

Memorandum

UTAH DEPARTMENT OF TRANSPORTATION

DATE: February 24, 1986

TO : P.K. Monson, P.E., District 3 Preconstruction Engineer

FROM : Heber Vlam, P.E., Engineer of Materials & Research *H.V.*

SUBJECT: I-70-1(23)36, South Richfield to North Richfield;
Collapsible Soil Study Near E.B. I-70 Stations
1935+00 to 1939+00 and 1965+00 to 1970+00

This office was requested by District No. 3 to assess the impact of impounding water in a proposed detention reservoir near Sta. 1967+00 E.B. I-70. The soils at this site were suspected of being collapsible, when severe cracking and differential subsidence developed after water was impounded in an area diked up adjacent to the Sevier Valley Canal by Richfield City during the summer of 1985. A collapsible soil is a soil that shows a sudden and dramatic volume decrease when saturated with water.

Six test holes were drilled near the site of the proposed detention reservoir and numerous soil samples were taken. These holes ranged from 25 feet to 52 feet deep and correlation between test holes is good. In general the subsoils may be described as follows: very loose to very dense silty sand with gravel and some sandy silt; also limestone bedrock was encountered in two of the test holes. See Fig. 1 - a & b, Log of Borings for more detailed descriptions and test hole locations.

Three test holes were also drilled at the site of some ground depressions or shallow "sink holes" near Sta. 1935+00 E.B. I-70, see Fig. 2, Log of Borings. These "sink holes" appear to be collapse structures caused by underlying collapsing soils. These three holes were each drilled to a depth of 31 feet. The principal subsoil encountered at this site was loose to medium sandy silt. See Fig. 2 Log of Borings.

Laboratory testing of samples taken reveals that there are collapsing soils at both sites. The soils that showed collapse generally ranged from 5 feet to 31 feet in depth.

Using laboratory test results we calculate that leakage from detention reservoirs could cause the nearby I-70 embankment to settle approximately 36 inches.

Even with leak resistant design these reservoirs could leak enough water to cause significant damage to the I-70 embankments and surfacing. We therefore recommend against putting any water retaining earth structures within 500 feet of any embankment.

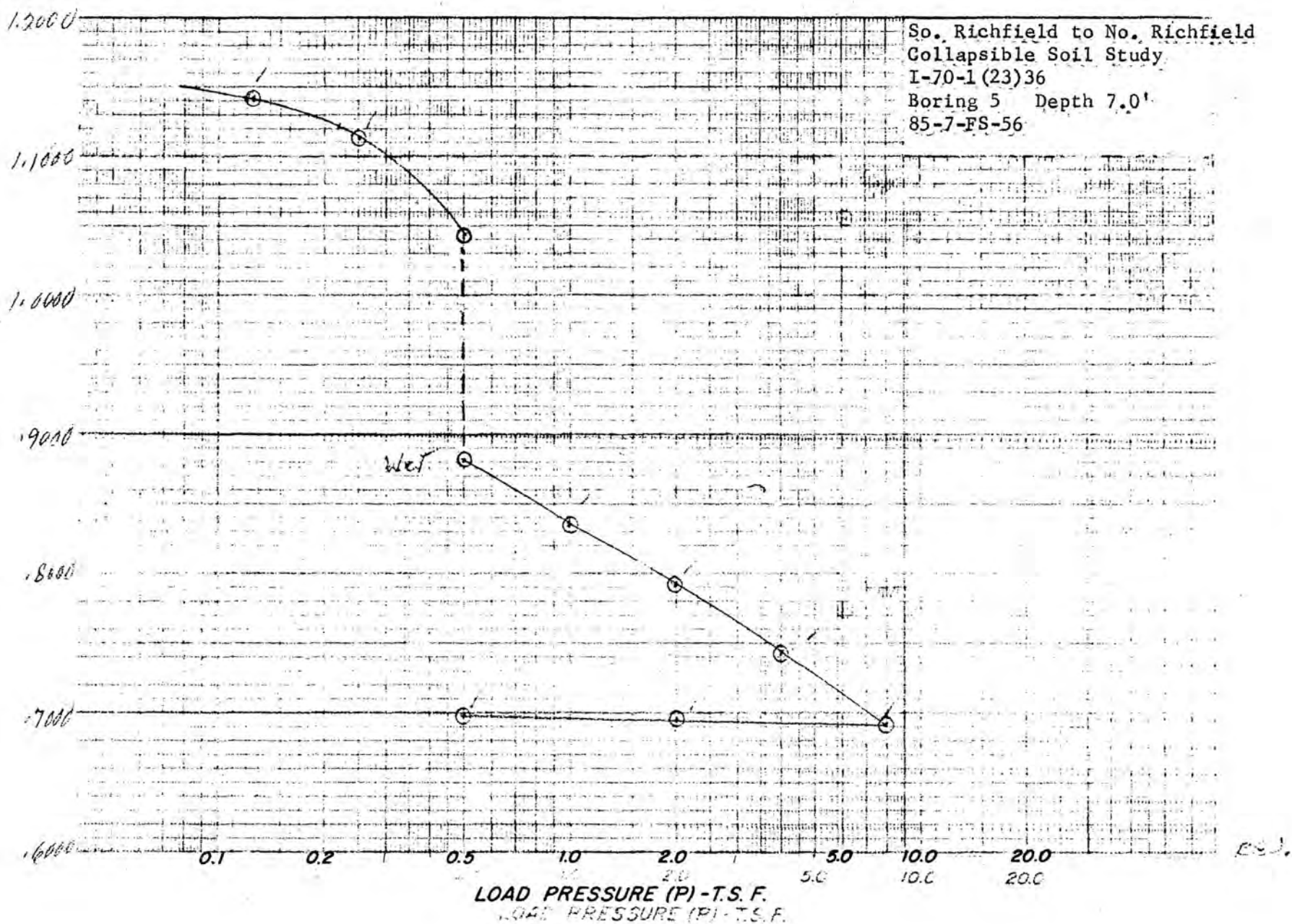
Flooding this area prior to construction in order to stabilize these soils is not recommended. We feel that extensive damage to and possible contamination of the Richfield City culinary water supply would occur if this area was thoroughly flooded.

