7. Locations of wells and springs near the Ice Caves.
Numbers are the NMOSE Water Right File Number

Alternatives for a water supply for future NPS facilities at the Ice Caves

Possible sources for a water supply for future NPS facilities at the Ice Caves include;

1. Purchase of the well and water system that supplied water to the site when it was owned and operated by Candelaria.
2. Construct a new water system using the Wm. Vance well (B-1094) as the source.
3. Construct a pipeline from the well at the NPS El Malpais visitor center.
4. Drill a new well at the Ice Caves.

Each of these alternatives will have pros and cons. A complete evaluation of the economics, reliability, and potential impacts of each alternative will help to guide park management to a final decision regarding this matter.

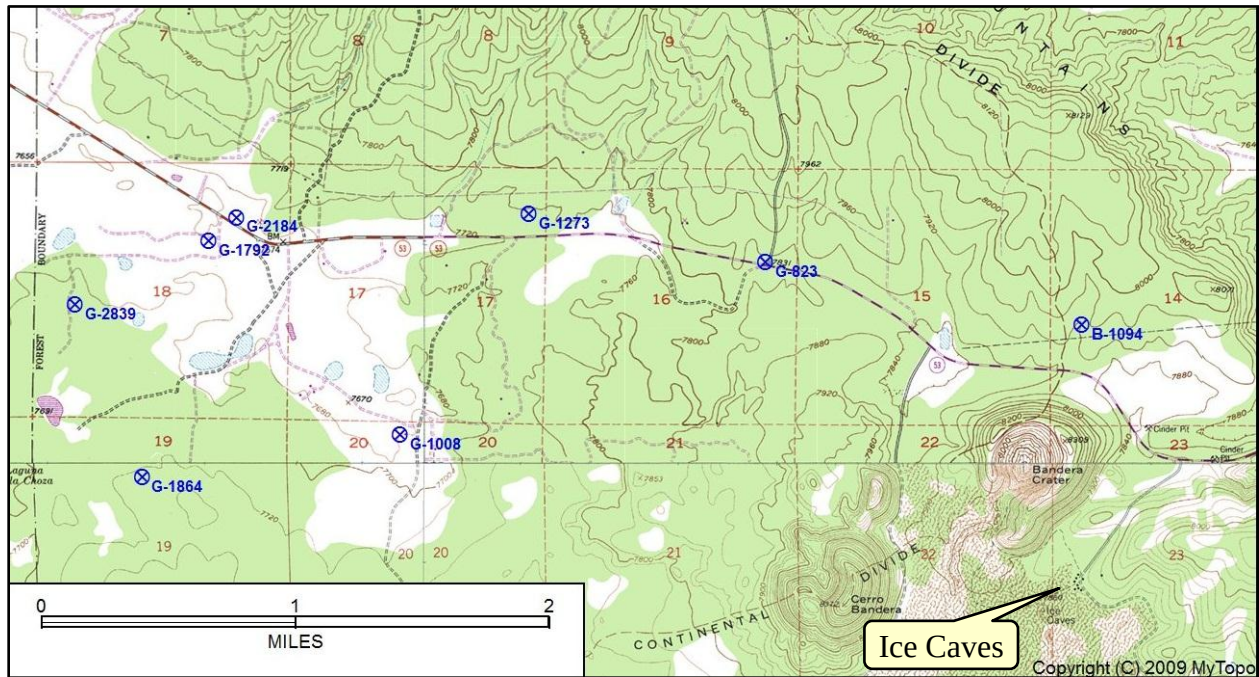


Figure 8. Private wells west of Bandera Crater. Labels are NMOSE water right file numbers. Candelaria Well (B-1745 is shown on Figure 7.

If there are any questions regarding this report, please call me at (970)-225-3515.

cc:
IMR – Jon Bergeron

References

- Baldwin, Joe A., and Rankin, Dale R., 1995, *Hydrogeology of Cibola County, New Mexico*, U.S. Geological Survey Water-Resources Investigations Report 94-4178, 102 pages
- Foster, Roy W. 1971, *Southern Zuni Mountains, Zuni-Cibola Trail: Scenic Trips to the Geologic Past*, No 4, NM Bureau of Mines and Mineral Resources, p 36-45.
- New Mexico Bureau of Geology and Mineral Resources, 2003, *Geologic Map of New Mexico*, 1:500,000, 2 sheets.

Attachments:
Well logs for Candelaria, Vance, and NPS

Candelaria Well Log, Page 1

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

a. Owner of well DAVID CANDELARIA B-1745
 Street or Post Office Address 12,000 ICE CAVE RD
 City and State GRANTS NM 87020
 Well was drilled under Permit No. B-1745 and is located in the: N 35° 00' 28.41" W 108° 03' 42.63"
 b. NW 1/4 SW 1/4 of Section 13 Township 9N Range 12W N.M.P.M.
 b. Tract No. _____ of Map No. _____ of the _____
 c. Lot No. _____ of Block No. _____ of the N/A RURAL LAND
 Subdivision, recorded in VALENCIA 1-27-1959 County.
 d. X= 2654481 see CIBOLA exeluturs deed-book D 25 page 492
 foot, Y= 1458281 feet, N.M. Coordinate System NAD 1983 SP FT NM West
 the UTM Zone 13N Grant,
 (B) Drilling Contractor COYOTE DRILLING INC. License No. WD-1451
 Address _____
 Drilling began 5-13-08 Completed 8-16-08 Type tool hammer tool Size of hole 7" in.
 Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.
 Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 510' ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
460	480	20	granite	20 gpm

