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A Summary of Wells and Springs used as Water Supply Sources Devils Tower National Monument

Like many of our national parks and monuments, the files for water-supply wells at Devils Tower contain a confusing set of records, particularly for wells. Well naming and numbering is not consistent; names and numbers change and get switched from one well to another and back again. I've scoured the files at WRD and provide the following summary of well construction and springs used for water sources at Devils Tower. Fortunately, the uncertainty regarding well names and numbers isn't critical at DETO. There is only one deep well that provides all of the water for facilities at the park.

It appears that water was diverted from a spring in the early days of the monument. Eventually, as visitation increased, the demand exceeded the supply from the spring. Additional springs were developed and wells were drilled. A well was drilled into the Minnelusa Formation at the CCC camp. This well provided sufficient water, but it was poor quality. In the early 1960s, a deep well was drilled into the Pahasapa Limestone (aka Madison Limestone). This well provides an ample supply of good-quality water and is the sole-source of water for the park.

If/when a new well is needed, it should be constructed into the Pahasapa Limestone. Simply move 20-50 feet from the existing well and drill a new well to a total depth of 1350 feet. Steel casing should be placed from ground surface to the top of the Pahasapa (about 1315 feet) and cemented in place to prevent poor-quality water from intermediate aquifers from entering the well.

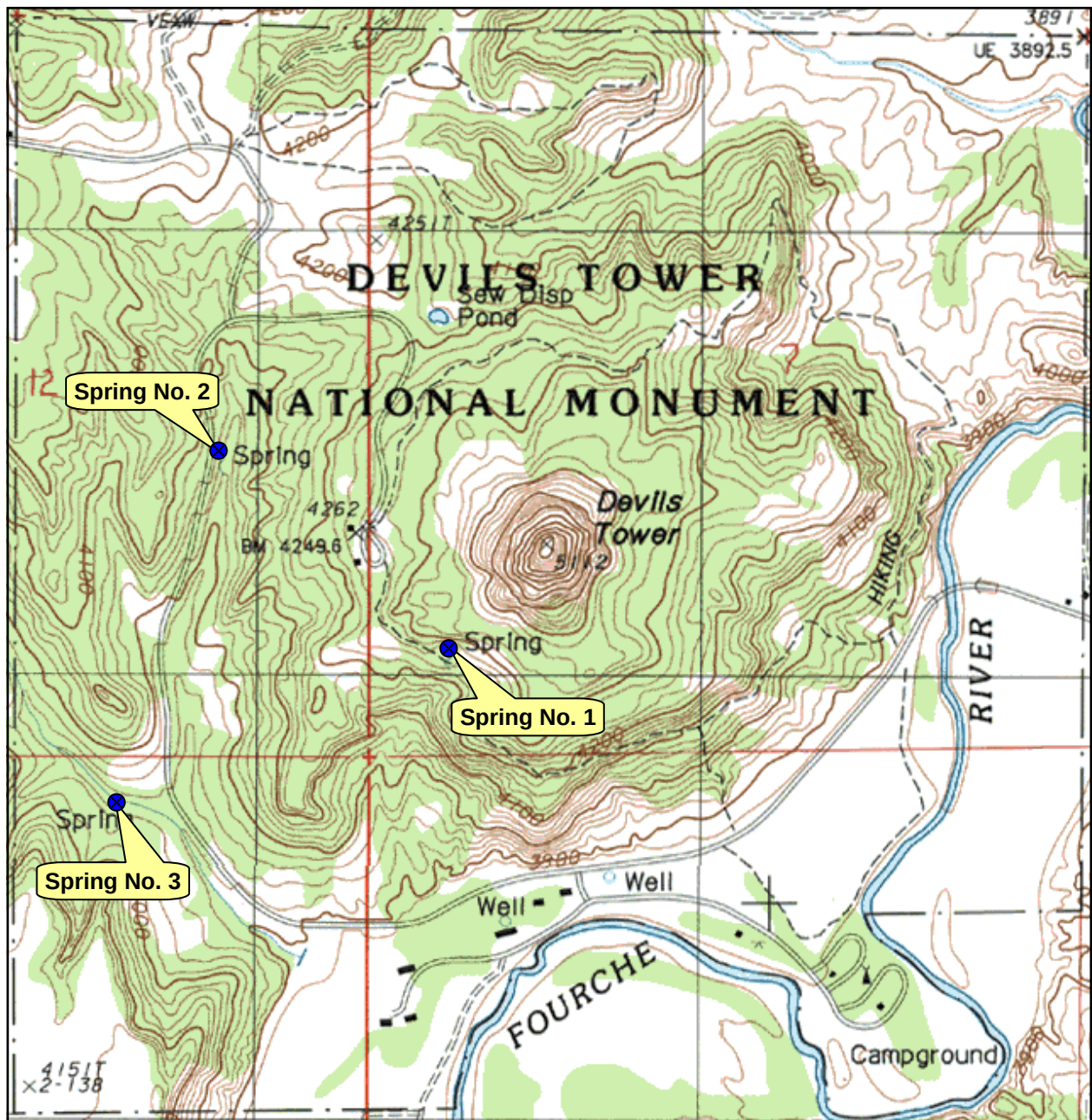
Springs

Three springs were developed as water-supply sources (See Map 1) prior to construction of wells at the monument. The springs are no longer used as water-supply sources.

