

**REPORT OF THE
NATURAL MEAN HIGH WATER ELEVATION
OF SPOFFORD LAKE
CHESTERFIELD, NEW HAMPSHIRE**

**Prepared for the
New Hampshire Department
of Transportation
Reference Project #13597**

**July 1, 2013
Revised 7/09/2013**

Prepared by:
Timothy F. Bernier, LLS, CWS
T. F. Bernier, Inc.
39 Warren Street
Concord, NH 03301

Background

The New Hampshire Department of Transportation proposes improvements to New Hampshire Route 63 (Project #13597). These improvements will impact the surface water currently known as Spofford Lake. Spofford Lake is listed on the Official List of Public Waters prepared and maintained by the New Hampshire Department of Environmental Services (NHDES) as a public water raised by damming. Given the lakes current size of somewhere around 700 acres and the relatively small dam there appears to be no doubt the lake meets the common law definition of a great pond. The lake is considered by most to be a spring fed cold water inland lake, a position supported by its relatively small watershed and lack of any significant tributary.

As a public water, the natural lake is owned in fee by the state of New Hampshire. The boundary of the state ownership follows the contour matching the natural mean high water (NMHW) elevation of the natural lake. Because this lake is impounded the area from the NMHW to the current lake edge is under the jurisdiction of the NHDES Wetlands Bureau as prescribed in the revised statues annotated (RSA) Chapter 483-B. These two boundaries vest regulatory authority in two separate bodies of state government. The improvements to Route 63 will impact the surface water of Spofford Lake necessitating the need to determine this jurisdictional boundary and the limits of impact to each jurisdiction.

The NMHW boundary was defined in RSA 483-B:4 XI-a which has since been repealed. The NMHW can be characterized by physical evidence such as staining or other naturally occurring lines which result from prolonged inundation. Shelving, or abrupt changes in grade, naturally occurring changes in vegetation such as predominately aquatic to predominantly upland species, presence of litter and debris carried by the water to a point where it is caught in a line along the shore are also indicators. The NMHW may also be found in record information such as past studies or reports which provide a longer record of water elevations.

When looking for the NMHW in lakes raised by damming many of these options are no longer available. The surveyor tasked with defining this contour, now submerged, is left with ancient or relic physical evidence and record information only. Depending on the age of the impoundment even this information can be difficult to find.

Scope of the Investigation

The study began by gathering an understanding of the lake and its history. It was important to understand when the lake was first impounded. We began in the obvious place first, the internet. A simple Google search produced historic maps of the lake and even a scanned copy of the town history by Oran E. Randall. Local organizations were contacted and interviewed including the Chesterfield Historical Society and Spofford Lake Association.

The physical evidence investigations focused on the dam itself which proved to be of little value in the end but seemed too obvious to ignore. We quickly determined that hydrological analysis of the watershed would be of little value as the lake is most certainly spring fed. The dam investigation included an extensive field survey of the structure itself and the surrounding lake bottom. We also researched title records at the Cheshire Country Registry of Deeds focusing on

the land around the dam. Although much of this work produced little concrete facts, the historic maps and field notes from Samuel Wadsworth, a prolific surveyor and cartographer, were extremely helpful in piecing together the history of the Lake and its factory to recreation history.

Additional investigation grew from the historical research and included a visual inspection of the shore around the lake which was conducted by boat, a survey of manmade shore armoring particularly the older stone retaining walls, and a search for submerged evidence such as preserved stumps and shelving. This investigation was first undertaken with chest waders and survey grade global positioning equipment. Rocks shown on historical maps as exposed were also located at this time. When chest waders become ineffective further investigation was completed using snorkel and scuba equipment.

During the compiling of information collected it was deemed necessary to research legislative acts at the State Library to confirm dates and affirm or discount some parole evidence. This also led to additional research at the New Hampshire Historical Society which provided additional Town and County Histories. A phone interview with David Mann, LLS a local surveyor originally from Chesterfield now of Keene, was also undertaken.

Findings

1. Spofford Lake was originally called Spafford Lake.
2. Spofford Lake outlets through a dredged cove commonly referred to as “The Outlet”. The Outlet ends at the current dam site which also supports the road known as Canal Street. Below the dam the natural brook is known as Partridge Brook. There also exists the remains of a manmade canal.
3. From 1810 through 1840 a factory village formed along Partridge Brook just downstream from Spofford Lake. The brook was dammed at several locations through the village providing water power to several factories.
4. In 1805 the legislature incorporated the Chesterfield Manufactory, a company manufacturing cotton yarn as well as other related items. Per Oran Randall’s History of Chesterfield this factory was constructed in 1810 and sold to Barton Skinner in “about 1853”.
5. In 1823 the state legislature incorporated the Lake Manufacturing Company and included the right to erect dams and canals in Chesterfield. The only later mention of the Lake Manufacturing Company was in the 1894 court action which referenced this incorporation.
6. The 1858 cadastral map shows the B. Skinner Cotton Mill located at the end of the canal. This map is the only map found prior to 1900 which accurately depicts the location of the canal and Partridge Brook. Based on field inspections it is not likely the two channels merged into a single pond as shown on several later maps of the region.
7. The 1858 map also depicts the correct locations of what are now Canal Street and the Gate House.
8. Recreational activities expanded significantly on the lake from 1880 through 1930. Several hotels and camps were constructed around the lake during this time.
9. As a result of the dam The Outlet (that area between the lake and the dam) would fill with sediment and was dredged regularly from 1851 through 1966.

