



United States Department of the Interior

NATIONAL PARK SERVICE
Water Resources Division
1201 Oak Ridge Drive, Suite 250
Fort Collins, CO 80525

IN REPLY REFER TO:

January 29, 2002

Memorandum

To: Jerry Burgess, Park Engineer, Glacier National Park

From: Larry Martin, Hydrogeologist, Water Resources Division

Subject: New Well at Walton Ranger Station

The existing well at the Walton Ranger Station is located within a few feet of the eroding streambank of the Middle Fork of the Flathead River. Montana DEQ requirements for monitoring at this well, due to proximity to a surface water source, cost NPS approximately \$6000 per year. The park would like to construct a new well that is less susceptible to continuing erosion of the riverbank and that is not under the direct influence of surface water to provide a more secure water source and reduce monitoring costs.

I have reviewed the information available in our files and researched water well construction data from the Internet site of the Montana Bureau of Mines and Geology Ground-Water Information Center. Based on the information available, I believe that a new well could be constructed in the area just north of the ranger station that will meet the objectives of the park.

Coffin (1968) evaluated the prospects for obtaining alternate water supplies at the Walton Ranger Station. At the time, water was being provided from a spring development at an elk wallow ¼-½ mile northeast of the ranger station. He identified the most likely possibilities for improving the water supply as (1) improvement and expansion of the spring development, (2) an infiltration gallery in the Middle Fork of the Flathead River, and (3) a well drilled near the ranger station. Apparently park staff took his advice and a well was constructed in 1970. This well is still in use. Erosion of the streambank has resulted in the edge of the cut bank now being only about 5 feet from the well.

There are records of two NPS wells constructed to provide water for the Walton Ranger Station and other NPS facilities in the area. The first well was constructed in October of 1970. It was drilled to a depth of 78 feet, bottoming in clean, coarse gravel. The well was completed as an open bottom well. There was no well screen or perforated casing; all of the water entering the well came through the open bottom of the 6-inch casing. The well was reported to yield 36 gpm of clear, sand free water. The well is located south of the highway, between the highway and the river. The second well was completed on October 15, 1993. The well was drilled to 56 feet deep. No lithologic information was available. The well was completed as an open bottom well

using 8-inch casing. The exact location of this well is not known, but the reported location puts it about 500-1000 feet north of the ranger station. It is reported to have been abandoned. Perhaps the well encountered only glacial till, or bedrock was encountered before reaching the water table in the alluvium and was abandoned due to low yield or unfavorable hydrogeologic conditions.

A search for well completion records from the Montana Bureau of Mines and Geology Ground-Water Information Center website provided information for 25 wells. All of the wells are located in the valley, north of the Walton Ranger Station. The search area extended about 1½ miles from the ranger station. In general, wells constructed near the margins of the valley encountered glacial till and/or bedrock and produced only a few gallons per minute at best. Wells completed more toward the middle of the valley encountered alluvial sands and gravels that have been reworked and sorted by the river, resulting in larger permeability. These wells produced several tens or hundreds of gallons per minute.

The information from records of existing wells in the area verifies the hydrogeologic conditions that we would expect for the area. Where the river has reworked the glacial till and deposited alluvium, wells can be expected to produce large quantities of water. Where a well encounters only glacial till overlying bedrock, such as at the margins of the valley, wells will have a very low yield. With that in mind, a new well located near the ranger station should be successful. However, it should not be located too far north or too far east of the river.

The suggested location for a new well is about 100-200 feet north of the highway and 100-200 feet east of the river. This general location presents the best compromise between providing some buffer space between the well and the river and between the well and the highway, while still being near enough to the river that it is likely to encounter reworked alluvium rather than glacial till. The location is shown on the attached map.

The well should be constructed by drilling and driving casing as drilling proceeds. This will allow the driller to continually obtain representative samples of the strata encountered. Drilling should continue until glacial till or bedrock are encountered. This could possibly be as much as 250 feet. After drilling is completed, a decision will be made regarding which zone(s) should be screened. Grain size analyses of sediment samples from the selected interval(s) will be conducted to select the appropriate size screen opening. The screen will be installed by telescoping inside the casing to the desired depth. The casing will then be pulled back to expose the well screen. The well will be developed by a combination of surging, jetting, and pumping to remove the fine-grained portion of the sediments immediately outside the well screen. This is a standard method of well construction that any competent driller should be capable of accomplishing.

If bedrock or glacial till are encountered before reaching a suitably permeable zone in the alluvium, the borehole should be plugged and abandoned. A new drilling site should then be attempted closer to the river.

It would be our desire to locate the well screen in the deepest permeable zone encountered. This will provide vertical separation between the intake to the well and the river.

A temporary conductor casing should be installed to a depth of at least 20 feet. After completion of the well, this casing will be removed as a cement grout mixture is being installed. This will provide a surface seal to prevent surface water from flowing into the well along the casing and possibly contaminating the well.

