

GENERAL INFORMATION

INTRODUCTION

The project consists of the construction of a section of IR 71, approximately 1.2 miles in length. The project begins 300 feet west of Bellaire Road, and extends eastward, terminating 1800 feet east of the B & O RR.

The proposed grade indicates cuts, maximum 28 feet in depth; and fill embankments, maximum 50 feet in height.

GEOLOGY OF THE PROJECT

The alignment traverses the Big Creek valley and valley walls where moderately deep to thin glacial-derived soils overlie shale bedrock, of Devonian age. Land fill and industrial waste have altered the natural topography in some areas.

EXPLORATION

The exploration consisted of borings made by means of truck-mounted mechanical soil auger, made on November 11 and 12, and between December 2 and 5, 1963. Included with this report are the logs of borings made for structure foundation investigations on the project and from the B & O RR and Big Creek Channel Relocation project.

INVESTIGATIONAL FINDINGS

Borings disclose that materials occurring immediately below proposed grade consist of gravels and silt clays, in the A-1-a and A-6 classifications, generally having low moisture contents or moisture contents in the lower portions of the plastic range, as well as shale bedrock, anticipated to be encountered between approximately stations 797+00 and 811+00, 814+00 and 823+00, 842+30 and 843+00, 846+00 and 847+20, and Westbound Lane stations 863+00 to 866+00.

Random fill, comprised of soil, brick bats, stone fragments, and cans, is anticipated to be encountered in the vicinity of stations 811+00 to 811+50.

Embankment foundation materials consist of gravels, sandy silts, silts and silt clays, in the A-1-b, A-2-4, A-4 and A-6 classifications, generally having low moisture or moisture contents in the lower portions of the plastic range.

LEGEND FOR PROJECT AVERAGE RESULTS OF TESTS— 54 SAMPLES TESTED

DESCRIPTION	H.R.B. CLASS	OHIO CLASS	% AGG.	% C. SAND	% F. SAND	% SILT	% CLAY	LIQUID LIMIT	PLASTICITY INDEX	WATER CONTENT	SAMPLES TESTED
Stone fragments	A-1-a(0)	A-1-a	72	8	5	8	7	NP	NP	10	1
Stone fragments with sand	A-1-b(0)	A-1-b	60	11	7	12	10	28	5	11	2
Stone fragments with sand and silt	A-2-4(0)	A-2-4	51	13	9	14	13	20	5	12	6
Stone fragments with sand, silt, and clay	A-2-6(0)	A-2-6	64	1	5	10	20	42	13	16	1
Sandy silt	A-4(5)	A-4a	18	10	13	34	25	18	4	15	8
Silt	A-4(8)	A-4b	3	2	6	52	37	10	2	27	3
Silt and clay	A-6(9)	A-6a	13	4	9	35	39	32	12	17	18
Silty clay	A-6(11)	A-6b	4	4	8	34	50	38	17	21	3
Clay	A-7-6(14)	A-7-6	0	3	4	25	68	46	22	21	3
Random fill											
Weathered shale											8
Shale											
Weathered sandstone											1
Sod and/or Topsoil—X'—Approximate depth.											
Berm material.											
Auger boring—plan view.											
Drive sample and/or core boring—plan view.											
Auger boring plotted to vertical scale only.											

NOTE: Figures beside borings indicate water content in percent. e.g. /5

REVISED - 10/26 /64.

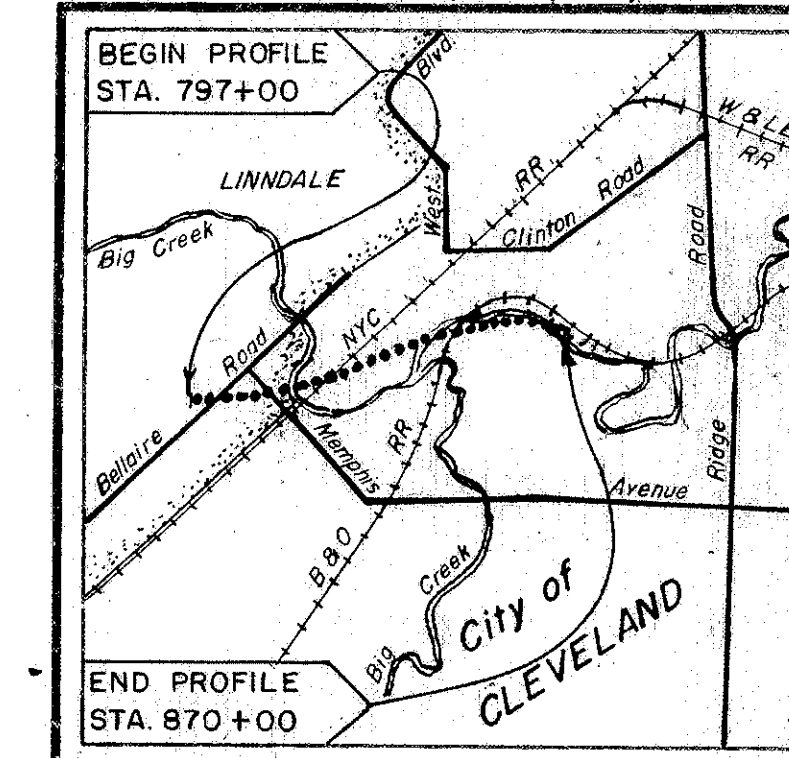
SOIL PROFILE

CUYAHOGA COUNTY
CUY-IR 71-13.68

OHIO STATE HIGHWAY TESTING LABORATORY
1620 W. BROAD ST. COLUMBUS 23, OHIO

NOTE: INFORMATION SHOWN BY THIS SUBGRADE PROFILE WAS OBTAINED SOLELY FOR USE IN ESTABLISHING DESIGN CONTROLS FOR THE PROJECT. THE STATE OF OHIO DOES NOT GUARANTEE THE ACCURACY OF THIS DATA AND IT IS NOT TO BE CONSTRUED AS A PART OF THE PLANS GOVERNING CONSTRUCTION OF THE PROJECT.

Fed. No. 1-75-5(18)247



LOCATION MAP

Recon - N.P.L. - 11/12/63

Drilling - B.D.L. - 11/21/63 and 11/22/63, 12/2/63 to 12/5/63

Drafting - C.L.I. - 9/28/64

REVISION

Drilling - B.D.L., T.R.S. - 12/4/63 and 12/5/63, 9/16/64.