10. During the late 1800's the factory owners wished to lower the canal to allow more water to be drained from the lake for power. A legal dispute arose between the land owners on the lake and the factory owners resulting in a Supreme Court Decision in 1894 (see James H. Stearns vs. George Hamilton and Fred B. Peirce). The Supreme Court ruled that the "natural line of low water of the lake, to wit a line five inches above the ledge under the center of the defendants gate at the dam".
11. Based on photographs and surveys around the turn of the century the width of The Outlet at the point the lake drains into it was no more than twenty feet and possibly as little as ten feet wide.
12. The dam was reconstructed in 1919 and it appears to have become the property and responsibility of the Town of Chesterfield at that time. Reference was made in 1919 that sufficient water was maintained in the canal for the factories of the time.
13. The factories ceased using water power sometime between 1920 and 1939.
14. From 1939 through 1956 continued dispute over the elevation of the lake was carried on between the lake residents, the business owners, and the Town of Chesterfield. This dispute was carried out through correspondence between the owners of the Spofford Yacht Club, the State Water Resources Board, and the Selectman of the Town of Chesterfield. The dispute rose to the point of letters to the Governor from the Yacht Club and the mailing by the Selectman to the Water Resources Board of a notice of delinquent property taxes issued against the Yacht Club.
15. In 1954 the town raised the sum of \$1,000 to make repairs to the dam.
16. In 1955 Francis C. Moore, Civil Engineer (possibly of the Water Resources Board), prepared plans and specifications for improvements to the dam. It is also noted at this time that the sluice gate is badly deteriorated and not functioning.
17. At some point after the fall of 1955 some repairs were carried out to the dam in accordance with the plans and specifications prepared by Francis C. Moore. The function of the sluice gate was replaced with a stoplog weir. Neither the gate house nor the deteriorated sluice gate was removed at this time. The first corrugated metal pipe was inserted into the box culvert at this time.
18. In 1965 or 1966 The Outlet was dredged and significantly widened. The current width of The Outlet at the lake is 96 feet wide.
19. During the winter of 1977, 78 complaints were made to the Chesterfield Selectman and the Water Resources Commission that the water elevation was being maintained too high and causing ice damage to docks and homes.
20. In November of 1978 a report was issued by the Department of the Army New England Division, Corps of Engineers on the condition of the dam at Spofford Lake.
21. In a 1979 letter from the National Dam Inspection Program a list of recommended repairs to the dam was provided.
22. In 1987 the Town of Chesterfield installed a new 30" corrugated metal pipe into the existing outlet and replaced the outlet side slope of the dam. The gate house was left in place, however what was left of the sluice gate appears to have been removed.
23. Following several letters of deficiency from the New Hampshire Dam Bureau, SVE Associates of Brattleboro Vermont was hired in 1998 to prepare plans and specifications for a full replacement of the spillway and culvert under the dam.
24. The reconstruction of the spillway was completed in 1999. Per a telephone conversation with the Chesterfield Highway Department no blasting was done in the construction of

