BC Cobb History of Construction
Ponds 0-8

Initial Compiled History Certification by Owner or Operator

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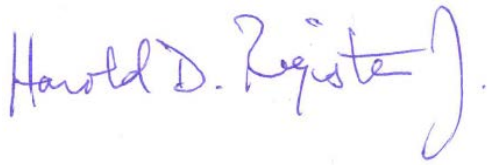
CERTIFICATION

Certification Statement by Owner or Operator

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Consumers Energy Company



Signature

October 17, 2016

Date of Report Certification

Harold D. Register, Jr.

Name

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) promulgated the Resource Conservation and Recovery Act (RCRA) Coal Combustion Residuals (CCR) Rule ("CCR RCRA Rule") on April 17, 2015. The CCR RCRA Rule requires that owners or operators of existing CCR surface impoundments with a height of five feet or more and a storage volume of 20 acre-feet or more compile a history of construction, which shall contain, to the extent feasible, the information specified in 40 CFR 257.73 (c)(1)(i) through (xii). The history of construction, and any revisions of it, as required by 40 CFR 257.73(c) shall be placed in the operating record and shall be maintained until the CCR unit completes closure of the unit in accordance with 40 CFR 257.102 [40 CFR 257.105(f)(9)].

2.0 40 CFR 257.73 (C)(1)(I)

The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Consumers Energy Company (CEC)
Contact: Michelle Marion
1945 W. Parnall Road
Jackson, Michigan 49201

Name of CCR Surface Impoundment: BC Cobb Ponds 0-8
State Assigned Identification Number: None

3.0 40 CFR 257.73 (C)(1)(II)

The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

Figure 1 – Site Location Map presents the 7 ½ minute USGS quadrangle map of Dalton, Twin Lake, Muskegon East, and Muskegon West, Michigan dated 2014. The location of the CCR unit is denoted on the map with the callout box – Site Location.

4.0 40 CFR 257.73 (C)(1)(III)

A statement of the purpose for which the CCR unit is being used.

CEC ceased electrical generation activities at BC Cobb on April 15, 2016. The facility is currently being decommissioned. Ponds 0-8 will be used to treat CCR contact wash water and low volume miscellaneous wastewaters under the facility's existing National Pollutant Discharge Elimination System (NPDES) permit.

Historically, CCR (fly ash and bottom ash) from coal-fired power generation was deposited into the Bottom Ash Pond and these 9 ponds using wet sluicing methods. Generally, bottom ash CCR slurry was

directed into the Bottom Ash Pond [exempt from 40 CFR 257.73 (c)(1)(i) through (xii) due to storage volume], with overflow directed to either Pond 5 or Pond 6. Overflow from these ponds was subsequently directed to Pond 1 before being routed through Pond 2, Pond 3, and Pond 4. Similarly, fly ash CCR slurry was directed into a concrete structure south of Pond 8 before being routed into either Pond 7 or Pond 8. Overflow from Pond 7 and Pond 8 was then directed to Pond 1 before being routed through Pond 2, Pond 3, and Pond 4 and ultimately discharged at the permitted NPDES outfall location. Before reaching the NPDES outfall location, the sluiced CCR settled to the bottom of the ash ponds and formed deposits which were excavated as required to maintain capacity (Golder 2016d).

5.0 40 CFR 257.73 (C)(1)(IV)

The name and size in acres of the watershed within which the CCR unit is located.

According to the EPA MyWATERS Mapper website (USEPA 2016), the BCC Ponds 0-8 CCR surface impoundment is located within the Muskegon Lake-Muskegon River Subwatershed, which encompasses approximately 31,981 acres.

6.0 40 CFR 257.73 (C)(1)(V)

A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

As part of a subsurface investigation and sampling program conducted by Golder Associates, Inc. (Golder) in October 2015, soil samples were collected from beneath Ponds 0-8 to document foundation conditions. Sampling locations are visually depicted on **Figure 2** – History of Construction Sections and Borehole Location Map. The physical properties of the foundation and abutment materials are presented in the "*Ash Pond Material Characterization Report*" (Golder 2016d).

Engineering properties for the foundation and abutment materials were determined by laboratory testing for the structural stability and factor of safety assessments for Ponds 0-8. The engineering properties of the foundation and abutment materials are presented in the "*Structural Stability and Safety Factor Assessment Report*" (Golder 2016c).

7.0 40 CFR 257.73 (C)(1)(VI)

A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

7.1 Physical and Engineering Properties

Based on a topographic survey completed in October 2015 and visual observations documented during yearly site inspections, the exterior and interior dikes range from approximately 5 to 25 feet in height.

As part of the subsurface investigation and sampling program conducted by Golder in October 2015, soil samples were collected from the exterior berm of Ponds 0-8 to gather subsurface information to develop certifications for structural stability and factor of safety assessment. Descriptions of the collected samples indicate that the dikes consist of a nearly equal mix of sand-sized and fines-sized CCR. The physical and engineering properties of these materials are presented in the "*Ash Pond Material Characterization Report*" (Golder 2016d) and "*Structural Stability and Safety Factor Assessment Report*" (Golder 2016c), respectively.

7.2 Site Preparation and Construction

CEC performed a document search and was unable to find design and construction records for Ponds 0-8 that detail the type, size, range, and physical properties of materials used in constructing each zone or stage of the CCR unit, the method of site preparation and construction, and the approximate dates of construction of each successive stage of construction of the CCR unit. Therefore, a USGS topographic map of the Twin Lake, Michigan quadrangle from 1985 (**Appendix A** – USGS Topographic Maps), historic aerial photographs from 1938, 1953, 1955 and 1968 (**Appendix B** – Historical Aerial Photographs), approved permits for construction of Ponds 0-8 for the purpose of ash disposal in 1946 by the Department of War and two permits in 1955 from the Department of the Army (**Appendix C** – Permits Issued), and a CEC Drill Hole Location Map from 1979 (AECOM 2009) were reviewed and the following sequence of construction was developed:

- The aerial photograph from 1938 depicts the area prior to the construction of BC Cobb. This photograph and the USGS topographic map from 1958 depict the area currently occupied by Ponds 0-8 as a wetland area.
- The August 26, 1946 Department of War, Corps of Engineers Section 10 Permit approval provides the first known permitted construction requested and approved through a federal agency to construct dikes to provide ash storage. Locations of construction, elevations for construction, and quantities of fill are also supplied.
- BC Cobb can be identified on the 1953 aerial photograph. The coal stockpile area and discharge channel are identifiable and appear in similar configuration to present day. With the exception of the area near the north channel of the Muskegon River, the majority of the area that will become Ponds 0-8 appears to have been filled.
- The 1955 aerial photograph portrays the generating facility, coal stockpile, discharge channel, and area that will become Ponds 0-8 in similar configuration to the 1953 aerial photograph. This high resolution photograph details the discharge of sluiced CCR into the southern portion of the wet ash pond area, and a perimeter berm is present on all sides of the pond area.
- The Department of Army, Corps of Engineers Section 10 Permit approval for Permit No. Permit No. 56-49-5 dated April 26, 1956 and Permit No. 56-49-6 dated April 24, 1956

describe and depict additional construction to expand and fortify the earthen dikes in support of coal ash storage.

- Ponds 0-4 are identifiable on the 1968 aerial photograph.
- A CEC Drill Hole Location Map from 1979 shows Ponds 0-4 and Ponds 6-8 in similar configuration to present day.
- The 1985 USGS Topographic Map of the Twin Lake, Michigan quadrangle shows Ponds 0-8 in similar configuration to present day.

8.0 40 CFR 257.73 (C)(1)(VII)

At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Golder developed the following figures, which are attached hereto, for Ponds 0-8:

- Figure 2 – History of Construction Sections and Borehole Location Map
- Figure 3 – Geologic Cross Section A-A'
- Figure 4 – Geologic Cross Section B-B'
- Figure 5 – Geologic Cross Section C-C'
- Figure 6 – Geologic Cross Section D-D'
- Figure 7 – Geologic Cross Section E-E'
- Figure 8 – Geologic Cross Sections F-F' and G-G'
- Figure 9 – Geologic Cross Sections H-H'
- Figure 10 – Geologic Cross Sections I-I' and J-J'
- Figure 11 – Geologic Cross Sections K-K' and L-L'

Cross sections were developed based on a Summit Surveying survey (October 2015) and the subsurface data collected and interpreted by Golder in October 2015. These cross sections are not intended to illustrate a comprehensive conceptual site model representing all data that may be available for Ponds 0-8.

9.0 40 CFR 257.73 (C)(1)(VIII)

A description of the type, purpose, and location of existing instrumentation.

The CCR RCRA Rule requires that a description of the type, purpose, and location of existing instrumentation be provided. Golder included the locations of the known instruments on **Figure 2** – History of Construction Sections and Borehole Location Map.

CEC retained ARCADIS to install 23 RCRA monitoring wells (BCC-MW-15001 through BCC-MW-15023) to characterize groundwater quality conditions in Ponds 0-8. The description and location of this existing instrumentation can be found in the "*Summary of Monitoring Well Design, Installation, and Development Report*" completed by ARCADIS (2016).

10.0 40 CFR 257.73 (C)(1)(IX)

Area-capacity curves for the CCR unit.

Area capacity curves for Ponds 0-8 were calculated by Golder using survey data collected by Summit Surveying in October 2015. The area capacity curves are included in the "*Inflow Design Flood Control System Plan*" completed by Golder (2016b).

11.0 40 CFR 257.73 (C)(1)(X)

A description of each spillway and diversion design features and capacities and calculations used in their determination.

11.1 Spillway and Diversion Description

Based on the annual "*RCRA CCR Surface Impoundment Inspection Report*" completed by Golder (2016), there are three discharge structures associated with Ponds 0-8, all within the Pond 4 perimeter berm: one reinforced concrete pipe (RCP) designed as a NPDES outfall pipe and two 18-inch high density polyethylene (HDPE) pipes designed as emergency overflow pipes.

Diversion is provided by the perimeter berm, minimum elevation of 588.0-ft (NAVD 88) (Golder 2016b), which surrounds Ponds 0-8.

11.2 Capacities and Calculations

Capacities and calculations regarding the spillway and diversion features can be found in "*Golder's Inflow Design Flood Control System Plan*" (2016b).

12.0 40 CFR 257.73 (C)(1)(XI)

The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

12.1 Construction Specifications

CEC performed a document search and was unable to find construction specification records for Ponds 0-8.

12.2 Surveillance, Maintenance, and Repair

The December 2010 "*Coal Ash Landfill Surveillance and Monitoring Program"* (SMP) (CEC 2010) outlines CEC's surveillance, maintenance, and repair program specific to each CCR surface impoundment at BC Cobb. Beginning in October 2015, Ponds 0-8 were inspected by a qualified individual at least weekly and by a qualified professional engineer (QPE) annually in accordance with the CCR RCRA Rule.

13.0 40 CFR 257.73 (C)(1)(XII)

Any record or knowledge of structural instability of the CCR unit.

Weekly inspections of the facility are performed by qualified individuals to detect potentially hazardous conditions or structural weakness per the CCR RCRA Rule and documented internally on CCR Weekly Inspection Observations Forms. Annual inspections at the facility have been performed by AECOM (2009a, 2012), Barr Engineering (2014), and Golder (2016, 2016a).

14.0 ATTACHMENTS

Figure 1 – Site Location Map

Figure 2 – History of Construction Sections and Borehole Location Map

Figure 3 – Geologic Cross Section A-A'

Figure 4 – Geologic Cross Section B-B'

Figure 5 – Geologic Cross Section C-C'

Figure 6 – Geologic Cross Section D-D'

Figure 7 – Geologic Cross Section E-E'

Figure 8 – Geologic Cross Sections F-F' and G-G'

Figure 9 – Geologic Cross Section H-H'

Figure 10 – Geologic Cross Sections I-I' and J-J'

Figure 11 – Geologic Cross Sections K-K' and L-L'

Appendix A – USGS Topographic Maps

Appendix B – Historical Aerial Photographs

Appendix C – Permits Issued

15.0 REFERENCES

AECOM (2009). "*Potential Failure Mode Analysis (PFMA) Report*."

AECOM (2009a). "*Inspection Report B.C. Cobb Generating Facility Ash Dike Risk Assessment Muskegon, MI*."

AECOM (2012). "*B.C. Cobb Ash Disposal Area 2012 Ash Dike Risk Assessment Final Inspection Report*."

ARCADIS (2016). "*Summary of Monitoring Well, Design, Installation, and Development*."

Barr Engineering (2014). "*Triennial Ash Dike Risk Assessment Report – Spring 2014*."

Consumers Energy Company (2010). "*Coal Ash Landfill Surveillance and Monitoring Program*."

Department of Army, Department of War (1946, 1955, 1955). Section 10 Permit approvals to construct, in part, earthen dikes for the purposes of ash storage in Muskegon Lake and Muskegon River.

Golder Associates Inc. (2016). "*Annual RCRA CCR Surface Impoundment Inspection Report – January 2016*."

Golder Associates Inc. (2016a). "*B.C. Cobb Ponds 0-8 Rule 257.73 RCRA CCR Surface Impoundment Inspection Report – June 2016*."

Golder Associates Inc. (2016b). "*B.C. Cobb Generating Facility Ponds 0-8 Inflow Design Flood Control System Plan*."

Golder Associates Inc. (2016c). "*B.C. Cobb Generating Facility Ponds 0-8 Structural Stability and Safety Factor Assessment Report*."

Golder Associates Inc. (2016d). "*B.C. Cobb Generating Facility Ash Pond Material Characterization*."

Historical Muskegon, Michigan Aerial Photographs (1938). Michigan State University Aerial Imagery Archive.

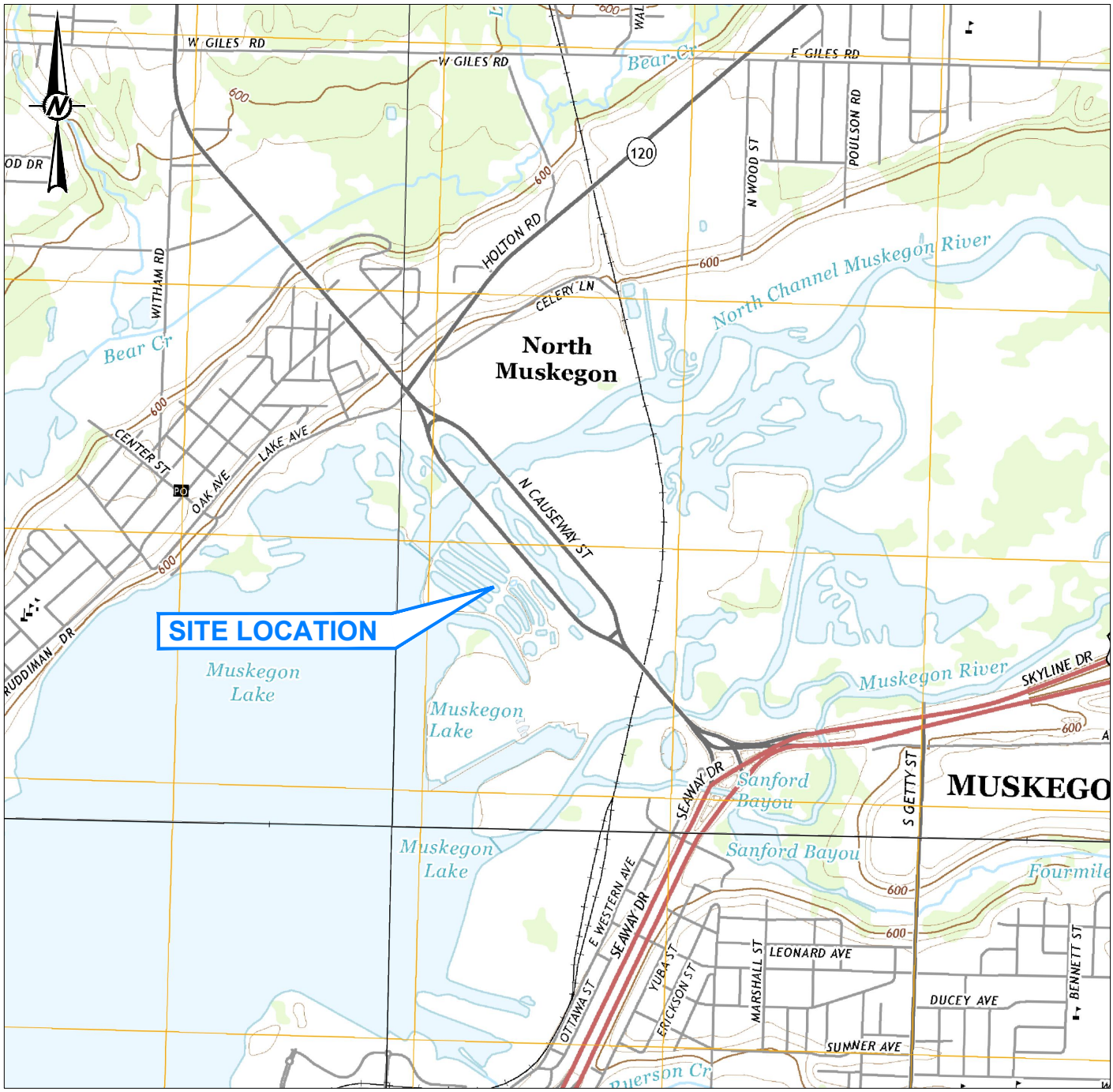
Historical Muskegon, Michigan Aerial Photographs (1953, 1955, 1968). United States Department of Agriculture Earth Explorer Website http://earthexplorer.usgs.gov/.

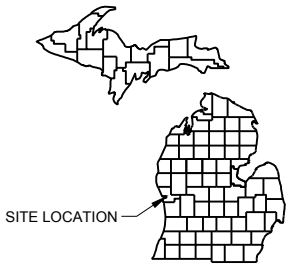
USEPA 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, (2015). Environmental Protection Agency, Washington D.C. epa.gov.

USEPA MYWATERS Mapper (2016). https://watersgeo.epa.gov.

USGS Twin Lake, Michigan Quadrangle Topographic Maps (1958, 1976, 1985). ngmdb.usgs.gov.

FIGURES





MICHIGAN COUNTIES
NOT TO SCALE

REFERENCE(S)

1. BASE MAP TAKEN FROM 7.5 MINUTE U.S.G.S. QUADRANGLES OF DALTON, TWIN LAKE, MUSKEGON EAST, AND MUSKEGON WEST, MICHIGAN, DATED 2014.