Drafting - C.L.I. - 10/26 /64

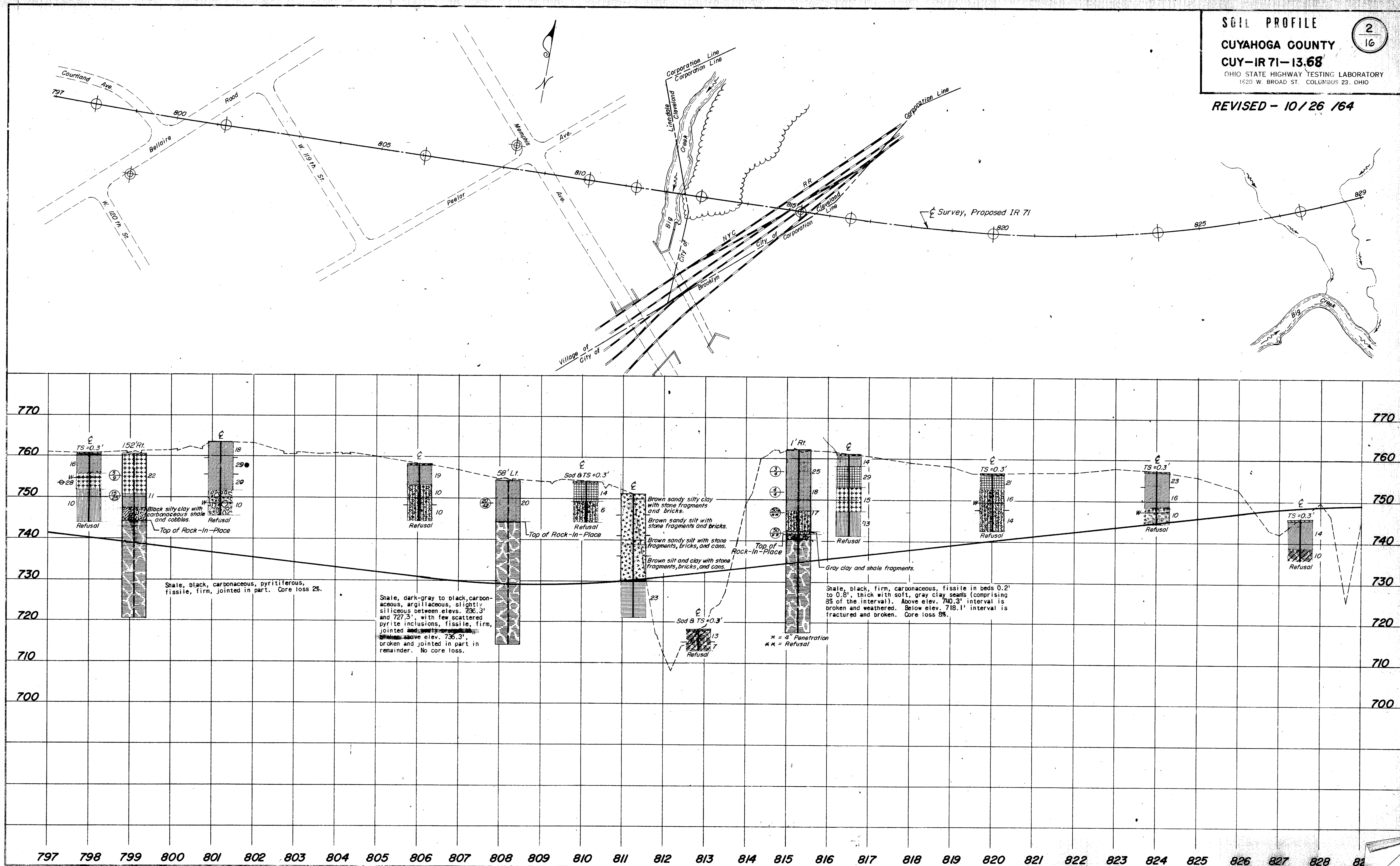
SUMMARY OF SOIL TEST DATA

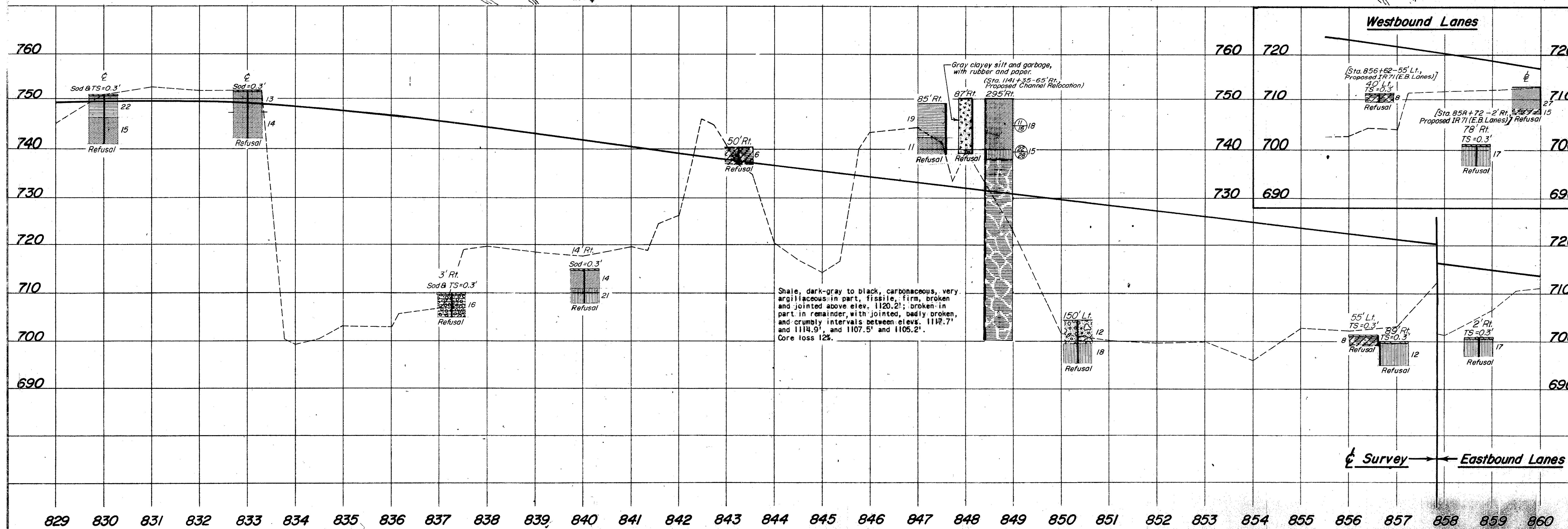
NOTE: NP shown in Liquid Limit and Plasticity Index columns indicates that the material is non-plastic. *Denotes sample taken at or near grade.

STATION & OFFSET	DEPTH	% AGG.	% C.S.	% F.S.	% SILT	% CLAY	L.L.	P.I.	% W.C.	SHTL
FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO	FROM-TO
CENTERLINE SURVEY										
798+00 CL	0.3-5.0	7	2	4	47	40	35	12	16	A-6a
	5.0-9.0	0	0	2	54	44	NP	NP	28	A-4b
	9.0-17.0	31	8	8	30	23	21	4	10	A-4a
801+20 CL	0.0-4.0	0	1	41	20	38	28	12	18	A-6a
	4.0-8.0	0	0	1	48	51	29	11	29	A-6a
	8.0-12.0	17	3	5	35	40	27	11	20	A-6a
	12.0-18.0	56	13	8	12	11	25	5	10	A-1-b
806+04 CL	0.3-5.0	5	8	9	42	36	31	11	19	A-6a
	5.0-10.0	48	13	11	19	9	NP	NP	10	A-2-4
	10.0-14.0	52	14	7	15	12	NP	NP	10	A-2-4
810+10 CL	0.3-5.0	0	6	7	33	54	44	22	14	A-7-6
	5.0-10.0	46	23	8	9	14	30	9	6	A-2-4
811+25 CL	0.0-5.0	Brown Sandy Silty Clay W/Stone Fragments and Bricks								Visual
	5.0-10.0	Brown Sandy Silt W/Stone Fragments and Bricks								Visual
	10.0-15.0	Brown Sandy Silt W/Stone Fragments, Bricks and Cans								Visual
	15.0-21.0	Brown Silt and Clay W/Stone Fragments, Bricks, and Cans								Visual*
	21.0-30.0	0	5	9	41	45	38	17	23	A-6b*
812+85 CL	0.3-3.0	Brown Weathered Shale								Visual
	3.0-5.0	Gray Weathered Shale								Visual
816+50 CL	0.3-3.0	20	7	24	27	22	NP	NP	14	A-4a
	3.0-8.0	0	0	0	18	82	48	24	29	A-7-6
	8.0-14.0	7	4	10	50	29	21	4	15	A-4b
	14.0-20.0	0	8	18	47	27	NP	NP	13	A-4a
820+00 CL	0.3-4.0	0	3	5	23	69	45	20	21	A-7-6
	4.0-9.0	50	9	8	16	17	30	9	16	A-2-4
	9.0-14.0	60	10	7	11	12	29	8	14	A-2-4
824+00 CL	0.3-4.0	0	5	6	36	63	32	11	23	A-6a
	4.0-9.0	9	5	8	31	47	35	14	16	A-6a
	9.0-13.0	72	8	5	8	7	-	-	10	A-1-a*
827+50 CL	0.3-7.0	6	4	6	45	39	29	11	14	A-6a
	7.0-10.0	Gray Weathered Shale								Visual
830+00 CL	0.3-5.0	0	3	8	33	56	38	17	22	A-6b*
	5.0-10.0	33	3	6	18	30	30	11	15	A-6a
833+00 CL	0.3-5.0	10	4	10	35	41	32	13	13	A-6a*
	5.0-10.0	18	4	9	32	37	30	11	14	A-6a*
837+27 3'Rt	0.3-5.0	64	1	5	10	20	42	13	16	A-2-7
840+03 14'Rt	0.3-4.0	0	1	10	41	48	37	14	14	A-6a
	4.0-7.0	0	14	11	43	32	35	9	21	A-4a
843+25 50'Rt	0.0-3.0	Gray Weathered Shale								Visual*
847+60 85'Rt	0.0-7.0	13	3	7	28	49	38	16	19	A-6b
	7.0-10.0	43	3	5	27	22	31	11	11	A-6a
848+15 87'Rt	0.0-11.0	Gray Clayey Silt and Garbage W/Rubber and Paper								Visual
850+35 150'Lt	0.0-5.0	65	9	5	12	9	30	6	12	A-1-b
	5.0-9.0	18	9	14	30	29	32	10	18	A-4a
850+62 55'Lt	0.3-2.0	Brown Weathered Shale								Visual
856+66 89'Rt	0.3-5.0	21	3	17	31	28	26	5	12	A-4a
Eastbound Lanes										
858+72 21'Rt	0.3-4.0	15	8	13	35	29	30	6	17	A-4a
DRIVE SAMPLE SOIL TEST DATA										
799+10 152'Rt	5.0-6.0	0	1	6	55	38	27	5	22	A-4b
	10.0-11.0	26	5	7	34	28	NP	NP	11	A-4a
808+22 58'Lt	5.0-6.0	45	4	3	28	20	32	11	20	A-6a
815+28 11'Rt	5.0-6.0	23	7	10	30	30	34	13	25	A-6a
	10.0-11.0	Brown and Gray Sandy Gravelly Clay								A-6a
	15.0-15.3	Gray and Brown Clayey Gravel								A-2-4
	20.0-20.5	Gray Clay and Shale Fragments								Visual
848+39 295'Rt	5.0-6.0	26	4	6	23	41	38	14	18	A-6a
	10.0-11.0	39	15	8	26	12	NP	NP	15	A-4a

* = Boring taken from CUY-IR 71 - Relocated B&O Railroad and Proposed Channel Relocation

