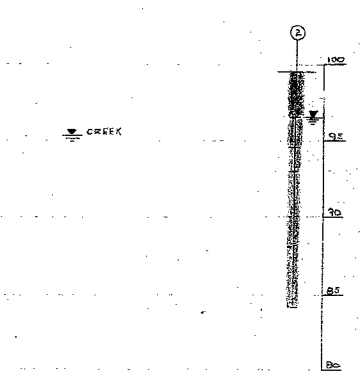
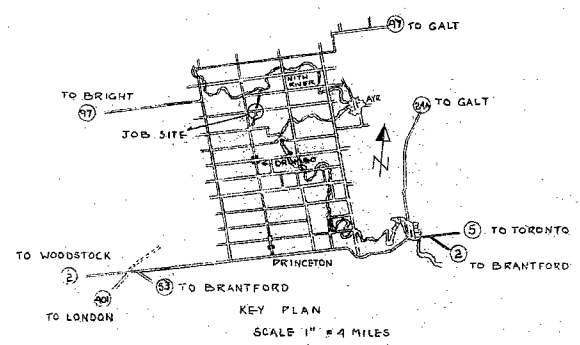
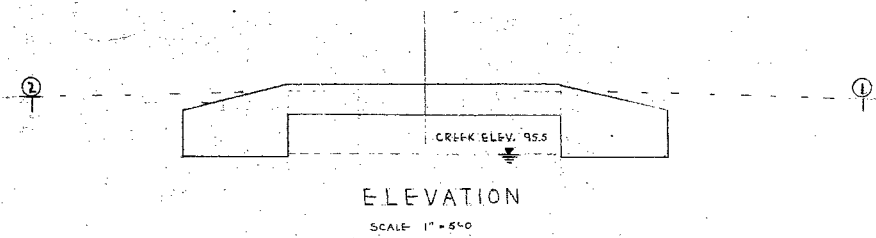
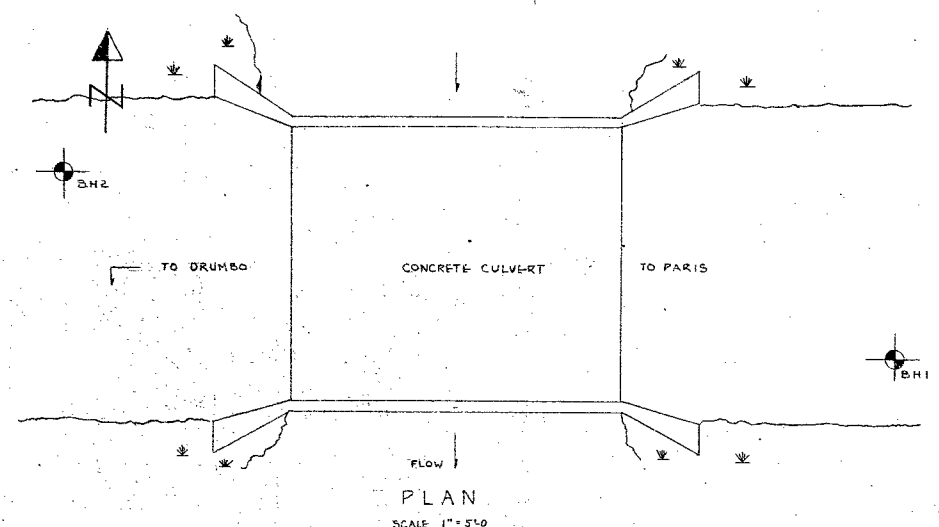


#63-F-277M

NEW CULVERT

CON. X

COUNTY OF  
OXFORD



- LEGEND-
- COMPACT BROWN SAND AND GRAVEL FILL
  - VERY LOOSE GREY AND BLACK ORGANIC SILTY FINE SAND AND GRAVEL
  - MUSKEG
  - VERY LOOSE GREY ORGANIC SAND AND GRAVEL
  - COMPACT GREY SILTY FINE TO COARSE SAND AND GRAVEL
  - WATER LEVEL APRIL 63
  - BOREHOLE IN PLAN
  - BOREHOLE IN SECTION

FRANKI OF CANADA LIMITED			
SOIL INVESTIGATION DIVISION			
Toronto	Montreal	Edmonton	Vancouver
COUNTY OF OXFORD		CONTRACT	PC 1192
		DATE	APRIL 63
PROPOSED CULVERT		SCALE	AS NOTED
NEAR DRUMBO, ONTARIO		DRAWN	Y.C.
BORING PLAN AND SOIL STRATIGRAPHY		APPROVED	[Signature]
		DRG. NO.	1192-1

Mr. K. L. Kleinsteinber,  
Municipal Bridge Liaison Engr.,  
Bridge Division.

