RIALS

LAY OR SILT

C MATTER

ATERIAL

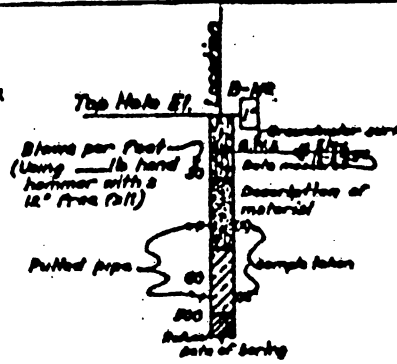
US ROCK

NTARY ROCK

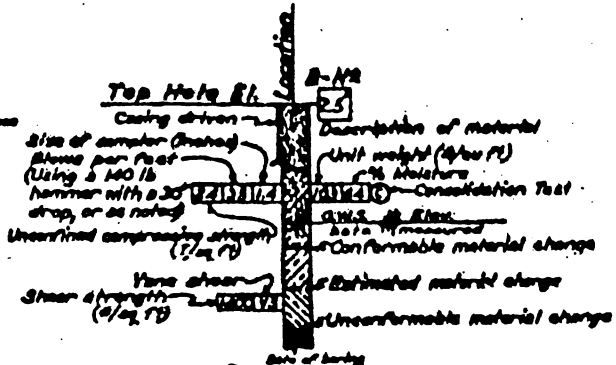
MORPHIC ROCK

LEGEND OF BORING OPERATIONS

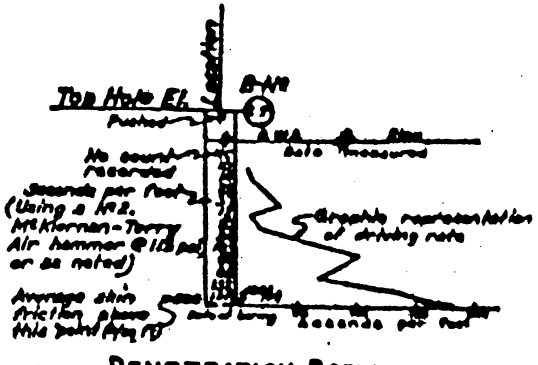
- PENETROMETER
- 2½" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



1" SOIL TUBE



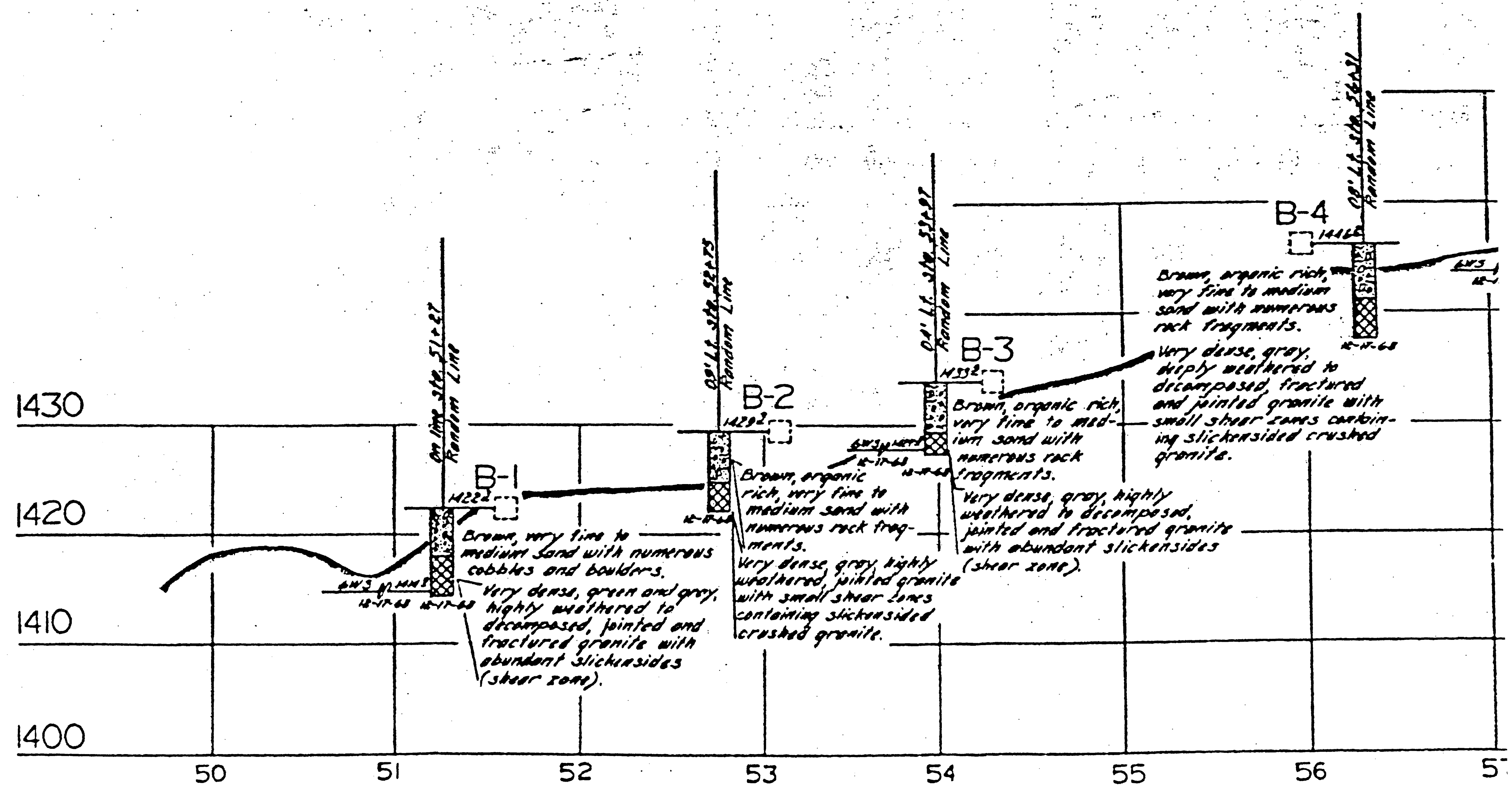
ROTARY BORING



PENETRATION BORING

LEGEND

B1 → B-4



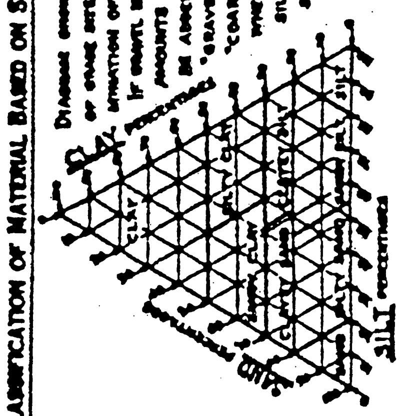
LEGEND

Penetrometer
2½" Cone Penetrometer
Sampler Boring (Dry)
Rotary Boring (Wet)
Auger Boring (Dry)
Jet Boring
Core Boring
Test Pit

LEGEND OF EARTH MATERIALS

Gravel
Sand
Silt
Clay
Sandy Clay or Clayey Sand
Sandy Silt or Silty Sand
Silty Clay or Clayey Silt
Peat and/or Organic Matter
Fill Material
Igneous Rock
Sedimentary Rock
Metamorphic Rock

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS



NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

FIELD STUDY	by W. C. Cain	12-18-68
DRAWN	by V. Lecaro	12-31-68
CHECKED	by W. C. Cain	1-2-69

