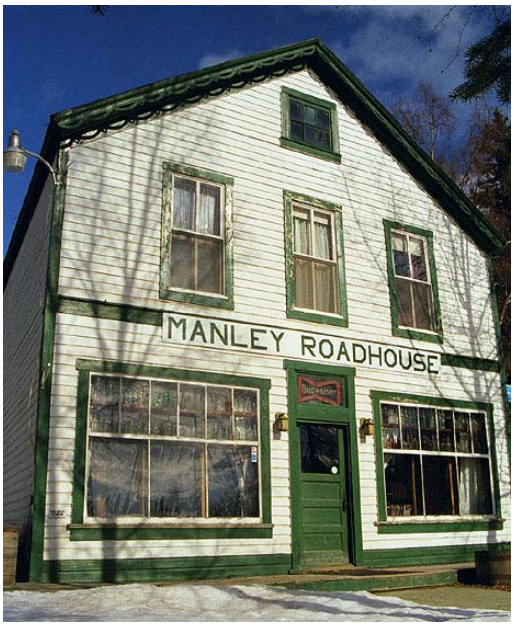
Water Well Data from the Manley Hot Springs Geothermal Area



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November, 2009

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Background

Manley Hot Springs is a community of 73 permanent residents located about 8 km (5 miles) north of the Tanana River on Hot Springs Slough, at the end of the Elliott Highway, 260 km (162 miles) west of Fairbanks. There is a moderate temperature geothermal resource associated with the community, which has been tapped for some beneficial purposes, including primarily space heating of private residences and greenhouses.

TDX Power, the owner of the electric utility at Manley Hot Springs, has received funding under the State of Alaska Renewable Energy Fund to develop a geothermal power plant to provide electric power to the community. As a first step in this project, TDX Power is conducting a resource assessment to select potential drilling targets and develop a preliminary conceptual model of the resource. Geologist Roger Bowers is leading this effort.

The Alaska Center for Energy and Power at the University of Alaska Fairbanks proposes to conduct a reconnaissance of existing wells in the Manley Hot Springs area as part of TDX Power's Manley Geothermal Project. Specifically, the work proposed meets the goals and objectives for Milestone 2 of the revised work plan submitted to the Alaska Energy Authority in May, 2009.

Objective

The purpose of this project was to assist TDX with obtaining data from existing water wells at Manley Hot Springs. There are numerous water wells that have been drilled over the years at Manley Hot Springs, but only four wells are on file in the State records and few data are available. The goal was to use standard geothermal pressure and temperature logging tools to obtain well data from any accessible water wells in the area. If wells were not accessible, a flowing temperature was obtained if possible.

Two secondary project objectives – to conduct some interference tests between wells to help determine the connectivity of different points within the known geothermal field, and conducting drawdown tests to determine recharge rates and estimate production rates of individual wells, were not completed. The wells indentified during this project were not appropriate to complete these secondary objectives that were part of the proposed original work plan.

Equipment and methods

Hot water well temperature and pressure/depth information was measured using a Kuster K10 gauge. Hot water temperatures were taken at 5 meter intervals and at the bottom of the well hole.

Cold water well temperature and depth were measured with a Heron Dipper-T water level and temperature indicator. Temperatures of the cold water wells, when measured were taken at the water surface and at the bottom of hole. Some wells, such as some domestic water wells are recorded as cold or unknown via reports of local residents.

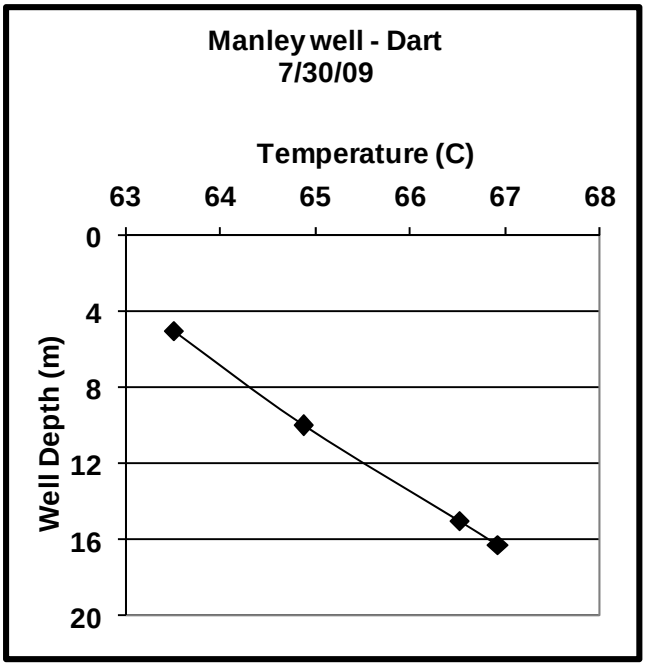
Well position was determined using a Garmin eTrex handheld GPS. Reported GPS positions are WAAS corrected.

Results

From information provided through conversation with the local populace and well drillers that have previously worked in the area, it was deduced that two areas in town had wells with elevated temperatures; these were on Gladys Dart's property and on the Zeitler/Resort Property.

Following are logs of the two wells that were available for access. There was an additional, supposedly higher temperature well about 20 feet from the Zeitler well but due to issues with equipment that was installed on the well it was inaccessible at the time of this field work.

