

Subject: FDM - Technical Assistance for
Rhode Island RC&D

Date: October 12, 1988

To: Robert J. Klumpe
State Conservationist
SCS, West Warwick, RI

File code: 390-13-14

Purpose:

To use ground-penetrating radar (GPR) techniques to determine the depth to bedrock along portions of the Cliff Walk historic trail in Newport Rhode Island.

Participants:

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Vicky J. O'Neal, Soil Conservationist, SCS, Newport, RI
Everett C. Stuart, Soil Resource Specialist, SCS, W. Warwick, RI
Kristine A. Stuart, District Conservationist, SCS, Newport, RI

Activities:

The Cliff Walk was surveyed on October 5 & 6, 1988 with the GPR. On October 6, 1988, a GPR short course was held at the University of Rhode Island for students and faculty of the Geology and Soil Departments.

Discussion:

Two areas were surveyed with the GPR along the Cliff Walk: (i) from the top of the last step at Marys Seat to the newly laid concrete at Forty Steps, and (ii) near Salve Regina College. Observation marks were placed at 25 foot intervals along the surveyed portions of the Cliff Walk. An engineering level was used to obtain relative ground observations along the Marys Seat/Forty Step portion of the walkway. These elevations were based on an estimated height of 40 feet at Forty Steps.

Results:

The GPR provided clear and interpretable imagery of the depth to bedrock along the Cliff Walk. The depth to bedrock is based on GPR imagery, limited ground-truth auger observations, and bedrock exposures. At all sites, rock fragments in the soil made it exceedingly difficult to auger and to define the soil/bedrock interface. In places, multiple subsurface images confused radar interpretations. Multiple images are caused by layering in the bedrock, zones of saprolite, or layers of coarse fragments. Therefore, depths to bedrock are suspected of an error of about 10%.

Figure 1 represents the bedrock-landscape relationships along the Marys Seat/Forty-Step portion of the Cliff Walk. In this figure, the vertical exaggeration is about 40X. The location of buried pipes which cross the

walk have been recorded. Figures 2, 3, and 4 are detailed cross sections of each 800 foot section of the walkway. Vertical exaggeration has been reduced in these figures and is about 13X.

The following tables record the depth to bedrock at each observation point.

DEPTH TO BEDROCK ALONG THE MARYS SEAT/FORTY STEP PORTION OF CLIFF WALK, NEWPORT, RHODE ISLAND

(observation point (OBS) 0 is at Marys Seat.)
(all measurements in feet)

OBS	DPTH	OBS	DPTH	OBS	DPTH	OBS	DPTH
0	3.2	625	4.3	1250	2.8	1875	3.2
25	5.2	650	2.7	1275	4.2	1900	2.9
50	7.2	675	2.5	1300	5.1	1925	2.4
75	8.3	700	2.3	1325	5.7	1950	1.8
100	7.7	725	4.0	1350	5.9	1975	1.8
125	5.5	750	4.9	1375	5.0	2000	2.8
150	4.2	775	7.2	1400	4.2	2025	2.5
175	4.0	800	6.3	1425	5.2	2050	3.3
200	3.2	825	5.0	1450	5.8	2075	2.1
225	2.1	850	3.9	1475	6.8	2100	3.3
250	1.2	875	4.5	1500	6.5	2125	3.8
275	1.6	900	4.5	1525	5.6	2150	2.8
300	1.4	925	5.3	1550	3.9	2175	2.3
325	2.3	950	6.0	1575	2.5	2200	1.4
350	3.5	975	6.6	1600	2.9	2225	1.6
375	3.0	1000	7.9	1625	3.4	2250	2.8
400	2.4	1025	7.7	1650	4.7	2275	5.8
425	1.8	1050	4.3	1675	6.5	2300	6.5
450	2.4	1075	3.4	1700	5.8	2325	4.7
475	3.8	1100	4.4	1725	3.9	2350	3.2
500	2.9	1125	4.1	1750	5.5	2375	5.2
525	4.3	1150	5.5	1775	7.7	2400	4.1
550	6.0	1175	4.8	1800	6.8	2425	3.3
575	5.0	1200	3.7	1825	6.5	2450	4.8
600	6.0	1225	3.2	1850	4.8		

