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Commonwealth of Massachusetts  
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H. F. Callahan, Commissioner

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

James E. Maynard  
Stations 150-155  
p. 49

Cooperative Geologic Project

Geologic Interpretation of Seismic Data  
Relocation Route 1  
Stations 150-155  
in Danvers, Mass.

by

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

and

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

2 pages of text  
2 plates



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COOPERATIVE GEOLOGIC PROGRAM

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Seismic Series # \_\_\_\_\_

# Geologic Interpretation of Seismic Data

## Relocation Route 1

Stations 150-155

in Danvers, Mass.

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### General Statement

At this site the reconstruction of Route 1 requires a deep excavation through a high, east-west elongated hill. In order to obtain subsurface information that would be of aid in selecting the most suitable location for this deep cut through the hill, geologic and seismic studies were made in October 1949. The work was done as part of a cooperative program of the Massachusetts Department of Public Works and the United States Geological Survey.

### Surface Geology

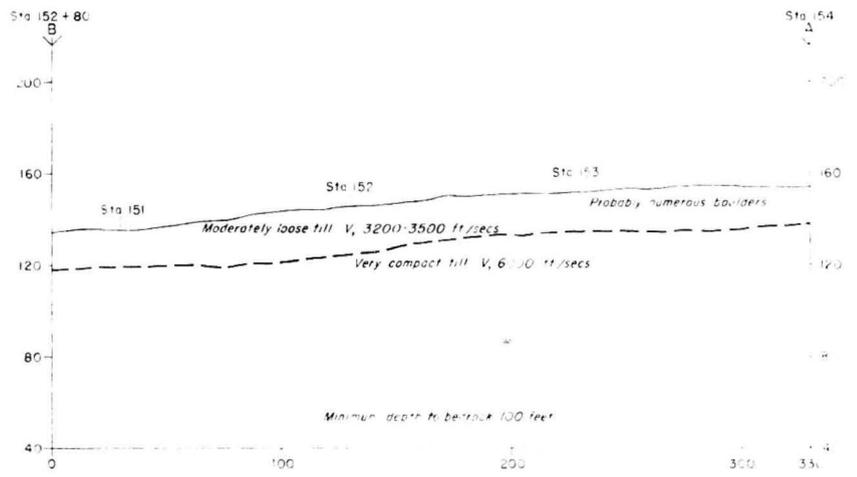
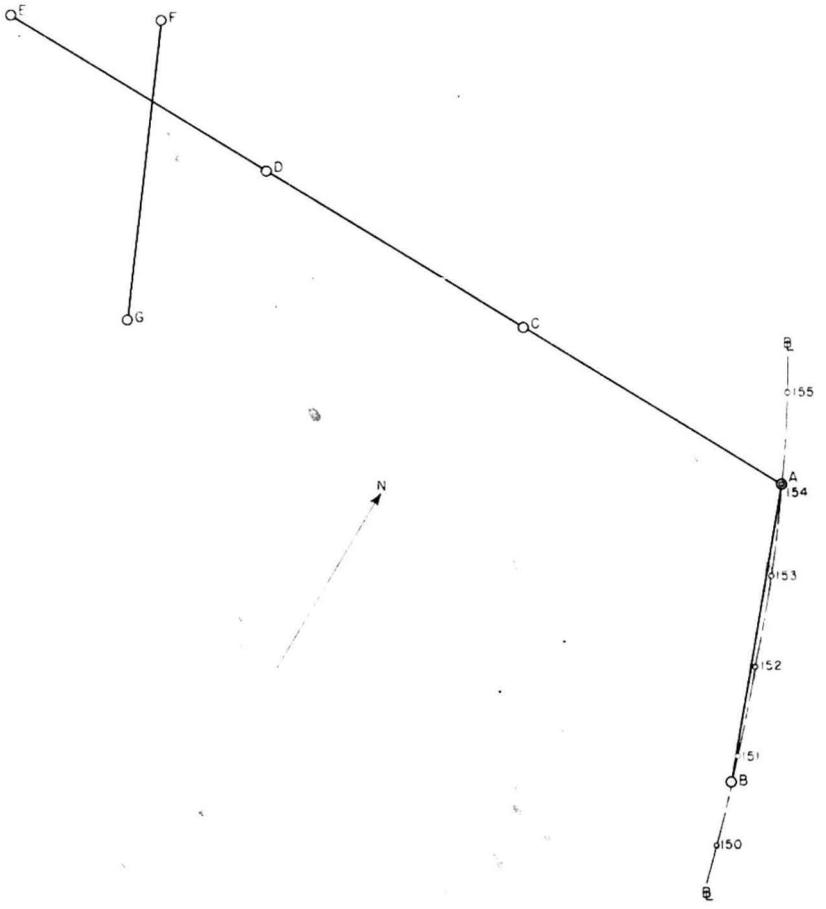
The surface geology of the site suggests that the elongated hill through which the excavation is to be made is a drumlin composed chiefly of compact till with a relatively high clay content and occasional large boulders that are predominantly melanite (dark-colored rock similar in texture to granite) in composition. A narrow gravel kame terrace flanks the north side of the drumlin.