Field reconnaissance of this project suggest that collapsible soils will likely be encountered along all of the foothills west of Richfield. We recommend that care be taken to ensure good positive surface drainage on this entire project. Any area where water is allowed to pond will be subject to soil collapse and the subsequent formation of collapse structures such as sink holes.

Attachments
PSizemore/cak

Note - There were no attachments
accompanying this memo, however,
file was full of raw data. Copied
& consol. test graphs showing
collapsible soils. Attached herein.
Found soil boring logs. ✓

VOID RATIO (e)



16 1/2

SO. Richfield to No. Richfield
Collapsible Soil Study
I-70-I(23)36
Boring 4 Depth 16.0'
85-7-FS-56

VOID RATIO (e)

1.1000

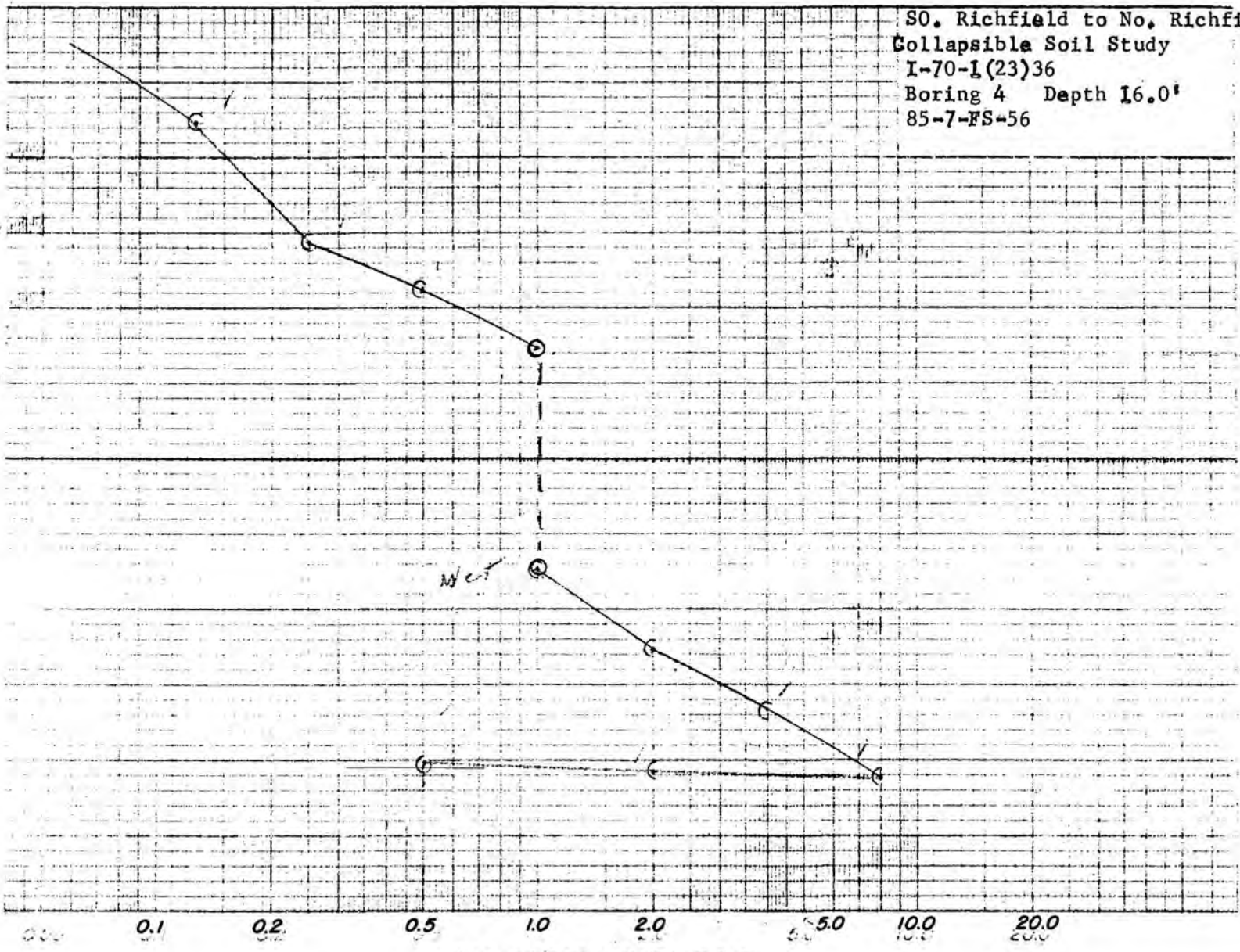
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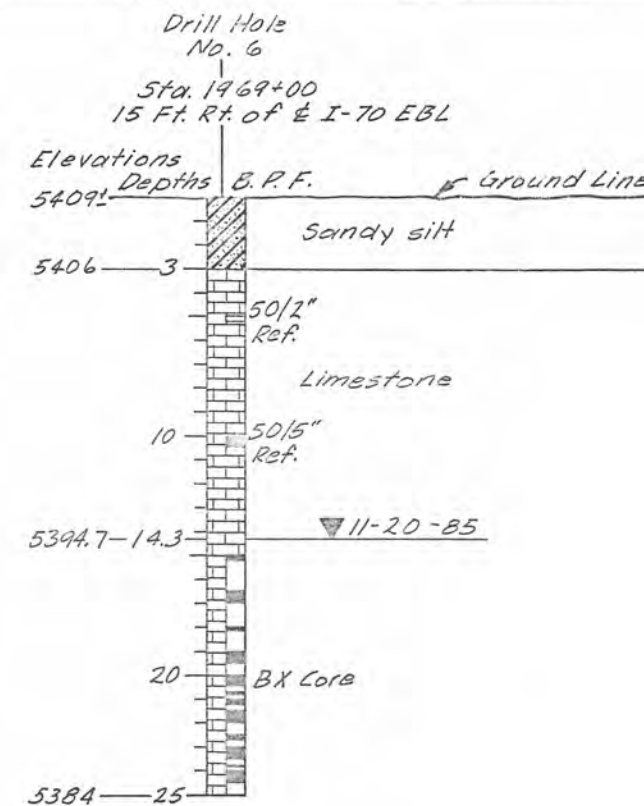
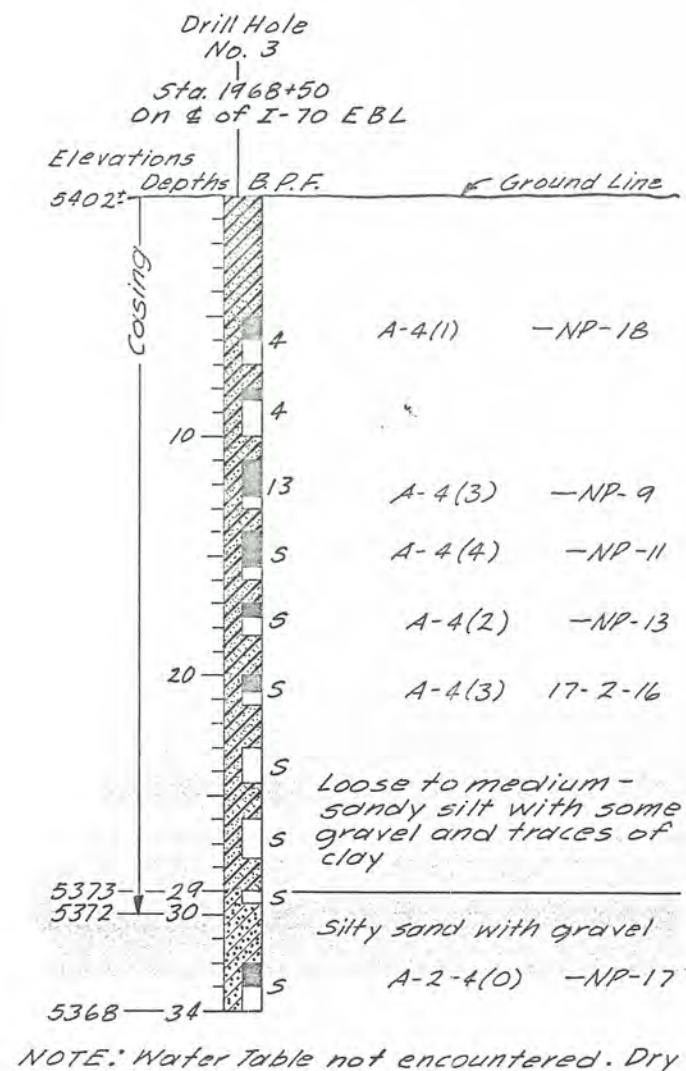
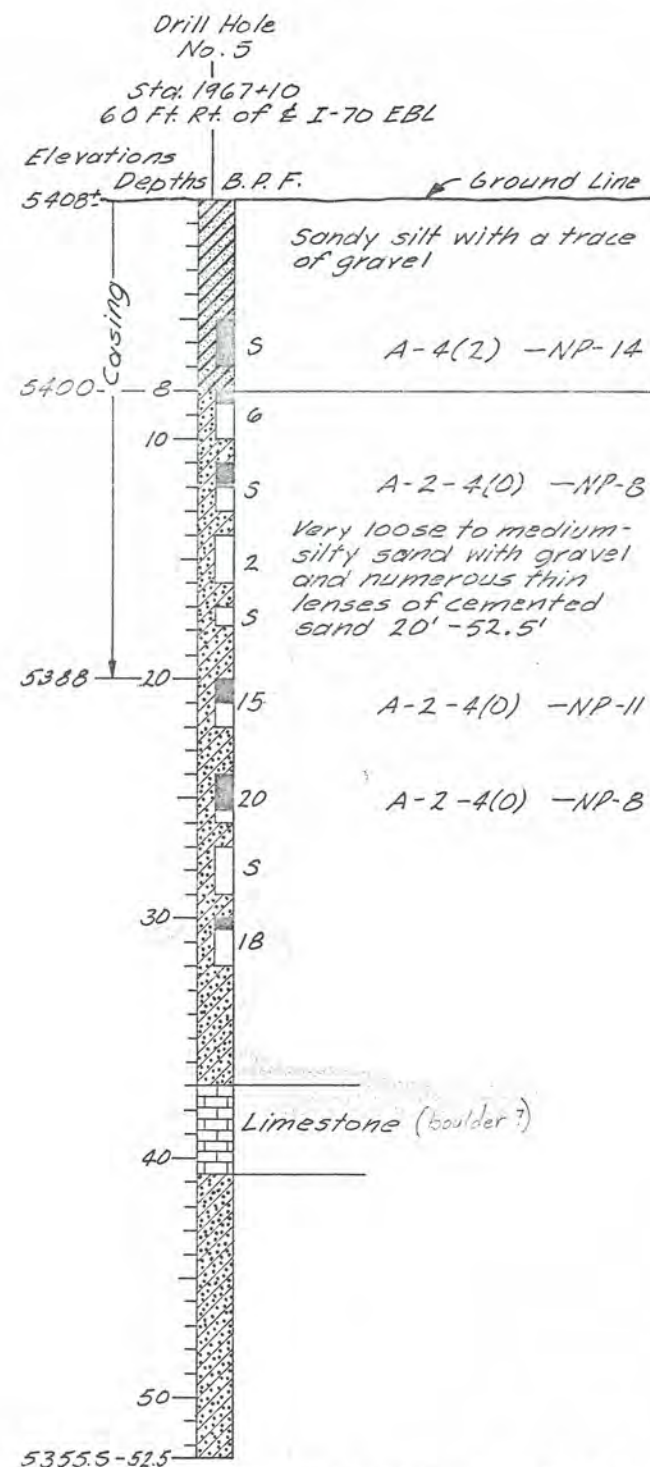
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R61

