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June 7, 2004
June 28, 2004
(Revised September 21, 2004)

Mr. Ben Kruse
Consultant Contract Manager
District 12
Ohio Department of Transportation
5500 Transportation Boulevard
Garfield Heights, Ohio 44125-5396

Re: Geotechnical Red Flag Summary
CUY – Innerbelt Curve
Task Order Number: 11973-8
Task Order PID Numbers: 77413 & 77613
Cleveland, Cuyahoga County, Ohio
PSI File Number: 142-45056

Dear Mr. Kruse:

In compliance with your instructions, we have conducted a Geotechnical Red Flag Study for the above-referenced project. The results of this exploration are to be found in the accompanying report, three (3) copies of which are being transmitted herewith.

Should you have any questions regarding the contents of this submittal, please do not hesitate to contact the undersigned at 216-447-1335.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Nathaniel Artman
Staff Engineer

A. Veeramani, P.E.
District Manager

NA/jm

GEOTECHNICAL RED FLAG SUMMARY

FOR THE

CUY-INNERBELT CURVE
TASK ORDER NUMBER 11973-8
PID NUMBERS 77413 & 77613
CLEVELAND, CUYAHOGA COUNTY, OHIO

PREPARED FOR

OHIO DEPARTMENT OF TRANSPORTATION
5500 TRANSPORTATION BOULEVARD
GARFIELD HEIGHTS, OHIO 44125

PREPARED BY

PROFESSIONAL SERVICE INDUSTRIES, INC.
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PSI FILE NUMBER: 142-45056

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1.0 PROJECT INTRODUCTION

This report presents the findings of a Geotechnical Red Flag Summary performed by Professional Service Industries, Inc. (PSI) for the CUY-Innerbelt Curve realignment. The project includes modifications to portions of Interstate Route 90, State Route 2 (Cleveland Memorial Shoreway) and East 55th Street, in the City of Cleveland, Cuyahoga County, Ohio. More specifically, the project limits begin on IR 90 near the Superior Avenue bridge structure (mile marker 173.5) and continue to East 55th Street. On East 55th Street, the project limits begin immediately south of the existing CSX Railroad bridge structure and continue north to North Marginal Road. Project limits also include SR 2 from approximately the East 26th Street Yard to the SR 2/IR 90 interchange.

The proposed construction in the vicinity of the IR 90 Innerbelt Curve includes modifications to the Superior Avenue, St. Clair Avenue, Hamilton Avenue, Norfolk Southern Railroad and Lakeside Road bridge structures. Also included is construction of the proposed IR 90/SR 2 interchange and the bridge structures for South Marginal Road and the CSX Railroad. SR 2, west of the IR 90 Innerbelt Curve, will be realigned slightly due to the relocation of the IR 90/SR 2 interchange. The proposed construction in the vicinity of East 55th Street includes realignment of IR 90 and East 55th Street. Also included is construction of the proposed CSX Railroad bridge structure and the East 55th Street bridge structure.

The purpose of this Geotechnical Red Flag Summary was to identify geotechnical concerns that could cause revisions to the anticipated design and construction scope of work, proposed project development schedules, the estimated project budget, or the potential impacts of the project on surrounding areas. Of particular concern to geotechnical engineering, "Red Flag" features may include, but are not limited to, known or suspected geological hazards (e.g., organic soils, karst, rockfalls, landslides, underground mines, poor subgrade conditions, or difficulty in correcting existing drainage problems).

The following items of work were performed to prepare this Geotechnical Red Flag Summary:

1. A literature review was performed to determine generalized geology, groundwater, and surface and subsurface conditions. This review included generalized geologic references, National Wetlands Inventory, Soil Surveys, and previous subsurface investigations along the project.

2. Information was obtained regarding construction and maintenance issues associated with the existing roadway and bridge structures within the study corridor.

3. A field reconnaissance was performed to identify and locate pertinent surface features.

The results of these items are discussed in more detail in the following sections. In addition, exhibits have been prepared using digital orthophoto quarter quadrangles and USGS 7 ½-minute quadrangles. Pertinent features identified during the review are shown on these exhibits, presented in Appendix I of this report. Also presented in Appendix I, bedrock topography obtained from ODNR, Division of Geological Survey, is shown on the USGS 7 ½-minute quadrangles. A site vicinity map, Ohio Karst map and an underground mine map are also presented in Appendix I.

2.0 LITERATURE REVIEWS

2.1 Physical Setting and Geology

The area of the study corridor consists of nearly level and gently sloping areas located within the Eastern Lake and Till Plains sections of the Central Lowland Province. The entire county is drained principally by the Cuyahoga, the Chagrin, and the Rocky Rivers and their tributaries into Lake Erie. Ground water supplies in the county are quite limited.

The subject site areas consist mainly of upperlying random fill materials underlain by the glaciated portion of Ohio with near surface soils consisting of Lacustrine and Alluvium sands, silts and clays.

The area's rock formation consists of Olentangy and Ohio shale from the Devonian Age, and is present at depths ranging from about 100 to 250 feet below the existing surface grades.

Additional geologic information was obtained from a report entitled "Climate and Shoreline Educational Issues Forum". The pertinent findings are as follows.

In the mid-1800's Cleveland began the process of filling and armoring its shoreline. By 1876, about 43 percent of the waterfront had been armored and filling had begun. Between 1876 and 1938 about 455 acres of land were created by filling, displacing the shoreline nearly 1,850 feet lakeward of the 1876 shoreline. Between 1938 and 1973 about 437 acres of land were created by filling, displacing the shoreline up to 2,200 feet lakeward of the 1876 shoreline. Since 1968, most of the material used as fill has been sediment dredged from navigation channels in the surrounding area.

Since 1973, most of the filling has occurred in large Confined Disposal Facilities built at Gordon Park and along Burke Lakefront Airport.

Over the long term, Lake Erie water levels have fluctuated about 5.5 feet due to volumetric changes in water from a low in the 1930's to a record high in 1986. From 1973 to 1998 lake levels were well above normal. However, in recent years, lake levels have been alternating between below normal to normal.

A map of the Cleveland shoreline as it existed prior to 1876 is shown on the final page of the report entitled "Climate and Shoreline Educational Issues Forum" which can be referenced in Appendix V. A map of the Cleveland shoreline as it existed in 1892 is also presented in Appendix V.

2.2 Wetlands

The National Wetlands Inventory published in 1977 was reviewed for wetland soils. The inventory indicated there are no wetland areas within the study corridor.

2.3 Soil Surveys

The US Department of Agriculture Soil Conservation Service Soil Survey of Cuyahoga County was reviewed. There are two predominant soil associations found along the study corridor. The line of demarcation between the soil types is located near the existing South Marginal Road bridge structure on IR 90. The areas to the north, west and east of the South Marginal Road bridge structure are considered urban land and are predominantly covered by buildings, concrete, asphalt, and other impervious surfaces, such as parking lots, industrial parks and shopping and business centers. Soils in this area consist almost totally of random fill materials. Soils along IR 90 south of the Marginal Road bridge structure are in areas of cut or fill. Typically, the upper 60 inches is silty clay loam, clay loam, or silt loam. The surface layer is commonly littered with shale fragments and is firm and dense. Hard rains tend to seal the surface in poorly vegetated areas, thus reducing the infiltration rate and restricting the emergence and growth of plants. In areas where the surface is bare, erosion hazard is severe. The suitability of the soils as a site for development varies.

2.4 Research / Interviews

Information regarding the history of the roadways and bridge structures within the study corridor was obtained from various sources and is presented in the following section.

Interstate Route 90

The Assistant County Manager of Cuyahoga County, Mr. Walter Biel, was contacted for information pertaining to the IR 90 portion of this study. It is understood that, in general, this area of IR 90 has performed well with few maintenance issues. Mr. Biel mentioned that a section of IR 90 approaching the Innerbelt Curve in the eastbound direction had experienced distressed conditions and was resurfaced approximately three years ago. However, based on PSI's field reconnaissance, this resurfaced stretch of IR 90 is once again exhibiting moderate distress conditions. Mr. Biel added that, in general, stretches of roadway under existing bridge structures tend to show earlier and more noticeable signs of distress.

Furthermore, it is understood that the Lakeside Road bridge structure and the Memorial Shoreway bridge structure required installation of timber subdecking due to spalling concrete. However, in general, it is understood that the existing bridge structures have performed well with few maintenance issues.

Mr. Biel also indicated occasional problems with blocked drains. However, it is understood that all drains are periodically checked and cleared if necessary.

Mr. Bill Miller (ODOT Central Office), Geologist in the Operations section of the Office of Geotechnical Engineering, was contacted in an attempt to locate soil profiles for the original construction of the bridge structures along IR 90. However, original soil profiles were not available at the time of the request. It should be noted that Mr. Miller has since retired from ODOT and any additional request for archived information from the ODOT Central Office should be directed to Mr. Steve Taliaferro.

Mr. Jawdat Siddiqi (ODOT Central Office), Assistant Administrator in the Bridge Design Resource section of the Office of Structural Engineering, provided pile driving records from the original construction for various bridge structures within the project limits. The pile driving records are included in Appendix II (on compact disc only).

Mr. Mike Karhan, a retired ODOT Area Engineer, was contacted for information regarding ODOT Project 542-86, CUY-90-17.95, a pavement repair performed in 1986. It is understood that a section of the eastbound left lane collapsed in the area of an abandoned brick sewer near East 40th Street. The abandoned brick sewer was completely removed and due to saturated soil conditions, the subgrade materials were over excavated and stabilized using approximately 12 inches of #2 stone. Mr. Don Phlipot, President of Elastizell Systems, Inc., located in Dayton, Ohio, was contacted to determine the limits of the elastizell backfill. Mr. Phlipot was able to verify that the elastizell backfill was placed up to a distance of approximately 100 feet in both eastbound and westbound directions, originating from the sewer location. It is understood that the pavement repair has performed well requiring only standard maintenance.

Mr. Gary Kopper, Superintendent of Cleveland Public Power (CPP), and Mr. Dale Turkovich, a Consulting Engineer of CPP, were contacted for information pertaining to the existing underground tunnels immediately South of the CPP Plant. Based on the provided information, it is understood that multiple tunnels were constructed in the 1930's when the original generator system was relocated from the south side of the existing Lake Road to the north side. The tunnels include a discharge and intake tunnel, an ash tunnel, a tunnel with a conveyor utilized to transport coal and a tunnel for electrical conduits. Based on the provided drawings, the top of the tunnels are approximately 23 to 34 feet below the existing surface grades and the bottom of the tunnels range between approximately 32 to 44 feet below the existing surface grades. It is understood that the tunnels have been abandoned and left in place. The coal conveyor is the only accessible tunnel and is inspected annually by ODOT District 12. The old generating station was demolished and the debris was left in place and buried. Based on provided drawings, it appears that the proposed new alignment of IR 90 may be in the area of the demolished generating station. Drawing number CMR-2, CMR-11 and CMR-14 show the location and approximate depths of the tunnels and are provided in Appendix II.

Ms. Lita Laven, Engineer II of the Northeast Ohio Regional Sewer District (NEORSD), was contacted for information pertaining to the interceptors and sewer outfalls within the study corridor. Based on the provided information, it is understood that the main interceptor running parallel and south of the existing SR-2/IR-90 roadway measures approximately 11.75 to 12.75 feet in diameter (long dimension of elliptical pipe) and the outfall pipes range between approximately 1.5 to 14.83 feet in diameter (long dimension of elliptical pipe). Drawings showing the location of the interceptor and sewer

outfalls within the project limits are provided in Appendix II. Also provided in Appendix II (on compact disc only), manhole inspection reports for the Easterly Interceptor and SWO pipes to the outfalls including various information such as the invert and rim elevations for manholes throughout the study corridor.

East 55th Street

Mr. Larry Hoe and Mr. Jim Deidrick, with the City of Cleveland, were contacted for information regarding the portion of the study near East 55th Street. Based on the available information, the CSX Railroad structure over East 55th Street was originally constructed in 1931. It is understood that the City of Cleveland has turned all plans over to the CSX Railroad Company.

Mr. John White, with the CSX Railroad Company, was contacted for available information regarding the CSX Railroad bridge structure. Available project information was limited to a drawing for the proposed reconstruction of the bridge structure, dated October 8, 1954. Information pertaining to the original foundations was not available.

It is understood that the East 55th Street bridge structure over IR 90 required the installation of timber subdecking due to spalling concrete. However, in general, the existing roadways and bridge structures within this area have performed well with few maintenance issues.

Cleveland Memorial Shoreway (SR 2)

Mr. Tom Hyland, an ODOT Area Engineer, was contacted for information regarding the SR 2 portion of this study. It is understood that this area of roadway has experienced poor drainage at times due to the configuration of the existing drainage system. All underdrains and roadside drains are tied in to the existing culvert system. Therefore, when lake levels are high, water is not allowed to drain freely.

During past roadway projects, the trench area (from the Innerbelt Curve to about East 22nd Street) has exhibited poor subgrade materials due to saturated soil conditions and has required undercut of about 6 to 12 inches. Furthermore, Mr. Hyland stated that large underground stock piles of compressible fill materials, such as railroad ties and rubber shoe soles, have been discovered in this area. The roadway has experienced moderate to excessive settlement since its original construction. It is understood that the roadway has been continually overlayed to remediate any settlement

distress. Therefore, the pavement composition varies drastically from one area to the next.

Mr. Hyland also mentioned that from the Innerbelt Curve to approximately East 40th Street, the base course consists of slag. This section of roadway has held up well and has required only regular maintenance.

MAJOR PROJECTS

The following is a list of major projects since the original construction:

PROJECT	ODOT (Dist. 12) Sub Directory #	PROJECT DESCRIPTION
CUY-90-16.22/VAR	001501	Overlay mainline of IR 90 with Novachip. Mill & replace existing surface course of ramps
CUY-90-16.22	000737	Milling and replacement of the existing asphalt surface course
CUY-90-17.60	000301	Reconstruction of the Innerbelt Curve (Superelevation)
CUY-90-17.74	000306	Pavement resurfacing
CUY-90-17.95	000422	Pavement resurfacing and elastizell backfill
CUY-90-18.03/VAR	001764	Timber subdecking
CUY-90-18.19	000695	Pavement resurfacing
CUY-90-18.63	008040	Partial depth repair

2.5 Previous Subsurface and Structure Investigations

PSI reviewed various sources of information related to previous investigation within the project limits. The following sections outline the information reviewed:

ORIGINAL ROADWAY SOIL PROFILES

CUY-42-18.77

These plans were prepared in 1956 for the construction of IR 90 from East 22nd Street to immediately east of Superior Avenue. A total of 21 borings

were drilled for this project and generally encountered granular materials. The soils encountered at grade consisted of A-1-b, A-3 and most predominately, A-3a. Moisture contents at grade ranged between 5 and 22 percent.

CUY-42R-19.78

These plans were prepared in 1955 for the construction of IR 90 from approximately Superior Avenue to East of the Innerbelt Curve (Station 85+88.93). The plans also include ramps for Superior Avenue, St. Clair Avenue, Lakeside Road and the interchange for the Memorial Shoreway. A total of 29 borings were drilled for this project. The test borings generally encountered random fill at the surface underlain by natural granular materials consisting predominantly of A-3a and A-4a. Moisture contents of the fill is not available, however, upperlying soils typically ranged between 8 and 24 percent.

CUY-2-16.98

These plans were prepared in 1950 for the construction of IR 90 from immediately east of the Innerbelt Curve to approximately East 55th Street. A total of 127 borings were drilled for this project up to 191 feet north of the centerline and up to 30 feet south of the centerline. The test borings generally encountered cinder fill material extending to the terminal depth at many test boring locations. However, some surface materials were classified as natural soils and consisted of sand, sandy silt and gravel and/or stone fragments. Furthermore, an area of silt was noted at or near the surface from approximately station 112+00 to station 122+00. The range of moisture contents are unclear based on the provided information, however, average moisture contents are provided in the soil summary.

The soil profiles discussed above have been reproduced for this report, and are presented in Appendix II.

BRIDGE STRUCTURES

Original soil profiles for the bridge structures were not available through ODOT District 12, ODOT Central Office, railroad companies or the City of Cleveland. However, original plans, pile driving records and current bridge inspection reports were reviewed to determine any pertinent information related to the existing bridge structures. The following sections present the pertinent findings from review of the available information.

The following table represents information obtained through review of pile driving records prepared during construction of the original bridge structures. All bridge piles were cast-in-place concrete.

BRIDGE DESCRIPTION	DATE	PILE DIAMETER	MINIMUM PILE LENGTH	MAXIMUM PILE LENGTH
East Memorial Shoreway over East Blvd. relocation	1950	12"	41'	52'
Pedestrian overpass over East Memorial Shoreway	1950	14"	49'	50'
Lakeside Avenue	1955	12"	61'	Only 1 Log
East 55th Street	1951	12"	62'	66'
S. Marginal Road	1955	12"	28'	50'
N.Y.C.R.R. (Norfolk Southern Railroad)	1955	14"	39'	60'
Penna R.R. Mainline (CSX Railroad)	1955	14"	57'	64'
Hamilton Avenue	1955	12"	59'	66'
St. Clair Avenue	1955	12"	60'	67'
Superior Avenue	1956	12"	52'	63'

The pile driving records for the bridge structures listed above are included in Appendix II (on compact disc format only).

BRIDGE INSPECTION REPORTS

The most recent bridge inspection reports were reviewed for the following structures:

BRIDGE STRUCTURE	STRUCTURE NUMBER	BRIDGE NUMBER CO. / RT. / UNIT	DATE
Superior Avenue	1808079	CUY / 00006 / 1672	12/08/03
St. Clair Avenue	1808109	CUY / 00090 / 1786	11/07/02
Hamilton Avenue	1808133	CUY / 00090 / 1794	12/26/02
CSX Railroad	1809350	CUY / 00090 / 1796	07/24/02
Lakeside Avenue	1808168	CUY / 00090 / 1803	07/24/02

Norfolk Southern	1809415	CUY / 00090 / 1812	07/24/02
S. Marginal Road	1808192	CUY / 00090 / 1815	11/21/02
Memorial Shoreway (Rt. 2)	1808222	CUY / 00002 / 1705	11/20/03
E. 55th Street Storm Sewer	1809377	CUY / 00006 / 1971	10/16/02
East 55th Street CH 382	1808257	CUY / 00090 / 1976	10/28/02

Review of the most current bridge inspection reports show mostly typical maintenance issues such as delaminations, leaching, scaling and spalling. However, a few bridge structures are experiencing more severe distress conditions including settlement, cracking and undermining of various components. The most significant findings are as follows:

- St. Clair Avenue – The slope protection has experienced uneven settlement and cracks were noted on piers.

- Hamilton Avenue – The back wall exhibits spalls as deep as 8 inches and cracks.

- Lakeside Avenue – Cracks exhibited in pier caps and top of start slope and finish slope are undermined below bays #1 and #2.

- South Marginal Road – Complete exposure of one lineal foot of vertical rebar and cracks in back wall. The finish abutment slope protection is undermined.

- Memorial Shoreway – Abutments exhibit cracking and the south half of the finished abutment has moved west at least 1.5 inches. Start abutment slope protection is undermined below bay #1 and the finished abutment slope protection is undermined below bay #6. Abutment seats exhibit cracks and spalls. The south half of the finished back wall has moved west at least 1.5 inches and exhibits cracks and spalls.

- East 55th Street Storm Sewer – Water infiltration and a few spalls were noted at joints. At one joint, a four inch stalactite was noted. The invert tiles exhibit signs of delamination.

- East 55th Street CH 382 – The abutments, abutment seats and piers all exhibit delaminated areas. Cracks and delaminations were noted on the backwalls and leaching cracks were noted on the wingwalls.

PREVIOUS SUBSURFACE INVESTIGATIONS CONDUCTED BY PSI

PSI has performed various subsurface explorations within or near the vicinity of the project limits. The soils encountered during these explorations are comparable to the soil profiles for the original construction of the roadway. The boring logs for various projects are provided in Appendix II of this report.

3.0 FIELD RECONNAISSANCE

Representatives of PSI performed a field reconnaissance of the study area on May 12, 13 and 28, 2004 and August 9 and 10, 2004. The field reconnaissance was limited to the existing right-of-way except within areas of the new alignment. The observations made during the field reconnaissance are presented below and photos taken during the field reconnaissance are presented in Appendix III.

3.1 Existing Land Use and General Features

The area along IR 90 and SR 2 consists mainly of industrial development as well as some commercial development. Within the area of the proposed new alignment, the land is mostly undeveloped with exception to a few nearby industrial building structures and some existing roadways. Furthermore, the existing surface grades in portions of the new alignment are approximately 20 feet above the existing grades of IR 90.

The area along East 55th Street in the vicinity of IR 90 and the CSX railroad consists mainly of industrial development with a mix of undeveloped land. Furthermore, the existing surface grades in portions of the new alignment for IR 90 are approximately 20 feet above the existing grades of IR 90.

3.2 Geotechnical Observations of Structures

All bridge structures and associated embankments were observed for signs of geotechnical concerns. These concerns are listed below.

- A timber subdecking was installed on Lakeside Road, Memorial Shoreway and the East 55th Street bridge structures due to spalling concrete.

- The southern bridgedeck drain on the west side of the St. Clair Avenue bridge structure is outletting below grade and is the likely cause of distress evidenced on the associated concrete embankment.

- On the northeast corner of the Lakeside Road bridge deck, the ground below the sidewalk has eroded causing the sidewalk to cave in. The extent of erosion is unknown.

- Hairline cracks are exhibited below all center piers on the Lakeside Road bridge structure.

- The South Marginal Road bridge structure over SR 2 has experienced differential settlement between the wing walls and abutment walls.

3.3 Geotechnical Observations of the Roadway

- Wet areas and ponded water were noted along both sides of IR 90 from approximately Superior Avenue to Lakeside Road. A wet area was also noted north of IR 90 near Quay 55.

- Many roadside drains are performing poorly due to partial or complete blockage resulting from build up of miscellaneous debris and soil. Two roadside drains near Lakeside Road were completely blocked and contained standing water. Additionally, three roadside drains on the SR 2 east/IR 90 west exit ramp are completely filled with soil.

- A few areas adjacent to blocked or partially blocked roadside drains are exhibiting signs of erosion.

- The eastbound lanes of IR 90 as you approach the Innerbelt Curve show noticeable signs of distress. This area was resurfaced approximately three years ago.

- The stretch of East 55th Street from the CSX Railroad to the area of North Marginal Road exhibits numerous longitudinal cracks extending across the entire roadway in some instances.

- State Route 2, within the project limits, exhibits numerous longitudinal cracks and pavement distress. Overall, this stretch of roadway exhibits more distress conditions when compared to other roadways within the study corridor.

- Moderate to severe distress conditions were exhibited at approach slabs for various bridge structures.

- A sinkhole was noted in a parking lot located immediately west of East 55th Street. It is understood that the sinkhole was caused by a damaged underground utility line.

4.0 GEOTECHNICAL RED FLAG SUMMARY

Based on the information reviewed and the field reconnaissance, it appears that the most significant geotechnical issues are poor drainage and potential problems due to substantial amounts of fill material within the study corridor.

The completed Red Flag Checklist is presented below:

	DESIGN ISSUES	COMMENTS
☒Yes ☐No ☐Possible ☐Not Applicable	Is there evidence of soil drainage problems (e.g., wet or pumping subgrade, standing water, the presence of seeps, wetlands, swamps, bogs)?	Many roadside drains were completely blocked and various others were partially blocked with miscellaneous debris. The drainage ditches along both sides of IR 90 south of Hamilton Road contain standing water, cattails and other wetland vegetation. A wet area was also noted near a partially blocked drain north of IR 90 in the area of Quay 55.
☒Yes ☐No ☐Possible ☐Not Applicable	Is there evidence of any embankment or foundation problems (e.g., differential settlement, sag, foundation failures, slope failures, scours, evidence of channel migrations)?	The concrete slope embankment under the west side of the St. Clair Avenue bridge structure is exhibiting excessive settlement. Hairline cracks were noted within the barrier wall under all center piers of the Lakeside Road bridge structure.

		Soil has eroded from below the sidewalk on the northeast corner of the Lakeside Road bridge deck causing the sidewalk to cave in. Cracks (horizontal separation) were noted at all of the wingwall/abutment interfaces on the South Marginal Road bridge structure over SR-2 near the East 26th Street Yard.
☐Yes ☒No ☐Possible ☐Not Applicable	Is there evidence of any landslides?	No evidence of landslides was noted during the field reconnaissance. Vegetation appeared adequate on all hillsides and embankments. However, channel erosion and a localized slope failure was exhibited on a hillside south of South Marginal Road, approximately 400 feet west of East 38th Street.
☒Yes ☐No ☐Possible ☐Not Applicable	Is there evidence of unsuitable materials (e.g., presence of debris or man-made fills or waste pits containing these materials, indications from old soil borings)?	Unsuitable materials were not evidenced at the surface. However, soil borings for the original construction of the roadways indicate substantial areas of fill material throughout the study corridor. The fill is present to varying depths.
☐Yes ☒No ☐Possible ☐Not Applicable	Is there evidence of rock strata (e.g., presence of exposed bedrock, rock on the old borings)?	Weathered shale is present at depths of approximately 100 to 250 feet below the existing surface grades.
☐Yes ☒No ☐Possible ☐Not Applicable	Is there information pertaining to the existence of underground mines?	No underground mines are reported immediately within the study corridor. However, an underground mine is documented approximately one-half mile geographically northwest of the Innerbelt Curve. The majority of the underground mine lies within Lake Erie.