0 1000 2000
1" = 2000' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

PROJECT
B.C. COBB GENERATING FACILITY
HISTORY OF CONSTRUCTION

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-09-23
DESIGNED	JTT
PREPARED	AM
REVIEWED	JTT
APPROVED	JRP

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D001	0	1

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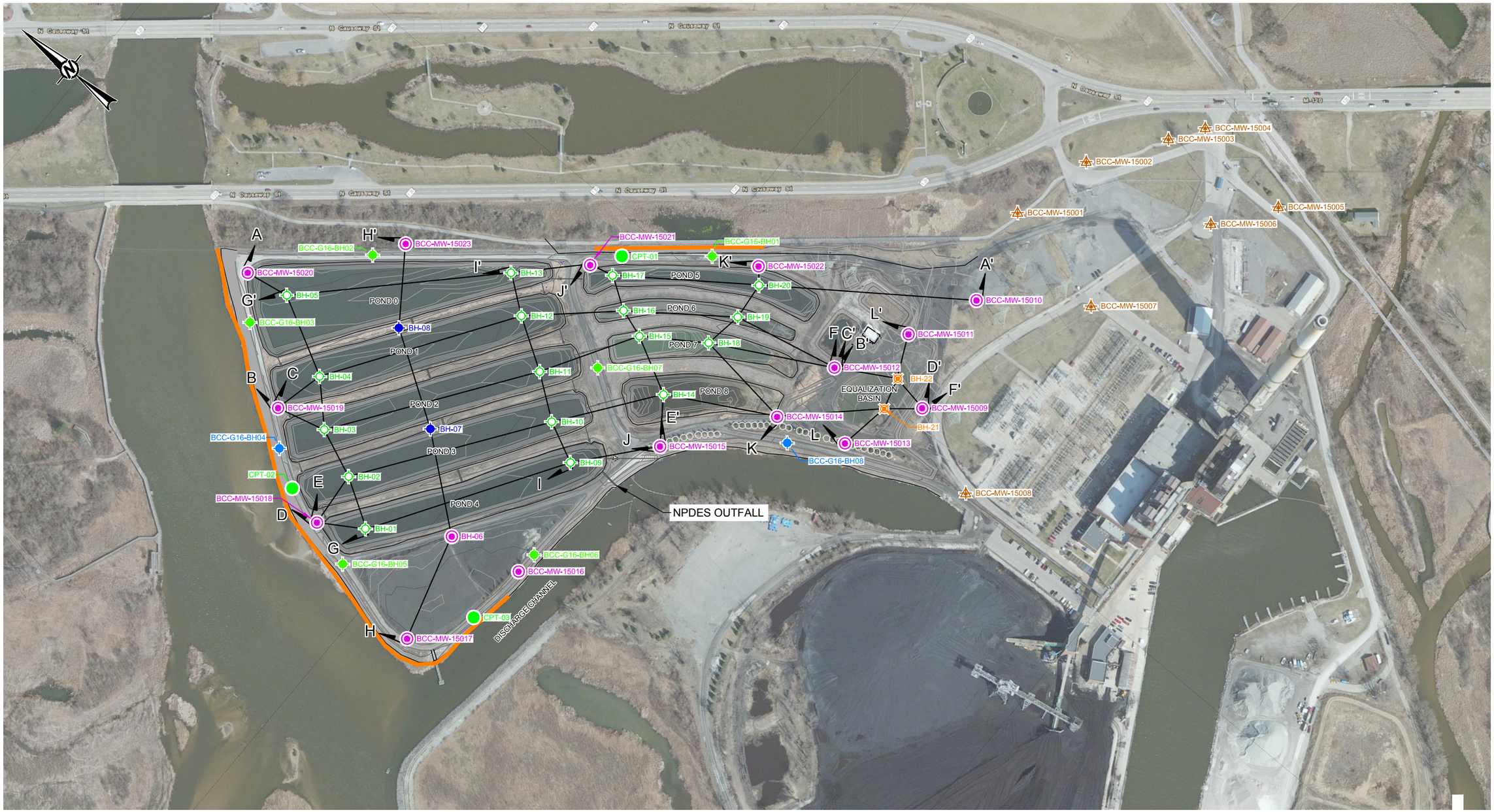

LEGEND

- 2016 CPT LOCATION
- 2016 BOREHOLE LOCATION (50-FT DEPTH)
- 2016 BOREHOLE LOCATION (100-FT DEPTH)
- POND SAMPLING LOCATION
- EQUALIZATION BASIN SAMPLING LOCATION
- INTERIOR BERM SAMPLING LOCATION
- EXTERIOR BERM SAMPLING LOCATION
- BACKGROUND SAMPLING LOCATION
- CROSS SECTION LOCATION
- AREAS OF SLOPE PROTECTION

REFERENCE

TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015.

0 150 300
1" = 300' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-09-29
DESIGNED	MJ
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
HISTORY OF CONSTRUCTION SECTIONS AND BOREHOLE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D002	1	2

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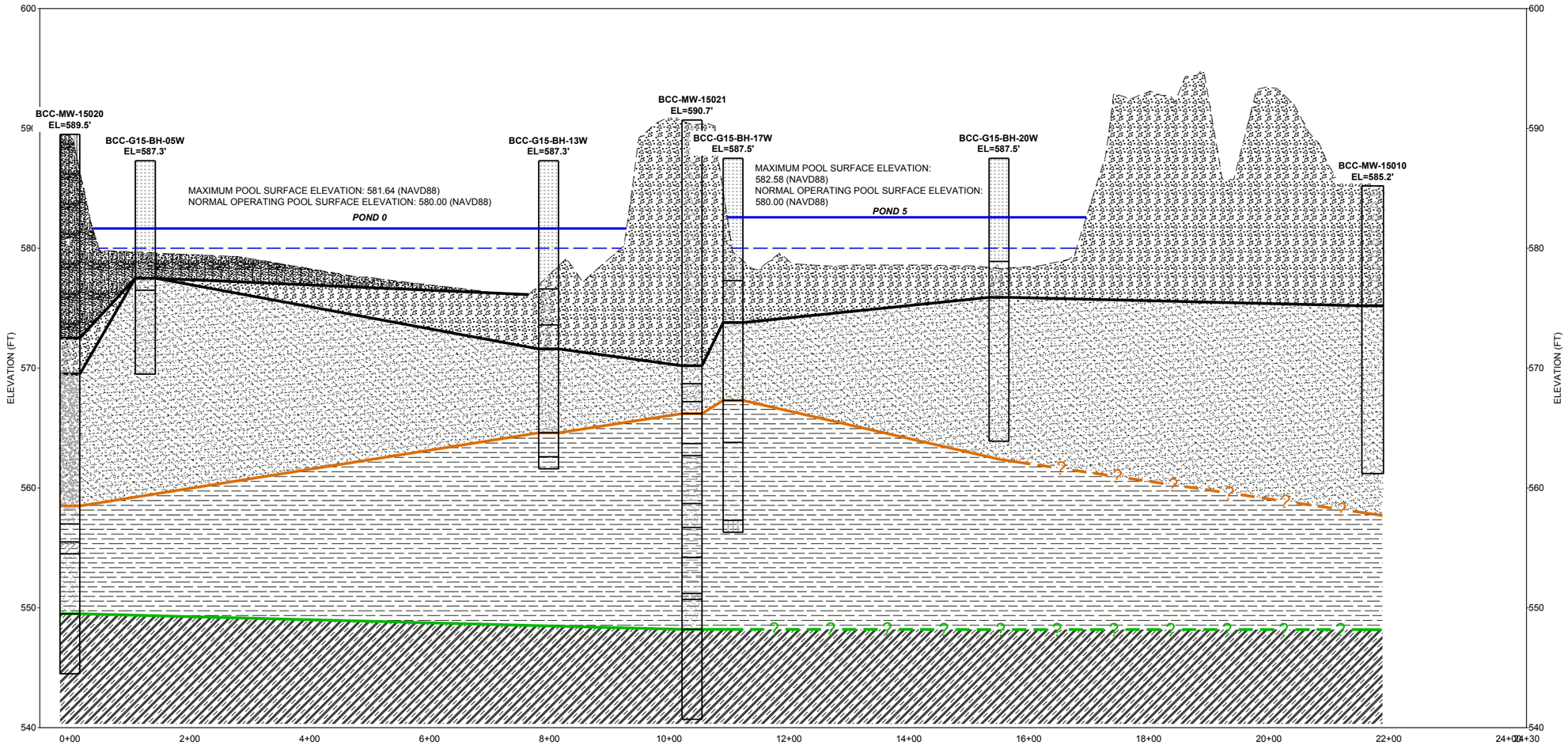

A-A'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- BCC-G15-BH-04W / EL=587.3' — SOIL BORING ID / SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

1. GROUND, POND SURFACE, AND POND BOTTOM ELEVATIONS SURVEYED BY SUMMIT SURVEYING AND ENGINEERING, OCTOBER 2015.
2. MONITOR WELL SURVEY DATA OBTAINED FROM WILLIAMS AND WORKS DRAWING NO. SG-22370, NOVEMBER 2015.
3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE: 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE: 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D003	1	3

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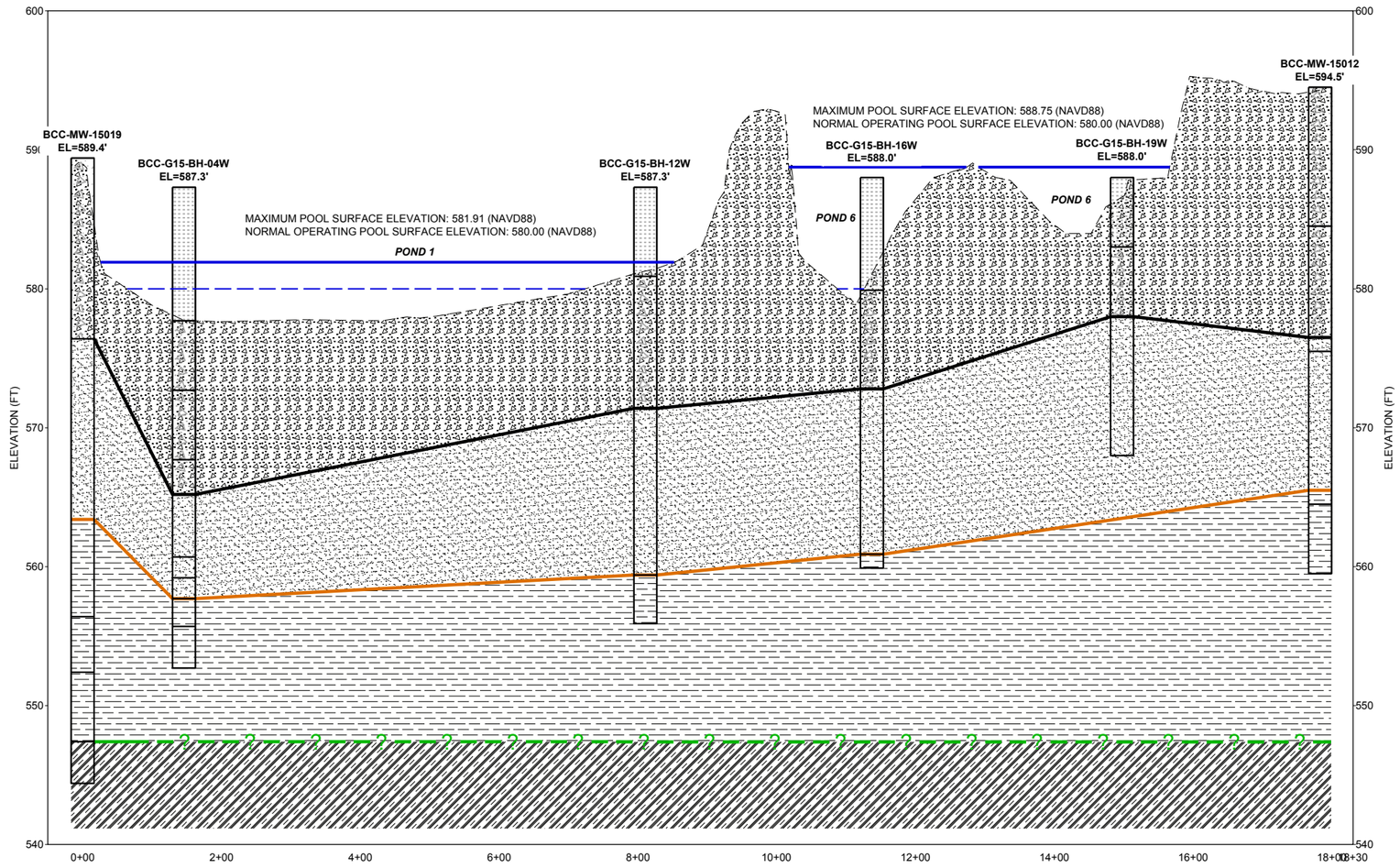

B-B'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- **BCC-G15-BH-04W** SOIL BORING ID
  EL=587.3' SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

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VERTICAL SCALE: 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE: 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION B-B'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D004	1	4

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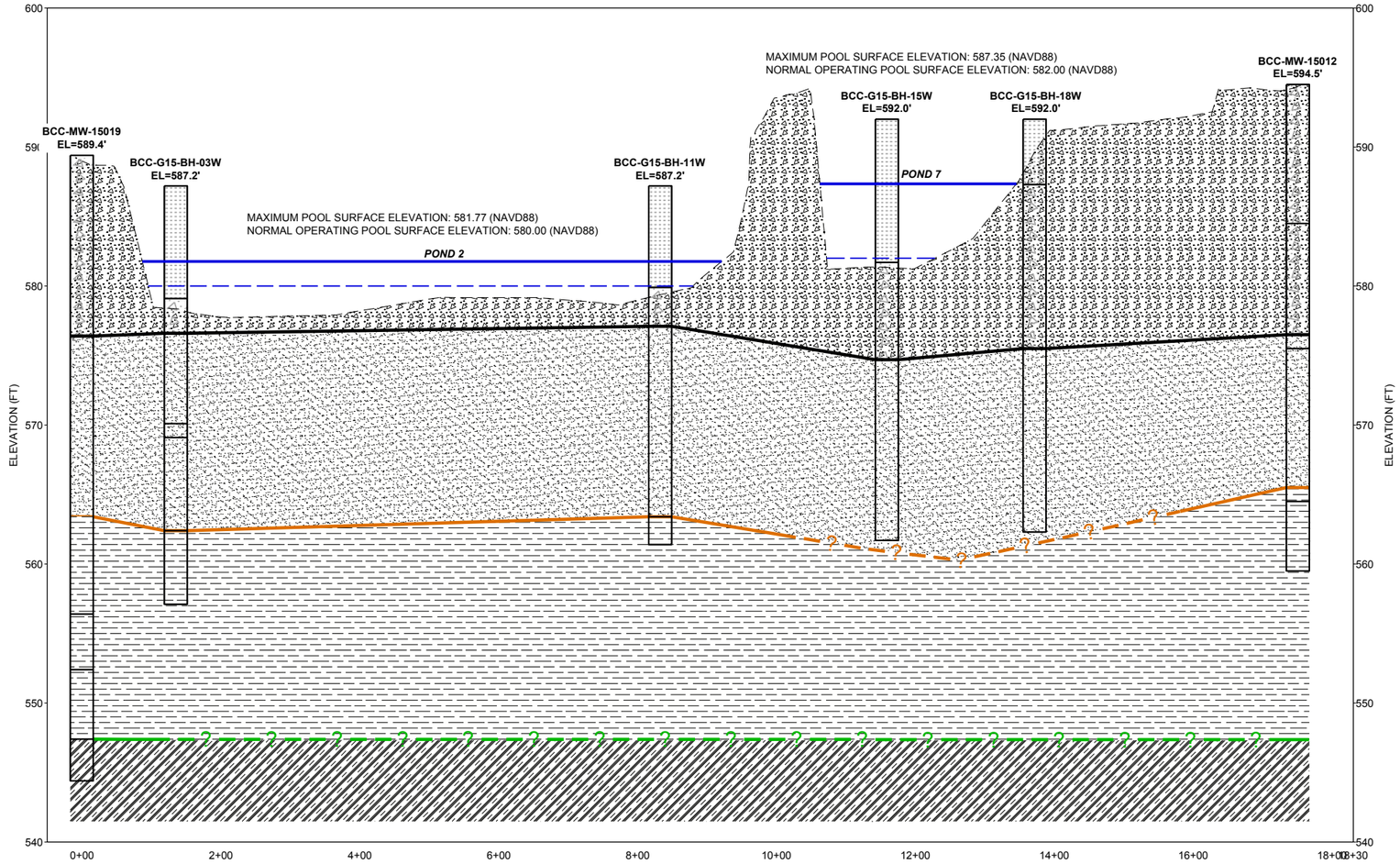

C-C'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- **BCC-G15-BH-03W** SOIL BORING ID
  EL=587.2' SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

1. GROUND, POND SURFACE, AND POND BOTTOM ELEVATIONS SURVEYED BY SUMMIT SURVEYING AND ENGINEERING, OCTOBER 2015.
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VERTICAL SCALE 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION C-C'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D005	1	5

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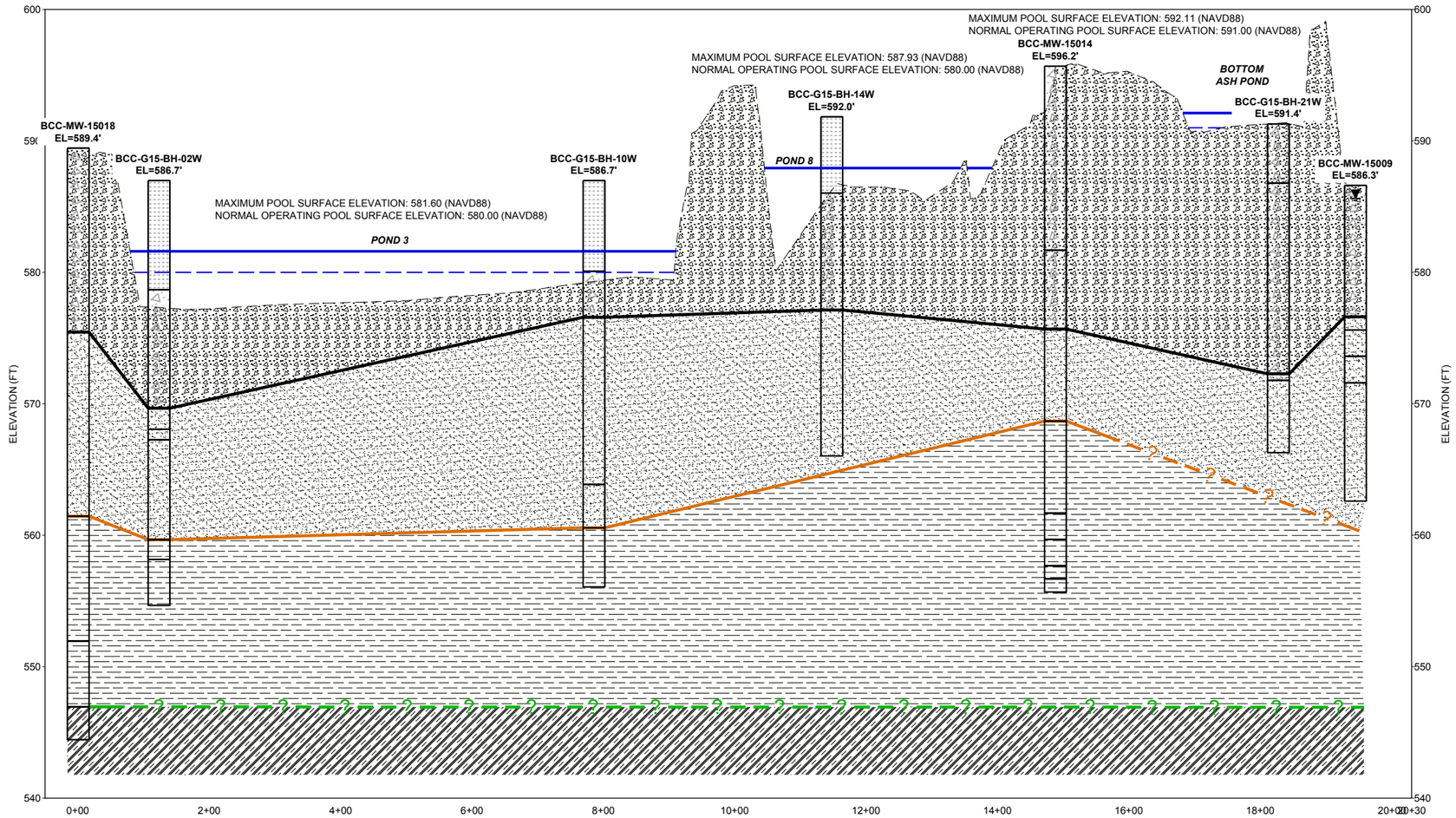