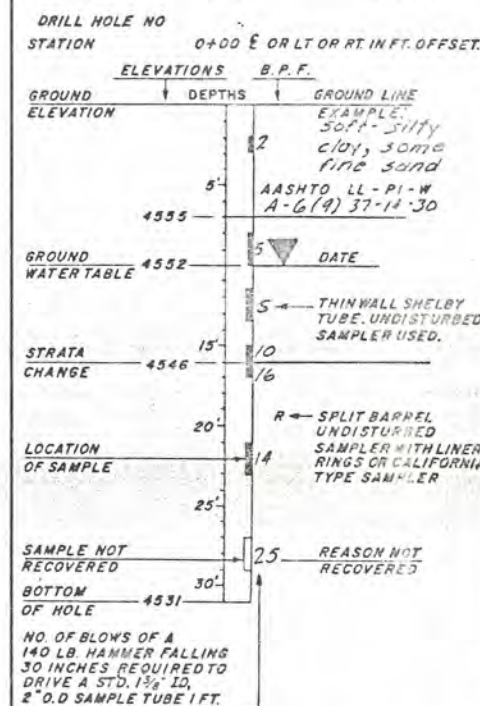


NOTE: The water table depths shown on the drill logs represent hole conditions on the date shown, either with casing still in place or with perforated plastic pipe installed. It should be noted however, that other locations away from the test holes or at other times of the year the water table elevation may vary significantly.

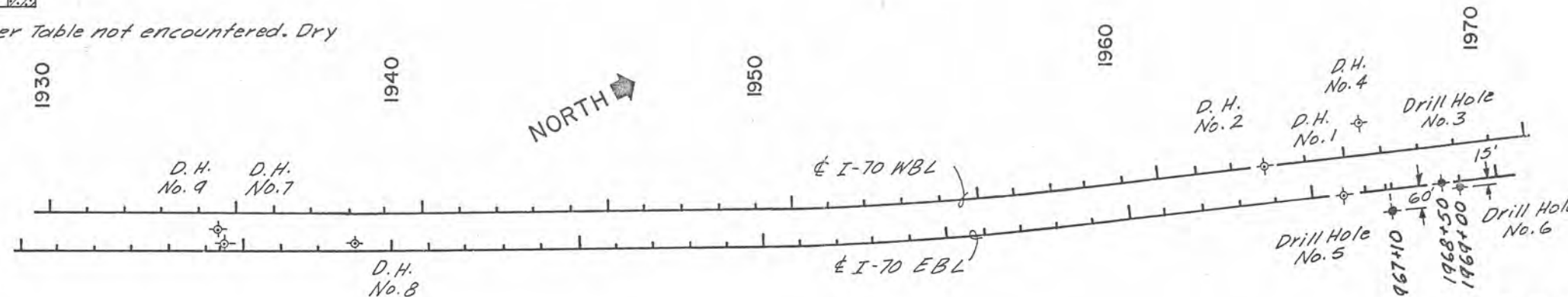
KEY TO DRILLING LOG
RELATIVE DENSITY (NON-PLASTIC SAND & SILT)
VERY LOOSE - LESS THAN 4 BLOWS PER FOOT.
LOOSE - 4 TO 10 BLOWS PER FOOT.
MEDIUM - 10 TO 30 BLOWS PER FOOT.
DENSE - 30 TO 50 BLOWS PER FOOT.
VERY DENSE - MORE THAN 50 BLOWS PER FOOT.