☐Yes ☒No ☐Possible ☐Not Applicable	Is there evidence of active, reclaimed or abandoned surface mines?	No active, reclaimed or surface mines are reported within the study corridor.
☒Yes ☐No ☐Possible ☐Not Applicable	Are soil borings needed for pavement design, foundations (bridge, headwall, retaining wall, noise wall), or slopes?	Soil profiles were not available for the original construction of the bridge structures. Additionally, very little soil information is available for the areas within the new alignment. Furthermore, the existing boring information for the roadway should be updated with new borings to evaluate the current subsurface conditions and to meet the requirements of SSI and GB1.
☒Yes ☐No ☐Possible ☐Not Applicable	Does an undercut appear to be needed?	Undercut is a very possible due to the substantial amounts of fill material within the study corridor. Areas along existing roadways will not likely require excessive undercut, stabilization or treatment. However, undercut is expected in areas of new alignment.
☒Yes ☐No ☐Possible ☐Not Applicable	Should the Office of Geotechnical Engineering be contacted to evaluate the project site?	The Office of Geotechnical Engineering should be informed to determine if redesign will require additional oversight. This effort is the beginning step of the geotechnical evaluation. Geotechnical oversight will be necessary throughout the projects development phase.
☐Yes ☒No ☐Possible ☐Not Applicable	Are there any other geotechnical issues? *Specify.*	At this time, no additional geotechnical concerns were detected. However, once additional information becomes available, additional geotechnical concerns may arise.

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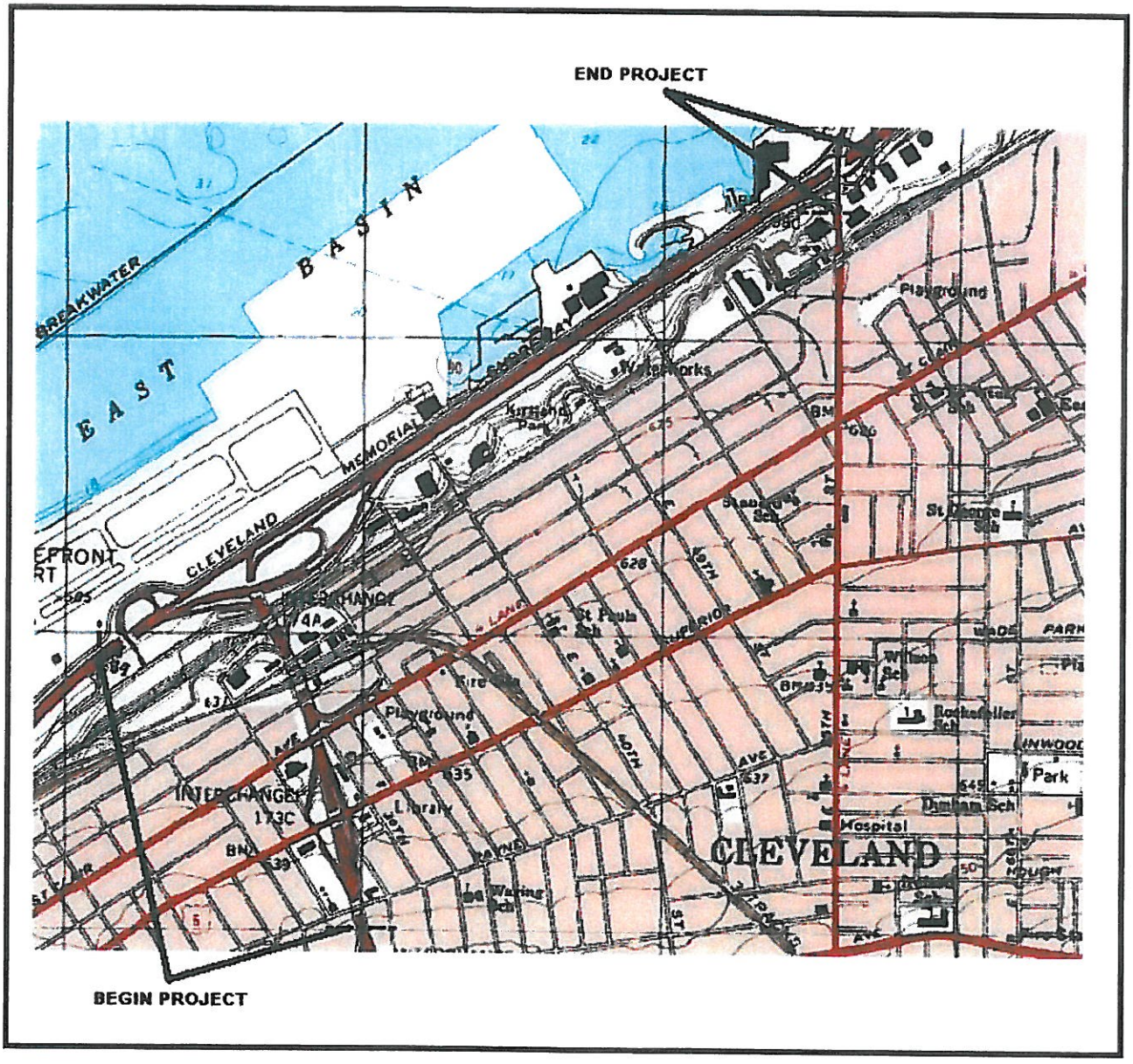
SITE VICINITY MAP



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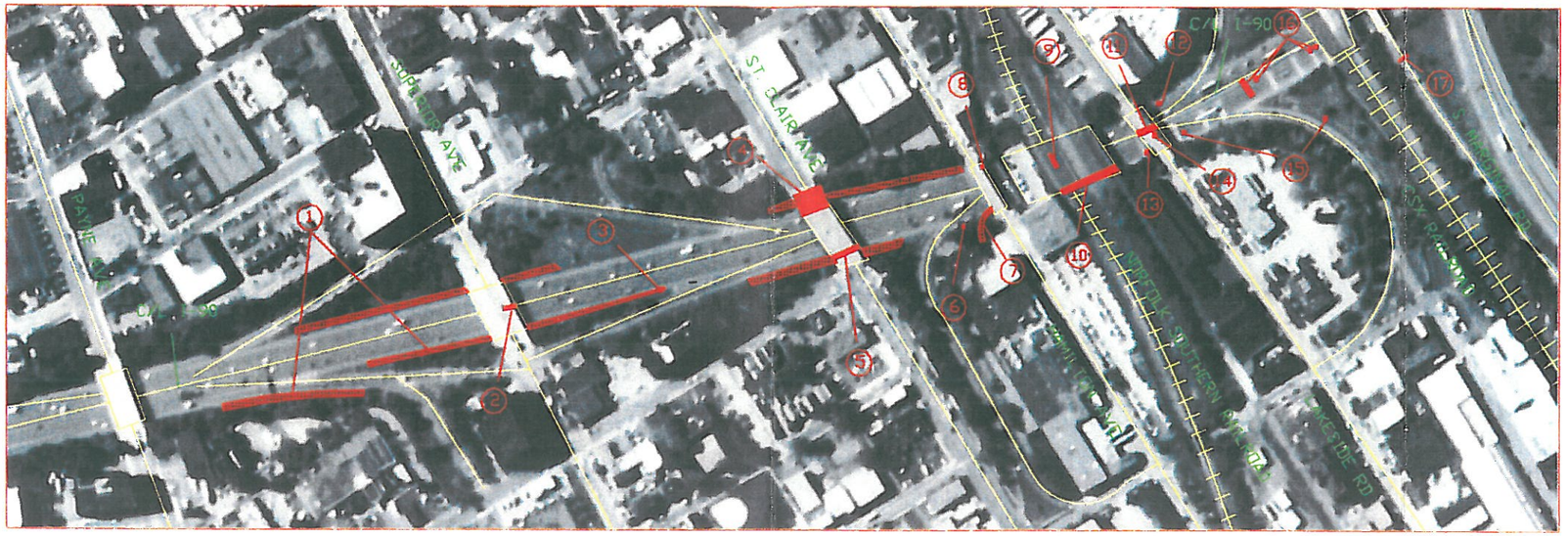
AUTOCAD SECTION PLAN

BEGIN PROJECT



MATCH LINE X

SECTION A

(1) WET AREA (TYPICAL)

(2) CENTER PIER CAP DISTRESS (SEE PHOTO #1)

(3) EROSION ADJACENT TO ROADSIDE DRAIN (SEE PHOTO #5)

(4) SOUTHERN BRIDGE DRAIN OUTLET BELOW GRADE/ SATURATED SOIL CONDITIONS / SETTLEMENT OF SLOPE PROTECTION (SEE PHOTOS #2 AND #3)

(5) PONDED WATER AT TOE OF SLOPE (SEE PHOTO #4)

(6) POTHOLE AND PONDED WATER ON ROADSIDE SHOULDER (SEE PHOTO #6)

(7) DISTRESS OF WING WALL (SEE PHOTO #7) / SEPERATION BETWEEN WING WALL AND ABUTMENT WALL (SEE PHOTO #8)

(8) HAIRLINE CRACK AND RUST STAINS ON ABUTMENT WALL (SEE PHOTO #9)

(9) PAVEMENT DISTRESS

(10) PREVIOUSLY REPAIRED CRACKS AND AREAS OF MILDEW ON ABUTMENT WALL (SEE PHOTOS #10 AND #11)

(11) HAIRLINE CRACKS UNDER ALL CENTER PIERS (SEE PHOTO #13)

(12) EROSION ADJACENT TO ROADSIDE DRAIN (SEE PHOTO #16)

(13) FAILURE OF BRIDGEDECK SIDEWALK DUE TO UNDERMINING OF SUPPORTING SOILS (SEE PHOTO #12)

(14) POTHOLES / PAVEMENT DISTRESS (SEE PHOTO #13)

(15) COMPLETE BLOCKAGE OF ROADSIDE DRAINS (SEE PHOTOS #14 AND #15)

(16) PREVIOUSLY REPAIRED SECTION OF ROADWAY / PAVEMENT DISTRESS (SEE PHOTO #17)

(17) EROSION AND PAVEMENT DISTRESS DUE TO PREVIOUS TRENCH WORK (SEE PHOTO #18)

NOTES:

1. AERIAL IMAGERY OBTAINED FROM TERRA SERVER. THE IMAGES WERE ACQUIRED IN 2000. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN

2. FIELD RECONNAISSANCE WAS COMPLETED MAY 12 13 AND 28, 2004 AND AUGUST 9 AND 10, 2004 BY REPRESENTATIVES OF PSI, INC. FIELD RECONNAISSANCE NOTES ARE SHOWN IN RED

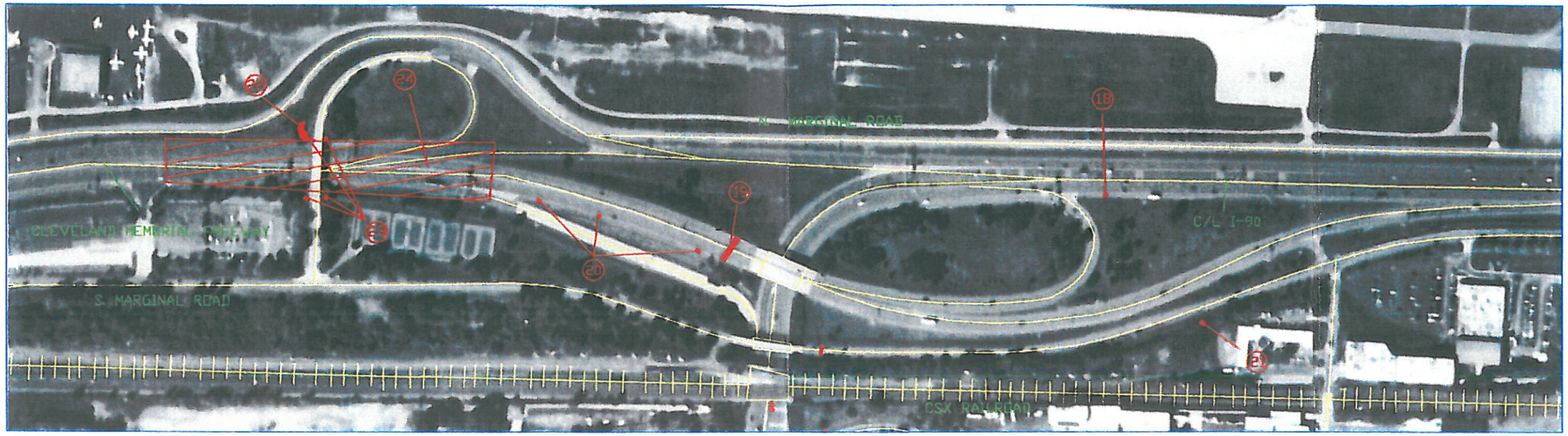
GEOTECHNICAL RED FLAG STUDY
CUYAHOGA I-90 / INNERBELT CURVE
PAYNE AVE TO CSX RAILROAD

DRAWN BY:	REVIEW BY:	REVIEW DATE:	SCALE:
SMP	AV	8/20/04	NTS

CUY-IR-90

1/4

BEGIN PROJECT



MATCH LINE Y

MATCH LINE X

SECTION B

(18) PONDED WATER ON ROADSIDE SHOULDER

(19) PAVEMENT DISTRESS AT APPROACH SLAB (SEE PHOTOS #19 AND #20)

(20) COMPLETELY BLOCKED ROADSIDE DRAINS (SEE PHOTOS #27 AND #28)

(21) CHANNEL EROSION AND MINOR SLOPE FAILURE (SEE PHOTO #29)

(22) HAIRLINE CRACKS AND PRIOR REPAIR (SEE PHOTO #22)

(23) VERTICAL SEPERATION BETWEEN WING WALL AND ABUTMENT (SEE PHOTOS #23 AND #24)

(24) MODERATE PAVEMENT DISTRESS (SEE PHOTOS #21, #25 AND #26)

NOTES:

1. AERIAL IMAGERY OBTAINED FROM TERRA SERVER. THE IMAGES WERE ACQUIRED IN 2000. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN

2. FIELD RECONNAISSANCE WAS COMPLETED MAY 12 13 AND 28, 2004 AND AUGUST 9 AND 10, 2004 BY REPRESENTATIVES OF PSI. INC. FIELD RECONNAISSANCE NOTES ARE SHOWN IN RED

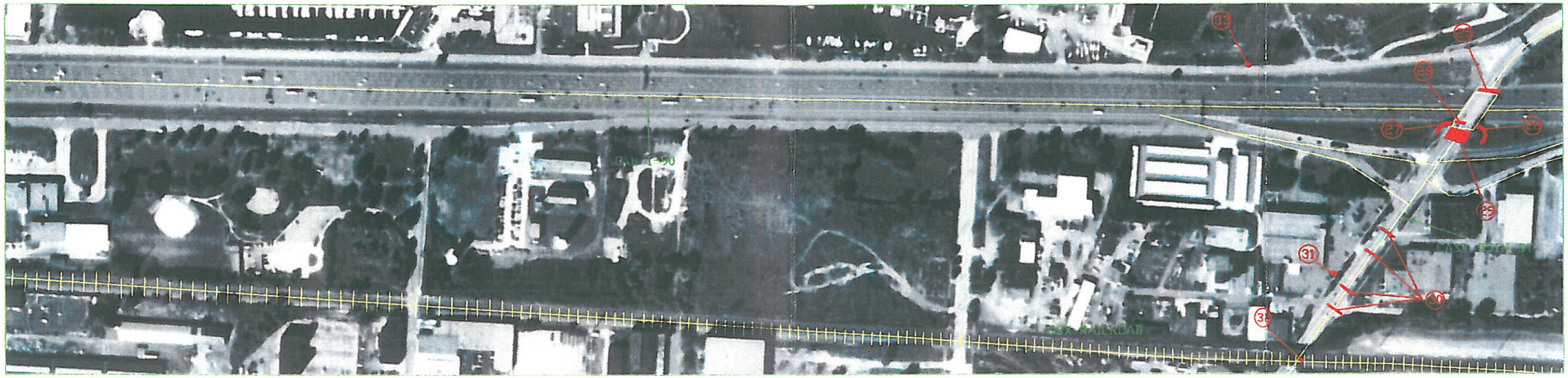
GEOTECHNICAL RED FLAG STUDY
CUYAHOGA I-90 / INNERBELT CURVE
CLEVELAND MEMORIAL SHOREWAY

DRAWN BY:	REVIEW BY:	REVIEW DATE:	SCALE:
SMP	AV	8/20/04	NTS

CUY-IR-90

2/4

MATCH LINE Y



END OF PROJECT

SECTION C

END OF PROJECT

(29) MINOR CRACKS IN ABUTMENT WALLS

(26) RUST STAINS AND CRACKS IN ABUTMENT WALL (SEE PHOTO #43)

(27) VERTICLE CRACK IN WING WALL (SEE PHOTO #44)

(28) HAIRLINE CRACK IN WING WALL (SEE PHOTO #41)

(29) PAVEMENT DISTRESS (SEE PHOTO #40)

(30) PAVEMENT DISTRESS (SEE PHOTOS #38 AND #39)

(31) SINKHOLE IN PARKING LOT (SEE PHOTO #37)

(32) PONDED WATER ON SHOULDER OF NORTHBOUND LANE (SEE PHOTO #33)

(33) PARTIALLY BLOCKED DRAIN / SURFACE EROSION / WET AREA (SEE PHOTOS #30, #31 AND #32)

NOTES:

1. AERIAL IMAGERY OBTAINED FROM TERRA SERVER. THE IMAGES WERE ACQUIRED IN 2000. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN

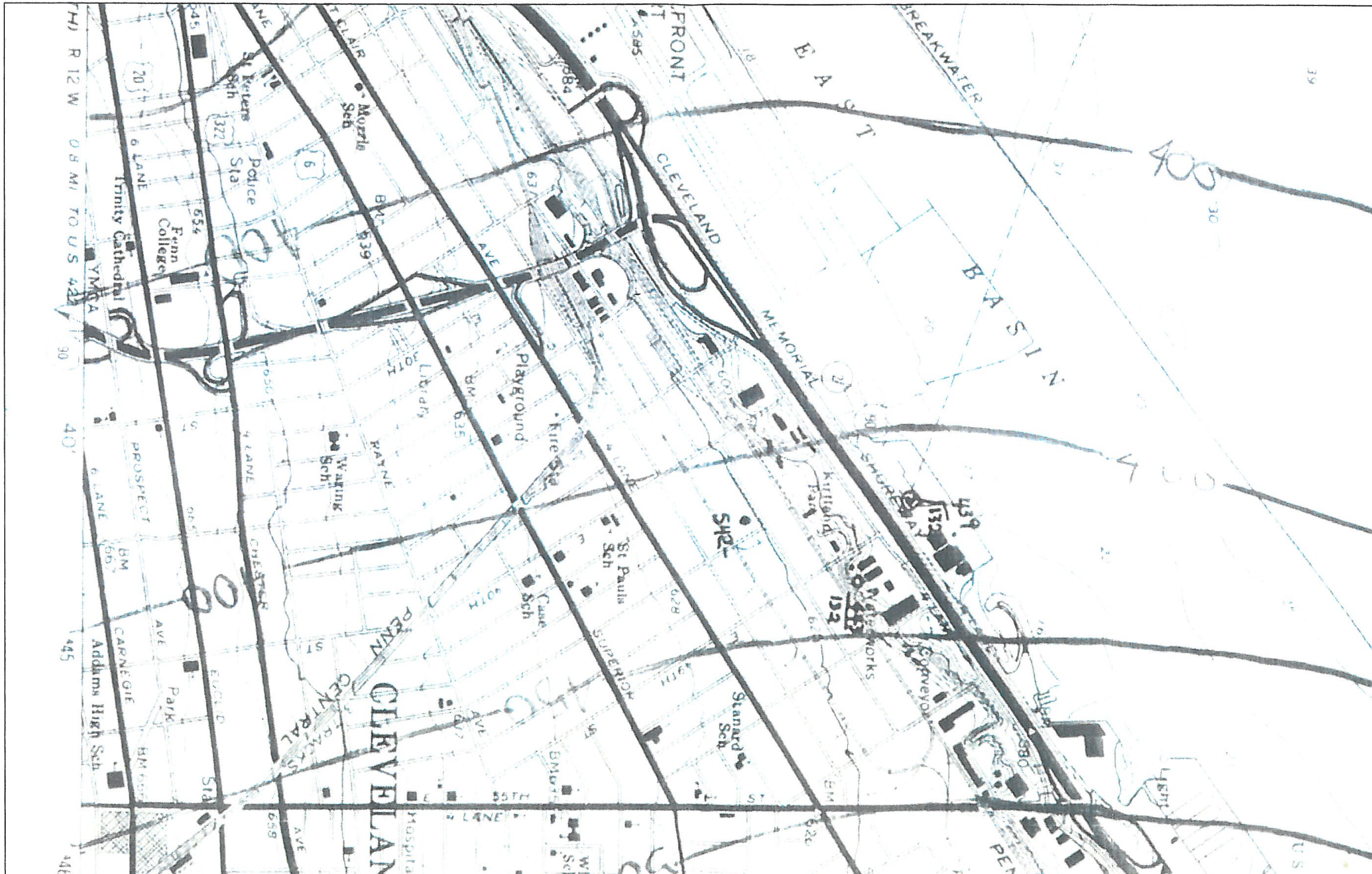
2. FIELD RECONNAISSANCE WAS COMPLETED MAY 12 13 AND 28, 2004 AND AUGUST 9 AND 10, 2004 BY REPRESENTATIVES OF PSI, INC. FIELD RECONNAISSANCE NOTES ARE SHOWN IN RED

GEOTECHNICAL RED FLAG STUDY
CUYAHOGA I-90 / INNERBELT CURVE
I-90 AND EAST 55TH STREET

DRAWN BY:	REVIEW BY:	REVIEW DATE:	SCALE:
SMP	AV	8/20/04	NTS

CUY-IR-90

3/4



NOTES:

1. BEDROCK TOPOGRAPHY OBTAINED FROM THE O.D.N.R 7.5 MINUTE BEDROCK TOPOGRAPHY MAP SERIES CLEVELAND NORTH QUADRANGLE. CONTOUR INTERVAL AS SHOWN.

DRAWN BY:	REVIEW BY:	REVIEW DATE:	SCALE:
SMP	AV	8/20/04	NTS

GEOTECHNICAL RED FLAG STUDY
CUYAHOGA I-90 / INNERBELT CURVE
BEDROCK TOPOGRAPHY

CUY-IR-90

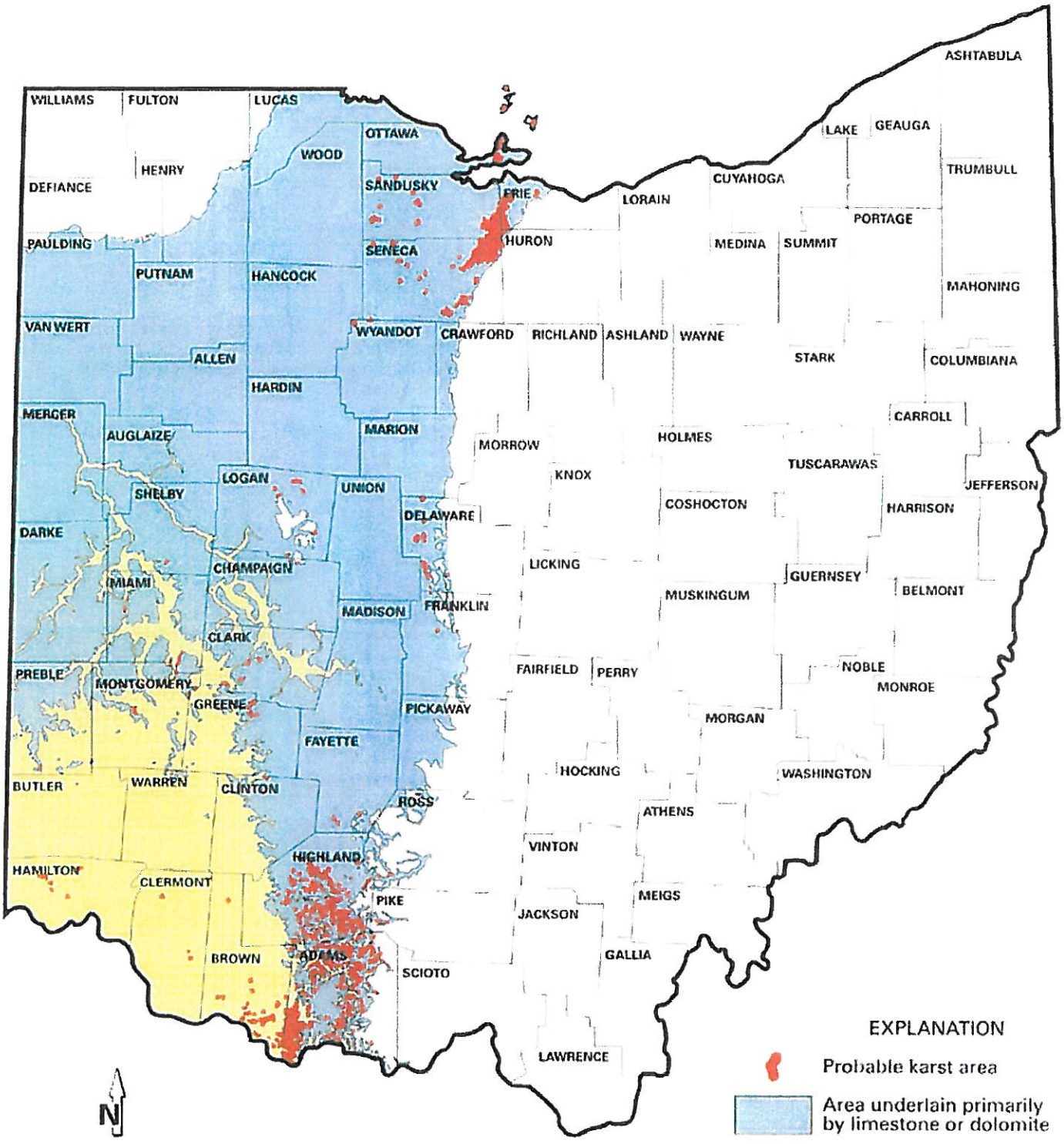
4/4

STATE OF OHIO
Bob Taft, Governor

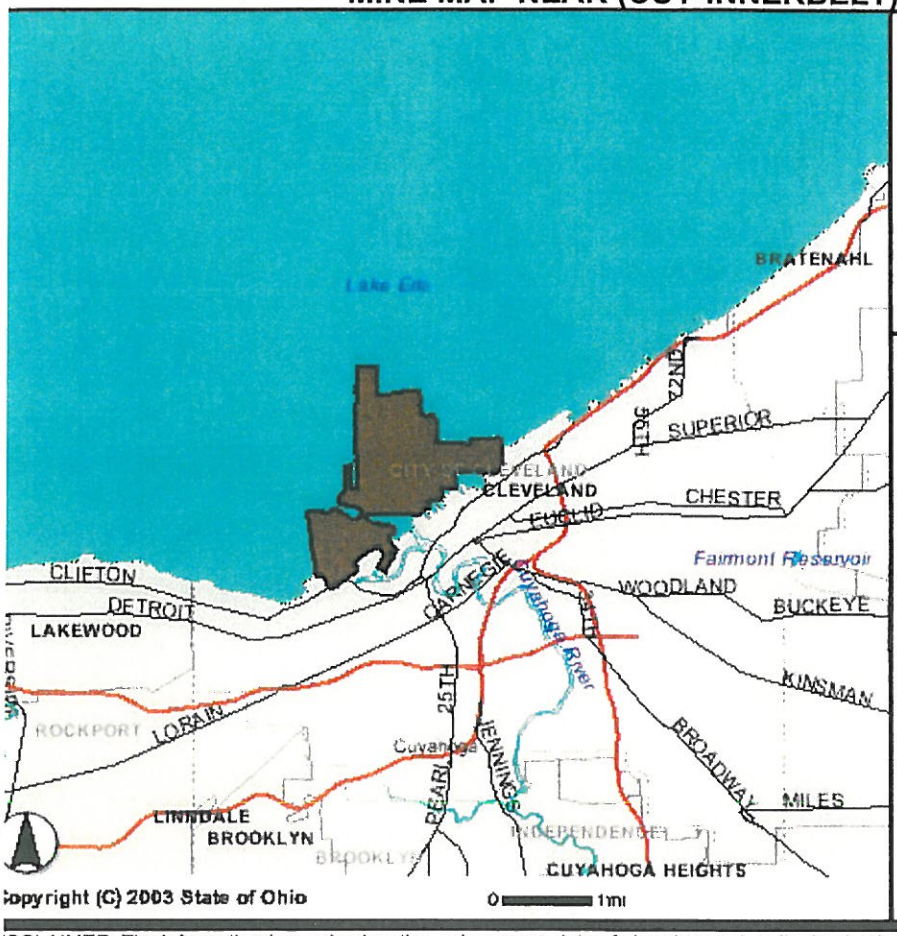
DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director

DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief

OHIO KARST AREAS



MINE MAP NEAR (CUY-INNERBELT) STUDY AREA



LEGEND

- State Routes
- Interstate Hwy
- Underground Mines
- Underground Mine Extent Partially Unknown
- Rivers
- Lakes
- Cities
- Quad 24K
- Townships
- Counties
- Digital Ortho Photography
- Topographic Maps

ISCLAIMER: The information (e.g. mine location, mine name, date of abandonment, unit mined, mine-entry locations, etc.) presented herein for abandoned-nderground mines in Ohio has been obtained from mine maps and records on file with the Ohio Department of Natural Resources, Division of Geological Survey. 'hile the information presented herein is periodically updated as new information becomes available, the Division of Geological Survey estimates that there may be as any as 2,000 abandoned-underground mines in Ohio for which the Division has no information. Neither the Ohio Department of Natural Resources, nor any agency ereof, nor any of their employees, contractors, or subcontractors, make any warranty, express or implied, nor assume any legal liability or responsibility for the :curacy, completeness, or usefulness of this product. Any use thereof for a purpose other than for which said information or product was intended shall be solely at e risk of the user.