D-D'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- BCC-G15-BH-02W / EL=586.7' — SOIL BORING ID / SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

1. GROUND, POND SURFACE, AND POND BOTTOM ELEVATIONS SURVEYED BY SUMMIT SURVEYING AND ENGINEERING, OCTOBER 2015.
2. MONITOR WELL SURVEY DATA OBTAINED FROM WILLIAMS AND WORKS DRAWING NO. SG-22370, NOVEMBER 2015.
3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

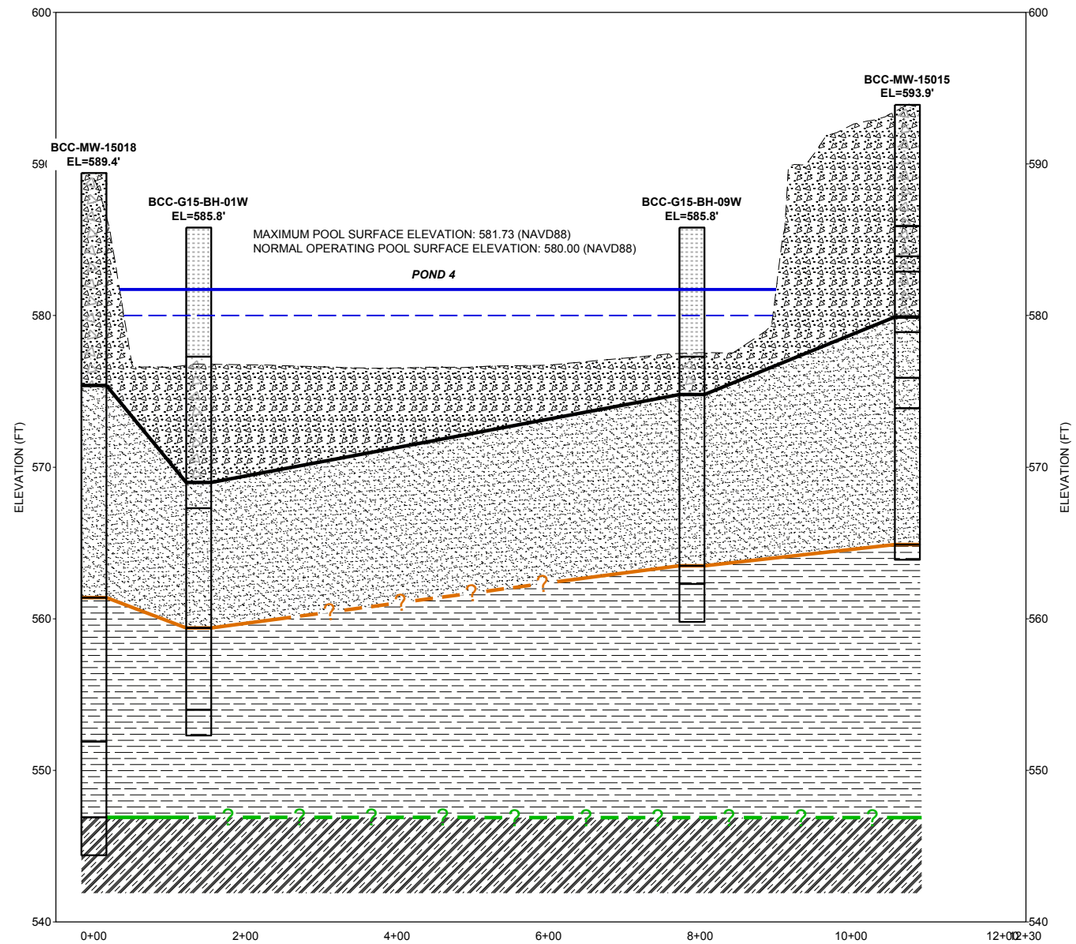
PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION D-D'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D006	1	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

Path: \\mtlaurel\cadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCT\CND - History of Construction\ | File Name: 1652598BD006.dwg



E-E'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- **BCC-G15-BH-01W** SOIL BORING ID
  EL=585.8' SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

1. GROUND, POND SURFACE, AND POND BOTTOM ELEVATIONS SURVEYED BY SUMMIT SURVEYING AND ENGINEERING, OCTOBER 2015.
2. MONITOR WELL SURVEY DATA OBTAINED FROM WILLIAMS AND WORKS DRAWING NO. SG-22370, NOVEMBER 2015.
3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

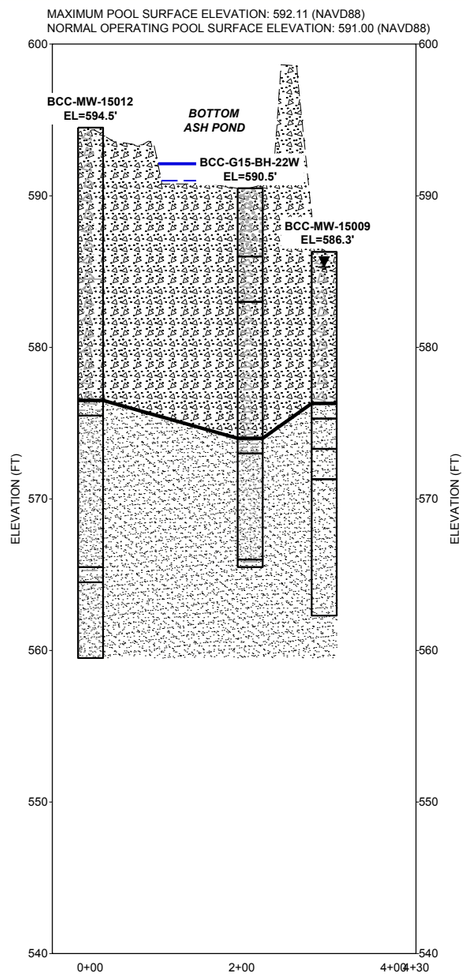
PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION E-E'

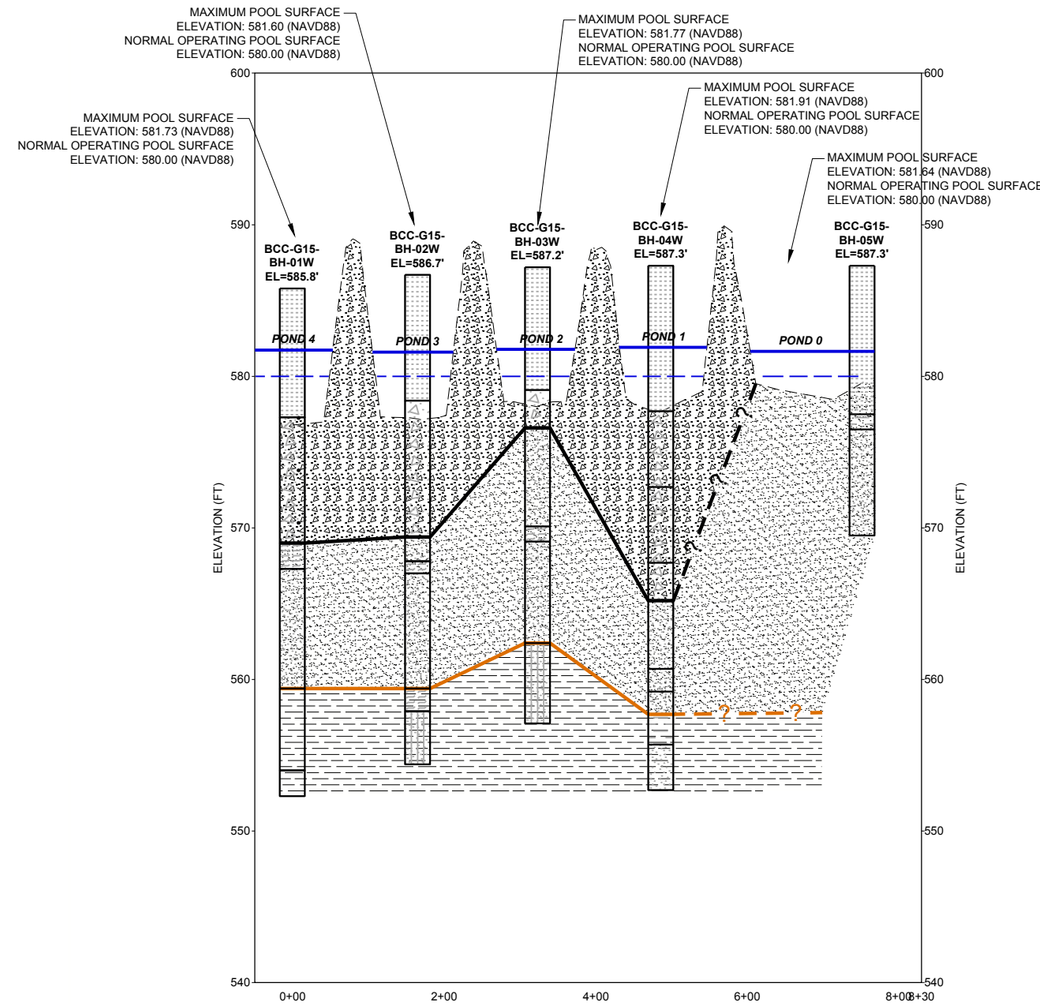
PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D007	1	7

Path: \\ntlauraefcadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\D - History of Construction\ | File Name: 1652598BD007.dwg

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



F-F'



G-G'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- **BCC-G15-BH-22W** SOIL BORING ID
  EL=590.5' SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- ? INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

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3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE: 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE: 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTIONS F-F' AND G-G'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D008	1	8

Path: \\mtlaurel\cadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\D - History of Construction\ | File Name: 1652598BD008.dwg
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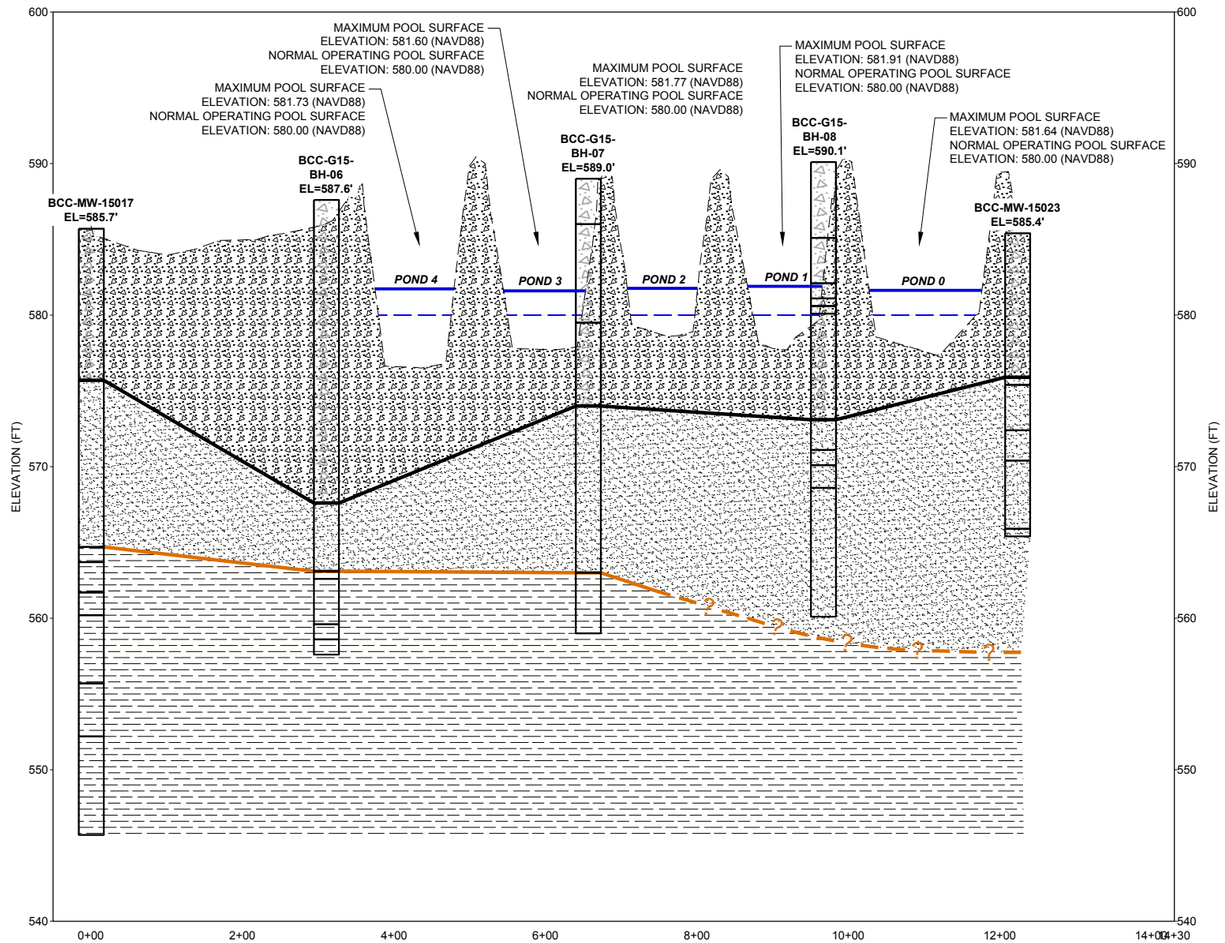
1in
0



H-H'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- BCC-G15-BH-06 / EL=587.6' — SOIL BORING ID / SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

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3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE: 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE: 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

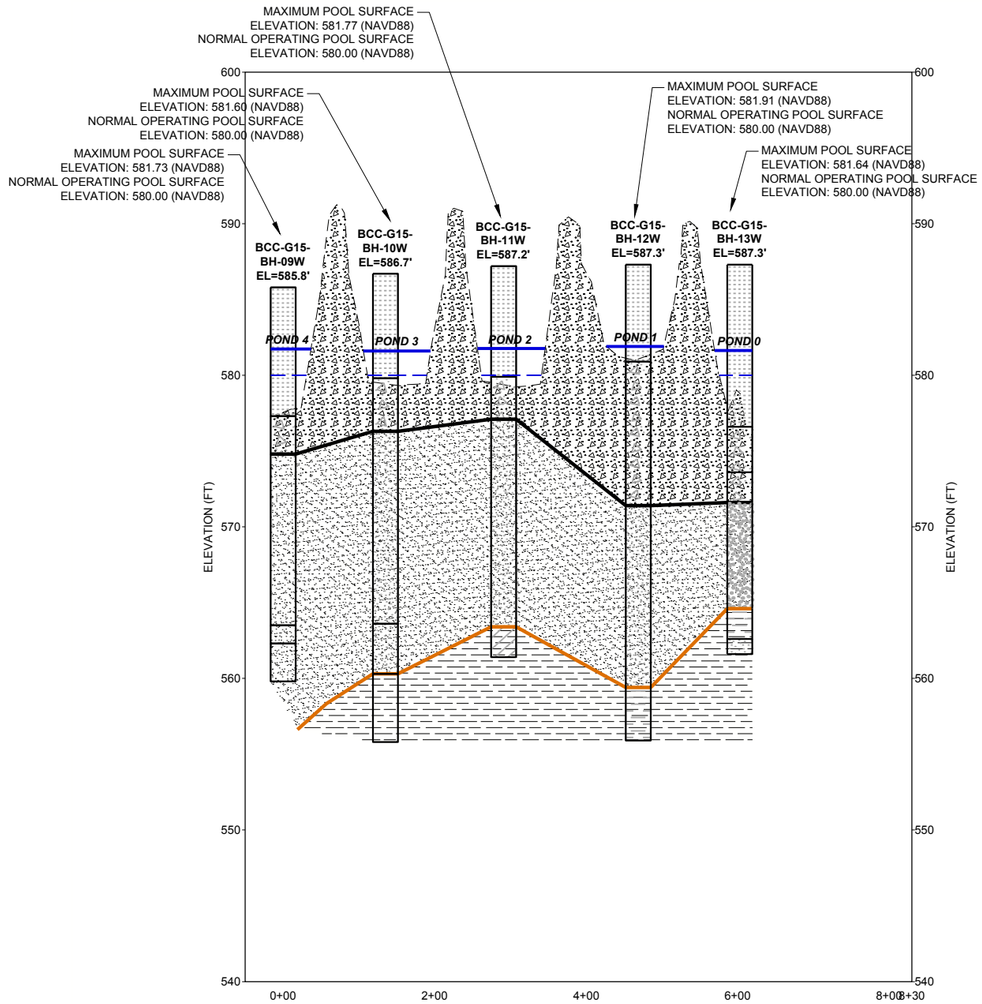
PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTION H-H'

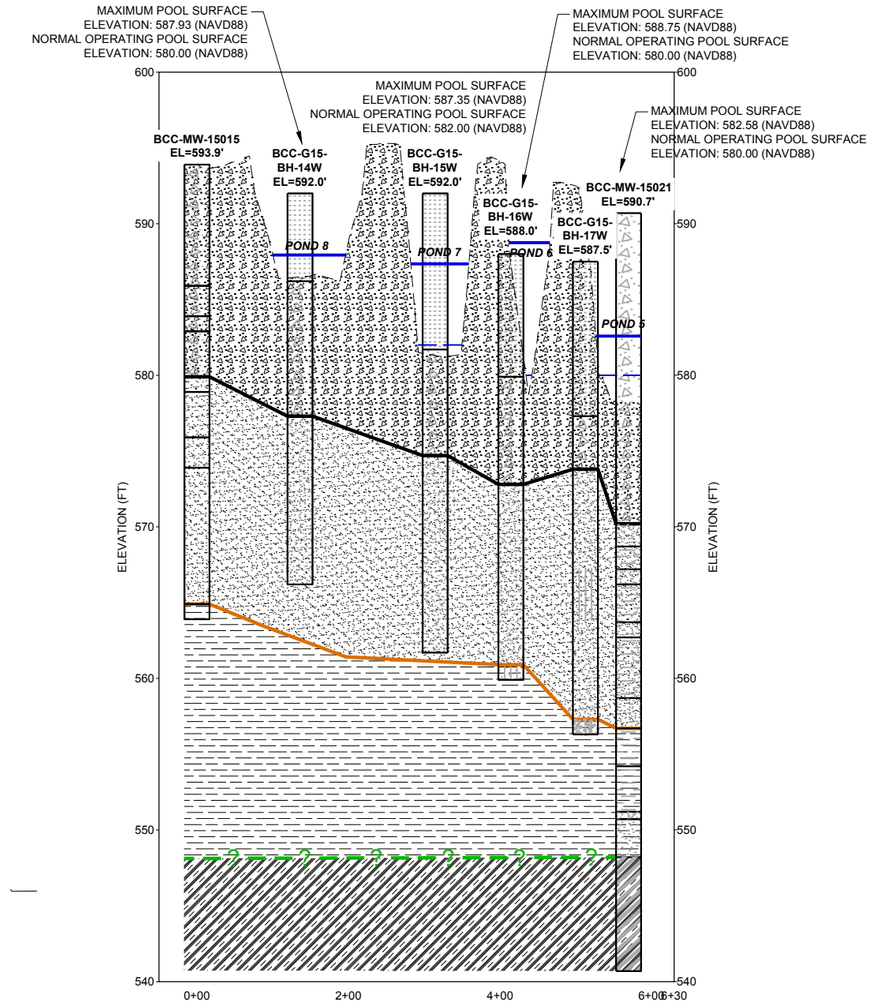
PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D009	1	9

