RESEARCH PROJECT TECHNICAL COMPLETION REPORT

Institution: The University of Connecticut           Date of Report: June 15, 1976

OWRT Project No. A-066-Conn               OWRT Agreement No. 14-31-0001-6007

Project Title: Sedimentation Rates and Sediment Thickness in Lake Champlain

Principal Investigator       Degree       Discipline
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Project Began: July 1, 1975    Project Ended: June 30, 1976

PROJECT OBJECTIVES:

1. To determine the total thickness of unconsolidated sediments beneath Lake Champlain.
2. To determine the shape of the bedrock surface.
3. To determine the rate at which sediments have accumulated in Lake Champlain.
4. To provide baseline data to agencies charged with shoreline planning and development.

ACHIEVEMENT OF OBJECTIVES:

Approximately 150 miles of continuous seismic reflection profile data were acquired (Figure 1). These data were used to construct a structure map of the bedrock surface (Figure 2). A map of total thickness of unconsolidated sediments was also constructed (Figure 3). Estimates of sedimentation rates were made but have to be considered uncertain until more sediment samples can be obtained.

This information is now available to workers studying shoreline erosion and consequences of proposed lake level changes.
In addition, the maps constructed can be used by the city of Burlington, Vermont in siting effluent pipelines for proposed treatment facilities.

Although not stated as one of the specific objectives of the program, further development of geological and geophysical techniques applied to lakes was a major achievement. These tools should now be put to use in compiling a data base for Connecticut lakes.

One undergraduate student from the University of Connecticut and several from the University of Vermont participated in the field work. The Connecticut student assisted in the data reduction and interpretation of portions of the data throughout the fall of 1975. One Master's candidate at Vermont used portions of the data as part of a thesis project.

RESEARCH PROCEDURES USED:

All measurements were made aboard the University of Vermont Research/Vessel MELOSIRA. Seismic reflection profiling was carried out using an air gun source. The gun volume was 1 cu. in. Operating pressure was 500 p.s.i. Compressed air was supplied by charged gas cylinders. Six bottles were sufficient for 6 hours of continuous operation. The bottles were recharged to 2400 p.s.i. when the boat returned to port each evening. A trailer-mounted compressor supplied the compressed air. Reflections were detected by a 30 foot array of pressure sensitive detectors towed beside the boat from an outrigger which extended 15' outboard. Reflections were amplified, filtered and displayed
on an OSR-19T facsimile recorder (Figure 4). All navigation was
done by means of horizontal sextant angles, two angles being
measured simultaneously. Reflection times from lake surface to
bedrock were measured from the seismograms, converted to depths
and plotted on charts at points corresponding to interpolated
positions between navigational fixes. These plotted values were
then contoured. Water depth was subtracted from bedrock depth
to obtain the sediment thickness. These values were also plotted
and contoured.

RESULTS OR CONCLUSIONS:

This investigation found that:

1. The bedrock depth contours roughly parallel the water
depth contours.

2. Depth to bedrock exceeds 1000 feet below lake level in
some places.

3. There are some offsets in the bedrock depth contours
indicating the possible existence of faults in the
bedrock.

4. The unconsolidated sediment overlying the bedrock is
thickest (≈600 feet) where the bedrock is deepest.

5. Maximum thickness of sediments can be related to the
15,000 year period of the Late Wisconsin of the Pleisto-
cene and a sedimentation rate of 0.5 inches per year.
But, since at least two periods of erosion occurred
during this interval, this rate must be considered a
minimum.
ACKNOWLEDGEMENT:

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PUBLICATIONS:

None to date.

ABSTRACT

A seismic reflection survey was conducted in Lake Champlain. An air gun was used as the energy source.

From the data obtained a map of the depth to the bedrock surface below lake level was constructed. A map of the unconsolidated sediment thickness was also constructed.

KEY WORDS:

Lake Champlain
seismic reflection
air gun
depth to bedrock
unconsolidated sediment thickness
Figure #1
Seismic Reflection Profile Trackline
Figure #2
Depth to Bedrock Below Lake Level
Figure #3
Unconsolidated Sediment Thickness
Figure #4

Seismic Reflection Profile
LAKE CHAMPLAIN  
7/15/75  

SCALE = 1/2 SEC.  

ONE CUBIC INCH AIR GUN  
at 500 psi, at 1 1/2 sec. rep. rate  

filter = 300-600 Hz  
source to receiver = 60'  

trigger delay = .008 sec.