APPENDIX I

Site Vicinity Map

AutoCAD Section Plan

Digital Orthophoto Quarter Quadrangles with
Field Reconnaissance Notes

USGS 7.5-minute Quadrangles with Bedrock Topography

Ohio Karst Area Map

Underground Mine Map

APPENDIX II

Original Soil Profiles

Pile Driving Records
(On Compact Disc Only)

Boring Logs in Vicinity of Project Limits

Drawing Numbers CMR-2, CMR-11 and CMR-14
(Cleveland Public Power Plant)

Sewer Interceptors and Outfall Locations (NEORSD)

Easterly Interceptor and SWO Pipe Depths (NEORSD)
(On Compact Disc Only)

I.R. I-90

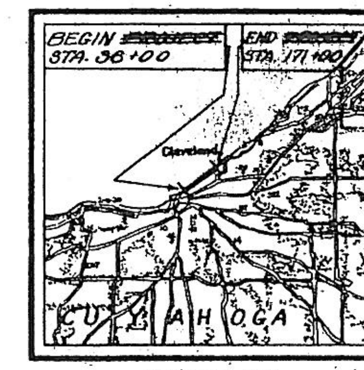
SOIL PROFILE
CUYAHOGA CO.
CUY-2-16.98

1/5

STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

FED. NO. F-131

NOTE: The information shown by this subgrade profile was secured for the information of the State of Ohio. The State does not guarantee the correctness thereof. ~~does not include it as a part of the plans governing the construction of the project~~



LOCATION MAP

LEGEND FOR PROJECT-AVERAGE RESULTS OF TESTS-115 SAMPLES TESTED

DESCRIPTION	H.R.B. CLASS	S.H.T.L. CLASS	% AGG.	% C. SAND	% F. SAND	% SILT	% CLAY	LIQUID LIMIT	PLASTICITY INDEX	WATER CONTENT	SAMPLES TESTED
GRAVEL AND/OR STONE FRAGMENTS SAND & SOIL	A-2-4(0)	2	40	18	19	19	4	27	1	17	8
GRAVEL & SAND	A-1-3(0)	3	49	31	7	12	1	N.P.	N.P.	25	1
SAND	A-2-4(0)	4	17	32	28	18	5	N.P.	N.P.	14	32
BERM MATERIAL		7	CLASSIFIED BY VISUAL INSPECTION								
SILT	A-4(8)	8	9	7	8	68	8	34	2	32	5
SANDY SILT	A-4(12)	9	18	19	22	33	8	23	N.P.	18	7
TOP SOIL		10	CLASSIFIED BY VISUAL INSPECTION								
SILT & CLAY	A-6(8)	11	13	8	7	38	34	31	12	23	3
ELASTIC SILT AND CLAY WITH ORGANIC MATERIAL	A-5(7)	12	15	9	15	47	14	53	8	67	1
CLAY & SILT	A-6(10)	15	5	11	10	40	34	38	15	29	3
CINDERS		18	44	23	14	15	4	28	N.P.	16	55

EXISTING PAVEMENT

AUGER BORING PLOTTED TO VERTICAL SCALE ONLY

• WATER CONTENT NEARLY EQUAL TO OR GREATER THAN THE LIQUID LIMIT

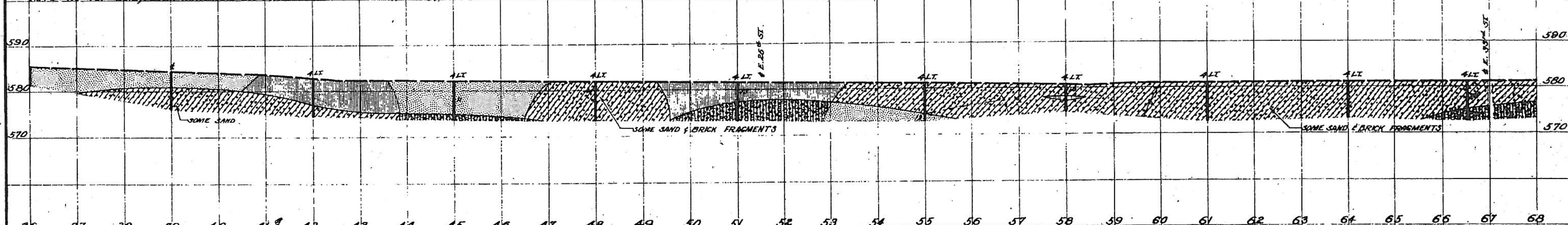
NOTE: FIGURES BESIDE BORINGS SHOW WATER CONTENT IN PER CENT

SAMPLES TESTED LAB. NOS. 50.
78747 - 78786
78943 - 78977
79108 - 79131
79156 - 79171

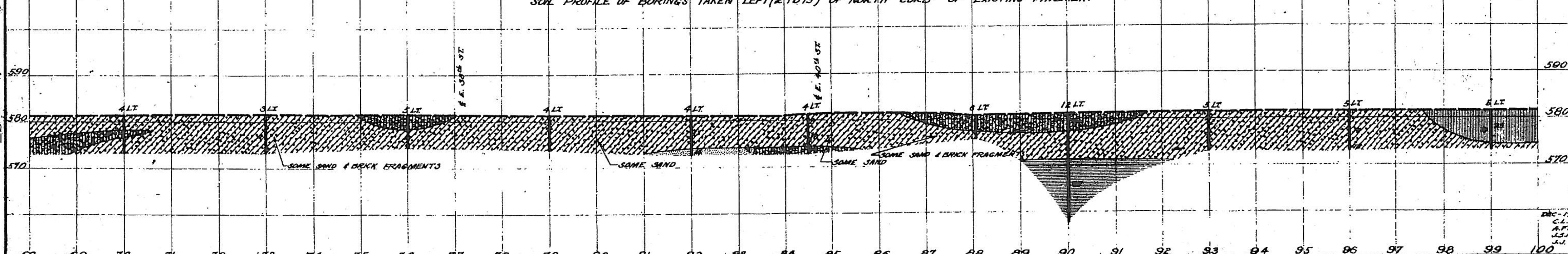
NOTE: GROUND LINE SHOWN IS THE NORTH GUTTER OF THE EXISTING PAVEMENT

SOIL PROFILE OF BORINGS TAKEN LEFT (2' TO 15') OF NORTH CURB OF EXISTING PAVEMENT

NOTE: NO TOP SOIL, BERM MATERIAL OR PAVEMENT SHOWN BETWEEN STA 36+00 TO 141+00



SOIL PROFILE OF BORINGS TAKEN LEFT (2' TO 15') OF NORTH CURB OF EXISTING PAVEMENT



DEC-1950
C.L.H.
A.F.
J.S.M.
J.J.

SOIL PROFILE
CUYAHOGA CO.
CUY-2-16.98
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

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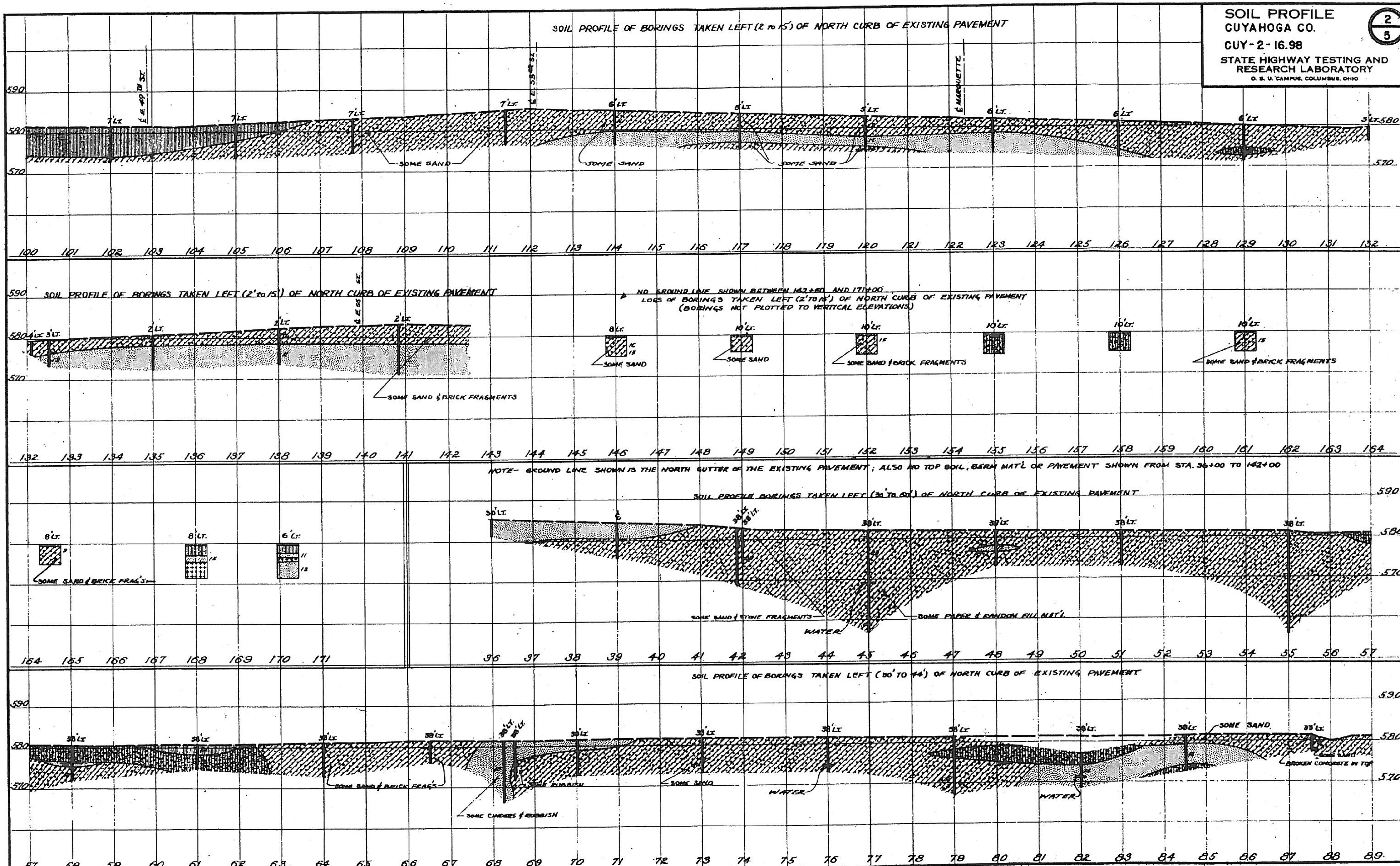


SOIL PROFILE

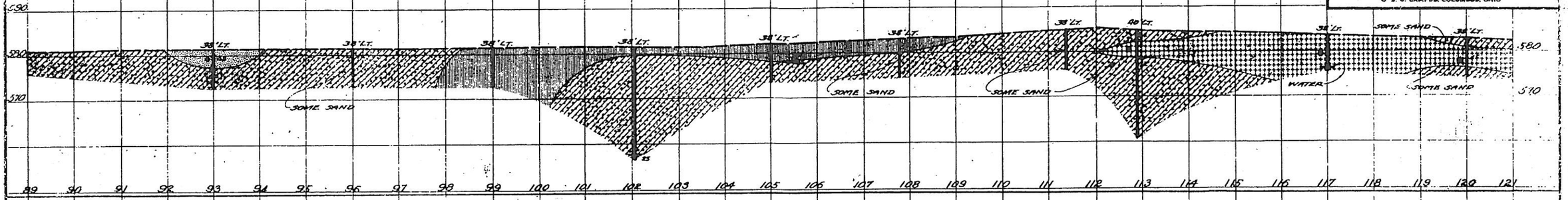
CUYAHOGA CO.

CUY-2-16.98

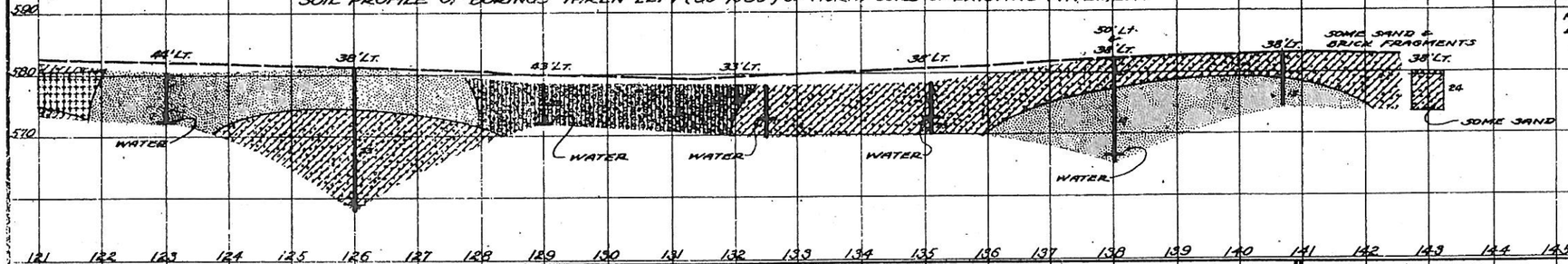
STATE HIGHWAY TESTING AND RESEARCH LABORATORY

O. S. U. CAMPUS, COLUMBUS, OHIO

SOIL PROFILE OF BORINGS TAKEN LEFT (30' To 50') OF NORTH CURB OF EXISTING PAVEMENT



SOIL PROFILE OF BORINGS TAKEN LEFT (30' To 50') OF NORTH CURB OF EXISTING PAVEMENT



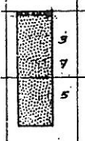
NOTE:-

NO GROUND LINE SHOWN FROM STA. 142+80 To STA. 171+00. LOGS OF BORINGS TAKEN (30' to 50') OF NORTH CURB OF EXISTING PAVEMENT (BORINGS NOT PLOTTED TO VERTICAL ELEVATION)

NOTE:-

LOGS OF BORINGS TAKEN LEFT (30' TO 50') OF NORTH CURB OF EXISTING PAVEMENT. (NOT PLOTTED TO VERTICAL ELEVATION)

FROM STA. 149+20 To STA. 165+75 CENTERLINE CROSSES A SECTION OF LAKE ERIE.

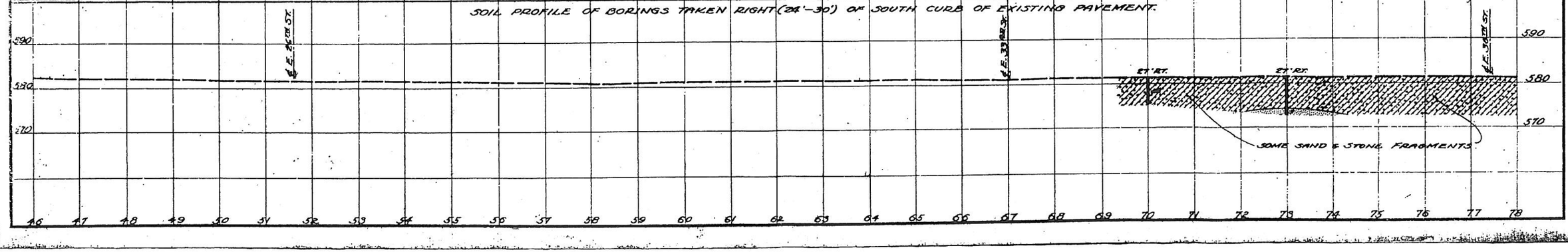


NOTE:- GROUND LINE SHOWN IS NORTH GUTTER OF EXISTING PAVEMENT. NO TOP SOIL, BERM OR PAVEMENT SHOWN BETWEEN STA. 36+00 To STA. 141+50.

SOIL PROFILE OF BORINGS TAKEN RIGHT (24' To 30') OF SOUTH CURB OF EXISTING PAVEMENT

NO BORINGS BETWEEN STATIONS 36+00 AND 69+00

SOIL PROFILE OF BORINGS TAKEN RIGHT (24'-30') OF SOUTH CURB OF EXISTING PAVEMENT.



SOIL PROFILE
CUYAHOGA CO.
CUY-2-16.98
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

4/5

SOIL PROFILE OF BORINGS TAKEN RIGHT (24' TO 30') OF SOUTH CURB OF EXISTING PAVEMENT

℄ E. 40TH ST.

℄ E. 49TH ST.

27' Rt.

SOME SAND & STONE FRAGMENTS

590
580
570

78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110

SOIL PROFILE OF BORINGS TAKEN RIGHT (24' TO 30') OF SOUTH CURB OF EXISTING PAVEMENT

℄ E. 29TH ST.

℄ HAGUETTE

℄ E. 55TH ST.

24' Rt.

27' Rt.

SOME SAND & STONE FRAGMENTS

590
580
570

110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142

NO GROUND LINE SHOWN FROM STA 142+50 TO 171+00 (BORINGS NOT PLOTTED TO VERTICAL ELEVATIONS)
LOGS OF BORINGS TAKEN RIGHT (27' TO 30') OF SOUTH CURB OF EXISTING PAVEMENT

30' Rt.

30' Rt.
SOME SAND

27' Rt.
SOME SAND

27' Rt.

590
580
570

142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171

LOGS OF BORINGS TAKEN LEFT (91' TO 191') OF NORTH CURB OF EXISTING PAVEMENT

91' Lt.
SOME 'SAND', TIN CANS, RUBBER, WOOD & BRICK FRAGMENTS
WATER AT 7'

91' Lt.
CONCRETE FRAGMENTS

95' Lt.
SOME SAND & BRICK FRAGMENTS

106' Lt.

91' Lt.
WATER 8½'
SOME SAND & BRICK FRAGMENTS

91' Lt.
SOME SAND
WATER 6½'

100' Lt.

91' Lt.
SOME SAND

91' Lt.
WATER 8½'

95' Lt.
WATER 7½'
SOME STONE FRAGMENTS

100' Lt.
CONCRETE PARKING LOT SLAB
WATER 6½'

150' Lt.
SOME SAND & BRICK FRAGMENTS

191' Lt.

580
570

STATIONS 70+00 76+00 82+00 87+90 93+00 99+00 105+00 111+38 117+00 123+00 129+00 135+00 140+65

SOIL PROFILE
CUYAHOGA CO.
CUY-2-16.98
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

5/5

LOGS OF BORINGS TAKEN IN THE ℄ OF THE NORTH LANE OF THE EXISTING PAVEMENT (BORINGS NOT PLOTTED TO VERTICAL ELEVATION)

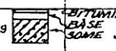
COMPOSITION OF BITUMINOUS TOP MATERIAL
PASS NO.6 = 100 %, PASS NO. 200 = 20.4 % AND BITUMEN = 9.5%
MATERIAL USED - FINE AGGREGATE - NATURAL SAND
BITUMINOUS CEMENT USED - AC

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	97	89 NON-PLASTIC	75	58	33	13

MATERIAL - SAND, STONE FRAGMENTS & SLAG

PAVEMENT THICKNESS
BITUMINOUS TOP = 6"
BASE MATERIAL = 10 ¾"
TOTAL = 16 ¾"



STA. 48+00

COMPOSITION OF BITUMINOUS TOP MATERIAL
PASS NO.6 = 100%, PASS NO. 200 = 18.6 % AND BITUMEN = 9.0%
MATERIAL USED - FINE AGGREGATE - NATURAL SAND
BITUMINOUS CEMENT USED - AC

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	100	97 NON-PLASTIC	89	71	46	26

MATERIAL - SAND & STONE FRAGMENTS

PAVEMENT THICKNESS
BITUMINOUS TOP = 4 ½"
BASE MATERIAL = 9 ½"
TOTAL = 14"

STA. 89+10

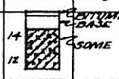
COMPOSITION OF BITUMINOUS TOP MATERIAL
PASS NO.6 = 100%, PASS NO. 200 = 2.6% , BITUMINOUS = 6.7%
MATERIAL USED - FINE AGGREGATE - NATURAL SAND
BITUMINOUS CEMENT USED - AC

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	100	97 NON-PLASTIC	87	74	57	18

MATERIAL - SAND, STONE FRAGMENTS & SLAG

PAVEMENT THICKNESS
BITUMINOUS TOP = 6"
BASE MATERIAL = 22 ½"
TOTAL = 28 ½"



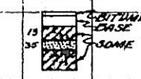
STA. 168+00

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

1"	⅜"	⅛"	NO.4	NO.10	NO.40	NO.200
100	100	88 NON-PLASTIC	85	79	44	21

MATERIAL - SAND AND STONE FRAGMENTS

PAVEMENT THICKNESS
BITUMINOUS TOP = 6"
BASE MATERIAL = 18"
TOTAL = 24"



STA. 128+00

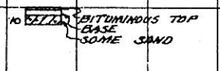
LOGS OF BORINGS TAKEN IN THE ℄ OF THE SOUTH LANE OF THE EXISTING PAVEMENT (BORINGS NOT PLOTTED TO VERTICAL ELEVATION)

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	100	92 NON-PLASTIC	82	70	53	20

MATERIAL - SAND, STONE FRAGMENTS & SLAG

PAVEMENT THICKNESS
BITUMINOUS TOP = 3 ½"
BASE MATERIAL = 12"
TOTAL = 15 ½"



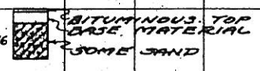
STA. 68+50

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

2"	1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	71	62	54	48	39	28	18

MATERIAL - STONE FRAGMENTS WITH SAND

PAVEMENT THICKNESS
BITUMINOUS TOP = 3 ¾"
BASE MATERIAL = 22 ½"
TOTAL = 26 ¼"



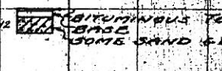
STA. 107+33

COMPOSITION OF BASE MATERIAL
TOTAL PER CENT PASSING

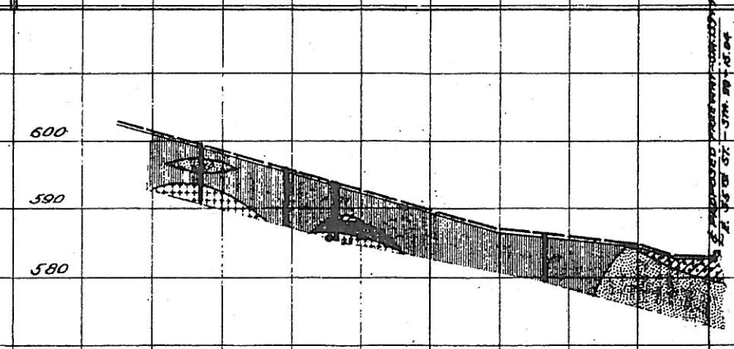
2"	1"	¾"	⅜"	NO.4	NO.10	NO.40	NO.200
100	86	80	65	52	35	21	11

MATERIAL - SLAG AND SAND

PAVEMENT THICKNESS
BITUMINOUS TOP = 3 ½"
BASE MATERIAL = 10 ½"
TOTAL = 14 ⅛"



STA. 148+00



SOIL PROFILE OF EAST 55TH STREET

I.R.I-90

SOIL PROFILE
CUYAHOGA COUNTY
CUY-42R-19.78

STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

NOTE: THE INFORMATION SHOWN BY THIS SUBGRADE PROFILE WAS SECURED FOR THE USE OF THE STATE OF OHIO AND IS NOT TO BE CONSTRUED AS A PART OF THE PLANS GOVERNING THE CONSTRUCTION OF THE PROJECT.