Path: \\mtlaurel\cadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\D - History of Construction\ | File Name: 1652598BD009.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



I-I'



J-J'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- **BCC-G15-BH-10W** SOIL BORING ID
  EL=586.7' SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

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3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

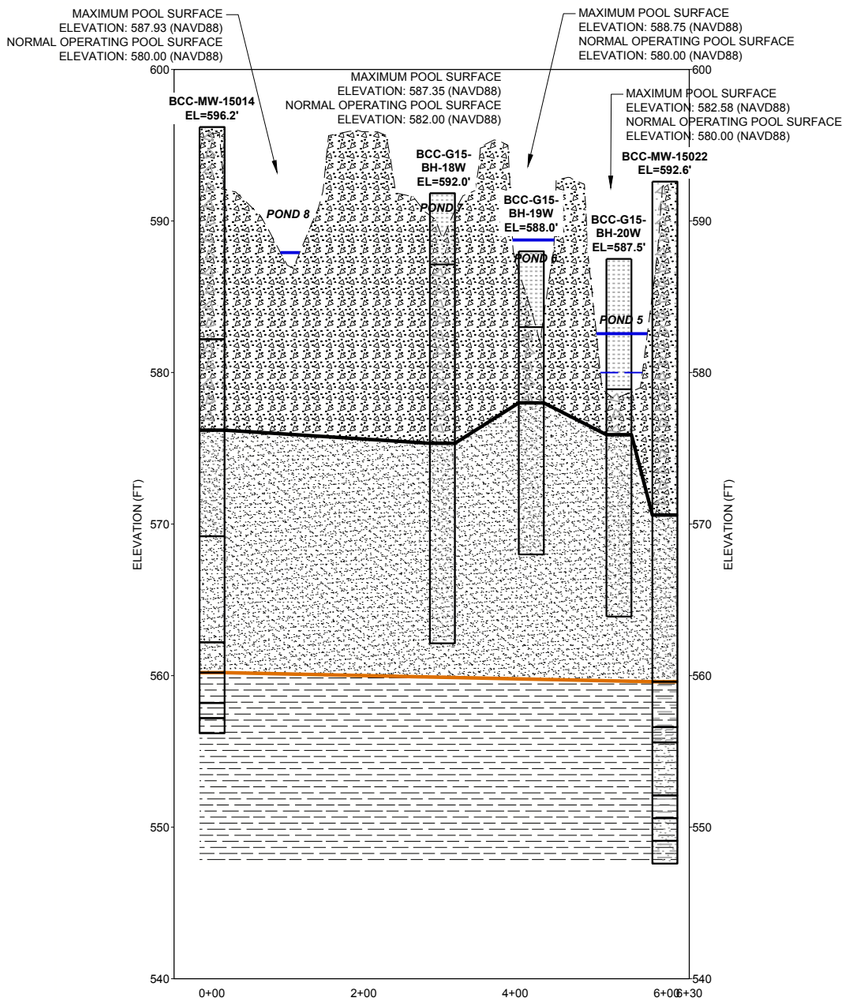
PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTIONS I-I' AND J-J'

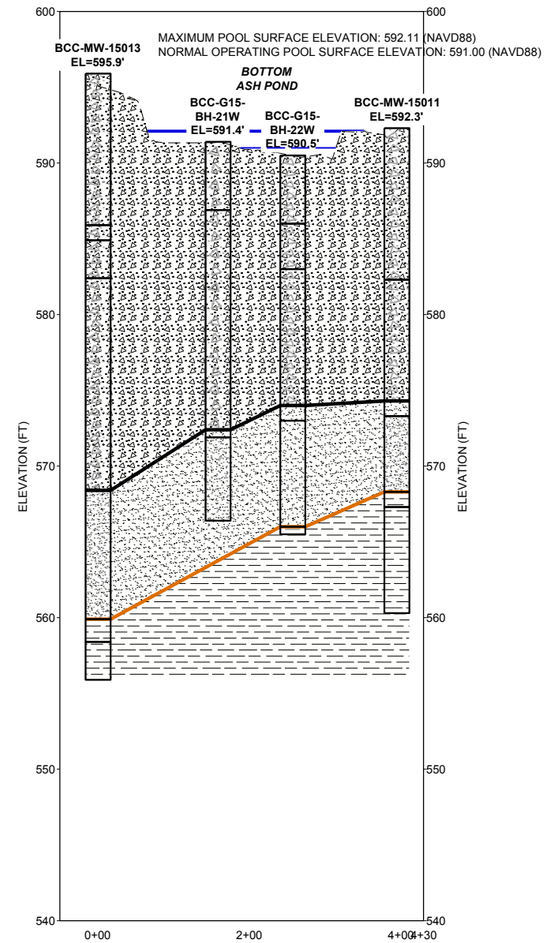
PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D010	1	10

Path: \\mlaurel\cadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\D - History of Construction\ | File Name: 1652598BD010.dwg

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



K-K'



L-L'

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- ORGANIC SILT OR CLAY
- LEAN CLAY
- SAND
- BCC-G15-BH-18W / EL=592.0' — SOIL BORING ID / SOIL BORING ELEVATION
- SOIL BORING
- EXISTING GROUND (APPROXIMATE)
- INTERPRETED MATERIAL BOUNDARY
- BASE OF CCR
- BASE OF SAND
- BASE OF INTERBEDDED SAND/SILT/CLAY
- MAXIMUM POOL SURFACE ELEVATION
- NORMAL OPERATING POOL SURFACE ELEVATION

NOTES

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3. GROUNDWATER ELEVATIONS AT MONITOR WELLS GAUGED BY ARCADIS INC. NOVEMBER 30, 2015.

VERTICAL SCALE: 0 5 10 — 1" = 10' FEET

HORIZONTAL SCALE: 0 100 200 — 1" = 200' FEET

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-28
DESIGNED	DF
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT GENERATING FACILITY
HISTORY OF CONSTRUCTION

TITLE
GEOLOGIC CROSS SECTIONS K-K' AND L-L'

PROJECT NO.	CONTROL	REV.	FIGURE
1652598B	D011	1	11

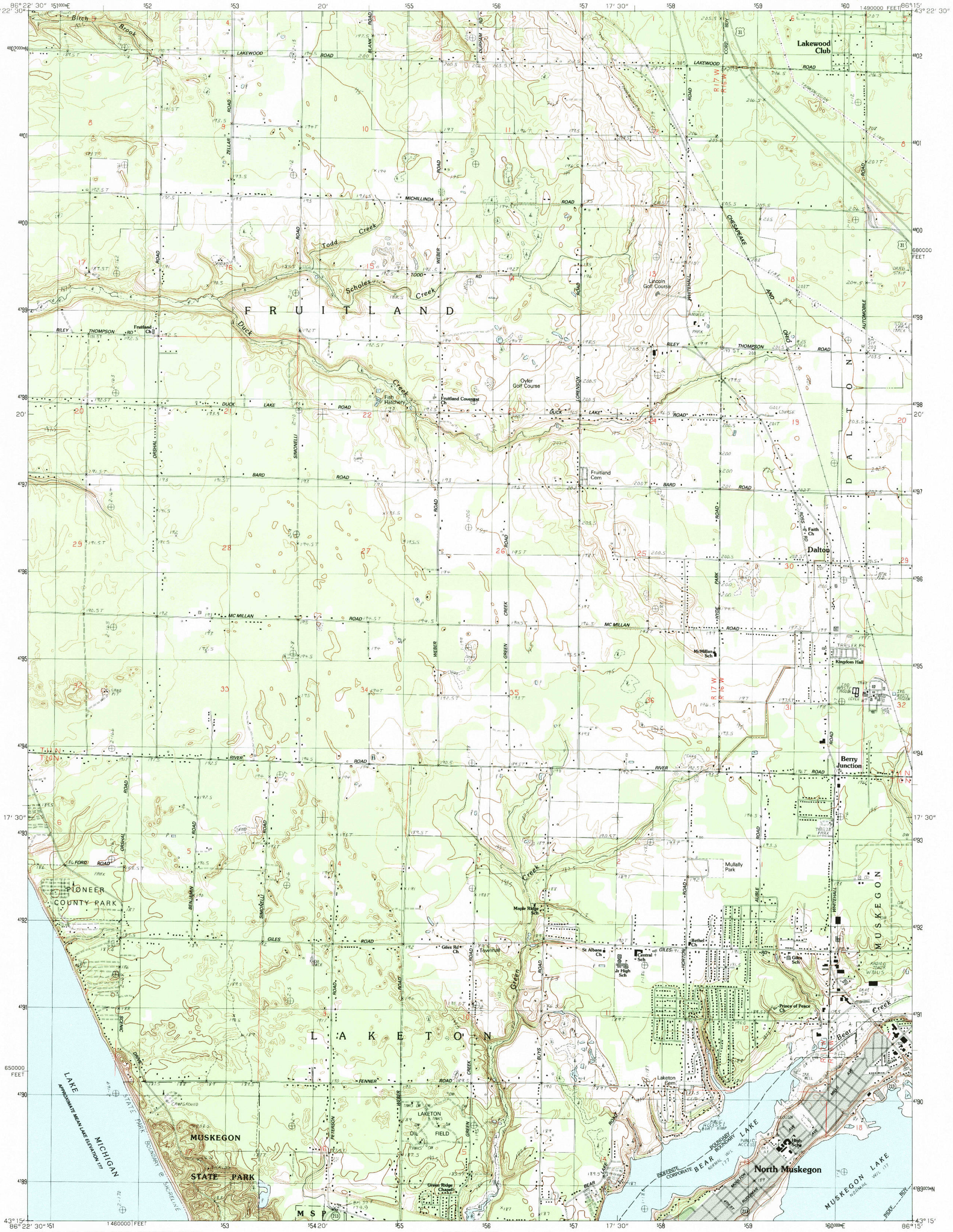
Path: \\mtlaurel\cadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\D - History of Construction\ | File Name: 1652598BD011.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

APPENDIX A
USGS TOPOGRAPHIC MAPS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DALTON QUADRANGLE
MICHIGAN–MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY ..... USGS AND NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1977
FIELD CHECKED ..... 1979. MAP EDITED 1983
PROJECTION ..... LAMBERT CONFORMAL CONIC
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR ..... ZONE 16
10,000-FOOT STATE GRID TICKS ..... MICHIGAN, SOUTH ZONE
UTM GRID DECLINATION ..... 0°28′ EAST
1983 MAGNETIC NORTH DECLINATION ..... 2°30′ WEST
VERTICAL DATUM ..... NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM ..... 1927 NORTH AMERICAN DATUM

To place on the predicted North American Datum of 1983 move the projection lines as shown by dashed corner ticks (2 meters north and 3 meters east)

There may be private inholdings within the boundaries of any Federal and State reservations shown on this map

Gray tint indicates area in which selected buildings are shown

PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of field check. 3

NORTH

SCALE 1:25 000

1 .5 0 KILOMETERS 1 2
1000 0 METERS 1000 2000
1 .5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000
FEET

CONTOUR INTERVAL 1.5 METERS

CONTROL ELEVATIONS SHOWN TO THE NEAREST 0.1 METER
OTHER ELEVATIONS SHOWN TO THE NEAREST 0.5 METER

To convert meters to feet multiply by 3.2808
To convert feet to meters multiply by .3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
AND THE GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF NATURAL RESOURCES, LANSING, MICHIGAN 48909

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Flower Creek
2 Montague
3 Big Blue Lake
4 Michillinda
5 Twin Lake
6
7 Muskegon West
8 Muskegon East

ADJOINING 7.5′ QUADRANGLE NAMES
CONTOURS AND ELEVATIONS IN METERS

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1983

ROAD LEGEND

Improved Road .....
Unimproved Road .....
Trail .....

Interstate Route U. S. Route State Route

DALTON, MICHIGAN
PROVISIONAL EDITION 1983
43086-C3-TM-025

MAY 4 1984

RETURN TO:
USGS NMD HISTORICAL MAP ARCHIVES

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MONTAGUE SE QUADRANGLE
MICHIGAN
7.5 MINUTE SERIES ORTHOPHOTOQUAD

Produced and published by the Geological Survey

Orthophotograph prepared from 1:80,000-scale aerial photograph taken May 8, 1976

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic) 1000-meter Universal Transverse Mercator grid, zone 16. 1927 North American datum

Photoimagery rectified by optical scanning which may produce double or mismatched images; use the mean of image positions for map point

MN GN
1½° 27 MILS
0°28′ 8 MILS
UTM GRID AND 1976 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092

MICHIGAN
QUADRANGLE LOCATION

PRINCIPAL NUMBERED HIGHWAYS
Interstate Route U. S. Route State Route

This quadrangle area also covered by SE/4 of Montague 1:62 500-scale topographic map

JUN 26 1979

MONTAGUE SE, MICH.
N4315—W8615/7.5
1976

USGS
Historical File
Topographic Division

1000

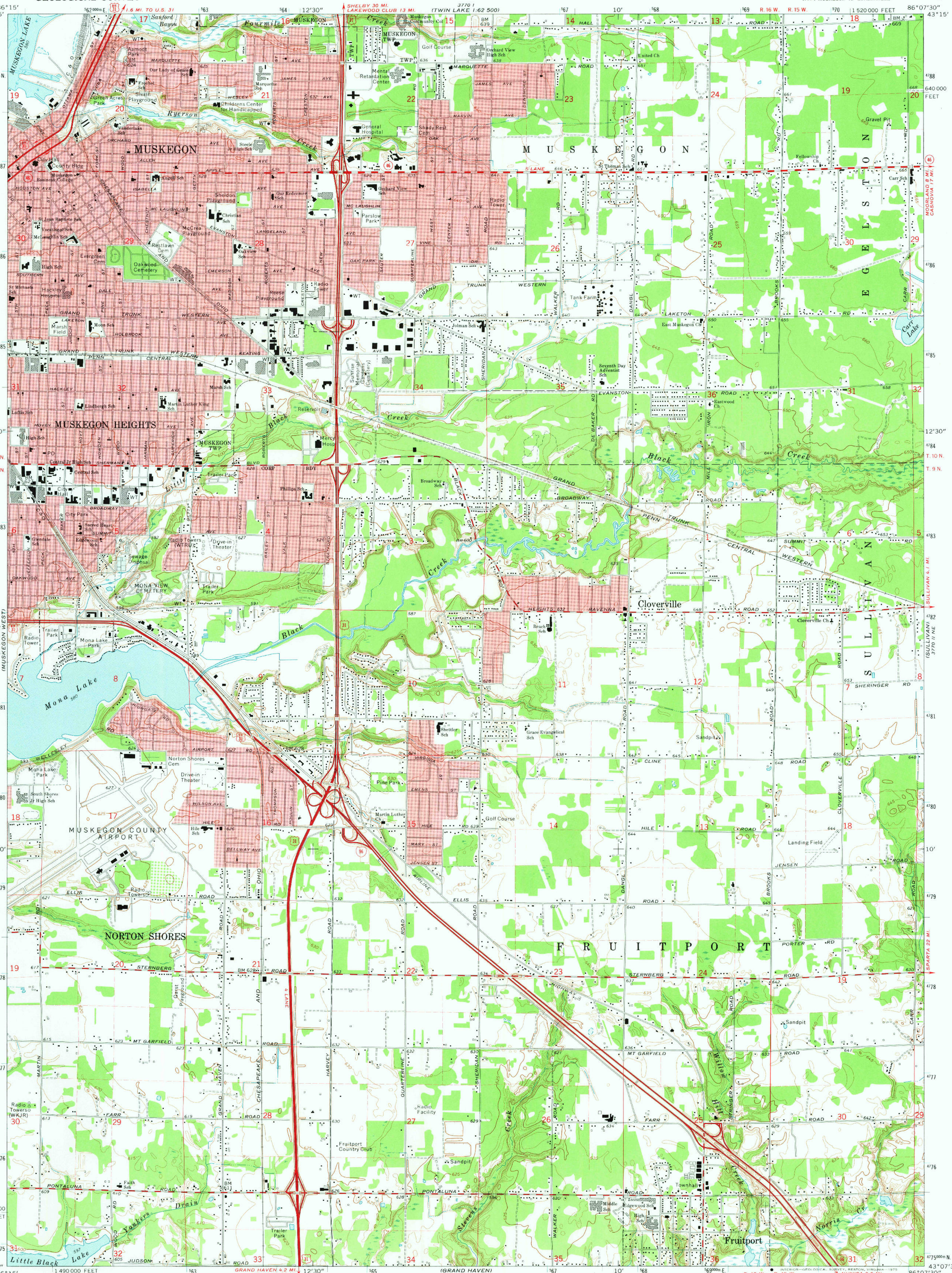
AMS 3770 IV SE—SERIES V062

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MICHIGAN

MUSKEGON EAST QUADRANGLE

MICHIGAN—MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 MUSKEGON 15' QUADRANGLE



Mapped, edited, and published by the Geological Survey in cooperation with State of Michigan agencies

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1972

Selected hydrographic data compiled from U. S. Lake Survey Chart 767 (1972). This information is not intended for navigational purposes

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue. 1927 North American datum

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs
This information is unchecked

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 576.8 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

MUSKEGON EAST, MICH.
NW/4 MUSKEGON 15' QUADRANGLE
N4307.5—W8607.5/7.5

1972

AMS 3770 II NW—SERIES V862

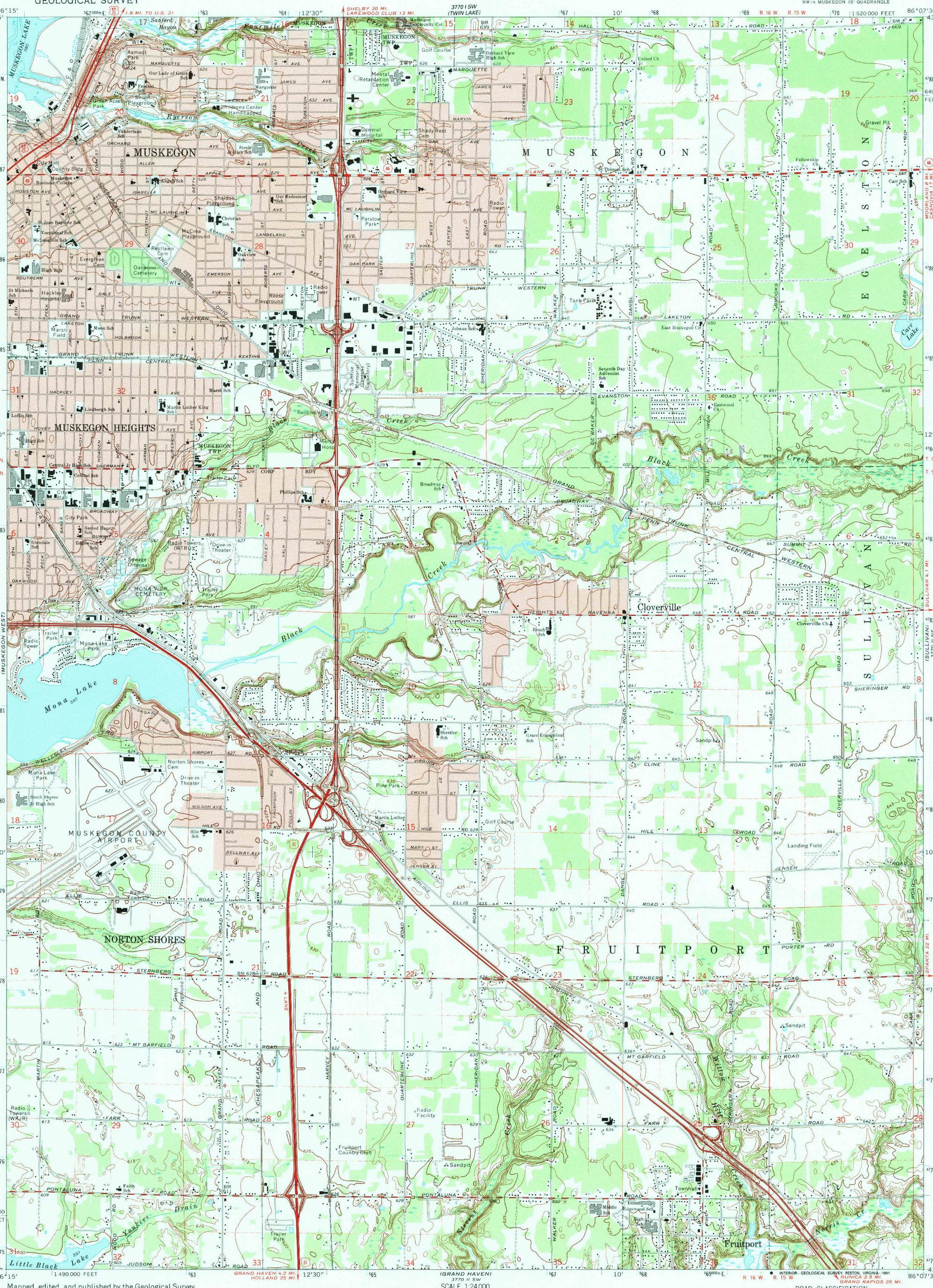
USGS
HISTORICAL FILE
TOPOGRAPHIC DIVISION

