

Hydrogeologic Assessment of the water-supply well at Kamloops Island Campground Lake Roosevelt National Recreation Area

Kamloops Island Campground is located at the mouth of the Kettle River arm of Lake Roosevelt. It is 7 miles north of Kettle Falls (Figure 1). The campground has 17 sites and is open all year long, but the water system is only available seasonally from June to September. The campground does not have flush toilets. The only source of water is from the hand pump on the well. Water from the well is piped through an iodine treatment system into an underground tank to provide some contact time. Water from the tank is piped back to the discharge spout of the hand pump. It is about 110 feet from the well to the normal full-pool shoreline (Figures 2 and 3).

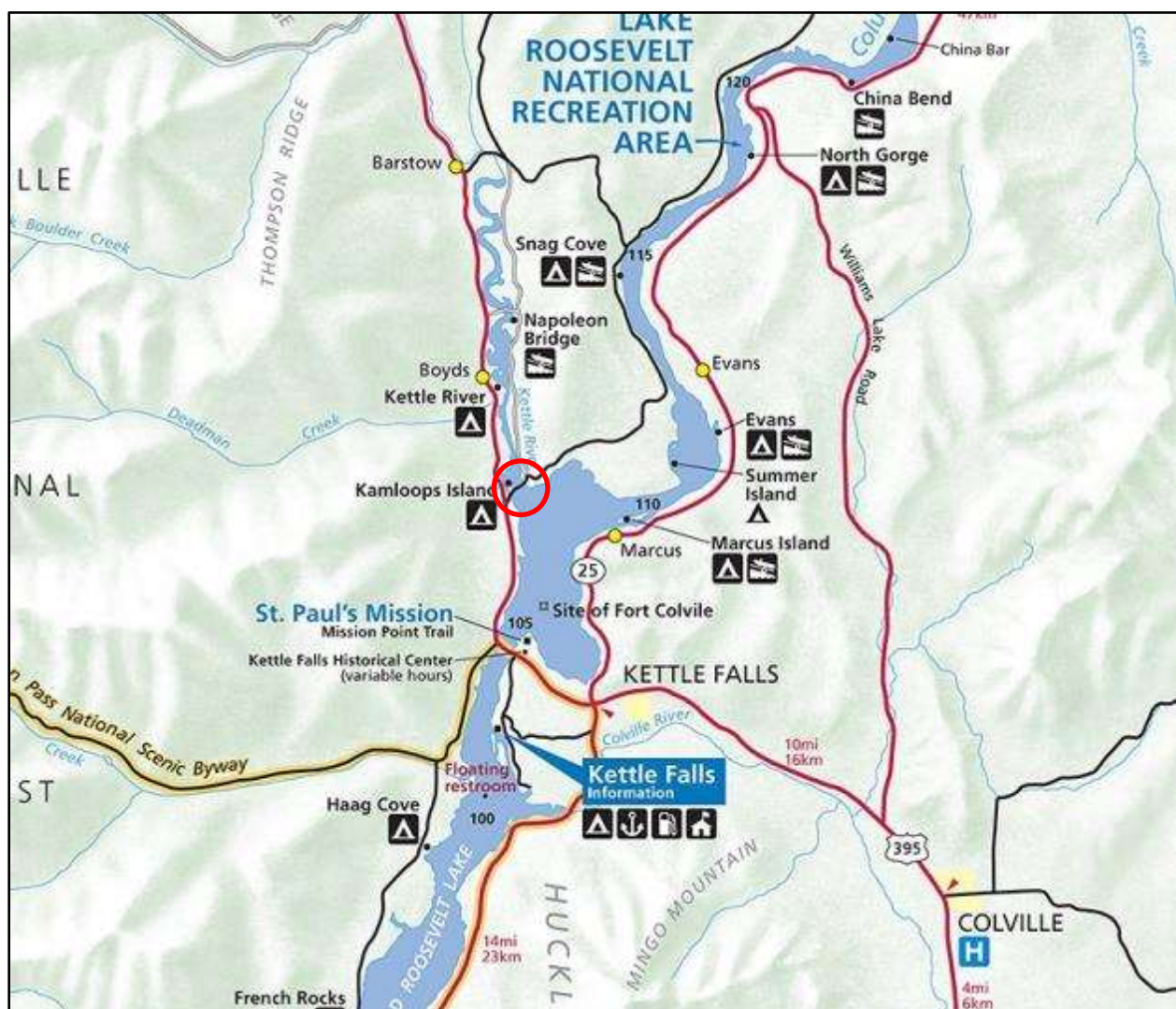


Figure 1. Location of Kamloops Island Campground.

Water is supplied to Kamloops Island campground from a 93-foot well that was constructed by the National Park Service in 1981. The well completion report is in the WA Dept. of Ecology database, but there is no tag # associated with the well. Correspondence from WA DOH shows a tag number of AHC051, but a search of the Dept. of Ecology database does not find a record associated with this tag number.

