

July 7, 1993

Memorandum

TO: Joe Durrenberger, Park Engineer, DENA

FROM: Larry Martin, Hydrologist, Water Operations Branch

SUBJECT: Information on water supply wells.

I have searched our files to find the information you requested regarding well construction for the two wells being monitored by the USGS. I have copied the header sheets for these two wells from the USGS annual report (attached). Additional information for these wells was found in WRD files.

Well A is 253 feet deep and cased to 204 ft with 8 inch casing. The well is open hole from 204-253 feet. This well is near the power plant. It is also referred to as "50001". The well was drilled through Quaternary alluvium from 0-70 feet and schist for the remainder of the hole (70-253 feet).

Well B is 307 ft deep and cased to 304 ft with 8 inch casing. The casing is perforated from 150 to 199.5 ft. This well is located 300 feet west of the southwest corner of the hotel, on the nature trail. It is also referred to as "50002". The well is completed in bedrock schist.

While I was investigating the well records in our files, I compiled a summary of information we have for wells in Denali. I am including that complete listing as an attachment for your information.

I also spent some time reviewing the information we have on the well at the Riley Creek Visitor Access Center and efforts to rehabilitate the well so it will not produce sand. I have serious doubts about whether this well could be rehabilitated. There must have been some rationale for using well screen having 0.080" and 0.100 " openings, but I don't know what it was. There may be more information in reports prepared by the consultants involved in the well construction, either CH2M Hill, TERRASAT, or ECI/Hyer. The only information I have for the second well drilled for the VAC (1992) is a copy of a well log from TERRASAT. I have no reports of the preconstruction site evaluation, drilling or testing of the well. I would be happy to review these reports and any other information that may be available and make recommendations regarding well construction in the area.

It should certainly be possible to construct a new well, taking advantage of information obtained from previous drilling, that will produce clear water for use at the VAC. It appears that the water bearing zone is a glacial till or boulder-clay deposit. A properly constructed well in this type of deposit would be constructed as follows. Drill an oversize hole, approximately 12 7/8-inch diameter.

Collect samples from all potential water bearing zones. Drive 12-inch diameter casing as drilling proceeds. Identify and select water bearing zones that will be developed and screened in the completed well. Conduct sieve analyses of formation samples from those intervals. Select gravel pack and screen size based on the results of the sieve analyses. Install 8-inch screen and casing in the well. Place sand filter between the 8 and 12 inch casing and screen. Withdraw the 12-inch casing adding additional sand filter material as necessary. Develop the well by a combination of surging, jetting, and pumping.

None of the described procedures are unusual, however, oftentimes well drillers are either not properly trained in constructing wells in difficult hydrogeologic environments, they don't exercise due diligence during the construction, or they take shortcuts resulting in poorly constructed wells.

I am available to review all of the Park's past efforts to complete wells in this area and make recommendations about prospective sites, well construction specifications, and to supervise (in the field) construction and testing of new wells.

cc: DENA - Supt.
479 - Kimball, Jackson, Werrell
DSC-TWE - Bill Shelley
ARO - Vequist

DENALI NATIONAL PARK

SUMMARY OF INFORMATION ON WATER SUPPLY WELLS FROM NPS-WRD FILES

July 1993

This document is a summary of information water supply wells at Denali National Park found in the files of the Water Resources Division in July, 1993. Copies of driller's logs, completion reports, and water quality analyses are available from WRD. In most cases, the water quality analyses are for only the initial sampling taken at the time the well was drilled.

MCKINLEY HOTEL AREA

Five wells, ranging in depth from 158-404 feet were drilled in the area between 1962 and 1965. Only one well produced more than 3 gpm. The locations of these wells are shown on an attached map.

Well A is 253 feet deep and cased to 204 feet with 8 inch casing. The well is open hole from 204-253 feet. This well is near the power plant. This well is used as a monitor well by the USGS. It is also referred to as "50001". The well was drilled through Quaternary alluvium from 0-70 feet and schist for the remainder of the hole.

Well B is 307 ft deep and cased to 304 ft with 8 inch casing. It is perforated from 150 to 199.5 ft. This well is located 300 feet west of the southwest corner of the hotel, on the nature trail. This well is used as a monitor well by the USGS. It is also referred to as "50002". The well is completed in bedrock schist.

Well C (a.k.a. Test hole 2 or MP-4) is 404 feet deep and is cased to 39 feet with 8-inch casing. The well was completed as an open hole boring from 39-404 feet. Drilling was through schist bedrock from 36 feet for the remainder of the hole. At about 400 feet, a fracture zone was encountered that yielded a significant amount of water. A letter report from the USGS (June 25, 1963) concludes that the well should be capable of producing 10-15 gpm. The well is located on the nature trail, about 1000 feet north of the service station. A report by Tryck, Nyman, & Hayes (1974) concludes that the well is capable of producing 6 gpm. The water is very hard and has high concentrations of iron and total dissolved solids. This well was activated in 1969 and is used to supply water to the hotel in the winter.