Records for development of Spring No. 1 as a water-supply source were not found. It was apparently the original water supply for the monument. Flow from the spring varied from 1500 to 10,000 gpd, depending on the season. Water was collected in a concrete sump near the spring outlet and then pumped to a 22,000 gallon underground storage reservoir. Water then flowed out to the distribution system for park facilities.

Spring No. 2 and No. 3 were developed in 1932-33. At both springs, flow was diverted into a pipeline and transmitted to a concrete tank near the road. When flow from Spring No. 1 was insufficient to meet demand, water would be pumped from these tanks to a truck and hauled to

the main underground storage reservoir. Spring No. 2 flowed about 500 gpd. Spring No. 3 flowed about 300 gpd.



Map 1. Springs which were developed as water supply sources at Devils Tower.

By the mid 1930s, flow from the springs was no longer adequate to meet the demand of increasing visitation. Additionally, there was a CCC camp at the park which would have increased the demand on the water supply. Several wells were drilled to supplement the flow from the springs.

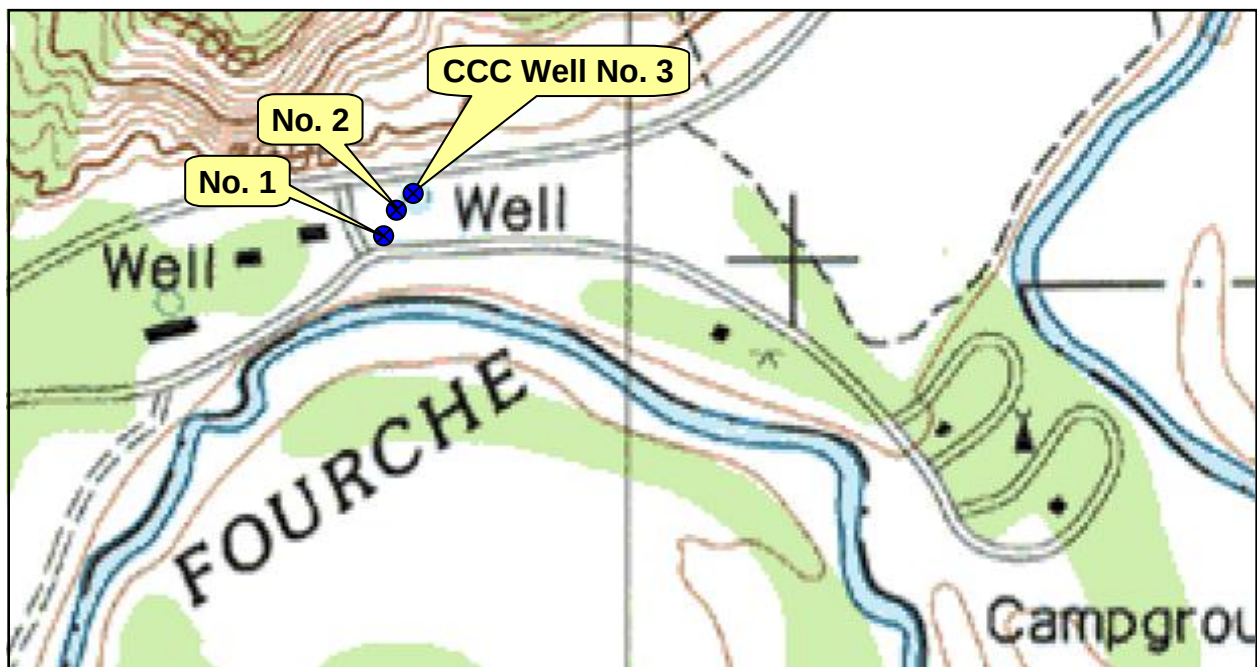
Wells at Devils Tower

Three wells were drilled at the CCC camp in the 1930s. Notes in WRD files indicate the army was involved in the drilling and construction of these wells. There is considerable confusion in the file documents regarding well numbers and names.