LEGEND FOR PROJECT-AVERAGE RESULTS OF TESTS- 59 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 WITH SAND	$A-1-b_{(0)}$	A-1-b	39	16	25	13	7	NP	NP	9	3
COARSE & FINE SAND	——	A-3a	3	13	59	17	8	NP	NP	16	19
SANDY SILT	$A-4_{(0)}$	A-4a	1	3	48	33	15	5	1	18	12
SILT	$A-4_{(8)}$	A-4b	0	0	13	64	23	26	4	22	19
SILT & CLAY	$A-6_{(9)}$	A-6a	0	0	8	53	39	30	12	28	4
SILTY CLAY	$A-6_{(11)}$	A-6b	4	1	5	45	45	36	18	30	2
CINDERS	CLASSIFIED BY VISUAL INSPECTION										
OLD DUMP FILL	CLASSIFIED BY VISUAL INSPECTION										

AUGER BORING PLOTTED TO VERTICAL SCALE ONLY

WATER CONTENT NEARLY EQUAL TO OR GREATER THAN LIQUID LIMIT

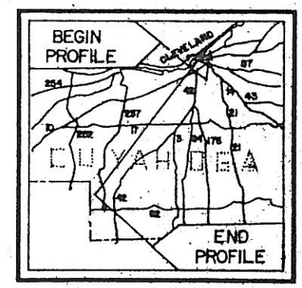
BERM MATERIAL

TOPSOIL = T.S. = X = APPROX. DEPTH.

-SAMPLES TESTED-
LAB. NOS. SQ-12600 - 12659 INCL.

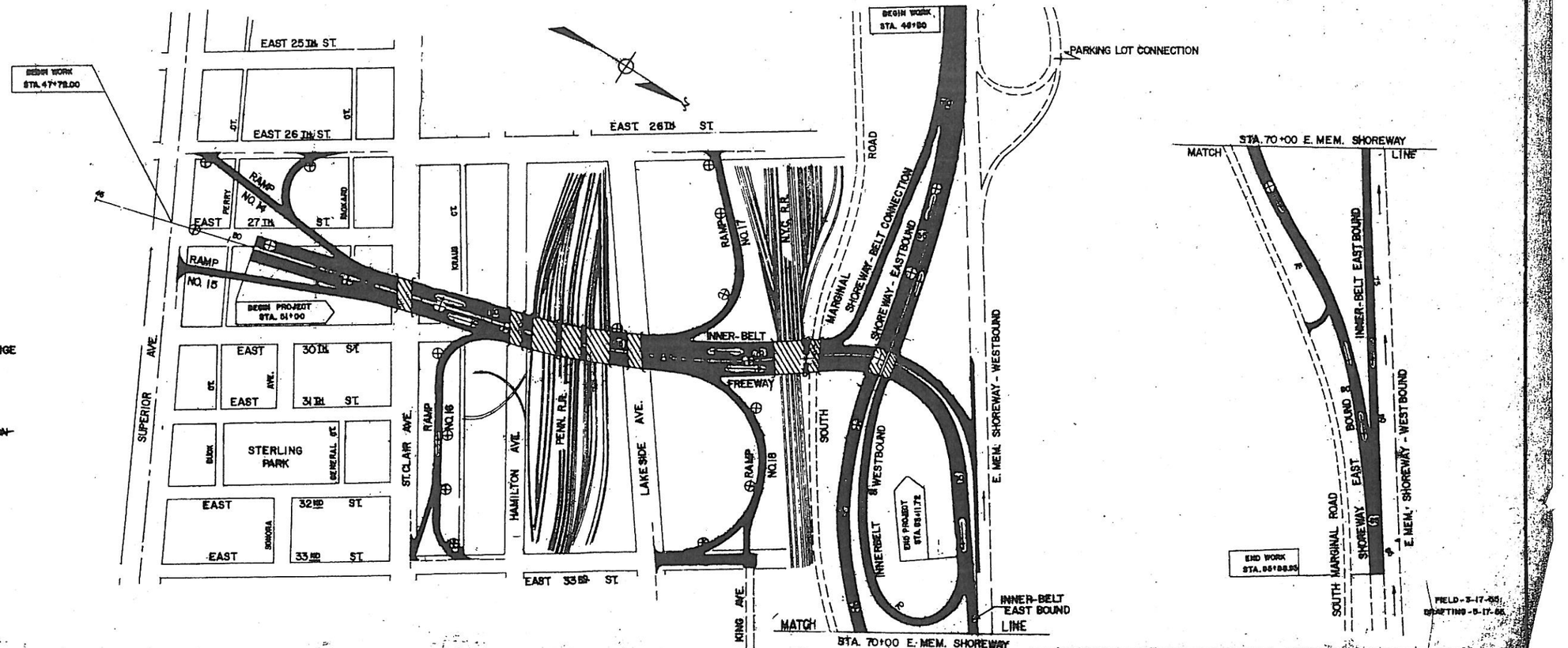
AUGER BORING — PLAN VIEW

NOTE: FIGURES BESIDE BORINGS INDICATE MOISTURE CONTENT IN PERCENT.



LOCATION MAP

LOCATION PLAN
SCALE: 1" = 200'



-LEGEND-

PROPOSED INNER-BELT FREEWAY, RAMPS & SHOREWAY INTER-CHANGE

PROPOSED STRUCTURES

AUGER BORING — PLAN VIEW
-PLOTTED TO APPROXIMATE LOCATION-

FIELD - 5-17-65
DRAFTING - 5-17-65

SOIL PROFILE
CUYAHOGA COUNTY
CUY-42R-19.78
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

2/3

PROPOSED INNER-BELT SOUTH
PROPOSED INNER-BELT NORTH
SHOREWAY EASTBOUND
SHWY. INNER-BELT CONN.
RAMP-14
RAMP-15
RAMP-16
RAMP-18
ALABAMA
SUPERIOR AVE.
EAST 27TH ST.
PERRY CT.
ST CLAIR AVE.
EAST 30TH ST.
HAMILTON AVE.
PENN. R.R.
LAKESIDE AVE.
N.Y.C. R.R.
SOUTH MARSHALL RD.
HOLE CAVED IN
REFUSAL
THIS AREA IS AN OLD DUMP FROM STEEL MILLS- HOT SOLIDES
STOPPED ON LARGE ROCK
GRADE PROBABLY LIES IN SILT
PROPOSED GRADE
NOTE: REFUSAL TO PENETRATION OF DRILL CAUSED BY RANDOM 'MAN MADE' FILL MATERIAL.

SOIL [illegible]
CUYAH[illegible] COUNTY
CUY[illegible].78

STATE [illegible]Y TESTING AND
RES[illegible] LABORATORY
[illegible], COLUMBUS, OHIO

3
3

-INNER-BELT-
RAMPS

RAMP-14

RAMP-16

RAMP-17

RAMP-18

640
630
620
610
600

SOILTS-CS

REFUSAL

HOLE CAVED IN

PROPOSED GRADE WILL PROBABLY BE IN SILTS & CLAYS

PROPOSED GRADE WILL PROBABLY BE IN SANDS & SILTS

G AT LEFT OF BORINGS INDICATE APPROXIMATE GRADE

STA.-7+75
STA.-6+75
STA.-1+50
STA.-3+50
STA.-9+50
STA.-6+00
STA.-2+50
STA.-5+50
STA.-8+50
STA.-3+00
STA.-6+00
STA.-9+50

I.R.I-90
18.77

SOIL PROFILE
CUYAHOGA COUNTY
CUY-42 - 18.77
CLEVELAND INNERBELT
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

1/2

NOTE: THE INFORMATION SHOWN BY THIS SUBGRADE PROFILE WAS SECURED FOR THE USE OF THE STATE OF OHIO AND IS NOT TO BE CONSTRUED AS A PART OF THE PLANS GOVERNING THE CONSTRUCTION OF THE PROJECT.

LEGEND FOR PROJECT-AVERAGE RESULTS OF TESTS- 166 SAMPLES TESTED

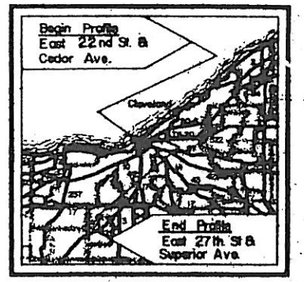
DESCRIPTION	N. R. B. CLASS	OHIO CLASS	% AGG.	% C. SAND	% F. SAND	% SILT	% CLAY	LIQUID LIMIT	PLASTICITY INDEX	WATER CONTENT	SAMPLES TESTED
Gravel	A-1-a (0)	A-1-a	63	20	10	3	4	NP	NP	8	3
Gravel with sand	A-1-b (0)	A-1-b	30	36	22	6	6	NP	NP	8	15
Fine sand	A-3 (0)	A-3	5	16	71	2	6	NP	NP	8	32
Coarse and fine sand	—	A-3a	5	14	61	10	10	NP	NP	14	73
Gravel with sand and silt	A-2-4 (0)	A-2-4	38	18	16	18	10	NP	NP	17	2
Sandy silt	A-4 (8)	A-4a	1	3	41	37	18	NP	NP	23	18
Silt	A-4 (8)	A-4b	1	1	14	61	23	NP	NP	25	21
Cinders and fill material	Classified by visual inspection										

Berm material
Topsoil, Sod & TS=X"=Approx. depth.
Auger boring plotted to vertical scale only.
Auger boring plan view.

● Water content nearly equal to or greater than Liquid Limit.
● This A-4a soil will become rubbery & unstable at water contents which exceed the optimum.
W= Free water

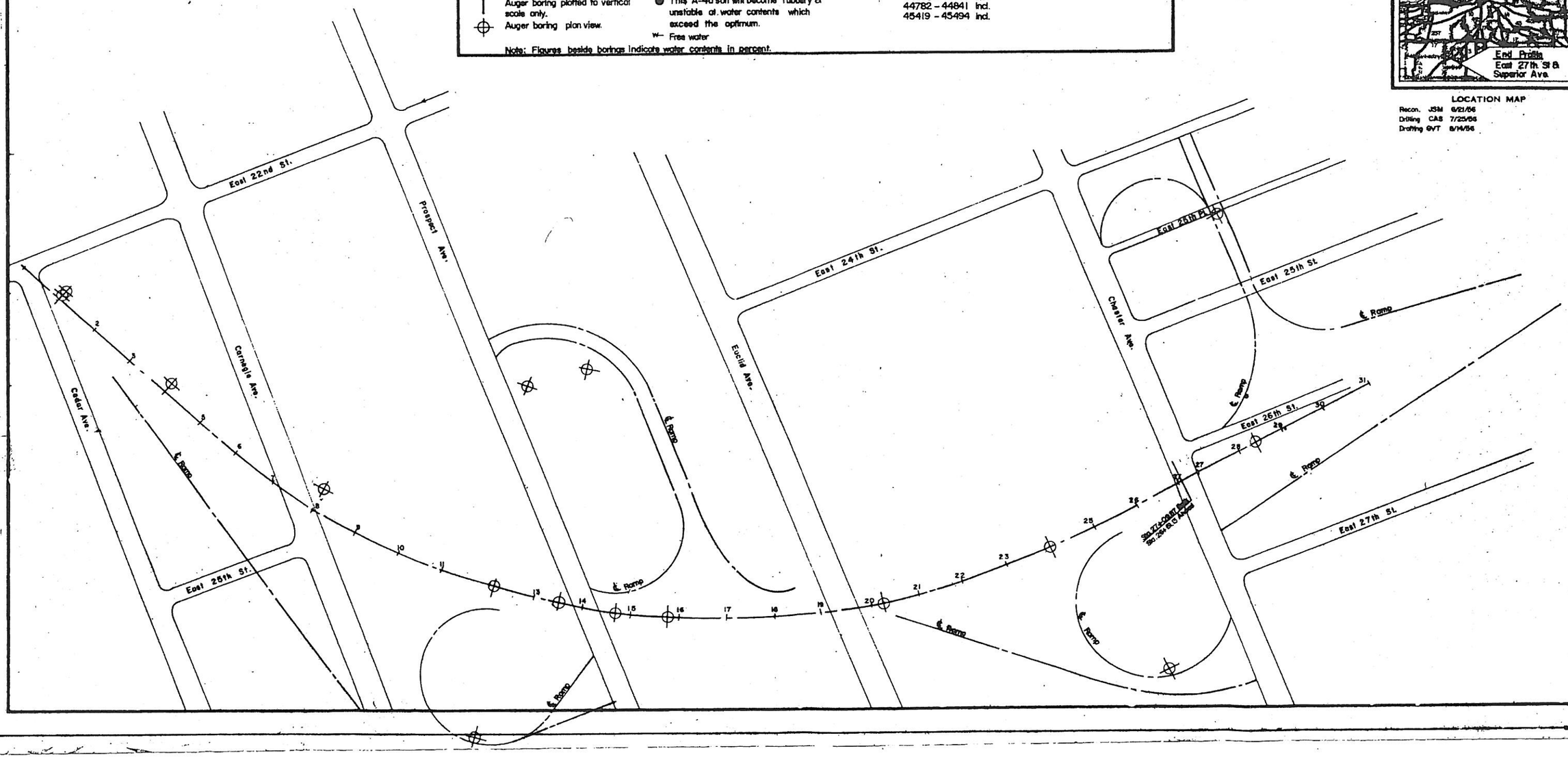
Note: Figures beside borings indicate water contents in percent.

Samples Taken
Lab. Nos. So.
44368 - 44399 Incl.
44782 - 44841 Incl.
45419 - 45494 Incl.



LOCATION MAP

Recon. JSM 6/21/56
Drilling CAS 7/25/56
Drafting GVT 8/14/56



SOIL PROFILE

CUYAHOGA COUNTY
CUY-42 - 18.77
CLEVELAND INNERBELT
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O S U CAMPUS, COLUMBUS, OHIO

2/2

Station Equation
Sta. 27+09.87 (Back) = Sta. 26+61.13 (Ahead)

℄ Carnegie Ave
℄ Prospect Ave.
℄ Euclid Ave.
℄ Chester Ave.

East 25th St.
East 26th St.
East 27th St.
East 30th St.
Payne Ave.
Superior Ave.
℄ Ramp
Ramp No. 14
Ramp No. 15
℄ E. 26th St
℄ Payne Ave
℄ Superior Ave.
Alabama

Hole Caved
Refusal

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-101 (Elev. 652.45± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/16/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
8" Sandy TOPSOIL							
Loose, Moist, Brown, Coarse and Fine SAND, Some Silt, Trace Clay, Brick Fragments and Organics (Fill)		SS-1	6		--	12	
Medium, Moist, Light Brown, Fine SAND, Little Silt, Trace Coarse Sand, Clay and Stone Fragments (SP)		SS-2	10		--	9	Encountered @ 5.0'
Loose, Moist, Brown, Silty SAND, Trace Clay and Stone Fragments (SM)	5	SS-3	8		--	22	
		SS-4	9		--	18	
	10						
Medium, Wet, Gray, Silty SAND, Trace Clay and Stone Fragments (SM)		SS-5	18		--	23	
	15						Completion @ 17.0'
		SS-6	17		--	26	Heaving Sands From 18.5' to 30.0'
	20						
		SS-7	17		--	26	
	25						
Dense, Moist, Gray, Sandy SILT, Little Clay, Trace Stone Fragments (SC)							
		SS-8	45		--	20	
End of Boring 30.0'	30						

PSI Information To Build On
Engineering - Consulting - Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-102 (Elev. 659.07± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/17/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
8" Sandy TOPSOIL							
Medium, Moist, Dark Brown, Coarse and Fine SAND, Trace Silt, Clay, Stone Fragments, Gravel, Asphalt Fragments, Slag and Organics (Fill)		SS-1	23		--	27	
		SS-2	14		--	8	
Loose, Wet, Brown, Coarse and Fine SAND, Trace Silt, Clay and Gravel (SP)	5	SS-3	7		--	9	
Loose, Moist, Light Brown, Fine SAND, Trace Coarse Sand, Silt and Clay (SP)		SS-4	8		--	9	
	10						
Medium, Moist to Wet, Grayish Brown to Gray, Silty SAND, Trace Clay and Gravel (SM)		SS-5	19		--	8	
	15						Encountered @ 18.5'
		SS-6	9		--	28	
	20						Completion @ 20.8'
		SS-7	22		--	25	
	25						
		SS-8	26		--	19	
End of Boring 30.0'	30						

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-103 (Elev. 659.71+' MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/15/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
8" Sandy TOPSOIL							
Medium to Loose, Moist, Orangish Brown, Coarse and Fine SAND, Trace Silt, Clay and Stone Fragments (Fill) (Layers of Topsoil)		SS-1	10		--	10	
		SS-2	5		--	13	
Medium, Moist, Brown, Coarse and Fine SAND, Trace Silt and Clay, Some Stone Fragments and Gravel (SP)	5	SS-3	13		--	8	
Medium, Moist, Light Brown, Fine SAND, Little Coarse Sand, Trace Silt and Stone Fragments (SP)		SS-4	11		--	7	
	10						
Medium, Moist, Light Brown/Orangish Brown/Dark Brown, Coarse and Fine SAND, Trace Silt, Clay and Gravel (SP)		SS-5	11		--	7	
	15						
Medium, Moist, Gray, Silty SAND, Little Clay, Trace Gravel (SM)		SS-6	28		--	22	Completion @ 21.0'
	20						Encountered @ 22.4'
		SS-7	22		--	26	
	25						
		SS-8	25		--	23	
End of Boring 30.0'	30						

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-104 (Elev. 661.17± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/15/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
8" TOPSOIL							
*		SS-1	4		--	18	
Medium, Moist, Brown, Silty SAND, Little Clay, Some Gravel and Stone Fragments, Trace Brick Fragments (Fill)		SS-2	7		--	10	
Medium, Moist, Brown, Coarse and Fine SAND, Trace Silt, Clay, Stone Fragments, Gravel and Ceramic (Fill)	5	SS-3	5		--	9	
Loose, Moist, Brown, Fine SAND, Some Coarse Sand, Little to Trace Silt and Clay, Trace Stone Fragments (SP)		SS-4	7		--	9	
	10						
		SS-5	6		--	8	
	15						
Medium, Moist, Brown, Silty SAND, Little Clay, Trace Stone Fragments (SM)		SS-6	12		--	11	Completion @ 21.5'
	20						
Medium, Wet, Gray, Silty SAND, Some Clay, Trace Stone Fragments (SM)		SS-7	23		--	26	Encountered @ 23.5'
	25						
		SS-8	21		--	25	
End of Boring 30.0'	30						
* Loose, Moist, Brown, Sandy SILT, Some Clay, Trace Stone Fragments and Organics (Fill)							

PSI Information To Build On
Engineering - Consulting - Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-105 (Elev. 658.42+' MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/14/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
* Very Loose, Moist, Brown and Gray, Coarse and Fine SAND, Little Silt and Clay, Trace Stone Fragments and Organics (Fill)		AU-1	--		--	4	
		SS-2	1-1 For 12"		--	15	
	5	SS-3	2		--	13	
Loose/Medium, Wet, Gray, Silty SAND, Little Silt and Clay, Trace Stone Fragments (SM)		SS-4	13		--	9	
(Layers of Wet, Brown, Coarse and Fine Sand, Trace Silt, Clay and Stone Fragments (SP))	10						
		SS-5	8		--	24	
	15						
		SS-6	20		--	22	
	20						Completion @ 22.2'
		SS-7	28		--	24	Encountered @ 23.5'
	25						
		SS-8	28		--	26	
End of Boring 30.0'	30						
* 6" TOPSOIL							

psi Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-106 (Elev. 659.11± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/15/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
9" Sandy TOPSOIL							
Loose, Moist, Dark Brown, Silty SAND, Trace Clay, Stone Fragments and Brick Fragments (Fill)		SS-1	5		--	13	
		SS-2	11		--	18	
Loose, Moist, Light Brown and Gray, Silty SAND, Little Clay, Trace Stone Fragments (SM)	5	SS-3	18		--	17	
Loose, Moist, Light Brown, Fine SAND, Trace Coarse Sand, Silt, Clay and Stone Fragments (SP)		SS-4	7		--	8	
	10						
Medium, Moist, Brown, Silty SAND, Little to Some Clay, Trace Stone Fragments (SM)		SS-5	7		--	9	
	15						
		SS-6	20		--	19	
	20						Encountered @ 23.2'
Medium, Wet, Gray, Silty SAND, Little Clay, Trace Stone Fragments (SM)		SS-7	26		--	19	No Groundwater @ Completion
	25						
		SS-8	18		--	27	
End of Boring 30.0'	30						

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-107 (Elev. 658.58± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/15/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
8" ASPHALT, No Base							
Moist, Dark Brown/Black, Silty SAND, Trace Clay, Little Brick Fragments (Fill)		AU-1	--		--	10	
Loose, Moist, Brown, Silty SAND, Trace Clay and Stone Fragments (Fill)		SS-2	5		--	10	
Loose, Wet, Gray, Coarse and Fine SAND, Little Silt, Clay and Brick Fragments, Some Stone Fragments (Fill)	5	SS-3	6		--	10	
Loose to Medium, Moist, Brown, Silty SAND, Trace Clay and Stone Fragments (SM)	10	SS-4	6		--	11	
		SS-5	11		--	7	
Loose to Dense, Wet/Saturated, Gray, Silty SAND, Little Clay (SM)	15						
	20	SS-6	12		--	21	Encountered @ 24.8'
	25	SS-7	9		--	26	No Groundwater @ Completion
	30	SS-8	18		--	22	* Induced Water to Keep Sand out of Augers
	35	SS-9	15		--	25	
	40	SS-10	36		--	19	
	45	SS-11	35		--	24	
	50	SS-12	11		1.2	27	

(Continued on Next Page)

PSI Information To Build On
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RECORD OF SUBSURFACE EXPLORATION

Boring: B-107 (Continued)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/15/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
(Continued from previous page)							
Soft to Stiff, Moist to Wet, Gray, Silty CLAY, Trace Sand and Stone Fragments (CL)							
	55	SS-13	10		1.2	26	
	60	SS-14	11		1.5	23	
	65	SS-15	5		0.6	29	
	70	SS-16	10		1.5	25	
	75	SS-17	13		1.7	22	
	80	SS-18	9		1.3	23	
	85	SS-19	16		2.2	24	
	90	SS-20	13		1.6	24	
	95	SS-21	9		0.9	28	
		SS-22	7		0.9	29	
End of Boring 100'	100						

PSI Information To Build On
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RECORD OF SUBSURFACE EXPLORATION

Boring: B-108 (Elev. 659.87± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/14/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
*							
**		SS-1	4		--	14	
Very Loose, Wet, Dark Brown/Black/Gray, Silty SAND, Trace Silt, Clay and Stone Fragments (Fill)		SS-2	WT/Tools For 12" - 1		--	23	
Medium, Moist, Orangish Brown, Coarse and Fine SAND, Trace Silt, Clay and Stone Fragments (SP)	5	SS-3	16		--	15	
Medium, Moist, Light Brown, Fine SAND, Trace Coarse Sand, Silt and Clay (SP)		SS-4	15		--	5	
	10						
Loose, Moist, Brown, Coarse and Fine SAND, Trace Silt, Clay and Stone Fragments (SP)		SS-5	5		--	24	
	15						
(Layers of Moist, Brown and Gray, Sandy SILT, Trace Clay and Stone Fragments (SM))							
Dense/Medium, Wet, Gray, Sandy SILT, Little Clay, Trace Stone Fragments (SM)		SS-6	20		--	21	
	20						Groundwater @ 23.5' Upon Completion
		SS-7	35		--	20	
	25						
		SS-8	21		--	24	
End of Boring 30.0'	30						

* 7" TOPSOIL

** Loose, Moist, Dark Brown, Coarse and Fine SAND, Trace Silt, Clay, Stone Fragments, Brick Fragments and Organics (Fill)

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-109 (Elev. 661.14± MSL)

Project Name: Proposed Recreation Center
Site: Cleveland State University

Date of Boring: 6/14/04
Project No.: 142-45076

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
*							
**		SS-1	4		--	7	
Loose, Moist, Coarse and Fine SAND, Trace Silt, Clay and Coal Fragments, Little Stone Fragments and Sandstone Fragments (Fill)		SS-2	5		--	7	
Medium, Moist, Brown, Sandy SILT, Little Clay, Trace Stone Fragments (SC)	5	SS-3	10		--	17	
Medium, Moist, Brown, Coarse and Fine SAND, Little Silt, Trace Clay and Stone Fragments (SP)		SS-4	17		--	8	
	10						
Loose to Dense, Moist, Brown to Gray, Silty SAND, Trace Clay (SM)		SS-5	9		--	14	
	15						
		SS-6	20		--	11	
	20						
		SS-7	35		--	20	Groundwater @ 26.5' Upon Completion
	25						
Medium, Wet, Gray, Silty SAND, Little Clay, Trace Stone Fragments (SM)							
		SS-8	18		--	27	
End of Boring 30.0'	30						

* 7 1/2" TOPSOIL

** Loose, Moist, Brown, Silty SAND, Trace Clay and Organics, Little Stone Fragments and Asphalt Fragments (Fill)

PSI Information To Build On
Engineering • Consulting • Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-1

Project Name: Proposed Truss Replacement
Site: CEI Lakeshore Plant, Cleveland, Ohio