CONSISTENCY (PLASTIC SILT & CLAY)
VERY SOFT - LESS THAN 2 BLOWS PER FOOT.
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MEDIUM - 4 TO 8 BLOWS PER FOOT.
STIFF - 8 TO 15 BLOWS PER FOOT.
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TOPSOIL OR FILL	IGNEOUS	SANDY CLAY
GRAVEL	LIMESTONE	CLAYEY SAND
SAND	CONGLOMERATE	SILTY CLAY
SILT	DOLomite	CLAYEY SILT
CLAY	SANDSTONE	SILTY SAND
SHALE	SILTSTONE	SANDY SILT



ABBREVIATIONS
L.L. - LIQUID LIMIT IN %
P.I. - PLASTIC INDEX
W. - NATURAL MOISTURE CONTENT IN %
Ref. - REFUSAL ≥ 50 BLOWS PER 6"
PEN. - PENETRATION
G.W.T. - GROUND WATER TABLE
B.P.F. - BLOWS PER FOOT.
N.P. - NON PLASTIC
AASHTO - SOIL CLASSIFICATION SYSTEM



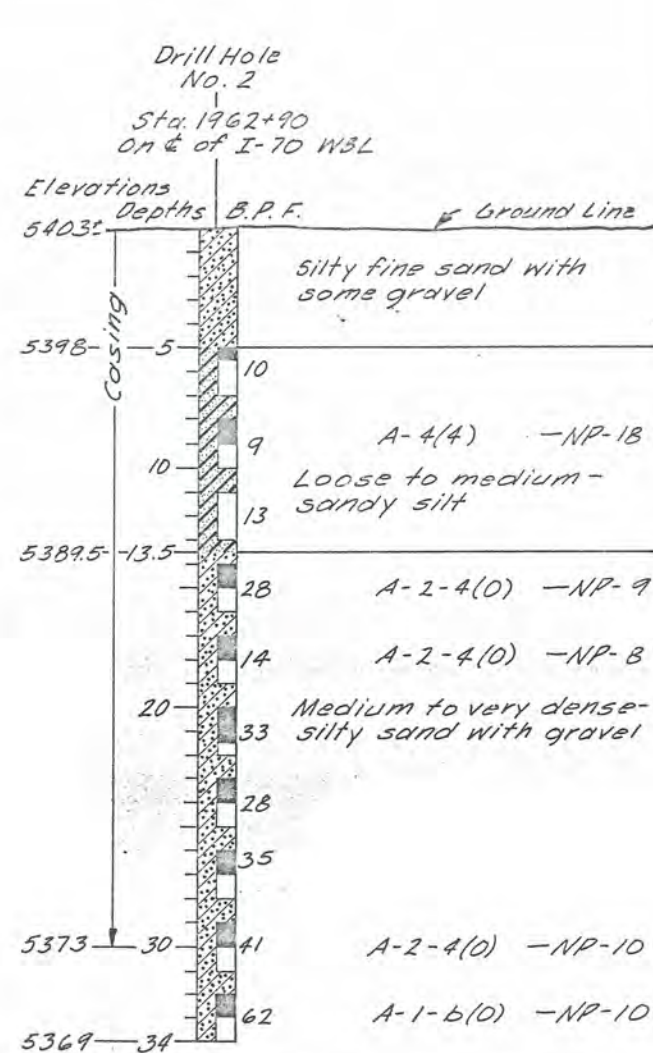
Date Drilled: Oct. & Nov. 1985

NO	BY	DATE

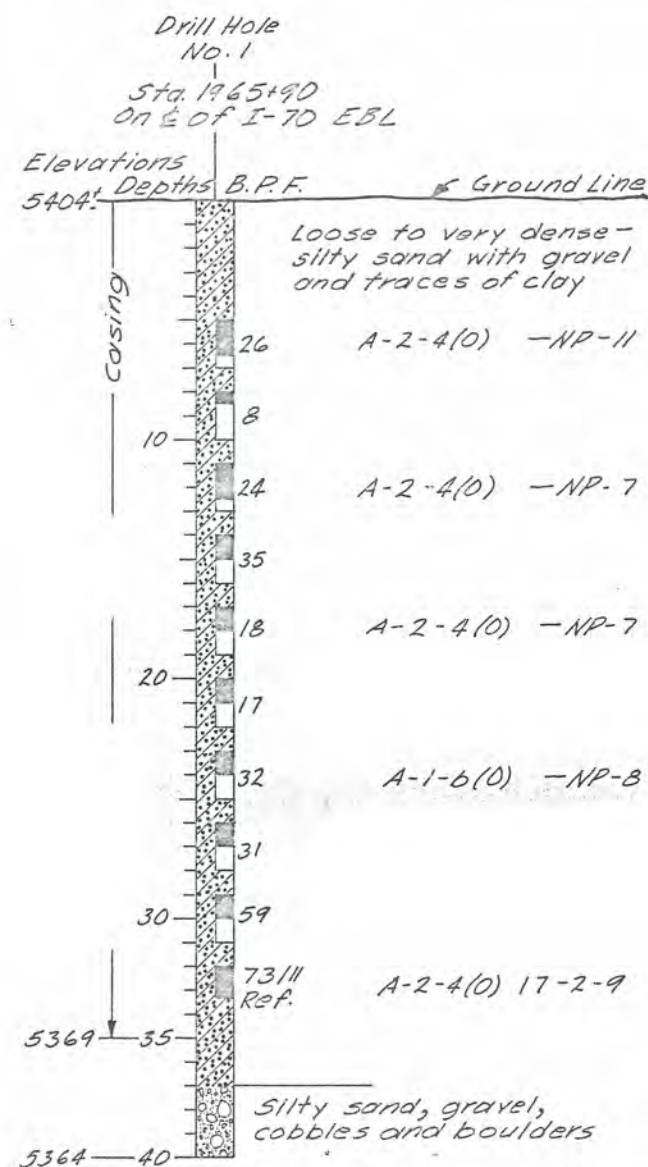
REVISIONS

UTAH STATE DEPARTMENT OF TRANSPORTATION SALT LAKE CITY, UTAH	
MATERIALS and RESEARCH SECTION	
SOUTH RICHFIELD TO NORTH RICHFIELD	
SOIL INVESTIGATION	
Drawn by KISTNER	Checked by
Designed by P. Sizemore	Checked by
Material by M. Basma	Checked by
Special Recommendation by L. H. Raucher	Checked by
Received	Date
85-7-FS-56	Fig. No.
1-70-1(23)36	Project Number
1930 To 1970	Station
SEVIER	County

