

31731 LAKE SHORE BLVD.

23-LAK-11

WILLOWICK - LAKE COUNTY - OHIO

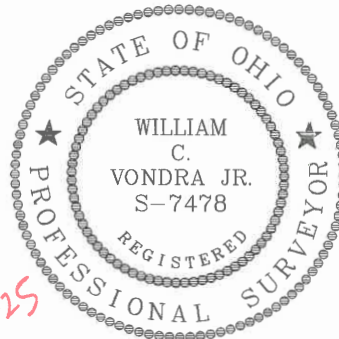
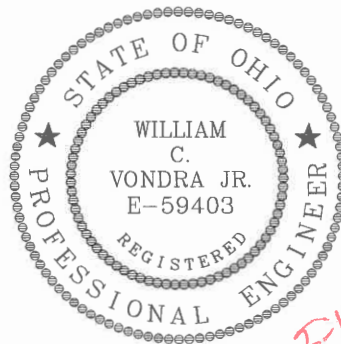


DRAWING INDEX

DESCRIPTION	SHEET
TITLE SHEET _____	1
PRE-CONSTRUCTION CONDITIONS _____	2
CURRENT AS-BUILT _____ EXISTING CONDITIONS	3
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VICINITY MAP
NTS



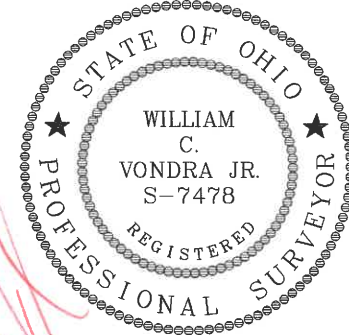
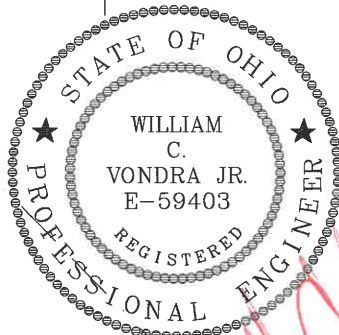
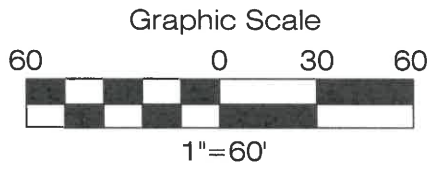
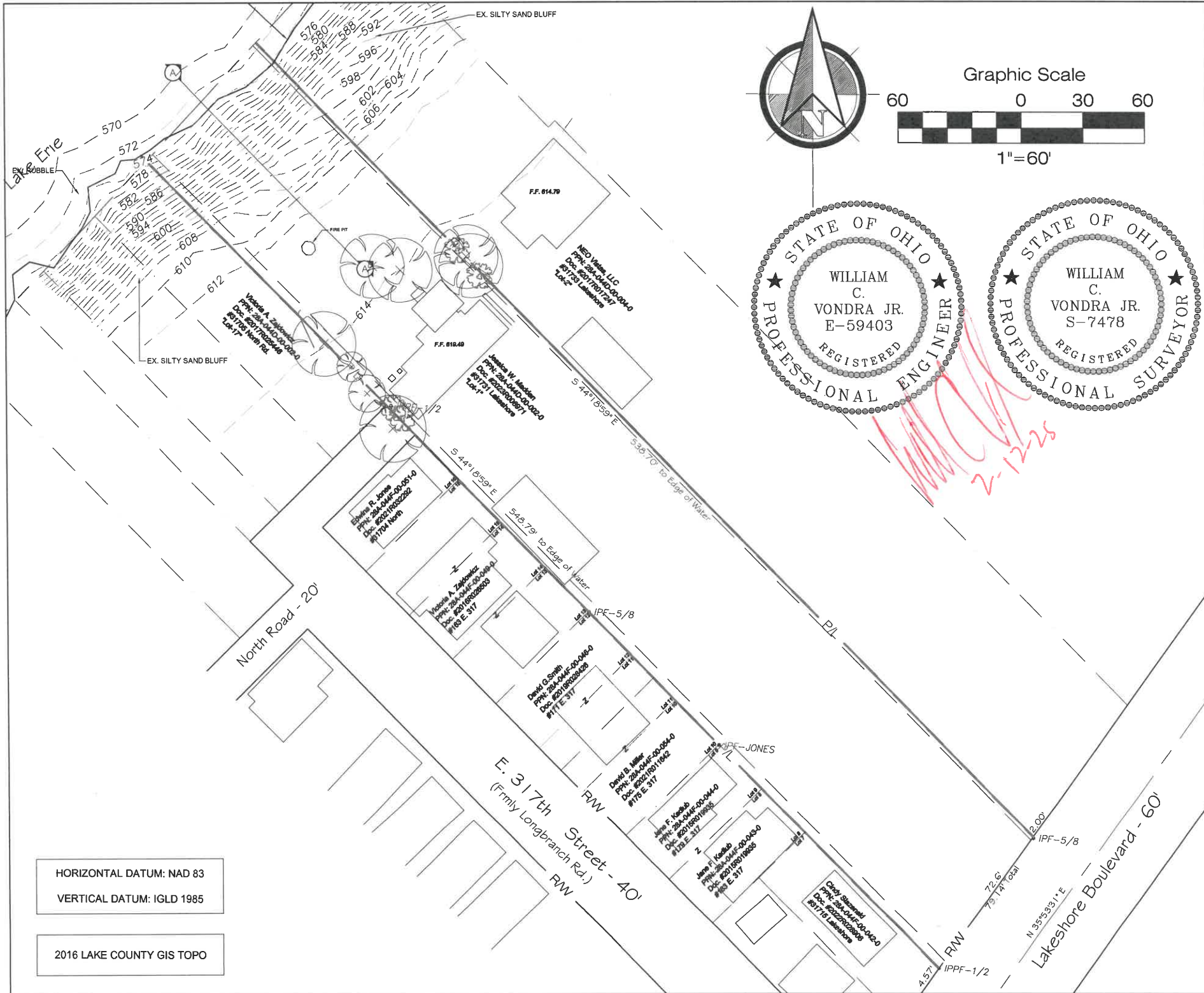
E-12-25