Date of Boring: 5/4/04
Project No.: 142-45053

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
11" GRAVEL and Sand							
FILL: Very Loose to Medium, Moist to Saturated, Brown/ Gray/Black; SAND, Silt and Stone Fragments; Contains Organics, Brick Fragments, Slag, Asphalt and Concrete Fragments		AU-1	--		--	9	
		SS-2	1/18"		--	14	
	5	SS-3	7		--	11	
		SS-4	3-50/6"		--	15	
	10						Encountered @ 13.5'
		SS-5	5		--	21	
	15						
		SS-6	25		--	12	
	20						
Medium, Saturated, Gray/Black, Fine and Coarse SAND, Trace Silt, Stone Fragments and Organics (SP)		SS-7	12		--	21	
	25						
Stiff to Firm, Very Wet to Saturated, Gray, SILT, Some Clay, Trace Sand (ML)		SS-8	9		1.0	21	
	30						
		SS-9	8		0.75	27	
	35						
		SS-10	7		0.75	26	
	40						
Firm, Wet, Gray, Silty CLAY, Trace Sand (CL)		SS-11	9		0.75	25	
	45						Completion @ 43.5'
		SS-12	5		0.5	27	
End of Boring 50.0'	50						

PSI Information To Build On
Engineering - Consulting - Testing

RECORD OF SUBSURFACE EXPLORATION

Boring: B-2

Project Name: Proposed Truss Replacement
Site: CEI Lakeshore Plant, Cleveland, Ohio

Date of Boring: 5/4/04
Project No.: 142-45053

Description	Depth(ft)	Sample	N	Qu	Qp	Mc	Remarks
Surface							
3" TOPSOIL							
FILL: Loose, Moist to Saturated, Dark Brown/Black; SAND, Silt and Stone Fragments; Contains Organics, Foundry Sand, Slag, Topsoil, Asphalt, Cinders and Concrete Fragments		SS-1	5		--	16	
		SS-2	4		--	17	
	5	SS-3	5		--	17	
		SS-4	4		--	16	
	10						Encountered @ 12.5'
		SS-5	9		--	15	Groundwater Unavailable @ Completion Due to Hole Cave-in
	15						
		SS-6	6		--	18	
	20						
Medium, Saturated, Dark Gray/Brown, Fine and Coarse SAND, Trace Silt and Stone Fragments (SP)		SS-7	13		--	22	
	25						
Stiff, Very Wet, Gray, SILT, Trace to Some Clay, Trace Sand (ML)		SS-8	15		1.25	24	
	30						
		SS-9	11		1.0	26	
	35						
Firm to Soft, Very Wet, Gray, Silty CLAY to Lean Clay, Trace Sand (CL)		SS-10	4		0.5	35	
	40						
		SS-11	5		0.25	34	
	45						
Stiff, Very Wet, Gray, Clayey SILT, Trace Sand (ML)		SS-12	14		1.5	27	
End of Boring 50.0'	50						

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-1

Project Name: Quay 55 Site — Date of Boring: December 24, 1997

Site: Cleveland, Ohio — Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Med. Dense, Saturated, Black Silty SAND, Trace Wood, Rock, Brick, & Glass Frags. (Fill)		SS-1	14			34	Encountered @ 3'-0"
Loose, Saturated, Black, SAND & Rock Frags. (Fill)		SS-2	7			30	
Med.Dense, Wet, Black SAND & Rock Frags., Some Glass Frags. (Fill)	5'	SS-3	22			27	
V/Loose, Saturated, Black, SAND & Rock Frags. (Fill)	10'	SS-4	5			30	
Loose, Wet, Gray, Fine SAND, Trace Rock Frags. (SP)	15'	SS-5	8			30	
	20'	SS-6	7			20	
Stiff, Wet, Gray, Silty CLAY. (CL)	25'	SS-7	13			26	
Stiff, Wet, Gray, Clayey SILT. (ML)	30'	SS-8	15			26	
	35'	SS-9	14			30	
Firm, Saturated, Gray, Silty CLAY. (CL)	40'	SS-10	9			31	@ Completion 39'-3"
Stiff, Wet, Gray, Clayey SILT. (ML)	45'	SS-11	10			28	

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-1 (Continued)

Project Name: Quay 55 Site Date of Boring: December 24, 1997

Site: Cleveland, Ohio Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
	50'	SS-12	15			26	
End of Boring - 50.0'							

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-2

Project Name: Quay 55 Site

Date of Boring: January 9, 1998/ January 13, 1998

Site: Cleveland, Ohio

Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Loose, Wet, Brown/Black, Silty SAND, Little Rock Frags. (Fill)		SS-1	7			19	
		SS-2	7			23	Encountered @ 4'-6"
V/Loose, Saturated, Black/Red, Rock & Brick Frags., Little Sand. (Fill)	5'	SS-3	4			31	
V/Loose to Med. Dense, Saturated, Black, Rock Frags., Little Sand. (Fill)	10'	SS-4	12			31	
	15'	SS-5	3			29	
Med. Dense, Saturated, Gray, Silty SAND. (SM)	20'	SS-6	11			36	@ Completion 23'-0"
V/Soft, Moist to Wet, Gray, Silty CLAY. (CL)	25'	SS-7	4			30	
	30'	SS-8	1			14	
Firm, Moist, Gray, Clayey SILT. (ML)	35'	SS-9	8			14	
V/Soft to Firm, Wet to Saturated, Gray, Silty CLAY. (CL)	40'	SS-10	7			24	
	45'	SS-11	2			34	

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-3

Project Name: Quay 55 Site

Date of Boring: January 5, 1998/ January 7, 1998

Site: Cleveland, Ohio

Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							*1" Topsoil
V/Loose, Wet, Black/Brown, Silty SAND, Trace Rock Frags.& Organics (Fill)		SS-1	4			20	
Hard, Dry, Black, ASPHALT CONCRETE. (Fill)		SS-2	43			1	
Loose, Wet, Black, Silty SAND, Trace Rock Frags. (Fill)	5'	SS-3	11			23	Encountered @ 6'-11" ▼
	10'	SS-4	4			27	
V/Loose, Wet, Black, SAND & Rock Frags. (Fill) PETROLEUM ODOR	15'	SS-5	4			20	
V/Loose, Saturated, Black/Gray, Silty SAND, Trace Rock Frags. (Fill)	20'	SS-6	3			30	
V/Loose, Wet, Gray, Clayey SAND. (SC)	25'	SS-7	4			23	
Soft, Wet, Gray, Silty CLAY. (CL)	30'	SS-8	6			29	
	35'	ST-9	--	0.66 tsf		22	
V/Stiff, Wet, Gray, Clayey SILT. (ML)	40'	SS-10	19			25	
Firm to V/Stiff, Wet, Gray, Silty CLAY. (CL)	45'	SS-11	9			27	

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-3 (Continued)

Project Name: Quay 55 Site

Date of Boring: January 5, 1998/ January 7, 1998

Site: Cleveland, Ohio

Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
Firm to V/Stiff, Wet, Gray, Silty CLAY. (CL)							
	50'	SS-12	12			30	@ Completion 50'-5"
	55'	SS-13	12			28	
	60'	SS-14	13			28	
	65'	SS-15	17			29	
	70'	SS-16	19			28	
	75'	SS-17	8			32	
	80'	SS-18	9			29	
	85'	SS-19	10			32	
	90'	SS-20	8			29	

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-3 (Continued)

Project Name: Quay 55 Site

Date of Boring: January 5, 1998/ January 7, 1998

Site: Cleveland, Ohio

Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
	95'	SS-21	9			30	
V/Soft, Wet, Silty CLAY. (CL)	100'	SS-22	1			25	
V/Stiff, Moist, Gray, Silty CLAY, Trace Rock Frags. (CL)	105'	SS-23	33			19	
	110'	SS-24	23			19	
	115'	SS-25	25			19	
	120'	SS-26	37			18	
V/Stiff, Saturated, Gray, Silty CLAY. (CL)	125'	SS-27	21			33	
End of Boring - 125.0'							

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-4

Project Name: Quay 55 Site — Date of Boring: December 24, 1997

Site: Cleveland, Ohio — Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Med. Dense, Moist, Black, Silty SAND, Some Rock Frags. (Fill)		SS-1	24			13	@ Completion 3'-0"
Dense, Moist, Black/Gray, ROCK & Concrete Frags., Little Sand. (Fill)	5'	SS-2	45			11	
Med. Dense, Moist, Black/Gray, SAND & Rock Frags., Trace Glass & Ceramic Frags. (Fill)		SS-3	17			17	Encountered @ 5'-0"
Med. Dense, Saturated, Black, SAND & Rock Frags., Little Glass Frags., Trace Organics. (Fill)	10'	SS-4	14			30	
Med. Dense, Wet, Black, SAND & Rock Frags., Trace Brick & Glass Frags. (Fill)	15'	SS-5	17			23	
Med. Dense, Saturated, Gray/Black, Sandy SILT, Little Rock & Wood Frags. (Fill)	20'	SS-6	13			35	
Dense, Moist, Gray, Sandy SILT, Trace Rock Frags. (ML)	25'	SS-7	49			13	
Soft to Stiff, Moist to Saturated, Gray Silty CLAY, Trace Sand. (CL)	30'	SS-8	6			14	
	35'	SS-9	4			46	
	40'	SS-10	11			25	
V/Stiff, Wet, Gray, Clayey SILT. (ML)	45'	SS-11	16			24	

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-4 (Continued)

Project Name: Quay 55 Site Date of Boring: December 24, 1997

Site: Cleveland, Ohio Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
	50'	SS-12	22			25	
End of Boring - 50.0'							

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring B-5 (Continued)

Project Name: Quay 55 Site Date of Boring: January 5, 1998

Site: Cleveland, Ohio Project No.: 142-75177

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
	50'	SS-12	7			24	
End of Boring - 50.0'							

CMR-21

E. 33RD ST. GENERATING STATION

LAKE ROAD GENERATING STATION

REACTORS

TRANSFORMERS

SANITARY SEWAGE SUMP & PUMP

ELECTRIC MANHOLE

CRUSHER HOUSE

STORE HOUSE & MACHINE SHOP

COAL TRESTLE

SCREEN HOUSE

FOREBAY

ELECTRIC CONDUITS

4'-0" SQUARE DISCHARGE

7'-0" DIA. DISCHARGE

4'-0" SQUARE INTAKE

7'-0" DIA. INTAKE

ASH TUNNEL

BULKHEAD

PRESENT LAKE ROAD

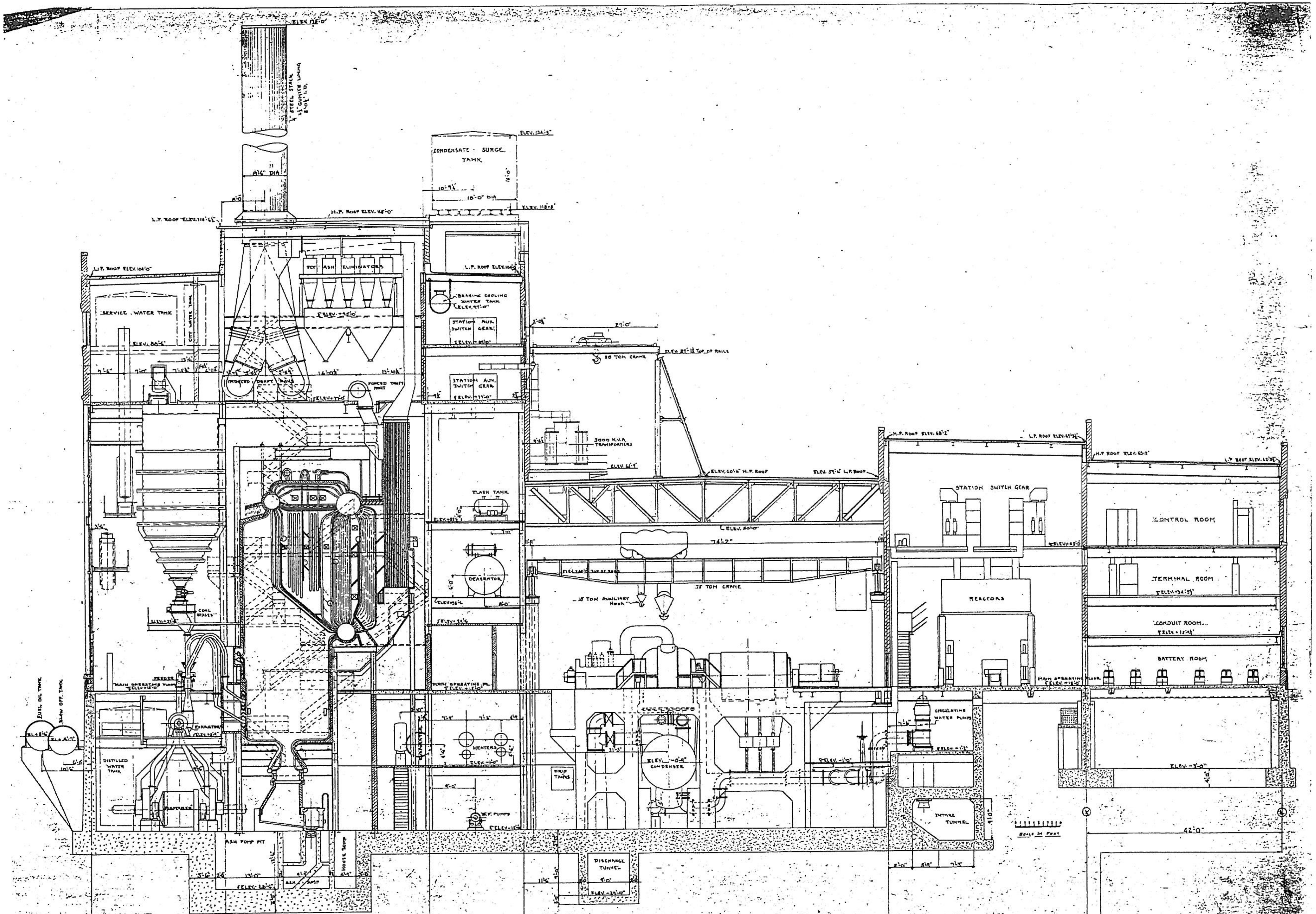
FUTURE LAKE ROAD

PARKWAY

BASE LINE

CONSTRUCTION FENCE LINE

LAKE ERIE

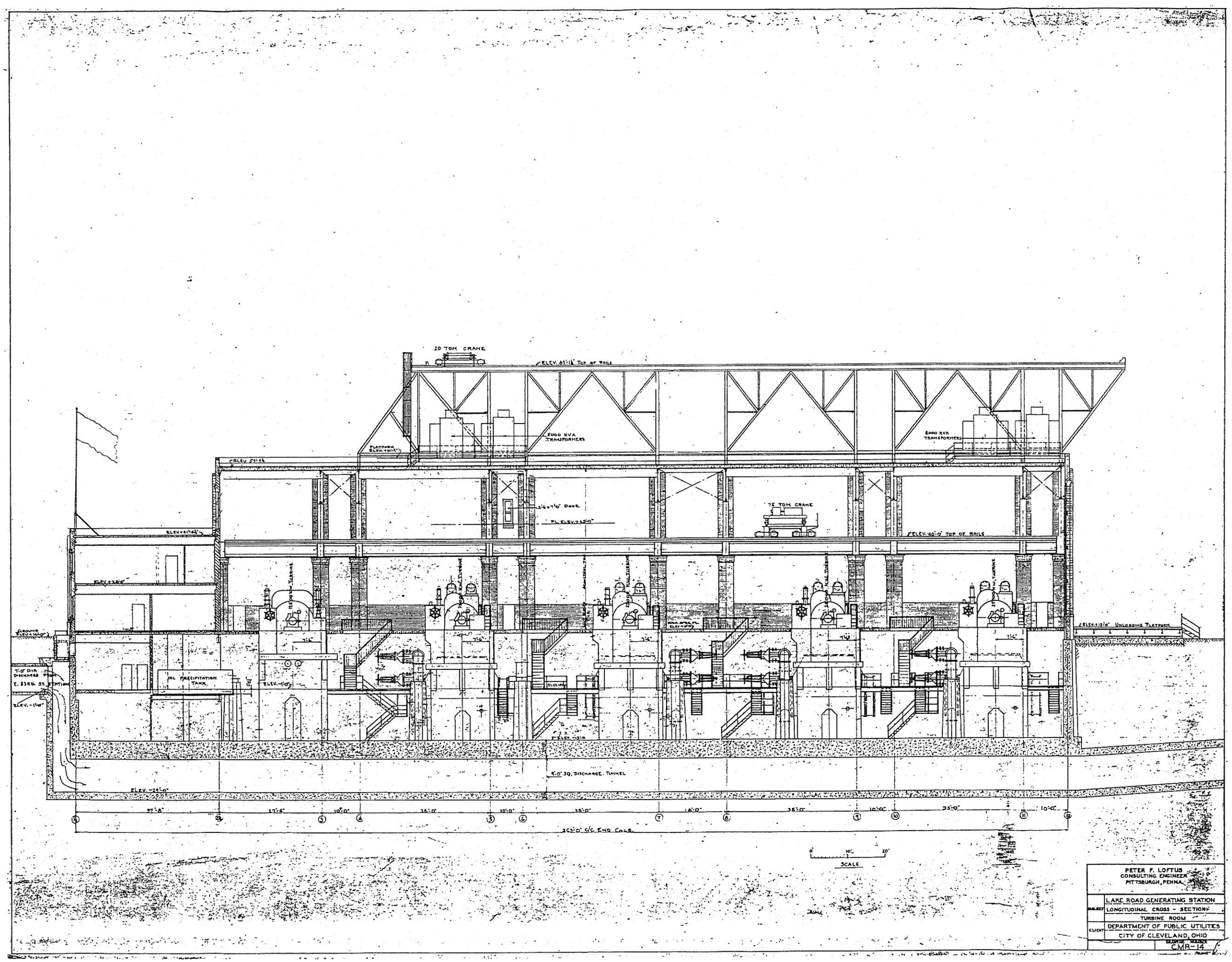


PETER F. LOFTUS
CONSULTING ENGINEER
PITTSBURGH, PENNA.

SUBJECT: LAKE ROAD GENERATING STATION
CROSS-SECTION

CLIENT: DEPARTMENT OF PUBLIC UTILITIES
CITY OF CLEVELAND, OHIO

DRAWING NUMBER CMR-1



PETER F. LOFTUS
CONSULTING ENGINEER
PITTSBURGH, PENNA.

LAKE ROAD GENERATING STATION

DRAWING: LONGITUDINAL CROSS - SECTION
TURBINE ROOM

CLIENT: DEPARTMENT OF PUBLIC UTILITIES
CITY OF CLEVELAND, OHIO

DRAWING NUMBER
CMR-14

Northeast Ohio Regional SEWER DISTRICT

"Protecting Your Clean Water Investment"

Data Request for Innerbelt Study

District Facilities Along I-90 between Superior Bridge and E. 55th Street

Legend

- Auto-Regulators
- Regulators
- Outfalls
- Interceptor Labels
- Interceptors
- CSOs
- WWTPs
- Street Names
- Interstates
- Street Centerlines
- Water Bodies

9/3/04

Prepared By: L. Laven

Created For: A. Veeramani

Project:

Lake Erie

099 098 096 200 201 202 203

E-01 E-02 E-03 E-04 E-05 E-06 E-07 E-08 E-09 E-11 E-12 E-15 E-33 E-34 E-35 E-36 E-37 E-50 E-50A E-52

Easterly - Main Branch

Easterly - E. 40th St. Branch

Easterly - E. 55th St. Branch

Easterly - E. 65th St. Branch

Easterly - Addison Rd. Branch

Easterly - E. 79th St. Branch

N Marginal Rd

S Marginal Rd

Lakeside Ave

Hamilton Ave

St Clair Ave

Payne Ave

Hamilton Ct

Sorg Ct

Edna Ave

Superior Ave

Dibble Ave

Wade Park Ave

Zoeter Ave

Melrose Ave

Lawnview Ave

Linwood Ave

Lexington Ave

Addison Rd

E 32nd St E 33rd St E 34th St E 36th St E 38th St E 40th St E 43rd St E 45th St E 47th St E 49th St E 51st St E 52nd St E 53rd St E 58th St E 59th St E 60th St E 61st St E 63rd St E 64th St E 67th St E 68th St E 69th Pl E 70th St E 71st St E 72nd St E 73rd St E 73rd Pl E 74th St E 75th St E 76th St E 77th St E 79th St E 80th St

0 2500ft

APPENDIX III

Project Photos

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #1
Superior Avenue bridge structure – Distressed pier caps

Photo #2
St. Clair Avenue bridge structure (Westbound) – Bridge deck drain outlet below grade

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #3
St. Clair Avenue bridge structure (Westbound) - Settled slope protection / Saturated soils

Photo #4
St. Clair Avenue (Eastbound) – Ponded water

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #5
Eastbound IR-90 near Superior Ave. entrance ramp – Roadside erosion

Photo #6
Eastbound IR-90 approaching Hamilton Road overpass – Pothole & ponded water

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

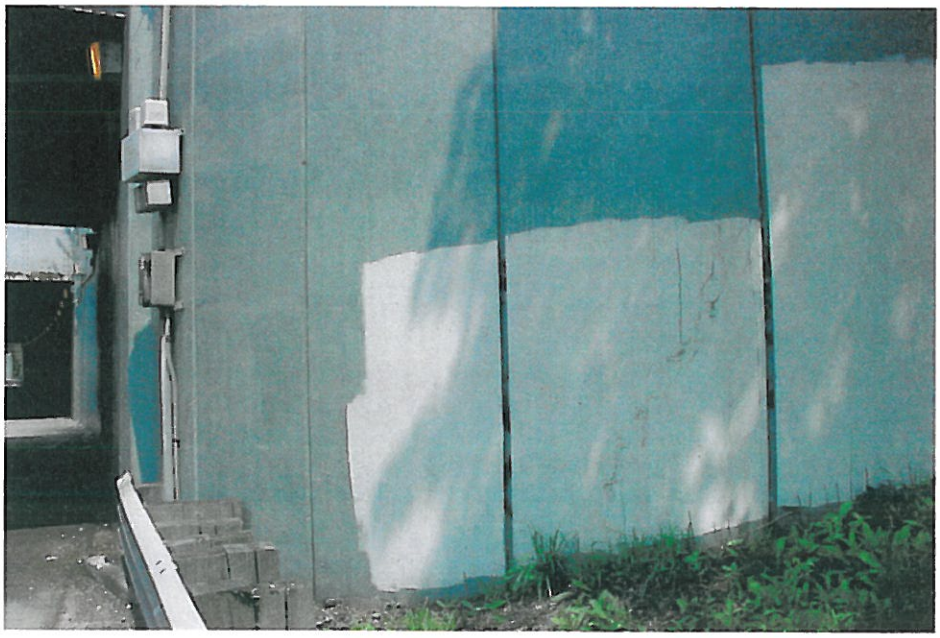


Photo #7
Hamilton Road bridge structure (Southeast wing wall) – Repair work and new distress

Photo #8
Hamilton Rd. bridge structure – Separation between southeast wing wall and abutment

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #9
Norfolk Southern Railroad (Westbound) – Cracks and rust stains

Photo #10
Norfolk Southern Railroad (Eastbound) – Mildew

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #11
Norfolk Southern Railroad (Eastbound) – Mildew / Cracks

Photo #12
Lakeside Road bridge deck (Northeast section) – Umdermined sidewalk

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #13
Lakeside Road bridge structure – Cracks in barrier wall below all piers

Photo # 14
Eastbound IR-90 approaching Lakeside Road exit ramp – Backed up drain

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #15
Lakeside Road exit ramp (Eastbound IR-90) – Backed up drain

Photo #16
Westbound IR-90 at Lakeside Road entrance ramp – Roadside erosion

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #17
Eastbound IR-90 at Lakeside Road exit ramp – Pavement distress and repair work

Photo #18
South Marginal Road – Area of previous trench work

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #19
Westbound Memorial Shoreway Interchange (IR-90 overpass) – Distress at approach slab

Photo #20
Eastbound Memorial Shoreway Interchange (IR-90 overpass) – Distress at approach slab

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #21
Westbound Memorial Shoreway – Pavement distress (Typical)

Photo #22
South Marginal Road bridge structure (Memorial Shoreway) – Northwest wing wall

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #23
South Marginal Road bridge structure (Memorial Shoreway) – Northeast abutment

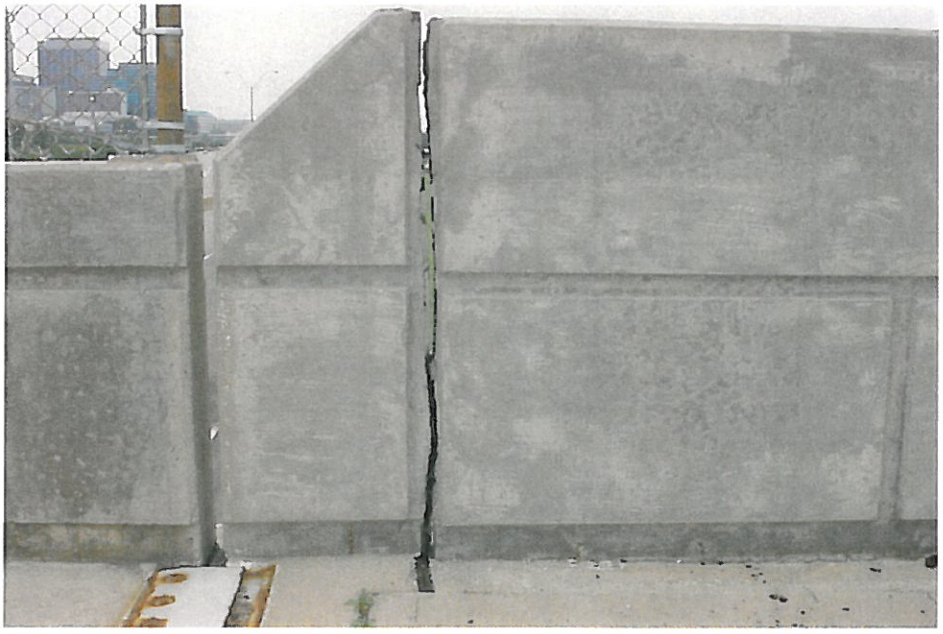


Photo #24
South Marginal Road bridge structure (Memorial Shoreway) – Northwest abutment

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #25
Eastbound Memorial Shoreway – Pavement distress (Typical)

Photo #26
Eastbound Memorial Shoreway (IR-90 west split) – Pavement distress (Typical)

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #27
E.B. Memorial Shoreway (Beyond IR-90 west split) – Blocked roadside drain