REVISED - 10/26/64



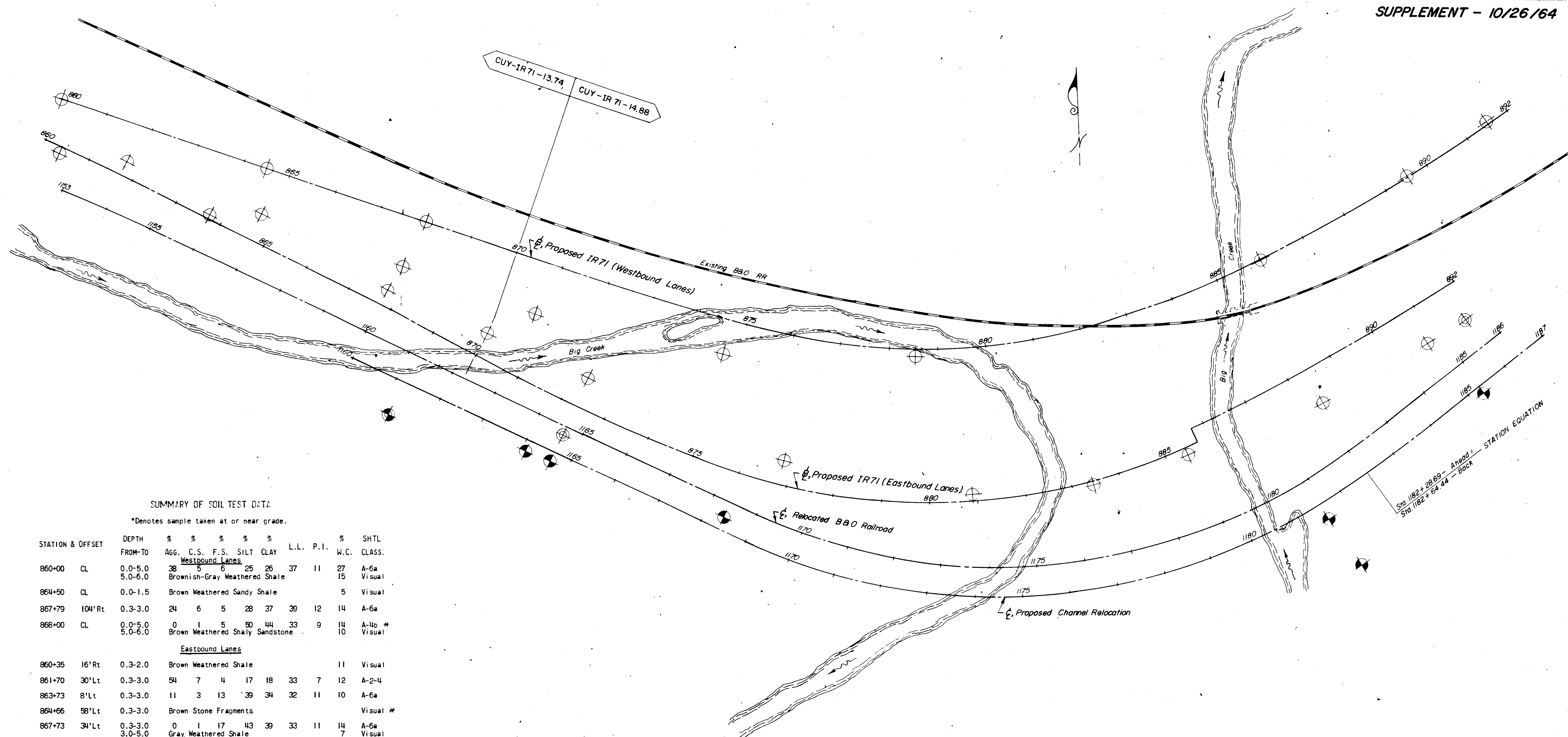


SOIL PROFILE

CUYAHOGA COUNTY
CUY-IR 71-13.66

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SUPPLEMENT - 10/26/64



SUMMARY OF SOIL TEST DATA

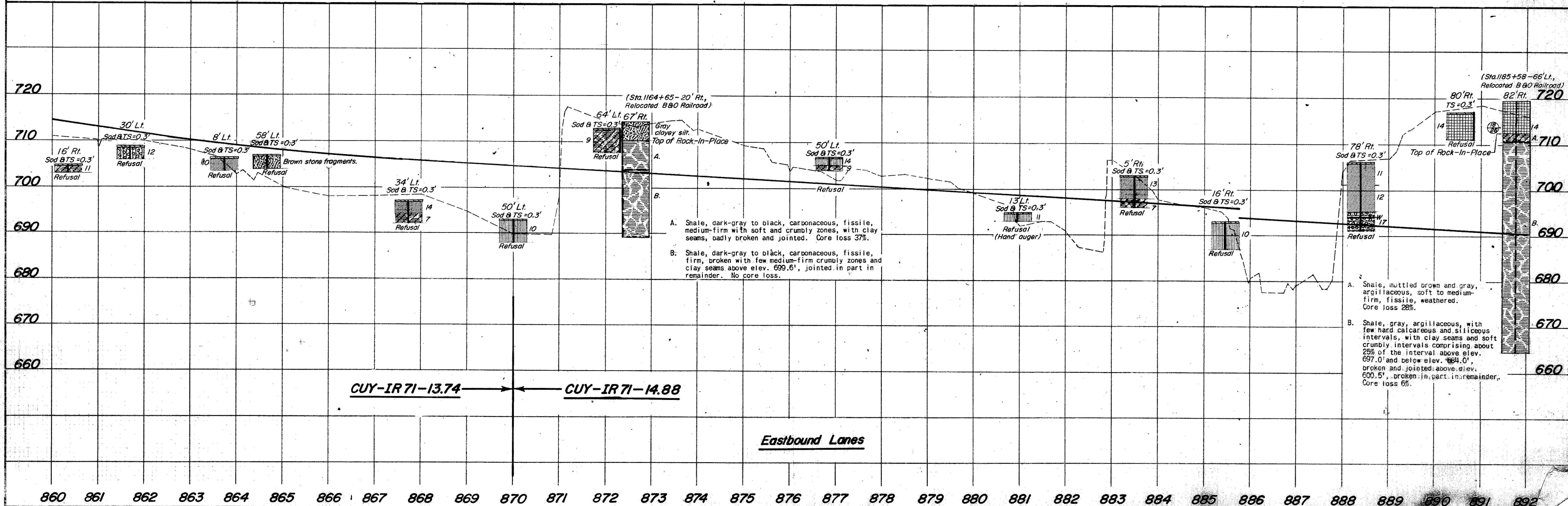
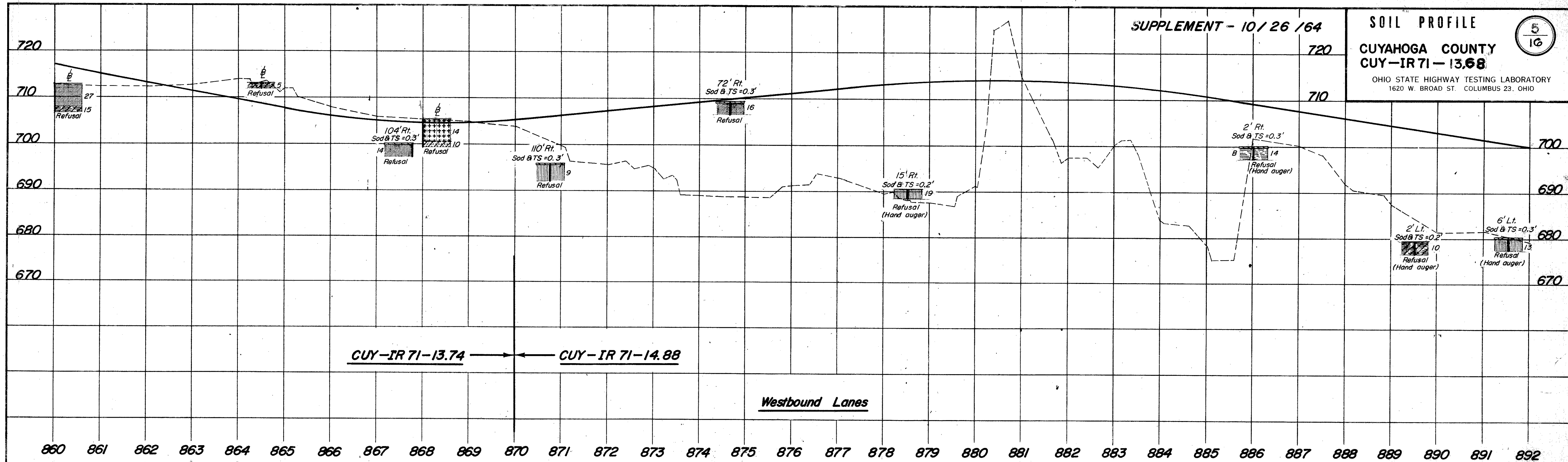
*Denotes sample taken at or near grade.

STATION & OFFSET		DEPTH	%	%	%	%	L.L.	P.I.	%	SHTL	
		FROM-TO	AGG.	C.S.	F.S.	SILT			CLAY	W.C.	CLASS.
<u>Westbound Lanes</u>											
860+00	CL	0.0-5.0 5.0-6.0	38	5	6	25	26	37	11	27	A-6a Visual
864+50	CL	0.0-1.5	Brown Weathered Sandy Shale						5	Visual	
867+79	104'Rt	0.3-3.0	24	6	5	28	37	39	12	14	A-6a
868+00	CL	0.0-5.0 5.0-6.0	0	1	5	50	44	33	9	14	A-4b * Visual
<u>Eastbound Lanes</u>											
860+35	16'Rt	0.3-2.0	Brown Weathered Shale						11	Visual	
861+70	30'Lt	0.3-3.0	54	7	4	17	18	33	7	12	A-2-4
863+73	8'Lt	0.3-3.0	11	3	13	39	34	32	11	10	A-6a
864+66	58'Lt	0.3-3.0	Brown Stone Fragments								Visual *
867+73	34'Lt	0.3-3.0 3.0-5.0	0	1	17	43	39	33	11	14	A-6a Visual
870+00	50'Lt	0.3-5.0	0	4	28	33	35	28	8	10	A-4a

— Borings taken from CUY-IR 71 -
Relocated B&O Railroad and
Proposed Channel Relocation

SUPPLEMENT - 10/26/64

SOIL PROFILE

CUYAHOGA COUNTY
CUY-IR 71-13.68OHIO STATE HIGHWAY TESTING LABORATORY
1620 W. BROAD ST. COLUMBUS 23, OHIO5
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GENERAL INFORMATION

GEOLOGY OF THE SITE

The structure site is located in the relatively flat glaciated Mississippi Valley Plain, in an area where moderately deep glacial-derived soils overlie shale, of Mississippian Age.

EXPLORATION

The exploration consisted of two drive sample-core borings and ten drive rod penetration tests, made between January 7 and 10, 1964.

INVESTIGATIONAL FINDINGS

Borings disclose that sloping shale bedrock, encountered at 16 and 24 feet below ground surface, elevations 744 and 739 feet is overlain by dense and very dense gravelly, sandy silts and an interval of cobbles and boulders immediately overlying bedrock surface. Borings were terminated 16 and 24 feet below bedrock surface at elevations 722 and 721 feet.

Rod soundings encountered gradual increase in penetration resistance with increase in depth and were terminated because of refusal to penetration at 20-foot depth, elevations 747 and 744 feet, in very dense glacial till, cobbles, and boulders, as revealed by the borings.

If it is the intention to found substructure units on bedrock, it is considered advisable that the open excavation be inspected in the field in order to insure that the excavations have been extended to rock throughout the entire founding area. It is further suggested that the area of the footing contact not be subjected to prolonged atmospheric exposure, and that the excavation be well drained at all times.

Unconfined compression tests on similar shale bedrock indicates a crushing strength on the order of 150 tons per square foot.

No free water was observed in any of the rod sounding holes.

LEGEND

- Auger Boring-Plan View.
- Press and/or Drive Sample and/or Core Boring-Plan View.
- Drive Rod Penetration Resistance-Soundings-Plan View
- Electrical Resistivity Probe - Plan View.
- Indicates Auger Boring.
- Indicates Press and/or Drive Sample and/or Core Boring.
- Electrical Resistivity Probe plotted to vertical scale only.
- Top of Rock
- Water saturated zone.
- Total Depth.