CCC Well No. 1 was drilled in 1934 to a depth slightly more than 500 feet, into a 40 foot layer of quicksand. Several intervals of poor-quality water were encountered during drilling. The well was not cased, allowing better quality water from deep in the well to mix with poor quality water from shallower depths. The well was completed with 60 feet of pipe in the upper part of the well. The steel pipe was 6 or 8 inches at 60 feet, reducing to 1-inch at ground surface. There was enough artesian pressure to blow a stream of water 10 feet into the air.

CCC Well No. 2 was drilled about 1937. It was a cased well. The well was drilled to 300 feet and then a set of drilling tools was lost in the hole and it was abandoned.

CCC Well No. 3 was started after abandoning Well No. 2. The well is also called, “Spring Draw #2 Well” on some documents. Well No. 3 was drilled to 610 feet. It was the principal water supply for the monument during the summer prior to construction of the deep well into the Pahasapa Limestone. Water from the well was not very good; having high total dissolved solids (2900-3000 ppm); primarily calcium-magnesium-sodium-sulfate. Water was also very hard (1700-1800 ppm as calcium carbonate or 90 grains per gallon).

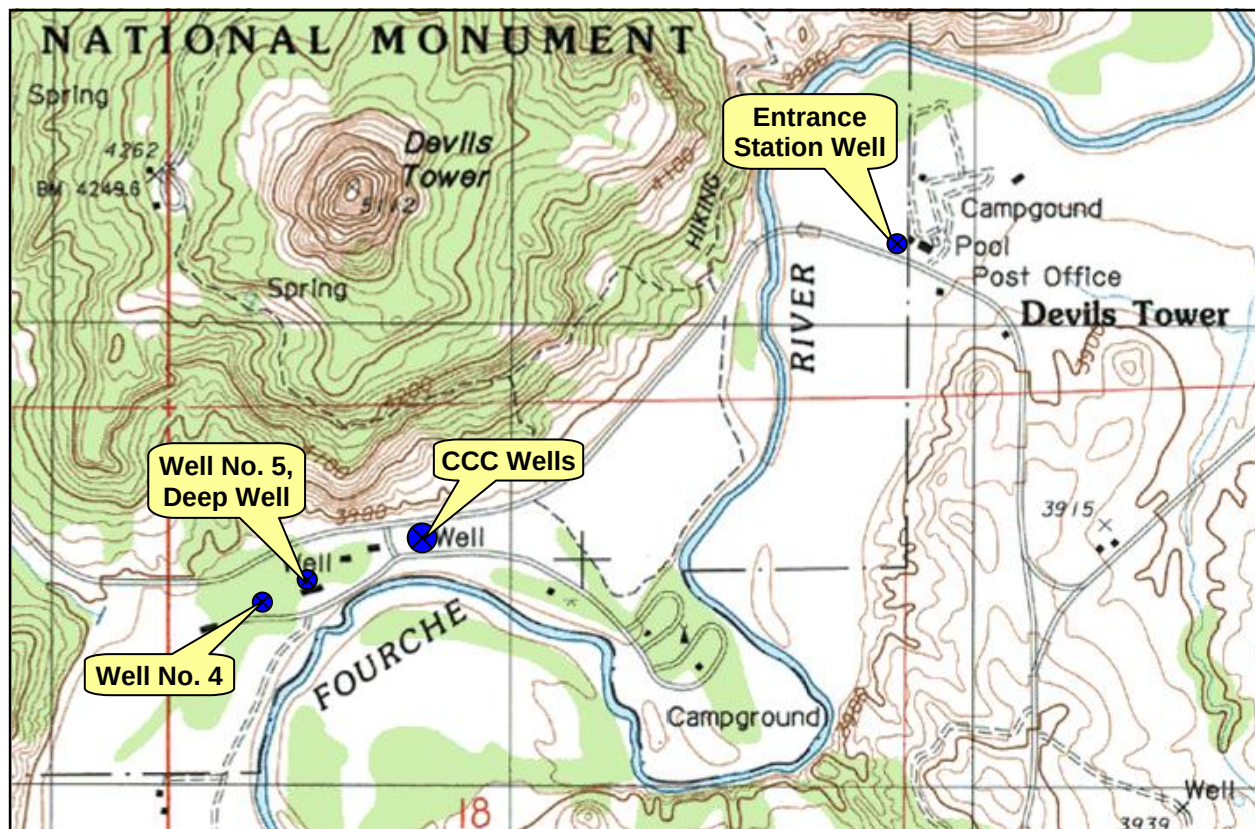


Map 2. Location of “CCC Wells” at Devils Tower.