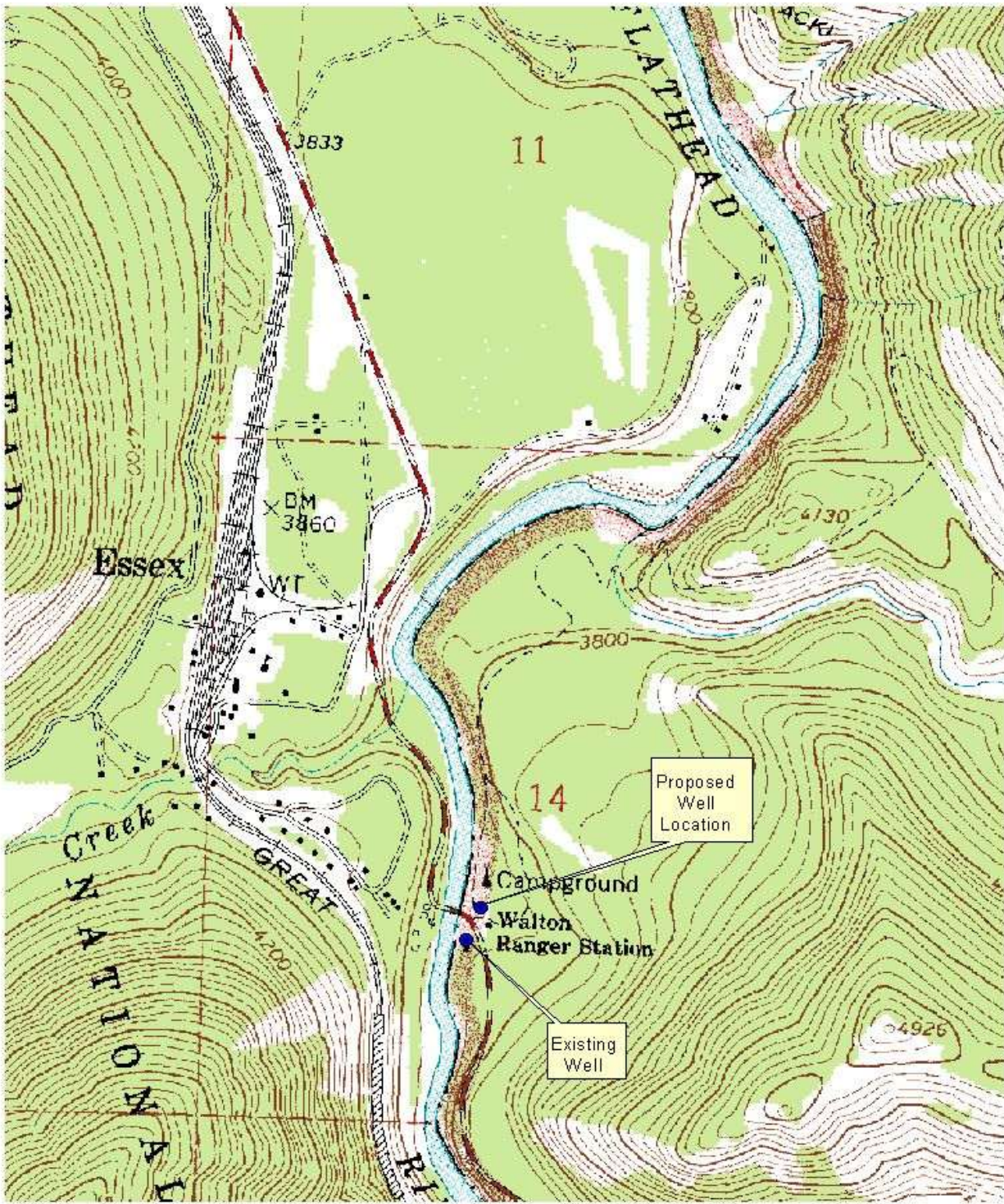
All work should be done by a well driller licensed in Montana and should conform to applicable requirements of the State of Montana.

If you have any questions regarding information in this memo, please call me at (970)-225-3515.

References

Coffin, Donald, 1968, Prospects for Obtaining Water Supply at Three Sites in Glacier National Park, Montana, USGS Administrative Report, 20 pp.

Attachments – Map of Walton Ranger Station Area
Scope of Work



Glacier National Park, Walton Ranger Station

0.5 0 0.5 Miles



SCOPE OF WORK

Construct a New Well at Walton Ranger Station Glacier National Park

This scope of work is for construction of a new well near the Walton Ranger Station at Glacier National Park. The site is approximately 30 miles southeast of the Town of West Glacier. The target aquifer for the well is the alluvium adjacent to the Middle Fork of the Flathead River. It is anticipated that a permeable zone can be found at a depth substantially lower than the riverbed, to provide vertical separation between surface water in the river and the screened interval in the well. Desired yield of the well is 20-30 gallons per minute (gpm).