- Horizontal bar on log indicates the depth the sample was taken.
- Figures to the right of boring log in profile view indicate the number of blows for "Standard Penetration" test.
X = First 6 inches
Y = Second 6 inches
- Casing
- Resistance "R" < 10,000 lbs.
- Resistance "R" > 10,000 lbs.
- Indicates final measurement of penetration in inches.
- Indicates Free Water elevation.
- Indicates Static Water elevation.
- Footing
- Capped pile
- Footing on pile

SYMBOLS OF ROCK TYPES

- Coal
- Weathered Indurated Clay
- Indurated Clay
- Weathered Shale
- Shale
- Weathered Sandstone
- Sandstone
- Leached Dolomite
- Dolomite
- Leached Limestone

Drive Rod Penetration Tests

Drive rod penetration resistance tests constitute driving a 1.315-inch diameter steel rod, with a 45° cone point, into the ground, using a 122-pound drop-hammer with a free fall of five feet. At one or two-foot depth intervals, a measurement is taken to determine the amount of penetration achieved in three hammer drops. This reading is converted to an empirical value for capacity "R", in thousands of pounds (which is a measure of both the point resistance and frictional resistance on the rod), by using charts prepared by the Ohio Department of Highways, Bureau of Bridges, on the basis of correlation study of rod penetration with past performance of pile driving. For interpretation, a graph is prepared by plotting the value "R" against the depth at which the reading was taken, and connecting the plotted points. The curve so obtained reflects the density of subsurface materials in a manner that can be readily compared with data from similar tests at other locations on the structure site. From this comparison, the overall uniformity of subsurface conditions may be evaluated.

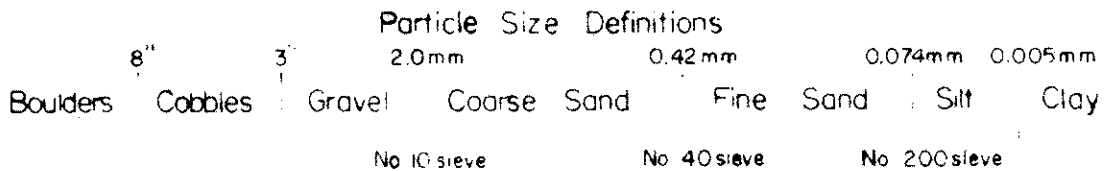
Drive Sample Borings - Drive - Press Sample Borings

Drive sample borings are by means of a rotary type drill rig, employing a 2" O.D., 1-3/8" I.D. sampler, at 2- 1/2 and/or 5-foot depth intervals, driven by means of a 140 pound drop-hammer, with a free fall of 30 inches. The number of blows required to drive the sampler 12 inches is considered the standard penetration test.

Drive-press sample borings are made by means of a rotary-type drilling, employing a 2" O.D., 1-3/8" I.D. drive sampler, and 3" O.D. thin-wall press sampler. The press sampler is advanced by continuous uniform pressure, applied by the drill rig.

The Boring Log sheets show a graphic plot of the information obtained, including depth and elevation of the sample, number of blows for the standard penetration tests in two 6-inch increments, depths of press samples, field sample number, sample description, based on laboratory test results and the Casagrande "A.C." classification system, and gradation, plasticity and moisture content determinations. Results of strength and consolidation testing appear on separate enclosures.

At depths where materials are bouldery or gravelly to the extent that the sampler can not be driven, a wash sample is procured for visual classification, in order to determine the general character of the material. These samples are not considered sufficiently representative to warrant laboratory testing.



LOG OF BORINGS															
Date Started <u>1-8-64</u>			Sampler Type <u>SS</u>			Dia. <u>1 3/8"</u>			Water Elev. _____						
Date Completed <u>1-9-64</u>			Casing Length <u>15'</u>			Dia. <u>3 1/2"</u>									
Boring No. <u>B-4</u>			Station & Offset <u>23+74.32° Rt (BEAR PIER)</u>			Surface Elev. <u>762.5'</u>									
Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	% Agg.	% G.S.	% F.S.	% Silt	% Clay	LL	PI	W. C.	SHTL. Class.
762.5	0														
	2														
	4														
757.5	6	5/7			Brown and Gray Silt	1	0	0	1	66	33	MP	MP	28	
	8														
752.5	10	5/15			Gray Sandy Gravelly Silt	2	22	8	10	28	32	24	6	16	
	12														
	14														
747.5	16	31/42			Gray Silty Sand and Shale Fragments	3	44	19	10	14	13	MP	MP	11	
744.5	18														
	20		1.4	0.6	Shale boulders and cobbles with 0.4' of black silty clay and shale fragments at base.										
	22														
738.8	24		4.0	1.0	TOP OF ROCK										
	26														
	28		5.0	0.0	Shale, black, carbonaceous, pyritiferous, fissile, firm, jointed and broken in part. Core loss 2%.										
	30														
	32														
	34		5.0	0.0											
	36														
	38		4.8	0.2											
722.5	40														

LOG OF BORINGS															
Date Started <u>1-9-64</u>			Sampler Type <u>SS</u>			Dia. <u>1 3/8"</u>			Water Elev. _____						
Date Completed <u>1-10-64</u>			Casing Length <u>14'</u>			Dia. <u>3 1/2"</u>									
Boring No. <u>B-9</u>			Station & Offset <u>26+57.27' Lt (FORWARD ABUTMENT)</u>						Surface Elev. <u>760.5'</u>						
Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics							SHTL Class.	
							% Agg.	% G.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	
760.5	0														
	2														
	4														
755.5	6	5/9			Brown and Gray Silt	1	0	1	6	55	38	27	5	22	
	8														
750.5	10	15/25			Gray Silt with Shale Fragments	2	26	5	7	34	28	MP	MP	11	
	12														
747.0	14		1.4	0.1	Black silty clay with carbonaceous shale fragments and cobbles.										
744.4	16				TOP OF ROCK										
	18		4.2	0.8											
	20														
	22		5.0	0.0	Shale, black, carbonaceous, pyritiferous, fissile, firm, jointed in part. Core loss 2%.										
	24														
	26														
	28		5.0	0.0											
	30														
	32														
	34		4.7	0.3											
	36														
	38		4.9	0.1											
720.5	40				BOTTOM OF BORING										

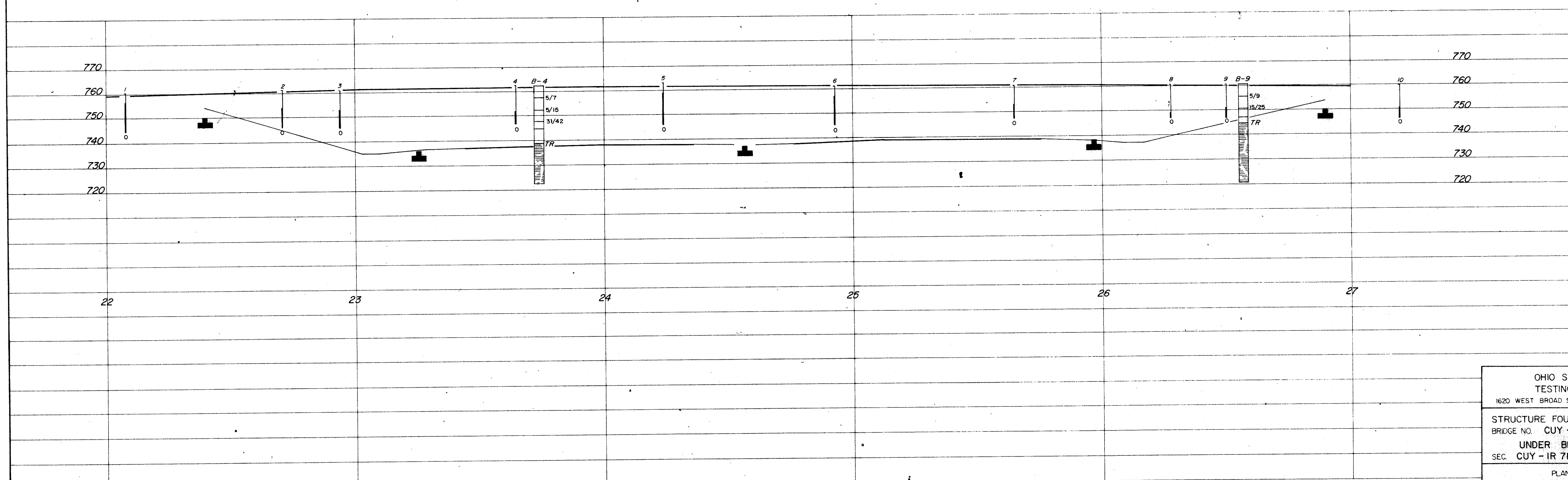
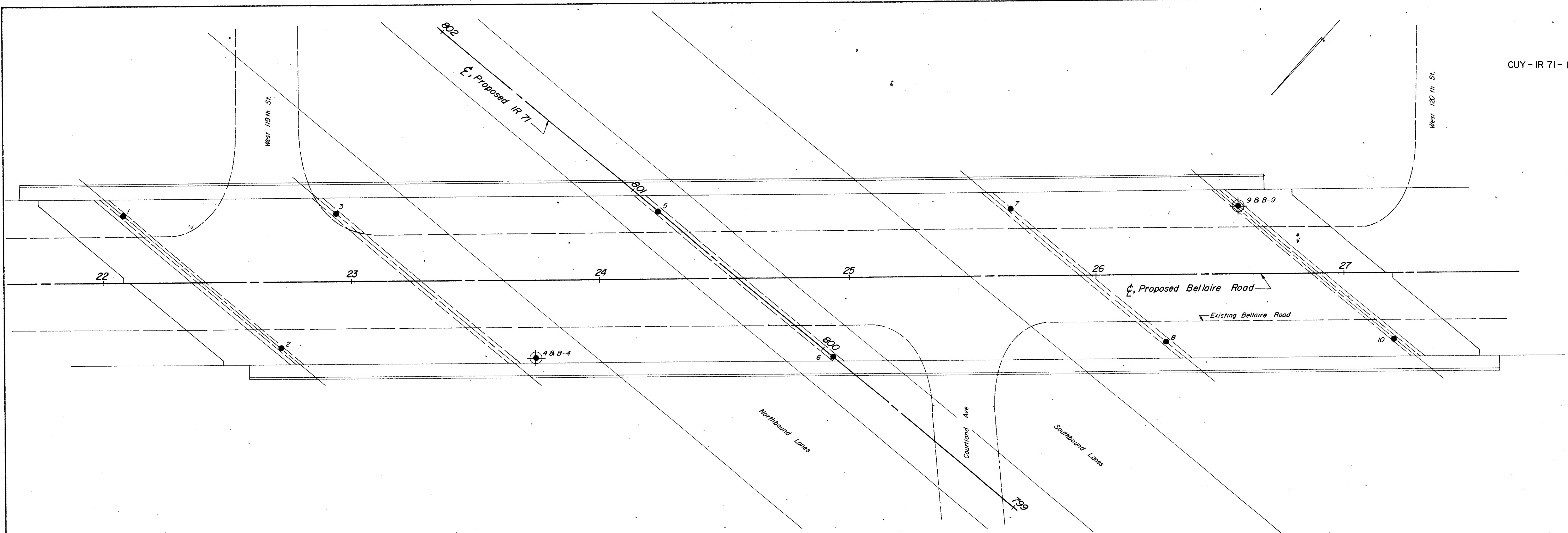
NOTE: Information shown by this subsurface investigation was obtained solely for the use in establishing design controls for the project. The State of Ohio does not guarantee the accuracy of this data and it is not to be construed as a part of the plans governing construction of the project.