Attn: Mr. G.C. Burkhardt.

Mr. A. G. Stermac,  
Principal Foundation Engr.,  
Foundation Section,  
Materials & Research Division.

June 6, 1963

Soil Investigation by Franki of Canada, Ltd.  
Proposed New Culvert, Concession X, County of  
Oxford, North of Drumbo, Ont. (BA 1652)

We have reviewed the above-mentioned report and herewith, submit our comments for your consideration:

The Consultant recommends the structure to be directly or indirectly founded at or below elevation 93.0. For the indirect foundation, the Consultant recommends the material above elev. 93.0 to be excavated and replaced with clean, well graded coarse gravel which should be well compacted, preferably in shallow lifts. It is stated that compaction may be obtained by hand tamping or by mechanical vibratory equipment.

We find it difficult to understand the recommendation pertaining to compaction, because the excavation will be under water. If pumping is applied, boiling of the silty fine to coarse sand and gravel layer will occur unless sheet piling driven to adequate depth around the excavation is used. We, therefore, feel that the gravel could only be placed without compaction.

From the attached drawing, we conclude that the bridge designer, C. C. Parker and Associates, Ltd., has chosen to put the footings at elevation 89.0. This will require quite deep an excavation, and a proper dewatering scheme should be used. The designer's as well as the contractor's attention should be drawn to the possibility of boiling or quick-sand conditions if an unbalanced hydrostatic head is created, and appropriate measures to cope with it are not undertaken.

AGS/MdeF

cc: Foundations Office  
Gen. Files

*A. G. Stermac*  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

BA 1652

FRANKI OF CANADA, LIMITED

SOIL INVESTIGATIONS

C. C. PARKER AND ASSOCIATES LIMITED	
REC'D	April 30 1963
READ BY	
COPY TO	
RE TO BY	
214 MERTON ST. TORONTO	
HU. 1-6426-7	
25th April 1963	

County of Oxford,  
c/o C.C. Parker and Associates  
Limited,  
Consulting Professional Engineers,  
795 Main Street West,  
Hamilton,  
Ontario.

Dear Sirs,

Re: Soil Investigation  
Proposed New Culvert  
Concession X, County of Oxford  
North of Drumbo, Ontario

This letter reports on the above soil investigation, which we carried out in accordance with your verbal instructions.

We submit this report in brief letter form in order to keep the cost of the work to a minimum, in accordance with your request.

PROCEDURES

The field work was carried out on 9th April, 1963, and consisted of two detailed boreholes with adjacent dynamic penetration tests at either side of the existing culvert, as shown on Drawing 1192-1. A detailed log of each boring is given on the Boring Records.

Because of the simplicity of the soil conditions, no laboratory testing was carried out. The samples obtained, however, will be stored until November 1st 1963 and then discarded unless other instructions are received.

Elevations referred to in this report are related to a local datum consisting of the top of the culvert in the centre line of the road. This datum was taken as elevation 100.00.

SOIL CONDITIONS

The Boring Records give a detailed account of the soil conditions. Briefly, the site is covered by road fill consisting of relatively clean sand and gravel, extending to about 4 feet in borehole 1 and about 5 feet in borehole 2. The lower 2 feet of this fill is mixed with the original topsoil which was not removed, during construction of the existing culvert. The lower part

continued .....

of the fill therefore is organic and contains pieces of decayed wood. In borehole 2, a layer of dark brown spongy and fibrous muskeg was encountered, about 1.5 feet in thickness. At comparable depth in borehole 1, a layer of very loose organic sand and gravel was encountered.

This organic sand and gravel in borehole 1 and the muskeg in borehole 2 is underlain by a stratum of grey silty fine to coarse sand with gravel, extending to the depth explored. This material is laminated, stratified, and cross-bedded, resulting in slight variations in composition in both horizontal and vertical directions. Generally, the material becomes coarser with depth. The gravel content is about 15 percent by weight and the average size is of the order of 1/4-inch. The standard and dynamic penetration resistance indicated that the relative density of the stratum is generally compact.