Specifications

1. All work shall be done by a well driller licensed by the State of Montana.
2. Well construction will comply with all well construction standards for public water supply wells in the State of Montana.
3. A 10-inch temporary conductor casing should be installed to a depth of at least 20 feet. After completion of the well, this casing will be removed as a cement grout mixture is being installed. This will provide a surface seal to prevent surface water from flowing into the well along the casing and possibly contaminating the well. Larger diameter, or longer casing may be required to meet well construction standards of the State of Montana.
4. The well should be constructed by drilling and driving casing as drilling proceeds. Samples should be collected at 5-foot intervals, or more frequently to provide representative samples of all strata encountered.
5. Minimum size of the permanent well casing shall be 6-inch inside diameter.
6. Drilling should continue until glacial till or bedrock are encountered. This could possibly be as much as 250 feet. After drilling is completed, a decision will be made regarding which zone(s) should be screened. Grain size analyses of sediment samples from the selected interval(s) (see Item 4 above) will be conducted to select the appropriate size screen opening. The screen will be installed by telescoping inside the casing to the desired depth. The casing will then be pulled back to expose the well screen. The bottom of the well screen must be capped.
7. Well construction must include installation of a Johnson type well screen. Open bottom construction or perforated casing are not acceptable for this well.

8. The well will be developed by a combination of surging, jetting, and pumping to remove the fine-grained portion of the sediments immediately outside the well screen. Pumping alone is not an adequate method of development. It is necessary to cause the water in the well to surge back and forth through the screened interval to wash the fine-grained portion of the sediment into the well for removal by bailing. This will result in formation of a naturally developed gravel pack in the screened interval.
9. If bedrock or glacial till are encountered before reaching a suitable permeable zone in the alluvium, the borehole should be plugged and abandoned. A new drilling site may then be attempted closer to the river.
10. The well will be completed by installing a pitless adaptor.
11. A submersible pump will be installed in the well. The pump shall be a Goulds 25GS15 or similar size pump of another brand. Installation shall include all electrical connections and necessary control boxes.
12. The well will be disinfected by chlorination according to guidelines of the State of Montana.
13. Drawdown, yield, and recovery characteristics of the well shall be determined by conducting a pumping test of at least 6 hours duration with a minimum of 2 hours monitoring the water level recovery following pumping. Recovery measurements shall continue until the water level has recovered to within 90% of the pre-pumping static water level. Water level and discharge measurements shall be frequent enough to allow characterization of drawdown and recovery curves for the well. If Montana guidelines require a longer test, the Montana guidelines will prevail. The time interval for measuring water levels in the well during the drawdown and recovery test shall be as follows;

Elapsed Time Since Start
of Drawdown or Recovery Test

0-15 minutes
15-60 minutes
1-2 hours
2-8 hours

Water Level Measurement
Time Interval, Minutes

1 minute
5 minutes
10 minutes
30 minutes

Well Drillers Report for the new well that was constructed in March 2004

Site Name: GLACIER NATIONAL PARK *

WALTON RANGER STATION

GWIC Id: 216550

Section 1: Well Owner(s)

1) UNITED STATES DEPARTMENT OF INTERIOR (MAIL)

GLACIER NATIONAL PARK

WEST GLACIER MT 59936 [03/19/2004]

Section 2: Location

Township Range SectionQuarter Sections

29N 16W 14 SE¼ NE¼ SW¼

County FLATHEAD

Latitude Longitude Geomethod Datum

48.2733 113.6025 NAV-GPS NAD27

Section 3: Proposed Use of Water

DOMESTIC (1)

PUBLIC WATER SUPPLY (2)

Drilling Method: ROTARY

Date well completed: Friday, March 19, 2004

Section 6: Well Construction Details

Borehole dimensions

From To Diameter

0 6 8

6 113.3 7.5

Casing

From	To	Diameter	Wall	Thickness	Pressure	Rating	Joint	Type
-2.5	113.3	6		0.250	WELDED	A53B	STEEL	

There are no completion records assigned to this well.

Annular Space (Seal/Grout/Packer)

From To Description Cont.

0 113 BENTONITE CRUMBLES Y

Total Depth: 113

Static Water Level: 63.4

Water Temperature:

Air-lift Test *

70 gpm with drill stem set at 113 feet for 2.5 hours.

Time of recovery 0 hours.
Recovery water level 63.5 feet.
Pumping water level feet.

Section 8: Remarks

WELL WAS DRILLED WITH A SYMATREX UNDER REAMING SYSTEM- WELL WAS PUMP TESTED AT 32.2 GPM WITH A PUMPING LEVEL OF 63.5 FEET - WELL STABILIZED 10 MINUTES INTO THE PUMP TEST

Section 9: Well Log

From-To	Description
0-9	MIXTURE OF REDISH BROWN SILT AND FINE GRAINED SAND
9-30	SMALL TO LARGE COBBLES AND SMALL BOULDERS WITH SOME BROWN SILT AND FINE SAND
30-59	RUSTY BROWN COLORED SILT AND CLAY WITH SOME FINE SAND WITH SMALL TO LARGE GRAVELS AND SMALL TO LARGE COBBLES
59-62	LIGHT BROWN COLORED SILT AND FINE TO COARSE GRAINED SAND
62-80	REDISH BROWN COLORED CLAY
80-113	SMALL TO LARGE GRAVELS AND SMALL COBBLES AND WATER WITH A LITTLE LIGHT BROWN SILT AND FINE SAND