Photo #28
E.B. Memorial Shoreway (Beyond IR-90 west split) – Blocked roadside drain

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #29
South side of South Marginal Road – Channel erosion and minor slope failure

Photo #30
Westbound I-90 (Near Quay 55) – Only top half of outlet and/or inlet pipes exposed

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #31
Westbound IR-90 (Adjacent to Photo #30) – Surface erosion

Photo #32
Westbound IR-90 (Adjacent to Photo #31) – Wet area

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

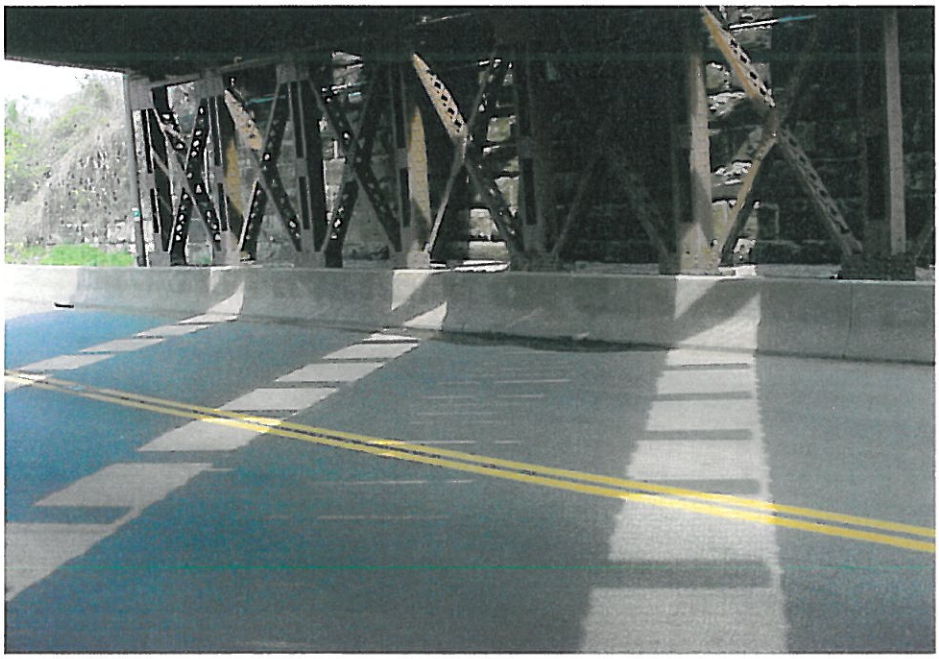


Photo #33
Northbound East 55th Street under CSX Railroad – Ponded water

Photo #34
CSX Railroad bridge structure over East 55th Street – Downed telephone pole

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #35
CSX Railroad bridge structure over East 55th Street – Downed wires

Photo #36
West wall of CSX bridge structure – Hairline crack at joint

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #37
Parking lot immediately north of Lake Court (East 55th Street) – Sinkhole

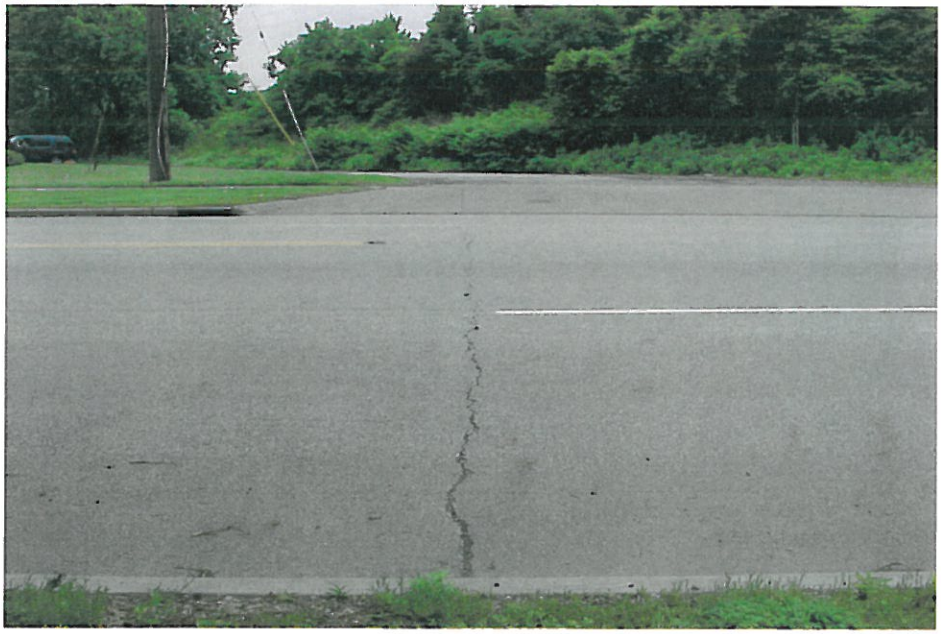


Photo #38
East 55th Street – Longitudinal crack (Typical)

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #39
East 55th Street – Longitudinal crack and surface wear

Photo #40
Northbound East 55th Street approach to IR-90 overpass – Longitudinal cracks

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

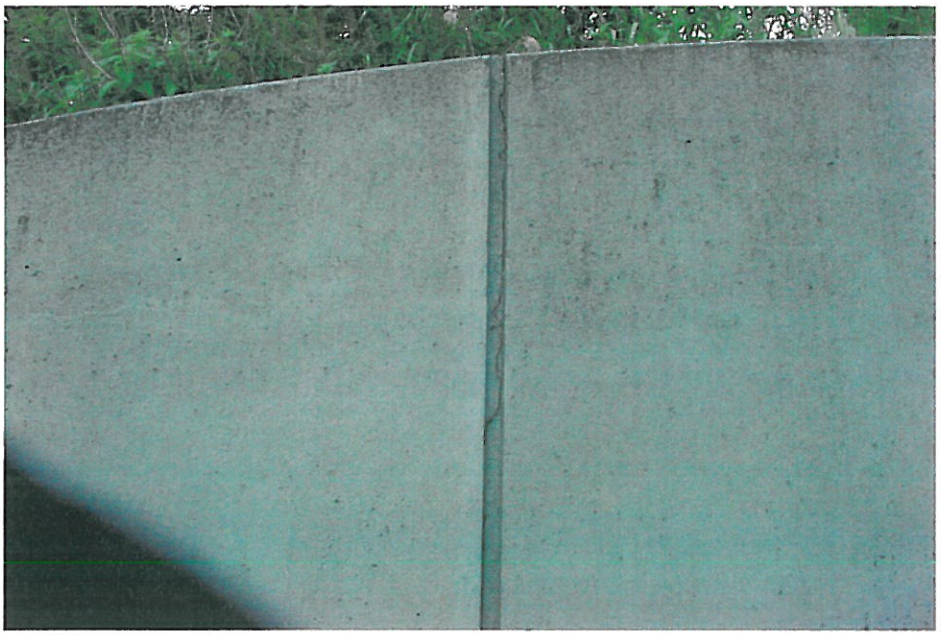


Photo #41
East 55th Street bridge structure (Southeast wing wall) – Hairline crack

Photo #42
East 55th Street bridge structure (SE abutment) – Vertical separation below bridge deck

Photograph Log
Red Flag Study – CUY-IR-90
Cleveland, Ohio
Project # 142-45056

Photo #43
East 55th Street bridge structure (South abutment) – Cracks and rust stains

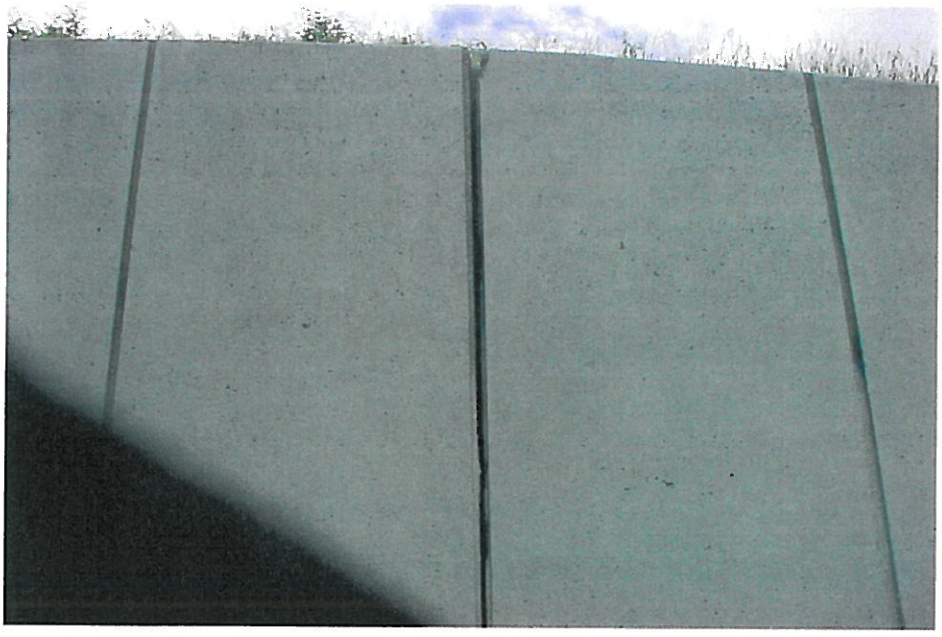


Photo #44
East 55th Street bridge structure (Southwest wing wall) – Horizontal separation

APPENDIX IV

"Climate and Shoreline Educational Issues Forum"

1892 Drawing – City of Cleveland (Shoreline)

MAXINE GOODMAN LEVIN
COLLEGE OF URBAN AFFAIRS

Cleveland State University

Climate and Shoreline Educational Issues Forum

Levin College Forum

Prepared for:
Cleveland Lakefront Partners

Prepared by:
Kathryn Wertheim Hexter
Matthew Harrison Grabenstein

May 2003

The Ohio Urban University Program

2121 Euclid Avenue Cleveland, Ohio
44115
http://urban.csuohio.edu

CLIMATE AND SHORELINE EDUCATIONAL ISSUES FORUM NOVEMBER 7, 2002

Part of

NORTHEAST OHIO'S WATERWAYS LAKEFRONT PLANNING ISSUE FORUMS

Prepared for:

CLEVELAND LAKEFRONT PARTNERS

(CITY OF CLEVELAND, GREATER CLEVELAND GROWTH ASSOCIATION, CLEVELAND TOMORROW, AND CLEVELAND NEIGHBORHOOD DEVELOPMENT COALITION)

By:

Kathryn Wertheim Hexter, Project Director

Matthew Harrison Grabenstein, Graduate Assistant

Maxine Goodman Levin College of Urban Affairs

TABLE OF CONTENTS

INTRODUCTION

On November 7, 2002, the Levin College Forum Program and the Cleveland Lakefront Partners (the city of Cleveland, The Greater Cleveland Growth Association, Cleveland Tomorrow, and The Cleveland Neighborhood Development Coalition) sponsored a public forum on Climate and Shoreline. The forum was the final in a series of four, intended to deepen the community's understanding of some of the more complex issues related to the city's lakefront planning efforts. It was also part of the Levin College Forum Program's two-year Northeast Ohio's Waterways forum series, which is focusing public attention on development of a comprehensive vision for all of Northeast Ohio's waterways, including the lakefront.

The issue forums are an important part of an ongoing process by the Lakefront Partners to involve the public in lakefront planning. The issues addressed in these forums emerged from the first round of city-sponsored public meetings in spring 2002 and from the February 2002 kick-off event of the Levin College Waterways series. More than 1,500 people attended the events and hundreds of comments were submitted. Summaries of the comments and proceedings can be found on the following web sites:
http://planning.city.cleveland.oh.us/lakefront/cpc.html
http://urban.csuohio.edu/waterways/proceedings/feb902.htm
Although opinions differed over strategies, the overwhelming consensus of these public meetings and comments can be summed up in one word: access.

Citizens of Greater Cleveland want greater access to its most unique asset, its waterways. After years of use and abuse, Clevelanders want to reclaim their waterways and usher in the next economic revolution, one that capitalizes on the region's natural environment beyond its traditional industrial use. Citizens want to make Cleveland a better place for natives to live and work and for newcomers to settle; they understand that this may be accomplished by respecting and enjoying the region's unique lakes, rivers, and valleys. The Climate and Shoreline Forum is the fourth in a series that was designed to help Clevelanders better understand the factors that influence decisions affecting their waterways so that the citizenry may serve as educated participants in the planning process.

PANEL DISCUSSION

Introduction: Wayne Dawson, co-anchor, FOX 8 News

The two-hour Climate and Shoreline Forum was held from 7:00 to 9:00 p.m. on November 7, 2002, at the Maxine Goodman Levin College of Urban Affairs at Cleveland State University. Wayne Dawson, co-anchor of FOX 8 News, moderated the discussion. He noted that it was the last in a series of four forums in the Northeast Ohio Waterways Series, which included, "Burke Lakefront Airport," "Utilities and Railroads," and "Port Activities." The first three forums addressed man-made developments. This forum was intended to deepen the community's understanding of the natural forces that have shaped the lakeshore.

In 1849, Cleveland citizen John Stockley built a pier and private bathhouse at the foot of Water Street (now West 9th). If Stockley, the lakefront's first developer, were to come back today, he would not recognize the Lake Erie shore. It has been transformed by both human and natural forces. The first three forums looked at the legacy of infrastructure--the airport, utilities, railroads, roadways, and shipping-- left by the developers who followed Stockley.

This forum addressed issues related to Lake Erie's natural geology, how the shoreline might have looked when John Stockley built his pier, how it has been changed over time, and how it might affect future use of the lakefront. The forum's five speakers were Donald E. Guy, Jr., Senior Geologist, Ohio Department of Natural Resources, Lake Erie Geology Group; Susan Davies, Environmental Reporter, News Channel 5; Jay Onacila, Commander, Greater Cleveland Boating Association; Jeffrey L. Busch, Ph.D., Executive Director, Ohio Lake Erie Commission; and John Watkins, Coastal Engineer, Ohio Department of Natural Resources. Speakers covered the following topics:

- The potential impact of shoreline geology and climate on development and recreational use, including boating.
- The significant ecological changes and biological issues related to lakefront planning, including strategies of balanced growth and sustainable development throughout the watershed.
- State programs available to assist Cleveland's lakefront planning efforts through coastal management programs and policies.

Donald E. Guy, Jr., Senior Geologist, Ohio Department of Natural Resources, Lake Erie Geology Group.

Geology

Mr. Guy described the geologic forces that have shaped the Lake Erie shoreline and provided an overview of the geology of the region. The Cleveland waterfront extends eight miles along Lake Erie and is fronted by about five miles of federal breakwaters that create a harbor of nearly 1,300 acres (see Map 1).

He displayed a map of the Cleveland lakefront in 1835, which showed the lakefront in its natural state (See Map 2).

At that time, the only visible structures were jetties extending out into the lake at the mouth of the river. He also displayed an 1838 geologic drawing to illustrate the unprotected lake bluff composed of sands, silts, and clays along the shoreline to the east of the river. (The old lake bluff is still visible south of the Shoreway.) Erosion of the bluff supplied sand to the littoral system, nourishing beaches along Cleveland and the shore east of Cleveland (Map 3.)

In the mid-1800s Cleveland began the process of filling and armoring its shoreline. By 1876, about 43 percent of the waterfront had been armored, principally by pilings along the shore east of the river jetties, and filling had begun along the 2,000 feet of waterfront just east of the river. Beaches remained along only 36 percent of the waterfront and consisted of a 4,500-foot stretch west of the federal breakwater, a 2,500-foot stretch east of the jetties, and a 5,700-foot stretch west of Doan Brook.

By 1938, the federal breakwater had been completed and about 75 percent of the waterfront was armored with bulkheads that contained fill. About 455 acres of Lake Erie were filled between 1876 and 1938, displacing the shoreline nearly 1,850 feet lakeward of the 1876 shoreline.

By 1973, no beaches of significant size remained along the waterfront, and most of the shore was bulkheaded. Filling between 1938 and 1973 created 437 acres of land, displacing the shoreline up to 2,200 feet lakeward of the 1876 shoreline. Since 1968, most of the material used as fill has been sediment dredged from navigation channels in Cleveland Harbor and the Cuyahoga River. Although most of the changes along the waterfront were due to filling, about four acres of land were eroded by waves.

Filling has continued since 1973. Most of the filling occurred in the large Confined Disposal Facilities built at Gordon Park (now known as Dike 14) and along Burke Lakefront

Airport (Dike 10B) to contain sediment dredged from channels in Cleveland Harbor and the Cuyahoga River. (See Map 4.)

Lake levels and erosion

Mr. Guy then discussed lake levels, an important factor in lakefront development. Lake Erie is the shallowest of the Great Lakes. Its average depth is about 60 feet and its mean lake level is about 571 feet above sea level. The Lake Erie basin is divided into three parts, the western basin, the central basin, and the eastern basin. Cleveland is located on the central basin, about 50 miles across to the Canadian shore.

Over the long term, Lake Erie levels have fluctuated about five and half feet due to volumetric changes in the water from a low in the 1930s to the record high in 1986. From 1973 to 1998, lake levels were of significant interest because they were well above normal. However, in the last four or five years they have been alternating between below normal or approaching normal. This year (2002) again, the lake is running a few inches below normal levels.

The lake level fluctuates annually due to seasonal fluctuation in the volume of water in the lake as well as short-term fluctuations due to storm winds on the lake. Strong winds make the lake level rise, and during the peak of a storm with northeast winds the west basin can be as much as seven and a half feet higher than the east basin. When there is a reversal of the winds, strong southwest winds for example, the east basin will be higher than the west basin days later.

Cleveland is near the center of the long axis of the lake and in spite of all the storm activity, lake levels in Cleveland do not fluctuate very much from the strong northeast and southwest winds as they do in cities that are situated at either end of the lake, such as Toledo or Buffalo. Mr. Guy also stated that most of Cleveland's waterfront is five or more feet above lake level, and problems with flooding are rare although there are occasionally limited wave problems.

During times of strong northeast or southwest winds, large waves are generated on the lake, impinging along the shore and causing erosion of shoreline materials. Typically erosion occurs at the base of the bluff leaving the upper part supported; eventually it falls in a variety of different forms. This process, called undercutting, was more prevalent along the shoreline east of the city, but extensive armoring and the breakwall have prevented further erosion. In the western part of the county, there is bedrock, which erodes very slowly. In this case, failure typically occurs in terms of rock falls where material undercut by the waves eventually collapses and provides some protection until it is eroded by waves.

Cuyahoga County's geology is also a factor affecting shoreline erosion. As Mr. Guy indicated, the western portion of the county consists of shale bedrock, with glacial till in the eastern part of the county and a large deposit of sand and gravel that was carried down an ancestral Cuyahoga River and deposited along the eastern lakeshore. The various zones consist of sand, rock, and hard clay.

Mr. Guy noted that the Highway Division of Geological Survey has been tracking and mapping recession rates. Data goes back to 1876. Rates are measured every 100 feet along the lakeshore. In general, the recession in Cuyahoga County is less than three feet per year. The bulk of the rates fall in the six inch to one foot range.

Beaches

Mr. Guy addressed the issue of beaches along Cleveland's lakefront. The lack of beaches is partly the result of efforts to prevent erosion. In places where erosion still occurs, eroded material is transported along the shore until some structure impedes its movement. Most of the eroded sand eventually ends up at the harbors. He used a photograph of Fairport Harbor as an illustration. Sand is impounded on the west side of the harbor structures at rates somewhere between 88,000 and 124,000 cubic yards per year. (He stated that, if there were no shore protection, sand would be eroded from the Cleveland waterfront in excess of about 7,000 cubic yards per year, using an average rate of about one half foot per year.)

Cleveland's waterfront today is severely devoid of sand. Only a few beaches remain in Cuyahoga County where the sand continues to be trapped by structures. The Geological Survey staff has been studying the volume and movement of sand. By looking at how sand accumulates next to harbor structures, he continued, they can begin to put together maps of transport directions along the lakeshore. From Avon Point westward, sand generally moves toward the west; east of that point, sand generally moves toward the east. He noted that by measuring the volume of sand impounded at the harbors, geologists can derive rates of sand transport in the Cleveland region. For example, accumulation rates near White City Beach are about 160 cubic yards per year.

This information is important if Cleveland decides that it wants to create additional beaches along the lakefront. He concluded his remarks with the presentation of a graphic of what Cleveland might look like with further development of the lakeshore, perhaps re-engineering some of the embankments along the waterfront to provide a few recreational beaches.

Susan Davies, Environmental Reporter and Meteorologist, News Channel Five

Climate

Ms. Davies began her presentation by making the distinction between weather and climate. She defined weather as the normal fluctuations in outdoor conditions, the record highs, the record lows, the record-breaking precipitation, the droughts, the flooding, etc. Climate is the region's average weather conditions taken together.

Cleveland's climate is quite variable, with hot summers and cold winters. Some winters are warmer or colder than others. The 1970s are an example of a decade in which winters were particularly cold with several extreme blizzards, winters in the 1980s were a bit milder and the winters of the 1990s were the warmest on record all across the country.

Over the last few decades, meteorologists have found a relationship between ocean temperatures off South America, the jet stream, and Cleveland's winters. She noted that jet stream conditions affect Cleveland winters more than summers. The terms for the water temperature variations are El Nino and La Nina. Ms. Davies noted that this year (2002-03) is supposed to be a mild El Nino year.

Expanding on this, she explained that when the ocean temperatures rise, more evaporation and more condensation occurs. This changes the air currents of the world, which in turn eventually lead to a change in the North American jet stream. The process tends to give Cleveland milder and wetter winters, more rain, and less snow in an El Nino year. The winter of 1997-1998 was very mild as a result of a strong El Nino. That year, Cleveland had the mildest February on record since record keeping began in the 1870s. The opposite occurs during La Nina years when the ocean temperature is cooler than normal, which tends to cause cold winters. As climatologists learn more about these fluctuations, meteorologists will be better able to forecast weather.

While future weather is unpredictable, Ms. Davies expects that global warming is expected to cause air temperatures to rise, which in turn will cause lake temperatures to rise. A warmer lake could stimulate more algae growth, resulting in less oxygen in the lake, which has a host of possible outcomes. For example, it could lead to more precipitation, but with warmer air temperatures and more evaporation. The evaporation may lead to frequent, strong, and severe storms (a severe thunderstorm is defined as one with winds of at least 58 miles per hour

or greater, dime-sized or larger hail, and heavy precipitation events). Severe storms will cause more run off and could potentially affect water quality.

Ms. Davies cautioned, however, that it is difficult to predict the effects of climate change factors on Northeast Ohio's weather over the next century. Most scientists studying the issue as it relates to the Great Lakes believe that there will be a five to 10 degree increase in air temperature in the next 100 years. In general, scientific models are predicting warmer and wetter winters with late or no ice covering. Less ice cover will lead to more evaporation and lower lake levels. Lake Erie could experience as much as a five-foot reduction in water levels.

Ms. Davies then turned to the micro-climate created by the lake. It is well known that Cleveland's temperatures vary widely. The average high on August 1st is 81° F and on February 1st it is 33° F. Cleveland's daily high and low temperatures are measured at Hopkins International Airport, but that does not necessarily reflect what's happening along the lakeshore because the lake creates its own micro-climate. The water temperature off the lake influences the air temperature along the lake. At certain times of year, temperatures two to three miles inland from the lake can be different from temperatures along the shoreline. For example, the average lake temperature is 33 degrees in February, 40 degrees in April, 51 degrees in May, and 64 degrees in June. In April and early May, inland communities like Akron and Medina can easily reach 80 degrees on any given day, but on that same day it might be only 50 degrees along the lakeshore.

Lake Erie is the shallowest and the most southerly of the Great Lakes. It warms faster than any of the other Great Lakes and stays warm longer, making air temperatures warmer along the lakeshore in the fall. The lake temperatures make spring colder along the lakeshore, which may make it a less appealing place for outdoor activities such as bicycling, jogging, and roller-blading. Ms. Davies noted that it is important to capitalize on the lake's strengths and minimize the challenges that it presents from a climactic standpoint when planning for the lakefront.

Ms. Davies noted that Toronto is similar to Cleveland in that it is also looking at ways to connect the city with the lake and is considering relocating a major highway, the Gardiner Expressway. She shared the observation that weather was a consideration in Toronto's lakefront planning efforts and that some designers involved in the lakefront planning in Toronto recommended against creating a large strip of green space, concerned that it might not be used during the winter. Instead, they proposed narrow pedestrian corridors along the edge of the

lake buffered by trees, and mid-rise residential buildings that incorporate commercial and retail space.

Looking at other cities is instructive, but it is important to take into account that each city is different. Ms. Davies noted that Toronto sits on the northern shore of Lake Ontario, which is much deeper and much colder than Lake Erie. Toronto faces south while Cleveland faces north, which has important ramifications, especially in the wintertime when Toronto's air temperature tends to be five to 10 degrees colder than Cleveland's.

Ms. Davies stated if we are going to make Cleveland's lakefront more pedestrian friendly, we should also consider ways to make it climate friendly by careful placement of trees and other vegetation to act as buffers to strong northwest winds in the winter and as shade in the summer. Similarly, when planning for apartments and cafes along the waterfront, it is important to consider design features that can mitigate an inhospitable environment for six months of the year. She suggested that entranceways face east or south, not north or northwest due to the force and direction of winter winds.

Commander Jay Onacila, Greater Cleveland Boating Association

Lake Erie Boating

Mr. Onacila began his presentation by saying that he would address the types of recreational activities that occur along the shoreline, particularly recreational boating. The Greater Cleveland Boating Association represents recreational boaters. The position of Cleveland's shoreline limits recreational activities when storms are imminent, especially in spring and fall, and recreational boaters must obtain daily forecast information from the National Oceanic and Atmospheric Administration (NOAA) weather radio and local weather forecasters before they venture out into the lake.

Mr. Onacila indicated that recreational boating supports a wide array of recreational activities including lake cruising in large boats, day sailing in regattas, fishing, personal watercraft, water skiing, sea kayaking, and canoeing along the shoreline. Boaters support local establishments and restaurants in the Flats and other points of disembarkation.