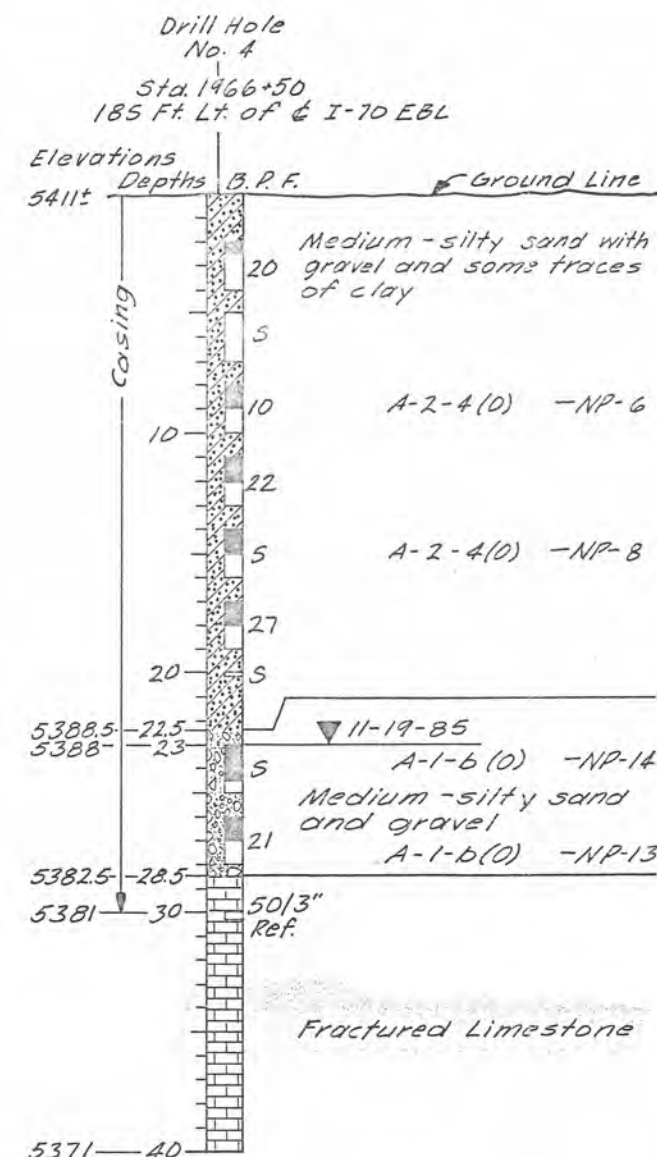
FIGURE 1-B



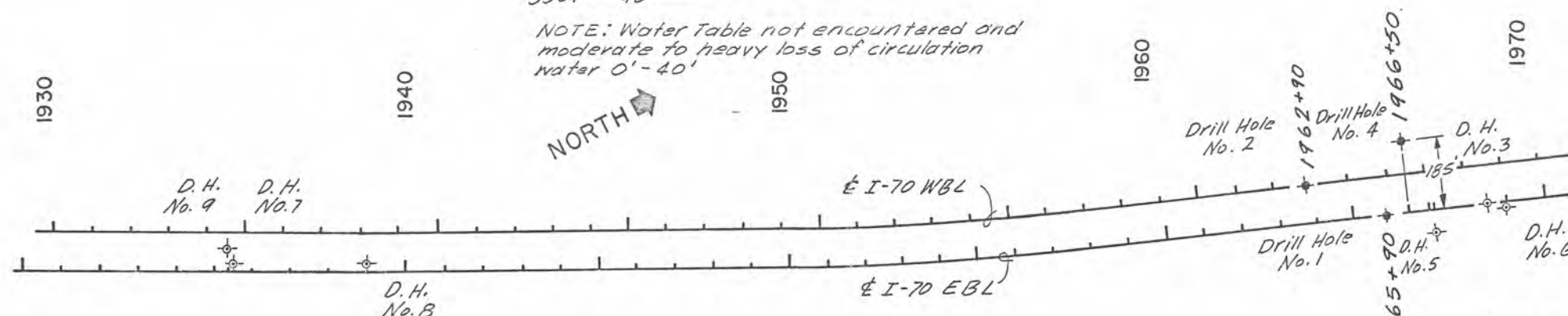
NOTE: Water Table not encountered



NOTE: Water Table not encountered and moderate to heavy loss of circulation water 0'-40'



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Date Drilled: Oct. & Nov. 1985

NO.	BY	DATE

REVISIONS

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DRILL HOLE NO. STATION 0+00 E OR LT OR RT. IN FT. OFFSET.

ELEVATIONS B.P.F.

GROUND ELEVATION

DEPTHS

GROUND LINE

EXAMPLE: soft silty clay, some fine sand

AASHTO LL - PI - W

A-6(4) 37-14-30

DATE

THIN WALL SHELBY TUBE, UNDISTURBED SAMPLER USED.