SEP 29 1975
3500

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MICHIGAN

MUSKEGON EAST QUADRANGLE
MICHIGAN—MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 MUSKEGON 15' QUADRANGLE



Mapped, edited, and published by the Geological Survey in cooperation with State of Michigan agencies

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1972

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1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue. 1927 North American datum

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs
This information is unchecked

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Map photoinspected 1980
No major culture or drainage changes observed

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 576.8 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5-minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1991

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

MUSKEGON EAST, MICH.
NW/4 MUSKEGON 15' QUADRANGLE
43086-B2-TF-024

1972
PHOTOINSPECTED 1980
DMA 3770 II NW—SERIES V862

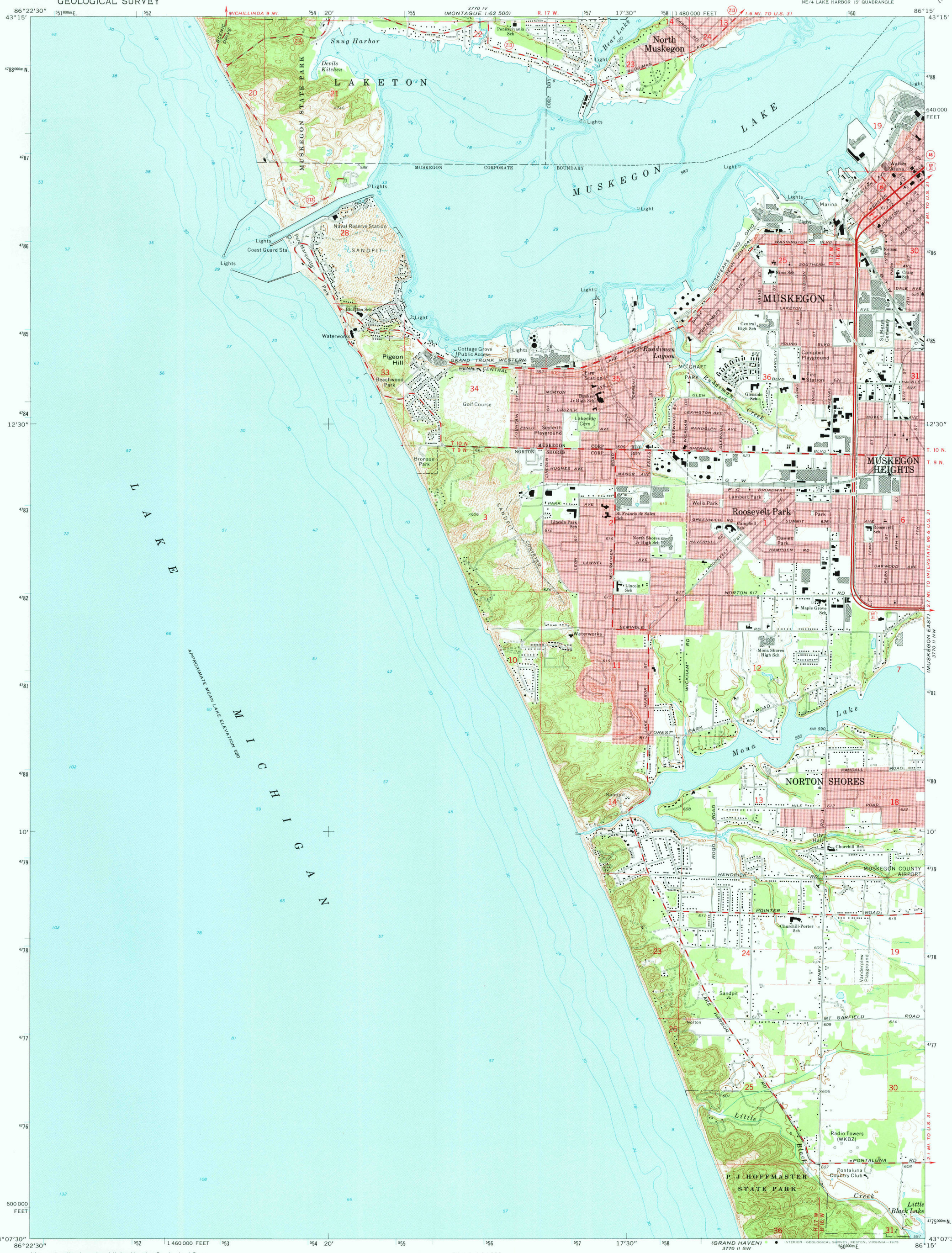
USGS NMD HISTORICAL MAP ARCHIVES
SEP 13 1991
REC'D FILE COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MICHIGAN

MUSKEGON WEST QUADRANGLE
MICHIGAN—MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 LAKE HARBOR 15' QUADRANGLE

3770 I (TWIN LAKE 1.62 500)



Mapped, edited, and published by the Geological Survey in cooperation with State of Michigan agencies

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1972

Selected hydrographic data compiled from U. S. Lake Survey Charts 76 (1973) and 767 (1972). This information is not intended for navigational purposes

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue. 1927 North American datum

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

MN GN
1° 18 MILS
0°28' 8 MILS
UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 576.8 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

MICHIGAN
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1975

MUSKEGON WEST, MICH.
NE/4 LAKE HARBOR 15' QUADRANGLE
N4307.5—W8615/7.5

1972

AMS 3770 III NE—SERIES V862

HISTORICAL FILE
TOPOGRAPHIC DIVISION

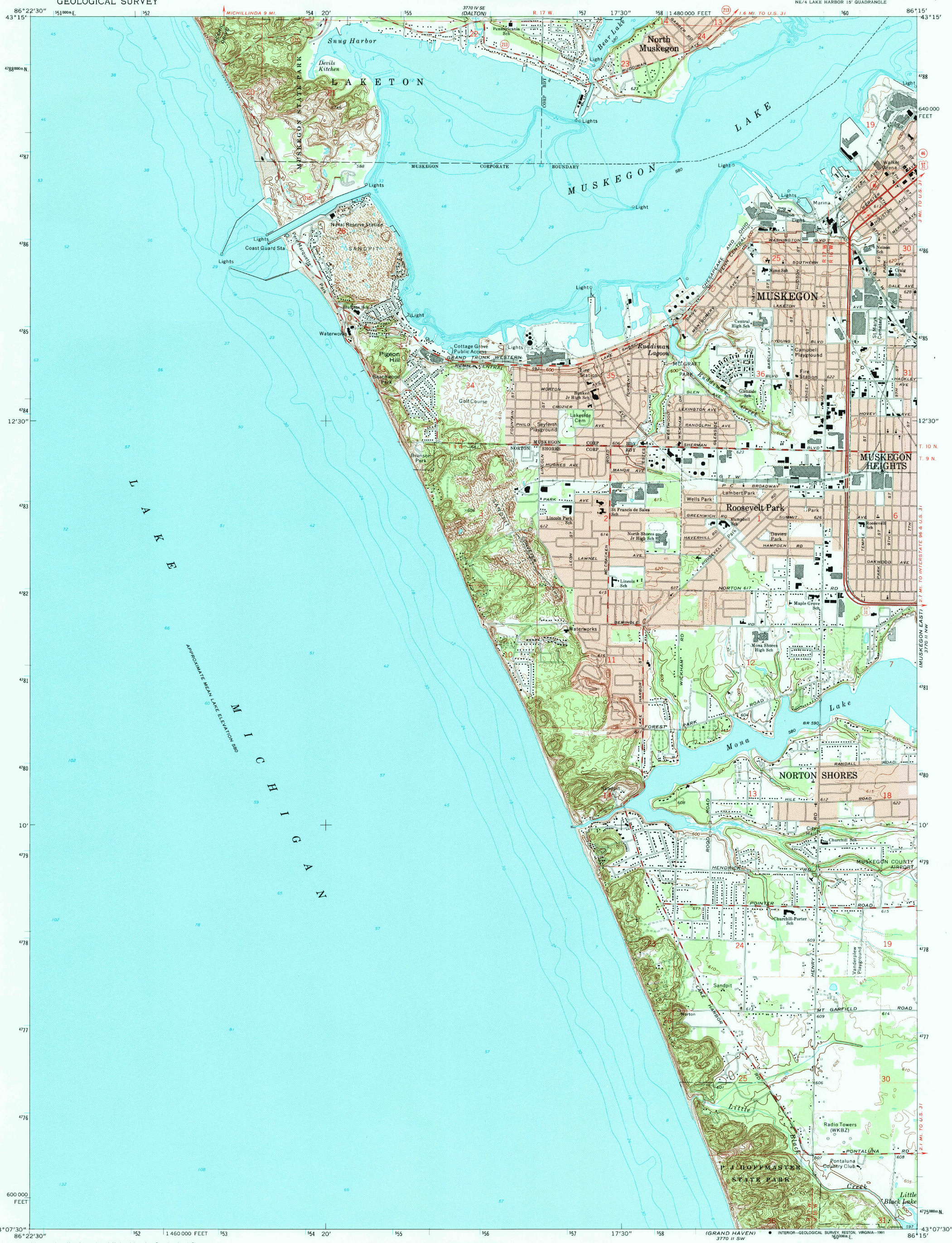
3,500

SEP 29 1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MICHIGAN

MUSKEGON WEST QUADRANGLE
MICHIGAN—MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 LAKE HARBOR 15' QUADRANGLE



Mapped, edited, and published by the Geological Survey in cooperation with State of Michigan agencies

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1972

Selected hydrographic data compiled from U. S. Lake Survey Charts 76 (1973) and 767 (1972). This information is not intended for navigational purposes

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue. 1927 North American datum

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Map photoinspected 1980
No major culture or drainage changes observed

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 576.8 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5-minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

MUSKEGON WEST, MICH.
NE/4 LAKE HARBOR 15' QUADRANGLE
43086-B3-TF-024

1972
PHOTOINSPECTED 1980
DMA 3770 III NE—SERIES V862

MAPS AND HISTORICAL MAP ARCHIVES
AUG 26 1991
REC'D FILE COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TWIN LAKE SW QUADRANGLE
MICHIGAN
7.5 MINUTE SERIES ORTHOPHOTOQUAD

Produced and published by the Geological Survey

Orthophotograph prepared from 1:80,000-scale aerial photograph taken May 8, 1976

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic) 1000-meter Universal Transverse Mercator grid, zone 16. 1927 North American datum

Photoimagery rectified by optical scanning which may produce double or mismatched images; use the mean of image positions for map point

MN GN
1½° 27 MILS
0°33′ 10 MILS
UTM GRID AND 1976 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092

MICHIGAN
QUADRANGLE LOCATION

PRINCIPAL NUMBERED HIGHWAYS
Interstate Route U. S. Route State Route

This quadrangle area also covered by SW/4 of Twin Lake 1:62 500-scale topographic map

JUN 26 1979

USGS
Historical File
Topographic Division

TWIN LAKE SW, MICH.
N4315—W8607.5/7.5
1976

1000

AMS 3770 I SW—SERIES V062

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1979

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TWIN LAKE QUADRANGLE
MICHIGAN-MUSKEGON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

CONVERSION GRAPH
(1 meter = 3.28 feet)
Meters Feet

Meters	Feet
1	3.2808
2	6.5617
3	9.8425
4	13.1234
5	16.4042
6	19.6850
7	22.9659
8	26.2467
9	29.5276
10	32.8084

EXAMPLE: Convert 479 meters to feet

479 = 400 + 70 + 9

400m = 1312.3ft
70m = 229.7ft
+ 9m = + 29.5ft
479m = 1571.5ft

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1985

PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY ..... USGS AND NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1980-81
FIELD CHECKED ..... 1981. MAP EDITED 1985
PROJECTION ..... UNIVERSAL TRANSVERSE MERCATOR
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR ..... ZONE 16
10,000-FOOT STATE GRID TICKS ..... MICHIGAN, SOUTH ZONE
UTM GRID DECLINATION ..... 0°33' EAST
1984 MAGNETIC NORTH DECLINATION ..... 2°30' WEST
VERTICAL DATUM ..... NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM ..... 1927 NORTH AMERICAN DATUM

To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks (2 meters north and 2 meters east)

There may be private inholdings within the boundaries of any Federal and State reservations shown on this map

NORTH

PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of field check. 2

SCALE 1:24 000

KILOMETERS 1 .5 0 1 2
METERS 1000 0 1000 2000
MILES 1 .5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 3 METERS
SUPPLEMENTARY CONTOUR INTERVAL 1.5 METERS
CONTROL AND FIELD ESTABLISHED ELEVATIONS SHOWN TO THE NEAREST 0.1 METER
OTHER ELEVATIONS SHOWN TO THE NEAREST 0.5 METER
To convert meters to feet multiply by 3.2808
To convert feet to meters multiply by .3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
AND GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF NATURAL RESOURCES, LANSING, MICHIGAN 48909

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Montague
2 Big Blue Lake
3 Holton
4 Dalton
5 Wolf Lake
6 Muskegon West
7 Muskegon East
8 Sullivan

ADJOINING 7.5' QUADRANGLE NAMES

CONTOURS AND ELEVATIONS IN METERS

ROAD LEGEND

Improved Road
Unimproved Road
Trail

Interstate Route U.S. Route State Route

TWIN LAKE, MICHIGAN
PROVISIONAL EDITION 1985

43086-C2-TM-024

USGS NMD RESEARCH
DEC 18 1985
REFERENCE COLLECTION

RETURN TO:
NMD HISTORICAL MAP ARCHIVES
USGS NATIONAL CENTER, MS-522
RESTON, VA 22092

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TWIN LAKE QUADRANGLE
MICHIGAN
15 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1955. Field check 1958

Hydrography compiled from U. S. Lake Survey chart 767 (1957)

Polyconic projection. 1927 North American Datum
10,000-foot grid based on Michigan coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks,
zone 16, shown in blue
To place on the predicted North American Datum 1983
move the projection lines 2 meters north and 2 meters east

There may be private inholdings within the boundaries of
the National or State reservations shown on this map

UTM GRID AND 1958 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS 578 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
AND BY THE GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF NATURAL RESOURCES, LANSING, MICHIGAN 48909
A FOLDER DESCRIBING TOPOGRAPHIC MAPS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
U. S. Route — State Route

MICHIGAN
QUADRANGLE LOCATION

TWIN LAKE, MICH.
N4315—W8600/15
1958
AMS 3770 I—SERIES V762

APR 23 1982

3200

SCALE 1:100 000

CONTOUR INTERVAL 5 METERS

1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND

KILOMETERS 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

MILES 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13

1000 0 5000 10 000 15 000 20 000 METERS

5000 0 10 000 20 000 30 000 40 000 50 000 60 000 70 000 FEET

MUSKEGON, MICHIGAN
43086-A1-TM-100

1982

43086-A1-TM-100

Muskegon
MICHIGAN

1:100 000-scale *metric* topographic map

30 X 60 MINUTE QUADRANGLE SHOWING

- Contours and elevations in meters
- Highways, roads and other manmade structures
- Water features
- Woodland areas
- Geographic names

GEOLOGICAL SURVEY

1982

Produced by the United States Geological Survey in cooperation with the Soil Conservation Service

Compiled from USGS 1:24 000 and 1:62 500-scale topographic maps dated 1958-1972. Planimetry revised from aerial photographs taken 1981 and other source data. Revised information not field checked. Map edited 1982

Projection and 10 000-meter grid, zone 16, Universal Transverse Mercator
25 000-foot grid ticks based on Michigan coordinate system, south zone
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 3 meters east

There may be private inholdings within the boundaries of the National or State reservations shown on this map

CONTOUR INTERVAL 5 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ELEVATIONS SHOWN TO THE NEAREST METER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

CONVERSION TABLE

Meters	Feet
1	3.2808
2	6.5617
3	9.8425
4	13.1234
5	16.4042
6	19.6850
7	22.9659
8	26.2467
9	29.5276
10	32.8084

To convert meters to feet multiply by 3.2808

To convert feet to meters multiply by 0.3048

DECLINATION DIAGRAM

MN 1 GN 2 36 MILS 21' 6 MILS

UTM grid convergence (GN) and 1982 magnetic declination (MN) at center of map. Diagram is approximate

ADJOINING MAPS

1	2	3
4	5	
6	7	8

1 Big Rapids
2 Milwaukee
3
4
5
6 Racine
7 Holland
8 Grand Rapids

FOR SALE BY U. S. GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

Topographic Map Symbols

Primary highway, hard surface
Secondary highway, hard surface
Light duty road, principal street, hard or improved surface
Other road or street; trail
Route marker: Interstate; U.S.; State
Railroad: standard gage; narrow gage
Bridge: overpass; underpass
Tunnel: road; railroad
Built up area; locality; elevation
Airport: landing field; landing strip
National boundary
State boundary
County boundary
National or State conservation boundary
Land grant boundary
U.S. public lands survey: range; township; section
Range; township; section line: protracted
Power transmission line; pipeline
Dam; dam with lock
Cemetery; building
Windmill; water well; spring
Mine shaft; adit or cave; mine, quarry; gravel pit
Campground; picnic area; U.S. location monument
Ruins; cliff dwelling
Distorted surface; strip mine; lava; sand
Contours: index; intermediate; supplementary
Bathymetric contours: index; intermediate
Stream, lake: perennial; intermittent
Rapids, large and small; falls, large and small
Area to be submerged; marsh, swamp
Land subject to controlled inundation; woodland
Scrub; mangrove
Orchard; vineyard

A pamphlet describing topographic maps is available on request

APPENDIX B
HISTORICAL AERIAL PHOTOGRAPHS

7-24-38
BEI-3R-75

KODAK AEROCHROME
VV HU M 28 AMS 11JUNE53 108
3105

APR 22 1955 22 50 GS-VBF

2V 1370PMW 75JUL47A
25JUL68 151.725MM 7,5000AMT AF 68-30A R-2
229

APPENDIX C
PERMITS ISSUED

Cobb. Transferred to Plant 1 8-26-46

Permittee

MICROFILMED 1963

WAR DEPARTMENT

See attached Revisions

NOTE.—It is to be understood that this instrument does not give any property rights either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to private property or invasion of private rights, or any infringement of Federal, State, or local laws or regulations, nor does it obviate the necessity of obtaining *State assent* to the work authorized. IT MERELY EXPRESSES THE ASSENT OF THE FEDERAL GOVERNMENT SO FAR AS CONCERNS THE PUBLIC RIGHTS OF NAVIGATION. (See *Cummings* v. *Chicago*, 188 U. S., 410.) 16—13168-1

GLDGW 800.6 (Muskegon Lake, Muskegon, Mich.- Consumers Power Co.)

