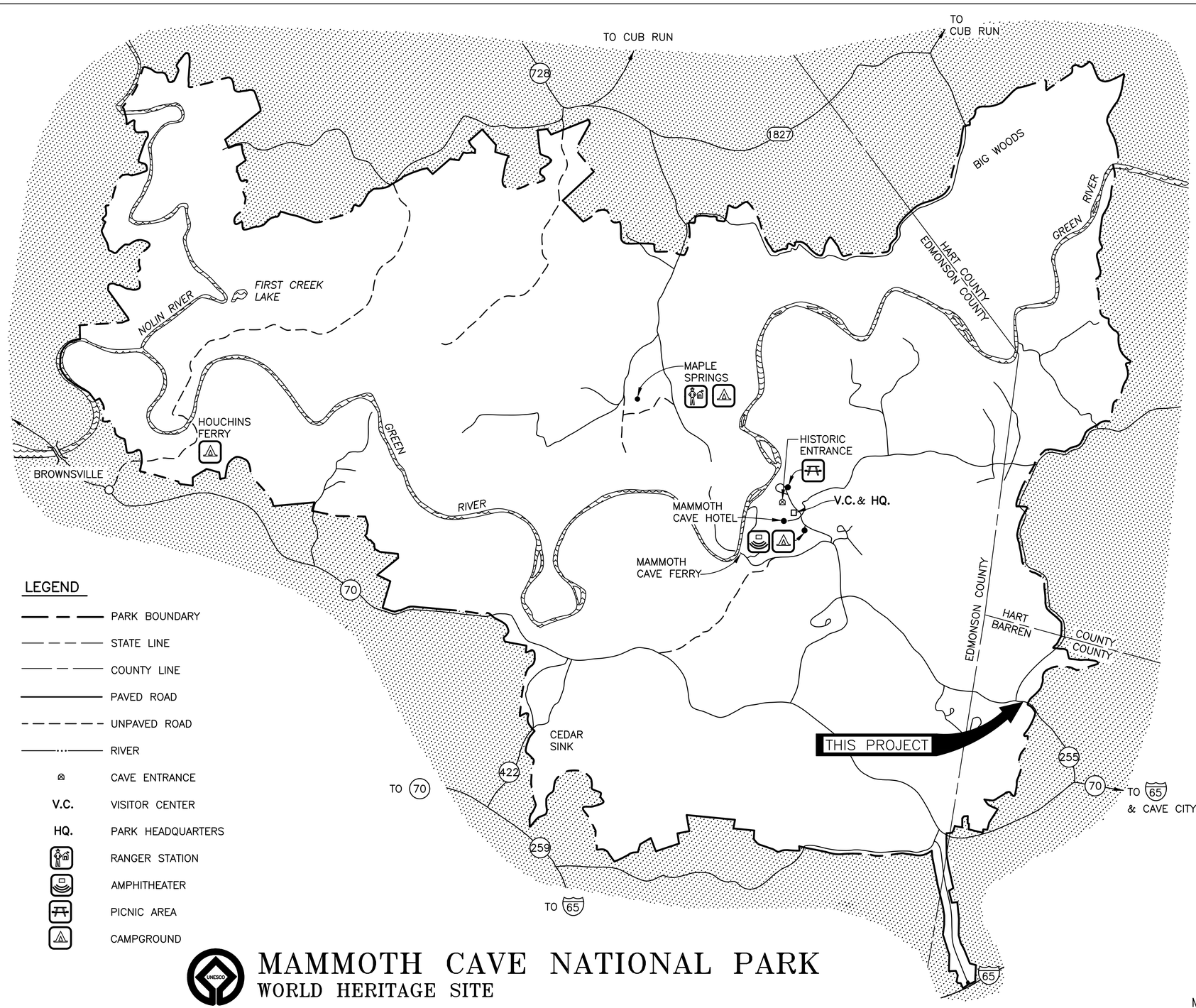

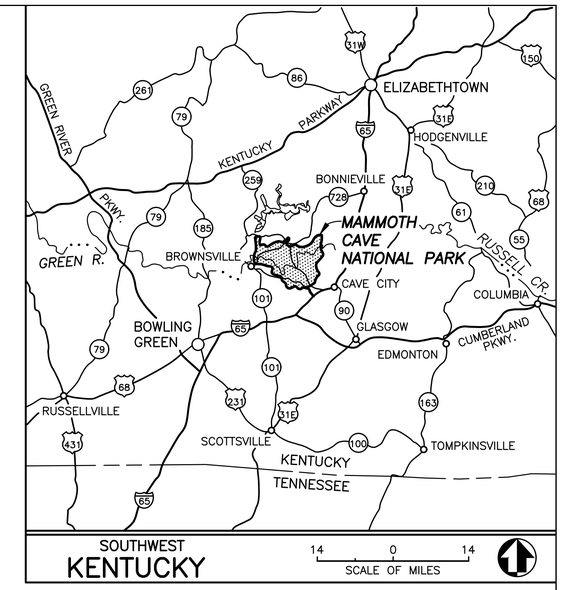

LEGEND

- PARK BOUNDARY
- STATE LINE
- COUNTY LINE
- PAVED ROAD
- UNPAVED ROAD
- RIVER
- CAVE ENTRANCE
- V.C. — VISITOR CENTER
- HQ. — PARK HEADQUARTERS
- RANGER STATION
- AMPHITHEATER
- PICNIC AREA
- CAMPGROUND

MAMMOTH CAVE NATIONAL PARK
WORLD HERITAGE SITE

SCALE OF FEET: 2,000 0 2,000 4,000

SCALE OF METERS: 500 0 500 1,000

PMIS #:
MACA 217854

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

Mark	Sheet	REVISION	Date	Initial

QUALITY DESIGN CERTIFICATION

- ☐ Prepared in Accordance with Preliminary Design (Title I)_____ OR Drawing No.
- ☐ Variance from Preliminary Design (Title I) Approved by Superintendent on_____ OR Date
- ☐ Construction Drawing Not Preceded by Preliminary Design (Title I)

Project Manager _____ Date _____

FINAL
CONSTRUCTION DOCUMENTS

UNITED STATES
DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE
DENVER SERVICE CENTER

TITLE OF DRAWING
RECONSTRUCT THE SAND CAVE BOARDWALK

LOCATION WITHIN PARK
SAND CAVE TRAIL
NAME OF PARK
MAMMOTH CAVE NATIONAL PARK

REGION	COUNTY	STATE
SOUTHEAST	EDMONSON	KENTUCKY

DRAWING NO. 135

PKG. NO. MACA 217 854

SHEET 01 OF 56

BASIC DATA: 135/60,001; NP-MC2121A 6/62; PARK MINI FOLDER 1990;
REVISED & REDRAWN 4/93. UPDATED 11/98. SGS

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\COVER.DWG

GENERAL NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL REQUIRED PERMITS AND APPROVALS HAVE BEEN OBTAINED. NO CONSTRUCTION OR FABRICATION SHALL BEGIN UNTIL THE CONTRACTOR HAS RECEIVED AND THOROUGHLY REVIEWED ALL PLANS AND OTHER DOCUMENTS APPROVED BY ALL PERMITTING AUTHORITIES.

2. NO GRADING, STRIPPING, EXCAVATION, FILLING OR OTHER DISTURBANCE OF THE NATURAL GROUND COVER SHALL TAKE PLACE UNTIL PROPOSED SOIL EROSION CONTROL PLAN HAS BEEN APPROVED AND IN PLACE.

3. ALL DIMENSIONS INVOLVING CURB ARE SHOWN TO FACE OF CURB, UNLESS NOTED OTHERWISE.

4. IN THE CASE OF CONFLICT BETWEEN THIS DRAWING AND ANY OTHER DRAWING AND/ OR SPECIFICATIONS, THE CONTRACTING OFFICER SHALL BE IMMEDIATELY NOTIFIED FOR CLARIFICATION.

5. THE CONTRACTOR SHALL BID AND PERFORM THE WORK IN ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND THE REQUIREMENTS OF LOCAL UTILITY COMPANIES.

6. IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND WILL NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS AND THE TRAFFIC CONTROL DEVICES DURING CONSTRUCTION. CONTRACTOR SHALL COMPLY WITH OSHA REGULATIONS AND SAFETY REQUIREMENTS. CONTRACTOR SHALL PROVIDE A SAFETY PLAN TO CONTRACTING OFFICE FOR REVIEW AND APPROVAL

7. THE CONTRACTOR IS RESPONSIBLE FOR THE SAFETY OF ALL VEHICLE TRAFFIC IN AND AROUND THE CONSTRUCTION AREA.

8. ALL UNPAVED AREAS TO RECEIVE MULCH TO MINIMIZE EROSION.

9. ALL PAVEMENT MARKINGS INCLUDING STRIPES, DIRECTIONAL ARROWS, ETC., SHALL MATCH COLORS AND SYMBOLS USED THROUGHOUT THE PARK. ACCESSIBILITY SYMBOL AND COLORS SHALL BE PER ISA REQUIREMENTS.

10. ANY APPLICABLE NON-HAZARDOUS CONSTRUCTION WASTE SHALL BE RECYCLED.

GRADING AND DRAINAGE NOTES:

1. CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES HAVING UNDERGROUND UTILITIES ON SITE OR IN RIGHT-OF-WAY PRIOR TO EXCAVATION. CONTRACTOR SHALL NOTIFY KY-811 48 HOURS PRIOR TO EXCAVATION.

2. SITE GRADING SHALL NOT PROCEED UNTIL EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND APPROVED BY CONTRACTOR.

3. NO CUT OR FILL SLOPES SHALL BE CONSTRUCTED STEEPER THAN 3H:1V UNLESS SPECIFICALLY NOTED ON THE PLANS.

4. SITE GRADES AROUND PAVEMENT SHALL BE GRADED DURING CONSTRUCTION TO PREVENT PONDING. ANY SURFACE WATER ACCUMULATION IN THE PAVEMENT AREAS SHALL BE DRAINED IMMEDIATELY TO AVOID SATURATION OF THE SUBGRADE SOILS.

5. ALL EXCAVATIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST OSHA GUIDELINES AS MANDATED IN CURRENT FEDERAL, STATE AND LOCAL REGULATIONS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE IN PROVIDING SAFE WORKING CONDITIONS IN CONNECTION WITH ANY EXCAVATION WORK.

6. SUITABLE FILL MATERIAL PLACED UNDER PAVEMENT AREAS SHALL BE PLACED IN MAXIMUM 8-INCH (LOOSE THICKNESS) VERTICAL LIFTS, WITH EACH LIFT BEING COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY, AT A MOISTURE CONTENT WITHIN 2 PERCENT OF OPTIMUM. THE COMPACTION REQUIREMENT MAY BE REDUCED TO 92 PERCENT IN PROPOSED LANDSCAPE AREAS. WETTING OR DRYING OF THE SOILS MAY BE NECESSARY TO ACHIEVE A MOISTURE CONTENT SUITABLE FOR COMPACTION. REPRESENTATIVE AND ADEQUATE FIELD DENSITY TESTING SHALL BE PERFORMED BY INDEPENDENT TESTING AGENCY PROVIDED BY AMERICAN ENGINEERS, INC. TO VERIFY THAT COMPACTION REQUIREMENTS HAVE BEEN MET.

7. STONE BASES SHOULD BE COMPACTED TO A DENSITY SATISFACTORY TO CONTRACTING OFFICER.

8. GRADE LINES SHOWN ARE FINISHED GRADE. CONTRACTOR SHOULD SEE DETAIL SHEET FOR APPROPRIATE PAVEMENT TYPE TO DETERMINE SUB-GRADE ELEVATIONS FOR PAVING AREAS.

9. CONTRACTOR IS ADVISED THAT FINAL PAVEMENT PLACEMENT SHALL BE COMPLETED TO ACCOMMODATE THE FOLLOWING:

   A. ALL CONSTRUCTED PEDESTRIAN SURFACES SHALL MEET THE ARCHITECTURAL BARRIERS ACT (ACCESSIBILITY) STANDARDS FOR SLOPE AND CROSS-SLOPE REQUIREMENTS AS NOTED ON THIS SHEET OR REWORK WILL BE PROVIDED BY THE CONTRACTOR TO CORRECT NON-COMPLIANCE AT THE CONTRACTOR'S EXPENSE.

ABBREVIATIONS:

A	AREA
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
B/C	BOTTOM OF CURB
BIT	BITUMINOUS PAVEMENT
BM	BENCH MARK
BS	BOTTOM OF STEP
C/C	CENTER TO CENTER
CB	CATCH BASIN
CONC	CONCRETE
DGA	DENSE GRADED AGGREGATE
DIA	DIAMETER
(E)	EAST
EL. ELEV	ELEVATION
EQ	EQUIVALENT
FH	FIRE HYDRANT
GND, GRD	GROUND
HD	HEAVY DUTY
HT	HEIGHT
LBS	POUNDS
LD	LIGHT DUTY
LF	LINEAR FEET
LOD	LIMITS OF DISTURBANCE
LOW	LIMITS OF WORK
MANUF	MANUFACTURE
MAT'L	MATERIAL
MAX	MAXIMUM
MIN	MINIMUM
MG	MATCH EXISTING GRADE
MH	MANHOLE
(N)	NORTH
NPS	NATIONAL PARK SERVICE
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATON
PE	POLYETHYLENE
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
R	RADIUS
REQ'D	REQUIRED
ROW	RIGHT-OF-WAY
RW	RETAINING WALL
(N)	SOUTH
SB	SOIL BORING
SF, SQFT	SQUARE FEET
SPCL	SPECIAL
STRUC	STRUCTURE
TC	TOP OF CURB
TEL	TELEPHONE
TP	TOP OF PAVEMENT
TS	TOP OF SLAB
TW	TOP OF WALL
TYP	TYPICAL
UC	UTILITY CROSSING
W	WIRE
(W)	WEST
W/	WITH
WTR	WATER

ACCESSIBILITY GUIDELINE NOTES:

1. CURB RAMP:
   TARGET MAX. RUNNING SLOPE 7.5%

2. ACCESSIBLE PARKING PAD:
   TARGET MAX. CROSS SLOPE IN ANY DIRECTION 1.5%

3. CROSSWALKS AND ACCESSIBLE ROUTES:
   TARGET MAX. RUNNING SLOPE 4.0%
   TARGET MAX. CROSS SLOPE 1.5%

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5	G4	CONTRACTOR STAGING & CONSTRUCTION ACCESS
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55	S2.0	OUTLOOK PLATFORM FRAMING PLAN
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Kentucky 811

BEFORE YOU DIG

The contractor is instructed to call 1–800–752–6007 to reach KY 811, the one–call system for information on the location of existing underground utilities. The call is to be placed a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor should be aware that owners of underground facilities are not required to be members of the KY 811 one–call Before–U–Dig (BUD) service. The contractor must coordinate excavation with the utility owners, including those whom do not subscribe to KY 811. It may be necessary for the contractor to contact the County Court Clerk to determine what utility companies have facilities in the area.

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	G1	GENERAL NOTES & ABBREVIATIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 2 OF 56
	DATE: JANUARY 2024			

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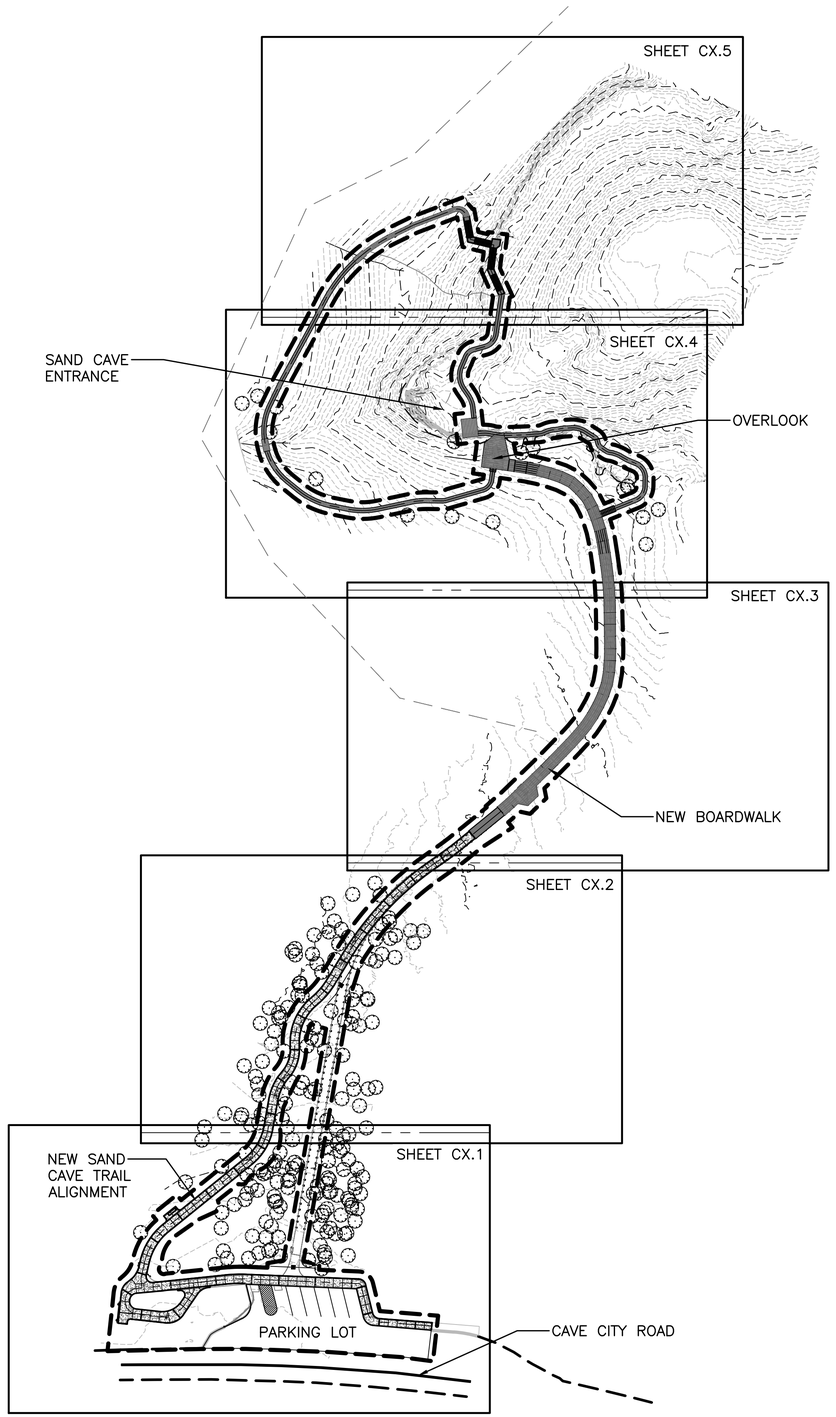

0 25 50 100 Feet

STATE OF KENTUCKY
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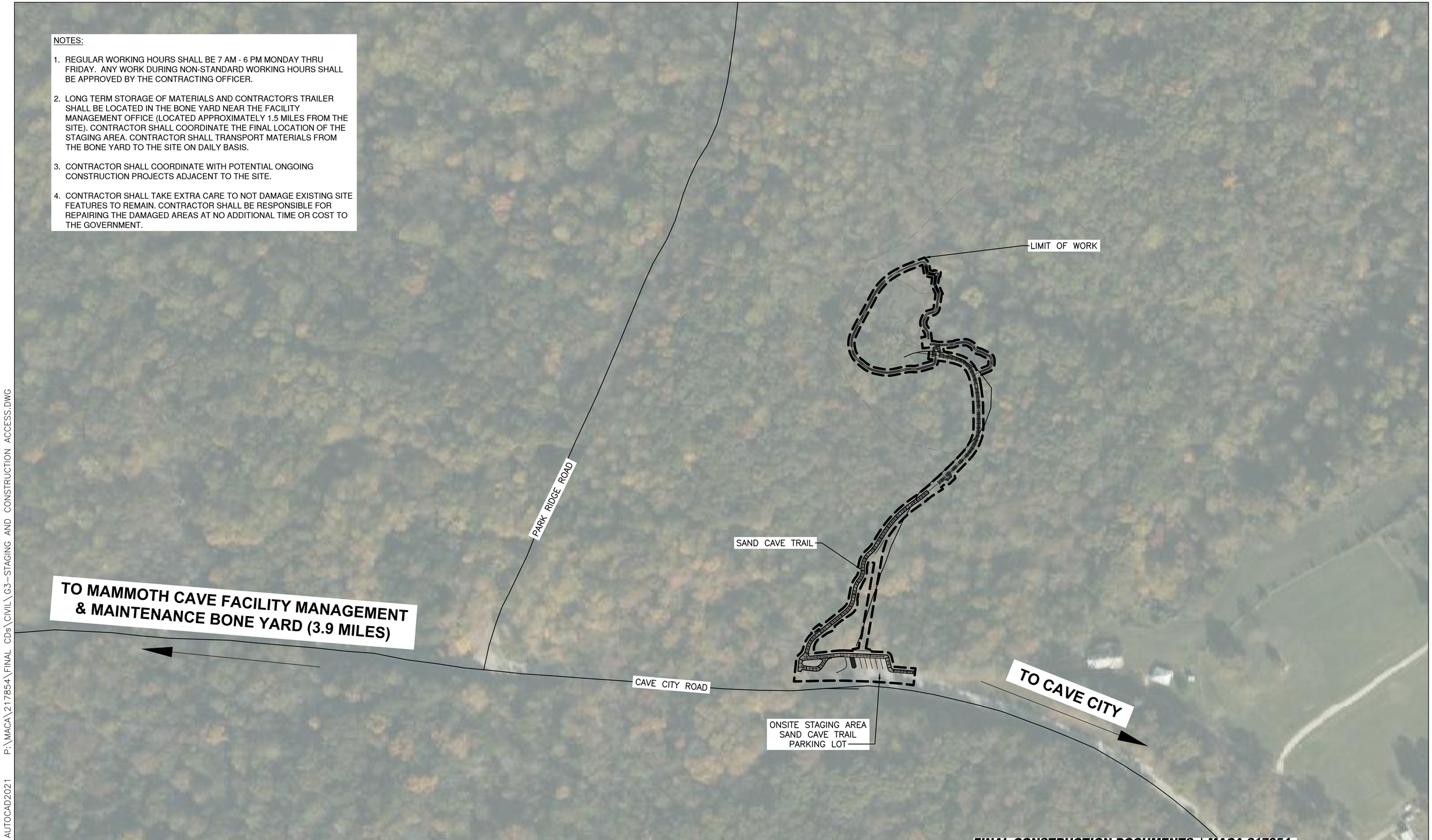
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	G2	OVERALL SHEET LAYOUT	135
SUB: AMI VIRGINIA, MI AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 3 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\G2-OVERALL SHEET LAYOUT.DWG

NOTES:

1. REGULAR WORKING HOURS SHALL BE 7 AM - 6 PM MONDAY THRU FRIDAY. ANY WORK DURING NON-STANDARD WORKING HOURS SHALL BE APPROVED BY THE CONTRACTING OFFICER.
2. LONG TERM STORAGE OF MATERIALS AND CONTRACTOR'S TRAILER SHALL BE LOCATED IN THE BONE YARD NEAR THE FACILITY MANAGEMENT OFFICE (LOCATED APPROXIMATELY 1.5 MILES FROM THE SITE). CONTRACTOR SHALL COORDINATE THE FINAL LOCATION OF THE STAGING AREA. CONTRACTOR SHALL TRANSPORT MATERIALS FROM THE BONE YARD TO THE SITE ON DAILY BASIS.
3. CONTRACTOR SHALL COORDINATE WITH POTENTIAL ONGOING CONSTRUCTION PROJECTS ADJACENT TO THE SITE.
4. CONTRACTOR SHALL TAKE EXTRA CARE TO NOT DAMAGE EXISTING SITE FEATURES TO REMAIN. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING THE DAMAGED AREAS AT NO ADDITIONAL TIME OR COST TO THE GOVERNMENT.