Approval Recommended by: [signature], Engineering Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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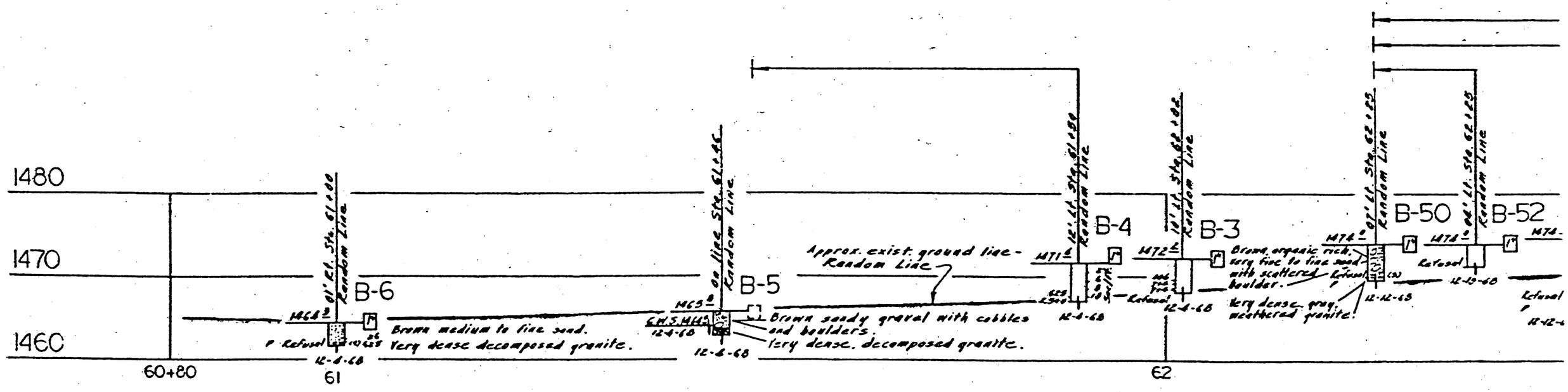
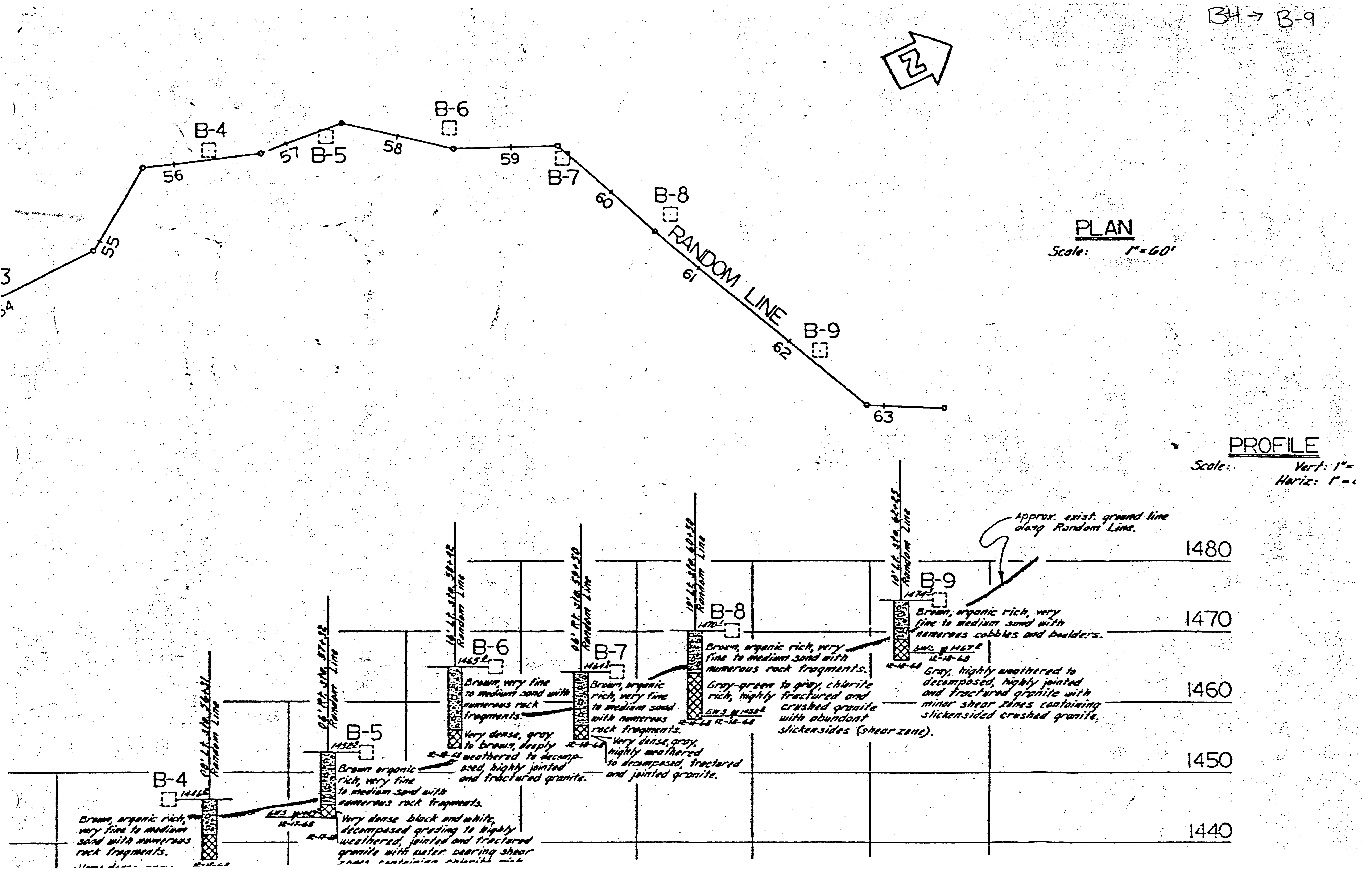
AS BUILT PLANS
Contract No. 07-063744
Date Completed
Document No.

B-3 → B-6
B-50
B-52



AS
CORREC
CONTR
DATE



B4 → B-9
PLAN
Scale: 1" = 60'
B-4
B-5
B-6
B-7
B-8
B-9
55
56
57
58
59
60
61
62
63
RANDOM LINE
PROFILE
Scale: Vert: 1" =
Horiz: 1" =
Approx. exist. ground line along Random Line.
1480
1470
1460
1450
1440
Brown, organic rich, very fine to medium sand with numerous rock fragments.
Brown organic rich, very fine to medium sand with numerous rock fragments.
Very dense black and white, decomposed grading to highly weathered, jointed and fractured granite with water bearing shear
Brown, very fine to medium sand with numerous rock fragments.
Very dense, gray to brown, deeply weathered to decomposed, highly jointed and fractured granite.
Brown, organic rich, very fine to medium sand with numerous rock fragments.
Very dense, gray, highly weathered to decomposed, fractured and jointed granite.
Brown, organic rich, very fine to medium sand with numerous rock fragments.
Gray-green to gray, chlorite rich, highly fractured and crushed granite with abundant slickensides (shear zone).
Brown, organic rich, very fine to medium sand with numerous cobbles and boulders.
Gray, highly weathered to decomposed, highly jointed and fractured granite with minor shear zones containing slickensided crushed granite.