#### WATER CONDITIONS

The ground water level at the time of the investigation was encountered at elevations 97.5 and 96.5 in boreholes 1 and 2 respectively. Sufficient time was not available to determine the stationary water level in the boreholes. However, the water level in the creek at the time was at about elevation 95.7 and it is considered that the level of the creek at any time would coincide with the ground water level at the locations of boreholes 1 and 2.

#### FOUNDATIONS

From observations at the site, it appears that the existing culvert is founded at about elevation 95.7 or at the present water level in the creek. It further appears that the abutments are bearing directly on natural soil of which the organic part was not removed, or on fill which was placed on the natural soil again without removal of organic material.

At the present time the culvert is in a secondary county road for local traffic. Assuming that the class of road will remain the same, it is considered that the foundation treatment for the new culvert will only have to be so that it satisfies the present requirements.

It is considered that the most economical way to obtain a satisfactory foundation would be to dredge the abutment sites to elevation 93. The excavated material should then be replaced with clean well graded coarse granular material which should be well compacted preferably in shallow lifts. This procedure could be used with or without diverting the creek. Compaction may be obtained by hand tamping or by mechanical vibratory equipment. The new abutments may be placed on the compacted granular mat. When adequate compaction has been obtained, an allowable bearing pressure of the order of 3000 pounds per square foot may be used, which should be more than sufficient to accommodate the proposed structure.

continued .....

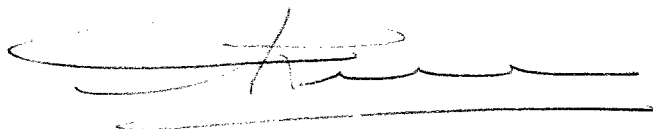
3.

Depending on the design and condition of the present structure, it may be possible to use this structure as sheeting for the excavation and/or for form work for the new structure.

In conclusion, it is considered that the foundation treatment of the new culvert is dependant on economy, class of traffic and required life span. The main requirement from a viewpoint of soil mechanics is that the abutments be founded either directly or indirectly at or below elevation 93.

We trust that this letter contains the information which you require to proceed with the design. If, however, you have any further questions, please call us.

Yours very truly,  
FRANKI OF CANADA LIMITED

A handwritten signature in dark ink, appearing to be 'A. Prior', written over a horizontal line.

A. Prior, P. Eng.  
Divisional Soils Engineer

AP/DRB

BORING RECORDS

The boring records on the following pages give a comprehensive picture of the soils information obtained from each boring. The explanation of the various headings is given below:

SOIL PROFILE

Under this heading is given a short form description of the various soils encountered. The elevations given are referred to the Datum shown on the general heading.

In the description of the soil, the consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

<u>Consistency</u>	<u>Shear Strength</u> <u>pounds/sq.foot</u>	<u>Relative</u> <u>Density</u>	<u>Standard</u> <u>Penetration</u> <u>blows/foot</u>
Very soft	less than 250	Very loose	less than 4
Soft	250 -- 500	Loose	4 -- 10
Firm	500 -- 1000	Compact	10 -- 30
Stiff	1000 -- 2000	Dense	30 -- 50
Very stiff	2000 -- 4000	Very dense	more than 50
Hard	more than 4000		

STANDARD PENETRATION RESISTANCEDYNAMIC PENETRATION RESISTANCE

Under this heading are shown graphically the penetration resistances as a function of blows per foot. The dynamic penetration resistance is obtained by the continual driving of a standard 2-inch 60-degree cone and observing the blows required for each foot of penetration. The standard penetration resistance is obtained during driving of a standard 2-inch drive or split-spoon sampler and observing the blows required to advance the sampler 1 foot. For both tests the driving force consists of a 140-pound hammer dropping 30 inches.