STRATA CHANGE

LOCATION OF SAMPLE

SPLIT BARREL UNDISTURBED SAMPLER WITH LINER RINGS OR CALIFORNIA TYPE SAMPLER

SAMPLE NOT RECOVERED

REASON NOT RECOVERED

BOTTOM OF HOLE

NO. OF BLOWS OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO DRIVE A STD. 1 1/2" ID, 2" O.D. SAMPLE TUBE 1 FT.

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UTAH STATE DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH

MATERIALS and RESEARCH SECTION

SOUTH RICHFIELD TO NORTH RICHFIELD
SOIL INVESTIGATION

Drawn By: Ristler Checked By: 1-70-1(23)36

Checked By: R. Sizemore Checked By: Proj. No.

Checked By: M. Bash Checked By: 1930 To 1970

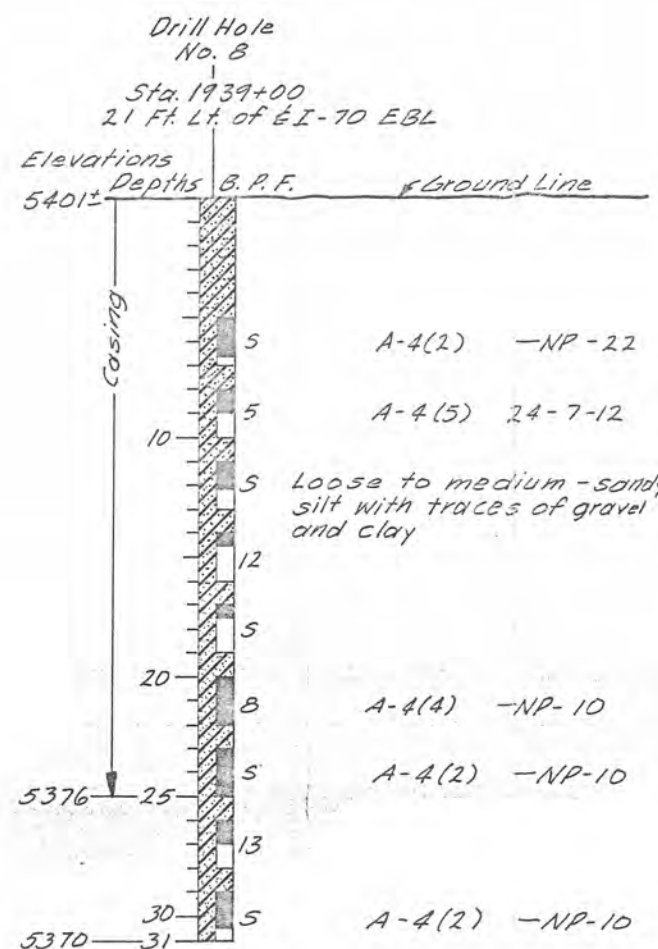
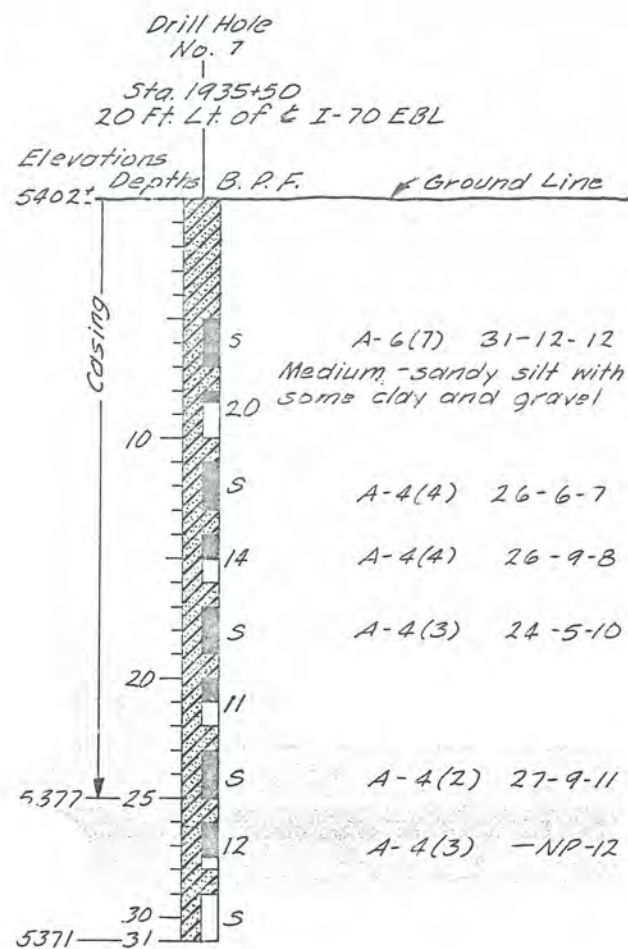
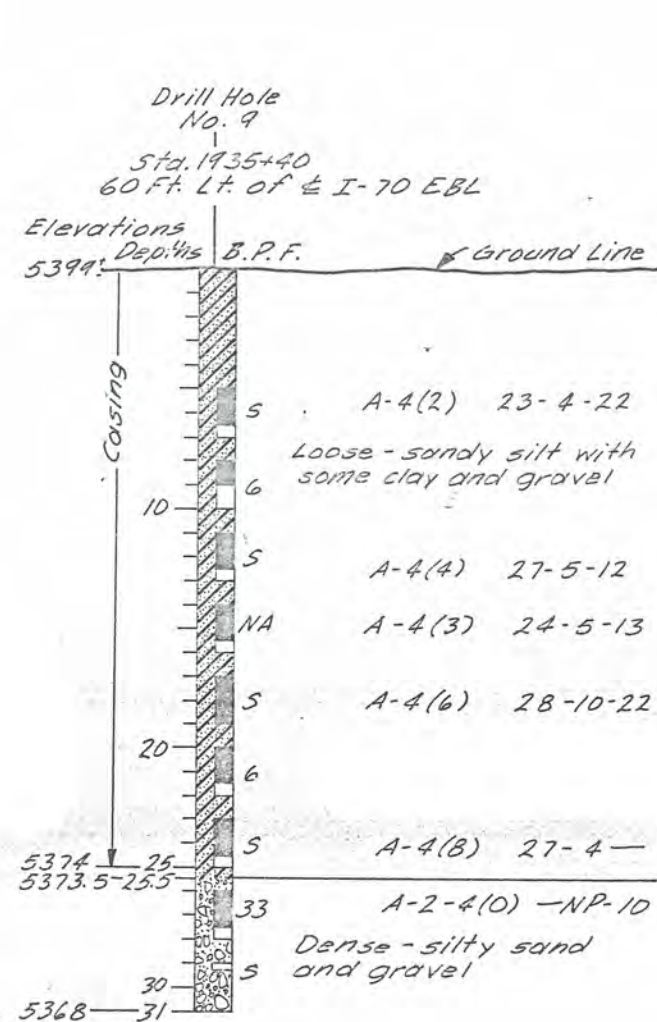
Checked By: Checked By: Station