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 40 80 160 Feet

STATE OF KENTUCKY
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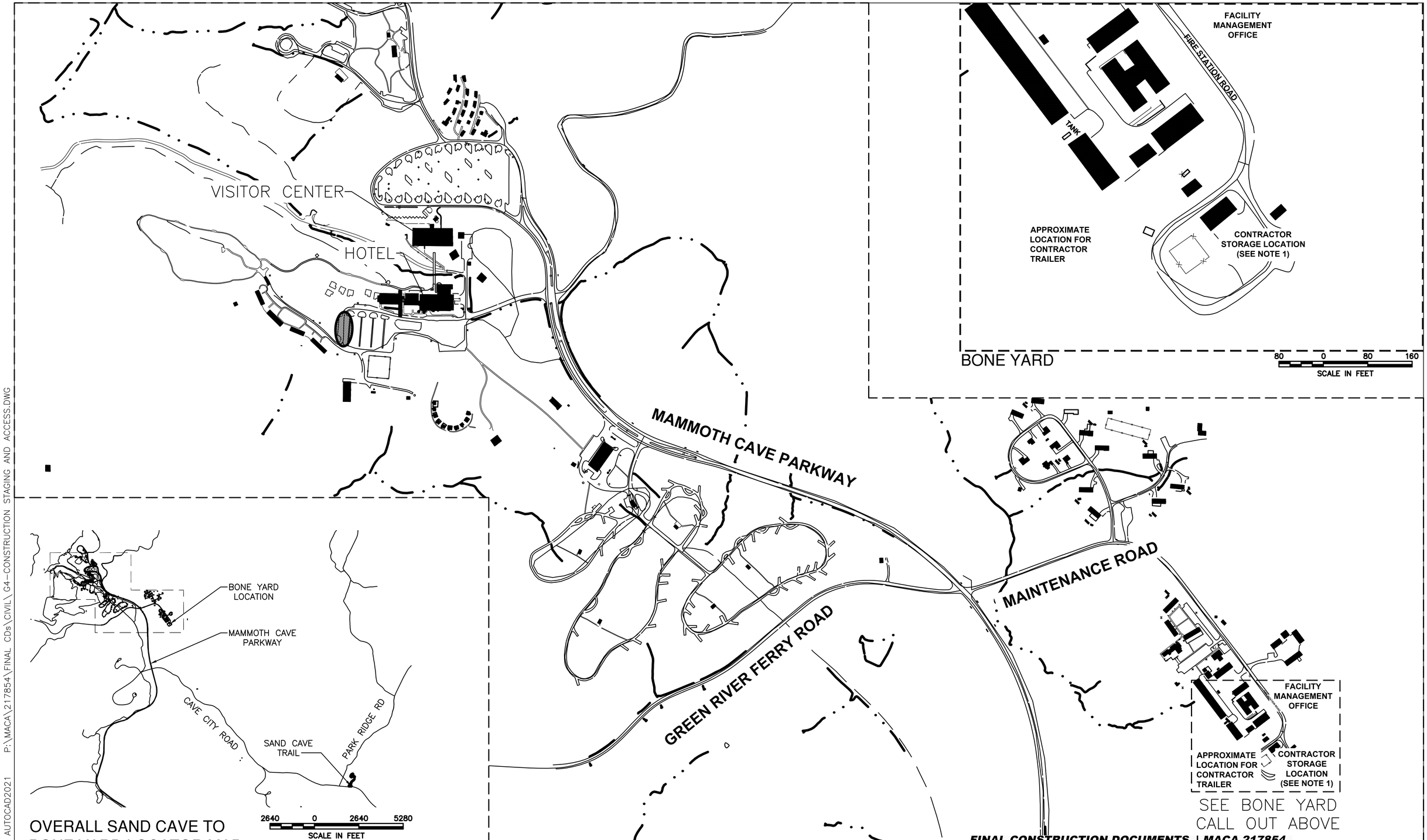
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA SUB: AMI VIRGINIA, MI AEI MADISON, WI	DM/ST CADD LY/ST TECH. REVIEW: TH DATE: JANUARY 2024	G3	CONSTRUCTION STAGING AND ACCESS RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	135 PMIS/PKG NO. 217854 SHEET 4 OF 56

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\G3-STAGING AND CONSTRUCTION ACCESS.DWG



OVERALL SAND CAVE TO BONE YARD LOCATOR MAP. FOR DETAIL, SEE MAP AT RIGHT AND BONE YARD CALL OUT

NOTE:

1. CONTRACTOR TO RECEIVE APPROVAL FROM THE CONTRACTING OFFICER (CO) REGARDING EXACT LOCATION FOR STORAGE WITHIN THE BONE YARD.
2. DISTANCE FROM SAND CAVE TRAIL TO BONE YARD IS APPROXIMATELY 3.9 MILES.

0 125 250 500 Feet

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FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	G4	CONSTRUCTION STAGING AND ACCESS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 5 OF 56
	DATE: JANUARY 2024			

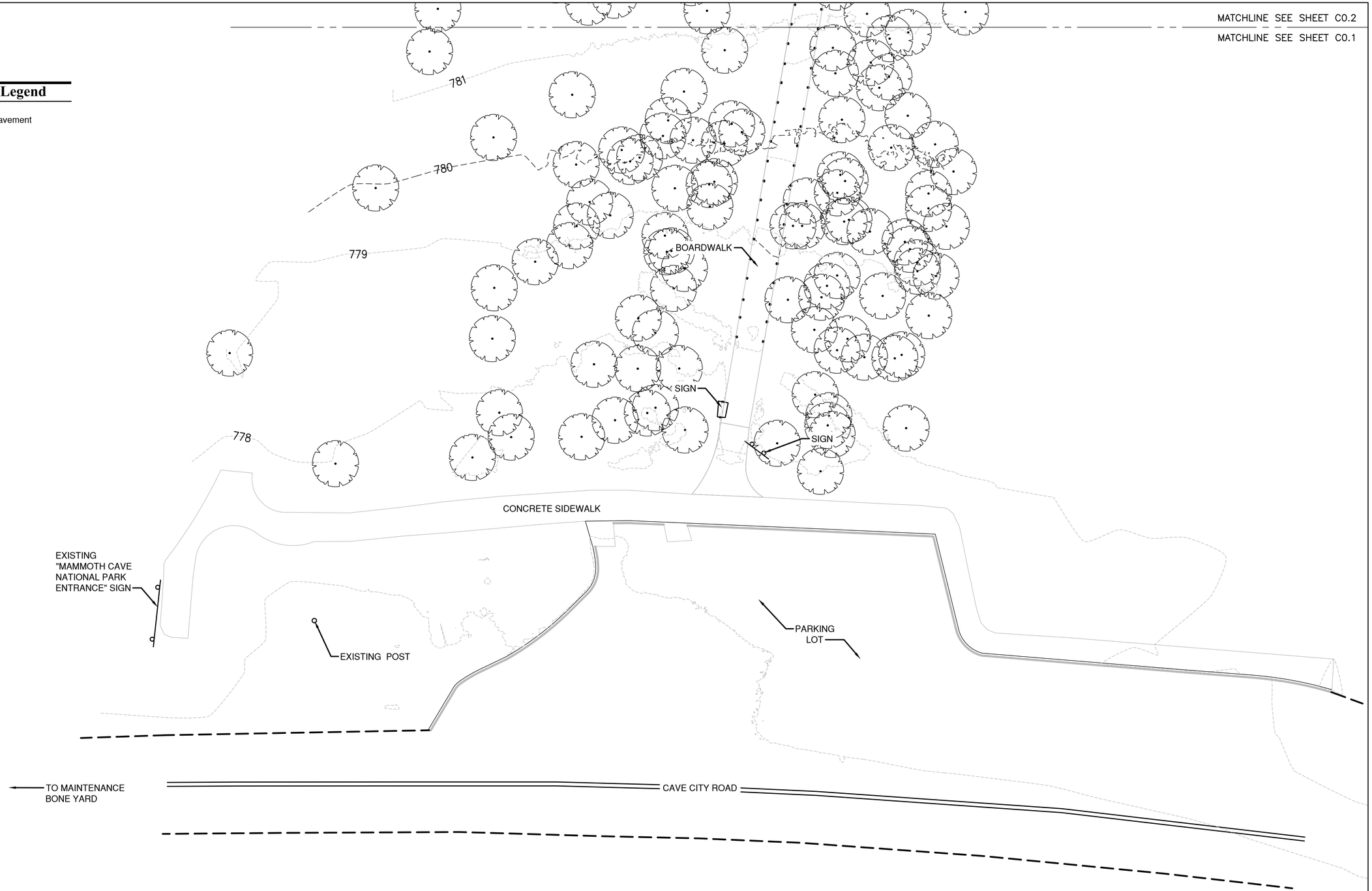
31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\G4-CONSTRUCTION STAGING AND ACCESS.DWG

MATCHLINE SEE SHEET C0.2

MATCHLINE SEE SHEET C0.1

Existing Conditions Legend

- Existing Concrete Pavement
- Existing Trees
- 10 Existing Contours
- Signage



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

STATE OF KENTUCKY
TIMOTHY J. HOGAN
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A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C0.1	EXISTING CONDITIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 6 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	

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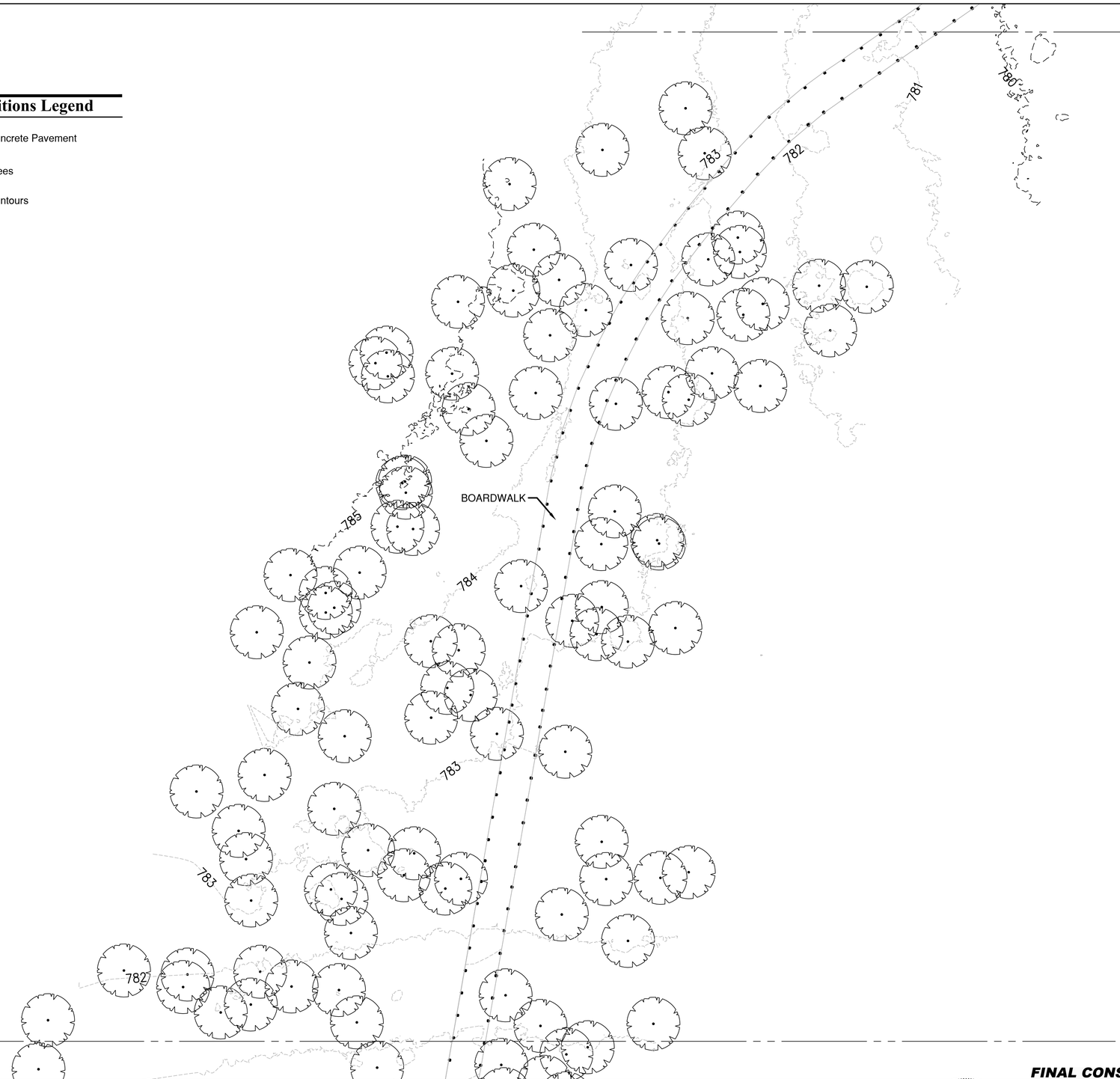
MATCHLINE SEE SHEET C0.3

MATCHLINE SEE SHEET C0.2

Existing Conditions Legend

- Existing Concrete Pavement
- Existing Trees
- 10 Existing Contours
- Signage



MATCHLINE SEE SHEET C0.2

MATCHLINE SEE SHEET C0.1

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

STATE OF KENTUCKY
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A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C0.2	EXISTING CONDITIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 7 OF 56
	DATE: JANUARY 2024			

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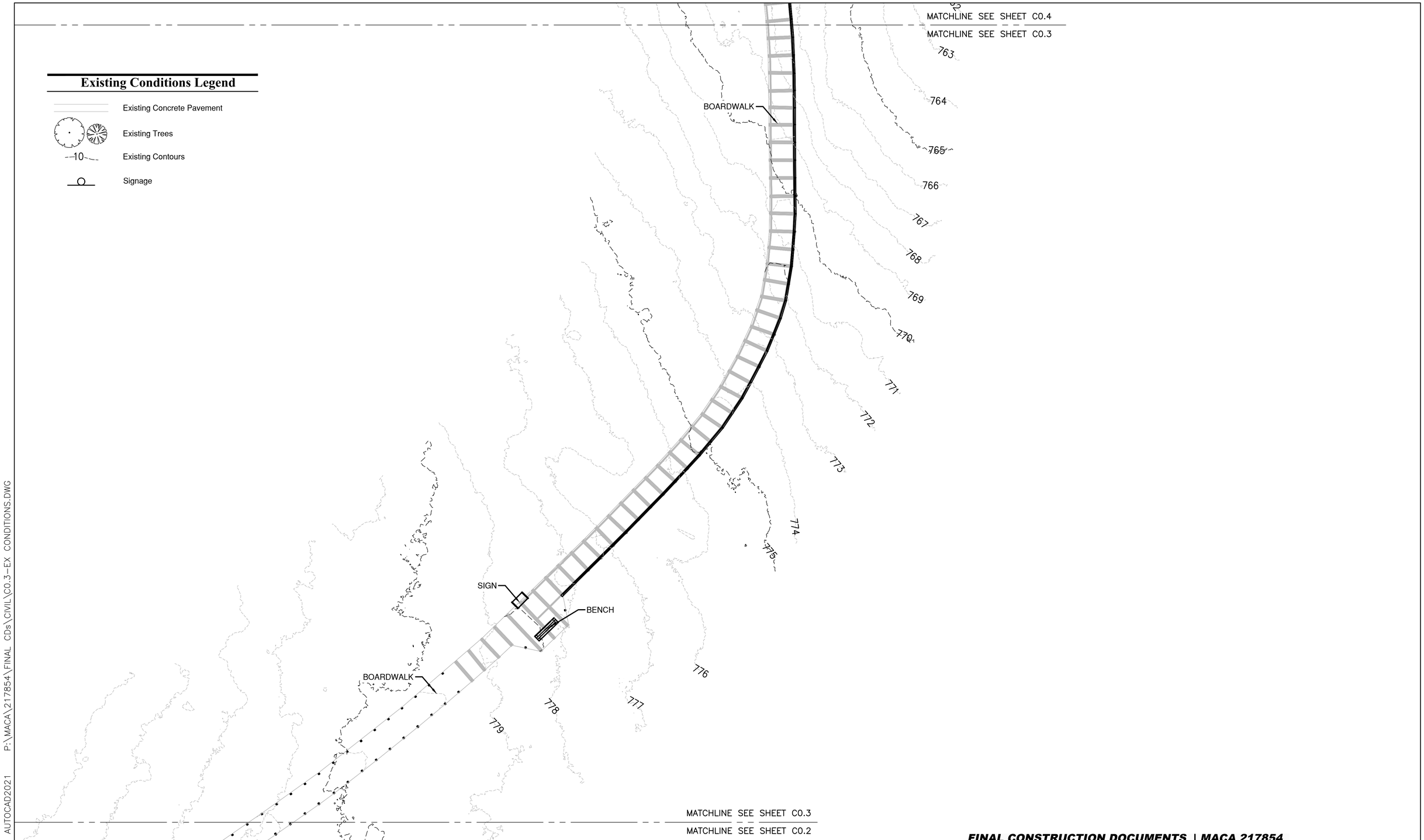

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

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PRIME: VHB WILLIAMSBURG, VA	DM/ST	C0.3	EXISTING CONDITIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
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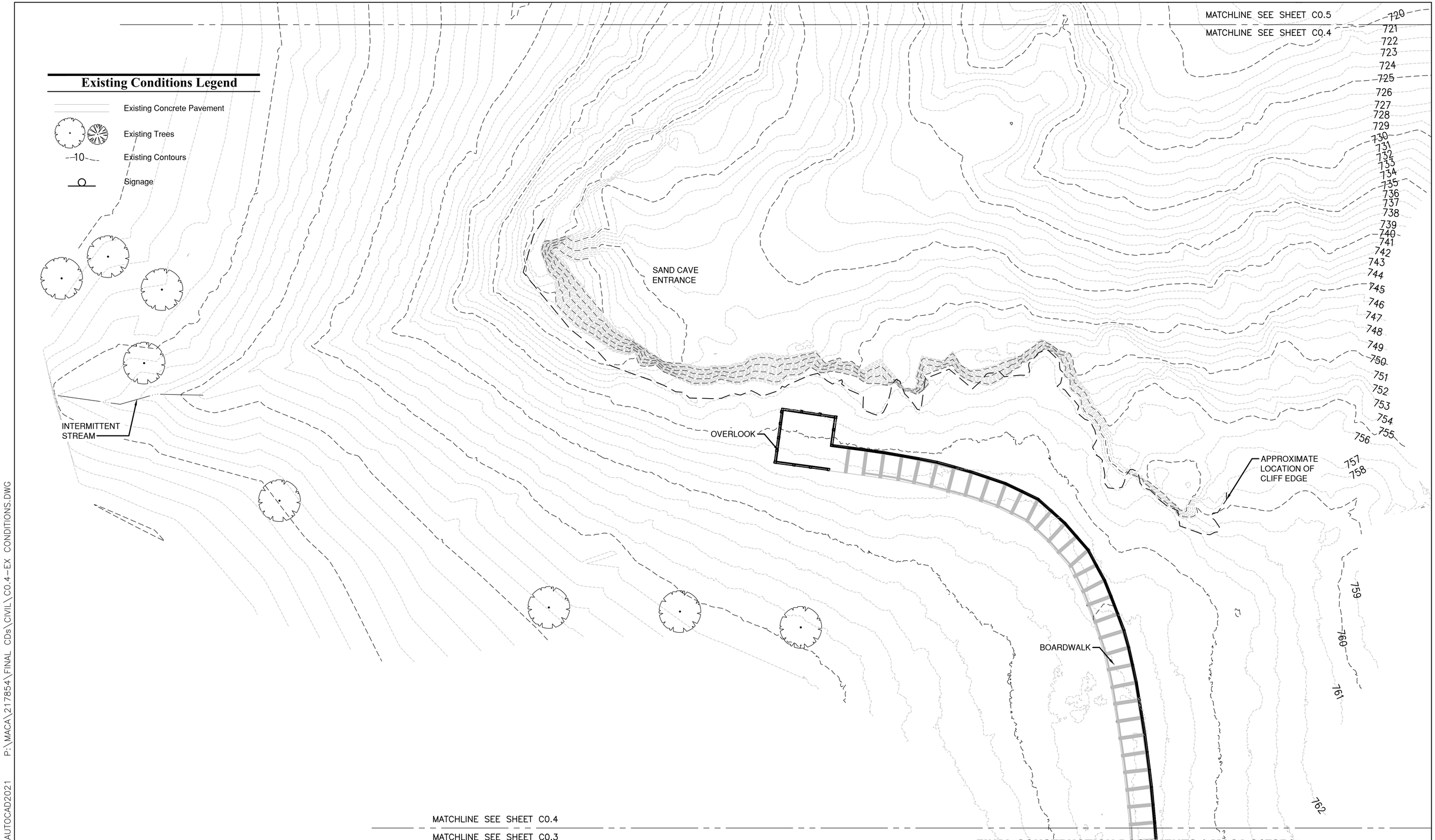

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

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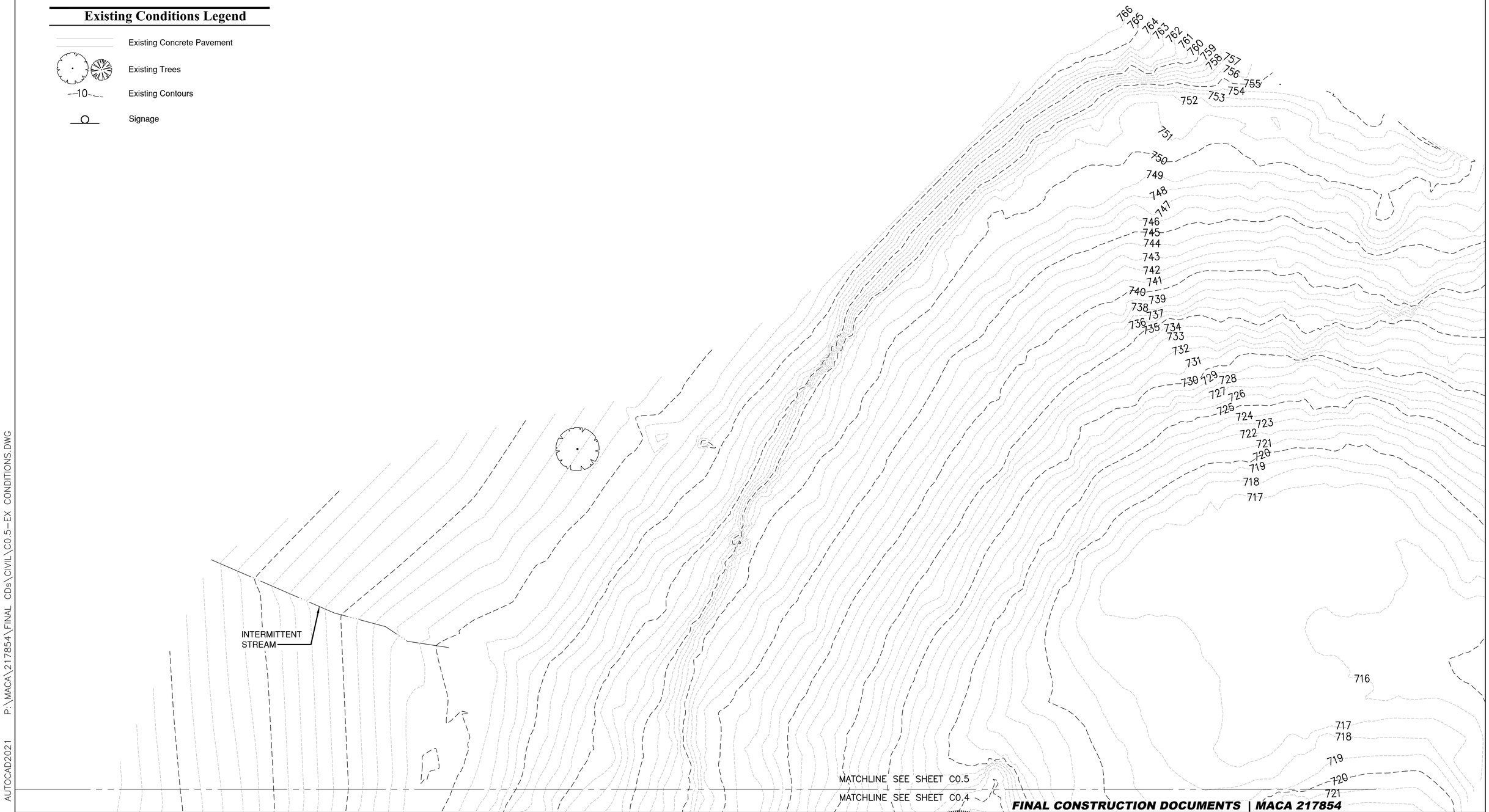
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C0.4	EXISTING CONDITIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 9 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C0.4-EX CONDITIONS.DWG

Existing Conditions Legend

- Existing Concrete Pavement
- Existing Trees
- 10 Existing Contours
- Signage



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

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A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C0.5	EXISTING CONDITIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 10 OF 56
	DATE: JANUARY 2024			