PERMIT

OFFICE OF DIVISION ENGINEER
GREAT LAKES DIVISION
United States Engineer Office.
Chicago 6, ~~Illinois~~
26 August, 1946.

Muskegon City (Muskegon Co.)

Consumers Power Company
Jackson, Michigan

Dear Sirs:

Referring to written request dated 18 June 1946 addressed to the District Engineer, U. S. Engineer Office, Milwaukee, Wisconsin,

I have to inform you that, upon the recommendation of the Chief of Engineers, and under the provisions of Section 10 of the Act of Congress approved March 3, 1899, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," you are hereby authorized by the Secretary of War,

to construct a steel sheet pile wharf and earth dikes; to dredge at mouth of main
(Here describe the proposed structure or work.)
or north channel of Muskegon River; to fill areas inclosed by dikes, diverting the south channel of the river into the main channel; and to drive four (4) pile clusters

in Muskegon Lake
(Here to be named the river, harbor, or waterway concerned.)

at the mouth of Muskegon River at the north city limits of Muskegon, Michigan.
(Here to be named the nearest well-known locality—preferably a town or city—and the distance in miles and tenths from some definite point in the same, stating whether above or below or giving direction by points of compass.)

Issd Permit in 2 sheets

in accordance with the plans shown on the drawing attached hereto marked: Proposed
(Or drawings; give file number or other definite identification marks.)
Wharf and Dredging at Mouth of Muskegon River, Muskegon, Michigan (about 500,000 cubic yards to be excavated. Material to be deposited behind wharf to raise site to El.586'-0", proposed dikes to be built to El.586'-0" to provide ash storage.)
Application by Consumers Power Company, Jackson, Michigan. June 18, 1946 (in 2 sheets)
File No: 46-G-56.

subject to the following conditions:

Incl 1

(*a*) That the work shall be subject to the supervision and approval of the District Engineer, Engineer Department at Large, in charge of the locality, who may temporarily suspend the work at any time, if in his judgment, the interests of navigation so require.

(*b*) That any material dredged in the prosecution of the work herein authorized shall be removed evenly, and no large refuse piles, ridges across the bed of the waterway, or deep holes that may have a tendency to cause injury to navigable channels or to the banks of the waterway shall be left. If any pipe, wire, or cable hereby authorized is laid in a trench, the formation of permanent ridges across the bed of the waterway shall be avoided and the back filling shall be so done as not to increase the cost of future dredging for navigation. Any material to be deposited or dumped under this authorization, either in the waterway or on shore above high-water mark, shall be deposited or dumped at the locality shown on the drawing hereto attached, and, if so prescribed thereon, within or behind a good and substantial bulkhead or bulkheads, such as will prevent escape of the material into the waterway. If the material is to be deposited in the harbor of New York, or in its adjacent or tributary waters, or in Long Island Sound, a permit therefor must be previously obtained from the Supervisor of New York Harbor, Army Building, New York City.

(*c*) That there shall be no unreasonable interference with navigation by the work herein authorized.

(*d*) That if inspections or any other operations by the United States are necessary in the interests of navigation, all expenses connected therewith shall be borne by the permittee.

(*e*) That no attempt shall be made by the permittee or the owner to forbid the full and free use by the public of all navigable waters at or adjacent to the work or structure.

(*f*) That if future operations by the United States require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Secretary of War, it shall cause unreasonable obstruction to the free navigation of said water, the owner will be required, upon due notice from the Secretary of War, to remove or alter the structural work or obstructions caused thereby without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed; and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners shall, without expense to the United States, and to such extent and in such time and manner as the Secretary of War may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable capacity of the watercourse. No claim shall be made against the United States on account of any such removal or alteration.

(*g*) That the United States shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

(*h*) That if the display of lights and signals on any work hereby authorized is not otherwise provided for by law, such lights and signals as may be prescribed by the U. S. Coast Guard, shall be installed and maintained by and at the expense of the owner.

✓ (*i*) That the permittee shall notify the said district engineer at what time the work will be commenced, and as far in advance of the time of commencement as the said district engineer may specify, and shall also notify him promptly, in writing, of the commencement of work, suspension of work, if for a period of more than one week, resumption of work, and its completion.

✓ (*j*) That if the structure or work herein authorized is not completed on or before thirty-first day of December, 1956, this permit, if not previously revoked or specifically extended, shall cease and be null and void.

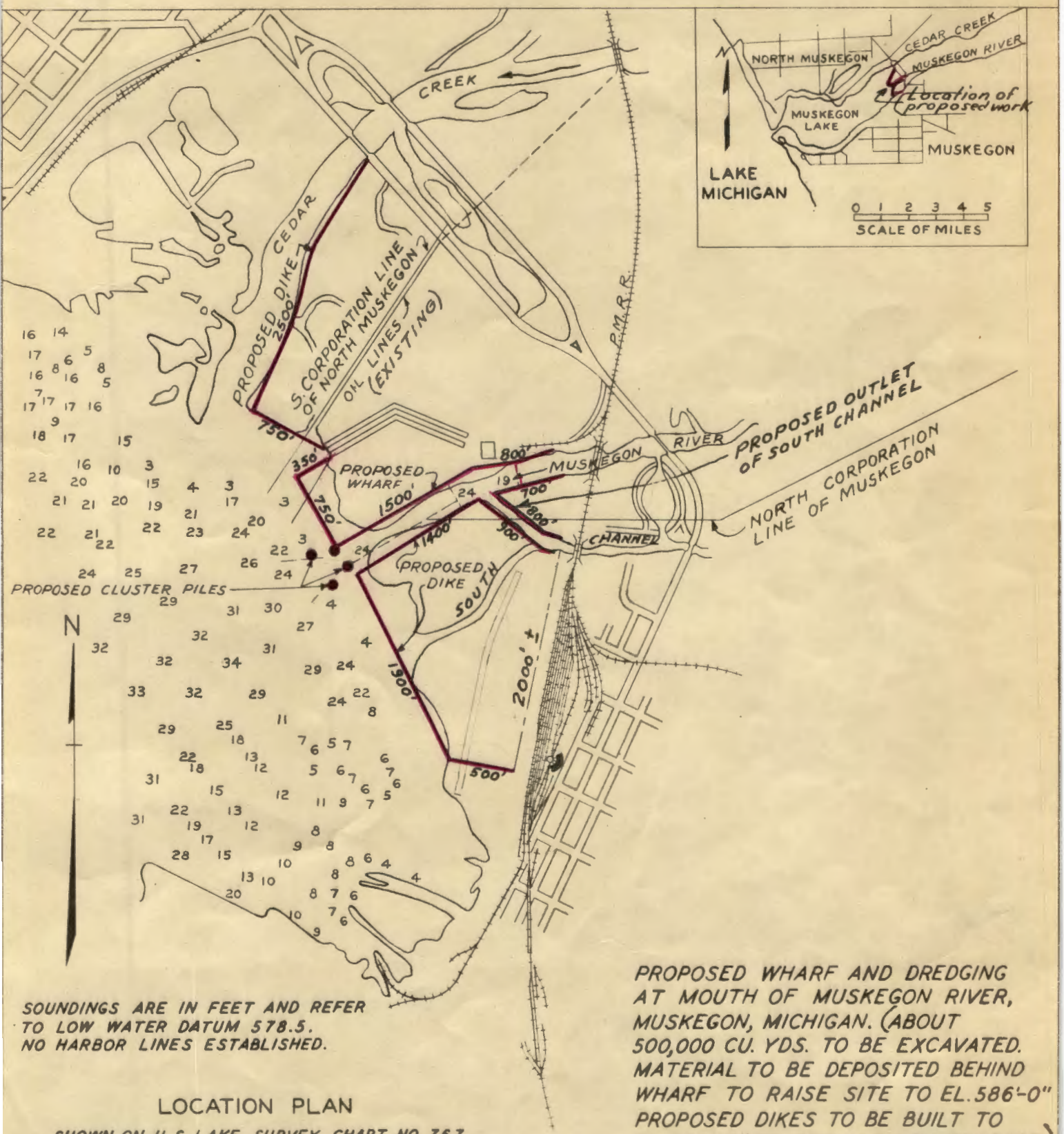
By authority of the Secretary of War:

D. O. Elliott

D. O. ELLIOTT
Colonel, Corps of Engineers
Division Engineer

WAR DEPARTMENT
O. C. OF E.
Form No. 96
Revised Jan. 17, 1940

U. S. GOVERNMENT PRINTING OFFICE 16—13168-1



SOUNDINGS ARE IN FEET AND REFER TO LOW WATER DATUM 578.5.
NO HARBOR LINES ESTABLISHED.

LOCATION PLAN

SHOWN ON U.S. LAKE SURVEY CHART NO. 767

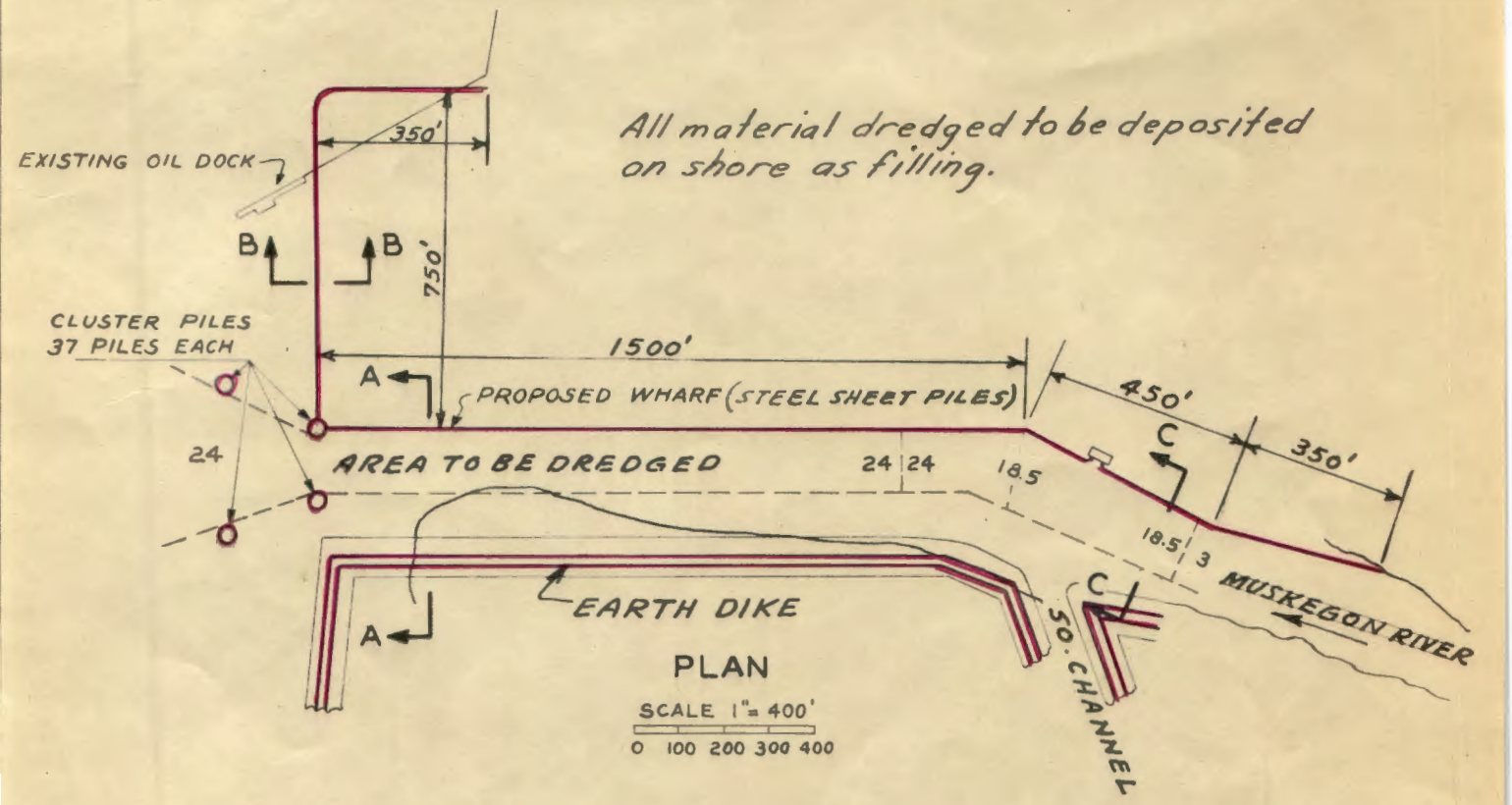
SCALE OF FEET

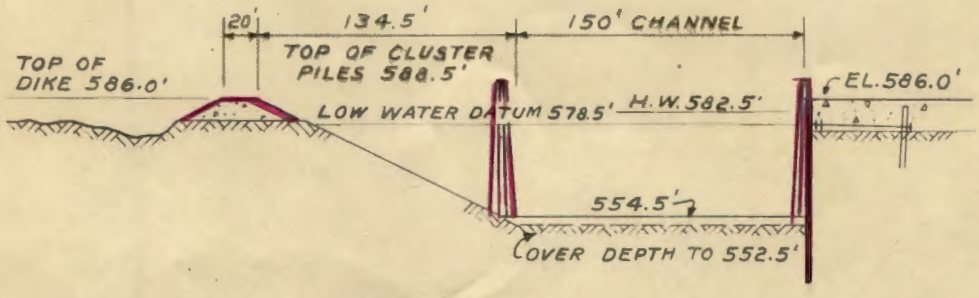
0 1000 2000 3000

PROPOSED WHARF AND DREDGING AT MOUTH OF MUSKEGON RIVER, MUSKEGON, MICHIGAN. (ABOUT 500,000 CU. YDS. TO BE EXCAVATED. MATERIAL TO BE DEPOSITED BEHIND WHARF TO RAISE SITE TO EL. 586'-0" PROPOSED DIKES TO BE BUILT TO EL. 586'-0" TO PROVIDE ASH STORAGE.)

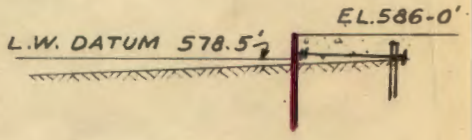
APPLICATION BY CONSUMERS POWER COMPANY
JACKSON, MICHIGAN JUNE 18, 1946

IN 2 SHEETS FILE. 46-G-56 SHEET 1



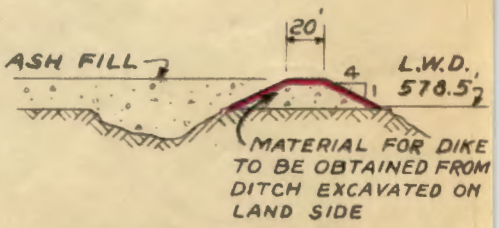


SECTION A-A



SECTION B-B

SECTION C-C



TYPICAL DIKE SECTION

0 100 200 FT.
HORIZONTAL SCALE FOR SECTIONS

0 50 100 FT.
VERTICAL SCALE FOR SECTIONS

APPLICATION BY CONSUMERS POWER COMPANY
JACKSON, MICHIGAN JUNE 18, 1946
IN 2 SHEETS FILE. 46-G-56 SHEET 2

File # 1467

ADDRESS REPLY TO:

DISTRICT ENGINEER
MILWAUKEE DISTRICT
CORPS OF ENGINEERS
P. O. BOX 744
MILWAUKEE 1, WISCONSIN

WAR DEPARTMENT
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
MILWAUKEE DISTRICT
428 FEDERAL BUILDING
MILWAUKEE 1, WIS.

REFER TO FILE NO. GLKGS

2 June 1947

SUBJECT: Approval of Revised Plans

Consumers Power Company
Jackson, Michigan

Gentlemen:

As requested in your letter of 21 February 1947, there is herewith letter dated 28 May 1947, signed by the Division Engineer, Corps of Engineers, Great Lakes Division, approving the revised plans to supersede the plans for works authorized by permit granted you under date of 26 August 1946.

Please acknowledge receipt.