I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS TOPOGRAPHY, INDICATED BY 6", 1', OR 2' CONTOURS, AND ELEVATIONS SHOWN HEREON, REPRESENT AN ACTUAL FIELD SURVEY MADE UNDER MY DIRECTION ON THE 5TH DAY OF JUNE, 2023, AND THAT THE ELEVATIONS WERE TAKEN AT APPROPRIATE INTERVALS AND THAT AS OF THAT DATE THEY EXISTED AS AS INDICATED HEREON. LDC DID NOT PARTICIPATE IN ANY DESIGN OF CURRENT CONDITIONS. OUR ROLE WAS TO LOCATE AND DOCUMENT CURRENT CONDITIONS ONLY.

WILLIAM C. VONDRA JR., P.S. 7478



Know what's below.
Call before you dig.



2-1228

HORIZONTAL DATUM: NAD 83
 VERTICAL DATUM: IGLD 1985

2016 LAKE COUNTY GIS TOPO

PRE-CONSTRUCTION
 CONDITIONS

LAND DESIGN consultants
 ENGINEERS PLANNERS SURVEYORS
 www.LDCinc.net
 2025 Calabone Drive Mentor, Ohio 44060
 TEL: (440) 255-9403 (440) 961-1400

DATE 1-6-25
 SCALE: HOR. AS SHOWN
 VERT. SHOWN
 FILENAME BASE
 COMPUTER S
 TAB NAME PRE

31731 LAKE SHORE BLVD
 WILLOWICK - LAKE COUNTY

SHEET 2 OF 7
 CONTRACT No. MADDT1-2301

NATURAL SHORELINE
(YEAR 2017 LAKE CO. GIS
PHOTOGRAPH WATER'S EDGE)