The Lake Erie boating season includes the traditional summer months and continues into the fall because water temperatures are still warm. Normal lake temperatures for the last week of October range from 54 to 56 degrees, which are also temperatures that are usually normal for the end of May and the first part of June. He reported that the normal water

temperature range for April is between 33 and 39 degrees Fahrenheit, and May averages are from 39 to 54 degrees.

Mr. Onacila is a member of the Lakefront Advisory Committee, which is advising the city on its Lakefront Plan. The plan seeks to create more access points, not only from a land use perspective, but also a boating perspective. Many boaters are intrigued by the city's beautiful skyline and many attractions upon their arrival in the area. However, a major issue preventing more boaters from spending time (and money) visiting Cleveland is the shortage of transient dockage.

This shortage translates into economic losses for the city. He explained that transient dockage for boaters is the equivalent to hotels, motels, and camp sites for motor vehicle travelers. There is a major shortage of slips for short-term and overnight tie-ups for cruising boats, especially on Lake Erie, and in the Cleveland area specifically. Mr. Onacila noted that a statewide study conducted by the Ohio Department of Natural Resources, Division of Watercraft, indicated that Lake Erie boaters want more good quality transient facilities than what is currently available.

He further explained that the recreational boating community is growing, and the demographics indicate that an increasing number of boaters will have the time and disposable income to leisurely cruise the waterways. He mentioned that the U.S. Congress has recognized the national shortage in boating infrastructure and has established a boating infrastructure grant program which, in effect, is federal aid for cities and areas to establish transient boating facilities for boats larger than 26 feet.

Mr. Onacila discussed the statewide economic impact from transient boaters using Lake Erie. There are approximately 1,670 slips available at 47 public and private marinas, statewide. Fifteen of these marinas have 50-plus slips, and 12 of the 15 are in Erie and Ottawa counties. Only one large marina is in Cuyahoga County, at the Old River Yacht Club. He compared Ohio to Michigan, which began taking a very strong approach in 1947 with its Great Lakes Harbors Program. The goal of Michigan's program is boater safety, and the program provides an extensive system of public harbors. These are located so that boaters on Lake Michigan are never more than 15 minutes away from a harbor. He noted that along lower Michigan's east coast, there are approximately 1,800 public transient slips for recreational boaters. This does not include the additional private marinas along the coastline.

According to Mr. Onacila, a typical transient boater would spend approximately $134 for a one and a half day boating trip, including food, lodging, fuel, dockage fees, and miscellaneous expenses. A popular 100-slip marina could easily bring $2,000,000 into the local economy during the boating season. The state of Ohio recognized this economic impact and, using the federal boating infrastructure grant money, added a transient facility to the newly renovated Middle Bass Island State Park.

The boaters represented by Mr. Onacila want to visit high quality transient facilities at locations well known for recreational options such as bicycle paths, parks, hiking trails, and other activities such as shopping opportunities and sports facilities. Successful transient marinas offer these options. In addition, he noted, they offer well-maintained and spotless facilities, practice excellent customer service, schedule various special events during the boating season, and partner with local shore-side businesses, restaurants, shopping malls, and areas of interest as well as provide transportation to these sites and advertising.

He concluded his presentation by asking the audience to think about the economic and recreational opportunities a transient marina could offer Cleveland that have been overlooked in the past.

Jeffrey Busch, Ph.D., Executive Director of the Ohio Lake Erie Commission (OLEC)

Lake Erie Ecology

Dr. Busch began his presentation by comparing Lake Erie's present ecology with its past. He pointed to an image on the screen of the burning Cuyahoga River and recounted that it became seriously polluted for a number of different reasons, including the common practice of using the lake and rivers as sewers. It was thought that rivers were so vast that human activity could never exceed their capacity to contain waste, which turned out to be wrong.

As a result of these practices, 30 years ago, Lake Erie was considered dead. Nothing survived in the lower Cuyahoga River, and Lake Erie became overloaded with nutrients, particularly phosphorus, and toxins from miles of industrial river dumping. The contamination became so severe that lake fish were no longer suitable for eating. Dr. Busch stressed that there was unsatisfactory sanitary disposal as well, which caused large-scale outbreaks of disease in the river areas.

Other activities that compromised the health of Lake Erie included:

- Clearing watershed woodland areas for farming, which added sediment loading of the rivers and the lake;
- Over-fishing, which depleted native river and lake aquatic species;
- The introduction of several exotic species from opening up the Great Lakes to international trade through various canal passages, which disrupted the species balance in the lake.

Dr. Busch reported that the present condition and increased clarity of the lake water is the result of federal, state, and local investments in improved sewage treatment and the reduction in point sources of pollution, primarily phosphorus, mercury, and other toxic chemicals that once entered the lake directly. Today, lake fish are for the most part much cleaner, and some are suitable for eating, at least on a limited basis. Many aquatic and land species that had once disappeared (e.g., walleye and bald eagles) are returning, as are insects such as mayflies. These species indicate that the health of the land and water ecology is improving. Water clarity has improved four-fold.

Since the Cuyahoga River and Lake Erie are considered to be prime recreational areas for the state of Ohio, bringing in substantial revenue, the Ohio Lake Erie Commission (OLEC), is focusing its attention on three major recreational elements: 1) fishing on Lake Erie, 2) boating on Lake Erie and 3) the bathing beaches, all of which have experienced a renaissance in usage and enjoyment.

OLEC did a survey of Lake Erie shoreline recreational users to determine the quality of their experiences. The consensus across a wide range of activities was that the experiences are very good. The resulting economic effect was over $1.5 billion in direct tourism sales (in 1996) for coastal counties along Lake Erie.

The number one challenge to the improving health of Lake Erie today is non-point pollution, primarily the run-off and erosion of soils and the loading of sediment coming off the farmland in Ohio, going down the rivers and entering the lakes. OLEC studies indicate that to bring back prime conditions of water clarity, sediment load must be reduced by two-thirds in order to increase healthy eco-communities in the rivers. Atmospheric sources of pollution also need to be addressed.

Dr. Busch reported that of the 20 Lake Erie commercial port areas located on the mouths of rivers, eight have extremely contaminated sediments resulting from the legacy of the

past. This continues to be the major source of contamination that enters the food chain and is projected to be a multi-billion dollar clean-up task.

Beach warnings also continue to be a problem. Dr. Busch reported that about 20 percent of the time in the summer, Ohio beaches are under a beach advisory due to bacterial contamination from leaking septic systems, municipal treatment systems, and other sources, particularly during storm events.

Dr. Busch noted that although many species have made dramatic improvement, Lake Erie still cannot accommodate healthy communities of aquatic life, and exotic species are still a problem. He stated that, in order to restore the health of Lake Erie, the entire watershed needs to be considered. The rapid rate at which we are developing land has as much of an impact as what is occurring along the shoreline and what is being dumped into the rivers and streams. He recommended that we get a perspective on the entire watershed and acknowledge that unplanned growth is detrimental.

John Watkins, Coastal Engineer, Ohio Department of Natural Resources (ODNR), Sandusky, Ohio

Ohio Coastal Zone Management Program

Ohio has 262 miles of coastline with varied geologic formations and aquatic habitats. The Ohio Coastal Zone Management Program coordinates the management of these coastal areas, addressing issues that involve the east and west basins and the Lake Erie watershed.

The Coastal Zone Management Act was developed as part of the Clean Water Act of 1972 to encourage states that border an ocean or Great Lake to develop and implement programs to manage their coastlines. Ohio's coastal management law designates the Department of Natural Resources as the lead agency in developing and implementing Ohio's coastal management program. There are 41 different policies grouped into nine specific areas that relate to the Ohio coastal management area. Information about the management policies can be found on the ODNR web site.

Mr. Watkins discussed the ODNR presence along the lakeshore in Cuyahoga County and its role in relationship to recreation and lake access. ODNR encourages agencies and local governments to provide greater Lake Erie access. The agency develops and maintains lakefront state parks. ODNR also encourages private developers to incorporate public access and recreation opportunities into development plans and helps local governments develop

lakeshore and urban waterfront recreational areas by providing financial and technical assistance.

The Cleveland Lakefront State Park is comprised of six areas: Edgewater Park, East 55th Street Marina, Gordon Park, Euclid Beach, Villa Angela, and Wildwood (see Map 1). Cleveland owns the lakefront parks and leases them to the state of Ohio, which is an unusual arrangement. The Department of Natural Resources manages the park on behalf of the city. All six park areas are administered through a single park office located at Gordon Park.

ODNR has two programs that are used in planning and policy implementation along the lakefront. The first is the Statewide Comprehensive Outdoor Recreation Plan (SCORP). This is the first step and provides a comprehensive assessment of recreational needs, resources, and planning for facilities. It serves as a guide for allocations from the land and water conservation fund and local nature works funding. The second program is the Lake Erie Access Program (LEAP). It provides up to 75 percent matching funds to local government agencies along Lake Erie for boating and fishing improvements.

Other assistance opportunities through the ODNR include Coastal Management Assistance Grants (CMAGs), which are annual competitive matching grants to local communities. In general, ODNR requires a 50 percent local match. At least $250,000 is available annually. Local governments, areawide planning agencies, county agencies, state agencies, colleges, universities, and other institutions of higher learning are eligible. Additionally, school districts, park conservancy districts, port authorities, and nonprofit agencies who have been nominated by one of these other agencies are included in the eligible funding categories.

Mr. Watkins stated that, since 1998, nearly $1.5 million has been granted to local communities through ODNR programs. He distributed a sheet with contact information for these various grant opportunities. A copy is attached to this report.

QUESTIONS AND DISCUSSION

Dr. Busch was asked if there are any programs for sediment clean up activities. He responded that although the Lake Erie Commission is not directly involved in sediment cleanup, the Commission is made up of six agencies with Ohio EPA involvement. There is currently a bill in the U.S. Senate under Senator Voinovich's Committee to supply $50 million for removing sediments in some hot spots. Great Lakes states are devising a long term Great Lakes restoration plan. A major portion of the plan deals with contaminant sediment removal and disposal. Currently only small projects are underway, such as the clean-up of the Ashtabula River.

Mr. Watkins was asked if there are any programs to deal with the run-off issues. He responded that as part of the coastal management program, Ohio is now receiving funding opportunities through the National Oceanic and Atmospheric Administration to address non-point pollution. Funds are provided for watershed coordinators for local soil and water management districts to work directly with property owners, farmers, and contractors to better manage run-off from their site. The program is new and hopefully will have an impact on sediment loading, but it may take five to 10 years to see the full results. Mr. Busch added that the conservation reserve enhancement program, which is being administered by ODNR, is in its third year and has been a remarkable success. Through this program, the state pays a rental fee to farmers to keep vulnerable tracts of land uncultivated, particularly buffer strips near streams and wetlands. Thousands of acres of wetlands and buffers have been constructed through this program in the last three years. The proposed new Ohio farm bill will most likely increase funds for this program due to its past success.

The next question was about the role of the Ohio Management Program in protecting our coastline, keeping public access to Whiskey Island, and insuring public input for the submerged land leases, which call for public access to Whiskey Island. Mr. Watkins noted that, with regard to Whiskey Island, the department is aware of the ongoing process, however, most of the discussion with the city of Cleveland and the Port Authority is through ODNR. He did not know personally exactly how much of Whiskey Island is under a submerged land lease, a term that refers to the areas of fill that occupy the bottom lands of Lake Erie, along with the water, the fish, and their habitats that belong to the citizens. The lease is an agreement between the person or entity that has placed the fill into the lake and the citizens of the state of Ohio. The issue is whether the person or entity that is placing the fill is now the owner of the fill structure. There is no hearing if a transfer of that lease occurs, but if there is a change in configuration of

the area being leased, or if the usage of that area changes, then there is an opportunity, if requested, for a public hearing to be held. It is not automatic and needs to be requested.

Jay Onacila added that House Bill 583, dealing with submerged land leases, was in committee but will probably not be acted on in the near future. With regard to the Whiskey Island Marina, the Greater Cleveland Boating Association would take the position that it does not want to see any public marina, private marina, or dockage facility (whether it is a yachting club or boating club) disappear, especially a 475-slip marina. The Lakefront Advisory Committee is evaluating all of the possibilities including a new marina, possibly a transient facility.

The panelists were asked for a few examples of waterfront best practices, considering Cleveland's variable climate. They were also asked to comment on how significant the differences are between the Cleveland lakefront and the Chicago lakefront. Mr. Busch responded that the Chicago waterfront has several urban beaches that can be accessed by walking; there is access across their shoreway as well. The other key difference is that the Chicago waterfront is not enclosed behind a federal breakwater, so there is better circulation of lake waters. There are 1,300 acres along the Cleveland waterfront that are restricted by the federal breakwaters, which creates a difference in basic water quality and water circulation between the two cities. There is a basic difference in the way the Chicago shoreway was developed to provide urban recreational beaches. It is very difficult for Clevelanders to take a bus or walk to the waterfront. Ms. Davies added that it is important to keep in mind that in Chicago, although the prevailing winds are out of the west or southwest, they are not coming off the lake. It is not as cold a wind as Cleveland's winter winds. The Cleveland lakefront is very unpleasant in January or February.

Ms. Davies was asked if, in regard to the global warming theories, she knew what impact a rise of two to three degrees in our average temperature would have on Lake Erie and the Great Lakes. She responded that there are a variety of models that consider different scenarios over the next several decades, but none that are definitive. We need to continue to create these models and add to the body of information and continue to examine the scenarios and what action should be taken. Mr. Watkins added that the National Oceanic and Atmospheric Administration has a division called the national ocean service. NOAA's web site, (www.noaa.gov) contains information about studies related to weather issues.

Mr. Watkins was asked what ODNR, with the state of Ohio's support, is prepared to do to carry out the public hopes, plans and wishes for the development or non-development of Dike 14. He replied that Dike 14 is a former confined disposal facility located off the extension of

Gordon Park. A confined disposal facility is used to collect the sediment that is dredged from local harbors. Dike 14 is currently under the control of the Cleveland-Cuyahoga County Port Authority. ODNR has a strong interest in what happens to Dike 14. It may be added to the state park system. In response to a lot of comments from the community, ODNR deputy director Scott Zody initiated a process with a consultant in Cleveland to hold information sessions and gather comments from people in the community and in the surrounding area. That process has been ongoing for about the last six months and provided opportunities to make comments and tour the site. In addition, a working group was developed to assess over 90 different proposals that were significant enough to differentiate. The working group developed categories, and the results of that process will be available in the very near future. ODNR is very interested in input from the community and will review the final public input report and opinions before taking any action on the fate of Dike 14. This is a Port Authority facility, and action by ODNR would be in conjunction with that entity.

Mr. Busch was asked to specify which of Ohio's ports contain polluted sediments. He replied that this included different sections of the Maumee River, Swan Creek, Sandusky, Lorain, Cleveland, Ashtabula, plus one or two more.

Mr. Busch was also asked about the impact on local beaches when ships entering the Cleveland Bulk Terminal churn up contaminated sediment. He responded that contaminated sediments are a huge problem in Cleveland due to propeller wash turning up the sediment. The main concern is that the contaminants are not only in the navigation channel and port area, but in those areas that also serve as a reservoir for toxins that move. The contaminated sediment is recycled back into the biota and works its way up the food chain to all species of sport fish and eventually, if consumed, to the human population. For that reason, contaminated sediments remain an issue. The main stem of the Cuyahoga is a confirmed reservoir for pockets of contaminants. The lakefront has not been as well mapped and the location of other pockets needs to be investigated.

The next question related to submerged land leases. If erosion takes away 10 or 20 feet of private land and the owner wants to restore that area with some kind of breaker, are they required to get a submerged land lease and pay the state a lease payment in perpetuity to reclaim their land? Mr. Watkins responded that, regarding the portions in public areas, the assumption is correct depending on several different factors. The deed will indicate that the land extends out to a certain location, low water mark, or a certain distance measured from a roadway. The type of measurement varies along the shoreline. Some sections along the

lakeshore have entire sub-divisions that have eroded away with lots 70 to 80 feet out into the lake. The issue of whether that land comes under the public domain is a question of how that erosion occurred. If there was what is referred to as an "erosive event," for example, a storm that washed out the land in one large event and if action was taken within a reasonable period of time, a year or two, to restore that land, then it may not become part of the public domain.

If the erosion occurred as a gradual process and recedes in a normal erosive process that occurs over a long period of time, then there is a possibility that the owner would lose title or deed. As the shore moves inland, it becomes a public overlay, and a public interest into that particular area because it is a shore area. The deed is not invalid. It is still retained at the county courthouse. However, issues arise if the owner decides to fill in that area, which is now in the public interest to keep as a coastal environment with a beach and near-shore aquatic habitat. The landowner is now leasing what has been created by water moving in and creating a public interest area.

Mr. Watkins was asked if there are any plans to extend the breakwall or creatively begin to protect the shoreline. He responded that ODNR is mandated to develop a Lake Erie erosion management plan. In the 1940s and 1950s, there were studies and plans to address the erosion issues, many of which were not successful. Currently, ODNR is offering grant opportunities and collaborating with community associations and other entities to work collectively on erosion prevention projects. There are no plans to extend the federal breakwater. Long breakwalls create water quality issues due to lack of circulation in that area. If a storm sewer outfalls, some of the biological contaminants can accumulate in the stagnant water.

As a follow-up question, Mr. Watkins was asked if it is feasible to have a long-range program to protect the shoreline against erosion, collapse, and the eating away of the sand. Mr. Guy answered that technically it is possible to armor the lakeshore. Ohio, compared to other Great Lake states, is already heavily armored. Some structures are better than others. The question about the concept of armoring the lakeshore is the impact it has on beaches and on near-shore aquatic habitats. Data from the 1860s indicates that there were beaches along most of the Ohio lakeshore. The change that has occurred since then is due to building harbors that impound sands. When shore protection structures are in place, there is less erosion of the bluffs, which contain about 20 percent of the sand that helps to nourish beaches. When the bluff erodes, sand is introduced into what is called the littoral system. That sand moves along the shore helping to maintain beaches, near-shore bars, and near-shore aquatic habitats. In Ohio there has been a steady decrease in the size of beaches and the length of beach-fronted shore

and an increase of armoring of the shore to replace what was there to begin with, a beach. Armoring results in restricted recreational access due to riff-raff revetments that cannot be crossed. When there is an erosion event, the whole near-shore profile from the top of the bluff down to the shoreline and out into the water readjusts. A built structure that extends out into the water stabilizes the tow of the bluff, but it does not recreate the near-shore profile and a beach will not reform in front of that structure. In order to recreate a beach in front of a structure, far more sand than what was along the shoreline initially will be needed. The challenge for Ohio is how to protect the shoreline and nourish the beaches.

In response to a question about the actual differences in climate between Chicago and Cleveland, Ms. Davies responded that there are a lot of similarities, but there is not a strong east wind off Lake Michigan except during storm events. The prevailing wind in Chicago, like Cleveland, is generally out of the southwest or west, except when pressure systems bring the wind out of the north or northwest. The point is that with 30 mile-per-hour winds out of the north/northwest across the Lake Erie, Cleveland can experience a wind chill factor of 15 degrees along the lakefront.

Another question was whether we should use Chicago as a model when the Chicago shoreline is north and south and our shoreline is east by northeast. Mr. Guy responded that not all beach models apply to Lake Erie beaches. Increasingly, activities that are more in tune with the cooler weather that prevails throughout the Great Lakes are becoming popular. If there were urban beaches along the Cleveland waterfront, there would be a substantial increase in use of the waterfront. It does not matter what the climate is if you have no place to go. If green space is available, even in the form of urban beaches along the Cleveland waterfront, there will be increased use of the waterfront.

The questions then shifted to marinas; where could they be built and who would use the retail facilities on the lakefront in the winter months when boaters do not come. Mr. Onacila replied that there is no established location yet and no source of funds identified. The planning is an ongoing process that will be implemented in small pieces over the next five to 15 years. The objective is to take the best ideas from other cities and incorporate them into the Cleveland plan, with considerations for the climate. The inner harbor is a good site for a transient facility. It may be underutilized for a portion of the year, but it can still be an economic development tool that could bring one to two million dollars a year back into the city.

The final question was whether it is feasible to diversify what is done at the lakefront, and if it would be feasible to put up a sustainable type of energy capturing device like windmills.

Mr. Watkins responded that the city of Cleveland is going through this process of holding public forums to look at the issues and draw out different types of ideas for diversified use of the Cleveland lakefront. The potential for renewable energy was raised during discussions for the Dike 14 project, but the final results of the committee's evaluation on that topic are not available as yet. Wind energy is now a recognized option throughout the United States, but it has to be economically viable and not disrupt scenic views. Kingston, Ontario has a large windmill but it dominates the view of the shoreline and the community needs to determine what is an acceptable view structure along the shoreline.

PANELIST BIOGRAPHIES

Wayne Dawson (Moderator)
Co-Anchor
Fox 8 News

Wayne Dawson is co-anchor of FOX 8 News in the Morning, seen weekdays from 5:30-9 a.m. on WJW. Wayne is also the host of "Neighborhood," a quarterly public affairs program. Before teaming up with Stefani Schaefer on the morning show, Wayne served as co-anchor of the weekend editions of FOX 8 NEWS from 1994-99.

Prior to joining WJW in 1979, Mr. Dawson was an anchor/reporter at WNIR-Radio in Kent, Ohio, from 1977-79. He is a 1979 graduate of Kent State University and holds a Bachelor of Arts degree in journalism. A six-time Emmy Award winner, Wayne is a member of the NAACP, the National Association of Black Journalists and the Phi Beta Sigma Fraternity. He has been chosen as the "Outstanding TV News Reporter" by the Professional Women's Business Association. Mr. Dawson was twice named one of the Jaycees "Outstanding Young Men of America." He has also been named "Man of the Year" by Delta Sigma Theta. He is also a member of the Broadcasters Hall of Fame.

Donald E. Guy, Jr.
Senior Geologist
Ohio Department of Natural Resources
Lake Erie Geology Group

Donald Guy is a senior geologist with the Ohio Department of Natural Resources, Division of Geological Survey, Lake Erie Geology Group. He has a Bachelor of Arts from Earlham College and a Master of Science from Bowling Green State University. Since 1973 he has been involved with research related to the geologic setting and processes of the Ohio shore of Lake Erie. This research includes mapping shore recession, designating coastal erosion areas along the Ohio lakeshore for the Ohio Coastal Management Program, collecting cross-profiles to study long-term changes in bluff topography and near-shore bathymetry, and studying sediment distribution in marina channels to assess its potential for near-shore disposal. In addition to research, he reviews applications for dredging and erosion control structures to assess potential impacts on coastal processes, advocates near-shore disposal of sand, selects near-shore disposal sites, provides technical assistance to owners/managers of lakefront property, and makes presentations to organizations.

Susan Davies
Environmental Reporter
News Channel 5

Susan Davies has been part of the News Channel Five Forecast Team for the past 7 years. On days when she's not tracking lake-effect snow or severe weather, she covers the environment and science beat and has produced several award winning environmental reports for WEWS

TV. Two years ago, she completed a master's degree in Environmental Science and Management from Duquesne University in Pittsburgh. As the mother of a two-year-old, Susan does not have a great deal of free time, but whenever her schedule allows, she is racing on a sailboat on Lake Erie or bicycling with her husband and daughter in one of Cleveland's Metroparks.

Jay Onacila
Commander
Greater Cleveland Boating Association

Jay Onacila is the Commander of the Greater Cleveland Boating Association (GCBA) as of November 2002. He has been serving the GCBA on their Executive Board for the past four years. Mr. Onacila has been involved with recreational boating for over 14 years. He volunteers his time to teach safe boating classes for Vermilion Power Squadron.

Mr. Onacila was appointed to serve on the Lakefront Planning Advisory Committee in July of 2002. He has been a resident of the city of Cleveland for 23 years. He is a graduate of St. Edward High School and Ohio Technical Institute. Currently, he works as a Foreman Electrician for Doan/Pyramid Electric.

Jeffrey L. Busch, Ph.D.
Executive Director
Ohio Lake Erie Commission

Dr. Busch is the executive director for the Ohio Lake Erie Commission Office. The Ohio Lake Erie Commission Office was formed in January of 1992 to serve as staff for the Ohio Lake Erie Commission, which is comprised of the directors of six State of Ohio agencies having Lake Erie management programs. This office is responsible for administrating several programs concerning Lake Erie including the administration of the Lake Erie Protection Fund.

Dr. Busch previously served as project manager for the Port of Toledo and director of the U.S. Senate Great Lakes Task Force in Washington, D.C. With the Task Force, Jeff was actively involved in Great Lakes environmental and economic issues, drafting legislation, and statement papers for the Great Lakes Senators.

His experience includes teaching and research positions at the high school and college level. A Commander in the U.S. Coast Guard Reserves, he also served as executive officer for Port Security Unit 309 and served in Operation Uphold Democracy in Haiti and Operation Noble Eagle following September 11th.

Dr. Busch also serves as a Board Member of the Great Lakes Protection Fund and Lake Erie Coastal Ohio, Inc., as Alternate Commissioner of the Great Lakes Commission and as Commander in the U.S. Coast Guard Reserves.

John Watkins
Coastal Engineer
Ohio Department of Natural Resources

John Watkins is a coastal engineer with the Ohio Department of Natural Resources, Office of Coastal Management in Sandusky, Ohio. He has a bachelor's degree in Civil Engineering from the University of Akron, and has received training in Coastal Engineering from various institutions, including the US Army Corps of Engineers Waterways Experiment Station in Vicksburg, Mississippi. He has been the program manager for the ODNR Coastal Engineering Group for the past four years, and is a registered Professional Engineer in the State of Ohio. Mr. Watkins previously worked for eight years as the environmental supervisor in the Northeast District Office of the Ohio Environmental Protection Agency.