DEPTH TO BEDROCK ALONG THE SALVE REGINA COLLEGE PORTION OF CLIFF WALK, NEWPORT, RHODE ISLAND

(observation point (OBS) 0 is northern most)
(all measurements in feet)

OBS	DPTH	OBS	DPTH	OBS	DPTH	OBS	DPTH
1	8.1	6	4.0	11	5.2	16	6.7
2	9.2	7	4.3	12	7.1	17	4.6
3	8.4	8	4.9	13	9.2	18	6.3
4	7.6	9	4.5	14	5.0	19	4.8
5	4.2	10	4.6	15	4.9	20	5.2

I deeply appreciated the opportunity to work in your state. Your staff was most enthusiastic and supportive. With kind regards.

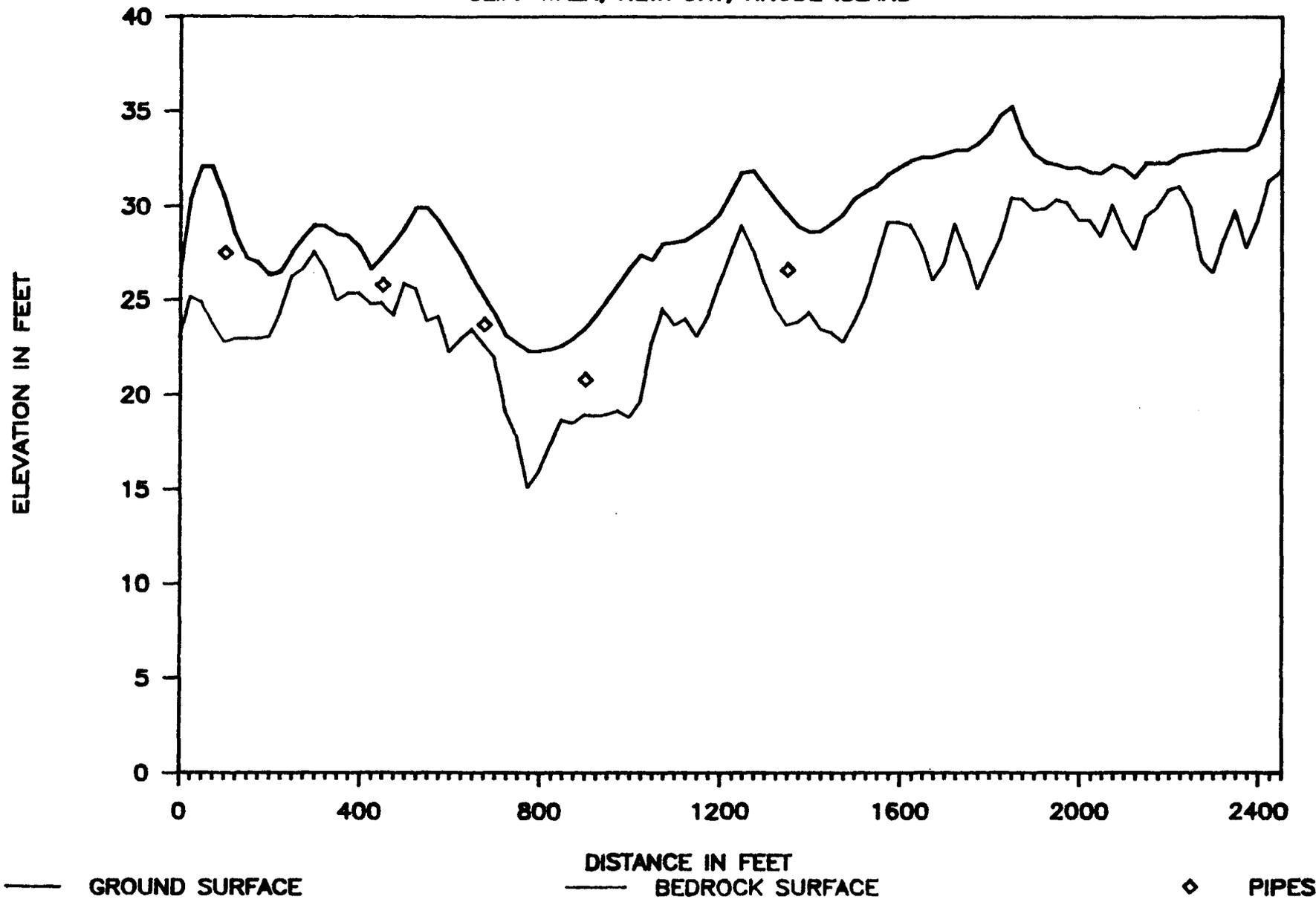
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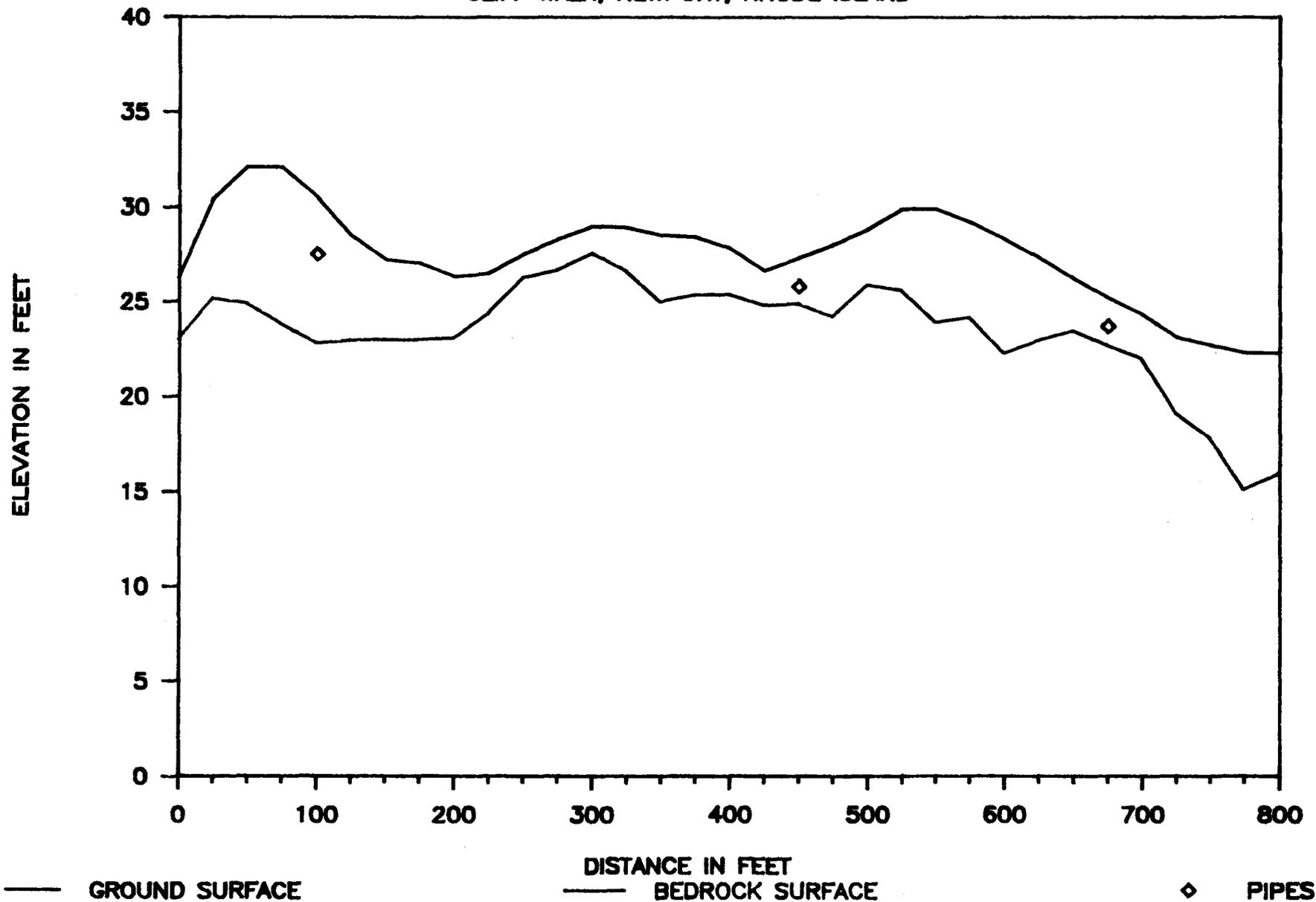
BEDROCK-LANDSCAPE RELATIONSHIPS

