

MAY 25 1965

**GEOLOGY OF THE SITE**

The structure site is located on the glaciated Lake Plain region, in an area where thin glacial derived soils overlie shale bedrock, of the Chagrin formation.

**EXPLORATION**

The exploration consisted of two drive sample-core borings, made on May 6 and 7, 1965, and eight drive rod penetration tests, made on April 20, 1965.

**INVESTIGATIONAL DISCLOSURES**

The borings disclosed that alying bedrock surface, occurring at 6-foot depth, elevation 628 feet in the rear area, and 13-foot depth, elevation 621 feet in the forward area, is overlain by stiff clay and dense silt. The borings were terminated at 20-foot depth, elevation 614 feet, 7 and 14 feet below bedrock surface.

Rod soundings encountered rapid increase in penetration resistance with increase in depth and were terminated upon encounter with refusal to penetration at 9 to 14-foot depths, elevations 627 to 622 feet, considered to be on or slightly below bedrock surface, as disclosed by the borings.

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

If it is the intention to found the pier 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 indicate a crushing strength on the order of 100 tons per square foot.

- Auger Boring Location - Plan View.
- Press and / or Drive Sample and / or Core Boring Location - Plan View.
- Drive Rod Penetration Resistance Sounding Location - Plan View.
- Capped Pile
- Footing
- Footing on Pile
- Top of Rock

- Coal
- Weathered Indurated Clay
- Indurated Clay
- Weathered Shale
- Shale

**LEGEND**

- Horizontal Bar on Boring Log Indicates the Depth the Sample Was Taken.
- Figures Beside the Boring Log in Profile Indicate the Number of Blows for Standard Penetration Test.  
X = Number of Blows for First 6 inches.  
Y = Number of Blows for Second 6 inches.
- Drive Rod Penetration Resistance Sounding Log - Profile
- 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.

**SYMBOLS OF ROCK TYPES**

- Weathered Sandstone
- Sandstone
- Leached Dolomite
- Dolomite
- Leached Limestone
- Limestone

**GENERAL INFORMATION**

**Drive Rod Penetration Sounding 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 condition may be evaluated.

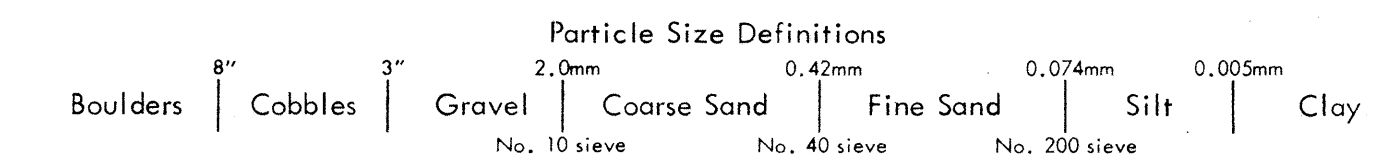
**Drive Sample Borings - Drive-Press Sample Borings**

Drive sample borings are made 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, depth of press samples, field sample number, sample description - based on laboratory tests and the Casagrande AC classification system - and gradation, plasticity, and moisture content determinations. Results of strength and consolidation testing, if performed, 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 5-6-65 Sampler Type SB Dia. 1 3/8" Water Elev. \_\_\_\_\_  
 Date Completed 5-7-65 Casing Length \_\_\_\_\_ Dig. \_\_\_\_\_  
 Boring No. B-1 Station & Offset 236+40, 44' 14" (REAR ABUTMENT) Surface Elev. 633.7'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Physical Characteristics								SHTL Class.		
						Sample No.	% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.		W.C.	
633.7	0															
631.2	2				Mottled Brown and Gray Silty Clay	1	0	1	18	35	46	37	18	30		
628.7	4	13/15			TOP OF ROCK											
628.0	6	50*			Gray Silt and Shale Fragments	2	42	3	2	32	21	31	10	12		
	8		2.6	2.4												
	10															
	12		3.0	2.0	Shale, gray, argillaceous, fissile, soft and crumbly to medium-firm, jointed, with many clay seams, broken. Core loss 43%.											
	14															
	16															
	18		2.8	2.2												
613.7	20				BOTTOM OF BORING											

**LOG OF BORING**

Date Started 5-6-65 Sampler Type SB Dia. 1 3/8" Water Elev. \_\_\_\_\_  
 Date Completed 5-6-65 Casing Length \_\_\_\_\_ Dig. \_\_\_\_\_  
 Boring No. B-16 Station & Offset 236+23, CL (FORWARD ABUTMENT) Surface Elev. 634.0'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Physical Characteristics								SHTL Class.		
						Sample No.	% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.		W.C.	
634.0	0															
	2															
	4															
629.0	6	15/30			Brownish-Gray Gravelly Clay	1	23	5	8	32	32	27	8	17		
626.5	8	21/21			Gray Silt and Stone Fragments	2	46	5	2	30	17	29	8	9		
624.0	10	50*			Gray Shale Fragments and Silt	3	63	1	1	24	11	--	--	7		
623.5	12				Gray clayey silt and stone fragments.											
621.0	14		3.8	1.2	TOP OF ROCK											
	16															
	18				Shale, gray, medium-firm, sub-fissile, jointed and beddy broken, with few thick 0.5" clay seams. Core loss 14%.											
	20		4.3	0.7	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.

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STRUCTURE FOUNDATION INVESTIGATION  
BRIDGE NO. LAK-91-0449  
OVER LAKE LAND BOULEVARD

CHECKED BY L.N.L. REVIEWED BY R.D.R. DATE 6/9/66