PROPOSED
SUBMERGED
LAND LEASE

ROCK RIP-RAP

OHW ELEV. 573.4

SAND REPLENISHMENT
(MIN. 158 CY)

A

CONC. STAIRCASE

EX. SILTY SAND BLUFF

FIRE PIT

EX. SILTY
SAND BLUFF

HORIZONTAL DATUM: NAD 83

VERTICAL DATUM: IGLD 1985

TOPO WAS CONDUCTED BY
LDC ON JUNE 5, 2023

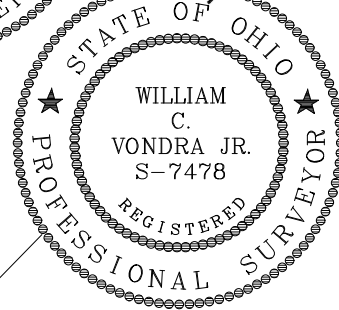
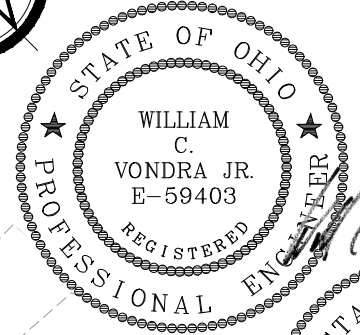
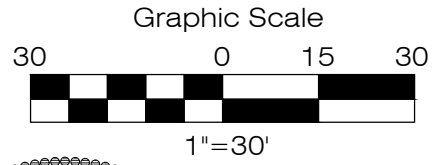
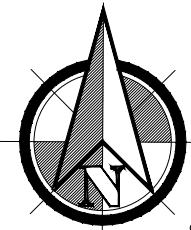
DESIGN INFORMATION (IGLD85)

DWL30 = 575.50
 ARMOR STONE TOE = 569.70
 BREAKING WAVE HT. = 580.02
 WAVE RUN UP ELEV. = 583.19
 MEDIAN STONE SIZE REQ'D = 0.9 TON
 STONE PLACED = 8-9 TON WITH 1-2 TON
 ASBUILT STONE SLOPE = 2.3:1
 ARMOR STONE ASBUILT HT. = 582.3 TO 592.4
 SAND PLACEMENT REQ'D = 79 LF x 2 CY = 158 CY

Victoria A. Zajdowicz
 PPN: 28A-044D-00-002-0
 Doc. #2017R025446
 #31705 North Rd.
 "Lot-17"

Jessica W. Madden
 PPN: 28A-044D-00-002-0
 Doc. #2023R006971
 #31731 Lakeshore
 "Lot-1"

NEO Vistas, LLC
 PPN: 28A-044D-00-004-0
 Doc. #2017R017247
 #31733 Lakeshore
 "Lot-2"



AS-BUILT
CONDITIONS

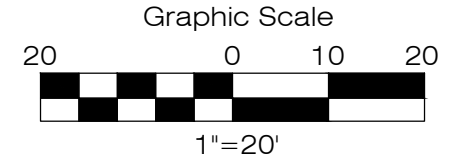
LAND DESIGN consultants
 www.ldcinc.com
 ENGINEERS PLANNERS SURVEYORS
 2020 ADDRESS: 31731 Lakeshore Blvd., Suite 100, Lakeshore, OH 44040
 TEL: (440) 226-2262 FAX: (440) 226-2260
L.D.C. Inc. d.b.a.