### Seismic Traverses

Five 330-foot traverses - A-B, A-C, C-D, D-E, and F-G - were run at this location. Traverse A-B was made along the base line from station 150+70 to station 154. Traverses A-C, C-D, and D-E were run to the west in a continuous line from shot-point A. The bearing of this line was N 90° W. Traverse F-G intersected traverse D-E 150 feet from D, with shot point F 90 feet from the point of intersection. The bearing of traverse F-G was N 50° E. The plan of these seismic traverses is shown on sheet 1.

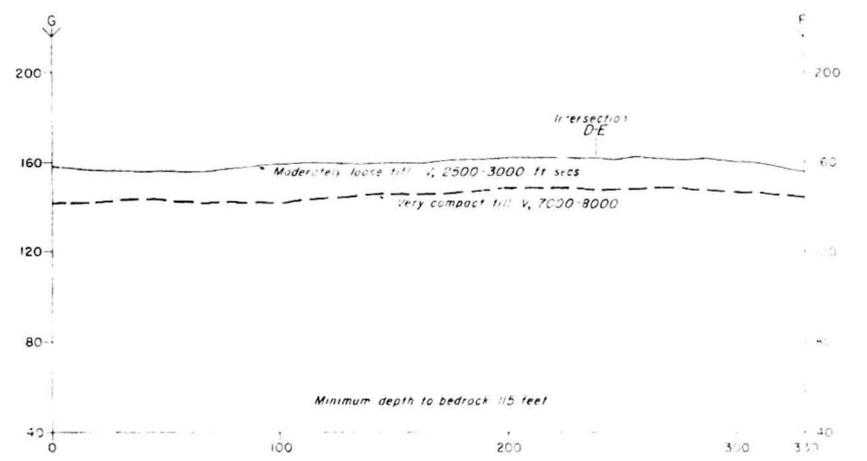
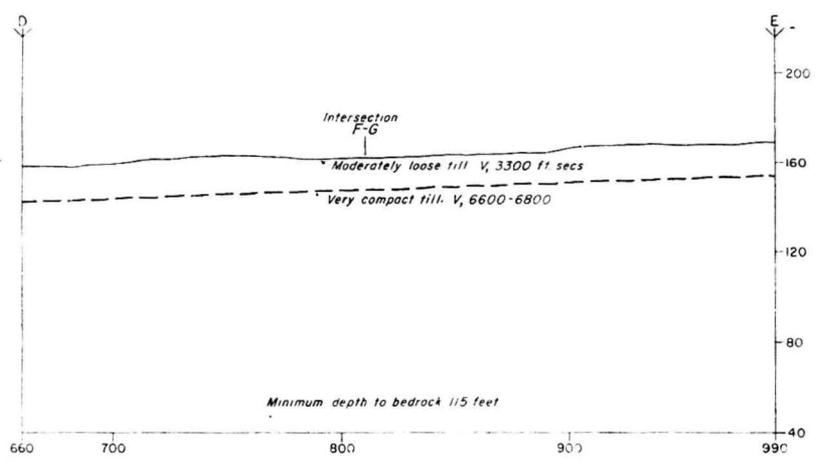
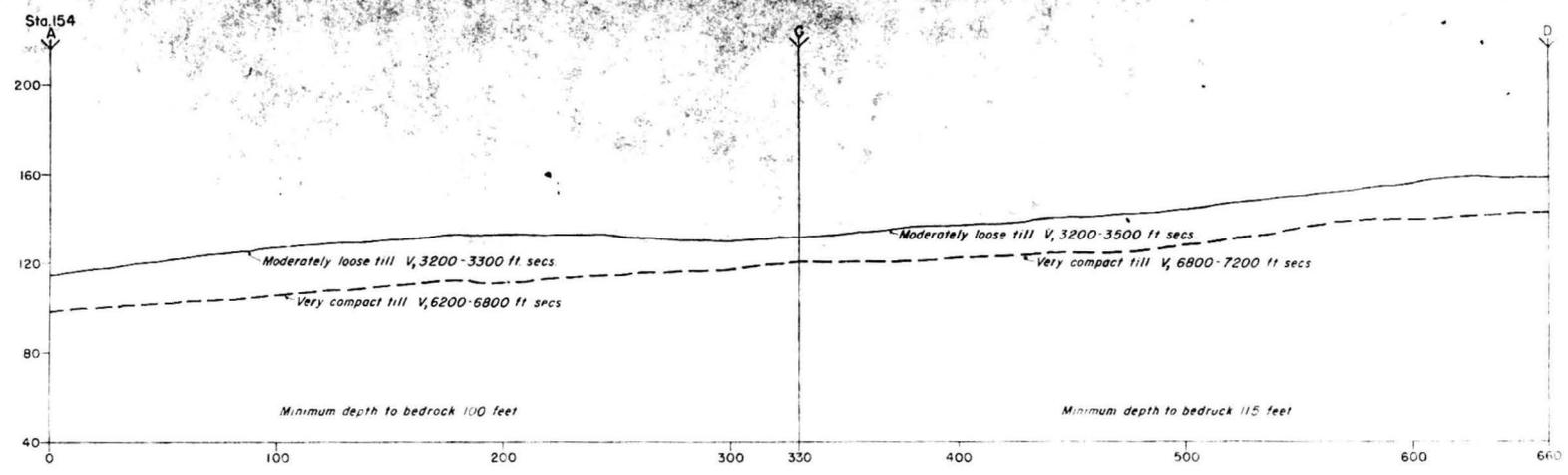
### Geologic Interpretation of Seismic Data