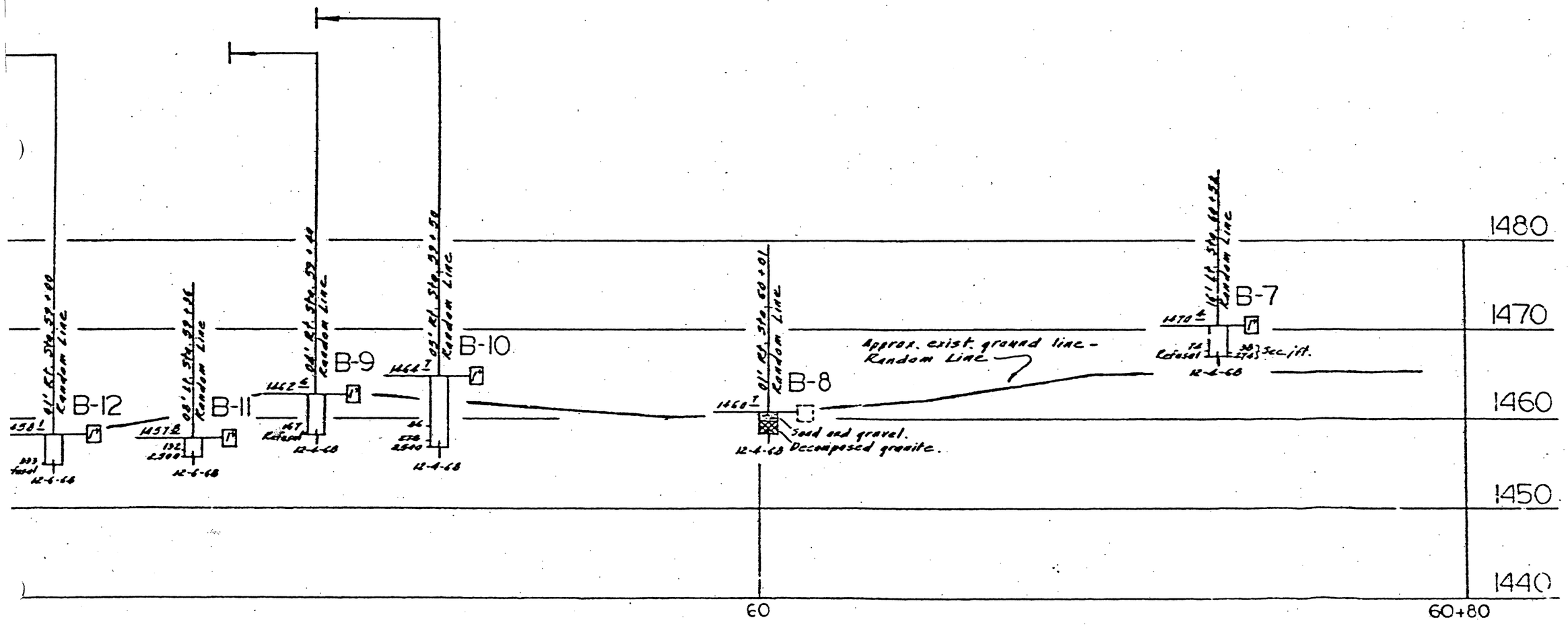
B-7 → B-12

N198,521.96
E196,475.81

MATCH LINE STA. 60 +

PROFILE

Scale : Vert. 1" = 10'
Horiz. 1" = 10'

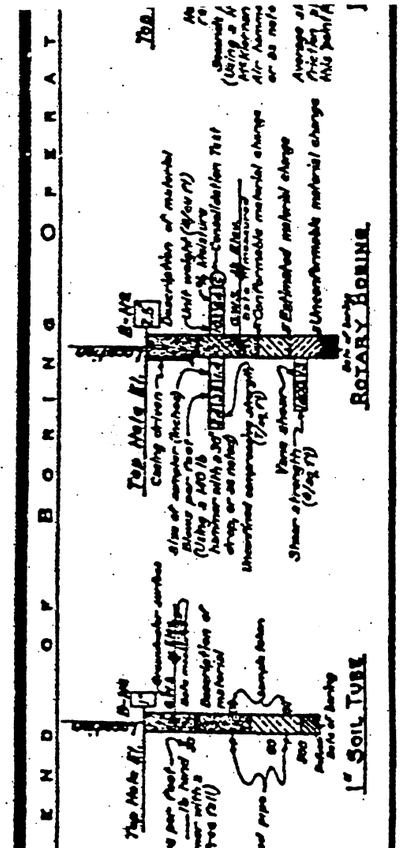


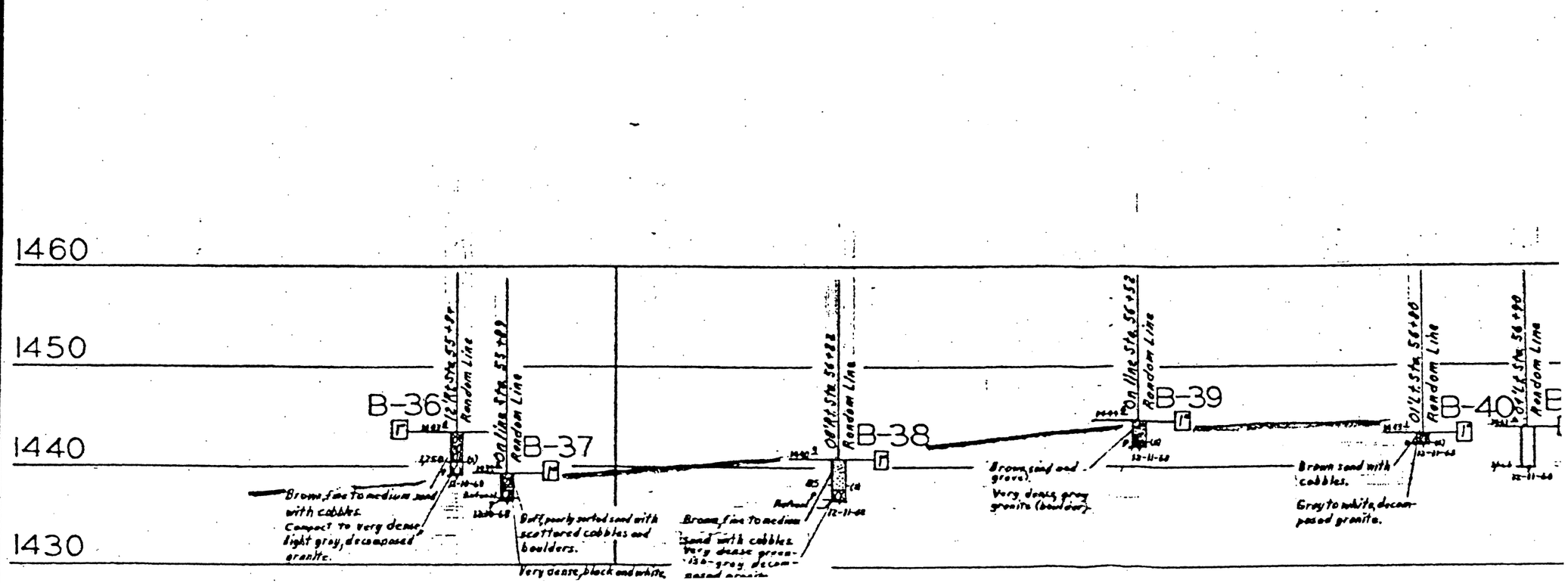
B-36 B-38

B-37 to B-40

PLAN

Scale: 1" = 20'