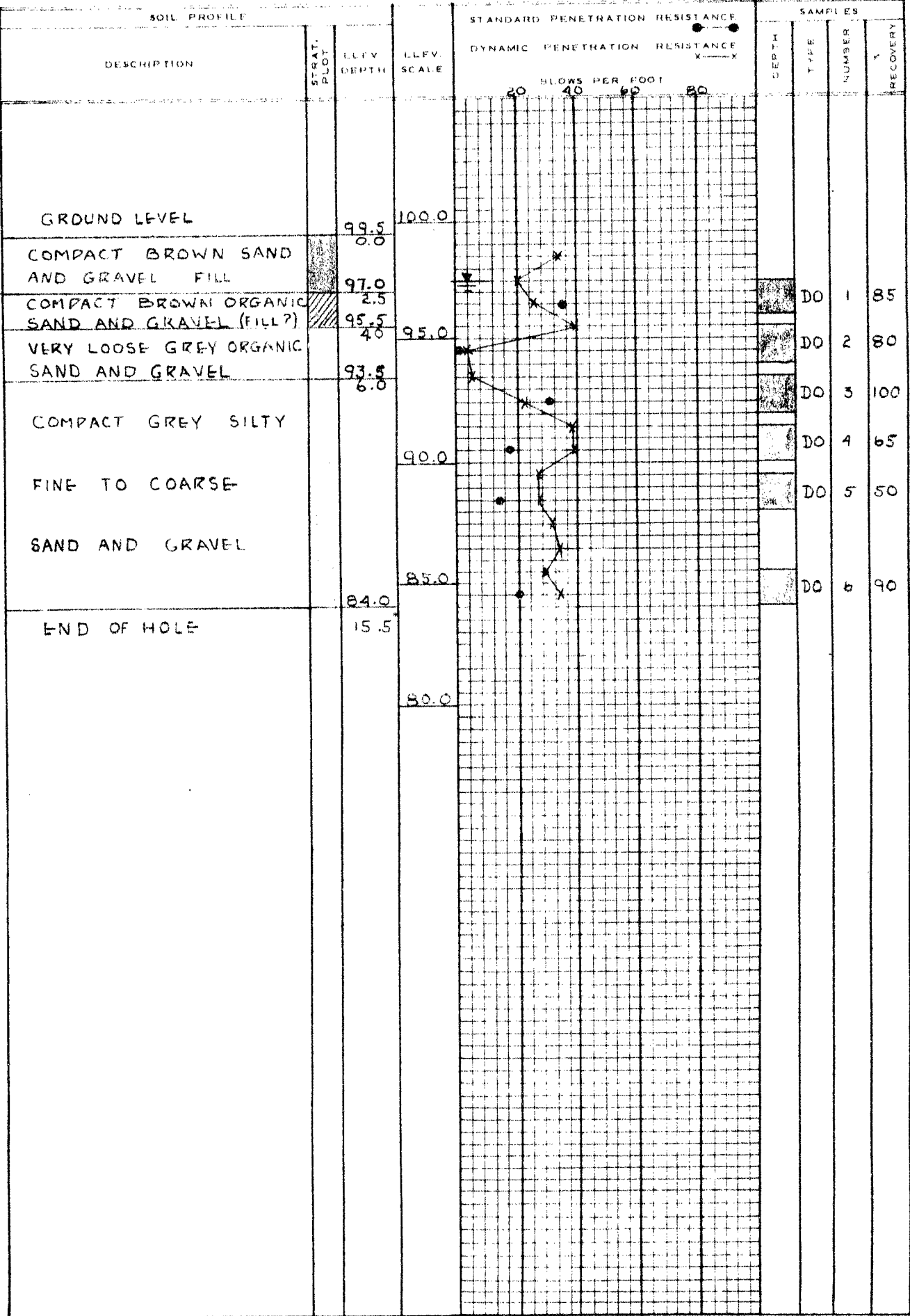
SAMPLES

Under this heading the samples taken are plotted to vertical scale in the first column. The second column shows the type of sampler used. The fourth column indicates the recovery as the percentage of the length over which the sampler is driven.

LABORATORY TESTS

When laboratory tests on samples obtained are carried out, the results are given on the right hand side of the form. The symbols used for individual tests are explained in the legend.