Well D (MP-2) is 158 (or 153) feet deep and is located 300 feet NE of the ARR depot. The well was completed with 6-inch casing to an unknown depth and then 4-inch casing to 148 feet deep. The hole is uncased below 148 feet. Yield is reported to be 0.5 gpm. It is unused.

Well E (MP-1) is 246 ft deep, is located at the hotel powerplant. The well was completed with 6-inch casing to a depth of 142 feet, 4-inch casing from 142-162 feet, and 3-inch perforated iron pipe

from 162-246 feet. Yield is reported to be 3 gpm. It is unused.

AUGUST 1975 TEST DRILLING

Five wells were drilled, three in the area of the McKinley Hotel and two at the old CCC camp area to supply a new maintenance building. The drilling contractor was M&W Drilling of Anchorage, Contract No. CX-9000-5-0088. I could not find a map showing locations of test wells 1-3. Test wells 4&5 are inside the maintenance garage.

Hotel Creek Well Site #1

The test hole was drilled on August 6, 1975 to a depth of 39 feet. It was drilled through silty sand and gravel to 25 feet and bedrock schist to 39 feet. It produced 2-3 gpm and was dewatered in less than an hour of pumping. The hole was backfilled and abandoned.

Hines-Riley Creek (in floodplain) Well Site #2

The test hole was completed on August 11, 1975. It was drilled to a depth of 30 feet, encountering silty gravel and silt. The hole was discontinued and abandoned by cutting the 8-inch casing off at ground level and welding a cap on the top.

Powerhouse Recharge Well Site #3

This well was drilled on August 12, 1975. It was 76' deep and cased to 37.9' with 8 inch casing. The well was determined to be unsuitable for artificial recharge, so the casing was pulled and the hole was backfilled.

New Maintenance Garage, Test Well #4

Drilling was completed August 14, 1975. The well was drilled to a depth of 76 feet through bedrock, Birch Creek Schist. The hole was abandoned and backfilled.

New Maintenance Garage, Test Well #5

Test well #5 was completed on August 21, 1975. The hole was drilled to 123 feet through semi-consolidated gravelly alluvium or glacial till with a very silty matrix derived from the Birch Creek schist. The well was backfilled with coarse gravel to a depth of 76 feet. The hole was completed with 6-inch casing from 0-71 feet and 6-inch telescoping screen, No. 40 slot, from 71-76 feet. The casing was perforated from 50-62 feet. The well produced 11 gpm for 3.5 hours with 6 feet of drawdown, and is cased to 73.66 feet with 2 feet of casing stickup. The well has a Johnson 304 stainless screen from 71 to 76 feet.

HEADQUARTERS SPRING

This test well was drilled on January 17, 1984 under Contract No. CX-2000-4-0006. The well is 150 feet deep and was drilled through glacial till, mostly silt. The well was abandoned by capping the 6-inch casing and driving it 6 feet below ground surface.

RILEY CREEK, VISITOR ACCESS CENTER (VAC) WELL

This well was completed to serve as the water supply for the new Visitor Access Center on September 28, 1984. A water bearing zone of sand and gravel lies between 285-298 feet. The total depth of the well is 345 feet, the last 33 feet of the well were drilled through schist bedrock. Six-inch stainless steel well screen, No. 100 slot from 291-293 feet and No. 80 slot from 293-298 feet was installed in

the well. We have field logs for this well (prepared by CH2M Hill) and a copy of a well log labeled "VAC-2" prepared by TERRASAT. It is not clear if a second test well was drilled in the area, but it appears likely. Also, we do not have a complete copy of the report from TERRASAT and are unable to decipher what other test drilling may have been done in the area.

The well that was constructed for use at the VAC had problems with excessive sand and silt flowing into the well. Repeated efforts at rehabilitating the well in 1990 were unsuccessful. Water is currently being supplied to the VAC by an overland pipeline from another well 3000 feet away (Horseshoe well). I could not find any information in WRD files related to a well by that name, but I have found evidence that indicates it may be "Well C" in the area near the McKinley Hotel.

SAVAGE RIVER

The well was drilled by M-W drilling of Anchorage in August 1981. The well is 160.7 feet deep. The well was completed with 6-inch casing to a depth of 155.3 feet and 6-inch telescoping well screen from 155.3 to 160.7 feet. The well was pumped at 100 gpm for 2 hours with about 5 feet of drawdown. A chemical analysis of the water (from 1981) is available in our file.