APPENDIX

Ohio Department of Natural Resources Contact List

Cleveland Lakefront Map

Map Key

ODNR Map 2

ODNR Map 3

ODNR Map 4

Ohio Department of Natural Resources

BOB TAFT, GOVERNOR — SAMUEL W. SPECK, DIRECTOR

Office of Coastal Management

GRANTS — Coastal Management Assistance Grants

Contact: Yetty Alley
yetty.alley@dnr.state.oh.us
1630 Sycamore Line
Sandusky, OH 444870
419.626.7980

Web site: www.dnr.state.oh.us/coastal/cmag/cmag7.htm

Division of Watercraft

GRANTS — Boating Infrastructure Grant Program (BigP)
Boating Safety Education Grant
Clean Vessel Act Grant
Cooperative Boating Facility Grant
Marine Patrol Grants

Contact: Headquarters: 4435 Fountain Square Drive
Columbus, OH 43224-1362
614.265.6480
1.877.4BOATER (Ohio only)
watercraft@dnr.state.oh.us

Cleveland: 8701 Lakeshore Blvd. NE
Cleveland, Oh 44108
216.361.1212
dnrwatercraftd5@ameritech.net

Sandusky: 1630 Sycamore Line
Sandusky, OH 44870
419.621.1402
Sandusky.watercraft@dnr.state.oh.us

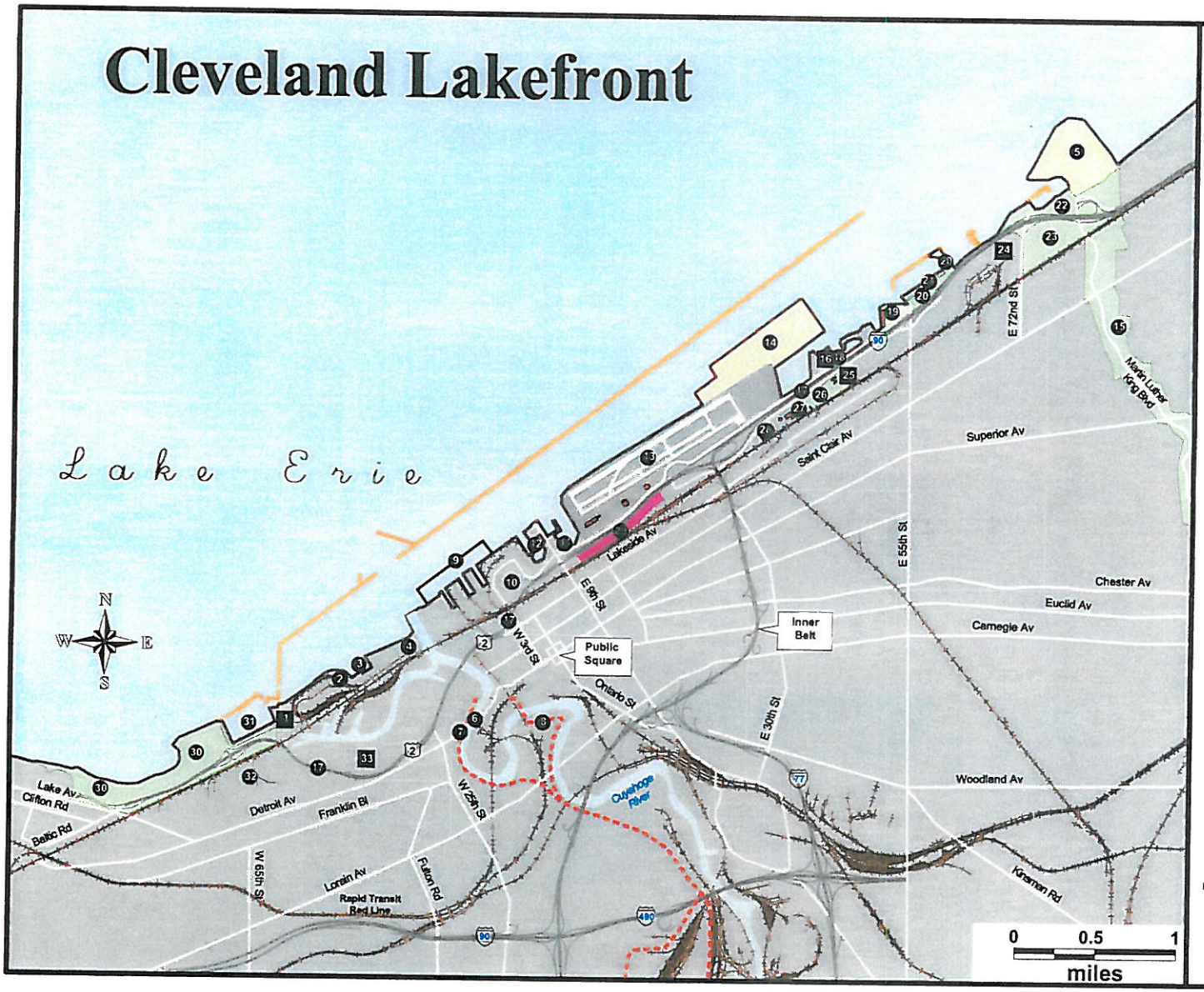
Web Site: www.dnr.state.oh.us/watercraft/grant

Division of Parks and Recreation

Contact: 1952 Belcher Drive, Building C-3
Columbus, OH 43224-1386
614.265.6561

Web Site: www.ohiodnr.com/parks

Cleveland Lakefront



Map Key

1	Westerly Waste Water Treatment Plant
2	Port Authority- Cleveland Bulk Terminal
3	Whiskey Island Marina
4	Whiskey Island (vacant)
5	Dike 14
6	Veterans Memorial (Detroit-Superior) Bridge
7	* Canal Basin Park
8	* Towpath Trail Extension
9	Port Authority- Docks 20 to 32
10	Cleveland Browns Stadium
11	U.S. Coast Guard Station
12	North Coast Harbor/ Voinovich Park/ Rock Hall/ Great Lakes Science Center
13	Burke Lakefront Airport
14	Burke Lakefront Airport Fill Property (Dike 10B)
15	Doan Brook/ Rockefeller Park
16	Cleveland Public Power- Lake Road Plant
17	Shoreway
18	Forest City Yacht Club
19	Quay 55
20	East 55th Street Marina State Park
21	East 55th Street Marina/ Inter City Yacht Club
22	Gordon Park- North of Shoreway
23	Gordon Park- South of Shoreway
24	First Energy Lakeshore Plant
25	Kirtland Pumping Station
26	Kirtland Park
27	Joseph L. Stamps Service Center
28	Police Mounted Unit
29	Municipal Parking Lot
30	Edgewater Park
31	Edgewater Yacht Club/ Edgewater Park Marina
32	Pedestrian/ Bike Tunnel
33	Garrett A. Morgan Waterworks Plant

□ = Utilities
* = Proposed

Prepared for: Levin College Forum, Northeast Ohio's Waterways: Lakefront Planning Issue Forums
February 2003

Prepared by:
Northern Ohio Data & Information Service
Maxine Goodman Levin College of Urban Affairs
Cleveland State University
Prepared 3/10/03 by JCW

MAP KEY
CLEVELAND LAKEFRONT MAP KEY

1. **Westerly Waste Water Treatment Plant:** Opened by the city in 1922, the plant is now owned and operated by the Northeast Ohio Regional Sewer District (NEORSD). The neighbor of Edgewater Park serves approximately 110,000 people on Cleveland's west side and portions of Lakewood, Brooklyn and Brookpark.

2. **Port Authority –Cleveland Bulk Terminal:** The Cleveland-Cuyahoga Port Authority holds 45 acres of lakefront property on Whiskey Island on the west side of the Cuyahoga River, commonly referred to as the Cleveland Bulk Terminal. It is used to store iron ore pellets brought to Cleveland by 1,000-foot long lake carriers and transfer them to smaller ships or rail carriers.

3. **Whiskey Island Marina:** A 475-boat facility, owned by the Whiskey Island Partners. The Cleveland-Cuyahoga County Port Authority has offered $7 million to purchase the land.

4. **Whiskey Island (vacant):** 22-acres of undeveloped land just east of the Bulk Terminal and owned by the Whiskey Island Partners. A now vacant United States Coast Guard Station which opened in 1940 and closed in 1972 sits on a narrow spit of land extending north into the lake. The site has been proposed as a lakefront park.

5. **Dike 14:** 88 acre site near Gordon Park, east of University Circle, constructed by the U.S. Army Corps of Engineers as a confined disposal facility for fill from Cuyahoga River and Cleveland Harbor dredge soils. It falls under the jurisdiction of the Ohio Department of Natural Resources, which has been exploring future uses, including a park.

6. ***Veterans Memorial (Detroit-Superior) Bridge:** A project due to begin in the Spring of 2003 will make the bridge more pedestrian-friendly by widening sidewalks and converting two traffic lanes into bike lanes.

7. ***Canal Basin Park:** If constructed, the proposed park would provide downtown access to the Ohio & Erie Canal National Heritage Corridor regional park system.

8. ***Towpath Trail Extension:** Would connect the Towpath Trail to the Flats Entertainment District creating a continuous multiuse trail from Akron to Downtown Cleveland. Projected to start within five years.

9. **Port Authority—Docks 20 to 32:** The Cleveland-Cuyahoga Port Authority holds 58 acres on the east side of the river. It also occupies another 39 adjacent acres owned by the city of Cleveland. Docks 20 to 32 extend from the Cuyahoga River to North Coast Harbor on the lakefront, including over 417,000 square feet of warehouse facilities used to store steel and machinery cargoes.

10. **Browns Stadium:** Built in 1999 to replace the old stadium on the same site.

11. **U.S. Coast Guard Station:** Built during World War II, the station is located at E. 9th and North Marginal Rd.

12. **North Coast Harbor/Voinovich Park/Rock Hall/Great Lakes Science Center:** North Coast Harbor is home to the Rock and Roll Hall of Fame and Museum, the Great Lakes Science Center and Voinovich park. The 5.8-acre park, located at the end of the East 9th Street Pier, offers the only public lakefront space in downtown Cleveland.

13. **Burke Lakefront Airport:** The 480-acre facility is designated as a reliever airport for Hopkins International and handled over 90,000 flight operations annually.

14. **Burke Lakefront Airport Fill Property (Dike 10B):** Composed of dredge soils from the river and harbor, viewed as future expansion space for the airport.

15. **Doan Brook/Rockefeller Park:** The centerpiece of a succession of parks that extend from Lake Erie to Shaker Heights. The once-pristine creek is now polluted and several rehabilitation proposals are now being discussed.

16. **Cleveland Public Power (Lake Road Plant):** This was the largest municipal power plant in the U.S. when it was completed in 1914. It stopped generating electricity in the 1970's but remains an important transmission and distribution facility.

17. **Shoreway:** Constructed in the 1960's, the east-west connecter is now the subject of a regional study to explore options for its relocation in order to provide greater access to the lakefront.

18. **Forest City Yacht Club/Municipal Light Plant Park:** After EPA authorization, the City of Cleveland constructed this greenspace on the site of a former landfill that was part of Cleveland Public Power's Lake Road Generation Station.

19. **Quay 55:** The site of a multi-phase development project that includes a residential renovation, retail and office space.

20. **East 55th Street Marina State Park:** Part of the Cleveland Lakefront State Park, operated by the Ohio Department of Natural Resources, this is one of Cleveland's few public access areas along the lakefront. Includes a 1,200-foot fishing platform.

21. **East 55th Street Marina/Inter-City Yacht Club:** Part of the park, the E. 55th Street Marina is a public facility that offers 335 seasonal docks. The Inter-City Yacht Club is a leased facility.

22. **Gordon Park-North of Shoreway:** Part of the Cleveland Lakefront State Park, operated by the Ohio Department of Natural Resources, includes six boat ramps, an onshore fishing platform and picnic areas.

23. **Gordon Park-South of Shoreway:** Once part of a continuous greenspace, this area was cut off when the Shoreway was constructed through the center of Gordon Park. It is part of the Cleveland Lakefront State Park, operated by the Ohio Department of Natural Resources.

24. **First Energy Lakeshore Plant:** The South Marginal Road facility has produced power since 1911. Now owned by FirstEnergy, the plant serves as an intermediate load facility, generating 240 MW of electricity. There are also transmission and distribution facilities located on the site. The plant provides power to Cleveland area businesses and residences as well as delivering electricity to Cleveland Public Power.

25. **Kirtland Pumping Station:** The station takes water in from Lake Erie and pumps it several miles up to the Baldwin Water Treatment Plant for processing.

26. **Kirtland Park:** Recreation facility at the intersection of East 49th Street and South Marginal Road.

27. **Joseph L. Stamps Service Center:** Located at East 40th Street and South Marginal Road, the City of Cleveland Division of Streets facility deploys snow removal/salt trucks and performs minor street repairs.

28. **Police Mounted Unit:** The location of the Cleveland Police horse stables. All mounted Cleveland Police Officers are deployed from this South Marginal Road location.

29. **Municipal Parking Lot:** The City-owned lot is located at South Marginal Road and East 9th Street and provides off-street parking to the general public.

30. **Edgewater Park:** Part of the Cleveland Lakefront State Park, operated by the Ohio Department of Natural Resources, Upper Edgewater Park features a 900-foot swimming beach and a renovated pavilion that can be reserved for special events. Lower Edgewater Park features a swimming beach with two picnic shelters, restrooms and a concession facility. The park also includes a 17.4 acre strip to the south that is cut is off from the rest of Edgewater by the Shoreway.

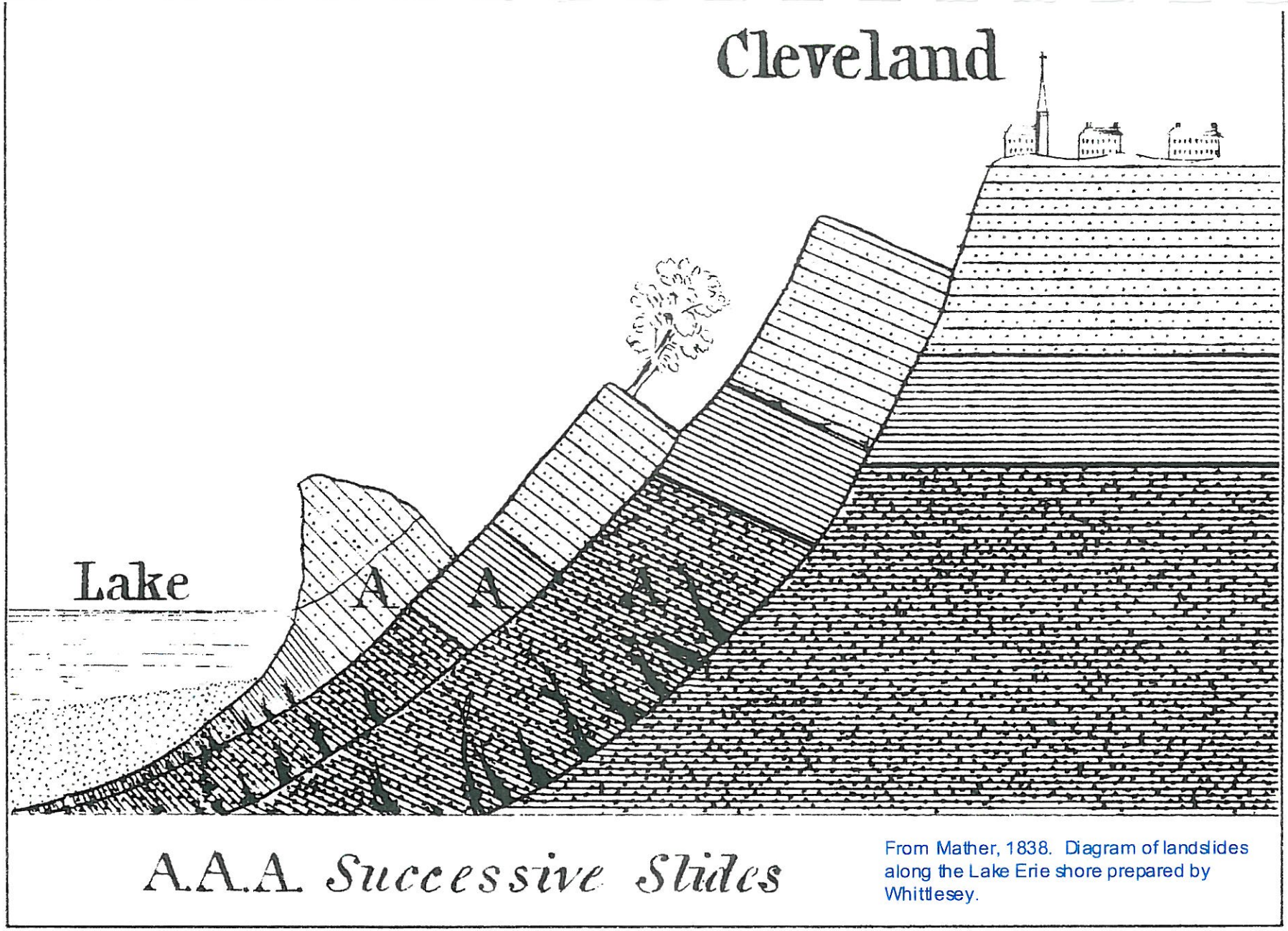
31. **Edgewater Yacht Club/Edgewater Park Marina:** Part of the Cleveland Lakefront State Park, operated by the Ohio Department of Natural Resources, the marina includes a fishing pier and 10 boat ramps, a scarce commodity on the west side of the city.

32. **Pedestrian/Bike Tunnel:** A plan is underway to improve the existing tunnels that link the Westside neighborhoods cutoff by the Shoreway to Edgewater Park.

33. **Garrett A. Morgan Waterworks Plant:** Opened in 1917 as the City's first filtration plant, it receives water from an intake several miles north of Whiskey Island.

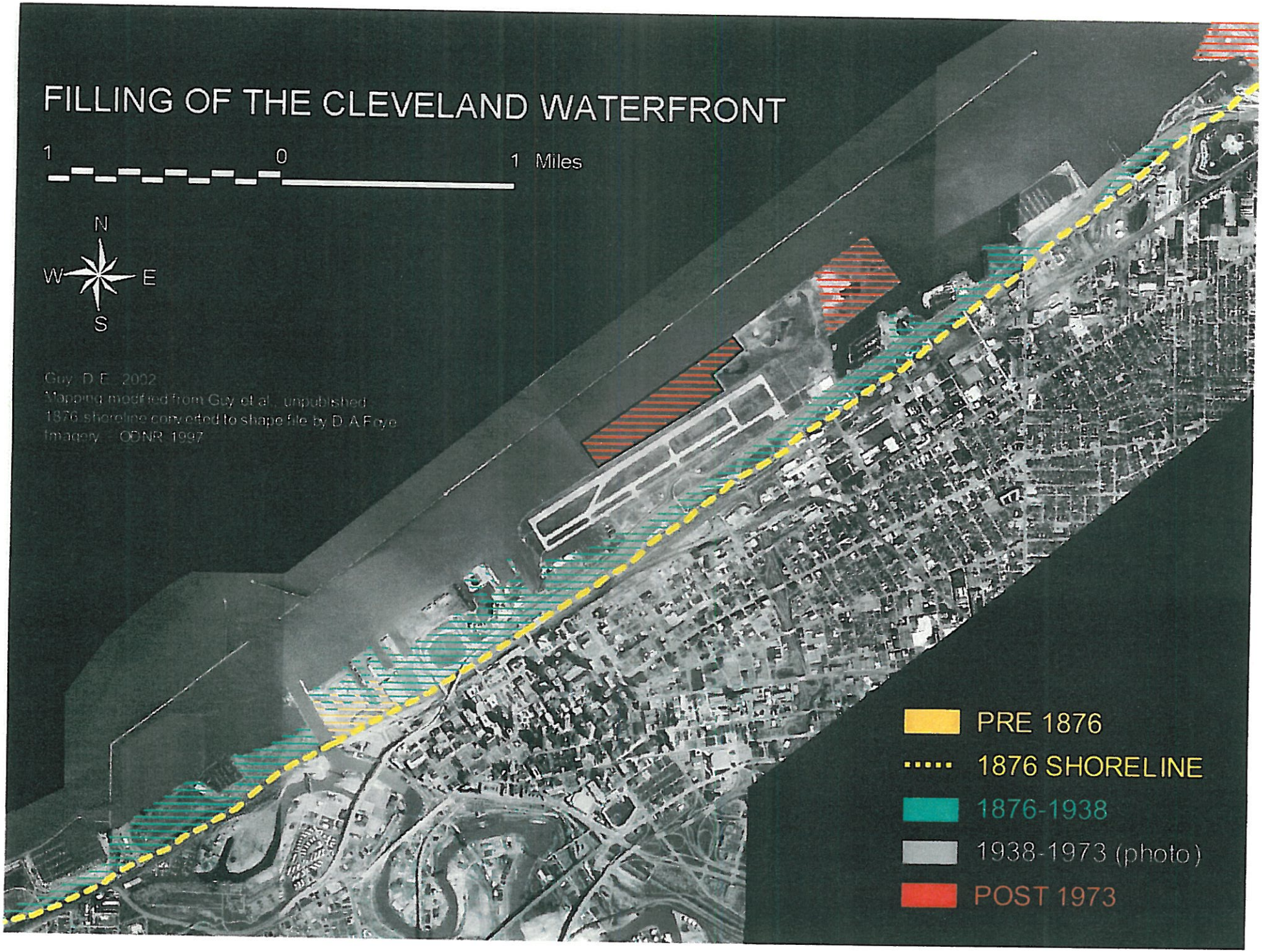
*** proposed**

Source: Donald E. Guy, Jr., Senior Geologist, Ohio Department of Natural Resources, Division of Geological Survey, November 7, 2002



From Mather, 1838. Diagram of landslides along the Lake Erie shore prepared by Whittlesey.

Source: Donald E. Guy, Jr., Senior Geologist, Ohio Department of Natural Resources, Division of Geological Survey, November 7, 2002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1876 shoreline converted to shape file by D.A.Foye
Imagery: ODNR 1997
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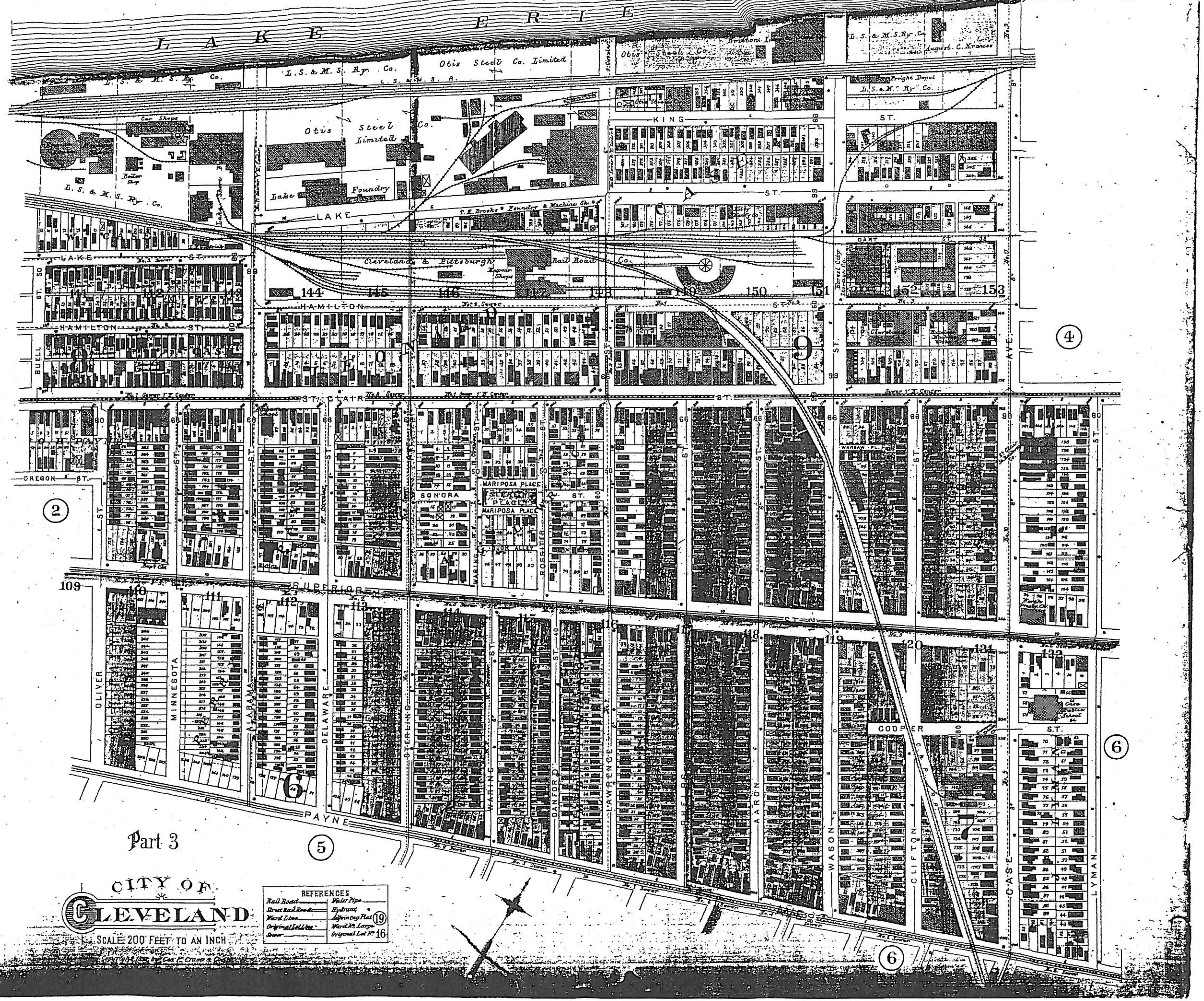
1938-1973 (photo)
POST 1973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Otis Steel Co. Limited
Otis Steel Limited
Lake Foundry
Car Shops
Boiler Shop
T. H. Brookes Foundry & Machine Sh.
Cleveland & Pittsburgh Rail Road Co.
Repair Shops
Freight Depot
KING ST.
LAKE ST.
HAMILTON ST.
ST. CLAIR ST.
SUPERIOR ST.
PAYNE AVE.
OREGON ST.
BUELL ST.
DART ST.
SONORA ST.
MARIPOSA PLACE
WARSAW PL.
COOPER ST.
OLIVER
MINNESOTA
ALABAMA
DELAWARE
STERLING
WARING
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Part 3
CITY OF CLEVELAND
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REFERENCES
Rail Road
Street Rail Road
Ward Line
Original Lot Line
Sewer
Water Pipe
Hydrant
Adjoining Plat 19
Ward No. Large
Original Lot No. 16