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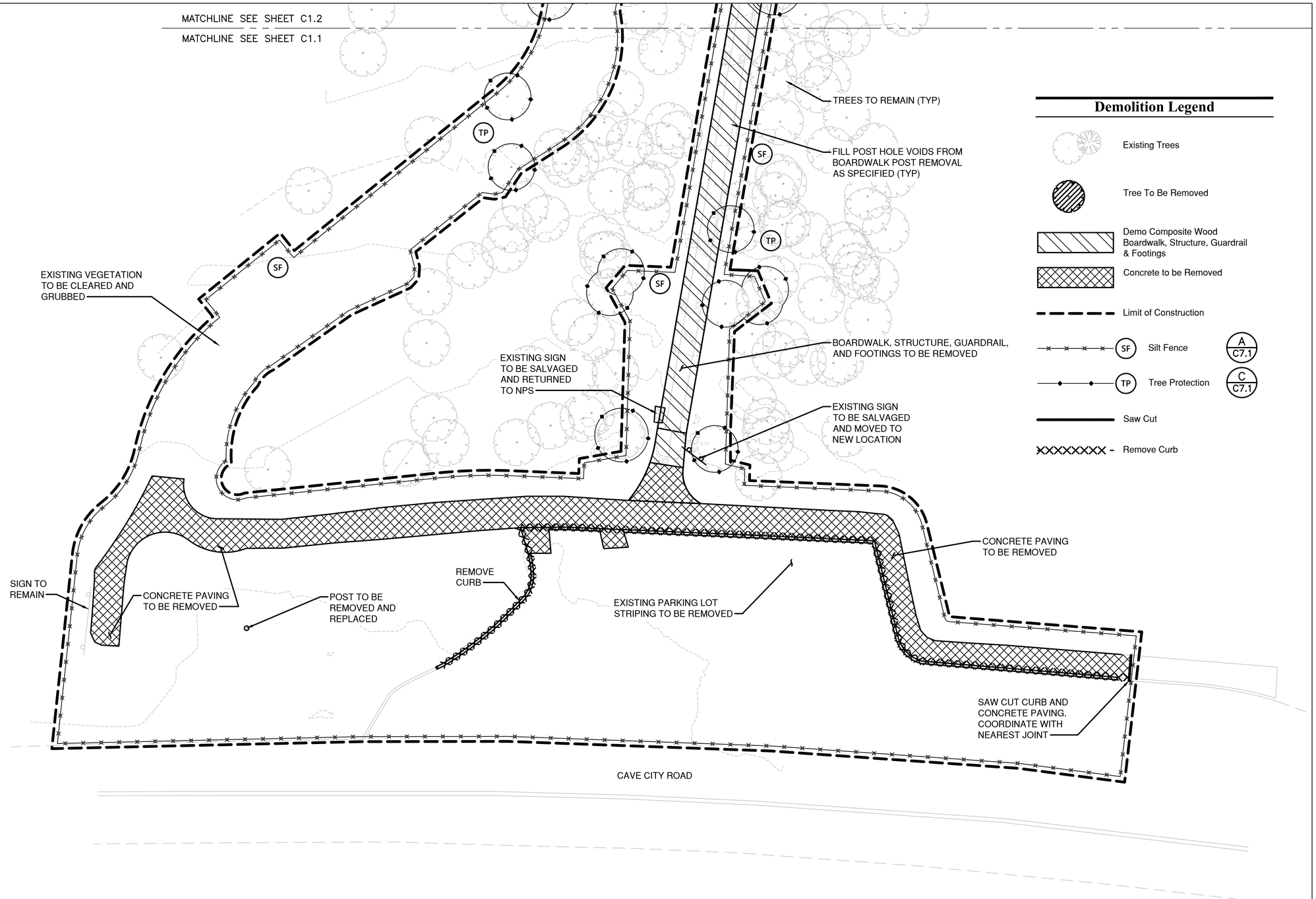


Demolition Legend

- Existing Trees
- Tree To Be Removed
- Demo Composite Wood Boardwalk, Structure, Guardrail & Footings
- Concrete to be Removed
- Limit of Construction
- SF Silt Fence — A / C7.1
- TP Tree Protection — C / C7.1
- Saw Cut
- Remove Curb

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

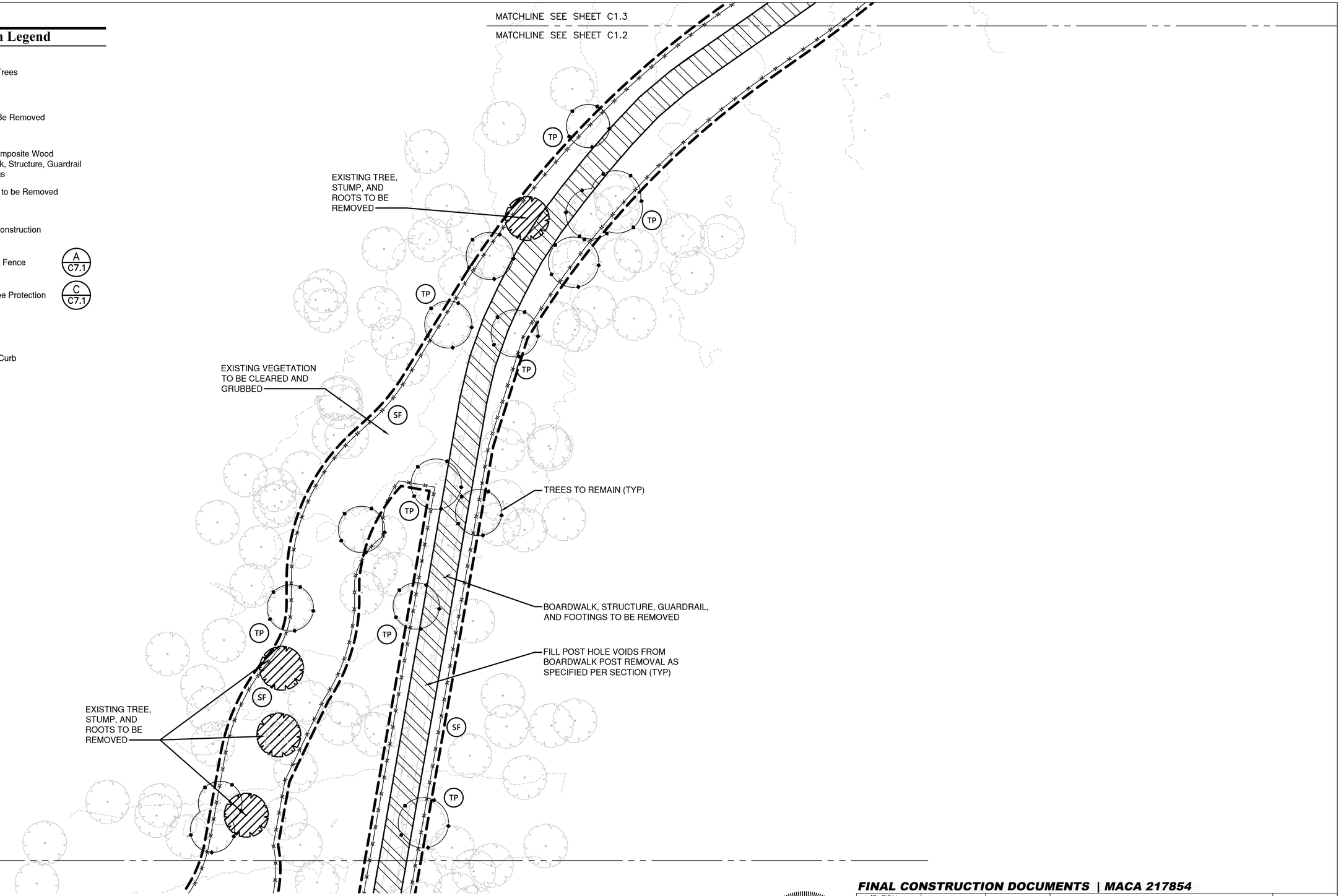
STATE OF KENTUCKY · TIMOTHY J. HOGAN · 26364 · 1/31/2024 · LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C1.1	DEMOLITION AND EROSION & SEDIMENT CONTROL PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 11 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C1.1-DEMO.DWG

Demolition Legend

- Existing Trees
- Tree To Be Removed
- Demo Composite Wood Boardwalk, Structure, Guardrail & Footings
- Concrete to be Removed
- Limit of Construction
- SF Silt Fence — A / C7.1
- TP Tree Protection — C / C7.1
- Saw Cut
- Remove Curb



0 5 10 20 Feet

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C1.2	DEMOLITION AND EROSION & SEDIMENT CONTROL PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 12 OF 56
	DATE: JANUARY 2024			

COMMONWEALTH OF KENTUCKY — TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

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MATCHLINE SEE SHEET C1.4

MATCHLINE SEE SHEET C1.3

SF

BOARDWALK, STRUCTURE, GUARDRAIL, AND FOOTINGS TO BE REMOVED

SF

EXISTING SIGN TO BE REMOVED

BENCH TO BE REMOVED

SF

MATCHLINE SEE SHEET C1.3

MATCHLINE SEE SHEET C1.2

Demolition Legend

- Existing Trees
- Tree To Be Removed
- Demo Composite Wood Boardwalk, Structure, Guardrail & Footings
- Concrete to be Removed
- Limit of Construction
- SF Silt Fence — A / C7.1
- TP Tree Protection — C / C7.1
- Saw Cut
- Remove Curb

0 5 10 20 Feet

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C1.3	DEMOLITION AND EROSION & SEDIMENT CONTROL PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 13 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C1.3-DEMO.DWG

MATCHLINE SEE SHEET C1.5

MATCHLINE SEE SHEET C1.4

SF

TP

SF

TP

SF

SF

EXISTING TREE, STUMP, AND ROOTS TO BE REMOVED

OVERLOOK

BOARDWALK, STRUCTURE, GUARDRAIL, AND FOOTINGS TO BE REMOVED

APPROXIMATE LOCATION OF CLIFF EDGE

SF

TP

TP

Demolition Legend

- Existing Trees
- Tree To Be Removed
- Demo Composite Wood Boardwalk, Structure, Guardrail & Footings
- Concrete to be Removed
- Limit of Construction
- SF — Silt Fence (A / C7.1)
- TP — Tree Protection (C / C7.1)
- Saw Cut
- Remove Curb

MATCHLINE SEE SHEET C1.4

MATCHLINE SEE SHEET C1.3

0 5 10 20 Feet

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TIMOTHY J. HOGAN
26364
1/31/2024
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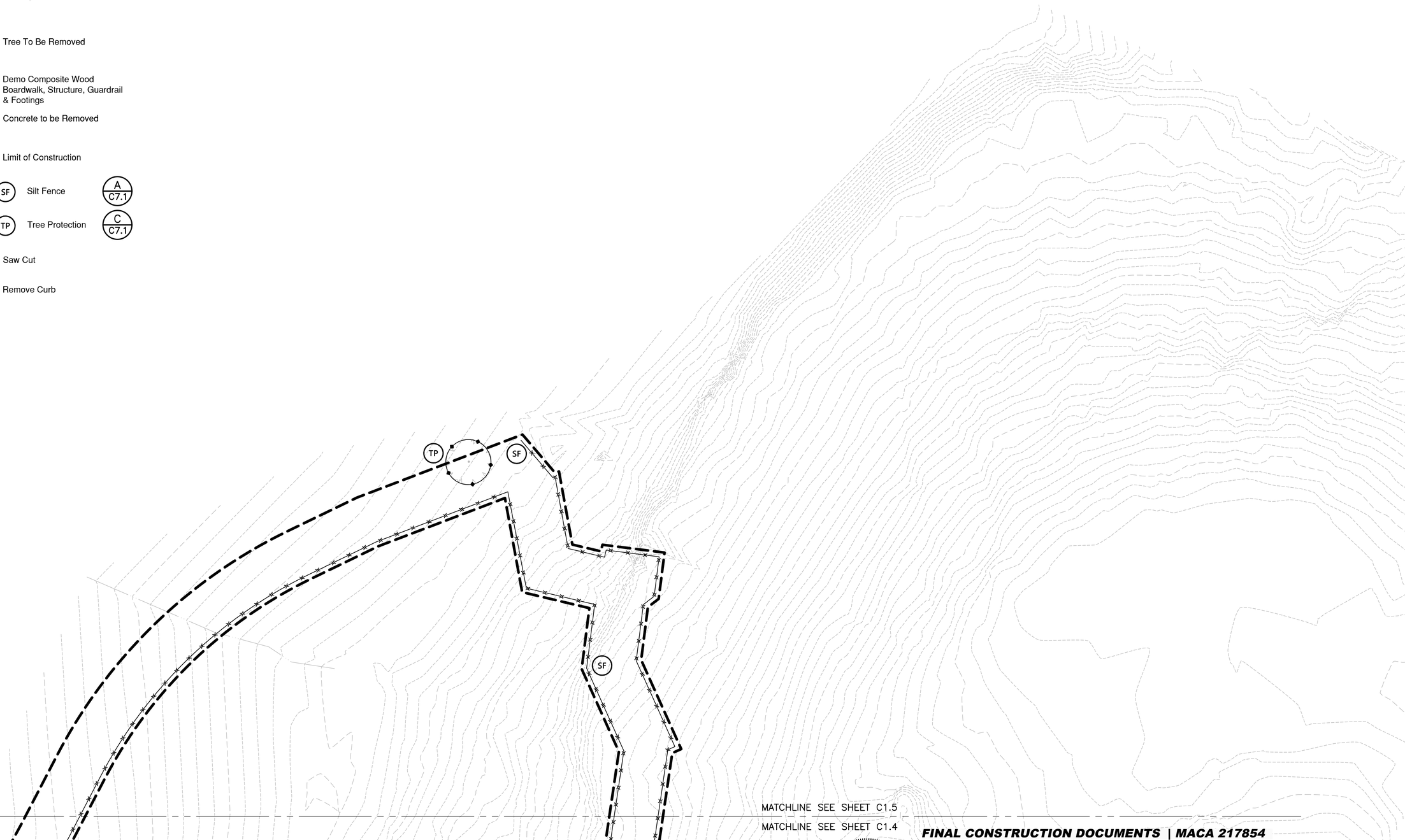
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C1.4	DEMOLITION AND EROSION & SEDIMENT CONTROL PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 14 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C1.4-DEMO.DWG

Demolition Legend

- Existing Trees
- Tree To Be Removed
- Demo Composite Wood Boardwalk, Structure, Guardrail & Footings
- Concrete to be Removed
- Limit of Construction
- SF — Silt Fence (A / C7.1)
- TP — Tree Protection (C / C7.1)
- Saw Cut
- Remove Curb



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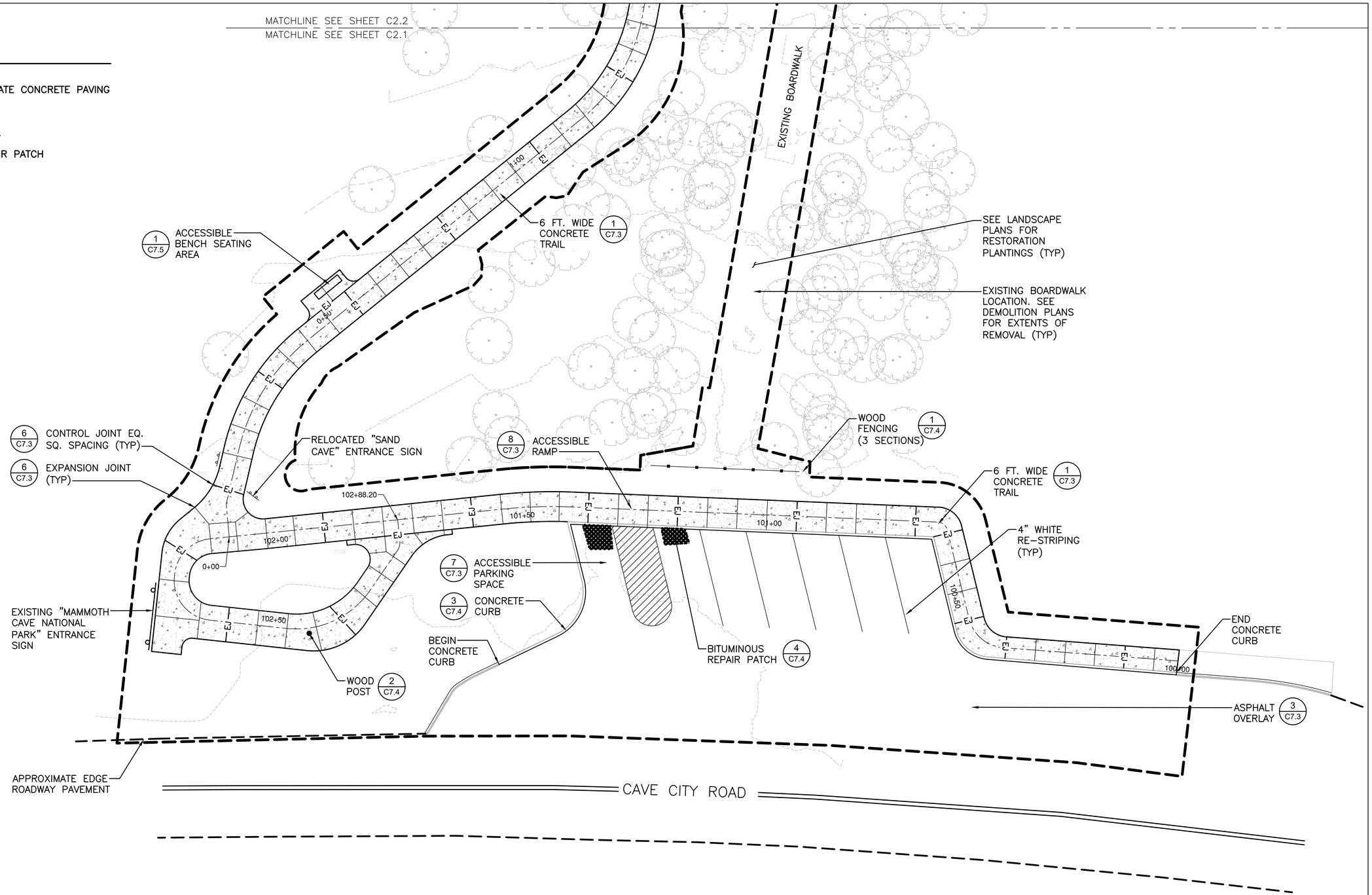
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C1.5	DEMOLITION AND EROSION & SEDIMENT CONTROL PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 15 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C1.5-DEMO.DWG

SITE PLAN LEGEND

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- BITUMINOUS REPAIR PATCH
- WOOD FENCING



0 5 10 20 Feet

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

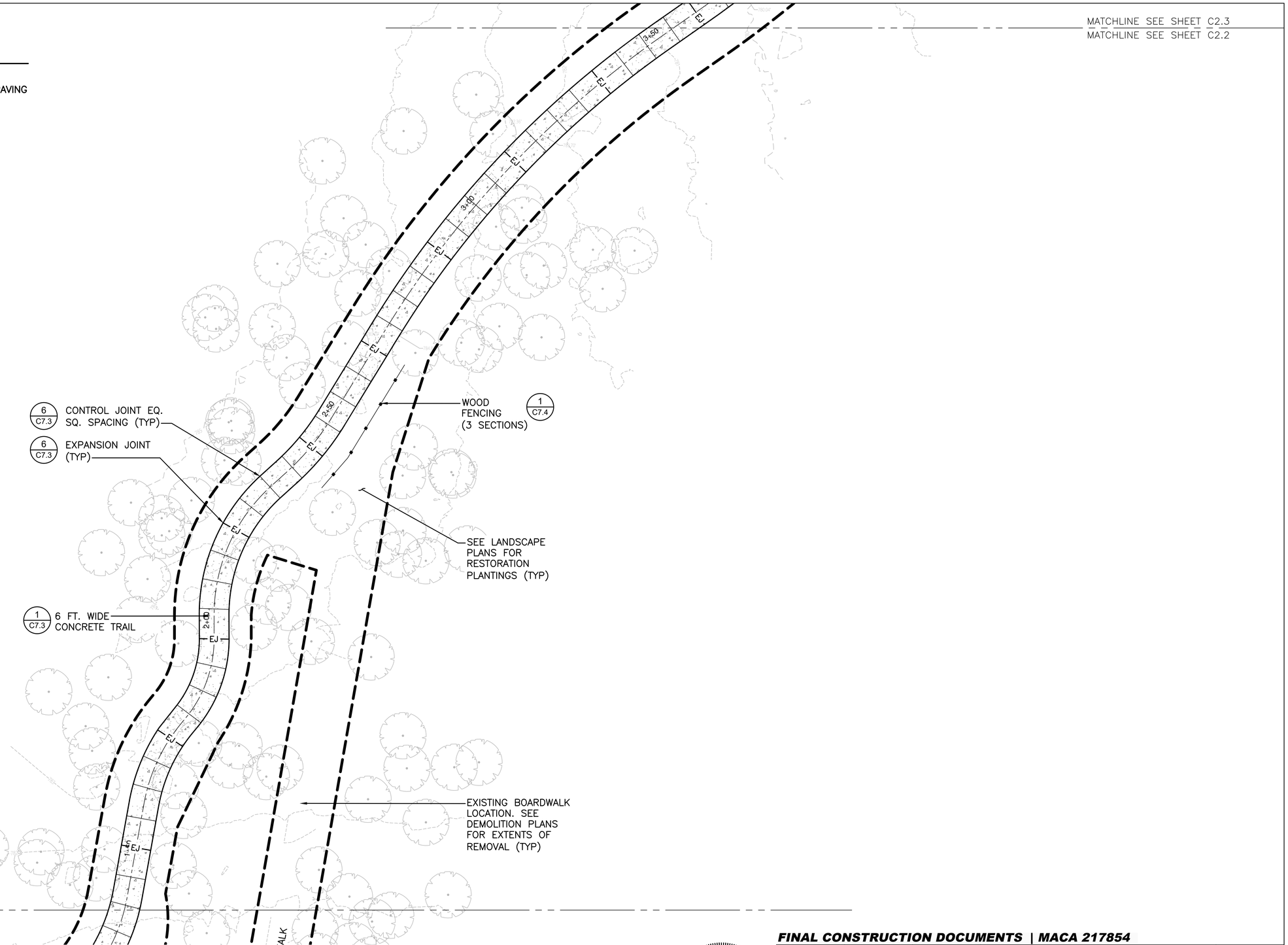
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C2.1	SITE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 16 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C2.1-SP.DWG

SITE PLAN LEGEND

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- BITUMINOUS REPAIR PATCH
- WOOD FENCING



0 5 10 20 Feet

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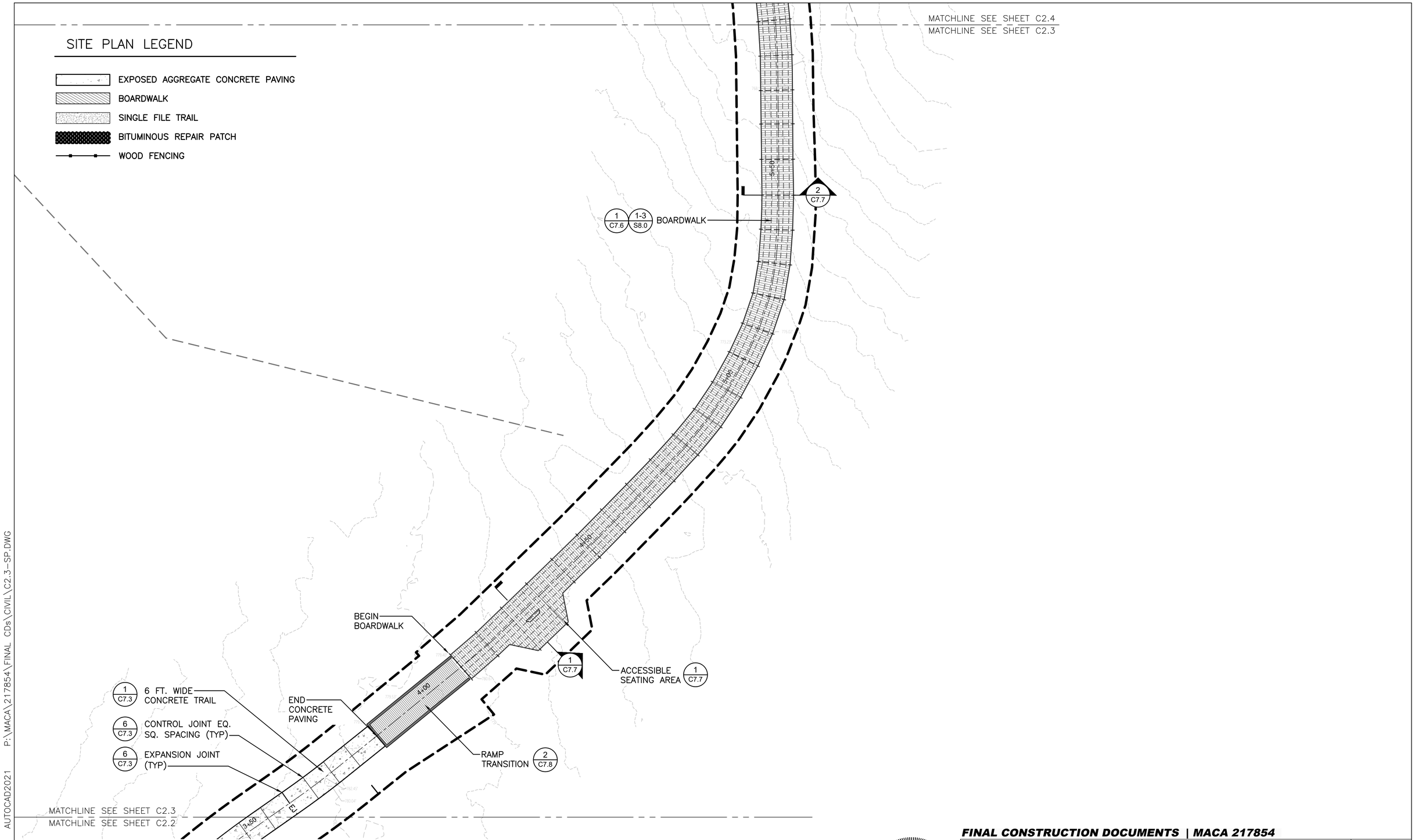
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C2.2	SITE PLAN	135
SUB: AMI VIRGINIA, MI AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 17 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C2.2-SP.DWG



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY
TIMOTHY J. HOGAN
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1/31/2024
LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C2.3	SITE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 18 OF 56
	DATE: JANUARY 2024			

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MATCHLINE SEE SHEET C2.5
MATCHLINE SEE SHEET C2.4

3 FT. WIDE SINGLE FILE TRAIL (4/C7.3)

CAVE ENTRANCE

WOOD PLATFORM (2/C7.7)

(1/C7.9)

3 FT. WIDE SINGLE FILE TRAIL BELOW (4/C7.3)

APPROXIMATE LOCATION OF CLIFF EDGE

APPROXIMATE LOCATION OF EXISTING PATH CENTERLINE BELOW

INTERMITTENT STREAM

FOOTBRIDGE (3/C7.7)

7+46.74

(1/S9.0) OVERLOOK

WOOD STEPS DOWN TO GRADE

(2/C7.6)

17+41.39

3 FT. WIDE SINGLE FILE TRAIL (4/C7.3)

WOOD STEPS DOWN TO GRADE.