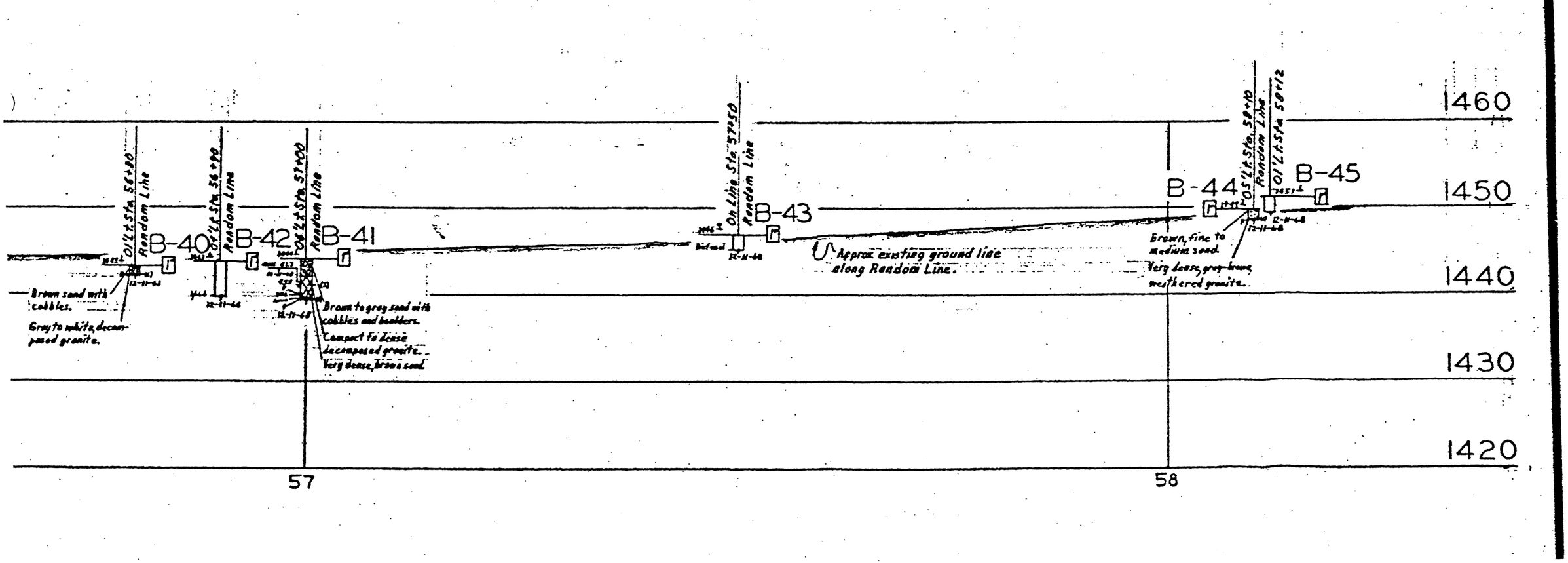




B-40 → B-45

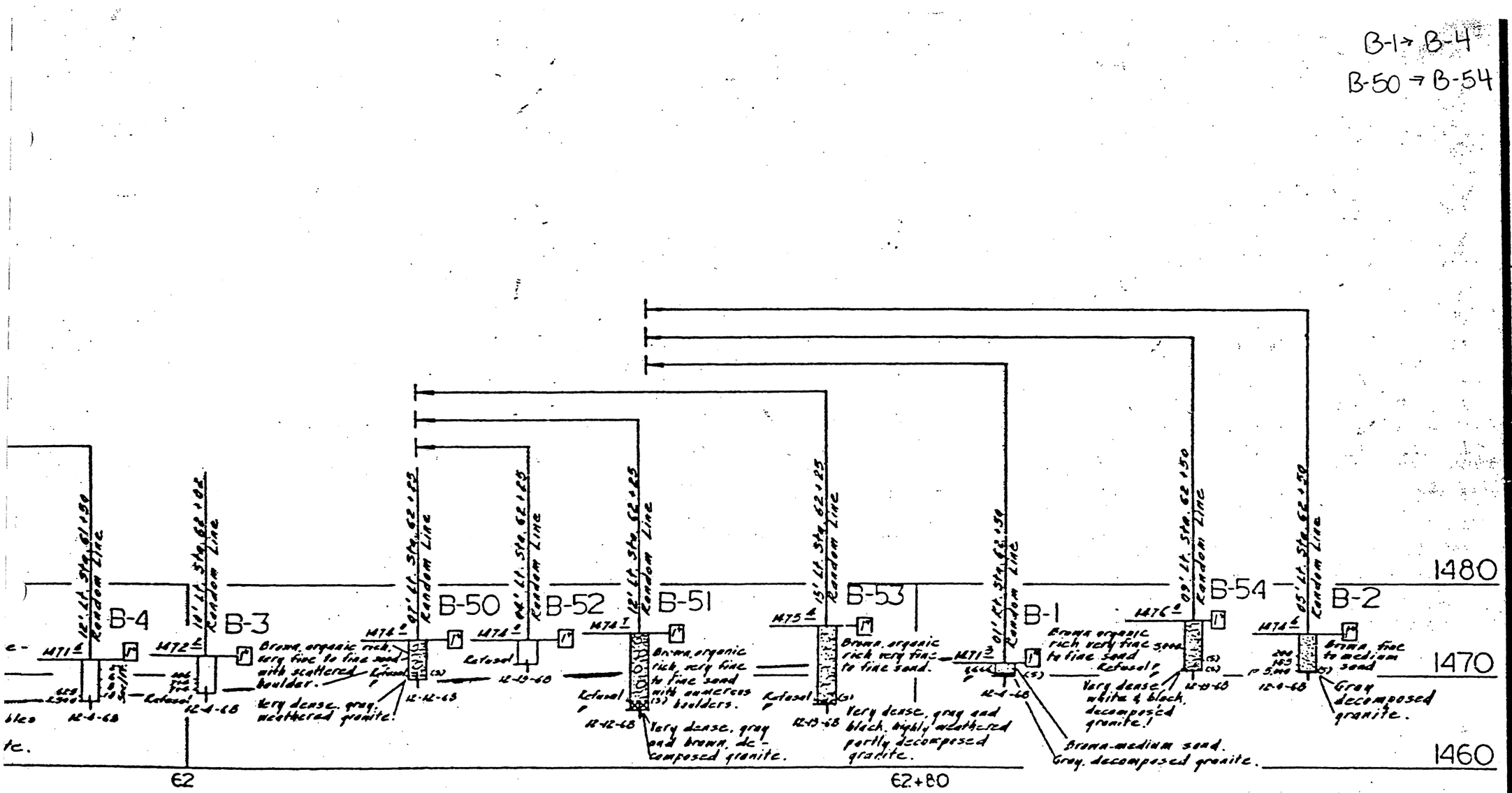
PLAN

Scale: 1"=20'



PROFILE

B-1 → B-4
B-50 → B-54



AS BUILT NONE (IF 4/76)
CORRECTIONS BY O.D. Maxie

STATE OF CALIFORNIA

SHEET 5 OF 6

CROSS CANYON CULVERT

- Penetrometer
- 2½" Cone Penetrometer
- Sampler Boring (Dry)
- Rotary Boring (Wet)
- Auger Boring (Dry)
- Jet Boring
- Core Boring
- Test Pit

1" Soil Tube

Ro

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

MATCH LINE ST

B-49

B-9
B-11
B-12

B-46 → B-49

1480
1470
1460
1450
1440

58+20

59

B-46

1451.2

Brown, very fine to medium sand. Very dense, yellow-brown, decomposed granite.

11-11-68

61' Rt. Sta. 58+20 Random Line

B-47

1465.1

Brown, organic rich, fine to medium sand with numerous rock fragments.

Very dense, grey, decomposed granite. (possible shear zone)

Refusal P 12-12-68

112' Lt. Sta. 58+50 Random Line

B-48

1467.2

Brown, organic rich, fine to medium sand with numerous rock frequents.

Very dense, light gray, decomposed granite. (possible shear zone)

Refusal P 12-12-68

146' Lt. Sta. 58+50 Random Line

B-49

1459.2

Buff poorly sorted sand with numerous cobbles and boulders

Very dense, light gray, decomposed granite (shear zone)

12-12-68

94' Lt. Sta. 59+20 Random Line

B-12

1458.1

Refusal 12-4-68

41' Rt. Sta. 59+40 Random Line

B-11

1457.2

Refusal 12-4-68

68' Rt. Sta. 59+40 Random Line

B-9

1462.6

Refusal 12-4-68

1464.1

12-4-68

91' Rt. Sta. 59+50 Random Line

FIELD STUDY	by R.E. CORBALLEY 12-19-68
DRAWN	by W. MARTIN 12-31-68
CHECKED	by [illegible] 1-3-69
Approval Recommended by	[signature] 1/22/69 Bridge Engineer Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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LEGEND OF EARTH MATERIALS

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

- Penetrometer
- 2½" Core Penetrome
- Sampler Boring (Dry)
- Rotary Boring (Wet)
- Auger Boring (Dry)
- Jet Boring
- Core Boring
- Test Pit

