Commonwealth of Massachusetts
Department of Public Works
W. F. Callahan, Commissioner

U. S. Department of the Interior
Geological Survey
W. E. Wrather, Director

Cooperative Geologic Project

SUPPLEMENTARY REPORT

Geologic Interpretation of Seismic Data

Relocation of Route 2, Shelburne Falls

in Shelburne, Mass.

by

James E. Maynard, Geologist, U. S. Geological Survey

and

Rev. Daniel Linehan, S. J., Seismologist, Weston College

4 pages of text
2 plates

Boston, Mass.
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Seismic Series #_____

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General Statement

In June 1945 a seismic study was made for the projected Halligan Avenue cut, stations 364-374, Route 2 relocation in Shelburne, Mass. Nine profiles were run at this time and a report on this work was submitted by James E. Maynard and Rev. Daniel Linehan (file report of July 1945). As a result of a consultation with the State Engineers in August 1948, the proposed center-line of the road was relocated so as to be in a more favorable position. This new location is shown as alternate center-line number 2 on the plan of the seismic traverses. A cut approximately 1600 feet long is planned between stations 364 and 380. The approximate maximum depths of the cut are:

17	feet	at	station	365
24	"	"	"	368+50
23	"	"	"	371+50
12	"	"	"	372+50
8	"	"	"	375+00

Between stations 375+80 and 379+50 the depth of the cut gradually decreases from 8 feet to 0 feet. In order to obtain additional information on subsurface conditions at this site, especially along the segment of the relocated center-line where cuts are to be the deepest, a supplementary program of seismic studies was undertaken.

The work was done in October 1948 as a part of a cooperative program of the Massachusetts Department of Public Works and the United States Geological Survey.

Seismic Traverses

The locations of the traverses, together with those made during the earlier study, are shown on the plan, sheet 1. The shot points of the traverses made in June 1945 are indicated by asterisks.

In 1948 seven additional traverses were made as follows: four consecutive traverses, Y-V, 220 feet long; V-S, 200 feet long; S-T, 220 feet long; and T-U, 165 feet long, were made as close to the center line as possible. Shot point Y was located 59 feet to the right (east) of station 372+85; V 12 feet to the right (east) of station 370+70; S 8 feet to the right (east) of station 368+90; T 34 feet to the left (west) of station 366+55; and U 40 feet to the left (west) of station 364+90.

Two consecutive traverses Z-AA and AA-BB, each 110 feet long, were run to the right (east) of the new center line in the vicinity of one of the deeper segments of the proposed cut. Shot point Z was located 93 feet to the right (east) of station 370+22; AA 84 feet to the right (east) of station 369+22; and shot point BB 38 feet to the right (east) of station 368+21.

Cross traverse W-X, 155 feet long, was located with shot point W 112 feet to the right (east) of station 366+32 and shot point X 43 feet to the left (west) of station 366+04.

Depths to Bedrock

Because of anomalous and inadequate velocity data, it was not thought advisable to attempt to calculate depths to bedrock at the shot points. The following figures represent only the minimum thicknesses of the surficial materials at these points:

S,	22	feet
T,	33	"
U,	30	"
V,	33	"
Y,	40	"
X,	46	"
W,	46	"
Z,	35	"
AA,	26	"
BB,	26	"

Geologic Interpretation of Seismic Data

The interpretative geologic sections as constructed from the surface geology and the new seismic data are shown on sheet 2. For the most part, the highway location appears to be within an area of gravel and sand that composes a terrace deposit on an irregular bedrock surface. As indicated in the sections, however, the higher and steeper parts of the location may be underlain by bouldery till. Generalized minimum thicknesses of the surficial materials are suggested by dotted lines in all the sections. The velocity data were insufficient or too erratic to permit an interpretation of the position and shape of the bedrock surface between the shot points, but it is probable that the surface is quite irregular. For many of the traverses several of the detectors toward the end of the profile away from the shot point either failed to register or produced velocity points that were anomalous and impossible to interpret with accuracy. This condition was brought about by a combination of poor energy transmission and the necessity for lowering the sensitivity of the seismograph because of a nearby high-

voltage power line.