12+50 12+00 11+50 11+00 10+50 15+00 15+50 16+00 16+50 17+00

MATCHLINE SEE SHEET C2.4
MATCHLINE SEE SHEET C2.3

SITE PLAN LEGEND

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- BITUMINOUS REPAIR PATCH
- WOOD FENCING

0 5 10 20 Feet

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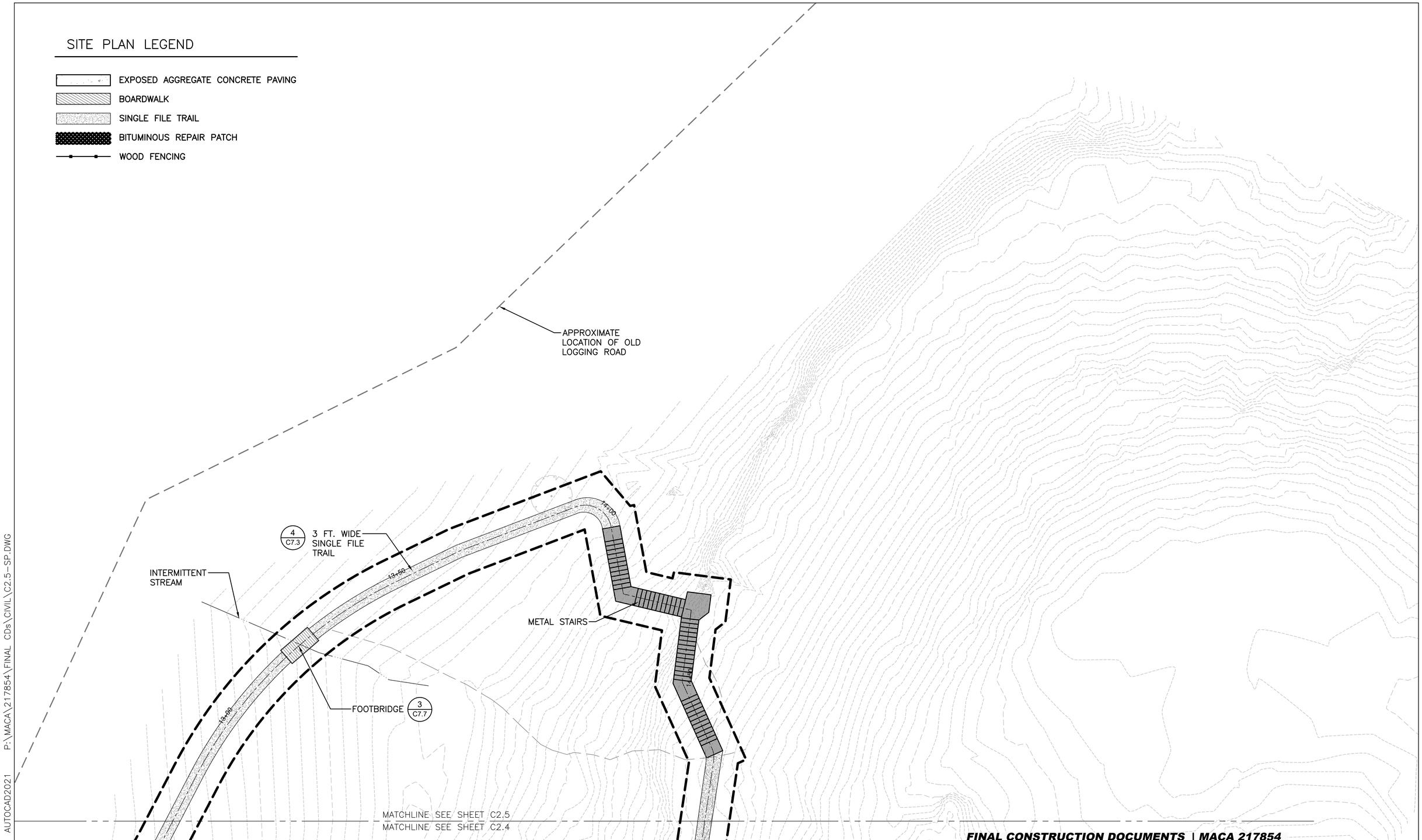
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C2.4	SITE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 19 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C2.4-SP.DWG

SITE PLAN LEGEND

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- BITUMINOUS REPAIR PATCH
- WOOD FENCING



0 5 10 20 Feet

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

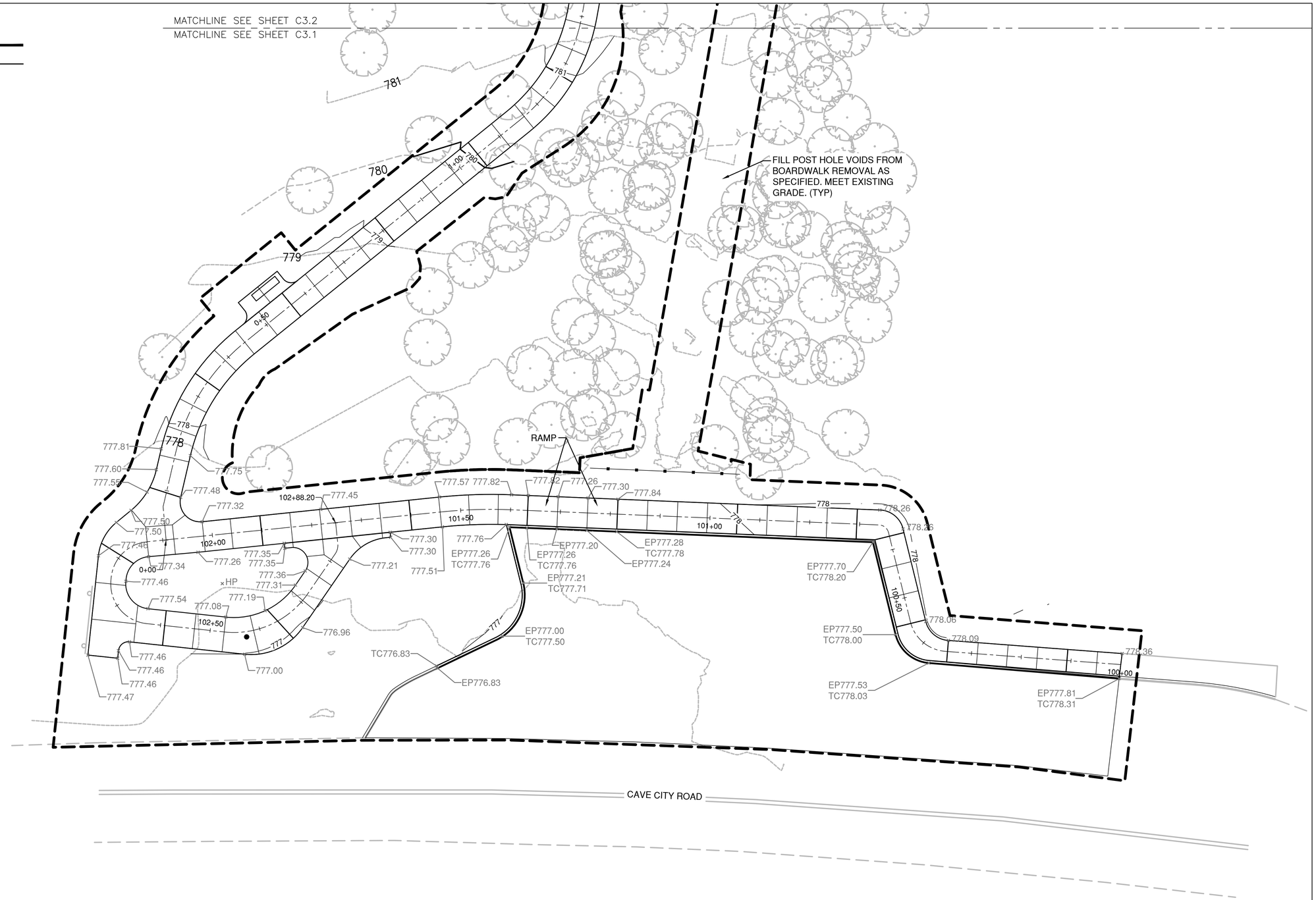
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C2.5	SITE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 20 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C2.5-SP.DWG

Grading Legend

+ 10.38	Proposed Spot Elevation
TS	Top of Steps
BS	Bottom of Steps
MG	Meet Existing Grade
10	Existing Contours
10	Proposed Contours
	Concrete Trail
	Limit of Construction



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

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1/31/2024
LICENSED PROFESSIONAL ENGINEER

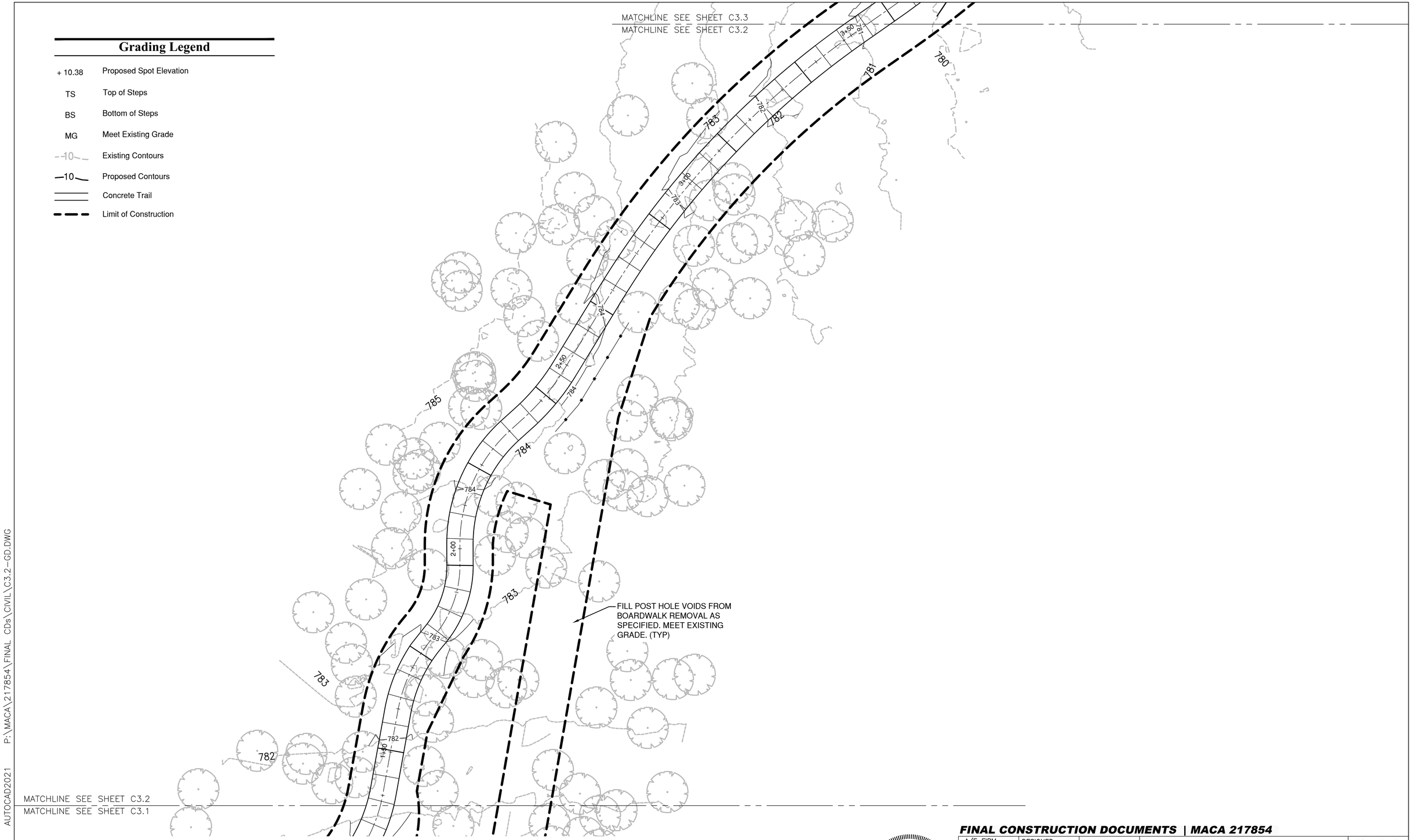
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C3.1	GRADING & DRAINAGE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 21 OF 56
	DATE: JANUARY 2024			

0 5 10 20 Feet

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C3.1-GD.DWG

Grading Legend

+ 10.38	Proposed Spot Elevation
TS	Top of Steps
BS	Bottom of Steps
MG	Meet Existing Grade
10	Existing Contours
10	Proposed Contours
	Concrete Trail
	Limit of Construction



0 5 10 20 Feet

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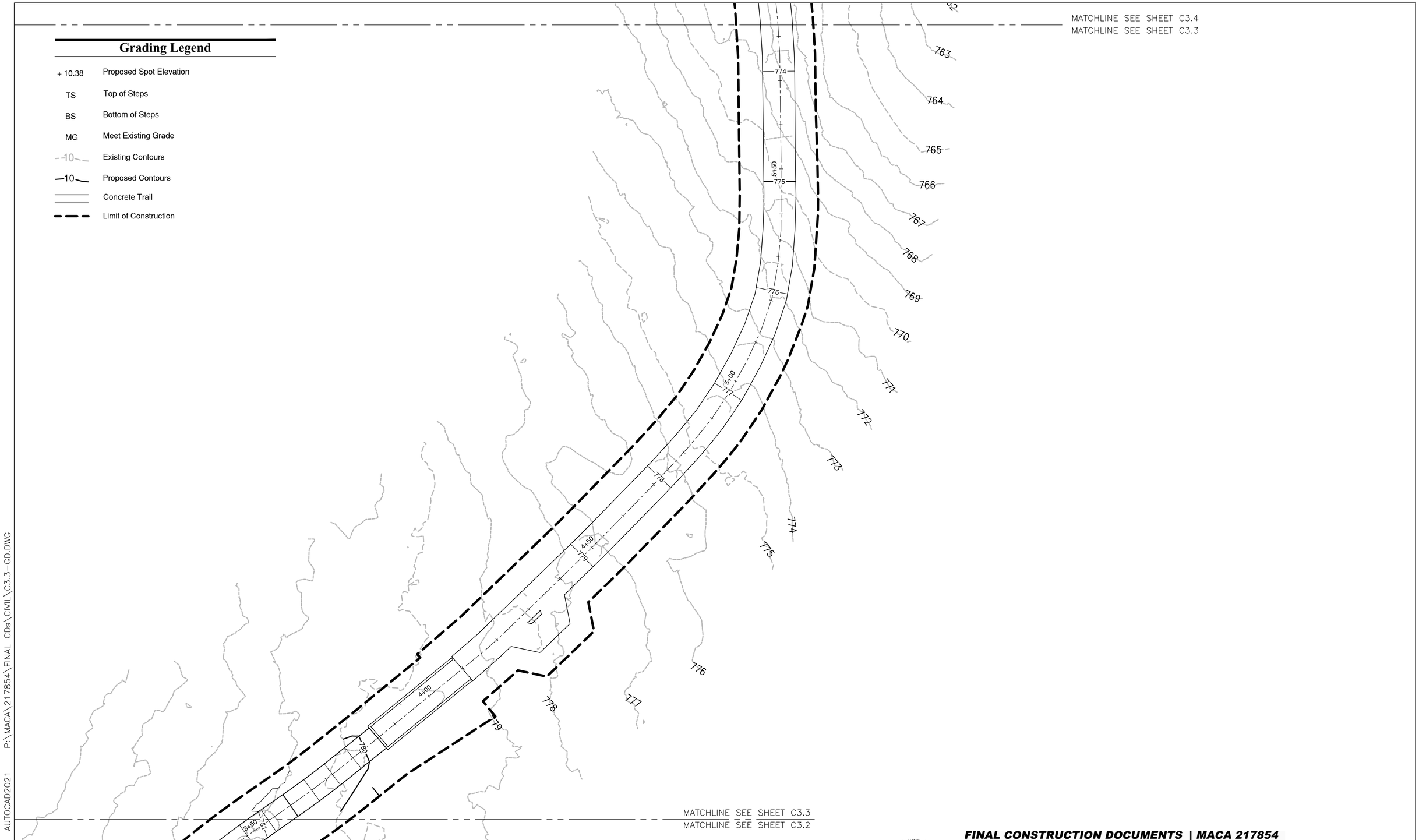
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C3.2	GRADING & DRAINAGE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 22 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C3.2-GD.DWG

Grading Legend

+ 10.38	Proposed Spot Elevation
TS	Top of Steps
BS	Bottom of Steps
MG	Meet Existing Grade
10	Existing Contours
10	Proposed Contours
	Concrete Trail
	Limit of Construction



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

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A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C3.3	GRADING & DRAINAGE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 23 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C3.3-GD.DWG

MATCHLINE SEE SHEET C3.5
MATCHLINE SEE SHEET C3.4

WOOD PLATFORM

WOOD BENCH

FOOTBRIDGE

WOOD STEPS DOWN TO GRADE

APPROXIMATE LOCATION OF CLIFF EDGE

WOOD STEPS DOWN TO GRADE

Grading Legend

+ 10.38	Proposed Spot Elevation
TS	Top of Steps
BS	Bottom of Steps
MG	Meet Existing Grade
10	Existing Contours
10	Proposed Contours
	Concrete Trail
	Limit of Construction

MATCHLINE SEE SHEET C3.4
MATCHLINE SEE SHEET C3.3

0 5 10 20 Feet

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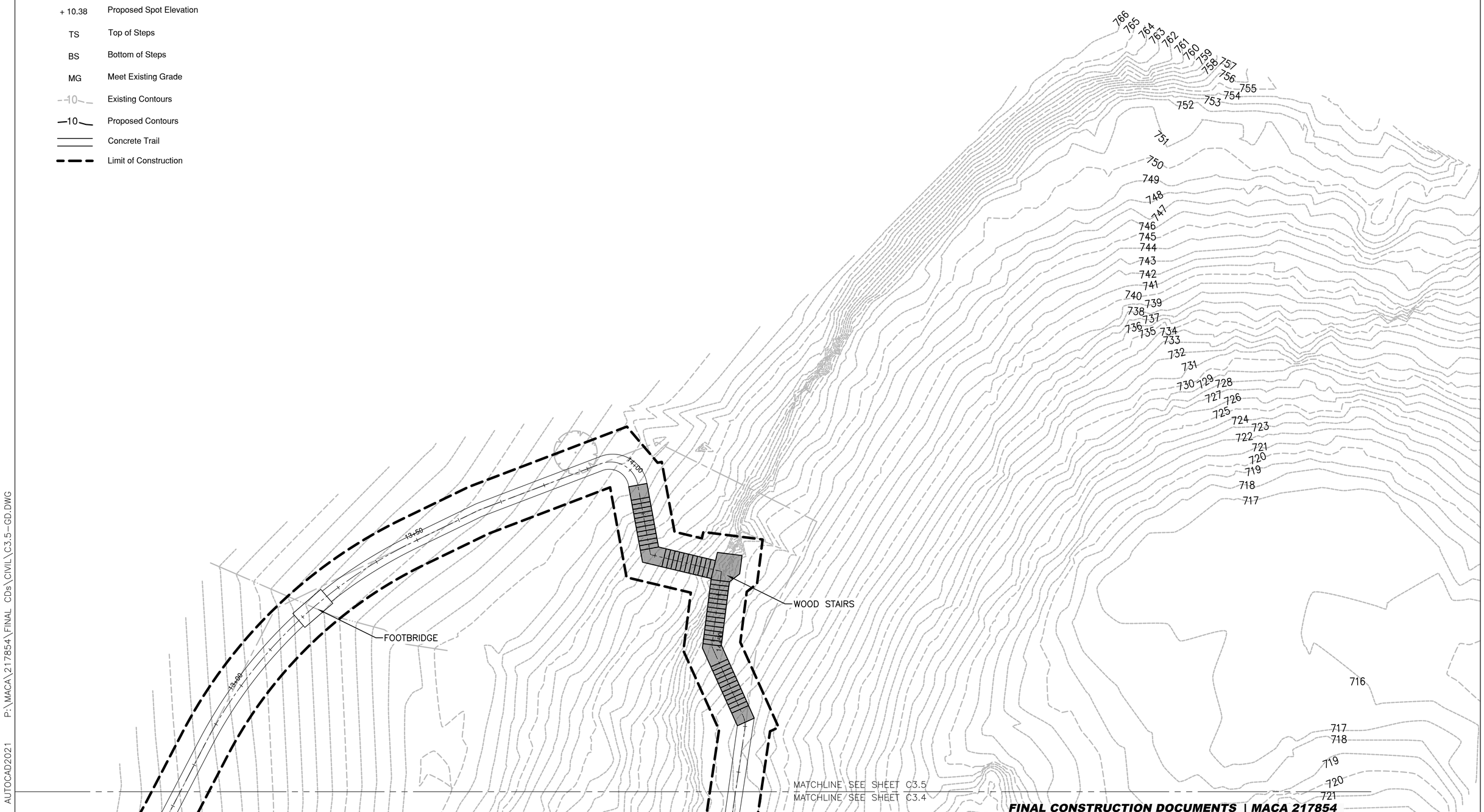
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C3.4	GRADING & DRAINAGE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 24 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C3.4-GD.DWG

Grading Legend

+ 10.38	Proposed Spot Elevation
TS	Top of Steps
BS	Bottom of Steps
MG	Meet Existing Grade
10	Existing Contours
10	Proposed Contours
	Concrete Trail
	Limit of Construction



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0 5 10 20 Feet

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C3.5	GRADING & DRAINAGE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 25 OF 56
	DATE: JANUARY 2024			

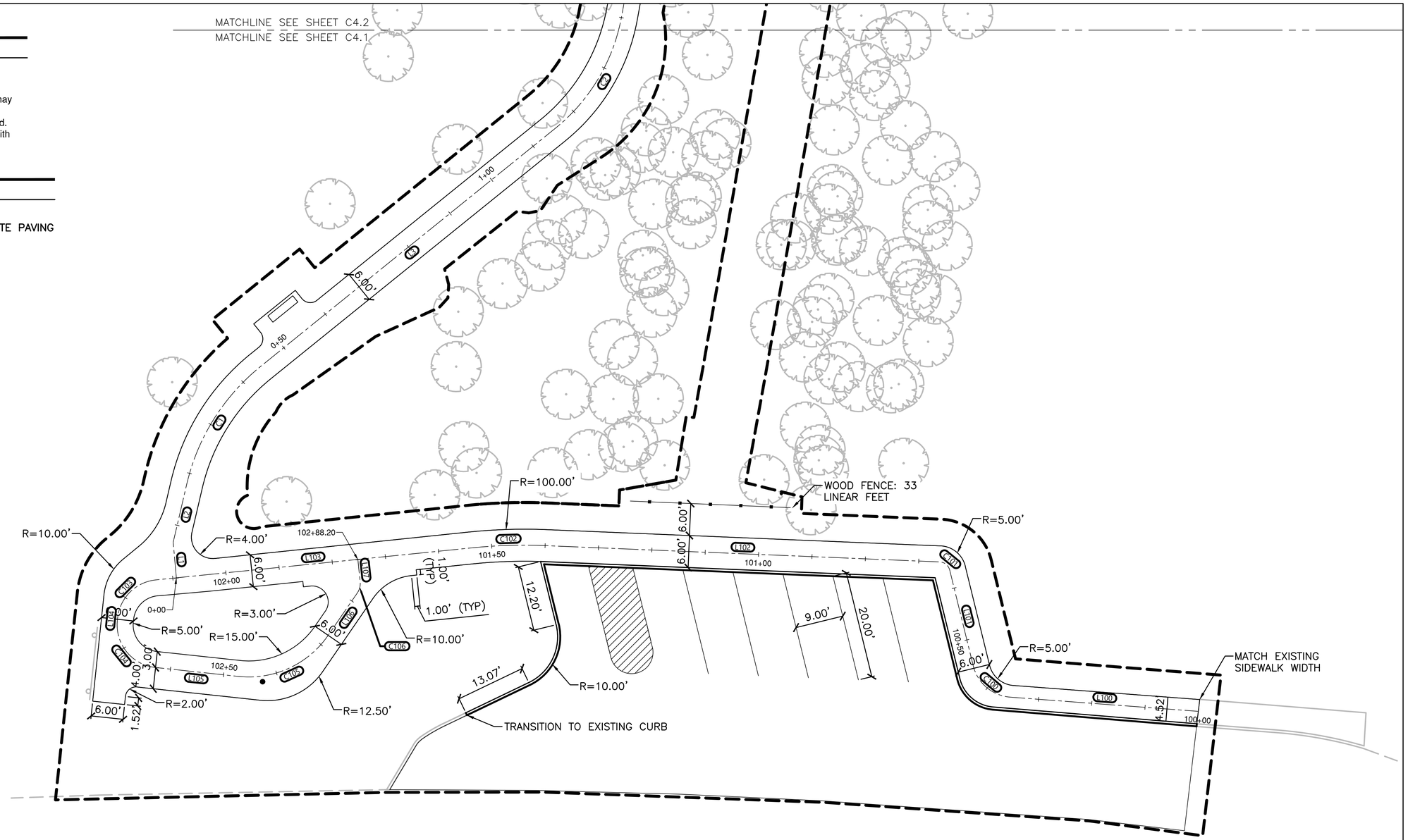
31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C3.5-GD.DWG

Layout Notes

1. See sheet C4.6 for layout tables.
2. Contractor to verify trail alignment with CO prior to proceeding with construction. Minor adjustments may be directed by CO at no additional cost to Gov.
3. Match existing control joints unless otherwise noted.
4. Coordinate control and expansion joint locations with existing sidewalk.