OHIO STATE HIGHWAY
TESTING LABORATORY
1620 WEST BROAD STREET, COLUMBUS 23, OHIO

STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO. CUY-IR 71-1352
UNDER BELLAIRE ROAD
SEC. CUY-IR 71-13.68

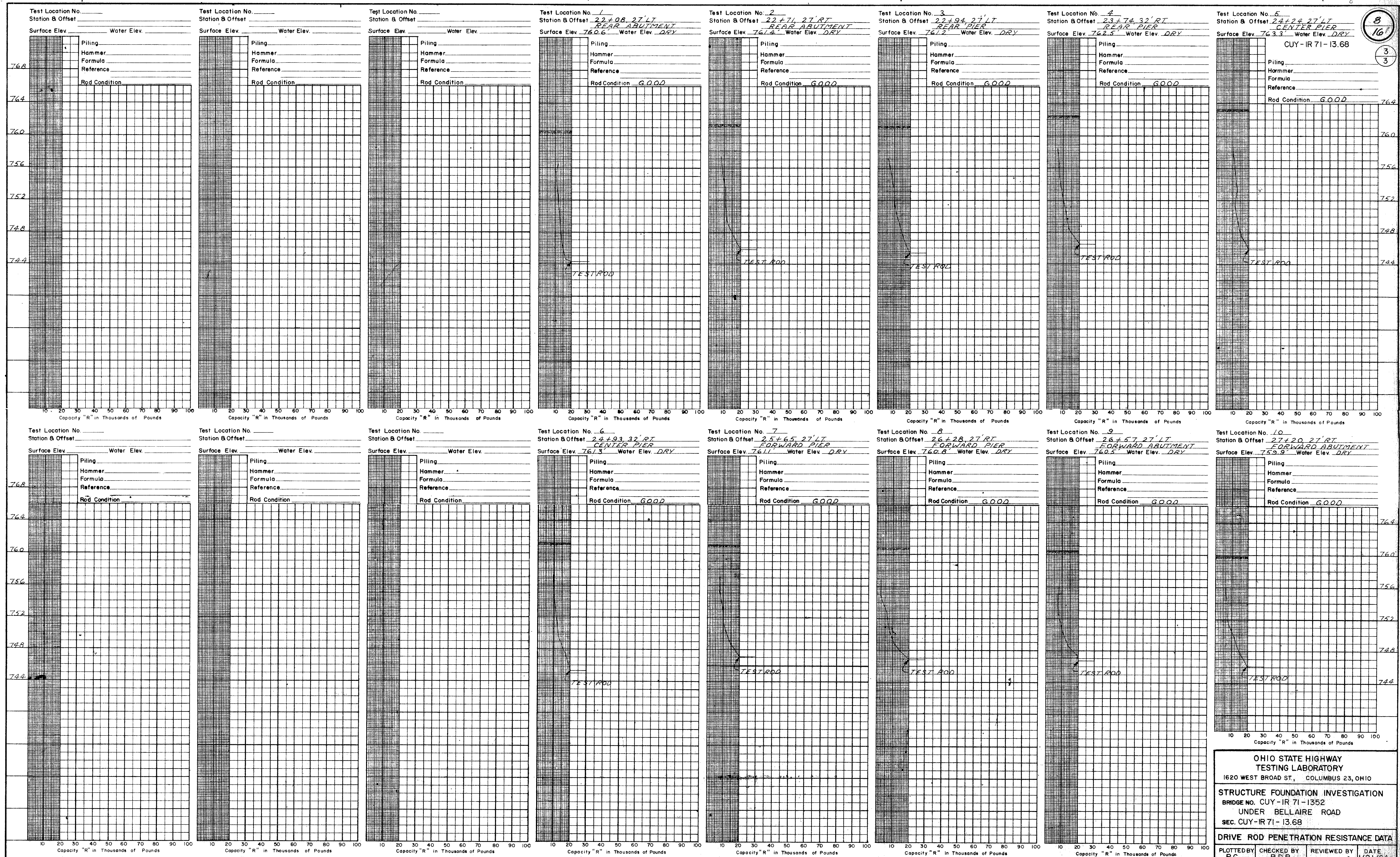
CHECKED BY RDR
REVIEWED BY
DATE 1/21/64

CUY - IR 71 - 13.68



SCALE: 1" = 20'

OHIO STATE HIGHWAY TESTING LABORATORY 1620 WEST BROAD ST., COLUMBUS 23, OHIO			
STRUCTURE FOUNDATION INVESTIGATION BRIDGE NO. CUY - IR 71-1352 UNDER BELLAIRE ROAD SEC. CUY - IR 71-13.68			
PLAN AND PROFILE			
DRAWN BY R.P.W.	CHECKED BY R.D.R.	REVIEWED BY	DATE 1/21/64



GENERAL INFORMATION

Drive Rod Penetration Tests

Drive rod penetration resistance tests constitute driving a 1.315-inch diameter steel rod, with a 45° cone point, into the ground, using a 122-pound drop-hammer with a free fall of five feet. At one or two-foot depth intervals, a measurement is taken to determine the amount of penetration achieved in three hammer drops. This reading is converted to an empirical value for capacity "R", in thousands of pounds (which is a measure of both the point resistance and frictional resistance on the rod), by using charts prepared by the Ohio Department of Highways, Bureau of Bridges, on the basis of correlation study of rod penetration with past performance of pile driving. For interpretation, a graph is prepared by plotting the value "R" against the depth at which the reading was taken, and connecting the plotted points. The curve so obtained reflects the density of subsurface materials in a manner that can be readily compared with data from similar tests at other locations on the structure site. From this comparison, the overall uniformity of subsurface conditions may be evaluated.

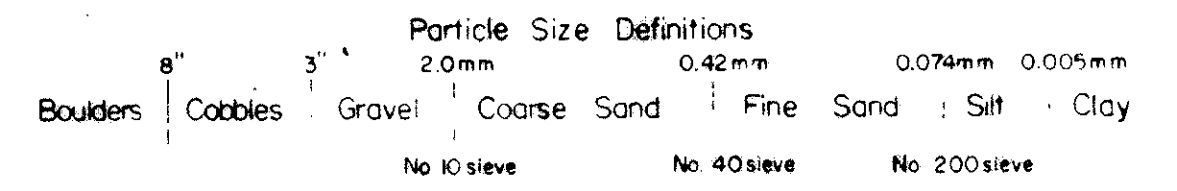
Drive Sample Borings - Drive-Press Sample Borings

Drive sample borings are by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. sampler, at 2-1/2 and/or 5-foot depth intervals, driven by means of a 140-pound drop-hammer, with a free fall of 30 inches. The number of blows required to drive the sampler 12 inches is considered the standard penetration test.

Drive-press sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. drive sampler, and 3" O.D. thin-wall press sampler. The press sampler is advanced by continuous uniform pressure, applied by the drill rig.

The Boring Log sheets show a graphic plot of the information obtained, including depth and elevation of the sample, number of blows for the standard penetration tests in two 6-inch increments, depths of press samples, field sample number, sample description based on laboratory test results and the Casagrande A.C. classification system and gradation, plasticity and moisture content determinations. Results of strength and consolidation testing appear on separate enclosures.

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LEGEND

- Auger Boring-Plan View.
- Press and/or Drive Sample and/or Core Boring-Plan View.
- Drive Rod Penetration Resistance-Soundings - Plan View.
- Electrical Resistivity Probe - Plan View.
- Indicates Auger Boring.
- Indicates Press and/or Drive Sample and/or Core Boring.
- Electrical Resistivity Probe plotted to vertical scale only.
- Top of Rock
- Water saturated zone.
- Total Depth.
- Horizontal bar on log indicates the depth the sample was taken.
- Figures to the right of boring log in profile view indicate the number of blows for "Standard Penetration" test.
X = First 6 inches
Y = Second 6 inches
- Casing
- Resistance "R" < 10,000 lbs.
- Resistance "R" > 10,000 lbs.
- Indicates final measurement of penetration in inches.
- Indicates Free Water elevation.
- Indicates Static Water elevation.
- Footings
- Capped pile
- Footings on pile

SYMBOLS OF ROCK TYPES

- Coal
- Weathered Indurated Clay
- Indurated Clay
- Weathered Shale
- Shale
- Weathered Sandstone
- Sandstone
- Leached Dolomite
- Dolomite
- Leached Limestone
- Limestone

SYMBOLS OF ROCK TYPES

The structure site is located in the relatively flat glaciated Mississippi Valley plain, in an area where moderately deep glacial-derived soils overlie shale, of Mississippian Age.

EXPLANATION

The exploration consisted of two drive sample-core borings and ten drive rod penetration tests, made between January 17 and 22, 1964.

INTERPRETATION

Borings disclose that relatively flat-lying shale bedrock, encountered at 8 and 11 feet below ground surface, elevations 744 and 743 feet, is overlain by very stiff, massive clay and stone fragments. Borings were terminated 29 and 32 feet below bedrock surface, at elevations 714 and 713 feet.

Two soundings encountered rapid increase in penetration resistance with increase in depth and were terminated because of refusal to penetration at 6 and 11-foot depths, elevations 744 and 743 feet, on or slightly below bedrock surface, as revealed by the borings.

If it is the intention to found the rear abutment on bedrock, it is considered advisable that the open excavation be inspected in the field in order to insure that the excavations have been extended to rock throughout the entire footing area. It is further suggested that the area of the footing contact not be subjected to prolonged atmospheric exposure, and that the excavation be well drained at all times.

Unconfined compression tests on similar shale bedrock indicates a crushing strength on the order of 150 tons per square foot.