- the dam. Jack hammers were used to remove small amounts of ledge and the inlet was poured concrete formed around ledge. The gate house was removed at this time.
25. An extensive survey of the existing dam was completed by this office and we found the bottom of the structure directly below the location of the old gate house to be at elevation 711.2' (NAVD88). Assuming this is close to natural ledge that would put the "Natural Low Water" elevation of the lake at 711.6' (NAVD88), see 1894 Supreme Court Decision.
 26. A visual inspection of the shore line conducted in May 2013 showed a large number of stone, stone and mortar, and concrete retaining walls along the shore with some found to be over 100 years old. These walls are typically installed to protect otherwise unprotected land from the erosive action of the lake. It was also observed that the shoreline had no naturally occurring shore. In nearly all undeveloped locations around the lake the water level was at the tree line. In a lake the size of Spoffard Lake normal ice and wave action should produce a natural rock shore or span of beach to buffer the upland vegetation from forces associated with the surface water.
 27. Existing submerged shelves were observed in several areas around the lake shore but were found to be most dominant along the northeast shore of the lake and Pierce Island. Along the break in portions of these shelves rows of rocks were observed appearing very much like a natural rocky shoreline. The top edge of these submerged shorelines averaged an elevation of 712.8' (NAVD88). With low elevations at 712.5' and high elevations at 713.1'. The rows of stones extended down the submerged bank anywhere from 2' to 4'+ and were 3' to 10' wide.
 28. Despite extensive searching by boat, chest waders, snorkeling and scuba diving no evidence of stumps were found between the current shore and elevation 700.
 29. We completed a cross section of The Outlet where it begins at the lake a low elevation of 711.5' (NAVD88) was observed in May of 2013. However this location was altered in 1999 when the spillway was replaced. This location was used as a coffer dam location in 1999 while the spillway was reconstructed. A cross section of the same area completed by SVE Associates in 1998 had a bottom elevation of 713.4' (NAVD88).
 30. Based on parole evidence from long standing residents, photographic evidence, and historical surveys of the lake it is clear the lake is higher today than it was from 1905 through the 1950's. Some have suggested the lake is a foot higher today than prior to the 1999 spillway construction.

Conclusion

Spoffard Lake has been raised by damming for 200 years. Water elevation from that time until the late 1950's fluctuated far more than similar natural lakes. The demand for lake water for use as a power source became so significant it resulted in a Supreme Court action in 1894. Even after water ceased to be used as a power source complaints about low water in the lake continued as the town used the lake to flush sewage from Partridge Brook.

Given this long history of fluctuating water elevations finding overwhelming evidence as to the location of the NMHW line was not to be. We are left with bits and pieces of evidence which we must piece together and apply the preponderance of that evidence to make our determination.

Based on physical observations of shore reinforcement and the lack of a naturally occurring shoreline, it is clear the water elevation is well above a NMHW level. The lake was first impounded in 1810 or shortly thereafter. The original impoundment was located in the same location as the current dam, was constructed on ledge, and only minimal amounts of ledge were removed to construct the current dam. Pursuant to the 1894 Supreme Court case (Stearns vs. Hamilton) and surveys by this office, the mean low water elevation is about 711.6' (NAVD88). Observed physical evidence of a shelf and ancient shore are at about 712.8' (NAVD88).

A conservative assessment of all of the physical and record evidence sets the Natural Mean High Water elevation at 712.5 feet of elevation in the North American Vertical Datum of 1988.

NHDOT Project #13597

The New Hampshire Department of Transportation project utilizes the older National Geodetic Vertical Datum of 1929 with a geoid model correction from 1988. This office utilized a field survey to tie the elevations at the dam site to existing survey control on Route 63. This report utilizes the current and modern datum of 1988 in an effort to provide the most valuable information for current and future surveyors. The correction from NAVD88 to the NHDOT project is +0.57' resulting in a Project elevation of 713'± for the Natural Mean High Water.

In addition utilizing CorpCon6 software the correction from NAVD88 to NGVD29 at the dam site is +0.42'. Based on a local Benchmark established by SVE Associates in 1998 the correction from NAVD88 to the 1998 SVE survey is +0.65'.