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

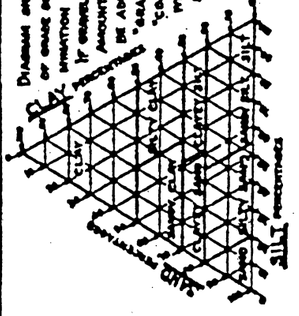
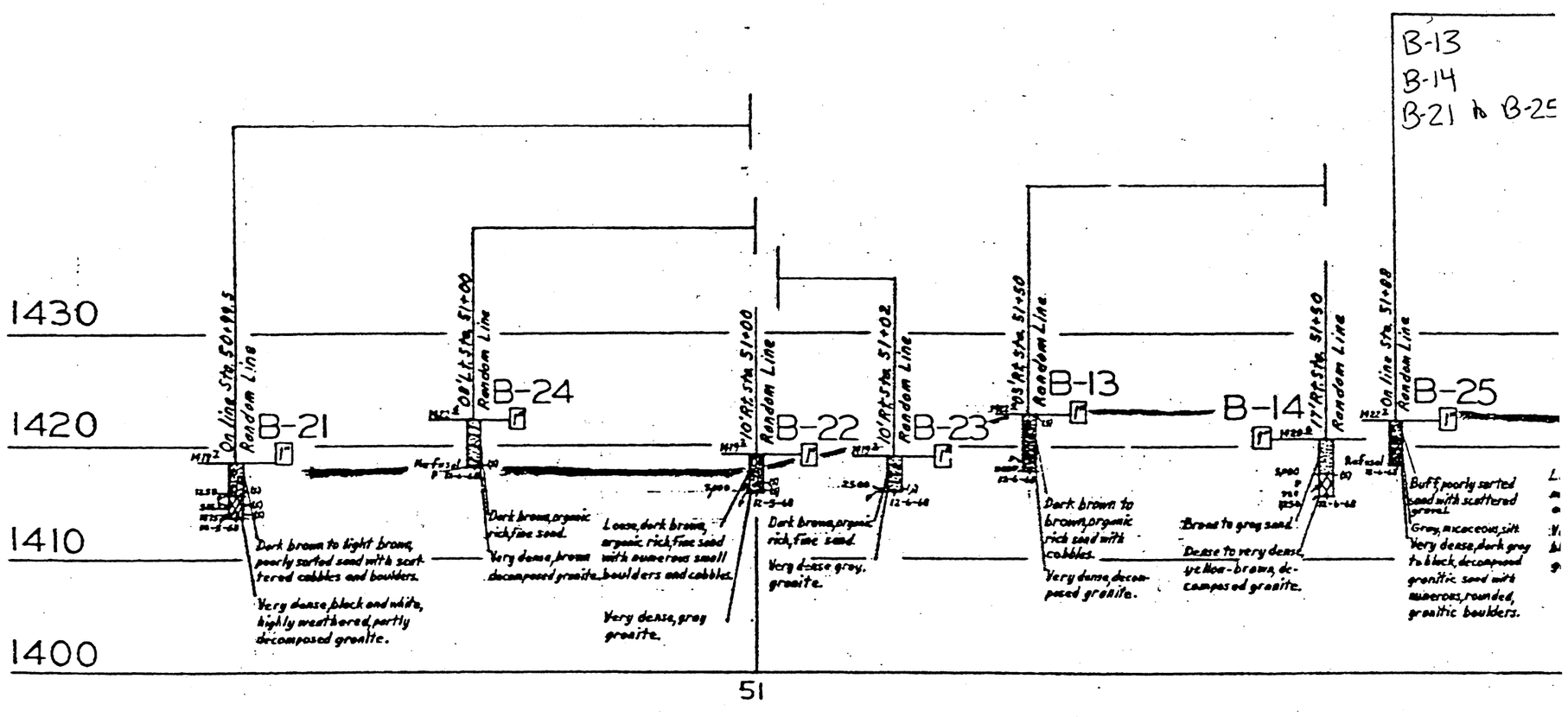


Diagram showing the basis for estimated percentages of grain size distribution used in determination of class names. If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse," "medium" and "fine" when used to describe sand, silt and gravel refer to standard grain size limits.

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.



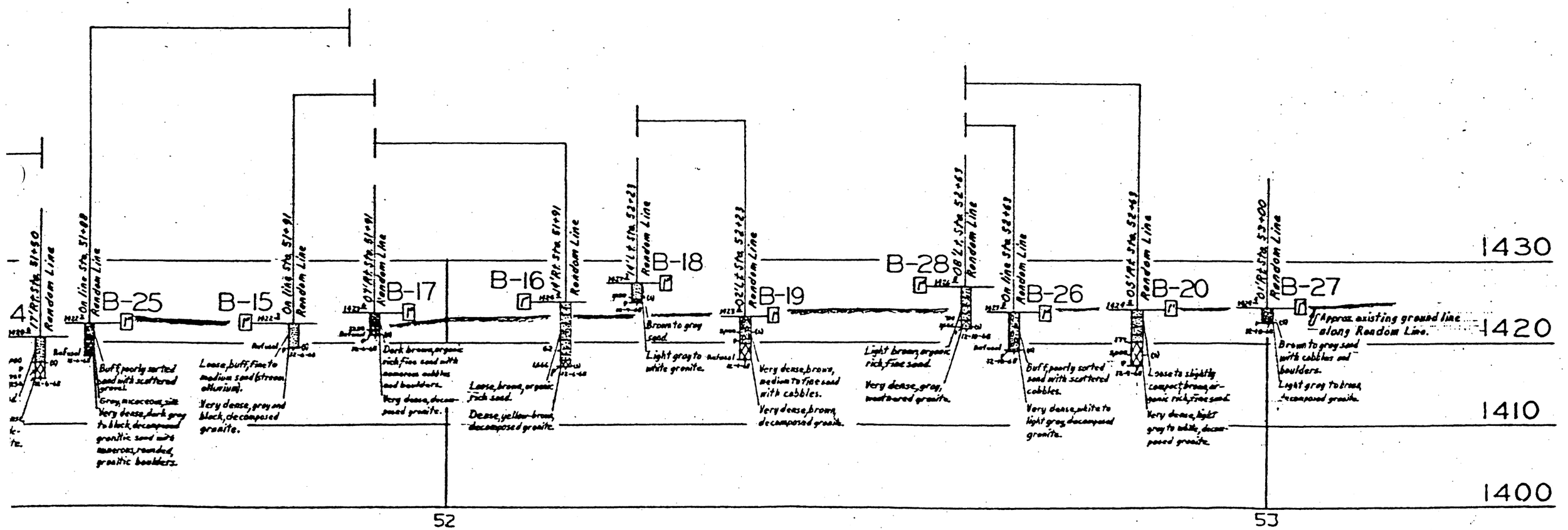
AS BUILT PLANS
Contract No. 07-063744
Date Completed
Document No. 7000 7379

Scale:

B-15 to B-20
B-25 to B-28

PLAN

Scale: 1"=20'

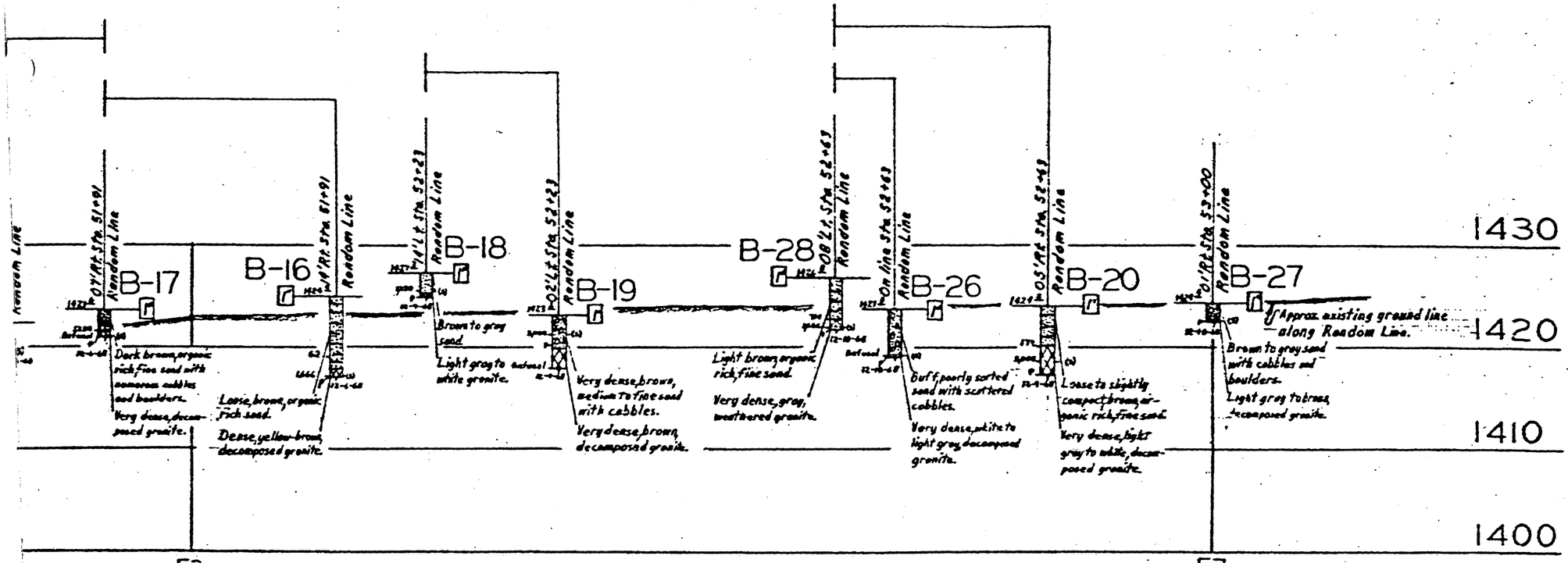


PROFILE

Scale: Hort. 1"=10'