DATE: 3-25-25
 SCALE: HOR. AS
 VERT. SHOWN
 FILENAME: BASE
 COMPUTER: S
 TAB NAME: ASBUILT

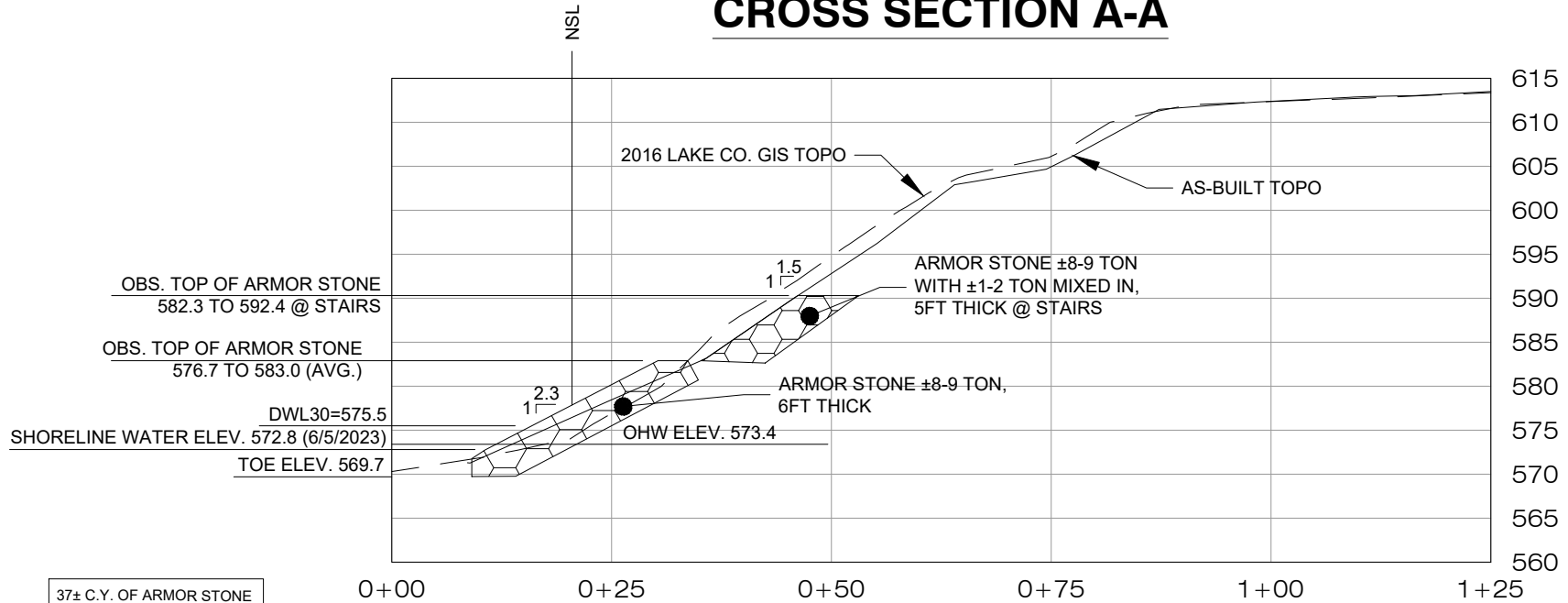
31731 LAKE SHORE BLVD
 WILLOWICK - LAKE COUNTY

SHEET OF
 3 / 7
 CONTRACT No.
 MADDT1-2301

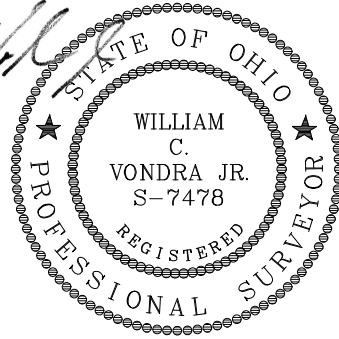
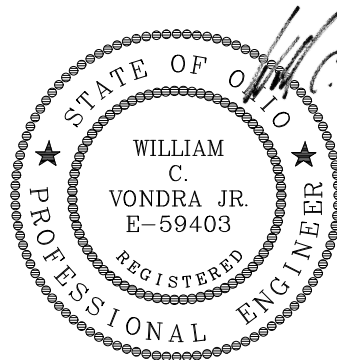
VERTICAL DATUM: IGLD 1985



CROSS SECTION A-A



37± C.Y. OF ARMOR STONE PLACED BELOW THE OHW (573.4) OF LAKE ERIE



BASED ON WAVE RUNUP, EROSION SHOULD BE MONITORED BY OWNER. PER CALCS, ODOT 601 TYPE "B" STONE ON FABRIC MAY BE NEEDED TO BE ADDED UP TO ELEVATION 586.0 TO ACCOMMODATE WIND DRIVEN SPLASH POTENTIAL.