The subsurface information yielded by this study, however, integrated with that obtained from the previous investigation strongly suggests that no bedrock will be found within the limits of most of the proposed cut; some knobs, ridges, or pinnacles may occur in the bottom of the cut between stations 368+00 and 369+50.

Many large angular blocks and boulders of rock will probably be found in the cut, especially between stations 364+50 and 367+00.

Further seismic work is not recommended for this with the present equipment until some means can be found to eliminate the adverse effects of the high voltage transmission line.

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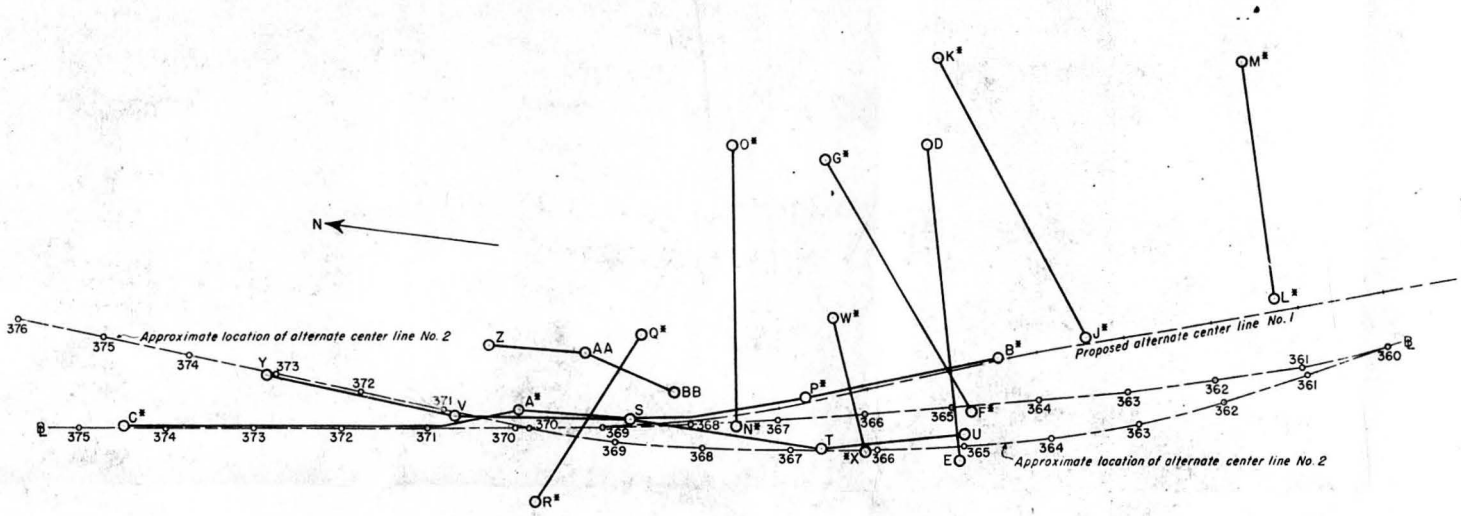

PLAN OF TRAVERSES
SCALE: 1 INCH = 100 FEET
Letters refer to shot points at ends of traverses Numbers refer to D.P.W. stations on centerlines and baselines. * Traverses made June, 1945

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES		
SHELBURNE	ROUTE NO. 2	
SHELBURNE FALLS BY-PASS - STAS. 364-374		
SCALE 1 INCH = FEET	GEOLOGY BY: JAMES E. MAYNARD	
↓ Shot point V- Apparent seismic velocity (ies) in feet per second.	SEISMIC DATA BY: DANIEL LINEHAN, S.J.	
	ENGINEERING BY: THOMAS COLEMAN	
	DATE: OCT. 1948	SHEET 1 OF 2