AS BUILT NONE if 4/x
CORRECTIONS BY O.D. Maxim

B-16 to B-20
B-26 to B-28



AS BUILT NONE if 4/x

CORRECTIONS BY O. D. Maxim

CONTRACT NO. 07-063743

DATE 10-28-75

STATE OF CALIFORNIA

SHEET 1 OF 6

CROSS CANYON CULVERT

LOG OF TEST BORINGS NO.1

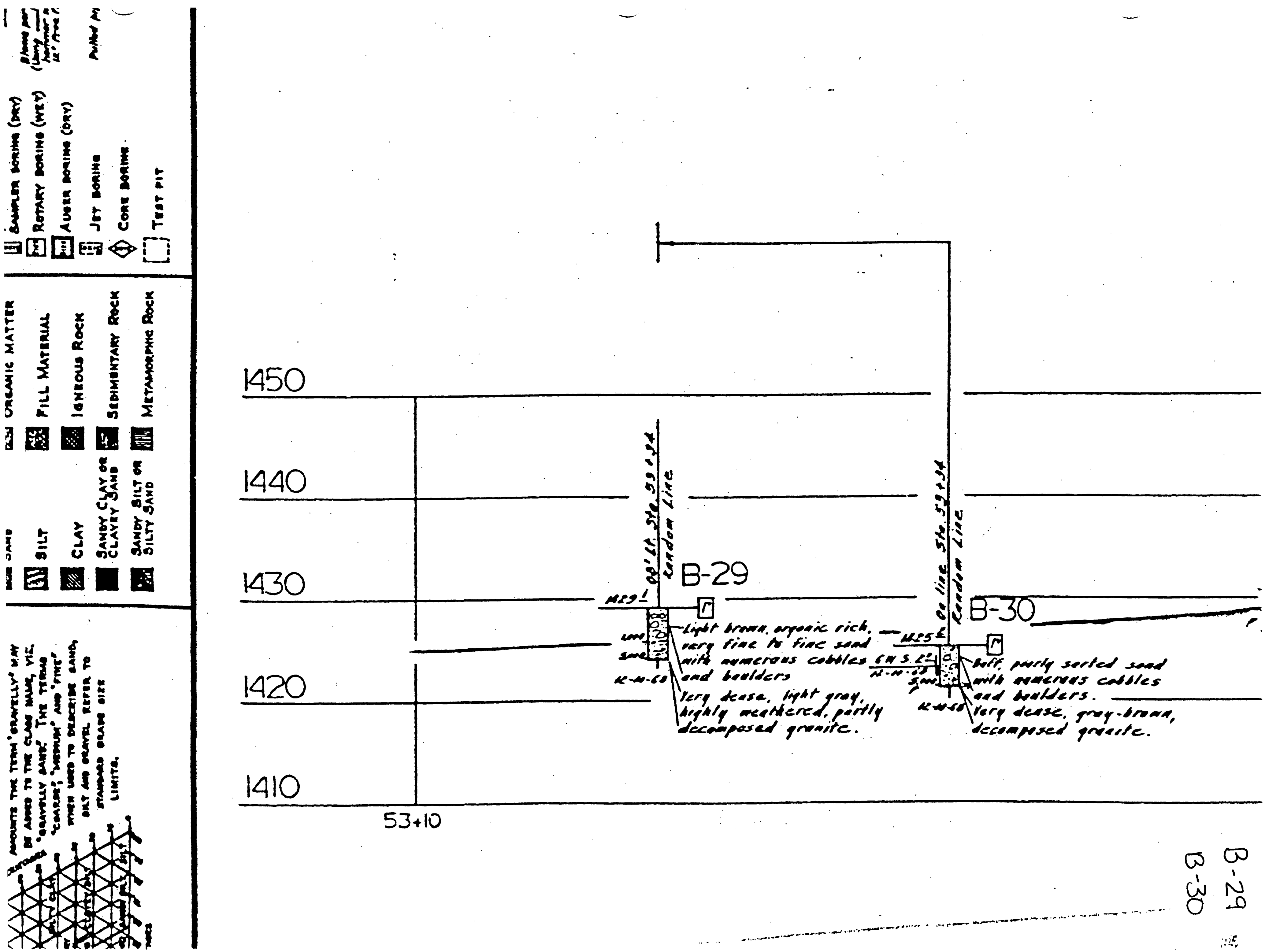
BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
53-2359	06	532359	8	13

WO 063741
CU 07203

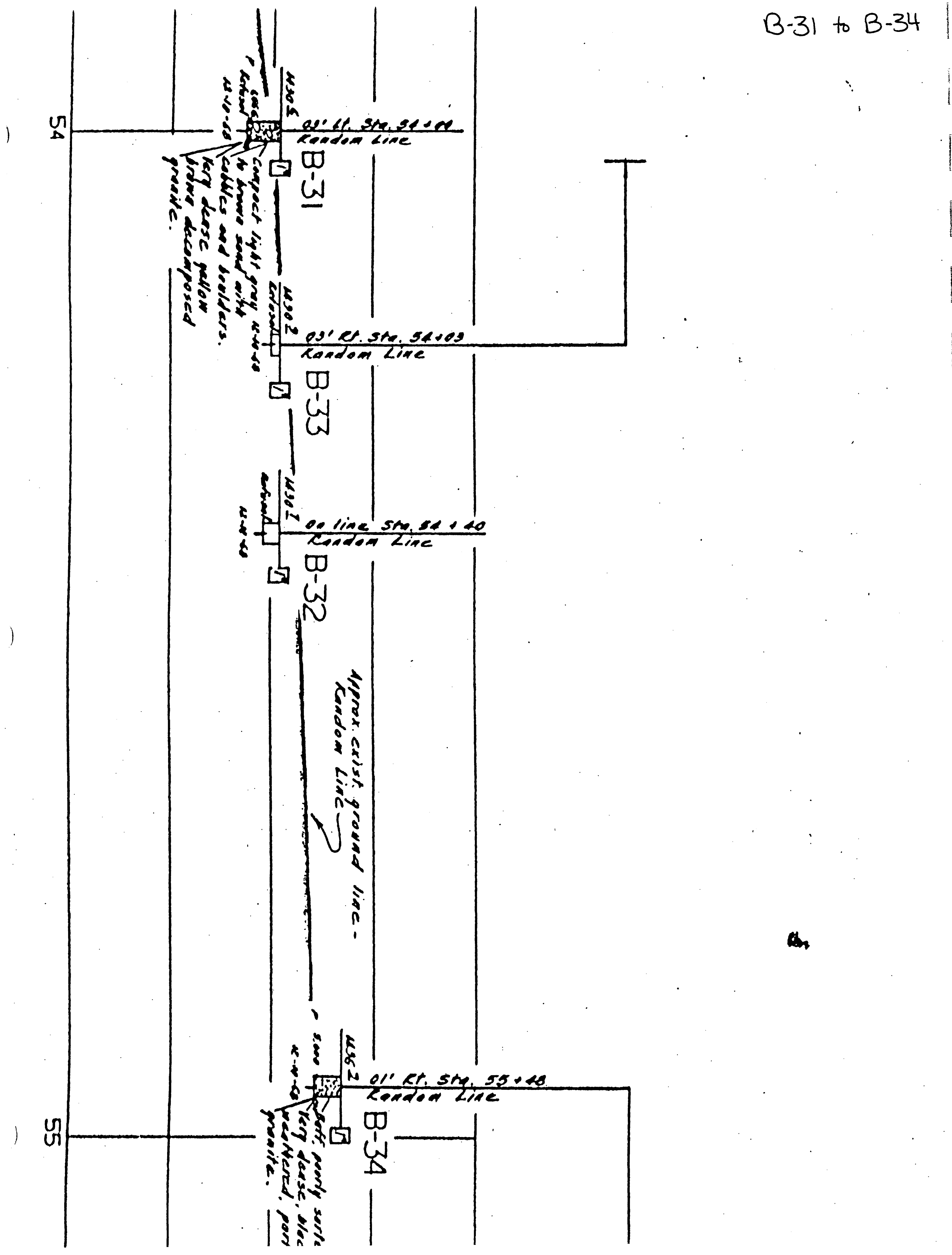
Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY ERASE ONLY)