BLUFF MATERIAL BASED ON ADJACENT PROPERTIES SILTY SANDS

CROSS SECTION A-A



DATE 3-25-25
 SCALE: HOR. AS
 VERT. SHOWN
 FILENAME BASE
 COMPUTER S
 TAB NAME XSECT

31731 LAKE SHORE BLVD
WILLOWICK - LAKE COUNTY

SHEET 4 OF 7

CONTRACT No. MADDT1-2301



LAND DESIGN CONSULTANTS

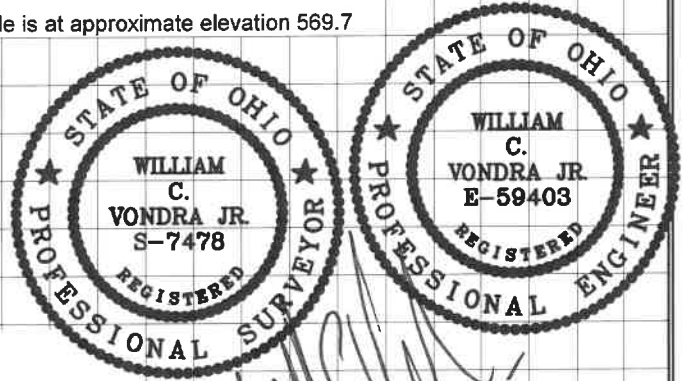
ENGINEERS & SURVEYORS

9025 Osborne Drive, Mentor, OH 44060
 Phone (440) 951-5263, (440)255-8463, (440)255-8575
 www.LDCinc.net

PROJECT Madden Residence
 Sht. # 5 of 7
 CALC'D BY RMF Date 1/6/2025
 CHK'D BY WCV Date _____
 SUBJECT Design Verification of Installed Project
Madden Shoreline Revetment
31731 Lake Shore Blvd, Willowick, OH

Per Temporary Shore Structure Permit #21-TLAK-01:

Shale is at approximate elevation 569.7



Verification of Armor Stone Size Installed

$$W_{50} = \frac{W_r H^3}{K_D (S_r - 1)^3 \cot \theta}$$

WCV
2-12-25

Using Hudson's Equation where:

- W_{50} = the 50th percentile (median) weight of stone (lbs)
- W_r = specific weight of stone (lbs/ft³) for limestone $W_r = 165$ lbs/ft³
- W_w = specific weight of water = 62.4 lbs/ft³
- H_b = Design wave height at the toe of the structure = 4.52 ft
- $S_r = W_r / W_w = 2.64423$
- K_D = Empirical Value based on physical properties
 = 2.0 for rough angular quarry stones ref: Coastal Eng. Man.
- $\cot \theta$ = as-built slope of the revetment (average) 2.0

Therefore $W_{50} = 859.218$ lb = 0.43 ton

Median Stone Size $REQD = W_{50} \times$ Factor of Safety of 2 = 0.9 ton

Armor Stone Utilized: approx. 8-9 ton armor stone with 1-2 ton stone mixed in, therefore installation exceeds design requirements for this site.