The drillers log for the well shows:

0-2 feet	Top soil
2-18 feet	Grey clay, moist
18-62 feet	Sand and gravel
62-93 feet	Sand and gravel, water bearing
93 feet	Green granite



Figure 2. Hand pump on well at Kamloops campground. The iodine treatment and contact chamber are in the vault in the foreground of the photo.



Figure 3. Google Earth view of the Kamloops Island area. View is to the south.

The well was completed with 6-inch casing to 88 feet. A Johnson well screen with 0.012" slots was installed by telescoping to place the screen from 88-93 feet. A cement surface seal was placed to 20 feet below ground surface. This well is referred to as the "North" well.

Water use at the campground is estimated to be no more than a couple hundred gallons per day. For example, if usage is 20 gallons per day per campsite, then the total usage would be 340 gallons per day. Pumping from the well is not great enough to induce rapid flow of water from the reservoir to the well. However, park staff have noted in the past that the water level in the well varies with the water level in the reservoir. Thus, it is obvious that groundwater pumped from the well is recharged by lateral infiltration from the reservoir.

Geology

Bedrock is exposed along the west and southwest shore of Kamloops Island. It is overlain by sand and gravel outwash deposits interbedded with glacial-lake clay.

Mills (1985) identified the bedrock outcrop on the southern end of Kamloops Island as quartzite of unknown age. The bedrock of the mainland to the west of the island is mapped as amphibolite of unknown age. Either of these rock types would be relatively impermeable. The sand and gravel outwash deposits comprising the island are the only feasible source of groundwater for the campground.

Geologic units shown on Figure 4

Qt/Qlz - Quaternary till over Quaternary lacustrine clay and/or silt interbedded in sand

Qes/Qog/Qlz - Quaternary eolian sand over Quaternary outwash pebbles (mostly fine to coarse gravels) over Quaternary lacustrine clay and/or silt interbedded in sand

Qog - Quaternary outwash gravels (fine gravel to cobbles)

Qr - Quaternary riprap or artificial fill

Qog/Qlm - Quaternary outwash gravels (fine gravel to cobbles) over Quaternary lacustrine silt

PZu - Paleozoic, undivided

A conceptual model of a geologic cross-section through the island shows the deposit of sediments overlying a bedrock knob (Figure 5). During most of the year, the water level of the reservoir (and the water table of the island) is around 1290 feet MSL. When the water level is drawn down in the spring, it sometimes goes below 1240 feet, resulting in drainage of the sediments comprising the island. When that happens, the well goes “dry”. When the reservoir level is raised, water infiltrates back into the sediments causing the water table to rise.

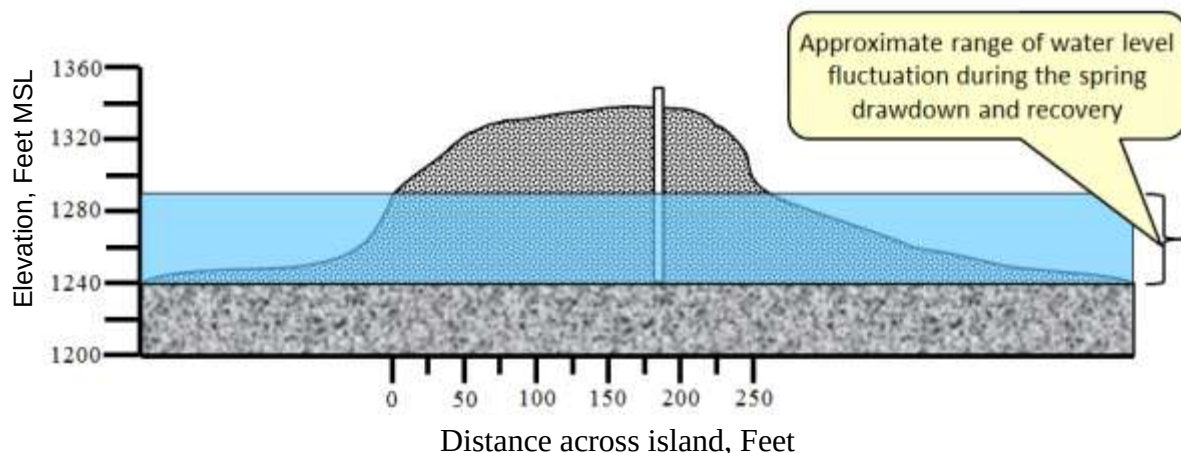


Figure 5. Conceptual hydrogeologic cross-section through Kamloops Island.