Very truly yours,

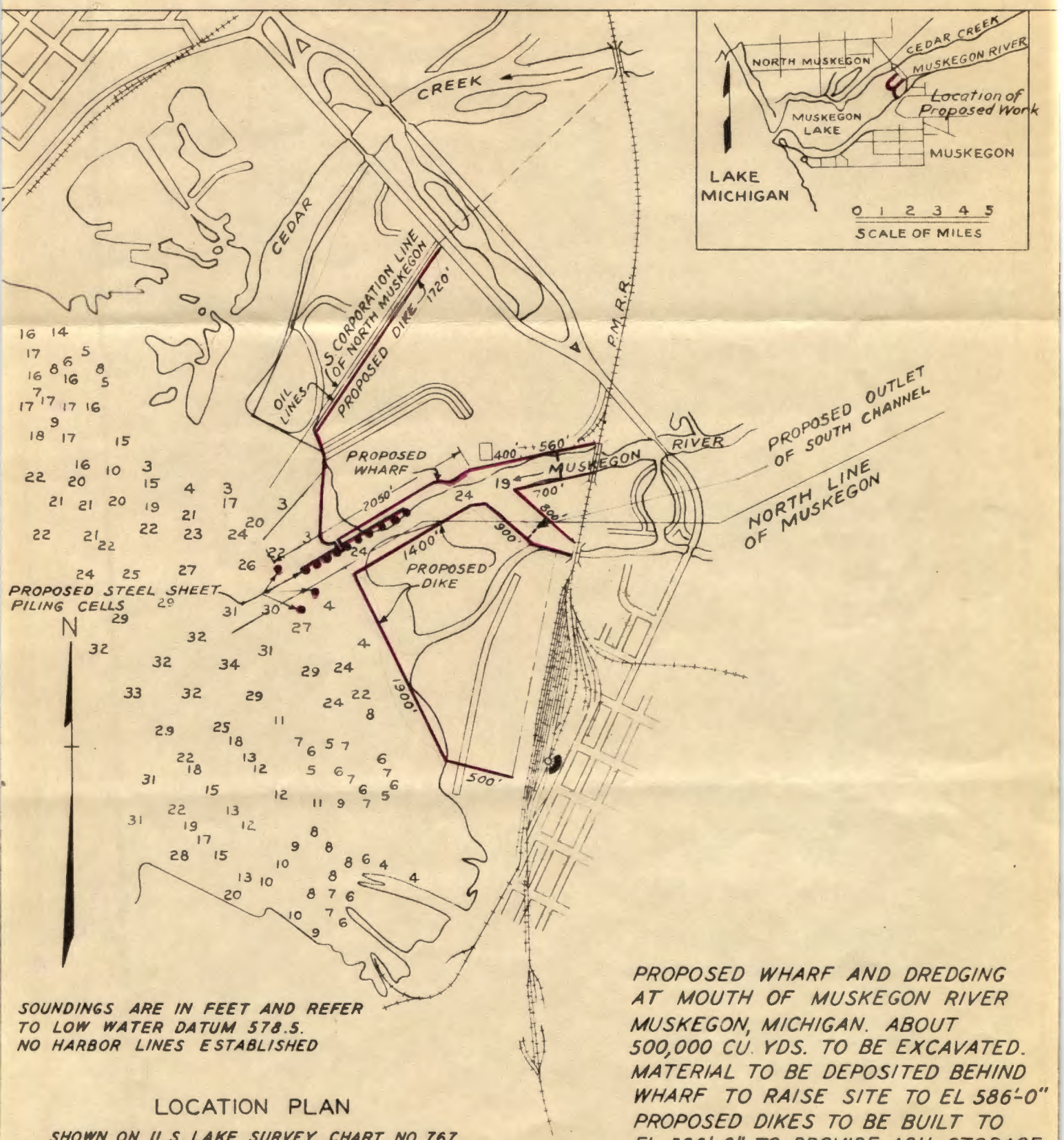
J. O. Colonna

J. O. COLONNA
Colonel, Corps of Engineers
District Engineer

1 Incl:
Ltr. dtd. 28 May 1947 w/plans attd.

#1

3



SOUNDINGS ARE IN FEET AND REFER TO LOW WATER DATUM 578.5.
NO HARBOR LINES ESTABLISHED

LOCATION PLAN

SHOWN ON U.S. LAKE SURVEY CHART NO. 767

SCALE OF FEET

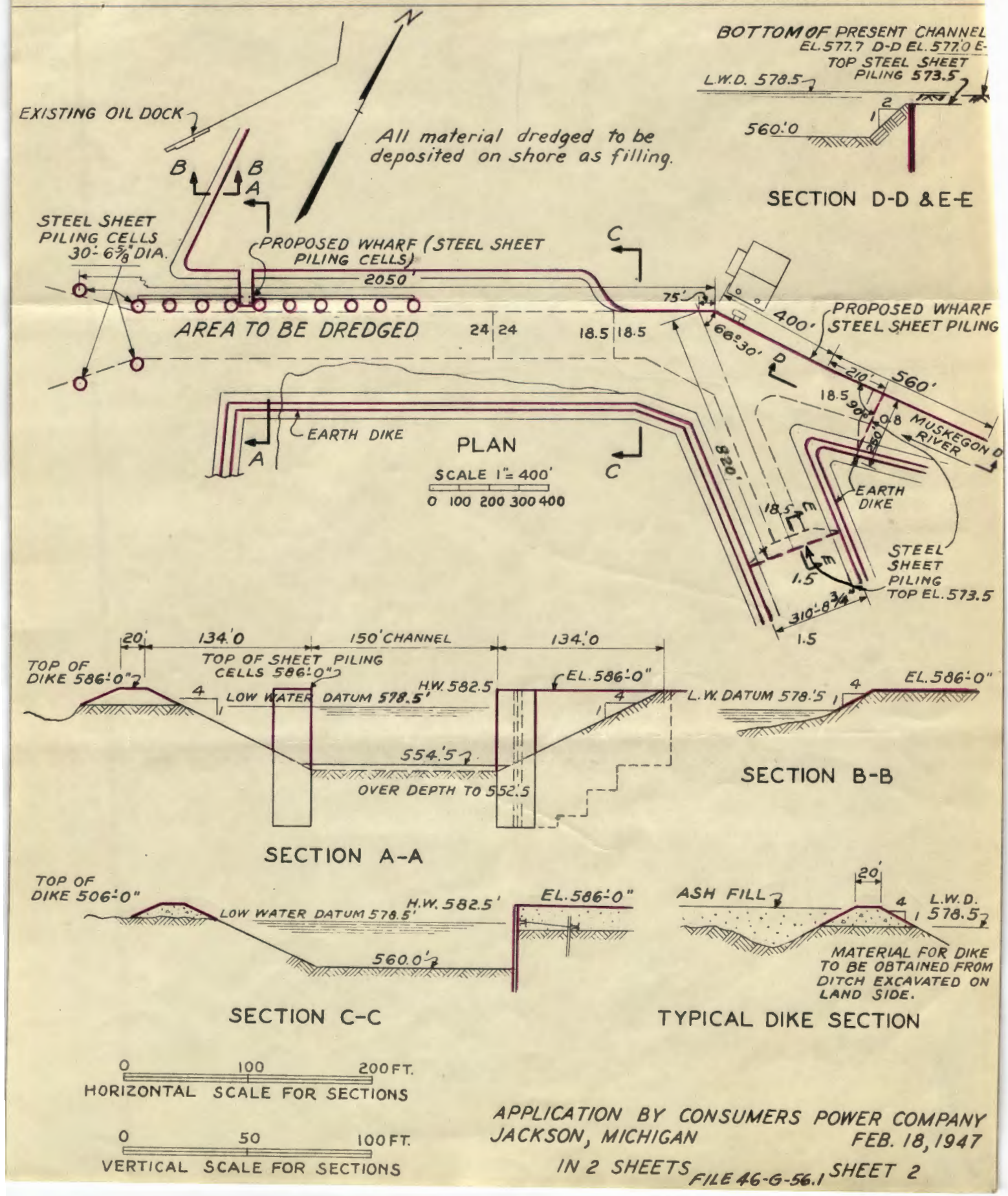
0 1000 2000 3000

PROPOSED WHARF AND DREDGING AT MOUTH OF MUSKEGON RIVER MUSKEGON, MICHIGAN. ABOUT 500,000 CU. YDS. TO BE EXCAVATED. MATERIAL TO BE DEPOSITED BEHIND WHARF TO RAISE SITE TO EL 586'-0" PROPOSED DIKES TO BE BUILT TO EL. 586'-0" TO PROVIDE ASH STORAGE

APPLICATION BY CONSUMERS POWER COMPANY
JACKSON, MICHIGAN FEB. 18, 1947

IN 2 SHEETS FILE 46-G-56.1 SHEET 1

Incl 2'



APPLICATION BY CONSUMERS POWER COMPANY
JACKSON, MICHIGAN FEB. 18, 1947

IN 2 SHEETS FILE 46-G-56.1 SHEET 2

15½

ADDRESS REPLY TO:
DISTRICT ENGINEER
MILWAUKEE DISTRICT
CORPS OF ENGINEERS
P. O. BOX 744
MILWAUKEE 1, WISCONSIN

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
MILWAUKEE DISTRICT
428 FEDERAL BLDG.
MILWAUKEE 1, WIS.

REFER TO FILE NO. GLKKS

24 May 1950

SUBJECT: Approval of Revised Plans for Work in Muskegon River at Muskegon, Michigan.

Consumers Power Company
Jackson, Michigan

Sirs:

In accordance with your written request dated 15 April 1950, the revised plans hereto attached are approved to supersede the plans for the works authorized by the Secretary of War, in letter dated 26 August 1946, from the Division Engineer at Chicago, Illinois, "to construct a steel sheet pile wharf and earth dikes; to dredge at mouth of main or north channel of Muskegon River; to fill areas inclosed by dikes, diverting the south channel of the river into the main channel; and to drive four (4) pile clusters in Muskegon Lake at the mouth of Muskegon River at the north city limits of Muskegon, Michigan."

The conditions to which the work is made subject remain in full force and effect.

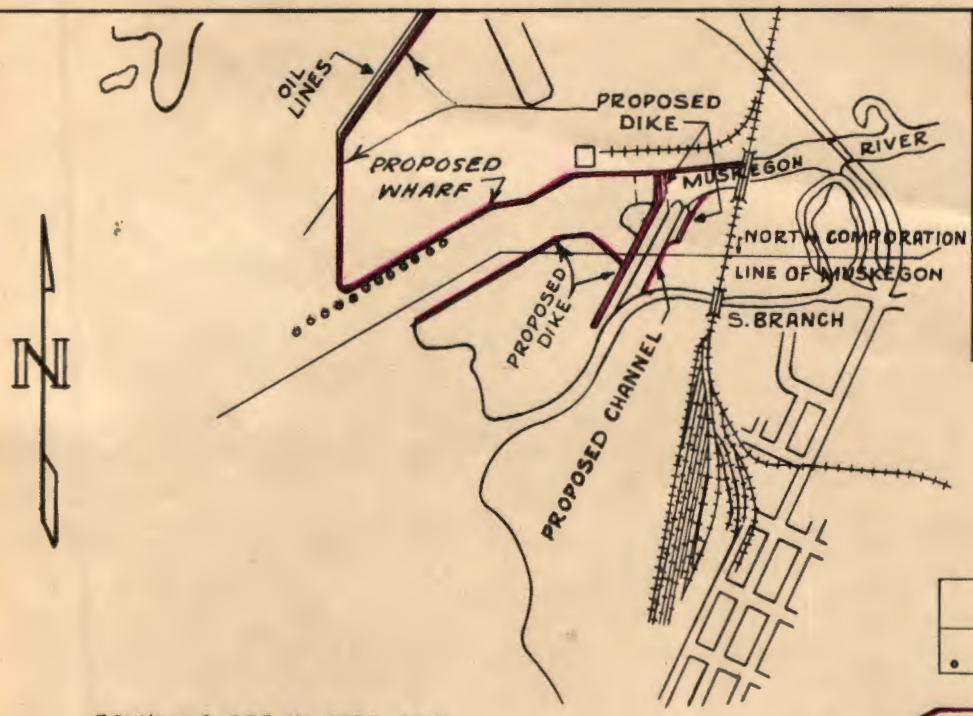
BY AUTHORITY OF THE SECRETARY OF THE ARMY:

D. A. MORRIS
Colonel, Corps of Engineers
District Engineer

Plan attached

Mark old sheet & file superseded by above (old permit in Envelope)

15 1A



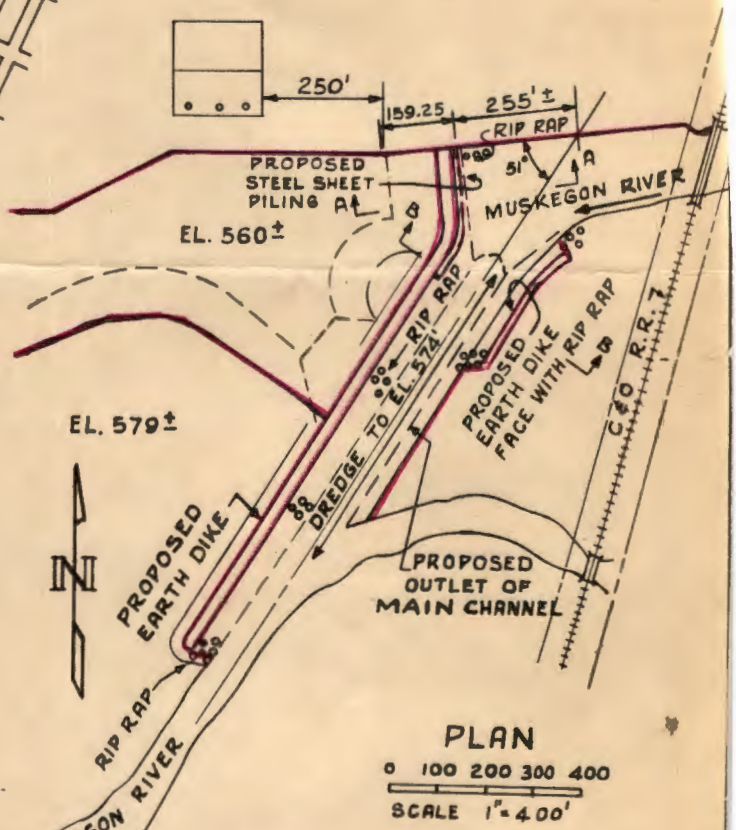
SOUNDING ARE IN FEET AND REFER TO LOW WATER DATUM 578.5
NO HARBOR LINES ESTABLISHED

LOCATION PLAN

SHOWN ON U.S. LAKE SURVEY CHART NO. 767

SCALE OF FEET

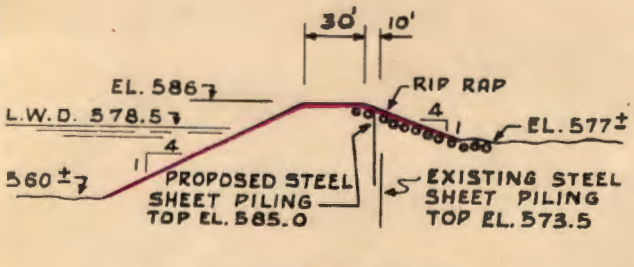
0 1000 2000 3000



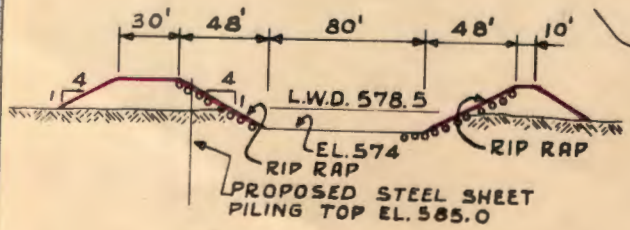
PLAN

0 100 200 300 400

SCALE 1" = 400'



SECTION A-A



SECTION B-B

0 100 200

HORIZONTAL SCALE FOR SECTIONS

0 50 100

VERTICAL SCALE FOR SECTIONS

PROPOSED WHARF AND DREDGING AT MOUTH OF MUSKEGON RIVER, MUSKEGON, MICH. ABOUT 500,000 CU. YDS TO BE EXCAVATED MATERIAL TO BE DEPOSITED BEHIND WHARF TO RAISE SITE TO EL. 586.0. PROPOSED DIKES TO BE BUILT TO EL. 586.0 TO PROVIDE ASH STORAGE.

APPLICATION BY CONSUMERS POWER COMPANY
JACKSON MICHIGAN
APR. 15, 1950
IN 2 SHEETS
SHEET NO. 1
FILE NO. 46-G-56.1A

N

Permittee

WAR DEPARTMENT
CORPS OF ENGINEERS
OFFICE OF THE DIVISION ENGINEER
GREAT LAKES DIVISION
1660 E. HYDE PARK BOULEVARD
CHICAGO 15, ILLINOIS

ADDRESS REPLY TO:
DIVISION ENGINEER
GREAT LAKES DIVISION
CORPS OF ENGINEERS
1660 E. HYDE PARK BOULEVARD
CHICAGO 15, ILLINOIS

BUTTERFIELD 5800

REFER TO FILE NO. GLDGW 800.6 (Muskegon Lake, Muskegon, Mich.- Consumers Power Co.

28 May 1947

Consumers Power Co.,
Jackson, Michigan

Sirs:

In accordance with your written request dated 21 February 1947, the revised plans hereto attached are approved to supersede the plans for the works authorized by the Secretary of War, in letter dated 26 August 1946, from the Division Engineer at Chicago, Illinois, to "construct a steel sheet pile wharf and earth dikes; to dredge at mouth of main or north channel of Muskegon River; to fill areas inclosed by dikes, diverting the south channel of the river into the main channel; and to drive four (4) pile clusters in Muskegon Lake at the mouth of Muskegon River at the north city limits of Muskegon, Michigan."

The conditions to which the work is made subject remain in full force and effect.

BY AUTHORITY OF THE SECRETARY OF WAR:

D. O. Elliott

D. O. ELLIOTT
Colonel, Corps of Engineers
Division Engineer

8/13/55 Agmts. (War. Dept.) (Cobb Site Transferred to Plant) 4-24-56

DEPARTMENT OF THE ARMY PERMIT NO 56-49-6

NOTE.—It is to be understood that this instrument does not give any property rights either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to private property or invasion of private rights, or any infringement of Federal, State, or local laws or regulations, nor does it obviate the necessity of obtaining *State assent* to the work authorized. IT MERELY EXPRESSES THE ASSENT OF THE FEDERAL GOVERNMENT SO FAR AS CONCERNS THE PUBLIC RIGHTS OF NAVIGATION. (See *Cummings* v. *Chicago*, 188 U. S., 410.) 16—13168-2

MICROFILMED 1963

City of North Muskegon (Muskegon Co.)

PERMIT

Office of the District Engineer
Detroit District, Corps of Engineers.
APR 24 1956 Detroit Michigan
----------, 19 .

Consumers Power Company
Jackson, Michigan

Sirs:

Referring to written request dated 29 March 1956

I have to inform you that, upon the recommendation of the Chief of Engineers, and under the provisions of Section 10 of the Act of Congress approved March 3, 1899, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," you are hereby authorized by the Secretary of the Army.

to construct an earth dike and to fill shoreward thereof
(Here describe the proposed structure or work.)

in Muskegon Lake
(Here to be named the river, harbor, or waterway concerned.)

at Muskegon, Michigan, immediately south of Cedar Creek
(Here to be named the nearest well-known locality—preferably a town or city—and the distance in miles and tenths from some definite point in the same, stating whether above or below or giving direction by points of compass.)

in accordance with the plans shown on the drawing attached hereto marked: "Proposed
(Or drawings; give file number or other definite identification marks.)
Dike and Ash Disposal Fill in Muskegon Lake at City of Muskegon County of Muskegon State of Michigan --- Application by Consumers Power Co. --- March 29, 1956."

subject to the following conditions:

RETURN TO LAND & R/W DEPT.

8133

(*a*) That the work shall be subject to the supervision and approval of the District Engineer, Corps of Engineers, in charge of the locality, who may temporarily suspend the work at any time, if in his judgment the interests of navigation so require.

(*b*) That any material dredged in the prosecution of the work herein authorized shall be removed evenly and no large refuse piles, ridges across the bed of the waterway, or deep holes that may have a tendency to cause injury to navigable channels or to the banks of the waterway shall be left. If any pipe, wire, or cable hereby authorized is laid in a trench, the formation of permanent ridges across the bed of the waterway shall be avoided and the back filling shall be so done as not to increase the cost of future dredging for navigation. Any material to be deposited or dumped under this authorization, either in the waterway or on shore above high-water mark, shall be deposited or dumped at the locality shown on the drawing hereto attached, and, if so prescribed thereon, within or behind a good and substantial bulkhead or bulkheads, such as will prevent escape of the material in the waterway. If the material is to be deposited in the harbor of New York, or in its adjacent or tributary waters, or in Long Island Sound, a permit therefor must be previously obtained from the Supervisor of New York Harbor, Whitehall Building, New York City.

(*c*) That there shall be no unreasonable interference with navigation by the work herein authorized.

(*d*) That if inspections or any other operations by the United States are necessary in the interest of navigation, all expenses connected therewith shall be borne by the permittee.

(*e*) That no attempt shall be made by the permittee or the owner to forbid the full and free use by the public of all navigable waters at or adjacent to the work or structure.

(*f*) That if future operations by the United States require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army, it shall cause unreasonable obstruction to the free navigation of said water, the owner will be required upon due notice from the Secretary of the Army, to remove or alter the structural work or obstructions caused thereby without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed; and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners shall, without expense to the United States, and to such extent and in such time and manner as the Secretary of the Army may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable capacity of the watercourse. No claim shall be made against the United States on account of any such removal or alteration.

(*g*) That the United States shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

(*h*) That if the display of lights and signals on any work hereby authorized is not otherwise provided for by law, such lights and signals as may be prescribed by the U. S. Coast Guard, shall be installed and maintained by and at the expense of the owner.

(*i*) That the permittee shall notify the said district engineer at what time the work will be commenced, and as far in advance of the time of commencement as the said district engineer may specify, and shall also notify him promptly, in writing, of the commencement of work, suspension of work, if for a period of more than one week, resumption of work, and its completion.

(*j*) That if the structure or work herein authorized is not completed on or before Thirty-first day of December, 1959, this permit, if not previously revoked or specifically extended, shall cease and be null and void.