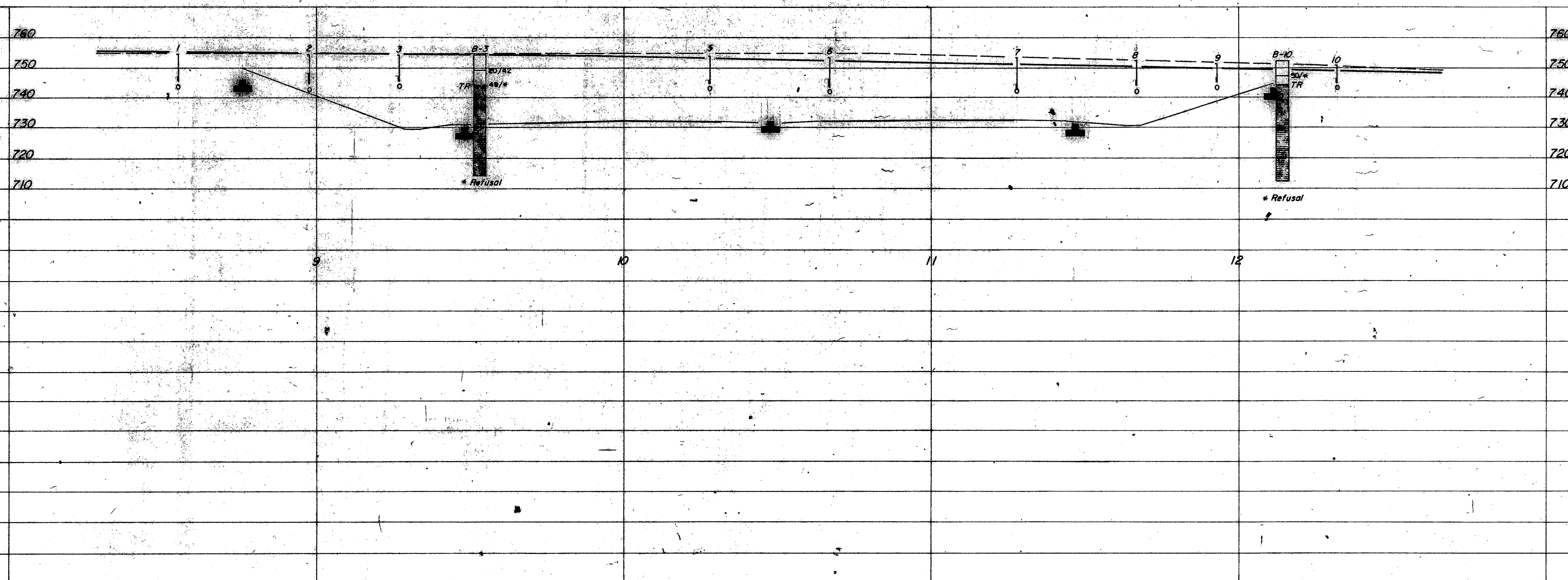
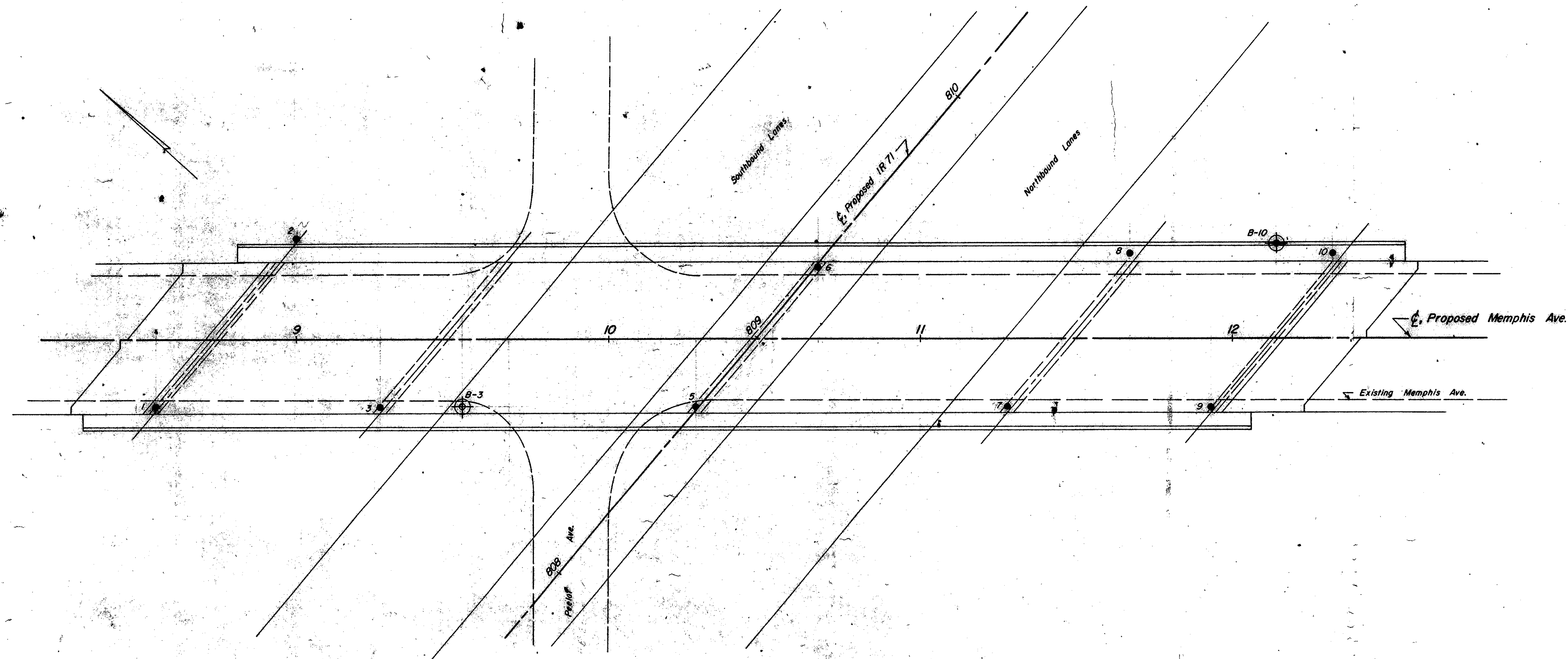
No free water was observed in any of the rod sounding holes.

NOTE: Information shown by this subsurface investigation was obtained solely for the use in establishing design controls for the project. The State of Ohio does not guarantee the accuracy of this data and it is not to be construed as a part of the plans governing construction of the project.

OHIO STATE HIGHWAY
TESTING LABORATORY
1620 WEST BROAD STREET, COLUMBUS 23, OHIO

STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO. CUY - IR 71-13.68
UNDER CONSTRUCTION
SEC. CUY - IR 71-13.68

CHECKED BY: [Signature]
REVIEWED BY: [Signature]
DATE: 2/3/64



OHIO STATE HIGHWAY TESTING LABORATORY 1620 WEST BROAD ST., COLUMBUS 23, OHIO			
STRUCTURE FOUNDATION INVESTIGATION BRIDGE NO. CUY-IR 71-1372 UNDER MEMPHIS AVE. SEC. CUY-IR, 71-13.68			
PLAN AND PROFILE			
DRAWN BY R.P.W.	CHECKED BY R.D.R.	REVIEWED BY R.D.R.	DATE 2/13/68

SCALE: 1"=20'

LOG OF BORING														
Date Started 1-21-64			Sampler Type SS			Dia. 1 3/8"			Water Elev.					
Date Completed 1-22-64			Casing Length 10'			Dia. 3 1/2"								
Boring No. B-3			Station & Offset 22+27.8 (BEAR PIER)			Surface Elev. 754.3'								
Elev.	Depth	Std. Pen. (N)	Rec. R.	Loss ft.	Description	Sample No.	% Agg.	% G.S.	% F.S.	% Silt	% Clay	LL	PI	W.C.
754.3	0													
	2													
	4													
749.3	6	20/42			Brown and Gray Gravelly Clay	1	45	4	3	28	20	32	11	20
	8													
748.3	10	49/8			Gray Weathered Shale Fragments	2								
	12				TOP OF ROCK									
	14	5.0	0.0											
	16													
	18	5.0	0.0											
	20													
	22													
	24	5.0	0.0											
	26													
	28	5.0	0.0											
	30													
	32													
	34	5.0	0.0											
	36													
	38	5.0	0.0											
714.3	40				BOTTOM OF BORING									
*REFUSAL														

LOG OF BORING														
Date Started 1-22-64			Sampler Type SS			Dia. 1 3/8"			Water Elev.					
Date Completed 1-23-64			Casing Length 8'			Dia. 3 1/2"								
Boring No. B-10			Station & Offset 12+14, 30' LT (FORWARD ABUTMENT)			Surface Elev. 752.6'								
Elev.	Depth	Std. Pen. (N)	Rec. R.	Loss ft.	Description	Sample No.	% Agg.	% G.S.	% F.S.	% Silt	% Clay	LL	PI	W.C.
752.6	0													
	2													
	4													
747.6	6	50/8			Gray Weathered Shale Fragments	1								
744.6	8													
	10	2.0	0.0		TOP OF ROCK									
	12													
	14	5.0	0.0											
	16													
	18	5.0	0.0											
	20													
	22													
	24	5.0	0.0											
	26													
	28	5.0	0.0											
	30													
	32													
	34	5.0	0.0											
	36													
	38	5.0	0.0											
712.6	40				BOTTOM OF BORING									
*REFUSAL														

OHIO STATE HIGHWAY TESTING LABORATORY 1620 WEST BROAD ST. COLUMBUS 23, OHIO			
STRUCTURE FOUNDATION INVESTIGATION BRIDGE NO. CUY-IR 71-1372 UNDER MEMPHIS AVE. SEC. CUY-IR 71-13.68			
BORING DATA			
TYPED BY JAC	CHECKED BY RDR	REVIEWED BY RDR	DATE 2/3/64

Figure 10-10 displays ten individual graphs, numbered 1 through 10, representing test results for various locations. Each graph plots Capacity "R" in Thousands of Pounds (X-axis, 0 to 100) against Surface Elevation (Y-axis, 74.1 to 75.7). The graphs are arranged in two rows of five. Each graph includes a vertical axis for Surface Elevation and a horizontal axis for Capacity "R". The graphs are labeled with Test Location No., Station & Offset, and Water Elev. The data points are plotted on the graphs, showing the relationship between Capacity "R" and Surface Elevation. The graphs are labeled with Test Location No., Station & Offset, and Water Elev. The data points are plotted on the graphs, showing the relationship between Capacity "R" and Surface Elevation. The graphs are labeled with Test Location No., Station & Offset, and Water Elev. The data points are plotted on the graphs, showing the relationship between Capacity "R" and Surface Elevation.