Layout Legend

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- WOOD FENCING
- TRAIL CENTERLINE ALIGNMENT
- LIMITS OF CONSTRUCTION
- EXPANSION JOINT
- WAYFINDING SIGN



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

0 5 10 20 Feet

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A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.1	LAYOUT PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 26 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.1-LM.DWG

Layout Notes

1. See sheet C4.6 for layout tables.
2. Contractor to verify trail alignment with CO prior to proceeding with construction. Minor adjustments may be directed by CO at no additional cost to Gov.
3. Match existing control joints unless otherwise noted.
4. Coordinate control and expansion joint locations with existing sidewalk.

Layout Legend

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- WOOD FENCING
- TRAIL CENTERLINE ALIGNMENT
- LIMITS OF CONSTRUCTION
- EXPANSION JOINT
- WAYFINDING SIGN

STATE OF KENTUCKY
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26364
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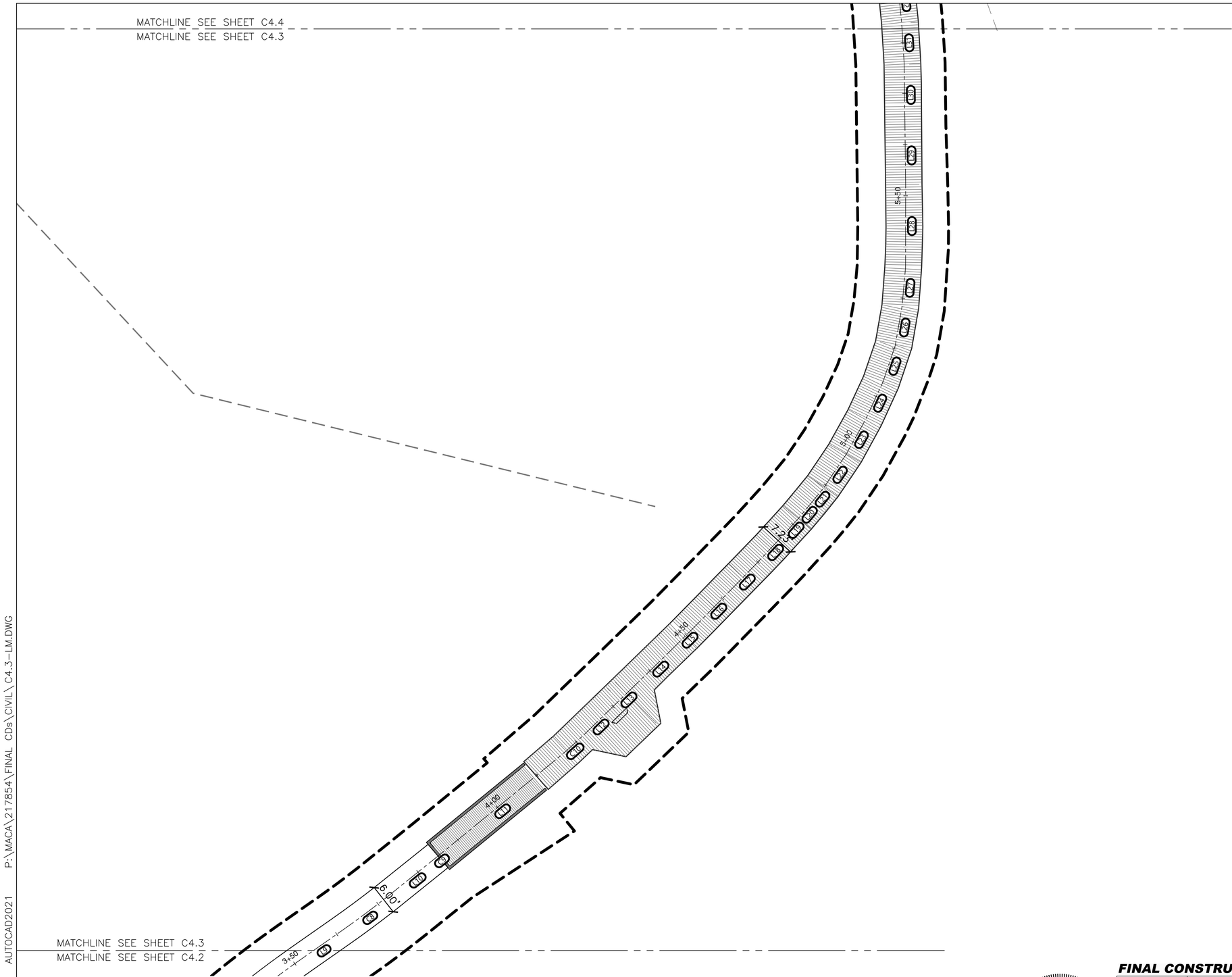
PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.2	LAYOUT PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 27 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.2-LM.DWG



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1. See sheet C4.6 for layout tables.
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Layout Legend

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- WOOD FENCING
- TRAIL CENTERLINE ALIGNMENT
- LIMITS OF CONSTRUCTION
- EXPANSION JOINT
- WAYFINDING SIGN

0 5 10 20 Feet

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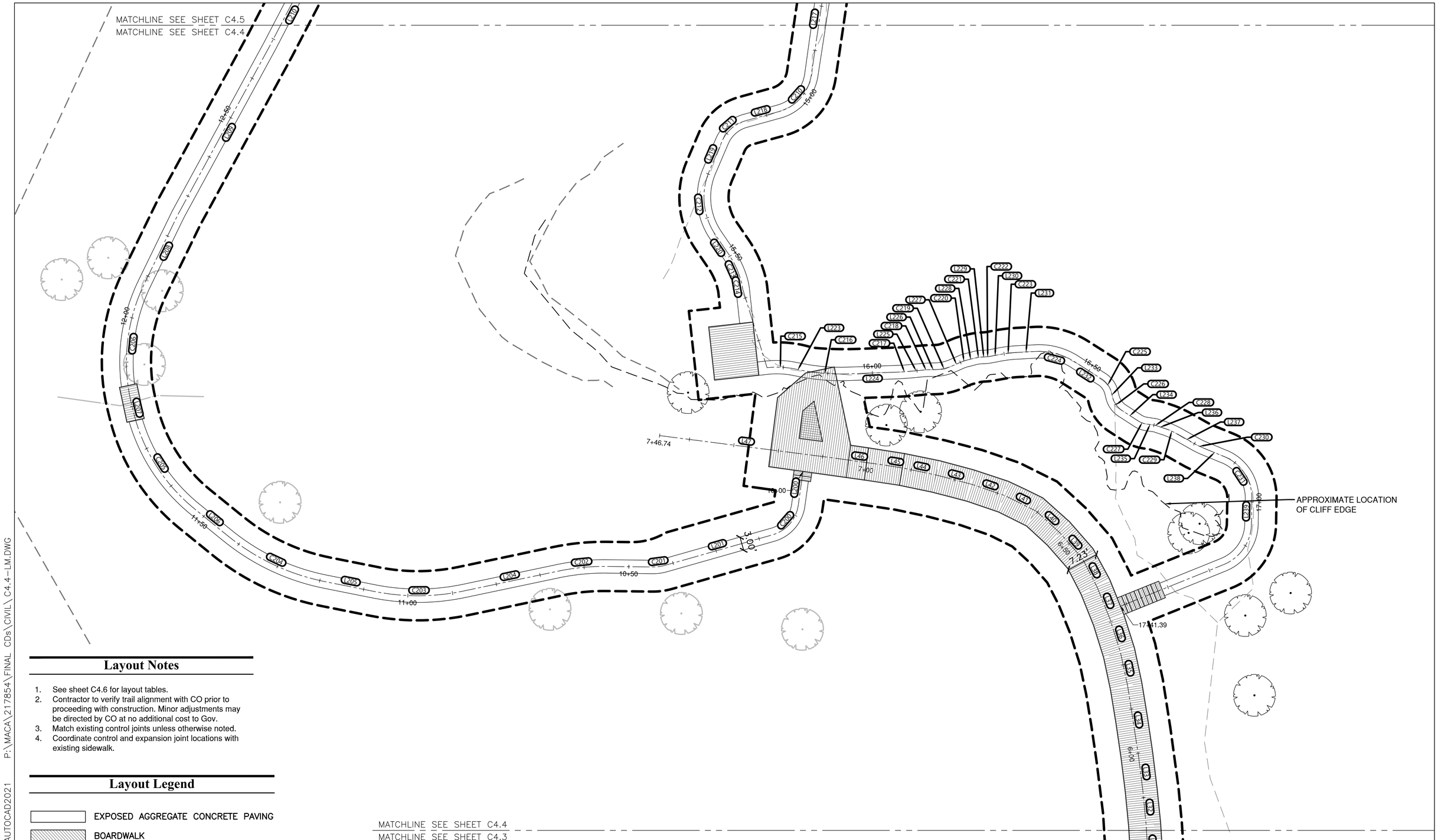
A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.3	LAYOUT PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 28 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.3-LM.DWG



Layout Notes

1. See sheet C4.6 for layout tables.
2. Contractor to verify trail alignment with CO prior to proceeding with construction. Minor adjustments may be directed by CO at no additional cost to Gov.
3. Match existing control joints unless otherwise noted.
4. Coordinate control and expansion joint locations with existing sidewalk.

Layout Legend

- EXPOSED AGGREGATE CONCRETE PAVING
- BOARDWALK
- SINGLE FILE TRAIL
- WOOD FENCING
- TRAIL CENTERLINE ALIGNMENT
- LIMITS OF CONSTRUCTION
- EXPANSION JOINT
- WAYFINDING SIGN

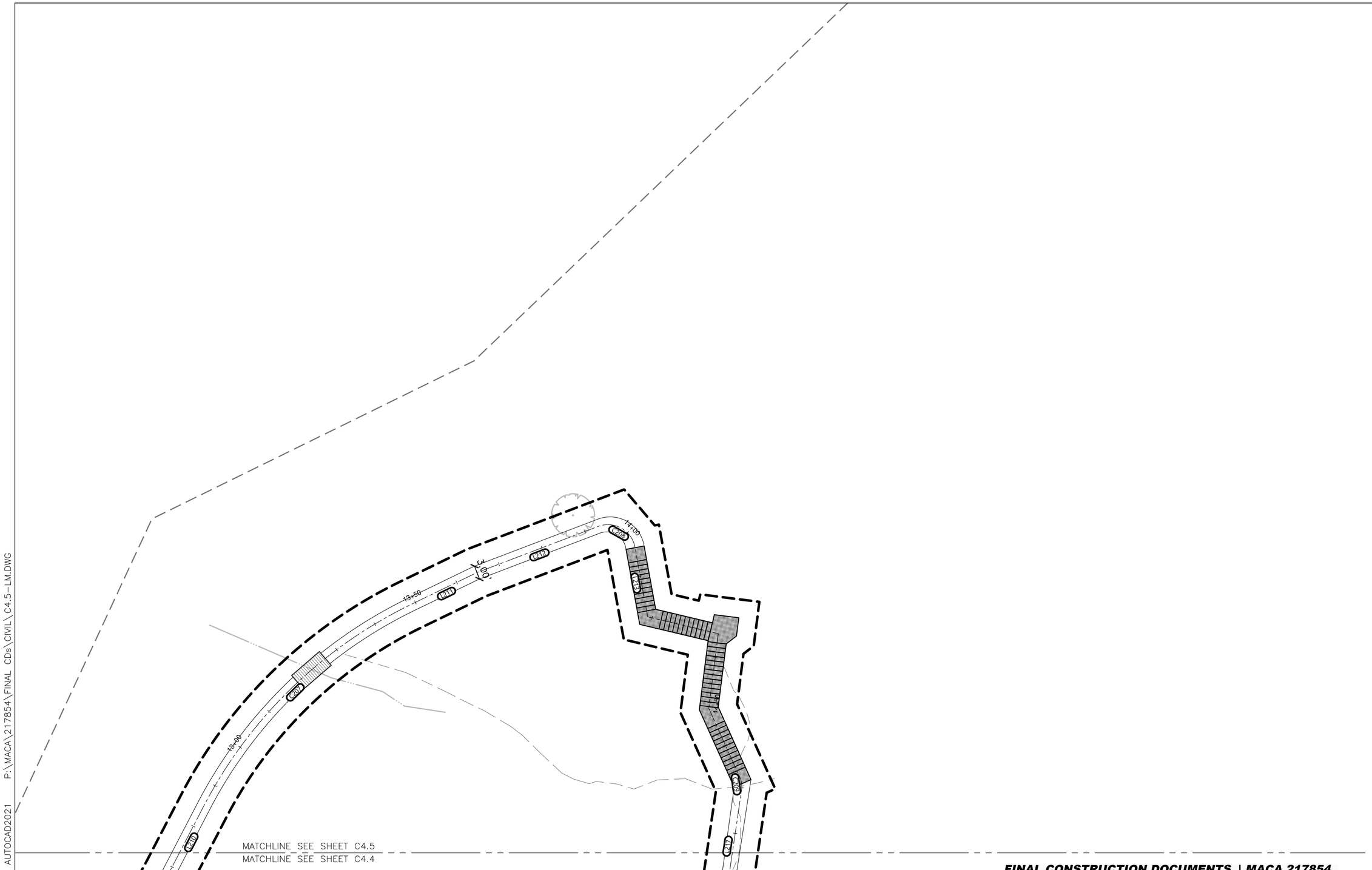
0 5 10 20 Feet

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.4	LAYOUT PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 29 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.4-LM.DWG



FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.5	LAYOUT PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 30 OF 56
	DATE: JANUARY 2024			

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

0 5 10 20 Feet

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.5-LM.DWG

MAIN TRAIL

Number	Delta	Radius	Length	Bearing	Ch. Dist.	Start Northing	Start Easting	End Northing	End Easting
L1			6.74'	N05°05'27"W		1938871.99	1553536.07	1938878.70	1553535.47
L2			11.19'	N13°08'18"E		1938878.70	1553535.47	1938889.60	1553538.02
C1	037°54'50"	40.00'	26.47'	N32°05'43"E	25.99'	1938889.60	1553538.02	1938911.62	1553551.82
L3			70.92'	N51°03'08"E		1938911.62	1553551.82	1938956.20	1553606.98
C2	040°50'53"	35.00'	24.95'	N30°37'42"E	24.43'	1938956.20	1553606.98	1938977.22	1553619.43
L4			19.23'	N10°12'15"E		1938977.22	1553619.43	1938996.15	1553622.83
C3	029°20'57"	35.00'	17.93'	N24°52'43"E	17.73'	1938996.15	1553622.83	1939012.23	1553630.29
L5			1.50'	N39°33'12"E		1939012.23	1553630.29	1939013.39	1553631.25
C4	039°33'18"	25.00'	17.26'	N19°46'33"E	16.92'	1939013.39	1553631.25	1939029.31	1553636.97
L6			4.89'	N00°00'07"W		1939029.31	1553636.97	1939034.21	1553636.97
C5	047°53'48"	35.00'	29.26'	N23°56'47"E	28.41'	1939034.21	1553636.97	1939060.18	1553648.51
L7			4.13'	N47°53'41"E		1939060.18	1553648.51	1939062.95	1553651.58
C6	016°27'05"	50.00'	14.36'	N39°40'09"E	14.31'	1939062.95	1553651.58	1939073.96	1553660.71
L8			20.48'	N31°26'36"E		1939073.96	1553660.71	1939091.43	1553671.39
C7	023°35'20"	200.00'	82.34'	N43°14'16"E	81.76'	1939091.43	1553671.39	1939151.00	1553727.40
L9			8.89'	N55°01'56"E		1939151.00	1553727.40	1939156.09	1553734.69
C8	003°47'09"	200.00'	13.21'	N53°08'22"E	13.21'	1939156.09	1553734.69	1939164.02	1553745.26
L10			10.32'	N51°14'48"E		1939164.02	1553745.26	1939170.48	1553753.31
C9	000°31'35"	200.00'	1.84'	N50°59'00"E	1.84'	1939170.48	1553753.31	1939171.64	1553754.73
L11			28.79'	N50°43'13"E		1939171.64	1553754.73	1939189.87	1553777.02
C10	004°47'54"	94.02'	7.87'	N48°19'16"E	7.87'	1939189.87	1553777.02	1939195.10	1553782.90
L12			5.91'	N45°55'19"E		1939195.10	1553782.90	1939199.21	1553787.15
L13			9.26'	N45°55'19"E		1939199.21	1553787.15	1939205.65	1553793.80
L14			8.04'	N45°49'49"E		1939205.65	1553793.80	1939211.26	1553799.57
L15			8.02'	N45°07'45"E		1939211.26	1553799.57	1939216.91	1553805.25
L16			7.88'	N44°20'54"E		1939216.91	1553805.25	1939222.55	1553810.76
L17			8.04'	N44°18'04"E		1939222.55	1553810.76	1939228.30	1553816.37
L18			7.95'	N43°12'52"E		1939228.30	1553816.37	1939234.10	1553821.82
L19			3.83'	N42°16'29"E		1939234.10	1553821.82	1939236.93	1553824.39
L20			4.08'	N39°45'50"E		1939236.93	1553824.39	1939240.06	1553827.00
L21			3.77'	N39°19'29"E		1939240.06	1553827.00	1939242.98	1553829.39
L22			7.77'	N33°56'57"E		1939242.98	1553829.39	1939249.43	1553833.73
L23			8.08'	N29°06'51"E		1939249.43	1553833.73	1939256.49	1553837.66
L24			7.78'	N24°46'17"E		1939256.49	1553837.66	1939263.55	1553840.92
L25			7.55'	N18°46'01"E		1939263.55	1553840.92	1939270.70	1553843.35
L26			7.70'	N09°55'47"E		1939270.70	1553843.35	1939278.29	1553844.68
L27			7.74'	N05°14'13"E		1939278.29	1553844.68	1939286.00	1553845.39
L28			16.20'	N00°03'21"E		1939286.00	1553845.39	1939302.20	1553845.40
L29			11.36'	N00°41'40"W		1939302.20	1553845.40	1939313.56	1553845.26
L30			12.27'	N00°41'40"W		1939313.56	1553845.26	1939325.83	1553845.12
L31			7.97'	N03°32'18"W		1939325.83	1553845.12	1939333.79	1553844.62
L32			7.87'	N05°32'36"W		1939333.79	1553844.62	1939341.62	1553843.86
L33			7.85'	N07°07'12"W		1939341.62	1553843.86	1939349.41	1553842.89
L34			15.59'	N08°49'08"W		1939349.41	1553842.89	1939364.81	1553840.50
L35			7.74'	N12°02'03"W		1939364.81	1553840.50	1939372.39	1553838.89

MAIN TRAIL

Number	Delta	Radius	Length	Bearing	Ch. Dist.	Start Northing	Start Easting	End Northing	End Easting
L36			7.92'	N17°28'07"W		1939372.39	1553838.89	1939379.95	1553836.51
L37			7.59'	N21°56'54"W		1939379.95	1553836.51	1939386.98	1553833.67
L38			7.20'	N27°17'44"W		1939386.98	1553833.67	1939393.38	1553830.37
L39			7.55'	N41°09'51"W		1939393.38	1553830.37	1939399.07	1553825.40
L40			7.19'	N47°17'53"W		1939399.07	1553825.40	1939403.94	1553820.12
L41			7.81'	N63°32'30"W		1939403.94	1553820.12	1939407.42	1553813.12
L42			7.82'	N71°08'01"W		1939407.42	1553813.12	1939409.95	1553805.72
L43			8.09'	N75°17'02"W		1939409.95	1553805.72	1939412.01	1553797.90
L44			7.56'	N78°04'54"W		1939412.01	1553797.90	1939413.57	1553790.50
L45			4.16'	N80°42'38"W		1939413.57	1553790.50	1939414.24	1553786.40
L46			12.14'	N82°02'11"W		1939414.24	1553786.40	1939415.92	1553774.38
L47			38.86'	N82°40'30"W		1939415.92	1553774.38	1939420.87	1553735.84

SIDEWALK CENTERLINE

Number	Delta	Radius	Length	Bearing	Ch. Dist.	Start Northing	Start Easting	End Northing	End Easting
L100			35.30'	N85°40'39"W		1938847.03	1553727.37	1938849.69	1553692.17
C100	071°53'24"	7.75'	9.72'	N49°43'57"W	9.10'	1938849.69	1553692.17	1938855.57	1553685.23
L101			18.46'	N13°47'15"W		1938855.57	1553685.23	1938873.50	1553680.83
C101	073°50'55"	2.00'	2.58'	N50°42'43"W	2.40'	1938873.50	1553680.83	1938875.02	1553678.97
L102			73.86'	N87°38'10"W		1938875.02	1553678.97	1938878.07	1553605.18
C102	008°09'34"	97.00'	13.81'	S88°17'03"W	13.80'	1938878.07	1553605.18	1938877.65	1553591.38
L103			59.47'	S84°12'16"W		1938877.65	1553591.38	1938871.65	1553532.22
C103	078°10'36"	8.00'	10.92'	S45°06'58"W	10.09'	1938871.65	1553532.22	1938864.53	1553525.07
L104			0.48'	S06°01'40"W		1938864.53	1553525.07	1938864.05	1553525.02
C104	089°52'35"	8.00'	12.55'	S38°54'38"E	11.30'	1938864.05	1553525.02	1938855.25	1553532.12
L105			15.69'	S83°50'55"E		1938855.25	1553532.12	1938853.57	1553547.72
C105	061°38'22"	18.00'	19.36'	N65°19'53"E	18.44'	1938853.57	1553547.72	1938861.27	1553564.48
L106			9.69'	N34°30'42"E		1938861.27	1553564.48	1938869.25	1553569.97
C106	040°26'57"	3.00'	2.12'	N14°17'14"E	2.07'	1938869.25	1553569.97	1938871.26	1553570.48
L107			4.20'	N05°56'15"W		1938871.26	1553570.48	1938875.43	1553570.04

0 5 10 20 Feet

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.6	LINE & CURVE TABLES	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 31 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C4.6-LM.DWG