By authority of the Secretary of the Army:

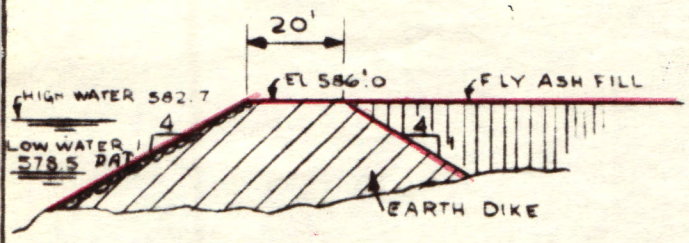
J. E. UNVERFERTH
Colonel, Corps of Engineers
Acting District Engineer

ENG FORM 1 SEP 48 1721 (Civil) This form supersedes ED Form 96, dated 1 Apr 48, which may be used until exhausted.

B15895

8-3 2/5

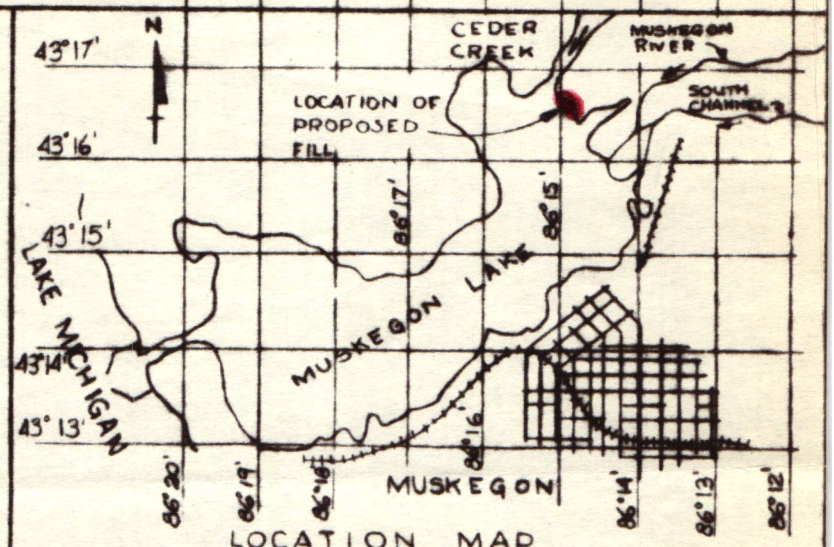
PERMIT NO 56-49-6



SECTION THROUGH DIKE

SCALE OF FEET
0 10 20 30 40 50

NO HARBOR LINE HAS BEEN ESTABLISHED IN MUSKEGON LAKE



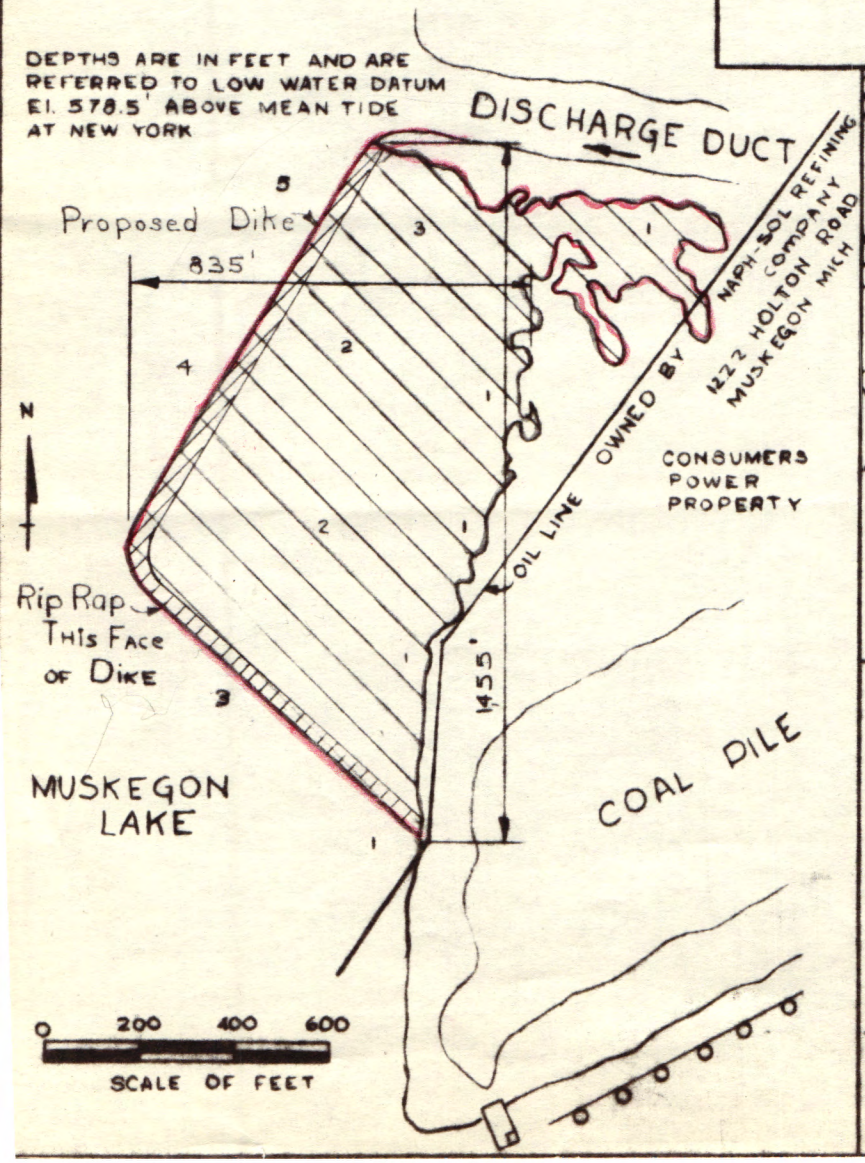
LOCATION MAP

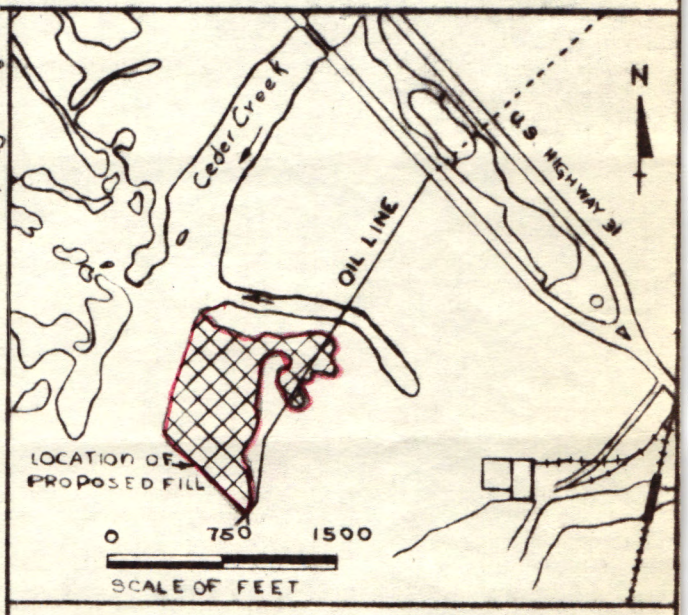
SCALE OF FEET
10,000 5000 0 10,000 20,000

NOTE

LOCATION MAP REPRODUCED FROM U.S. ENGINEERS LAKE MICHIGAN COAST CHART NO. 767 1954

DEPTHS ARE IN FEET AND ARE REFERRED TO LOW WATER DATUM EL. 578.5' ABOVE MEAN TIDE AT NEW YORK





PROPOSED DIKE AND ASH DISPOSAL FILL
IN MUSKEGON LAKE
AT CITY OF MUSKEGON
COUNTY OF MUSKEGON
STATE OF MICHIGAN

File #524-54

APPLICATION BY CONSUMERS POWER CO.

JACKSON, MICHIGAN MARCH 29, 1956

MICROFILMED 1963 (Cobb Site transferred to Plant)

DEPARTMENT OF THE ARMY PERMIT NO 56-49-5

NOTE.—It is to be understood that this instrument does not give any property rights either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to private property or invasion of private rights, or any infringement of Federal, State, or local laws or regulations, nor does it obviate the necessity of obtaining *State assent* to the work authorized. IT MERELY EXPRESSES THE ASSENT OF THE FEDERAL GOVERNMENT SO FAR AS CONCERNS THE PUBLIC RIGHTS OF NAVIGATION. (See *Cummings* v. *Chicago*, 188 U. S., 410.) 16—12168-8

PERMIT

Office of the District Engineer
Detroit District, Corps of Engineers.
APR 26 1956 Detroit 26, Michigan
----------, 19 .

Consumers Power Company
Jackson, Michigan

Sirs:

Referring to written request dated 29 March 1956

I have to inform you that, upon the recommendation of the Chief of Engineers, and under the provisions of Section 10 of the Act of Congress approved March 3, 1899, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," you are hereby authorized by the Secretary of the Army.

to construct an earth dike and fill shoreward thereof
(Here describe the proposed structure or work.)

in Muskegon Lake and Muskegon River (South Channel)
(Here to be named the river, harbor, or waterway concerned.)

at Muskegon, Michigan, between Sumner Street extended and Chesapeake and Ohio
(Here to be named the nearest well-known locality—preferably a town or city—and the distance in miles and tenths from some definite point in the same, stating whether above or below or giving direction by points of compass.)
Railroad Bridge across South Channel

in accordance with the plans shown on the drawing attached hereto marked: "Proposed
(Or drawings; give file number or other definite identification marks.)
Dike and Ash Disposal Fill in Muskegon Lake at City of Muskegon County of Muskegon State of Michigan. Application by Consumers Power Co. Jackson, Michigan March 29 1956."

subject to the following conditions:

(Muskegon Lake Site)

(*a*) That the work shall be subject to the supervision and approval of the District Engineer, Corps of Engineers, in charge of the locality, who may temporarily suspend the work at any time, if in his judgment the interests of navigation so require.

(*b*) That any material dredged in the prosecution of the work herein authorized shall be removed evenly and no large refuse piles, ridges across the bed of the waterway, or deep holes that may have a tendency to cause injury to navigable channels or to the banks of the waterway shall be left. If any pipe, wire, or cable hereby authorized is laid in a trench, the formation of permanent ridges across the bed of the waterway shall be avoided and the back filling shall be so done as not to increase the cost of future dredging for navigation. Any material to be deposited or dumped under this authorization, either in the waterway or on shore above high-water mark, shall be deposited or dumped at the locality shown on the drawing hereto attached, and, if so prescribed thereon, within or behind a good and substantial bulkhead or bulkheads, such as will prevent escape of the material in the waterway. If the material is to be deposited in the harbor of New York, or in its adjacent or tributary waters, or in Long Island Sound, a permit therefor must be previously obtained from the Supervisor of New York Harbor, Whitehall Building, New York City.

(*c*) That there shall be no unreasonable interference with navigation by the work herein authorized.

(*d*) That if inspections or any other operations by the United States are necessary in the interest of navigation, all expenses connected therewith shall be borne by the permittee.

(*e*) That no attempt shall be made by the permittee or the owner to forbid the full and free use by the public of all navigable waters at or adjacent to the work or structure.

(*f*) That if future operations by the United States require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army, it shall cause unreasonable obstruction to the free navigation of said water, the owner will be required upon due notice from the Secretary of the Army, to remove or alter the structural work or obstructions caused thereby without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed; and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners shall, without expense to the United States, and to such extent and in such time and manner as the Secretary of the Army may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable capacity of the watercourse. No claim shall be made against the United States on account of any such removal or alteration.

(*g*) That the United States shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

(*h*) That if the display of lights and signals on any work hereby authorized is not otherwise provided for by law, such lights and signals as may be prescribed by the U. S. Coast Guard, shall be installed and maintained by and at the expense of the owner.

(*i*) That the permittee shall notify the said district engineer at what time the work will be commenced, and as far in advance of the time of commencement as the said district engineer may specify, and shall also notify him promptly, in writing, of the commencement of work, suspension of work, if for a period of more than one week, resumption of work, and its completion.

(*j*) That if the structure or work herein authorized is not completed on or before Thirty-first day of December, 1959, this permit, if not previously revoked or specifically extended, shall cease and be null and void.

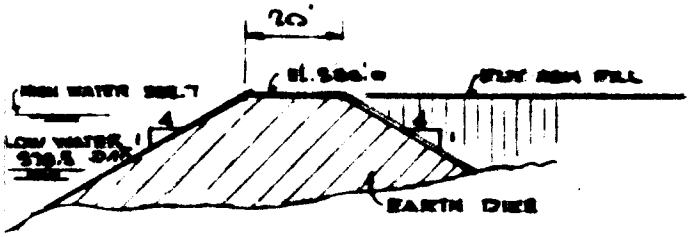
By authority of the Secretary of the Army:

J. E. UNVERFERTH
Colonel, Corps of Engineers
Acting District Engineer

ENG FORM 1 SEP 48 1721 (Civil) This form supersedes ED Form 96, dated 1 Apr 48, which may be used until exhausted.

B15895

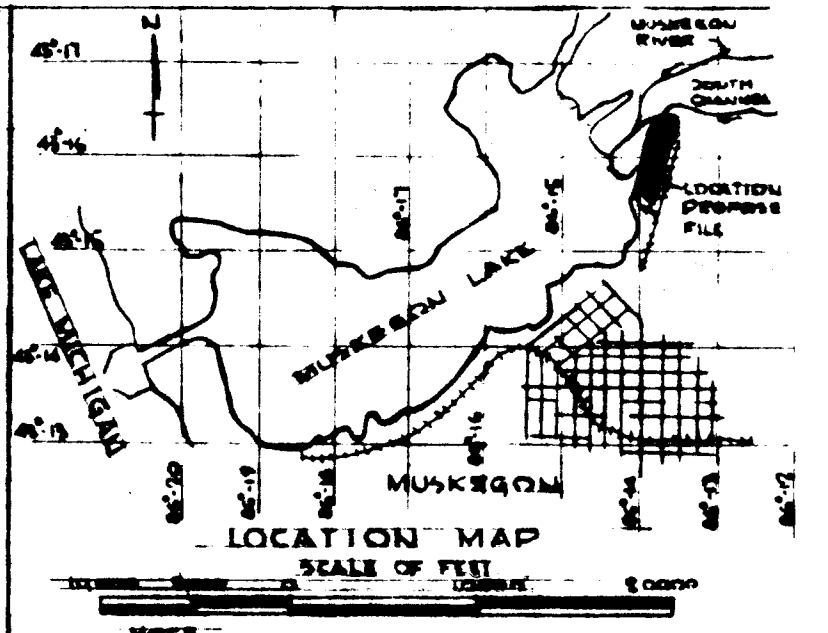
PERMIT NO. 56-49



SECTION THROUGH DIKE

SCALE OF FEET

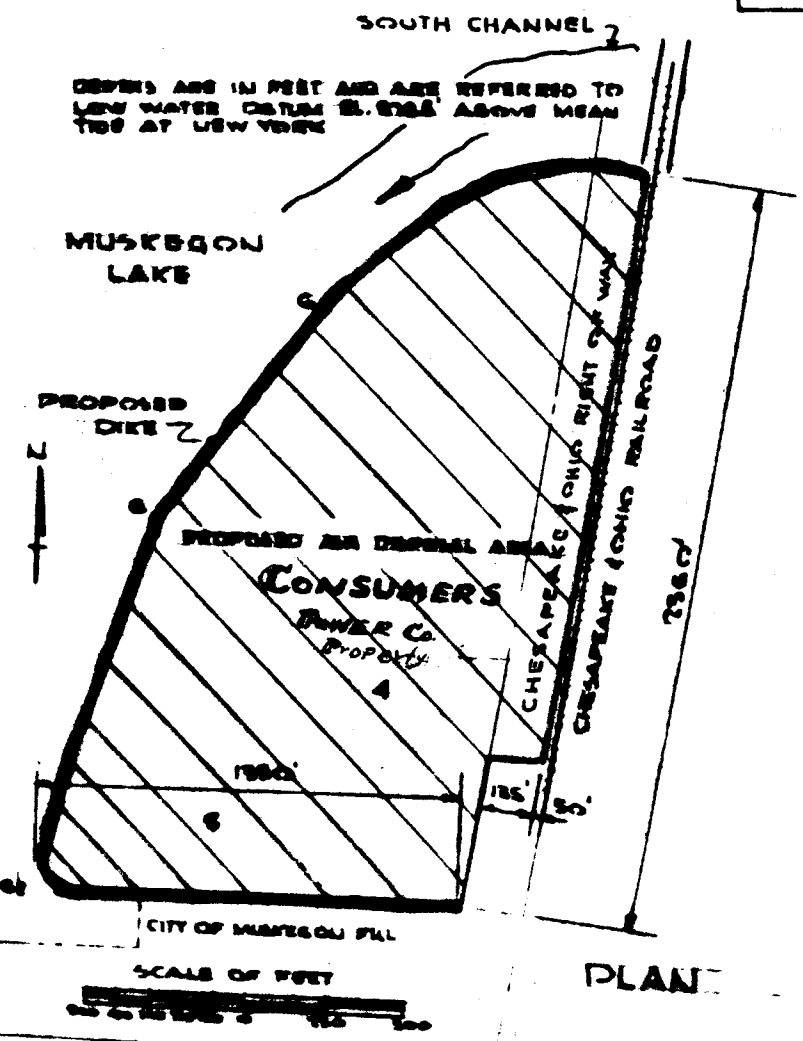
NO HARBOR LINE HAS BEEN ESTABLISHED IN MUSKEGON LAKE



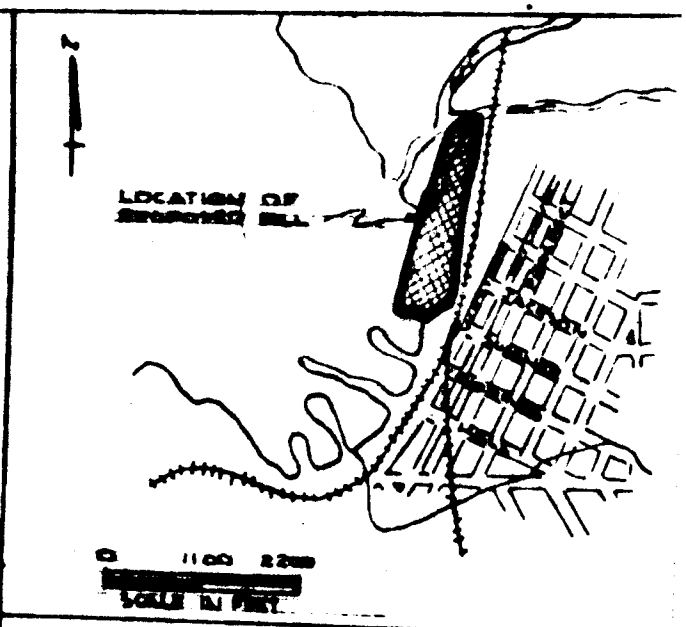
LOCATION MAP

SCALE OF FEET

LOCATION MAP REPRODUCED FROM U.S. LAKE MICHIGAN COAST CHART NO. 767 1954



PLAN



PROPOSED DIKE AND ASH DISPOSAL FILL
IN MUSKEGON LAKE
AT CITY OF MUSKEGON
COUNTY OF MUSKEGON
STATE OF MICHIGAN

File #524-53

APPLICATION BY CONSUMERS POWER CO.

JACKSON, MICHIGAN MARCH 2, 1956