Test Location No.	Station & Offset	Water Elev.	Capacity "R" (Thousands of Pounds)
1	0+45.22 RT	75.42	0.00
2	0+00.32 LT	75.46	0.00
3	9+27.22 RT	75.43	0.00
4	10+28.22 RT	75.40	0.00
5	10+28.22 RT	75.40	0.00
6	10+67.23 LT	75.36	0.00
7	11+28.22 RT	75.34	0.00
8	11+67.27 LT	75.27	0.00
9	11+93.27 RT	75.14	0.00
10	12+32.27 LT	75.10	0.00

The project is located on the flat, glaciated Lake Plain, immediately east of the valley of a tributary to Big Creek, now occupying a buried Deep Stage stream valley. Lacustrine and beach deposits, found to be 17 to 50 feet deep, overlie the Chic shale, of Devonian age.

The exploration consisted of five drive sample-core borings and seven drive rod penetration tests, made on November 21 and 22, and between December 5 and 13, 1963 and on July 23, August 4 and 5, 1964.

Soilings disclosed moist to very moist, medium-stiff gravelly clays and medium-fine to dense silts, sands, and gravels, to 15 and 38-foot depths, elevations 745 and 723 feet, where bedrock surface was encountered.

Mod soundings, with exception of number 3, met fairly rigid, somewhat erratic increase in penetration resistance with increase in depth, and were terminated upon encounter with refusal or near refusal to penetration at 17 to 26-foot depths, elevations 745 to 739 feet, as the limits of borings, considered to be on bedrock surface. Sounding number 3 met gradual increase in penetration resistance with increase in depth, before encountering abrupt refusal to penetration at 50-foot depth, elevation 712 feet, considered to be as much as 8 feet below weathered bedrock surface, as revealed by the berings.

Following is a table listing each substructure unit, the proposed footing elevation - as shown on the site plan, and the approximate elevation of bedrock surface below the ends of each unit.

<u>SUBSTANTIATION</u> <u>NOTE</u>	<u>FOOTING</u> <u>ELEVATION</u>	<u>APPROXIMATE ELEVATION OF</u> <u>REINFORCING BENCH</u>	
		<u>Left</u>	<u>Right</u>
Rear Abutment	730'	744'	748'
Center Pier	730'	741'	742'
Forward Abutment	730'	742'	743'
Right Forward Wing Wall			below 730

IF it is the intention to found substructure units on bedrock, it is considered advisable that the open excavations be inspected in the field in order to insure that the excavations have been extended to rock throughout the entire founding area. It is further suggested that the area of the footing contact not be subjected to prolonged atmospheric exposure and that the excavation be kept drained at all times, due particularly to the fact that while this shale bedrock is generally firm in place, it is susceptible to disintegration upon exposure to the atmosphere and water.

Unconfined compression tests on similar shale bedrock indicates a crushing strength on the order of 120 tons per square foot.

	Auger Boring - Plan View.
	Press and/or Drive Sample and/or Core Boring - Plan view.
	Drive Rod Penetration Resistance - Soundings - Plan View
	Electrical Resistivity Probe - Plan View.
<i>A</i>	Indicates Auger Boring.
<i>B</i>	Indicates Press and/or Drive Sample and/or Core Boring.
	Electrical Resistivity Probe plotted to vertical scale only.
	Top of Rock
	Water saturated zone.
	Total Depth.

Coal

Weathered Indurated Clay

Horizontal bar on log indicates the depth the sample was taken.

Figures to the right of boring log in profile indicate the number of blows for "Standard Penetration" test.

X = First 6 inches
Y = Second 6 inches

Casing

Resistance "R" $\leftarrow$ 10,000 lbs.

Resistance "R" $\rightarrow$ 10,000 lbs

Indicates final measurement of penetration in inches.

Indicates Free Water elevation.

Indicates Static Water elevation.

Footing

Capped pile

Footing on pile

Drive Rod Penetration Tests

Drive rod penetration resistance tests constitute driving a 1.35 inch diameter steel rod, with a 45° cone point into the ground, using a 22-pound drop hammer with a free fall of five feet. At one or two-foot depth intervals, a measurement is taken to determine the amount of penetration achieved in three hammer drops. This reading is converted to an empirical value for capacity "R", in thousands of pounds (which is a measure of both the point resistance and frictional resistance on the rod), by using charts prepared by the Ohio Department of Highways, Bureau of Bridges, on the basis of correlation study of rod penetration with past performance of pile driving. For interpretation, a graph is prepared by plotting the value "R" against the depth of which the reading was taken, and correcting the plotted point. The current corrected reading is the density of subsurface materials in a manner that can be directly compared with data from similar tests at other locations on the structure site. From this comparison, the overall uniformity of subsurface conditions may be evaluated.

Drive Sample Borings - Drive - Press Sample Borings

Drive sample borings are by means of a rotary type drill rig, employing a 2" O.D., 1-3/8" I.D. sampler, at 2-1/2 and/or 5-foot depth intervals, driven by means of a 140 pound drop-hammer, with a free fall of 30 inches. The number of blows required to drive the sampler 12 inches is considered the standard penetration test.

Drive-press sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. drive sampler, and 3" O.D. thin-wall press sampler. The press sampler is advanced by continuous uniform pressure, applied by the drill rig.

The Boring Log sheets show a graphic plot of the information obtained, including depth and elevation of the sample, number of blows, the standard penetration tests in two 6-inch increments, depths of press samples, field sample number, sample description based on laboratory test results and the Casagrande AC classification system, and gradation, plasticity and moisture content determinations. Results of strength and consolidation testing appear on separate enclosures.

At depths where materials are bouldery or gravelly to the extent that the sampler can not be driven, a wash sample is procured for visual classification, in order to determine the general character of the material. These samples are not considered sufficiently representative to warrant laboratory testing.

LOG OF BORING									
Date Started	8-4-64	Sampler Type	SS	Dia.	1 3/8"	Water Elev.			
Date Completed	8-5-64	Casing Length	33'	Dia.	3 1/2"				
Boring No.	B-3	Station & Offset	23+15, 30' Rt. (FORWARD ABUTMENT)			Surface Elev. 760.9'			
Elev.	Depth	Std Pen (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics	Grain Size	Moisture Content
760.9	0								
	2								
	4								
755.9	6	1/1			Brown and Gray Gravelly Sandy Clay	1	19	5	23 30 23 31 15 23
	8								
750.9	10	6/8			Gray Sandy Gravelly Silt	2	41	6	9 25 19 27 9 14
	12								
	14								
745.9	16	4/5			Gray Sandy Gravelly Silt	3	V I S U A L	32	10 25
	18								
740.9	20	5/6			Grayish-Brown Sandy Gravelly Silt	4	30	6	9 28 27 29 11 17
	22								
	24								
735.9	26	14/15			Gray Silty Sandy Gravel	5	53	13	9 14 11 24 6 14
	28								
730.9	30	5/6			Gray Silty Sandy Gravel	6	V I S U A L		15
	32								
728.4	34	4/5			Gray Gravelly Clay	7	40	7	6 26 21 34 13 17
	36								
725.9	38	8/13			Brownish-Gray Gravelly Clay	8	25	2	2 38 33 33 12 26
	40								
723.4	42	17/18			TOP OF WEATHERED ROCK				
	44								
720.9	46				Gray weathered shale				
720.5	48	50(6.4')							
	50								
	52								
	54								
	56								
	58								
710.9	60								

BOTTOM OF BORING

				LOG OF BORING			
Date Started	7-23-64	Sampler Type	SS	Dia	1 3/8"	Writer	Elev.
Date Completed	7-23-64	Casing Length	18'	Dia	3 1/2"		
Boring No.	B-6	Station & Offset	22+74.27' Lt	(FORWARD ABUTMENT)		Surface Elev.	762.0'
Elev.	Depth	Std Pen (N)	Rec ft	Loss ft.	Description	Sample No.	Physical Characteristics Gr% S% F.S. % L.P. % I.L. % W.C. C.I.
762.0	0						
	2						
	4						
757.0	6	10/6			Brown and Gray Silty Sandy Gravel	1	58 13 11 10 8 NP NP 14
	8						
752.0	10	2/2			No Sample Recovered - Brown Sand	2	V I S U A L
	12						
	14						
747.0	16	4/4			No Sample Recovered - Brown Sand	3	V I S U A L
	18						
742.0	20				TOP OF WEATHERED ROCK		
	22						
	24	4.8	0.2		Shale, dark gray, carbonaceous, medium-firm, moderately weathered and jointed. Core loss 4%.		
737.0					BOTTOM OF BORING		