SECONDARY TRAIL

Number	Delta	Radius	Length	Bearing	Ch. Dist.	Start Northing	Start Easting	End Northing	End Easting
L200			7.62'	S07°57'35"W		1939412.83	1553767.89	1939405.28	1553766.83
C200	066°11'21"	8.00'	9.24'	S41°03'10"W	8.74'	1939405.28	1553766.83	1939398.69	1553761.10
L201			24.94'	S74°08'51"W		1939398.69	1553761.10	1939391.88	1553737.10
C201	016°33'15"	10.00'	2.89'	S82°25'28"W	2.88'	1939391.88	1553737.10	1939391.50	1553734.25
C202	012°34'46"	50.00'	10.98'	S84°24'43"W	10.96'	1939391.63	1553724.00	1939390.56	1553713.09
L204			21.47'	S78°07'19"W		1939390.56	1553713.09	1939386.14	1553692.08
C203	023°09'42"	50.00'	20.21'	S89°42'10"W	20.07'	1939386.14	1553692.08	1939386.04	1553672.01
L205			11.16'	N78°42'59"W		1939386.04	1553672.01	1939388.22	1553661.07
C204	027°45'23"	50.00'	24.22'	N64°50'17"W	23.99'	1939388.22	1553661.07	1939398.42	1553639.36
L206			9.61'	N50°57'36"W		1939398.42	1553639.36	1939404.47	1553631.89
C205	036°59'58"	40.00'	25.83'	N32°27'37"W	25.38'	1939404.47	1553631.89	1939425.89	1553618.27
L207			1.89'	N13°57'38"W		1939425.89	1553618.27	1939427.73	1553617.81
C206	039°52'34"	40.00'	27.84'	N05°58'39"E	27.28'	1939427.73	1553617.81	1939454.86	1553620.65
L208			17.28'	N25°54'55"E		1939454.86	1553620.65	1939470.40	1553628.20
L209			42.93'	N28°34'50"E		1939470.40	1553628.20	1939508.10	1553648.74
L210			16.60'	N27°27'54"E		1939508.10	1553648.74	1939522.83	1553656.39
C207	036°42'03"	100.00'	64.06'	N45°48'56"E	62.97'	1939522.83	1553656.39	1939566.71	1553701.55
L211			15.80'	N64°09'57"E		1939566.71	1553701.55	1939573.60	1553715.77
L212			28.25'	N69°08'32"E		1939573.60	1553715.77	1939583.66	1553742.17
C208	100°30'39"	6.00'	10.53'	S60°36'09"E	9.23'	1939583.66	1553742.17	1939579.13	1553750.21
L213			15.40'	S10°20'49"E		1939579.13	1553750.21	1939563.99	1553752.98
C209	032°35'48"	5.00'	2.84'	S07°55'12"E	2.81'	1939529.06	1553773.02	1939526.28	1553773.41
L217			25.05'	S08°22'42"W		1939526.28	1553773.41	1939501.50	1553769.76
C210	066°12'17"	10.00'	11.55'	S41°28'51"W	10.92'	1939501.50	1553769.76	1939493.31	1553762.52
L218			7.77'	S74°34'59"W		1939493.31	1553762.52	1939491.25	1553755.03
C211	051°25'31"	8.00'	7.18'	S48°52'14"W	6.94'	1939491.25	1553755.03	1939486.68	1553749.80
L219			7.22'	S23°09'28"W		1939486.68	1553749.80	1939480.04	1553746.96
C212	057°29'14"	15.00'	15.05'	S05°35'09"E	14.43'	1939480.04	1553746.96	1939465.69	1553748.37
L220			5.17'	S34°19'46"E		1939465.69	1553748.37	1939461.42	1553751.28
C213	020°28'08"	20.00'	7.14'	S24°05'43"E	7.11'	1939461.42	1553751.28	1939454.93	1553754.18
C214	007°34'35"	10.00'	1.32'	S10°04'21"E	1.32'	1939454.93	1553754.18	1939453.63	1553754.42
C215	017°05'59"	20.00'	5.97'	S87°44'04"E	5.95'	1939436.06	1553759.86	1939435.82	1553765.80
L223			1.99'	S79°11'04"E		1939435.82	1553765.80	1939435.45	1553767.76
C216	012°48'39"	45.00'	10.06'	S85°35'23"E	10.04'	1939435.45	1553767.76	1939434.67	1553777.77
L224			11.27'	N88°00'17"E		1939434.67	1553777.77	1939435.07	1553789.04
C217	003°28'59"	50.00'	3.04'	N86°15'48"E	3.04'	1939435.07	1553789.04	1939435.26	1553792.07
L225			2.20'	N84°31'19"E		1939435.26	1553792.07	1939435.47	1553794.26
C218	004°19'09"	30.00'	2.26'	N86°40'53"E	2.26'	1939435.47	1553794.26	1939435.61	1553796.51
L226			0.96'	N88°50'28"E		1939435.61	1553796.51	1939435.62	1553797.48
C219	022°17'08"	10.00'	3.89'	N77°41'54"E	3.87'	1939435.62	1553797.48	1939436.45	1553801.25
L227			2.04'	N66°33'20"E		1939436.45	1553801.25	1939437.26	1553803.12
C220	009°14'34"	10.00'	1.61'	N71°10'37"E	1.61'	1939437.26	1553803.12	1939437.78	1553804.65
L228			1.49'	N75°47'54"E		1939437.78	1553804.65	1939438.15	1553806.10
C221	011°51'51"	10.00'	2.07'	N81°43'49"E	2.07'	1939438.15	1553806.10	1939438.44	1553808.14
L229			0.32'	N87°39'45"E		1939438.44	1553808.14	1939438.46	1553808.46

SECONDARY TRAIL

Number	Delta	Radius	Length	Bearing	Ch. Dist.	Start Northing	Start Easting	End Northing	End Easting
C222	008°19'49"	10.00'	1.45'	N83°29'50"E	1.45'	1939438.46	1553808.46	1939438.62	1553809.91
L230			1.93'	N79°19'56"E		1939438.62	1553809.91	1939438.98	1553811.81
C223	007°34'03"	30.00'	3.96'	N83°06'57"E	3.96'	1939438.98	1553811.81	1939439.45	1553815.74
L231			4.08'	N86°53'58"E		1939439.45	1553815.74	1939439.67	1553819.81
C224	035°35'26"	15.00'	9.32'	S75°18'19"E	9.17'	1939439.67	1553819.81	1939437.35	1553828.68
L232			7.12'	S57°30'36"E		1939437.35	1553828.68	1939433.52	1553834.69
C225	043°33'43"	5.00'	3.80'	S35°43'45"E	3.71'	1939433.52	1553834.69	1939430.51	1553836.85
L233			1.08'	S13°56'53"E		1939430.51	1553836.85	1939429.46	1553837.11
C226	043°10'28"	5.00'	3.77'	S35°32'07"E	3.68'	1939429.46	1553837.11	1939426.47	1553839.25
L234			4.16'	S57°07'21"E		1939426.47	1553839.25	1939424.21	1553842.75
C227	024°18'51"	5.00'	2.12'	S69°16'47"E	2.11'	1939424.21	1553842.75	1939423.46	1553844.72
L235			1.56'	S81°26'13"E		1939423.46	1553844.72	1939423.23	1553846.26
C228	009°51'46"	5.00'	0.86'	S76°30'20"E	0.86'	1939423.23	1553846.26	1939423.03	1553847.10
L236			1.52'	S71°34'27"E		1939423.03	1553847.10	1939422.55	1553848.54
C229	011°03'39"	20.00'	3.86'	S66°02'37"E	3.85'	1939422.55	1553848.54	1939420.98	1553852.07
L237			3.90'	S60°30'48"E		1939420.98	1553852.07	1939419.07	1553855.46
C230	007°12'41"	20.00'	2.52'	S64°07'08"E	2.52'	1939419.07	1553855.46	1939417.97	1553857.72
L238			4.69'	S67°43'29"E		1939417.97	1553857.72	1939416.19	1553862.07
C231	068°48'32"	10.00'	12.01'	S33°19'13"E	11.30'	1939416.19	1553862.07	1939406.74	1553868.27
L239			5.65'	S01°05'03"W		1939406.74	1553868.27	1939401.10	1553868.17

0 5 10 20 Feet

COMMONWEALTH OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C4.7	LINE & CURVE TABLES	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 32 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	

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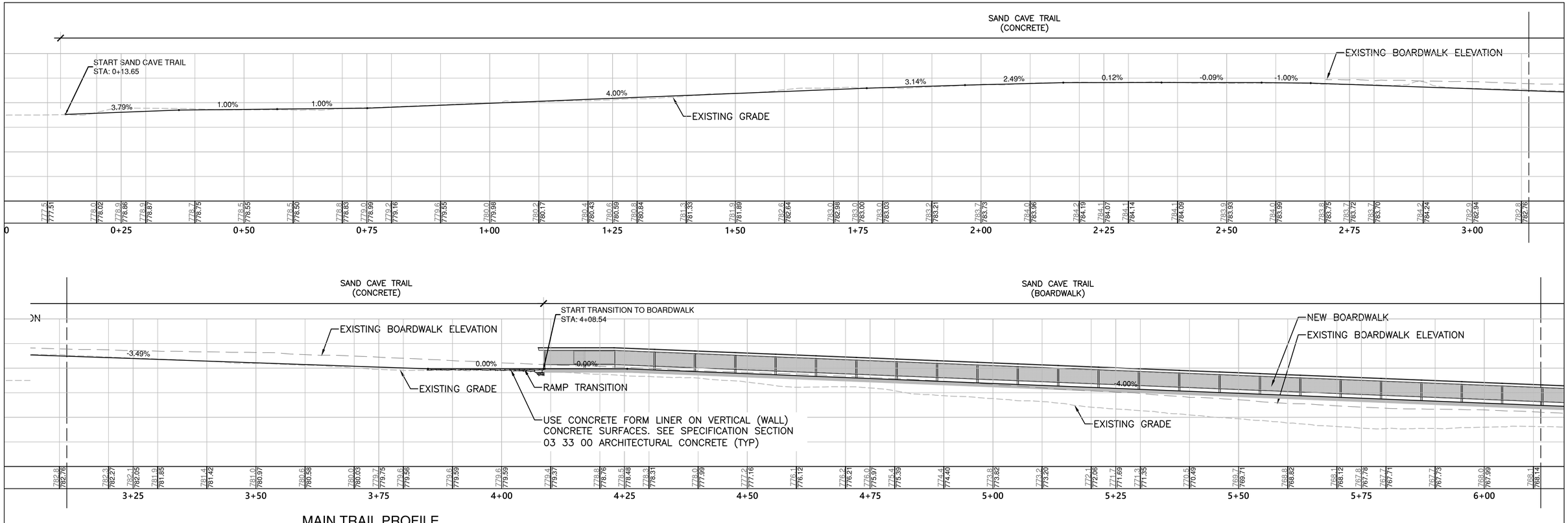
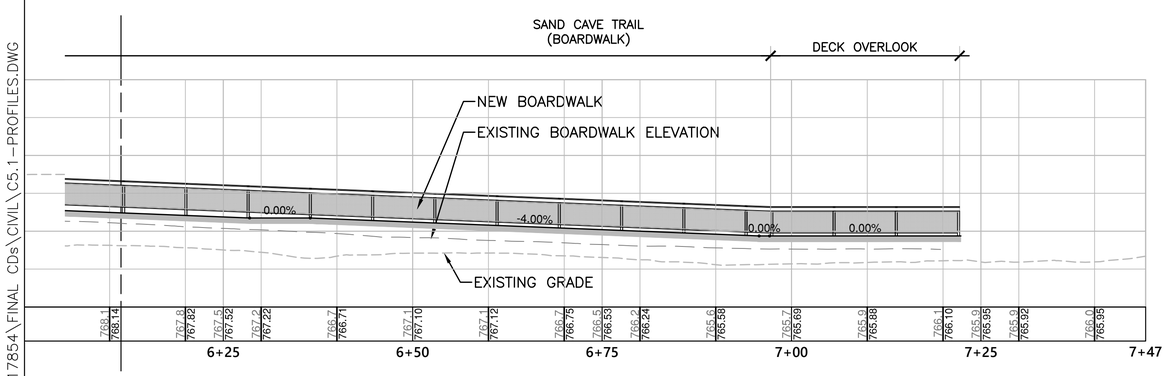


MAIN TRAIL PROFILE



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31 JANUARY 2024 AUTOCAD2021

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
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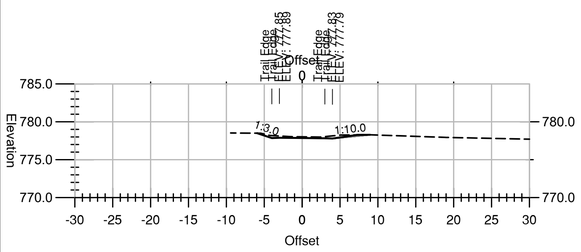
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C5.1	PROFILES	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 33 OF 56
	DATE: JANUARY 2024			



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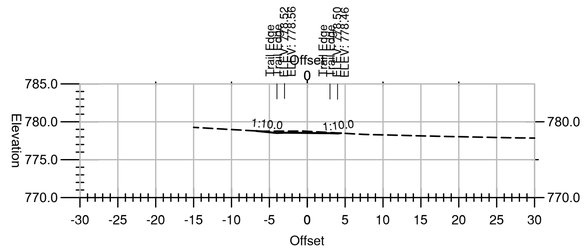

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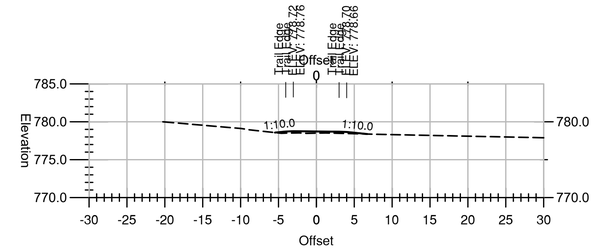

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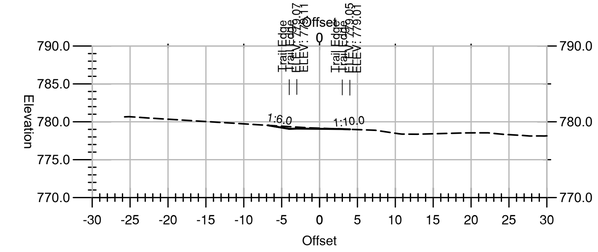

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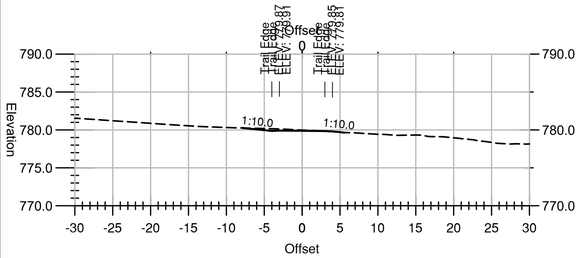

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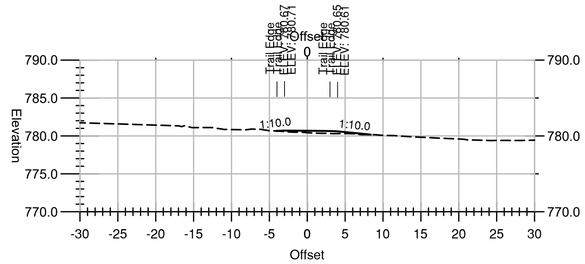

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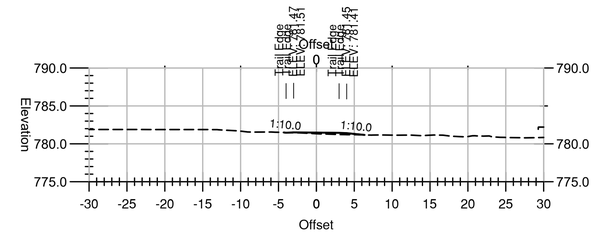

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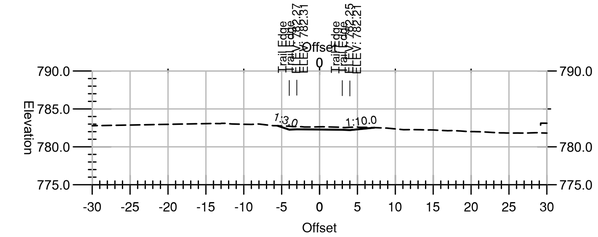

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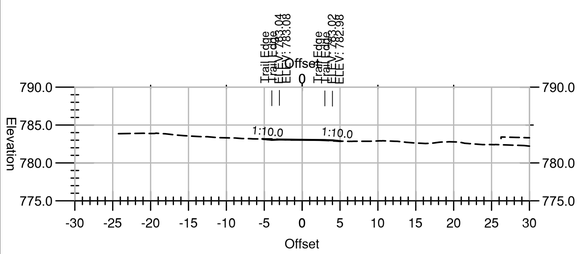

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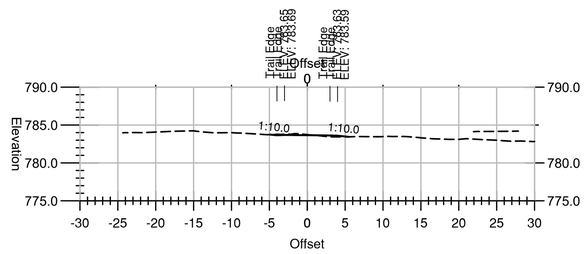

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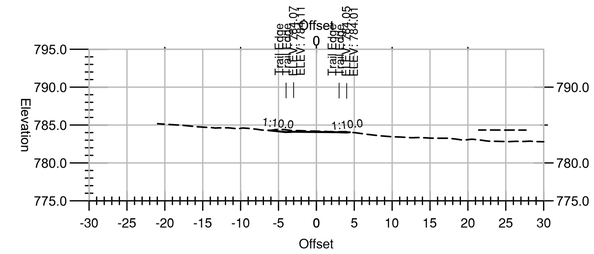

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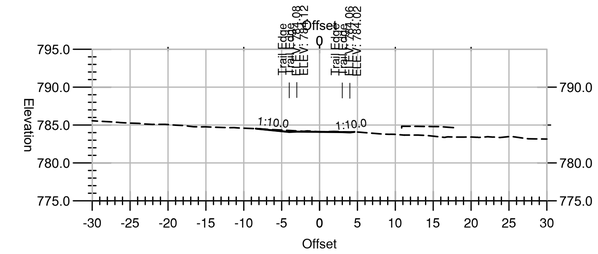

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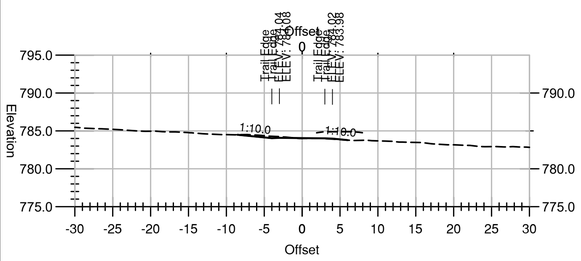

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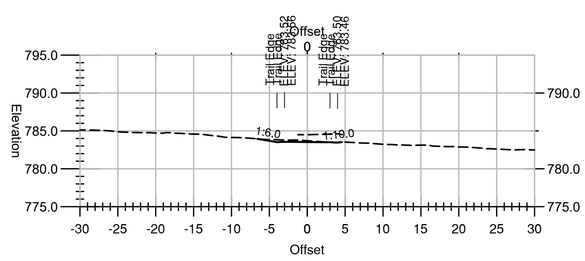

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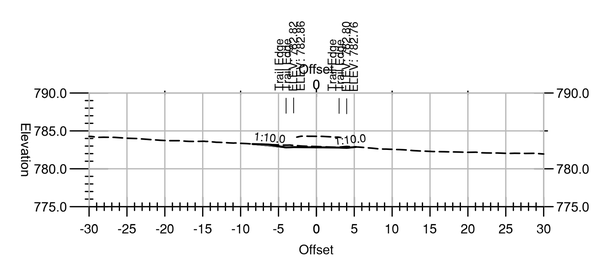

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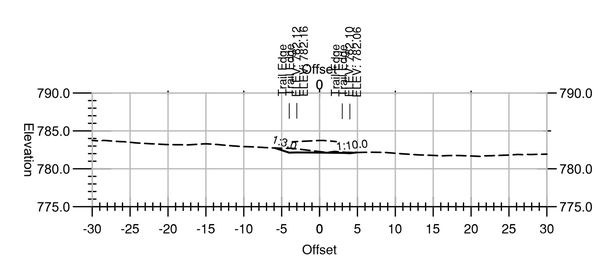

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FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C6.1	TYPICAL SECTIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 34 OF 56
	DATE: JANUARY 2024			

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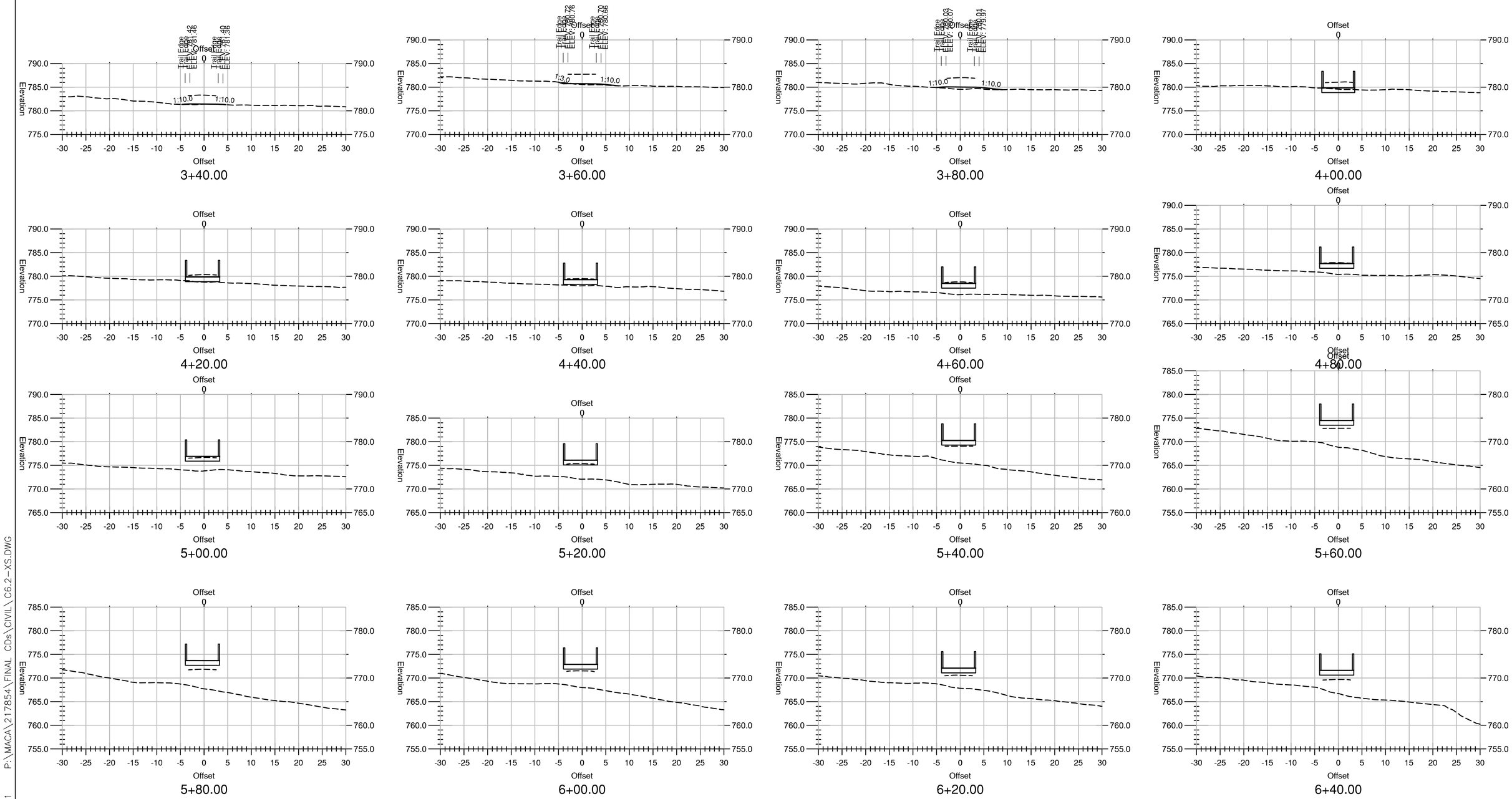

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PRIME: VHB WILLIAMSBURG, VA SUB: AMI VIRGINIA, MI AEI MADISON, WI	DM/ST CADD LY/ST TECH. REVIEW: TH DATE: JANUARY 2024	C6.2	TYPICAL SECTIONS RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	135 PMIS/PKG NO. 217854 SHEET 35 OF 56

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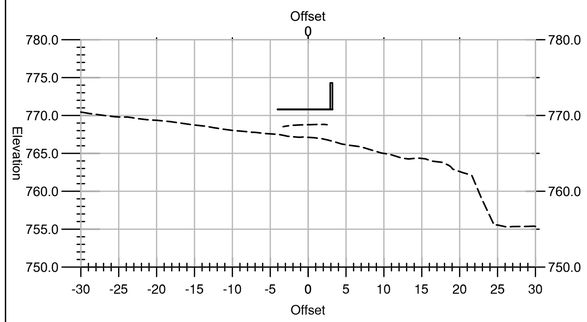