CLIFF WALK, NEWPORT, RHODE ISLAND



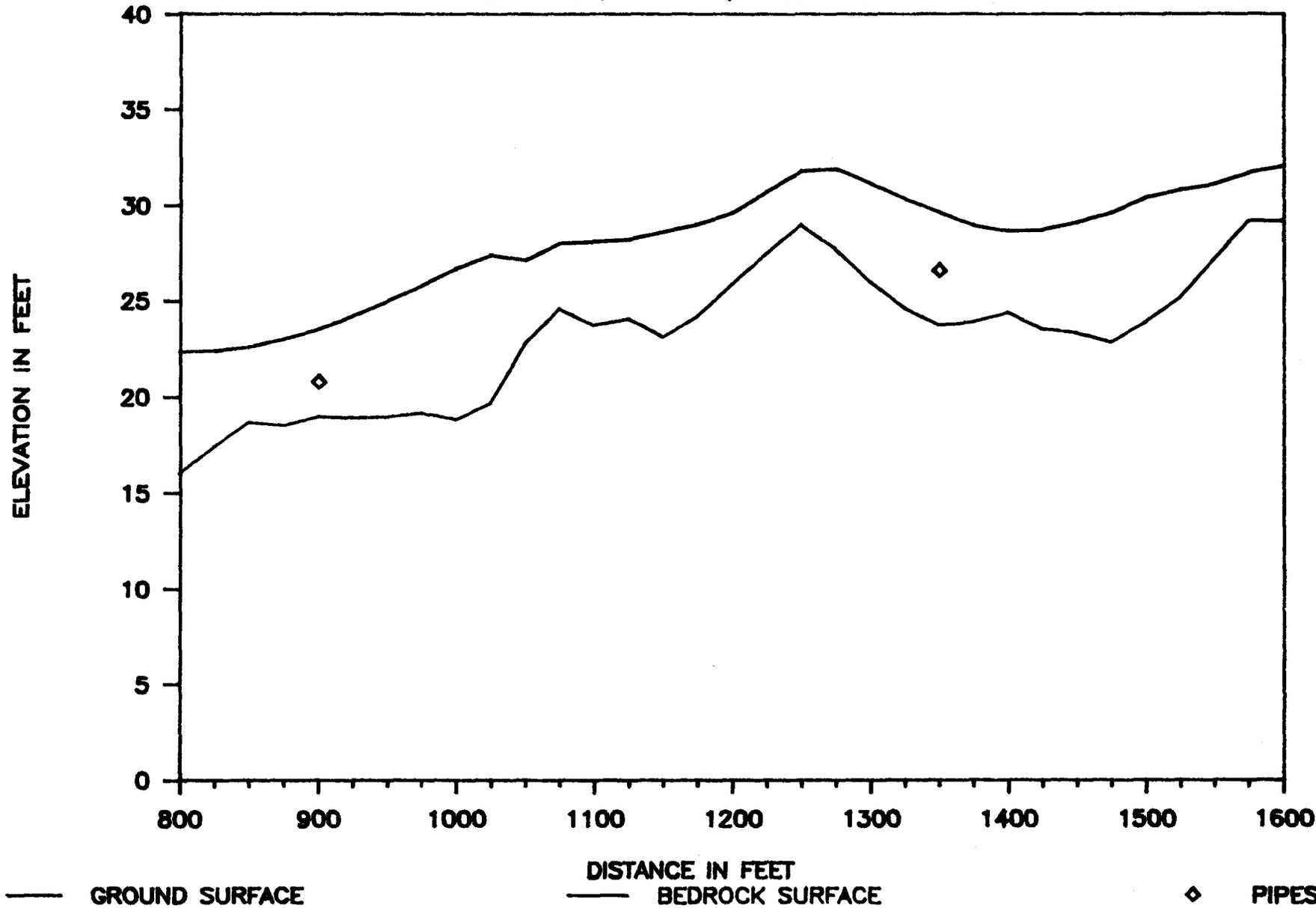
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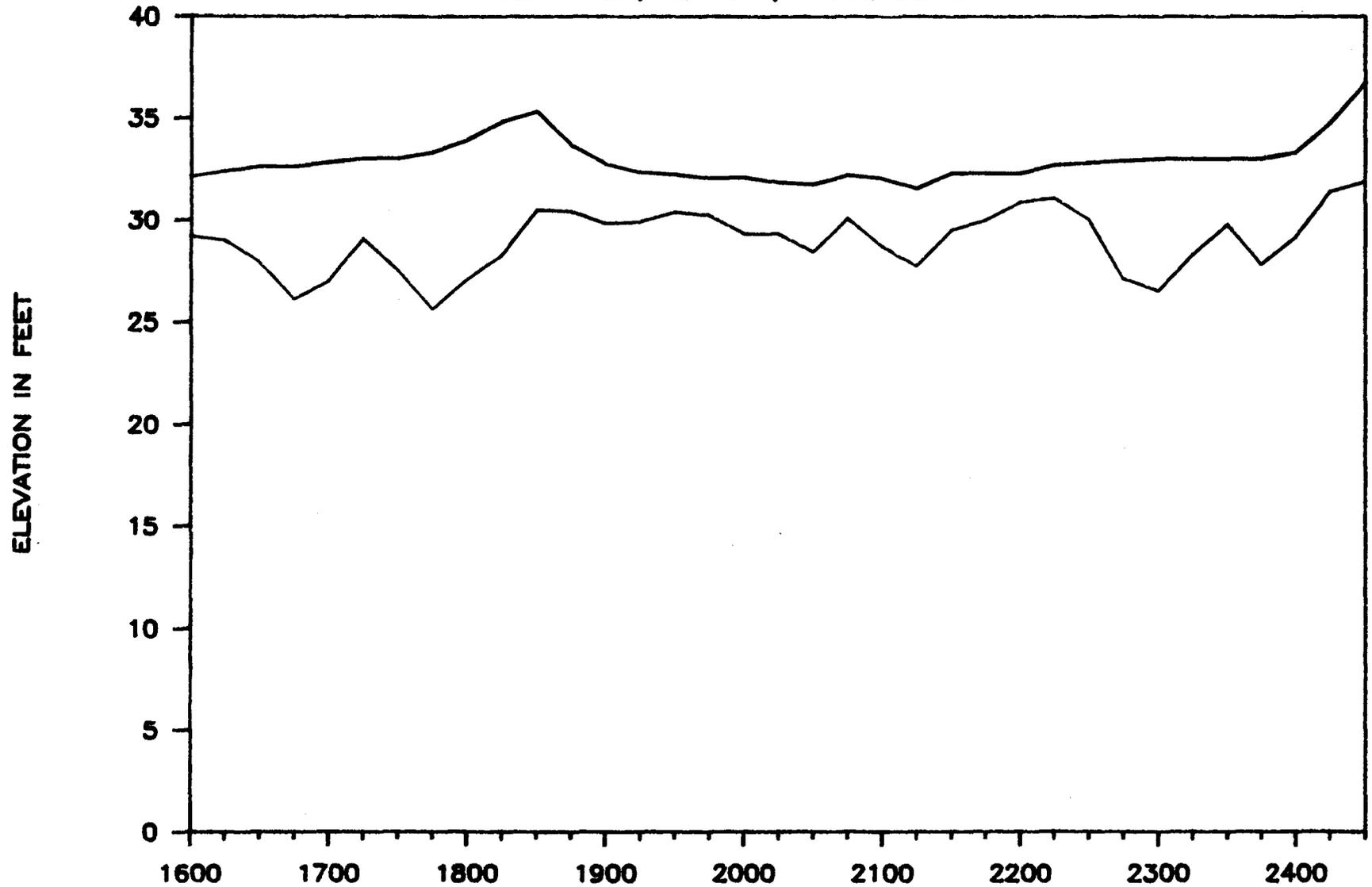
BEDROCK-LANDSCAPE RELATIONSHIPS

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— GROUND SURFACE

— BEDROCK SURFACE

◇ PIPES