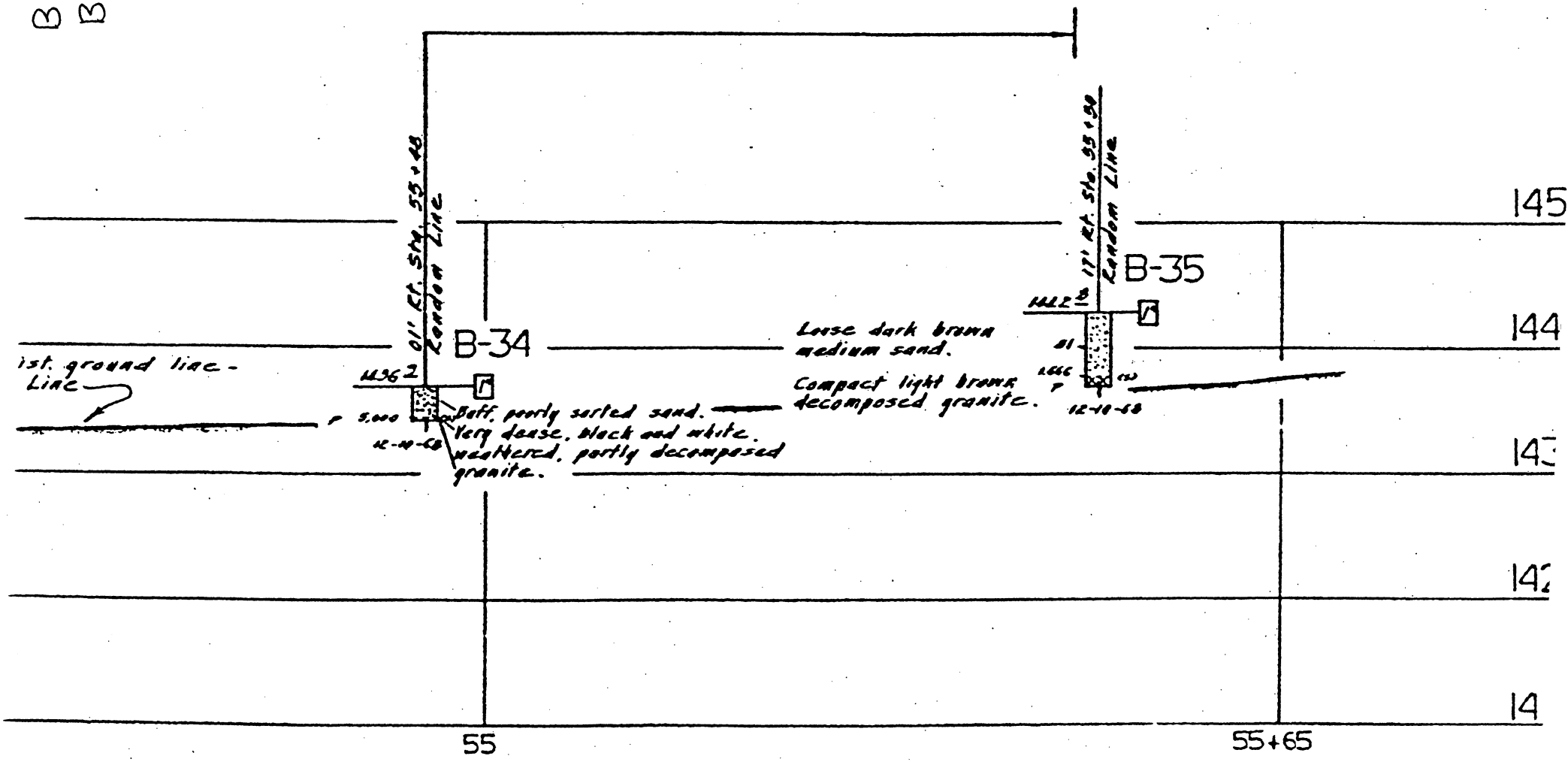
9/5/6


B-29
B-30
1450
1440
1430
1420
1410
53+10
B-29
08' Lt. Sta. 53+34
Random Line
Light brown, organic rich, very fine to fine sand with numerous cobbles and boulders
Very dense, light gray, highly weathered, partly decomposed granite.
B-30
On line Sta. 53+34
Random Line
Buff, poorly sorted sand with numerous cobbles and boulders.
Very dense, gray-brown, decomposed granite.
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
ORGANIC MATTER
FILL MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

B-31 to B-34


54
01' Lt. Sta. 54+04
Random Line
B-31
Compact light gray to brown sand with cobbles and boulders.
Very dense yellow brown decomposed granite.
03' Rt. Sta. 54+09
Random Line
B-33
On line Sta. 54+40
Random Line
B-32
Approx. exist. ground line -
Random Line
01' Rt. Sta. 55+48
Random Line
B-34
55

B-34
B-35



AS BUILT NONE
LF 4/76
CORRECTIONS BY D.D. Maxie
CONTRACT NO. 07-063743

STATE OF CALIFORNIA

SHEET 2 C

CROSS CANYON CULVERT

TEST BORINGS

APPENDIX E

SEISMIC REFRCTION SURVEY

Sub Surface Surveys

215 So. Highway 101, Suite 203 P.O. Box 1152 Solana Beach, CA 92075
Telephone: (858) 481-8949 Facsimile: (858) 481-8998 E mail: geop@subsurfacesurveys.com

February 26, 2002

Zeiser Kling Consultants, Inc.
1221 E. Dyer, Suite 105
Santa Ana, Ca 92705

Project Number: 02-056

Attn: James Chestnut

Re: Seismic Refraction Survey, Canyon Hills, Tujunga, California

Introduction - This report presents the findings of a seismic refraction survey conducted over raw land planned for residential construction located north and south of the 210 Freeway near La Tuna Canyon Road in Tujunga, California (Figure 1) on February 7 and 8, 2002. The purpose of this survey was to evaluate the depth to bedrock, and rippability characteristics of materials at proposed cut locations.

Instrumentation and Field Procedure - A total of 1338 lineal feet of data was collected along 6 survey lines. The seismic line locations were marked in the field with stakes and were detailed on a topographic map by the client's representative (Figures 2 through 5). The spread layouts were determined at the site, and were critically located to maximize useable information, with respect to anticipated earthwork/grading. As a general rule of thumb, the depth of investigation achieved with a seismic refraction traverse will be approximately 1/3 of the total spread length.

Seismic waves were initiated at the ends of each spread by striking an aluminum plate with a 16-pound sledge. Seismic arrivals were detected by a series of twenty four geophones, and recorded with a Bison multi channel signal enhancement seismograph. Four to six shots were vertically summed to increase energy input, and to combat cultural noise. The materials at the site provide good transmission of seismic energy, and the records produced are of good quality.

Methodology - The refraction method uses first-arrival times of refracted seismic waves to determine the thicknesses and seismic velocities of subsurface materials. Seismic waves generated at the surface are reflected and refracted from boundaries separating materials of contrasting velocities, and are detected by a series of surface geophones. The travel times of the seismic waves are used in conjunction with the shot-geophone distances to obtain thickness and velocity information.