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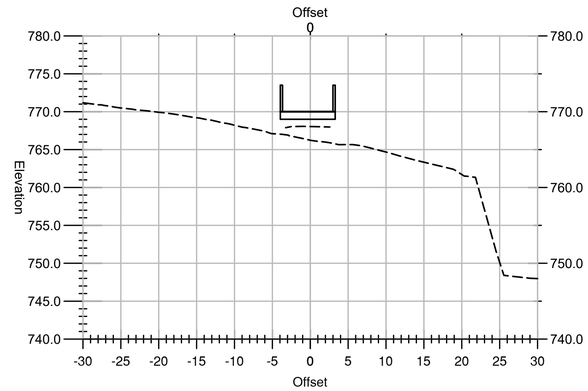

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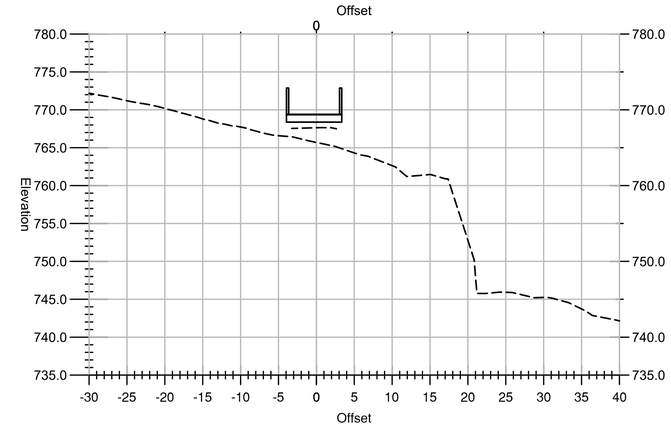

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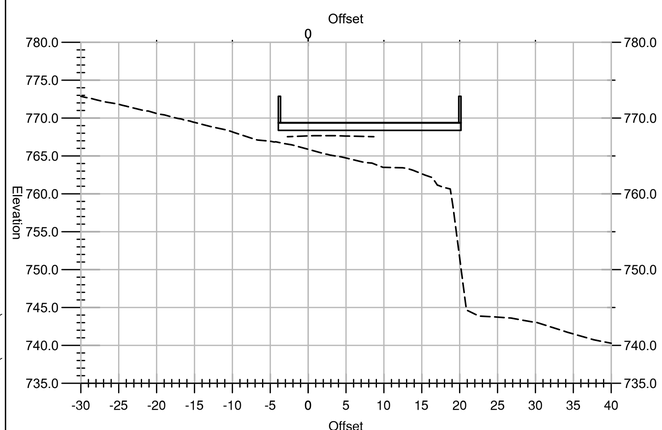

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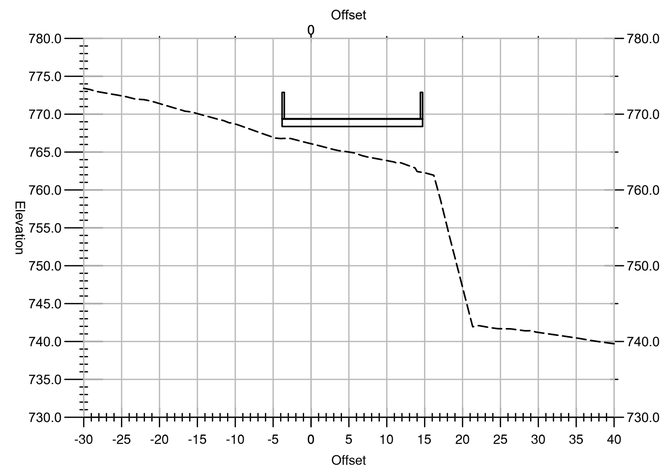

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AUTOCAD2021

31 JANUARY 2024

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

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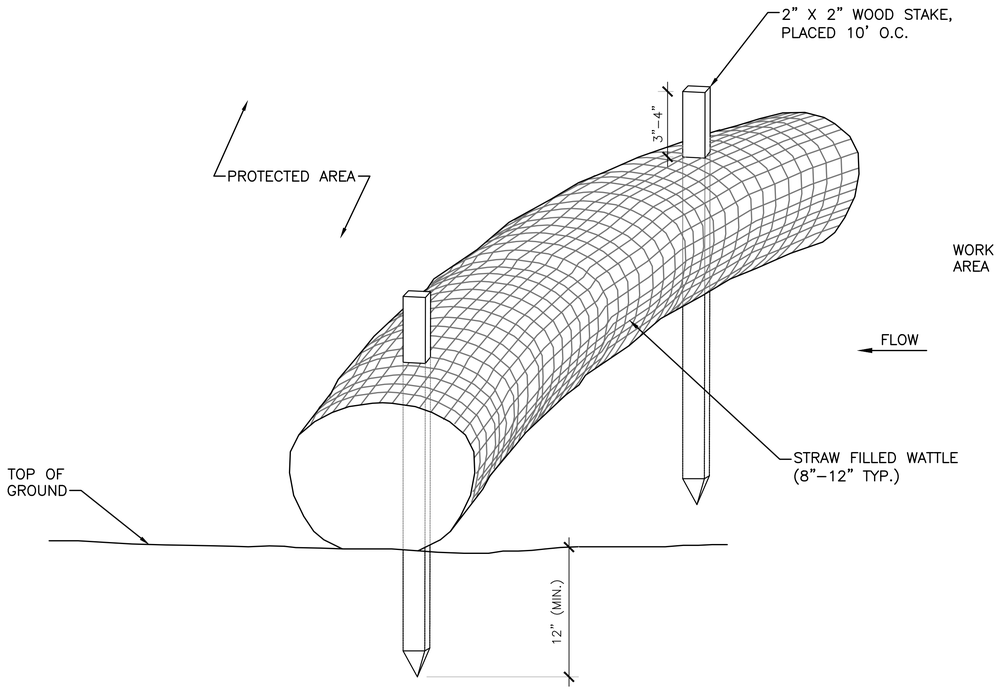
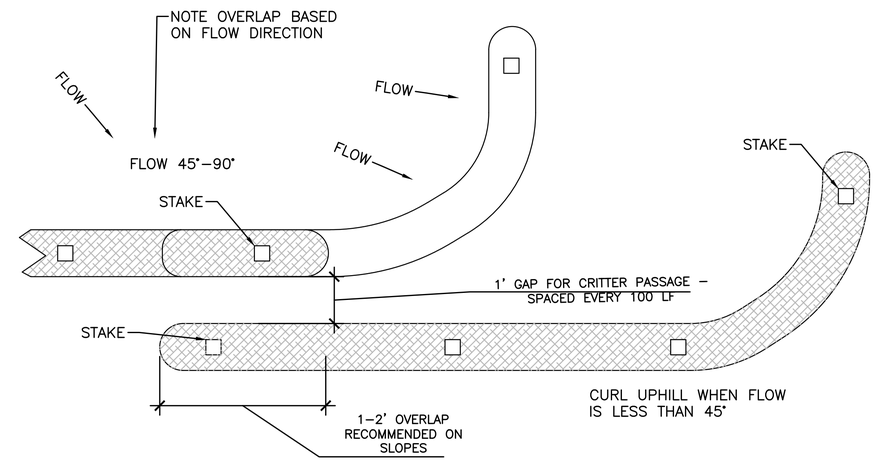
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C6.3	TYPICAL SECTIONS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 36 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	



NOTES

1. STRAW WATTLE SHALL BE AS MANUFACTURED BY EARTHSAVER OR APPROVED EQUAL.
2. STRAW WATTLES SHALL OVERLAP A MINIMUM OF 12 INCHES.
3. STRAW WATTLE SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. TEMPORARY STRAW WATTLES TO BE REMOVED BY CONTRACTOR. ALL OTHERS TO REMAIN IN PLACE.

PERIMETER CONTROL & OVERLAPPING



NOTES:
1. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. REFER TO REGULATORY AUTHORITY FOR DETAILED INSTALLATION PROCEDURES.
3. WOOD FILLER MATERIAL SHALL BE PROPERLY SIZED, BIODEGRADABLE, WEED, SEED & DISEASE FREE AND ENVIRONMENTALLY SOUND.
4. DO NOT OVERLAP THE ENDS OF THE WATTLES OVER TOP OF EACH OTHER.
5. WATTLE CASING MATERIAL SHALL BE 0.5"x0.5" OPENING, HD SYNTHETIC, UV PROTECTED MATERIAL, CYLINDRICAL WITH CLOSED ENDS.
6. STAKES SHALL PROTRUDE SEVERAL INCHES ABOVE THE WATTLE. CONTRACTOR SHALL USE 18" STAKE FOR HARD, ROCKY SOIL AND 24" STAKE FOR SOFT, LOAMY SOIL. THE DIAMETER OF THE STAKE SHOULD BE APPROXIMATELY 1" FOR EASE OF DRIVING THROUGH THE WATTLE.
7. FOR FLAT GROUND APPLICATIONS IT MAY NOT BE NECESSARY TO STAKE THE WATTLES.

STRAW WATTLE

NO SCALE

1
C7.1

SOIL EROSION & SEDIMENTATION CONTROL NOTES

1. ALL RELATED SEDIMENT AND EROSION CONTROL FACILITIES SHALL BE IN PLACE AND CAPABLE OF FUNCTIONING AS INTENDED PRIOR TO EARTH MOVING ACTIVITY WITHIN THEIR CONTRIBUTING WATERSHED AREAS.
2. REDUCE BY THE GREATEST EXTENT PRACTICABLE THE AREA AND DURATION OF EXPOSURE OF READILY ERODIBLE SOILS.
3. BACKFILLED EXCAVATIONS SHALL BE RESTORED TO ORIGINAL TYPE OF COVER AND GRADE AS PER SPECIFICATIONS. SEEDING SHALL BE DONE ACCORDING TO SCHEDULED OR PERMANENT SEEDING.
4. ALL AREAS SHALL BE FINISH GRADED WITH NATIVE MATERIALS. POSITIVE DRAINAGE SHALL BE MAINTAINED AWAY FROM ALL STRUCTURES. NO ISOLATED LOW SPOTS SHALL BE CREATED.
5. ALL SEDIMENT, CONSTRUCTION DEBRIS, EXCAVATED MATERIAL AND REFUSE SHALL BE PREVENTED FROM ENTERING ANY STORM SEWER, DITCH OR WATER COURSE THROUGH THE USE OF SEDIMENT FILTER STRUCTURES.
6. PROVIDE PROTECTION AGAINST DISCHARGE OF POLLUTANTS SUCH AS CHEMICALS, FUEL, LUBRICANTS, SEWAGE, ETC. INTO STREAMS OR STORMWATER FACILITIES.
7. PROTECT SOILS BY COMPLETING DISTURBED AREAS OF WORK AS RAPIDLY AS IS CONSISTENT WITH CONSTRUCTION SCHEDULES.
8. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE, THE OPERATOR SHALL STABILIZE ANY AREAS DISTURBED BY THE ACTIVITIES.
9. THE CONTRACTOR SHALL MAINTAIN AND ADJUST THE SOIL EROSION AND SEDIMENTATION CONTROL FACILITIES, SPECIFIED HEREIN AND SHOWN ON THE CONTRACT DRAWINGS, AS FIELD CONDITIONS REQUIRE, TO KEEP THE FACILITIES IN A FUNCTIONAL CONDITION DURING ALL PHASES OF CONSTRUCTION.
10. THE CONTRACTOR SHALL IMMEDIATELY REPAIR EACH SOIL EROSION AND SEDIMENTATION CONTROL MEASURE TO WORKING CONDITIONS AS SOON AS ANY ENCROACHMENT WORK AT SAID CONTROL IS COMPLETED. CLEARING, GRUBBING, AND MATERIAL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. GENERAL SITE CLEARING, GRUBBING, AND STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE E&S MEASURES SPECIFIED BY THE CONSTRUCTION SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.

SCALE A 1 0 1 2
SCALE IN FEET

STATE OF KENTUCKY
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FINAL CONSTRUCTION DOCUMENTS | MACA 217854

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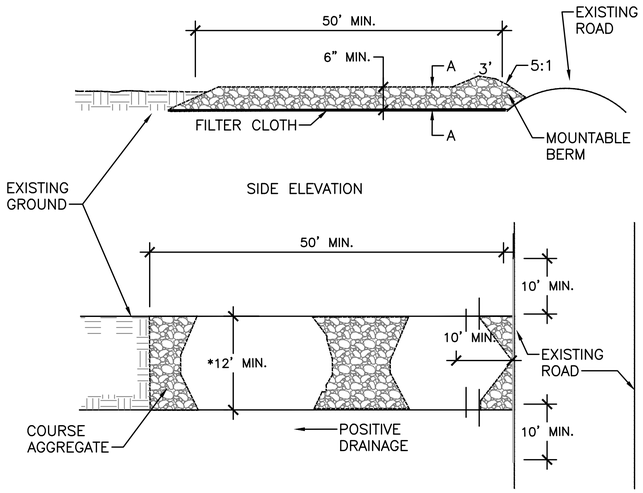
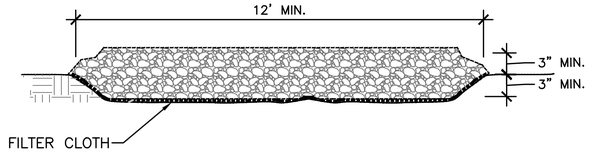
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 37 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C7.1-DT.DWG



* MUST EXTEND FULL WIDTH OF INGRESS AND EGRESS OPERATION



SECTION A–A

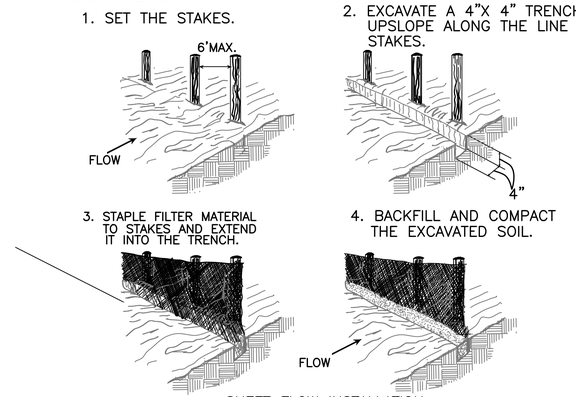
NOTES:
1. STONE SIZE – USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – AS REQUIRED, BUT NOT LESS THAN 50'.
3. THICKNESS – NOT LESS THAN 6"
4. WIDTH – 12' MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. FILTER CLOTH SHALL BE MIRAFI HP570 OR APPROVED EQUAL. PLACE OVER THE ENTIRE AREA AND SECURE PER MANUFACTURER'S RECOMMENDATIONS PRIOR TO PLACING STONE.
6. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.
7. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

CONSTRUCTION ENTRANCE

NO SCALE

1 / C7.2

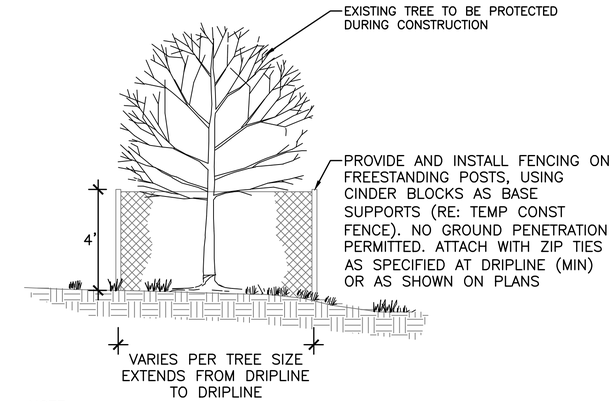
1. CONTRACTOR SHALL INSTALL SILT FENCE ON 'DOWNHILL' SLOPE OF OPEN TRENCH.



SILT FENCE

NO SCALE

2 / C7.2



NOTE:
1. CONTRACTOR SHALL INSTALL SILT FENCE ON 'DOWNHILL' SLOPE OF OPEN TRENCH. CONTRACTOR SHALL HAVE NO MORE THAN 100 LINEAR FEET OF OPEN TRENCH AT ANY GIVEN TIME.
2. IN AREAS WHERE GRADING EXTENDS INTO EXISTING TREE DRIPLINES CONTRACTOR SHALL HAND GRADE.

TREE PROTECTION/CONSTRUCTION FENCE

NO SCALE

3 / C7.2

SCALE A 1 0 1 2
SCALE IN FEET

STATE OF KENTUCKY
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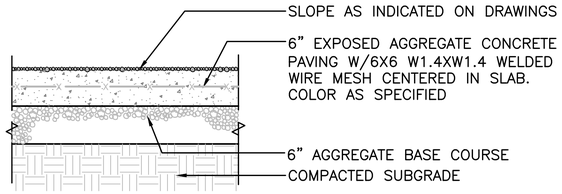
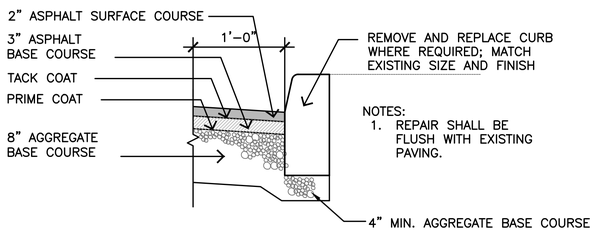
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 38 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C7.2-DT.DWG

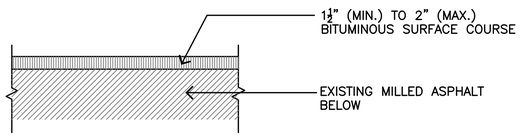


NOTES:
1. SEE TYPICAL EXPANSION AND CONTROL JOINT DETAILS.
2. SPACE EXPANSION JOINTS 24'0" O.C. UNLESS OTHERWISE INDICATED.
3. SPACE CONTROL JOINTS AS INDICATED ON PLANS.

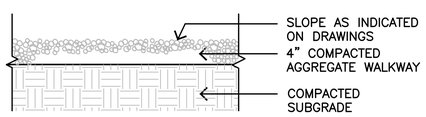
EXPOSED AGGREGATE CONCRETE PAVING (1 / C7.3)
SCALE A



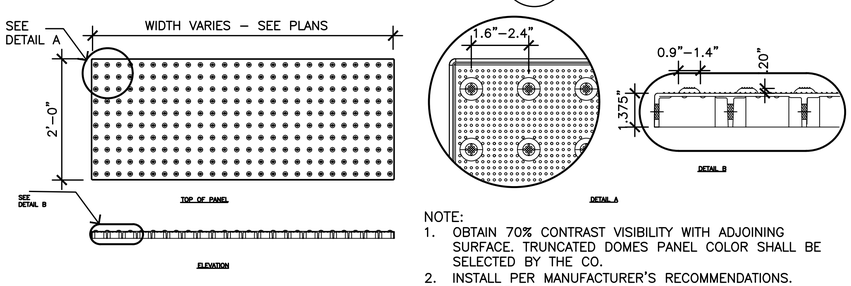
ASPHALT PAVEMENT REPAIR (2 / C7.3)
SCALE A



ASPHALT OVERLAY PAVING (3 / C7.3)
SCALE A

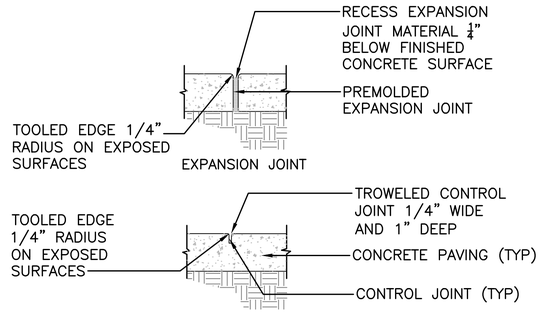


SINGLE FILE TRAIL (4 / C7.3)
SCALE A



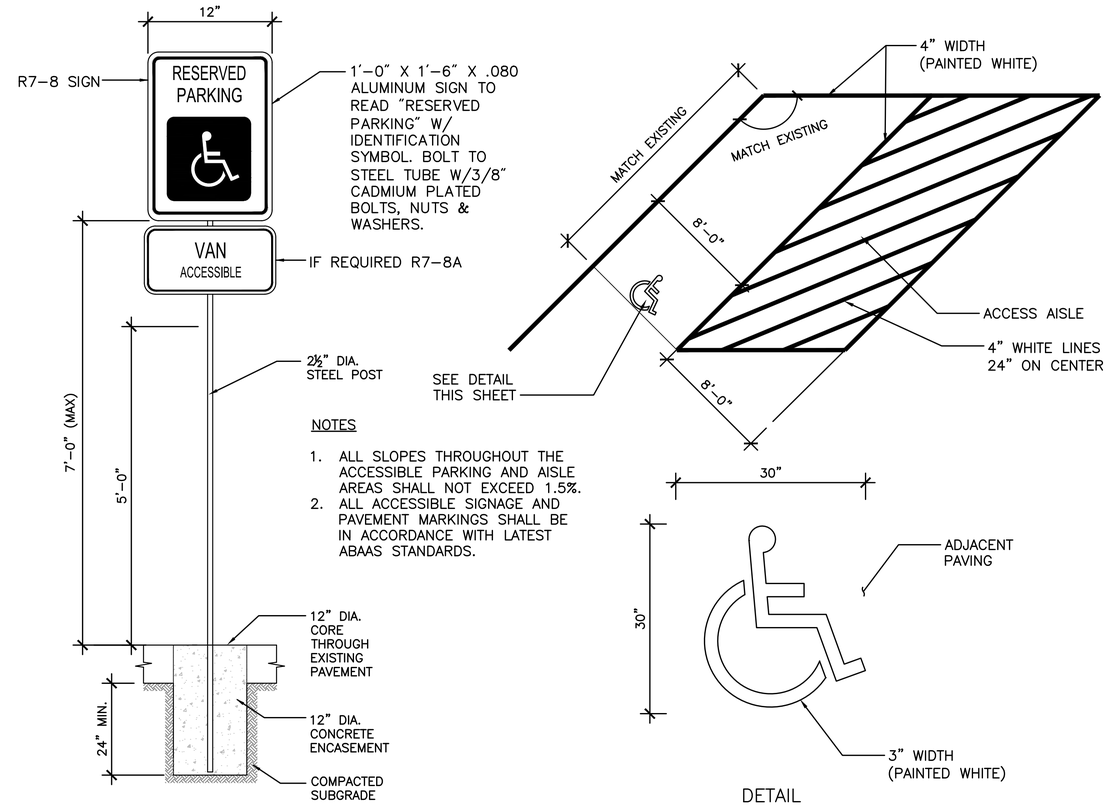
NOTE:
1. OBTAIN 70% CONTRAST VISIBILITY WITH ADJOINING SURFACE. TRUNCATED DOMES PANEL COLOR SHALL BE SELECTED BY THE CO.
2. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
3. PRODUCT SHALL MEET ALL REQUIREMENTS OF THE ARCHITECTURAL BARRIERS ACT ACCESSIBILITY STANDARDS (ABAAS) FOR FACILITIES FOR VISITORS AND EMPLOYEES.

DETECTABLE WARNING TRUNCATED DOMES (5 / C7.3)
NOT TO SCALE



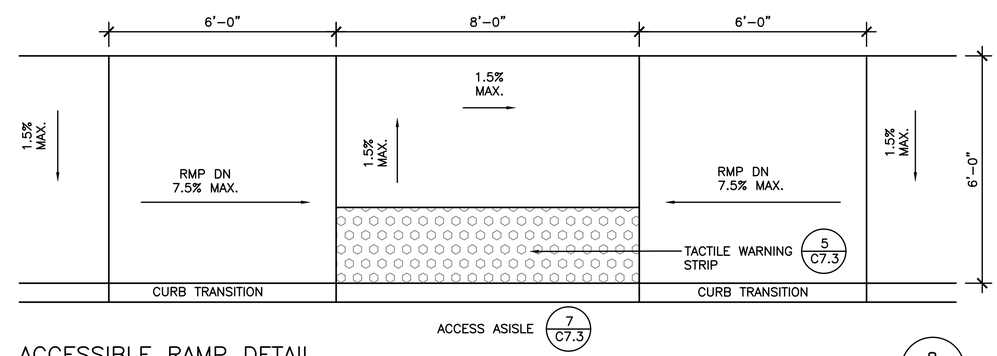
NOTES:
1. PROVIDE CONTRACTION JOINTS AT INTERVALS EQUAL TO THE WIDTH OF THE WALKWAY UNLESS OTHERWISE NOTED. SAW CUTTING IS NOT PERMITTED.
2. EXPANSION JOINTS SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 3 TIMES THE WIDTH OF THE WALK, AND AT JUNCTION POINTS OF CURBS AND ENTRANCES, AND ON BOTH SIDES OF ALL WALKWAY SECTIONS CONTAINING UTILITIES, ADJACENT TO WALLS OR OTHER FIXED OBJECTS. PREMOLDED, ½" JOINT FILLER SHALL BE USED EXTENDING FOR THE BOTTOM OF THE SLAB TO ¼" OF ITS TOP SURFACE.
3. AS SOON AS CONCRETE WILL NOT SLUMP, FACE FORMS ARE TO BE REMOVED, IRREGULARITIES REMOVED, APPLY INDICATED FINISH AND LIQUID MEMBRANE SEAL OR OTHER APPROVED CURING MEDIUM APPLIED.
4. THE CONTRACTOR SHALL PREVENT THE TEMPERATURE AT THE SURFACE OF THE CONCRETE FORM FALLING BELOW 40 F DURING THE FIRST 72 HOURS IMMEDIATELY FOLLOWING CONCRETE PLACEMENT. PROTECTIVE MATERIAL SHALL BE LEFT IN PLACE FOR ADDITIONAL 48 HOURS IF FREEZING AIR TEMPERATURES ARE EXPECTED TO CONTINUE.
5. CONCRETE PAVING FOR WALKWAYS ACROSS ENTRANCES OR ACCESSIBLE RAMPS SHALL HAVE A DEPTH OF 7 INCHES UNLESS OTHERWISE NOTED.
6. COORDINATE CONTROL JOINTS WITH ADJACENT CONCRETE PAVING.
7. EDGING TOOL SHALL BE SUBMITTED AND APPROVED BY OWNER'S REPRESENTATIVE.
8. SEE REQUIREMENTS FOR FOR EXPANSION AND CONTRACTION JOINT LAYOUT SPECIFICATION SECTION 32 13 13 "CONCRETE PAVING".