Checked By: Checked By: County

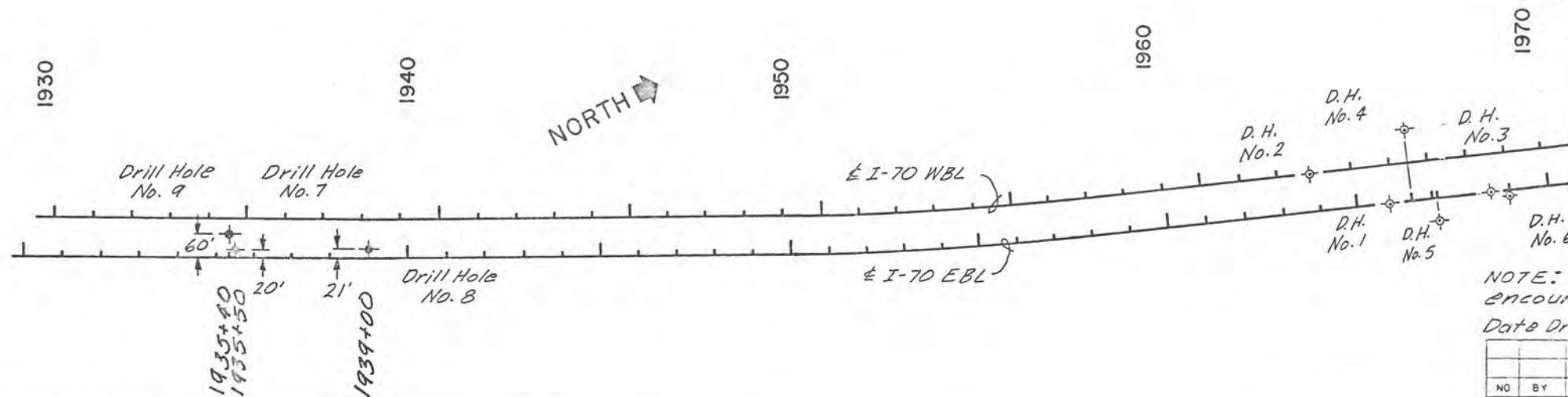
85-7-FS-56

01

FIGURE 1-A



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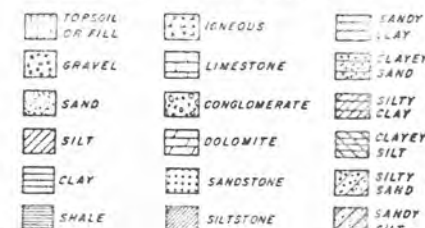
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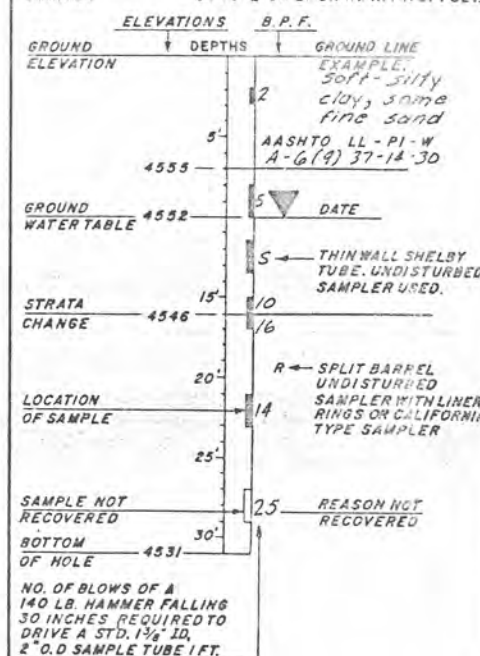
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MATERIALS and RESEARCH SECTION
SOUTH RICHFIELD TO NORTH RICHFIELD
SOIL INVESTIGATION

Drawn By: KISTNER
Checked By: P. STACHURA
Checked By: M. BASNA
Approved: J. H. RAUSCHER
Date: 85-7-FS-56
Project Number: 1-70-1(23)36
Project Name: 1930 TO 1970
Section: SEVIER
County: 01