Sub Surface Surveys

SITE LOCATION MAP

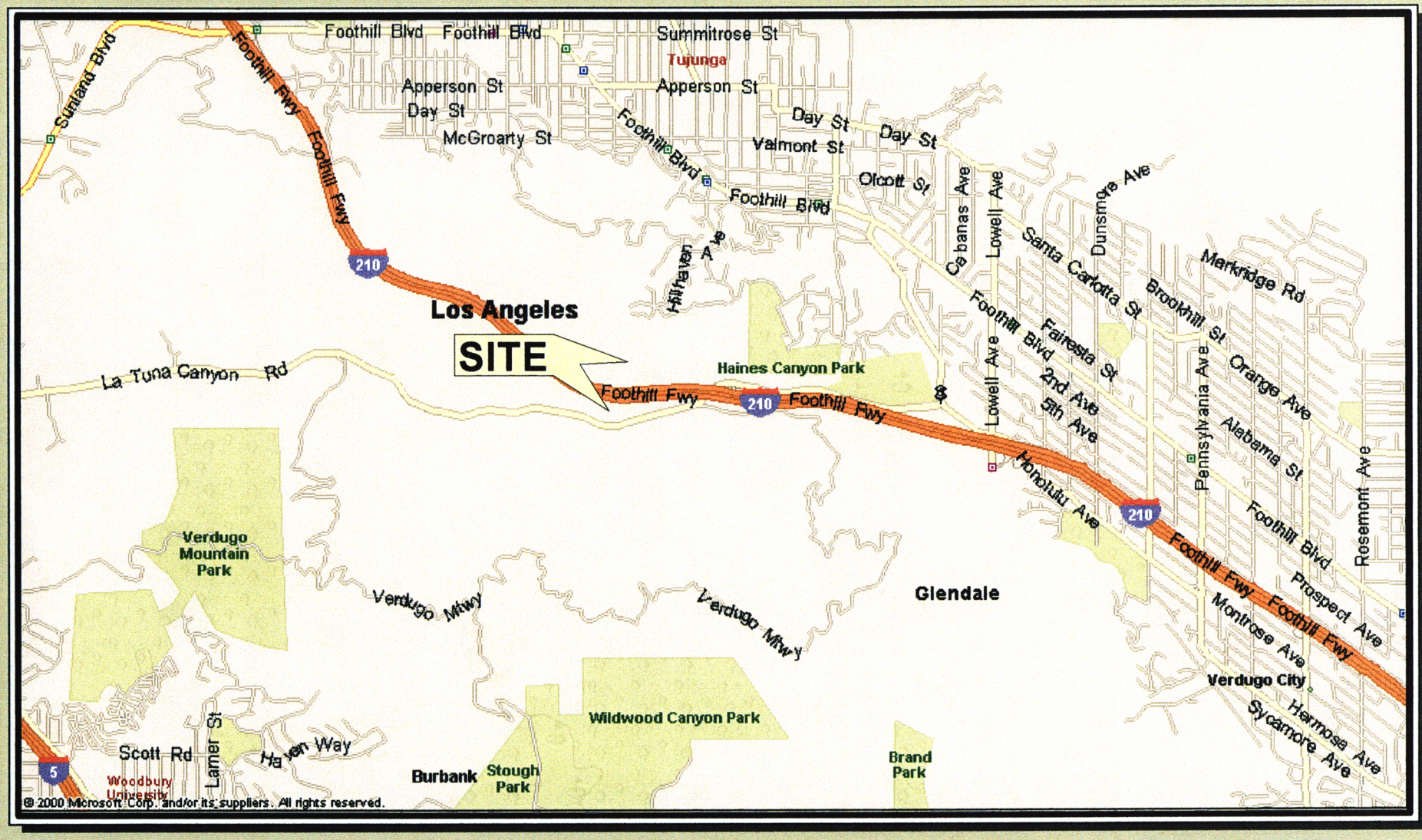


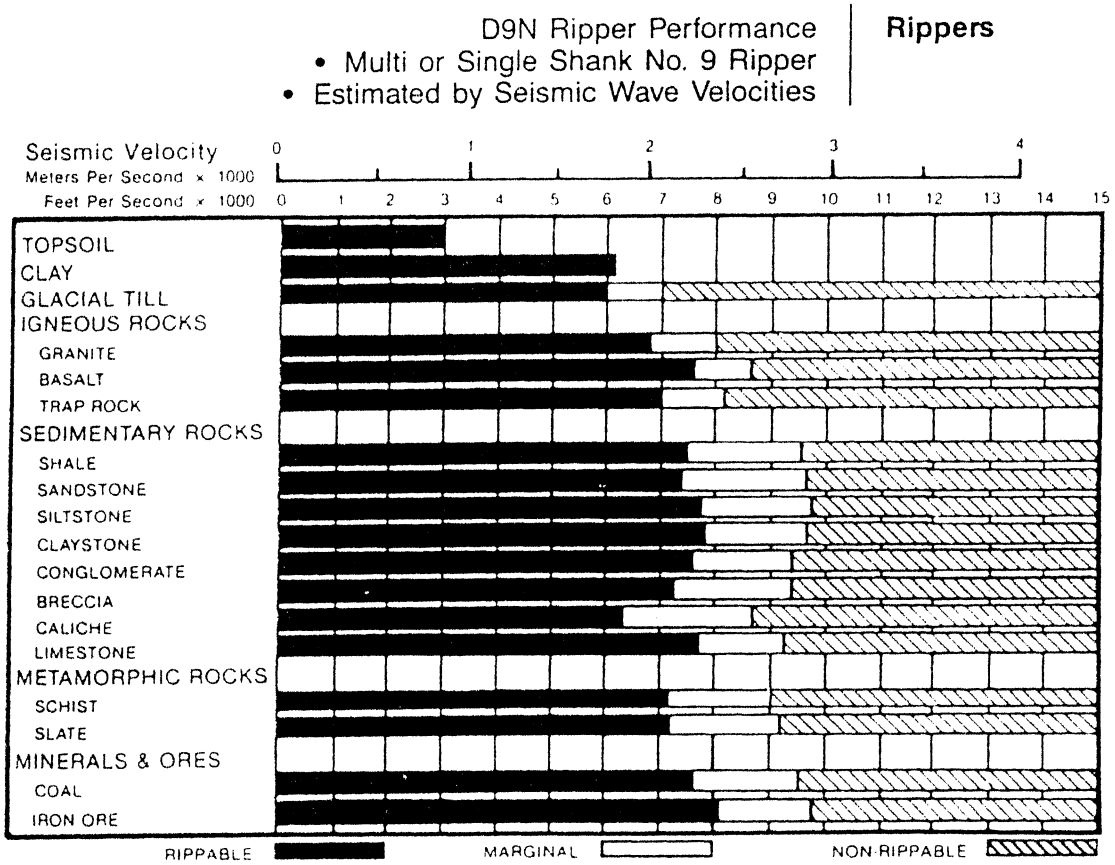
FIGURE 1

The seismic refraction technique requires that velocities increase with depth, which is usually the case. A layer having a velocity lower than that of the layer above will not be detectable by seismic refraction, and will lead to errors in the depth computations to any subsequent layers.

The processing of the acquired data is computationally intense. A ray tracing computer program, SIPT2, is used to iteratively honor all detector information to determine dip and irregularities in the refracting surfaces, and to be able to consider a large number of layers, where they are developed. A picking program, with such features as zoom, filtering, time stretching, and separation of traces, is also used.

Rock Rippability Classification - In order to group the materials to be excavated in terms of difficulty of excavation, Caterpillar has adopted a three-fold classification scheme, the independent variable being seismic velocity. This classification is based on experience with similar rocks in various locals, and assumes multi or single shank D9N or equivalent equipment.

The rocks are classified as follows:



Marginal ripping refers to rocks in which it becomes difficult to achieve tooth penetration, sharply reducing ripping production. Local blasting may be necessary in order to maintain a desired ripping production rate. Non-rippable refers to rocks in which the use of heavy machinery is likely to cease being a cost-effective method of excavation, necessitating the use of explosives to maintain a desired excavation rate. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a major role in determining rock rippability.

Findings - The data recorded (Figure 6) is displayed in Time-Distance plot format in order to complete layer assignments (Figure 7). The curves for the forward, mid and reverse shots are displayed in the same graph. Two layers are exhibited in the curve for Line 5. Also there is significant irregularity in the portion of the curve representing the deeper layer. Part of this irregularity is due to the undulatory nature of the layer boundaries.

After layers are identified in the time-distance plots, the redundant data provided by forward and reverse shots over each spread, are input into the iterative, ray tracing modeling program. The resulting geologic structure sections are illustrated on Figures 8 through 13. All of the seismic lines (Lines 1-6) collected illustrate a two-layer case. These layers are interpreted to represent alluvium/colluvium overlying weathered bedrock. The velocities of these layers are also well defined:

Layer	Velocity (ft/sec)	Material
1	1000-1400	Alluvium/Colluvium
2	2500-3650	Weathered bedrock

Note: The measured seismic velocities represent average velocities of the subsurface materials, and significant local variations related to locally unfractured zones or other causes may be present at any level.

Conclusions - The interpretation for the seismic lines collected agree well. Depths to weathered bedrock for Lines 1 – 6 will range between 3 and 16 feet b.g.s.. Based on the measured seismic velocities, material in layer 1 and 2 would be classified as rippable. These conditions should be expected throughout the depth of investigation achieved for each seismic spread. In most cases a line length of 240 feet was employed (Lines 2, 3, 4, & 6) which results in a depth of investigation of approximately 80 feet b.g.s.. However, in two cases, field conditions dictated a shorter spread length of approximately 150 feet (Lines 1 & 5) resulting in a depth of investigation of approximately 50 feet b.g.s..

All data acquired in these surveys are in confidential file in this office, and are available for review by your staff, or by us at your request, at any time. We appreciate the opportunity to participate in this project. Please call, if there are questions.

Lawrence J. Favilla, GP 969
Senior Geophysicist