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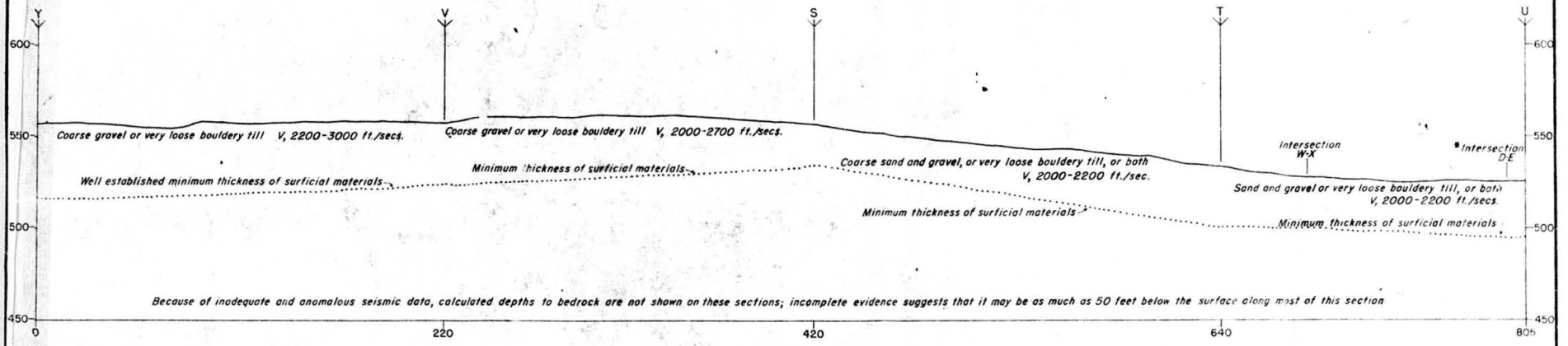

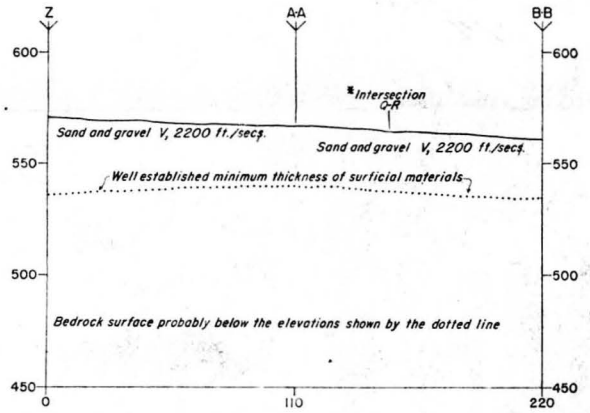

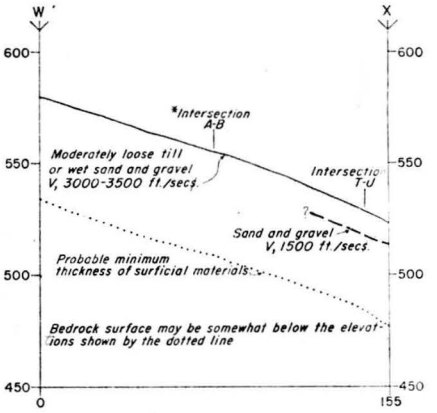

NOTE:
The seismic data shows that the surficial materials extend at least to depths represented by the dotted lines.

* Lines A-B, D-E, and O-R not shown here were seismic traverses run in 1945.

PLAN OF TRAVERSES

SCALE: 1 INCH = FEET

Letters refer to shot points at ends of traverses

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES

SHELBURNE | ROUTE NO. 2

SHELBURNE FALLS BY-PASS - STAS. 364-374

SCALE 1 INCH = 40 FEET

GEOLOGY BY: JAMES E. MAYNARD

↓ Shot point

V- Apparent seismic velocity (ies) in feet per second

SEISMIC DATA BY: DANIEL LINEHAN, S.J.

ENGINEERING BY: THOMAS COLEMAN

DATE: OCT. 1948

SHEET 2 OF 2