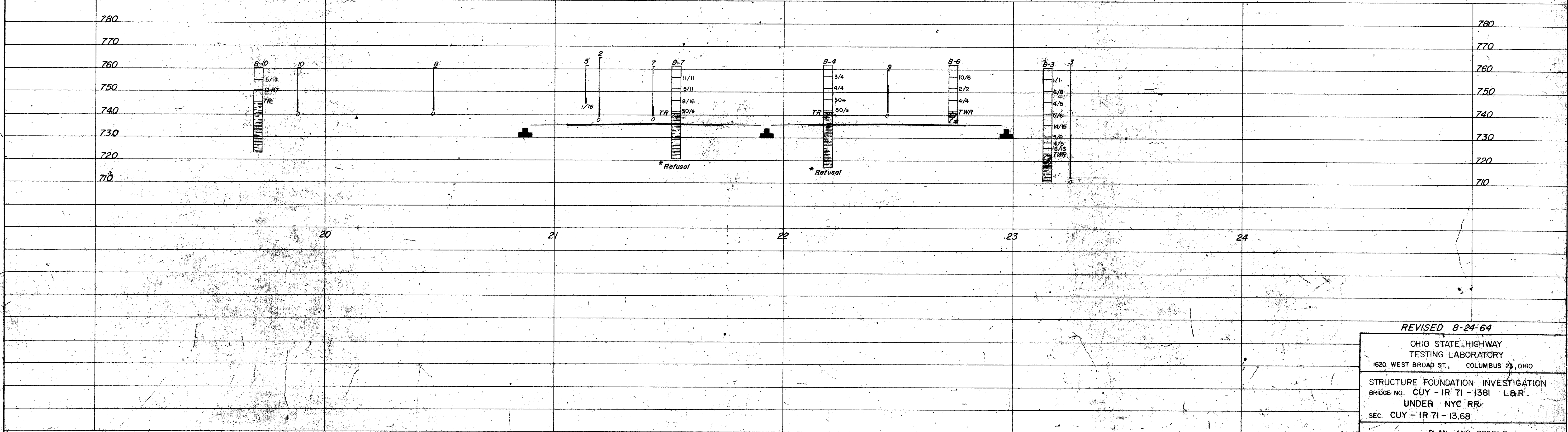
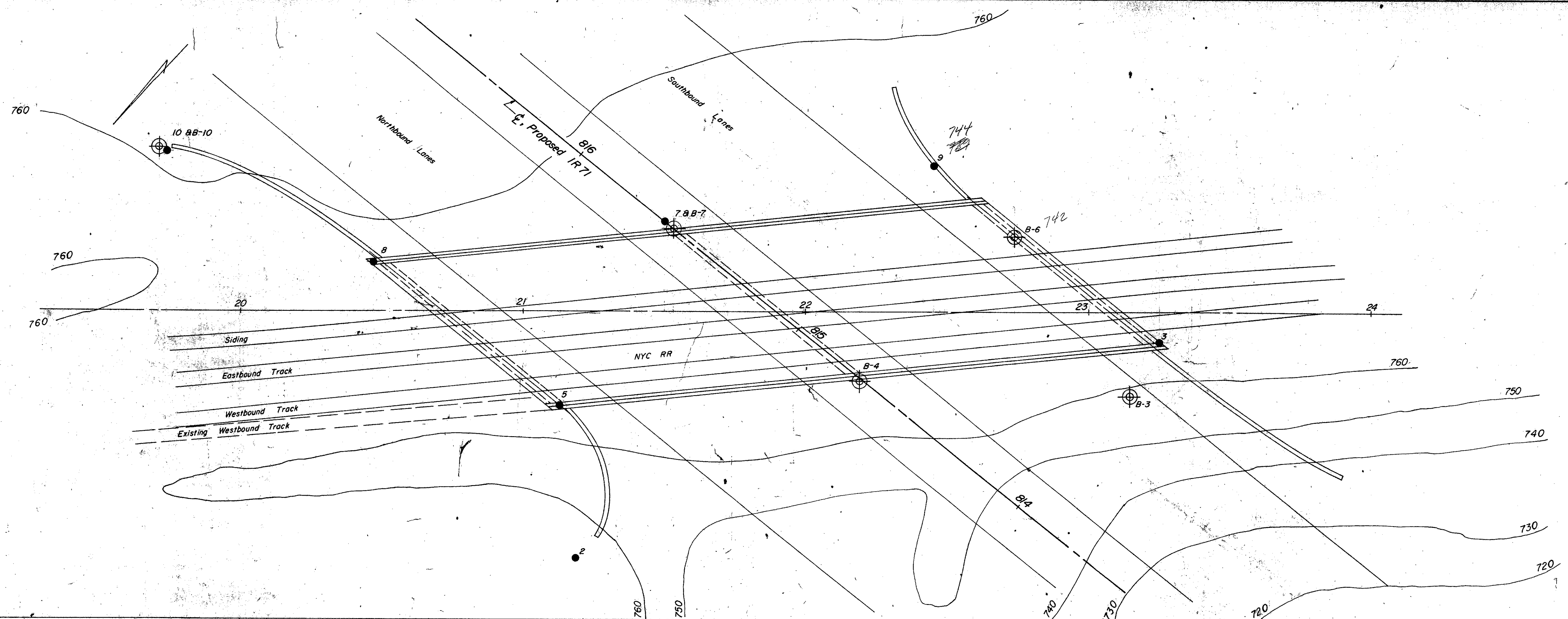
REVISED 8-24-64

NOTE: Information shown by this subsurface investigation was obtained solely for the use in establishing design controls for the project. The State of Ohio does not guarantee the accuracy of this data and it is not to be construed as a part of the plans governing construction of the project.

OHIO STATE HIGHWAY
TESTING LABORATORY
WEST BROAD STREET, COLUMBUS 23, OHIO

STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO CUY - IR 71 - 1381 L & R
UNDER NYC RR
SEC CUY - IR 71 - 1368

CHECKED BY R.P.W.	REVIEWED BY R.D.R.	DATE 12/31/63
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REVISED 8-24-64

OHIO STATE HIGHWAY
TESTING LABORATORY
1620 WEST BROAD ST., COLUMBUS 23, OHIO

STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO. CUY - IR 71 - 1381 L&R
UNDER NYC RR
SEC. CUY - IR 71 - 13.68

PLAN AND PROFILE

DRAWN BY R.L.F.	CHECKED BY R.P.W.	REVIEWED BY R.D.R.	DATE 12/31/63
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SCALE: 1" = 20'

LOG OF BORING														
Date Started 12-11-63		Sampler Type SS		Dia. 1 3/8"		Water Elev.		Surface Elev. 762.1'						
Date Completed 12-13-63		Casing Length 20'		Dia. 3 1/2"										
Boring No. B-4		Station & Offset 22+19, 25' Rt (PIER)												
Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	% Agg.	% C.S.	% F.S.	% Silt	% Clay	LL	PI	W.C.
762.1	0													
	2													
757.1	4	3/4			Brown and Gray Sandy Gravelly Clay	1	23	7	10	30	30	34	13	25
	6													
752.1	8													
	10	4/4			Brown and Gray Sandy Gravelly Clay	2	V	I	8	U	A	L	34	15
	12													
747.1	14													
	16	50*			Gray and Brown Clayey Gravel	3	V	I	8	U	A	L	34	7
	18	(0.3')												
742.1	20				Gray Clay and Shale Fragments	4	V	I	8	U	A	L	29	6
741.6	20	50/s												
	22		4.2	0.3	TOP OF ROCK									
	24													
	26		5.0	0.0										
	28													
	30													
	32		5.0	0.0										
	34													
	36													
	38		5.0	0.0										
	40													
	42		5.0	0.0	Shale, black, firm, carbonaceous, fissile in beds 0.2' to 0.8' thick with soft, gray clay seams (comprising 8% of the interval). Above 21.8' interval is broken and weathered. Below 44.0' interval is fractured and broken. Core loss 8%.									
	44													
717.1					BOTTOM OF BORING									

REFUSAL

LOG OF BORING														
Date Started 12-10-63		Sampler Type SS		Dia. 1 3/8"		Water Elev.		Surface Elev. 761.5'						
Date Completed 12-11-63		Casing Length 20'		Dia. 3 1/2"										
Boring No. B-7		Station & Offset 21+53, 29' Lt (PIER)												
Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	% Agg.	% C.S.	% F.S.	% Silt	% Clay	LL	PI	W.C.
761.5	0													
	2													
	4													
756.5	6	11/11			Dark-Gray Sand	1	0	14	83	-3	-	NP	NP	32
	8													
751.5	10				Brown Sandy Gravel	2	V	I	8	U	A	L		17
	12	5/11												
	14													
746.5	16				Brown and Gray Silt	3	0	2	3	58	37	NP	NP	25
	18	8/16												
741.5	20				Gray Extremely Weathered Shale Fragments	4	V	I	8	U	A	L		15
741.0	20	50/s												
	22				TOP OF ROCK									
	24		4.1	0.4										
	26													
	28		4.8	0.2	Shale, black, firm, carbonaceous, fissile, fractured by vertical joints in part, in beds 0.3' thick with soft, gray clay seams (comprising 6% of the interval). Above 22.5' shale is broken and weathered. From 40.0' to 40.4' the interval contains a soft, gray, crumbly, clay thin bed. Core loss 2%.									
	30													
	32		5.0	0.0										
	34													
	36													
	38		6.0	0.0										
	40													
720.5					REFUSAL									

BOTTOM OF BORING

LOG OF BORING														
Date Started 12-5-63		Sampler Type SS		Dia. 1 3/8"		Water Elev.		Surface Elev. 760.1'						
Date Completed 12-6-63		Casing Length 17'		Dia. 3 1/2"										
Boring No. B-10		Station & Offset 19+71, 58' Lt (J.T. WICKMALL)												
Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	% Agg.	% C.S.	% F.S.	% Silt	% Clay	LL	PI	W.C.
760.1	0													
	2													
	4													
755.1	6	5/14			Grayish-Brown Sandy Gravelly Silt	1	32	7	15	25	21	19	4	15
	8													
750.1	10				Gray Clayey Sandy Gravel	2	49	13	9	9	20	25	3	11
	12	12/17												
	14													
745.1	16				TOP OF ROCK									
	18		3.0	1.0										
	20													
	22		4.9	0.1	Shale, black, very firm, carbonaceous, fissile, in beds up to 1.0' with black, soft clay seams (comprising 8% of the interval). Above 23.0' interval is very broken and jointed. Core loss 2%.									
	24													
	26													
	28		4.7	0.3										
	30													
	32		6.6	0.4										
	34													
	36													
723.1					BOTTOM OF BORING									

REVISED 8-24-64

OHIO STATE HIGHWAY TESTING LABORATORY 1620 WEST BROAD ST. COLUMBUS 23, OHIO	
STRUCTURE FOUNDATION INVESTIGATION BRIDGE NO. CUY-IR 71-1361 L & R UNDER NYC RR	
SEC. CUY-IR 71-13.68	
BORING DATA	
TESTED BY J.A.	CHECKED BY R.P.W.
REVIEWED BY R.D.R.	DATE 2/31/63

Test Location No. 1
Station & Offset 21+19.88 RT
Surface Elev. 772.0 Water Elev. 768.0
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 2
Station & Offset 23+25.11 RT
Surface Elev. 762.2 Water Elev. 758.2
Piling Hammer Formula Reference
Rod Condition ROD BENT - 8'

Test Location No. 3
Station & Offset 21+13.34 RT
Surface Elev. 761.9 Water Elev. 757.9
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 4
Station & Offset 21+50.32 LT
Surface Elev. 761.5 Water Elev. 757.5
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 5
Station & Offset 20+47.17 LT
Surface Elev. 760.9 Water Elev. 756.9
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 6
Station & Offset 22+45.52 LT
Surface Elev. 759.8 Water Elev. 755.8
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 7
Station & Offset 19+74.57 LT
Surface Elev. 762.0 Water Elev. 758.0
Piling Hammer Formula Reference
Rod Condition GOOD

Test Location No. 8
Station & Offset 19+74.57 LT
Surface Elev. 762.0 Water Elev. 758.0
Piling Hammer Formula Reference
Rod Condition GOOD

OHIO STATE HIGHWAY TESTING LABORATORY
1620 WEST BROAD ST., COLUMBUS 23, OHIO
STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO. CUY - IR 71 - 1381 L & R
SEC. CUY - IR 71 - 13.68
DRIVE ROD PENETRATION RESISTANCE DATA
PLOTTER BY R.C. CHECKED BY R.P.W. REVIEWED BY R.D.R. DATE 12/3/64