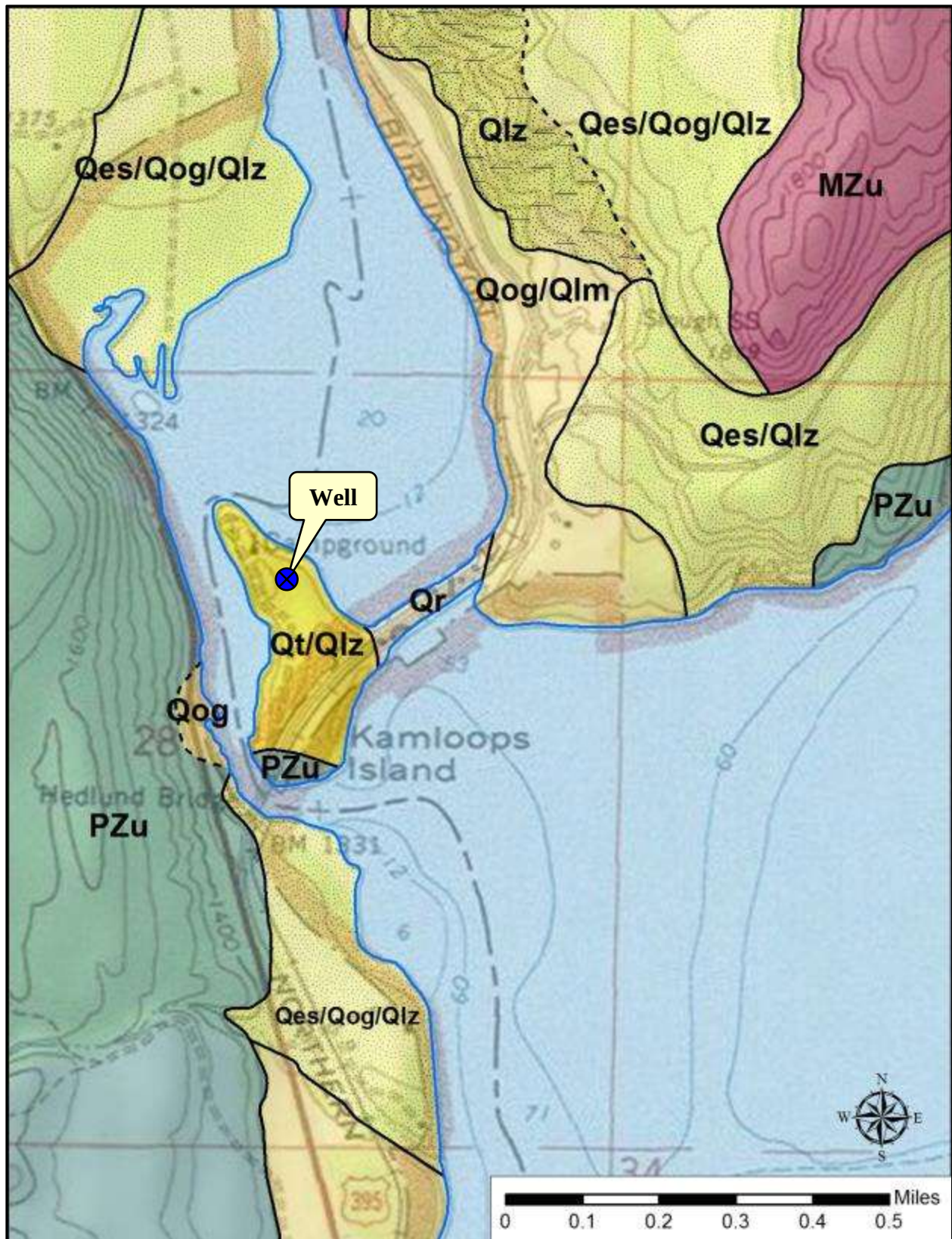


Figure 4. Surficial geology in the vicinity of Kamloops Island campground,
From NPS Geologic Resources Inventory Program. (2009).

Previous Drilling and Well Construction

USGS attempted construction of exploratory holes on the island in 1967 (Anderson, 1969). Both auger holes encountered layers of gravel and sand interlayered with silt and clay, but penetration was stopped by boulders at 7 feet and 12 feet.

A second well was drilled on the island in 1981. (This is in addition to the current water-supply well which was also drilled in 1981.) Copies of the well completion report in NPS files are nearly illegible. There is no record of this well in the Dept. of Ecology database. Notes on the well completion report identify it as Well No. 1 or the South Well. It was drilled to 130 feet, with 6-inch casing installed to 85 feet. The cement surface seal extends to 20 feet below ground surface.

The drillers log for the well shows:

0-38 feet	Sand and gravel
38-76 feet	Medium-hard grey sandy clay
76-85 feet	Sand and gravel bearing little water
85-110 feet	Greenish grey??????????
110-130 feet	Medium soft granite?

Alternative Water Sources for Kamloops Island

There are no reasonable alternative water sources for Kamloops Island. The underlying bedrock is not likely to yield water to a well. The only aquifer on the island is the sand and gravel overlying the bedrock.

Conclusions

Groundwater pumped from the well at Kamloops Island campground is most likely from lateral infiltration of water from the reservoir into the sediments underlying the area. The water level in the well fluctuates in response to reservoir elevation, providing a fairly good indication that the reservoir is the source of water for the well. Therefore, we must assume that the water pumped from the well is hydraulically connected with the adjacent surface water. MPA tests should be conducted to determine the degree of filtration that occurs as the water flows from the reservoir to the well.

References

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