The geologic sections as interpreted from the surface geology and the seismic data are shown on sheet 2. All sections show a layer of moderately loose till overlying a layer of more compact material that is probably also till but ~~containing~~<sup>having</sup> a much higher clay content. The upper layer averages approximately 16 feet in thickness. At shot point C, however, it is only about 10 feet thick and at shot point F 12 feet thick. The seismic velocity data in the vicinity of shot point A indicate a somewhat abrupt difference in the normal composition of the upper layer of till; this indicates an abnormally high concentration of large boulders. The minimum depth to bedrock at shot point A is at least 100 feet from the surface. This value may be too low, however, because it was computed from a somewhat doubtful bedrock velocity of 10,500 feet per second obtained only when shooting from A toward B. No bedrock was detected below shot-point A when shooting from A toward C, or below the shot-points of all the other seismic traverses. It seems reasonably certain that over most of this site the depth to bedrock is at least 115 feet.



**PLAN OF TRAVERSES**  
 SCALE 1" = 100 FEET  
 Letters refer to shot points at ends of traverses  
 Numbers refer to D.P.W. stations on baselines

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES	
DANVERS	ROUTE NO 1
STATIONS 150-155	
SCALE 1" = 40 FEET	GEOLOGY BY JAMES E. MAYNARD
SHOT POINTS	SEISMIC DATA BY DANIEL LINEHAN, JR.
APPROXIMATE SEISMIC VELOCITY IN FEET PER SECOND	ENGINEERED BY WILLIAM H. STEAD
	DATE: OCTOBER, 1949   SHEET 1 OF 2



PLAN OF TRAVERSES	
SCALE	INCH = FEET
Letters refer to shot points at ends of traverses.	

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES	
DANVERS	ROUTE NO 1
STATIONS 150-155	
SCALE: 1 INCH = 40 FEET	DESIGNED BY: JAMES E. MAYNARD
DATE: 1949	SEISMIC DATA BY: DANIEL LINEHAN, S.J.
APPROPRIATE SEISMIC VELOCITY VALUES IN TEXT BETWEEN SECTIONS	ENGINEERING BY: WILLIAM H. STRONG
	DATE: OCTOBER 1949 SHEET 2 OF 2