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
4 1/2	PVC		0	565	565	none	525	565

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor _____	<table><tr><th rowspan="2">No.</th><th colspan="2">Depth in Feet</th><th rowspan="2">Cubic Feet of Cement</th></tr><tr><th>Top</th><th>Bottom</th></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr></table>	No.	Depth in Feet		Cubic Feet of Cement	Top	Bottom	1				2				3				4			
No.			Depth in Feet			Cubic Feet of Cement																	
		Top	Bottom																				
1																							
2																							
3																							
4																							
Address _____																							
Plugging Method _____																							
Date Well Plugged _____																							
Plugging approved by: _____																							
State Engineer Representative _____																							

Date Received 11/14/2008 FOR USE OF STATE ENGINEER ONLY
 X= 2654481 Y= 1458281
 Quad (u) 10ne FSL _____ FSL _____
 File No. B-1745 Use Drnk/San Location No. 9N.12W.13 311
 Trn No. 405214

Candelaria Well Log, Page 2

[illegible]

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

believe, the foregoing is a true and correct record of the above
Clippie Long
 Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, reworked or deepened. When this form is used as a plugging record, only Section 1(a) and Section 3 need be completed.

234210
Revised June 1972STATE ENGINEER OFFICE
WELL RECORD

26 SEP 25 P 1:14

Section 1. GENERAL INFORMATION

(A) Owner of well William A. Vance Owner's Well No. 111100
 Street or Post Office Address 12600 Ice Cave Rd.
 City and State Grants, N.M. 87020

Well was drilled under Permit No. B-1094 and is located in the:

a. $\frac{1}{4}$ $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 14 Township 9N Range 12W N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
 Subdivision, recorded in Cibola County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
 the _____ Grant.

(B) Drilling Contractor Garner Drilling Co. License No. WD-595

Address Box 3146 Milan, N.M. 87021

Drilling Began 9-4-85 Completed 9-30-85 Type tools Rotary Size of hole 6 3/4 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 1033 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
1018	1029	11	Hard Fracs. & cavities	10 +

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
4	8.7	weld	+ 1	1033	1034	open	1018	1030
gravel pack								

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor _____	No.	Depth in Feet		Cubic Feet of Cement
Address _____		Top	Bottom	
Plugging Method _____				
Date Well Plugged _____				
Plugging approved by: _____				
State Engineer Representative _____				

FOR USE OF STATE ENGINEER ONLY

Date Received Nov. 13, 1985

Quad _____ FWL _____ FSL _____

File No. B-1094 Use dom Location No. 9N.12W.14.320 (Cibola)

Vance Well Log, Page 2

[illegible]

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

J. H. ...
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1 and Section 5 need be completed.

236538 *issd*
Revised June 1972STATE ENGINEER OFFICE
WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well NATIONAL PARK SERVICE Permit No. B1232
 Street or Post Office Address 301 SO. HOWES ST
 City and State FT. COLLINS, CO. 80521

Well was drilled under Permit No. HC 159314 and is located in the:

a. $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 19 Township 9 Range 1 N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
 Subdivision, recorded in CIBOLA County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
 the _____ Grant.

(B) Drilling Contractor ROTARY DRILLING License No. 643
 Address P.O. BOX 129 GRANTS, NM 87020

Drilling Began 11/02/91 Completed 05/14/92 Type tools REAMER Size of hole 8 3/4 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 298 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 116 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
275	276	1	FRACTURE IN GRANITE	60+

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
6 5/8			+2	298	300		273	283
						PERFORATIONS = 10'		.030
						STAINLESS STEEL SCREEN		

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				
30	40	8 3/4		2.2	POURED
					SANITARY SHALE TRAPS SET
					@ 40', 160', 180'

Section 5. PLUGGING RECORD

Plugging Contractor _____	<table><tr><th rowspan="2">No.</th><th colspan="2">Depth in Feet</th><th rowspan="2">Cubic Feet of Cement</th></tr><tr><th>Top</th><th>Bottom</th></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr></table>	No.	Depth in Feet		Cubic Feet of Cement	Top	Bottom	1				2				3				4			
No.			Depth in Feet			Cubic Feet of Cement																	
		Top	Bottom																				
1																							
2																							
3																							
4																							
Address _____																							
Plugging Method _____																							
Date Well Plugged _____																							
Plugging approved by: _____																							
State Engineer Representative																							

State Engineer Representative

FOR USE OF STATE ENGINEER ONLY

Date Received 5-21-92 Quad _____ FWL _____ FSL _____
 File No. B-1232 Use D/S Location No. 9N.11W.19.3

NPS Well Log, Page 2

Section 6. LOG OF HOLE

[illegible]

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

C. L. Fran
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) Section 5 need be completed.