SANCTUARY RIVER

The well was drilled by M-W drilling of Anchorage in August 1981. The well is 20.3 feet deep. The well was completed with 6-inch casing to a depth of 15.3 feet and 6-inch telescoping well screen from 15.3 to 20.3 feet. The well was pumped at 108 gpm for 2 hours with about 1.2 feet of drawdown. A chemical analysis of the water (from 1981) is available in our file.

TEKLANIKA RIVER

We have no information in our files about a well in this area.

IGLOO CREEK

The well was drilled by M-W drilling of Anchorage in August 1981. The well is 28.35 feet deep. The well was completed with 6-inch casing to a depth of 20.15 feet and 6-inch telescoping well screen (No. 30 slot) from 20.15 to 25.42 feet. A tailpipe (2.93 feet long) is welded to the bottom of the screen. The well was pumped at 108 gpm for 2 hours with about 4.75 feet of drawdown. A chemical analysis of the water (from 1981) is available in our file.

POLYCHROME REST AREA

We have no information in our files about a well in this area.

TOKLAT

This test well was drilled in June of 1984. It is 85 feet deep with 6 inch I.D. steel well casing down to 72 feet. A 5-inch steel casing riser pipe extends to 73 feet below land surface. No. 60 slot "telescoping" Johnson well screen was placed between 73 and 78 feet and a 5-inch tailpipe from 78-80 feet. The well was pumped at 150 gpm, with maximum drawdown of 1 foot. Recovery to static water levels occurred within less than 5 minutes. A chemical analysis of the water (from 1984) is available in our file.

EIELSON VISITOR CENTER

We have no information in our files about a well in this area.

WONDER LAKE

In the Wonder Lake area, the Birch Creek Schist is covered by only a thin veneer of glacial moraine deposits. Permafrost is present throughout the area except beneath and immediately adjacent to Wonder Lake. Test drilling for future ground water sources is most likely to be successful in shallow stream gravel deposits near perennial streams (Zenone, 1970).

We have information on 4 wells in this area. Two of the wells are at the Ranger Station and two are at the campground.

Campground Well #1

The well was drilled by M-W drilling of Anchorage in August 1981. The well is 40.03 feet deep. The well was completed with 6-inch casing to a depth of 35 feet and 6-inch telescoping well screen from 35 to 40 feet. The well produced in excess of 100 gpm with about 4-5 feet of drawdown. A chemical analysis of the water (from 1981) is available in our file. The well is located north of the campground, near the south shore of Wonder Lake.

Campground Well #2

Test well was reported to be dry. The well was drilled by M-W drilling of Anchorage in August 1981. Total depth was about 200 feet. The well was located at the turnoff from the McKinley Road to the campground.

Ranger Station Well #1

The well was drilled by M-W drilling of Anchorage in August 1981. The well was drilled to 120 feet deep but then abandoned and plugged with native materials.

Ranger Station Well #2

The well was drilled by M-W drilling of Anchorage in August 1981. The well is 26.5 feet deep. The well was completed with 6-inch casing to a depth of 21.2 feet and 6-inch telescoping well screen from 21.2 to 26.5 feet. We do not have information on yield and drawdown from the pump test. A chemical analysis of the water (from 1981) is available in our file.

Additional test wells were drilled near the Ranger Station and research camp in 1984. The first borehole was abandoned after drilling 25 feet and encountering a brown silt layer at 20 feet. The second test hole was drilled near the Research Camp. Total depth of this hole was 160 feet. Two minor seeps were noted at depths of 100 and 119 feet. The third test hole was drilled near the Ranger Station to a depth of 220 feet without encountering any saturated zones.

REFERENCES

Zenone, Chester, 1970, Water-Resources Investigations of Mount McKinley National Park, Alaska, USGS Administrative Report, 21 pp.

Drillers Log for Well F at the Wilderness Access Center

I am able to compile the following log of the well at the Wilderness Access Center from the daily activity logs of M-W Drilling during construction of the well in Sept. 1984

0-26	Brown silty gravel with boulders
26-48	Permafrost – Silty gravel with boulders
48-75	Gray clay – Frozen
75-80	Brown sand
80-100	Brown sandy clay with gravel
100-138	Brown sandy clay
138-150	Brown sandy clay with gravel
150-156	Clean gravel
156-161	Gray gravelly hardpan
161-195	Gray hardpan
195-220	Gray silty sand with gravel (water bearing)
220-235	Gray hardpan
235-250	Gray clay
250-280	Gray hardpan
280-285	Gray silty sand (water bearing)
285-298	Cemented water gravel (7½ gpm)
298-312	Gray silty gravel
312-345	Silver schist bedrock