CONTRACT PC 1192 BORING 1 BORING DATE APRIL 9 1963  
DATUM LOCAL DIAM. 4 1/2" HAMMER 140 LBS. DROP 30 IN



SAMPLE TYPES

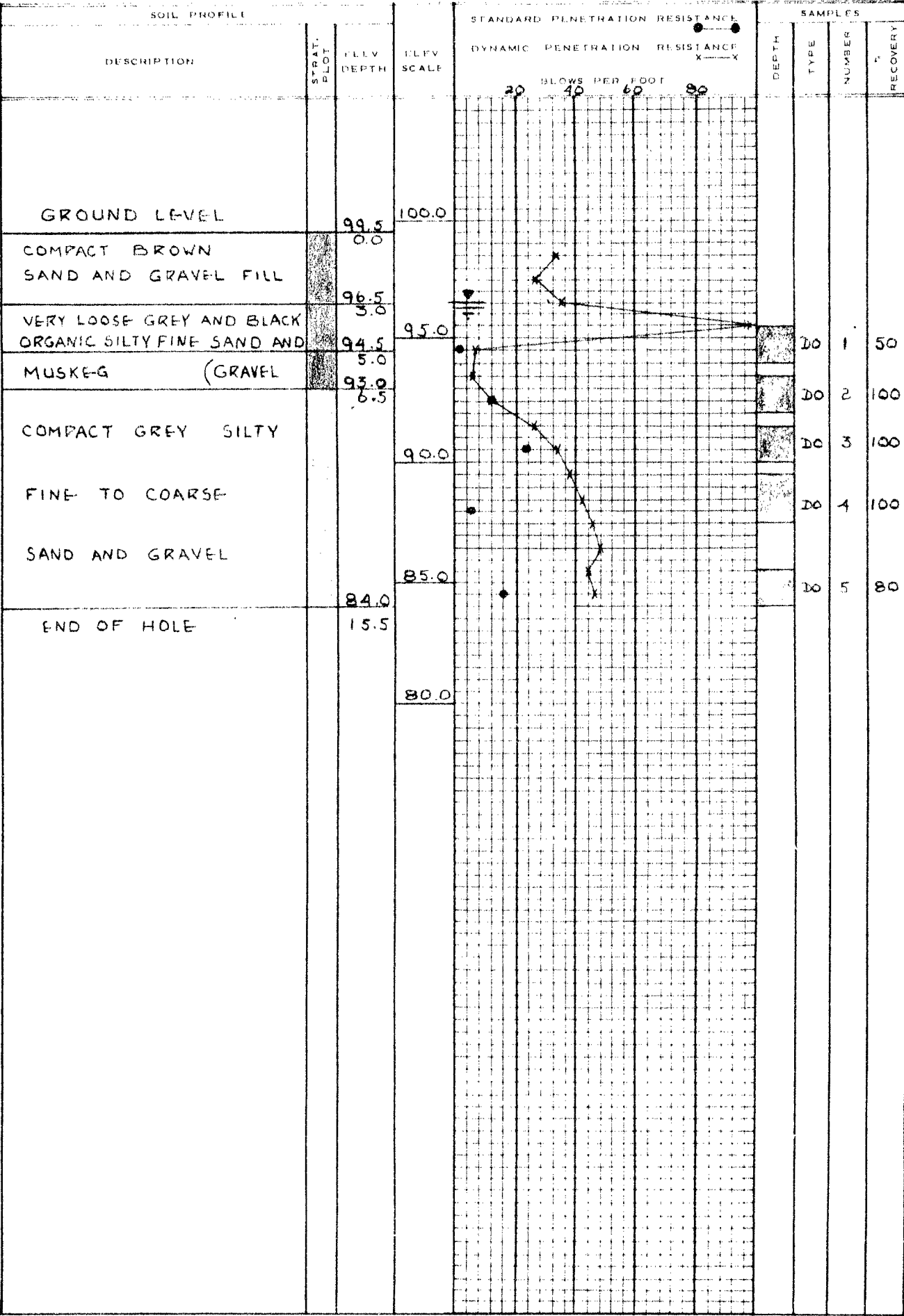
- AS AUGER SAMPLE
- DO DRIVE OPEN
- DF DRIVE FOOT VALVE
- SO SLEEVE OPEN
- SF SLEEVE FOOT VALVE
- TO THIN WALLED OPEN
- TP THIN WALLED PISTON
- WS WASHED SAMPLE

- RC ROCK CORE
- K<sub>F</sub> FIELD PERMEABILITY TEST
- ▽ GROUND WATER LEVEL AT TIME OF BORING

REMARKS



CONTRACT PC 1192 BORING 2 BORING DATE APRIL 9 1962  
DATUM LOCAL DIAM. 4 1/2 HAMMER 140 LBS. DROP 30 IN



SAMPLE TYPES

- AS AUGER SAMPLE
- DO DRIVE OPEN
- DF DRIVE FOOT VALVE
- SO SLEEVE OPEN
- SF SLEEVE FOOT VALVE
- TO THIN WALLED OPEN
- TP THIN WALLED PISTON
- WS WASHED SAMPLE

- RC ROCK CORE
- K<sub>f</sub> FIELD PERMEABILITY TEST
- ⏏ GROUND WATER LEVEL AT TIME OF BORING

REMARKS