Figure 1. Dart wellhead

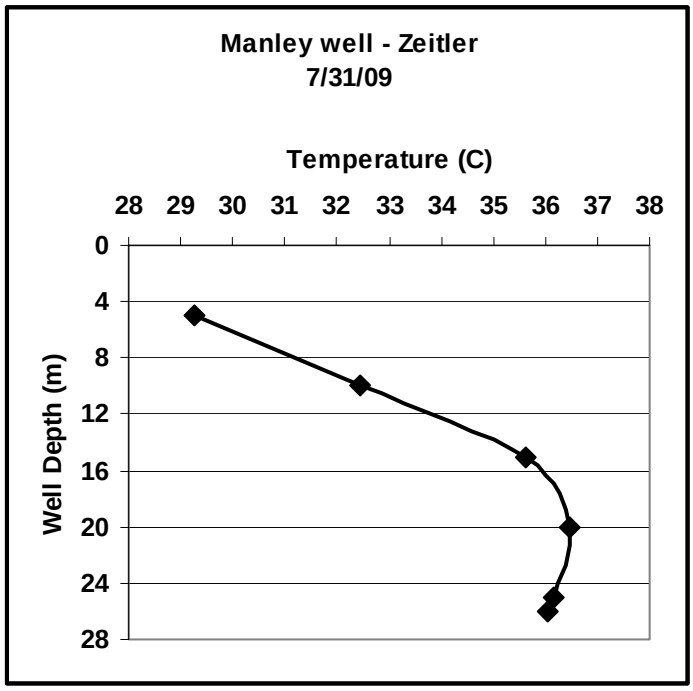


Graph 1. Dart well temperatures

The largest surface expression of the geothermal resource is located on the Dart property. The spring produces a noticeable flow which has been measured in years past. The flow from the spring was measured to be approximately 38 °C. It mixes with a nearby cold water stream and remains unfrozen year round. At the top of these springs, there are two wells drilled adjacent to one another. Logs of both were taken, with slightly higher temperatures in the deeper well (due to higher temperatures below heating the rest of the water column). Chart 1. depicts the log data for the deeper well. As is apparent from this chart, there is not an unusually high geothermal gradient present, however this well is extremely shallow and any predictions made from this data would be highly speculative. Figure 1. shows the pair of collocated well heads. The exact location is above the hot springs hot tubs owned by the Dart family, and above the small farm they maintain above the before mentioned pools. Note: both wells have not been used for production, and both had been static for a very long time. The location of the Dart well is 65°00.324'N latitude 150°38.083 W longitude.

About ½ a mile to the west of the Dart property there is one other area known locally as the “resort property subdivision”. Other hot wells are located in the “resort property” area. A well on the Zeitler property was logged.

Figure 2. Zeitler Well



Graph 2. Zeitler well temperatures

This well was the only one available for access at the time. It is pumped once or twice a day. The log shows a steady gradient until 20 meters, where the gradient reverses. Once again due to extremely limited well data in the area it is very difficult to interpret what this reversal could mean. Another well on property, owned by Tom Hetherington, neighboring the Zeitler’s is reportedly hotter, but the access to the well was not available. This would be a high priority target for future work.

The wellhead temperature of a nearby well, approximately 500 meters north and at an elevation 30 meters higher, was also measured. The temperature was about 6 ºC after flowing it and monitoring temperatures for several minutes. This well is about 30 meters in depth and the property owner is Rick Stout.

Additional cold water wells were visited in September. Well temperatures of the cold wells were in agreement with what might be expected for ground water temperatures minimally influenced by a hot geothermal resource. The results of all of the well positions, water temperatures, and depths are presented in tabular form in Table 1.

The location of a cased well on Bean ridge was visited with the help of Larry Bredeman of the Manley Tribal Council office. This well is less than 2 kilometers west of the Manley bridge and 2 kilometers north of the airstrip at an elevation about 40 meters

above the slough. According to Mr. Bredeman, the well was drilled in the early 1990's by Ice Water Wells of Fairbanks. The well was reportedly drilled and cased to 100 meters and the project stopped before reaching water. The well casing is closed with a welded cap. Further investigation would be necessary to determine the actual depth and ground temperature. The well may be a candidate for further development.

Conclusions

During two field visits to the Manley Hot Springs area, only two wells that were available for access and had elevated temperatures were logged. An attempt to obtain additional data on well locations and drilling logs from the two water well drillers that have been active in the area – Ice Brothers and Arctic Drilling – did not result in any additional useful information as neither could locate the appropriate records. In addition, cold water wells were logged that could theoretically be useful in drawing boundaries of surface geothermal resource expression, especially if combined with other geophysical techniques. Unfortunately, a true geothermal gradient was not obtained in the logging that was completed. With the possible exception of the Bean Ridge Corporation dry well, it is not expected that additional wells would provide significant additional useful data due to shallow depths and influence of ground water.

Cold wells – owner name	Latitude ddd° mm.mmm'	longitude ddd° mm.mmm'	well temp (surface)C	well temp (bottom)C	ground surface to water surface (m)	ground surface to well bottom (m)
Pete Moore	65 00.096	150 38.501	6.7	6.7	7.1	7.2
Washeteria-village council	65 00.398	150 35.450		Reported as cold		not available
Public well on Elliot highway	65 00.493	150 36.582		Reported as cold		30.0
Click Bishop west cabin	64 59.878	150 38.625	2.7	2.4	6.1	10.1
Click Bishop east cabin	64 59.897	150 38.561	3.0	2.6	2.7	10.1
Jack Wright	65 00.059	150 38.455		Reported as warm		
Bean Ridge Native Corp dry well	65 00.035	150 38.795	none	none		100
Rick Stout	65 00.824	150 37.463		6		
hot wells – owner name						
Gladys Dart	65 00.324	150 38.083		67		17
Katie Zeitler	65 00.642	150 37.234		35		27

Table 1. Well data and locations