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www.LDCinc.net

PROJECT	Madden Residence	
	Sht. #	6 of 7
CALC'D BY	RMF	Date 1/6/2025
CHK'D BY	WCV	Date
SUBJECT	Design Verification of Installed Project	
	Madden Shoreline Revetment	
	31731 Lake Shore Blvd, Willowick, OH	

Per Temporary Shore Structure Permit #21-TLAK-01:

Shale is at approximate elevation 569.7

Design Water Level 30 yr Return Rocky River to Perry Twp

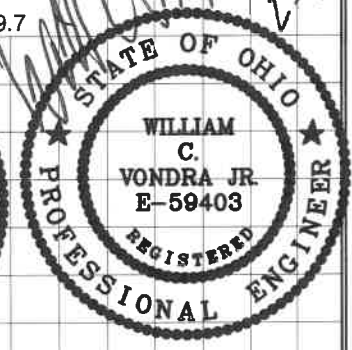
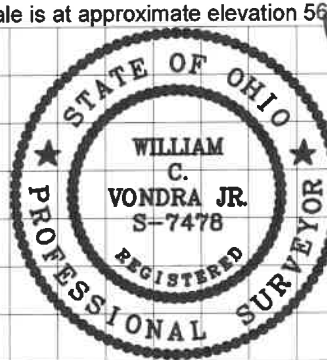
DWL_{30 yr} = 575.50 IGLD 85

Depth of Water at the structure Toe (d_s) under DWL conditions

d_s = DWL₃₀ - STRUCTURE TOE ELEVATION

d_s = 575.50 - 569.70

d_s = 5.80



Approx bottom of Armor Stone = 569.70

Conservative approach assumes scour to bottom of toe

USE ultimate d_s = 5.80 ft Worse case assumes Lake erodes to installed bottom of Armor Stone

Height of Breaking Wave (H_b)

H_b = 0.78 x d_s R = H_b x n

H_b = 0.78 x 5.80 R = 4.524 x 0.7

H_b = 4.524 ft R = 3.17 ft

WAVE ELEVATION (WE) = DWL₃₀ + H_b = 575.50 + 4.524 = 580.02 ft IGLD 85

WAVE RUN-UP ELEVATION = WE + R = 580.024 + 3.17 = 583.19 ft IGLD 85

Per As-built information obtained by LDC on 6/5/2023 (IGLD 85):

Top of Armor Stone ranges from 582.3 to 592.4

An additional splash apron of ODOT type 601 Type "B" Stone on fabric should be added up to elevation 586.0 using the conservative approach of undercutting material to bottom elevation of armor stone.

From Lake County GIS 2000

Top of Bluff: 604 +/-
 Toe of Bluff: 574 +/-
 Slope : 65 % +/- or 1.533:1

From As-Built Conditions taken December 2, 2017 (IGLD 85)

Top of Bluff: 603
 Soil Slope Top of Bluff to Armor Stone: 1.5:1
 Armor Stone Face Slope: 2.3:1
 Toe at water surface: 572.80



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www.LDCinc.net

PROJECT Madden Residence
 Sht. # 7 of 7
 CALC'D BY RMF Date 1/6/2025
 CHK'D BY WCV Date _____
 SUBJECT Design Verification of Installed Project
Madden Shoreline Revetment
31731 Lake Shore Blvd, Willowick, OH

ELEVATION CONVERSION FROM GPS NAVD 1988 TO IGLD 1985

Conversion was done using the following website: <https://www.ngs.noaa.gov/cgi-bin/IGLD85/IGLD85.pr1>

Using the elevation of 575.00 ft (175.2600m) and the following site coordinates obtained from: <https://touchmap.com/latlong.html>

A point was selected on the map at a point near the center of the existing armor stone, near the center of the parcel

Latitude: 41.646876

Longitude: -81.469393

Conversion from NAVD 88 to IGLD 85

Designation	North Latitude	West Longitude	Gravity (gals)	NAVD 88 Height (meters)	Dynamic Height (meters)	IGLD 85 Height (meters)
	41 38 48.753	81 28 09.814	980.248	175.26	175.195	175.190

Conversion from NAVD 88 to IGLD 85 at this location: -0.070 m = -0.23 ft

Therefore all LDC observed elevations using ODOT VRS on NAVD 88 were dropped by 0.23 ft to convert to IGLD 85

Required sand replenishment at this location:

Lineal toe footage of installed structure based on field measurement: 79 ft

Required replenishment (2 cy of sand / LF) = 158 cy

WCV
2-15-25

