

Granger & Associates, Inc.

224 South Main Street
Cheboygan, Michigan 49721
(231) 627-2763
Fax (231) 627-4409
Email: grangerandassociates@gmail.com

March 8, 2017

Black Lake Preservation Society
P.O. Box 206
Vicksburg, MI 49097

Attn: Beverly Haas

Re: Elevations at Alverno Dam and Black Lake Marina

Beverly and other Members:

We have completed the necessary field work and computations to establish elevations at the Alverno Dam and Black Lake Marina sites. Below is a narrative of our procedures and findings.

Alverno Dam Site:

In researching the NGS information for known benchmarks in the area, it was found that the closest known benchmark was located at the entrance of St. Francis Cemetery at the intersection of Orchard Beach Road and South River Road. This published benchmark is known as QK0050 "Cemetery 1962" which consists of a 5/8" rod. The elevation of this point per the published information is 688.07' NAVD 88 datum.

Once located, we used RTK GPS to take observations on the benchmark and multiple locations at the Dam site, including the water elevation and staff gauge. In addition to existing points used at the Dam site, we placed an iron with cap in the parking area as a future benchmark. Based on these observations, this enabled us to establish the elevation difference from the known benchmark to the features at the Dam.

In addition to the RTK observation for the set iron with cap, we also took a static GPS observation for 3 hours. This information was then post processed using OPUS on the NGS website. The elevation for this control point was 616.33'

On January 21, 2017, a static GPS observation for over 3 hours was taken on the existing benchmark QK0050. On January 31, 2017, a second static GPS observation for over 9 hours was taken on the same benchmark. Due to the overhead coverage, we also placed an iron with cap in a nearby field and took a static GPS observation for over 7 hours. We then ran differential leveling from this nearby iron to the existing benchmark QK0050 as another

verification of the elevation. These observations were also post processed using OPUS on the NGS website. The averaged elevation was 687.55'.

Results for Alverno Dam site are as follows:

Measured water elevation: 609.3'
Visual reading of staff gauge: 609.7'

Black River Marina Site:

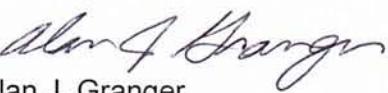
In researching the NGS information for known benchmarks in the area, there were none found. Therefore, an iron with cap was set in the open area of the Marina. Two static GPS observations were taken for this point. This first was on January 19, 2017 for approximately 2½ hours and the second was on January 31, 2017, for over 9 hours. Both observations were post processed using OPUS on the NGS website. After establishing this elevation, a couple of benchmarks were placed for future use.

Elevations were also established on the water elevation on January 19, 2017 in relation to the meter reading. The results were as follows:

Measured water elevation: 610.5'
Visual reading of meter: 610.8'

If you have any questions concerning any of the above information, please feel free to contact me.

Sincerely,


Alan J. Granger