The “Entrance Station Well” was drilled in 1958. It is 54 feet deep. It reportedly produced 70 gpm of water that was suitable for campground and other domestic use. Other notes in WRD files indicate that the water quality was tested in 1982 and that it was unsuitable. The well location is 53-65-7dda.

Well No. 4 was drilled to a depth of 63 feet in 1959. It is a short distance west of the admin building. The location is 53-65-18bdd1.

Well No. 5 is the deep well that is the current water supply for the park. Initial drilling occurred from August to December 1961, when drilling proceeded through the Spearfish and Minnelusa Fms. to 1200 feet. Water quality and yield from that depth was not great and it was decided to deepen the well into the Pahasapa Limestone. In June-July 1961, the well was deepened to 1341 feet and completed in the upper part of the Pahasapa Limestone. The Pahasapa is also known as the Madison Limestone. A formation packer was installed at 1315 feet, near the top of the Pahasapa, to isolate poor-quality water from the Spearfish and Minnelusa Fms. Water from the Pahasapa Limestone enters the well through a 2½-inch perforated pipe from 1315-1341 feet. The location of the well is 53-65-18bbd2. The deep well is the only water-supply well that has/had a permit from the Wyoming State Engineers Office. It is permit number P1923W.



Map 3. Well locations at Devils Tower National Monument.

Monitoring Wells

Table 1 contains a listing of permits from the Wyoming State Engineers Office for monitoring wells at Devils Tower. It appears that many of the permitted wells were never constructed, as there are no data for well construction and the permits have been cancelled. Four monitoring wells were constructed in the vicinity of the septic leachfield to the southwest of the housing/admin area. One monitoring well (Drywell Monitoring Well #3) was constructed in the middle of the park developed area.

Additionally, there are about 10 shallow monitoring wells in the alluvial deposits on the floodplain of the Belle Fourche River. These wells were installed in 1996 to allow monitoring of depth to water in the alluvium to provide data for planning of restoration or planting of cottonwood trees in the riparian area.

References

The USGS report by Whitcomb and Ellis contains a good summary of springs, wells, the history of water development, and drilling and testing of the deep well.

Whitcomb, Harold A., and Ellis D. Gordon, 1964, *Availability of Ground Water at Devils Tower National Monument, Wyoming*, U.S. Geological Survey Open-File Report, 61 pp.

Table 1. Well permits from the Wyoming State Engineers Office

Permit #	Priority	Status	Twp	Rge	Sec	Qtr/Qtr	Applicant	Facility Name	Uses	Yield	Well Depth	Static Depth	Mwbz Top	Mwbz Bottom	Well Log	Chem Analysis
P104504W	11/14/96	CAN	53N	65W	18	NWNW	NPS-DETO	DRYWELL MONITORING WELL #4	MON						No	
P104505W	11/14/96	GST	53N	65W	18	NWNW	NPS-DETO	DRYWELL MONITORING WELL #3	MON	0	19	14.2	10	19	Yes	Yes
P104506W	11/14/96	CAN	53N	65W	18	NWNW	NPS-DETO	DRYWELL MONITORING WELL #7	MON						No	
P104507W	11/14/96	GST	53N	66W	13	SENE	NPS-DETO	LEECH FIELD MONITORING WELL #1	MON	0	23.7	18.27	1	24	Yes	Yes
P104508W	11/14/96	GST	53N	66W	13	SENE	NPS-DETO	LEECH FIELD MONITORING WELL #2	MON	0	20	14.82	Unknown	Unknown	Yes	Yes
P104509W	11/14/96	GST	53N	66W	13	SENE	NPS-DETO	LEECH FIELD MONITORING WELL #3	MON	0	19	14.59	Unknown	Unknown	Yes	Yes
P104510W	11/14/96	GST	53N	66W	13	SENE	NPS-DETO	LEECH FIELD MONITORING WELL #4	MON	0	20	14.5	4	23	Yes	Yes
P124679W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-1	MON						No	
P124680W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-2	MON						No	
P124681W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-3	MON						No	
P124682W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-4	MON						No	
P124683W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-5	MON						No	
P124684W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-6	MON						No	
P124685W	4/10/00	A&C	53N	65W	18	SWNW	NPS-DETO	MW-7	MON						No	
P124686W	4/10/00	CAN	53N	65W	18	SWNW	NPS-DETO	MW-8	MON						No	
P1923W	3/27/62		53N	65W	18	NWNW	NPS-DETO	UTILITY AREA DEEP WELL #1	DOM,MIS	45	1341	24	1315	1341	Yes	No

A&C Abandoned and Cancelled

Can Cancelled

GST Good Standing

Qtr/Qtr location goes from small to large. It's the xx qtr of the xx qtr.

For example, SWNE is the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$.