Photo 1



Photo 2



Photo 3

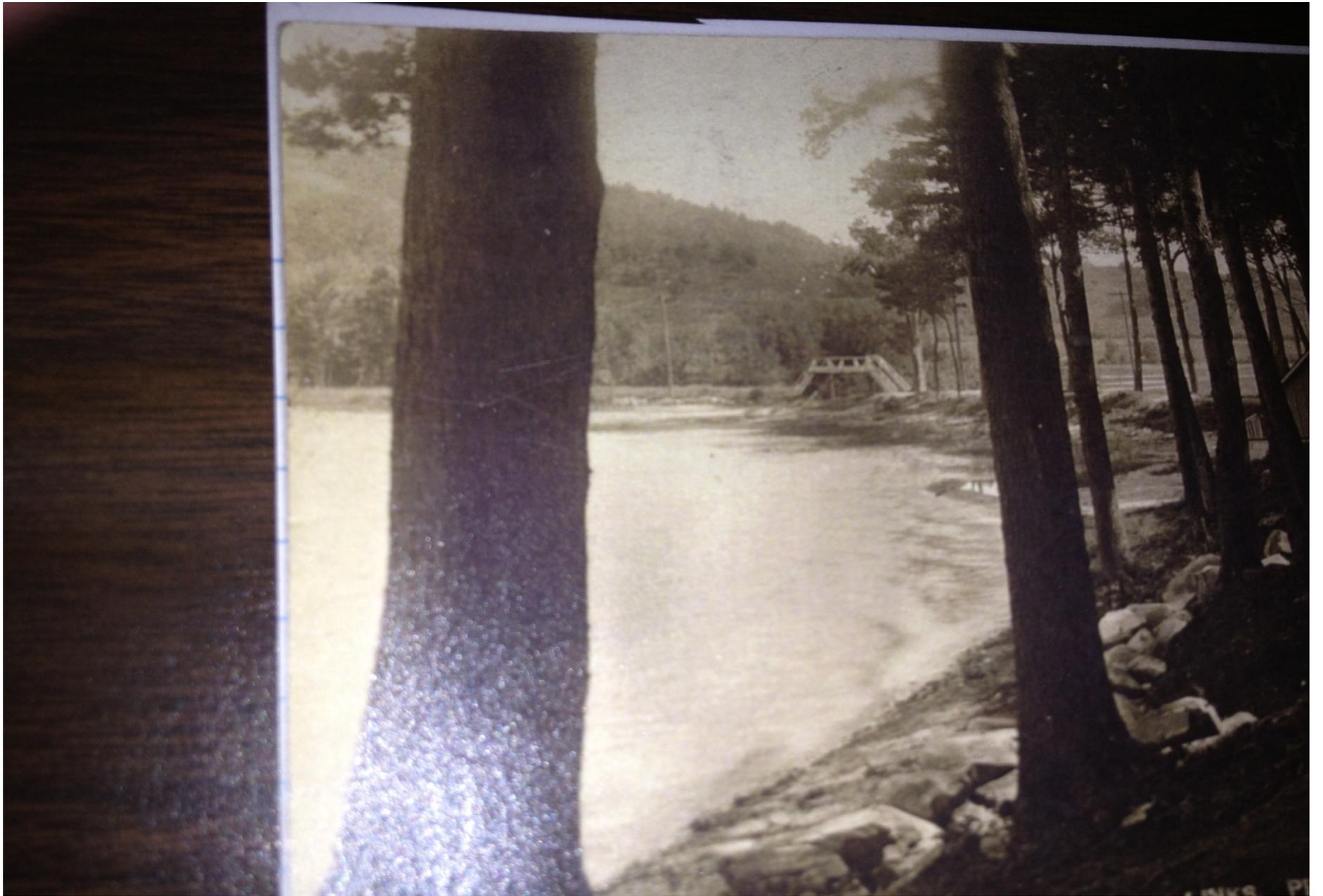


Photo 4



Photo 5



Photo 6



Photo 7

Reference Material

NH State Library

- Spofford Lake Chesterfield New Hampshire, [report] Concerning the Spofford Lake Problem Pond Study 1957, George R. Morrison, New Hampshire Fish & Game
- Laws of New Hampshire Second Constitutional Period, Vol. 7 Pg 446, Vol.9 Pg 248 Vol. ## Page 194

NH Historical Society

- History of Chesterfield by Oran E. Randall, 1882
- Gazetteer of Cheshire County N.H., Child
- History of Cheshire and Sullivan Counties New Hampshire Edited by D. Hamilton Hurd

Spofford Lake Association

- Contact Person: Pamela Walton
- Spofford Lake, A Retrospective of Her Cottages, Camps & Resorts by Martha Dodds Potter, Copyright 2008 ISBN-13 :978-1-934582-08-04 ISBN-10: 1-934582-08-5
- Elevation Data 2006-2012
- Four photographs of Spofford Lake, late 1800's to early 1900's.

Chesterfield Historical Society

- Contact Person: Cornelia Jenness
- Several unrecorded plans of Spofford Lake by Samuel Wadsworth and others
- 1858 cadastral maps of Cheshire County, (Chesterfield Factory) copy attached
- Several photographs from the late 1800's and early 1900's
- October 1894 Supreme Court case James H. Stearns and eleven others vs. George L. Hamilton and Fred B. Peirce

SVE Associates

- Existing conditions and design plans for Spofford Lake Dam dated 6/15/99
- Field notes from surveys for dam reconstruction (1998)

NHDES Dam Bureau Records (Dam 45.08)

- As-built plan Spofford Lake Dam prepared by SVE Associates, dated 12/15/99
- Description of the 1987 dam reconstruction
- Description of the 1955 proposed dam improvements
- Description of the 1919 dam reconstruction
- Several letters and miscellaneous correspondence concerning the lake level
- Phase 1 Inspection Report, National Dam Inspection Program, Department of the Army New England Division, Corps of Engineers [dated] November 1978
- Photo's of the dam, 1937 and later

Index of Photographs

First Photo..... Diving for submerged evidence south end Pierce Island

Second Photo 100 year old stone and mortar retaining wall

Third Photo Point where the lake drains into The Outlet 2013

Fourth Photo..... A foot bridge over the same point as third photo 1900±

Fifth Photo Outlet of the spillway at the dam 2013

Sixth Photo..... Spillway 2013

Seventh Photo Spillway and outlet 1937

Eighth Photo..... 1858 Map of Chesterfield Factory