CONCRETE PAVING JOINT DETAILS (6 / C7.3)
SCALE A



NOTES
1. ALL SLOPES THROUGHOUT THE ACCESSIBLE PARKING AND AISLE AREAS SHALL NOT EXCEED 1.5%.
2. ALL ACCESSIBLE SIGNAGE AND PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH LATEST ABAAS STANDARDS.

ACCESSIBLE PARKING STRIPING AND SIGNAGE (7 / C7.3)
NOT TO SCALE



ACCESSIBLE RAMP DETAIL (8 / C7.3)
SCALE B

SCALE A: 1 0 1 2 — SCALE IN FEET
SCALE B: 2 0 2 4 — SCALE IN FEET

STATE OF KENTUCKY — TIMOTHY J. HOGAN 26364 — 1/31/2024 — LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.3	SITE DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 39 OF 56
	DATE: JANUARY 2024			

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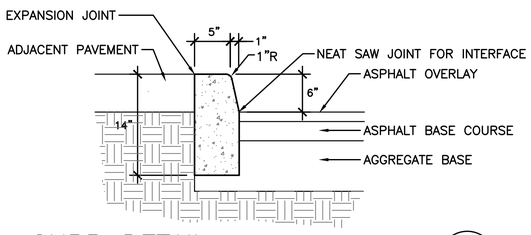
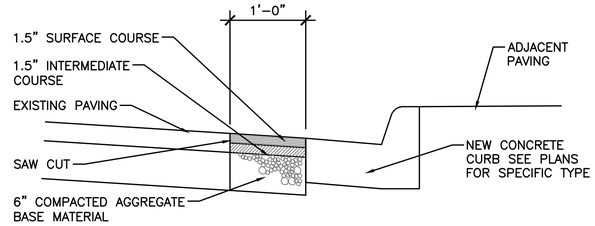
NOTE: EXPANSION JOINTS TO BE LOCATED 20'–0" O.C. MAX. JOINTS TO BE LOCATED AT ALL ANGLE CHANGE OF DIRECTIONS AND ALL RADII POINTS OF INTERSECTION.



CURB DETAIL

NOT TO SCALE

3 / C7.4

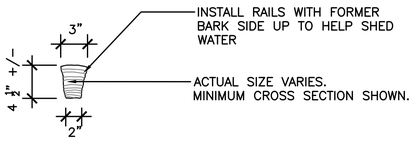


NOTES:
1. REPAIR SHALL BE FLUSH WITH EXISTING PAVING

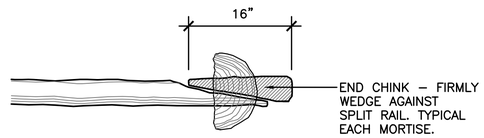
BITUMINOUS PAVEMENT REPAIR

SCALE A

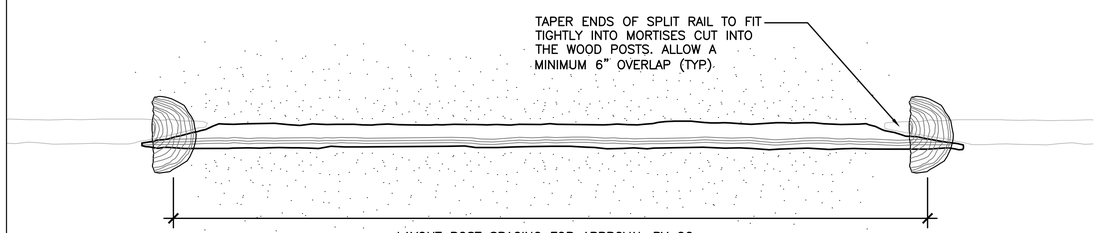
4 / C7.4



TYPICAL RAIL SECTION

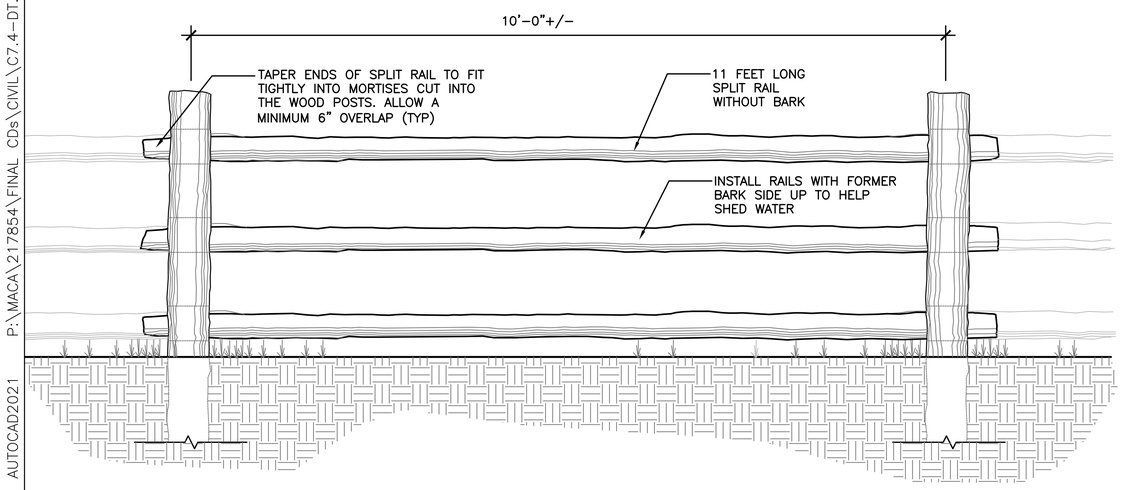


END POST



LAYOUT POST SPACING FOR APPROVAL BY CO PRIOR TO POST INSTALLATION. COORDINATE WIDTHS BETWEEN FENCE POSTS TO AVOID NARROW SECTIONS OF RAILS AT TURNS, CORNERS AND END OF FENCING

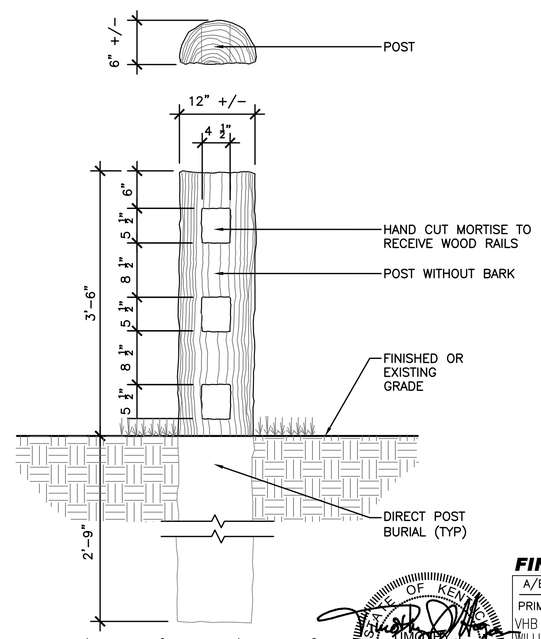
PLAN



WOOD FENCING – THREE RAIL

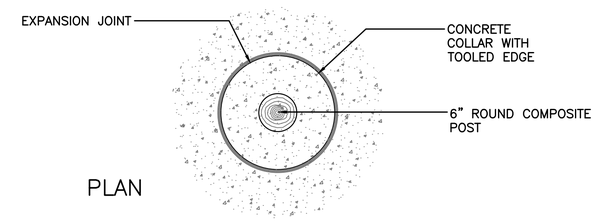
SCALE A

1 / C7.4

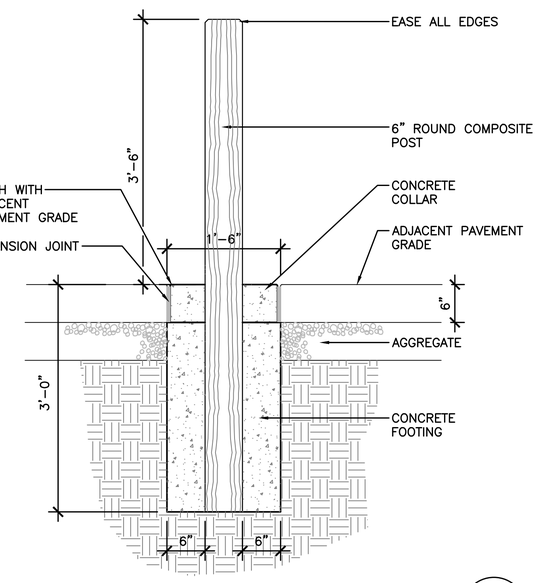


SCALE A 1 0 1 2

SCALE IN FEET



PLAN



WOOD POST

SCALE A

2 / C7.4

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.4	SITE DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 40 OF 56
	DATE: JANUARY 2024			

COMMONWEALTH OF KENTUCKY · TIMOTHY J. HOGAN · 26364 · 1/31/2024 · LICENSED PROFESSIONAL ENGINEER

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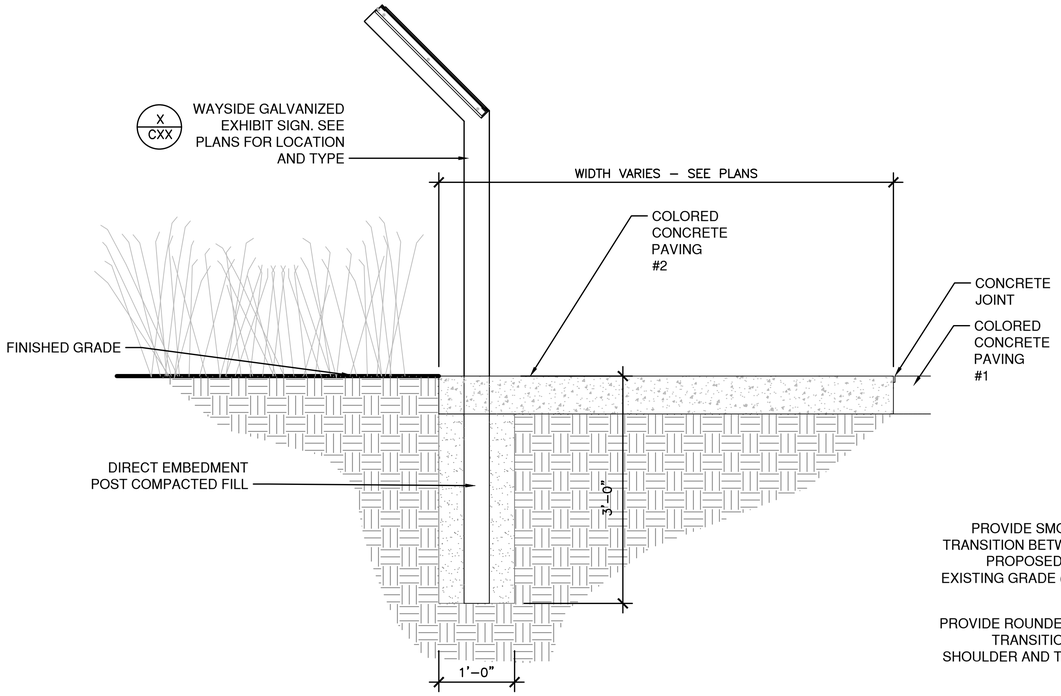
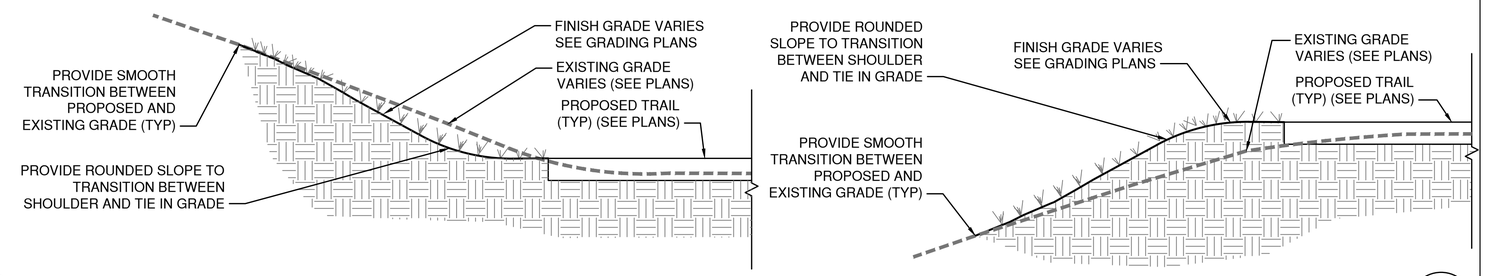


CONCRETE PAVING WITH INTERPRETIVE SIGN
SCALE A

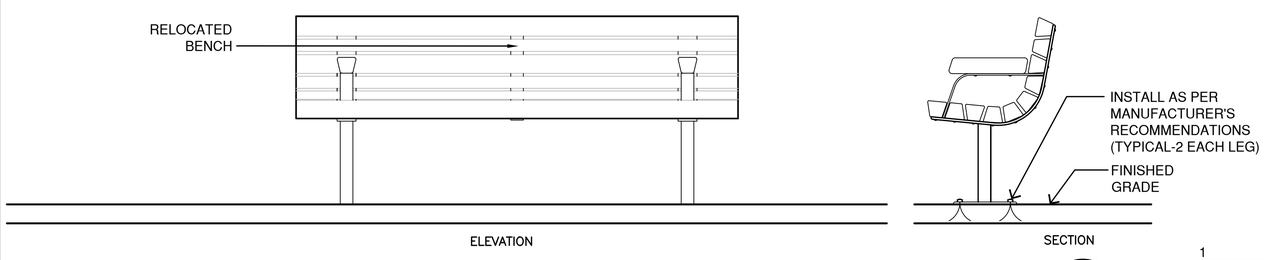
2
C7.5



SLOPE ROUNDING DETAIL
NOT TO SCALE

3
C7.5

TYPICAL BENCH PLAN

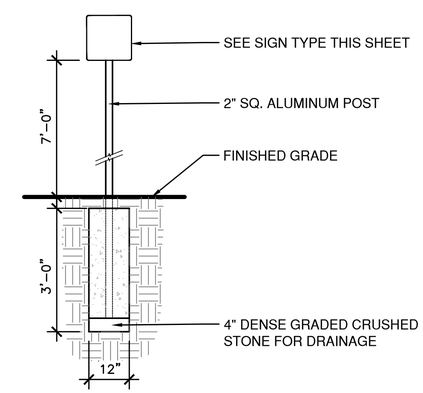


ACCESSIBLE BENCH LOCATION DETAILS
NOT TO SCALE

1
C7.5

SCALE A

1 0 1 2
SCALE IN FEET



SIGNAGE NOTES

1. ALL HARDWARE SHALL BE HOT DIPPED GALVANIZED.
2. SUBMIT FINAL ARTWORK FOR EACH SIGN FOR APPROVAL BY CO REPRESENTATIVE PRIOR TO INSTALLATION.
3. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) LATEST EDITION.
4. ALL SIGNAGE LOCATIONS SHALL BE APPROVED BY CO REPRESENTATIVE PRIOR TO INSTALLATION.

TRAIL SIGNAGE
NOT TO SCALE

4
C7.5

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.5	SITE DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 41 OF 56
	DATE: JANUARY 2024			

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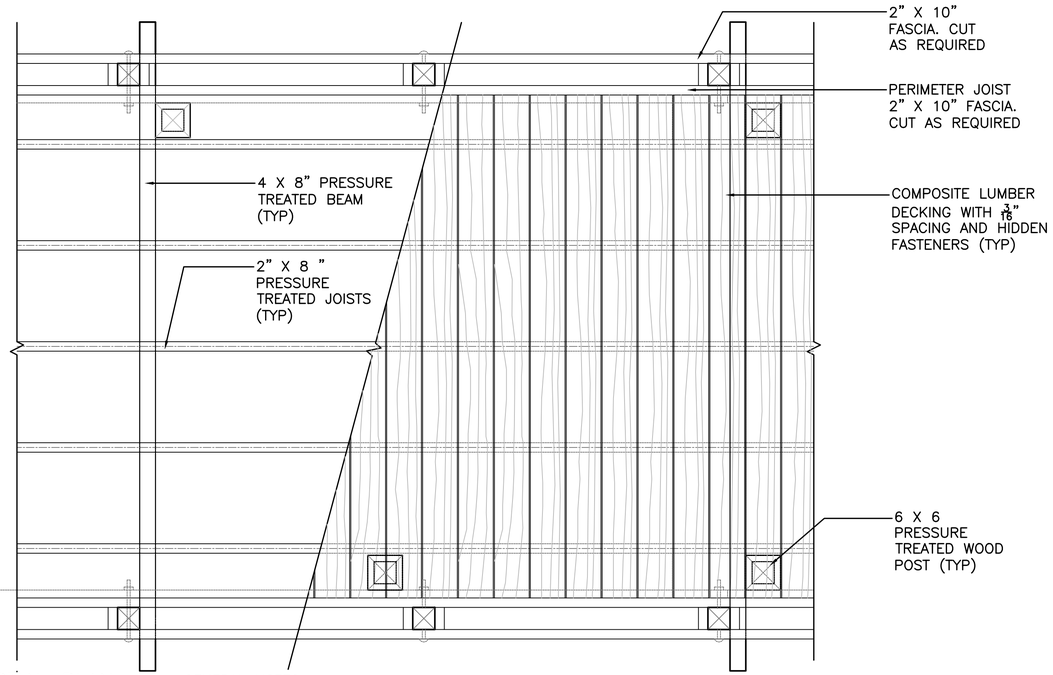
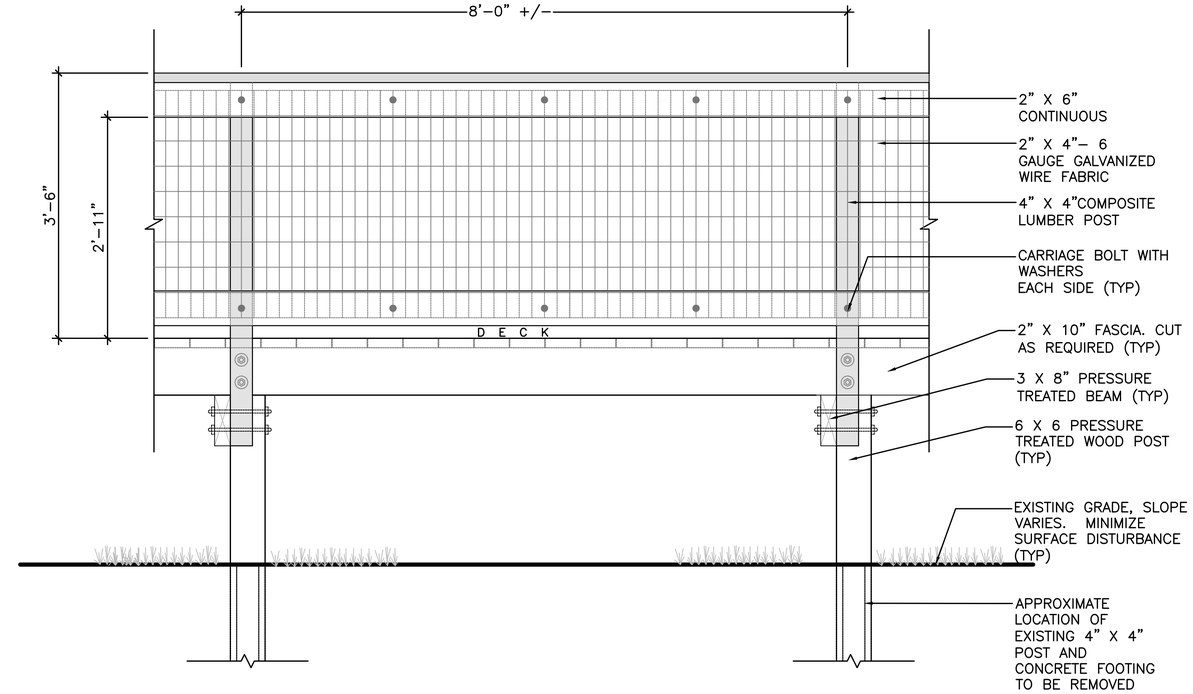


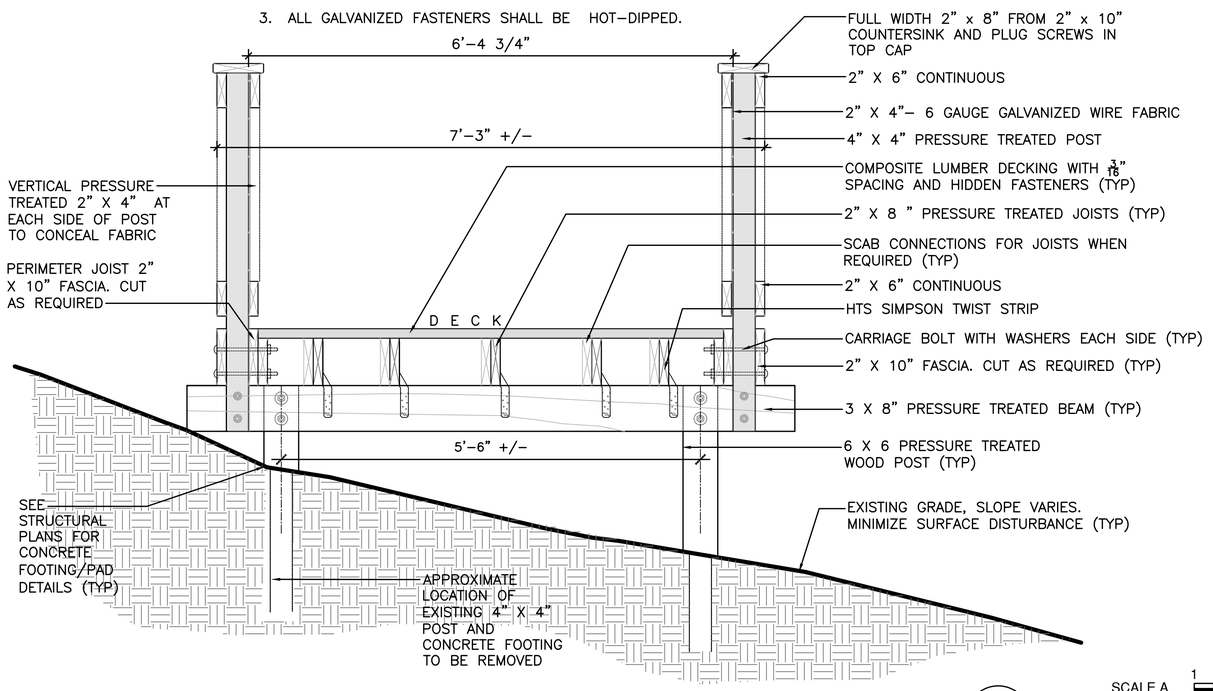
PARTIAL PLAN



PARTIAL ELEVATION

GENERAL NOTES:

1. ALL POSTS SHALL BE 1.00 pcf A.C.Q. RETENTION LEVEL OR BETTER.
2. ALL FRAMING LUMBER SHALL BE .40 pcf A.C.Q. RETENTION LEVEL OR BETTER.
3. ALL GALVANIZED FASTENERS SHALL BE HOT-DIPPED.



BOARDWALK CROSS SECTION
SCALE A

1
C7.6

SCALE A 1 0 1 2
SCALE IN FEET

TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER COMMONWEALTH OF KENTUCKY

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.6	BOARDWALK DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 42 OF 56
	DATE: JANUARY 2024			

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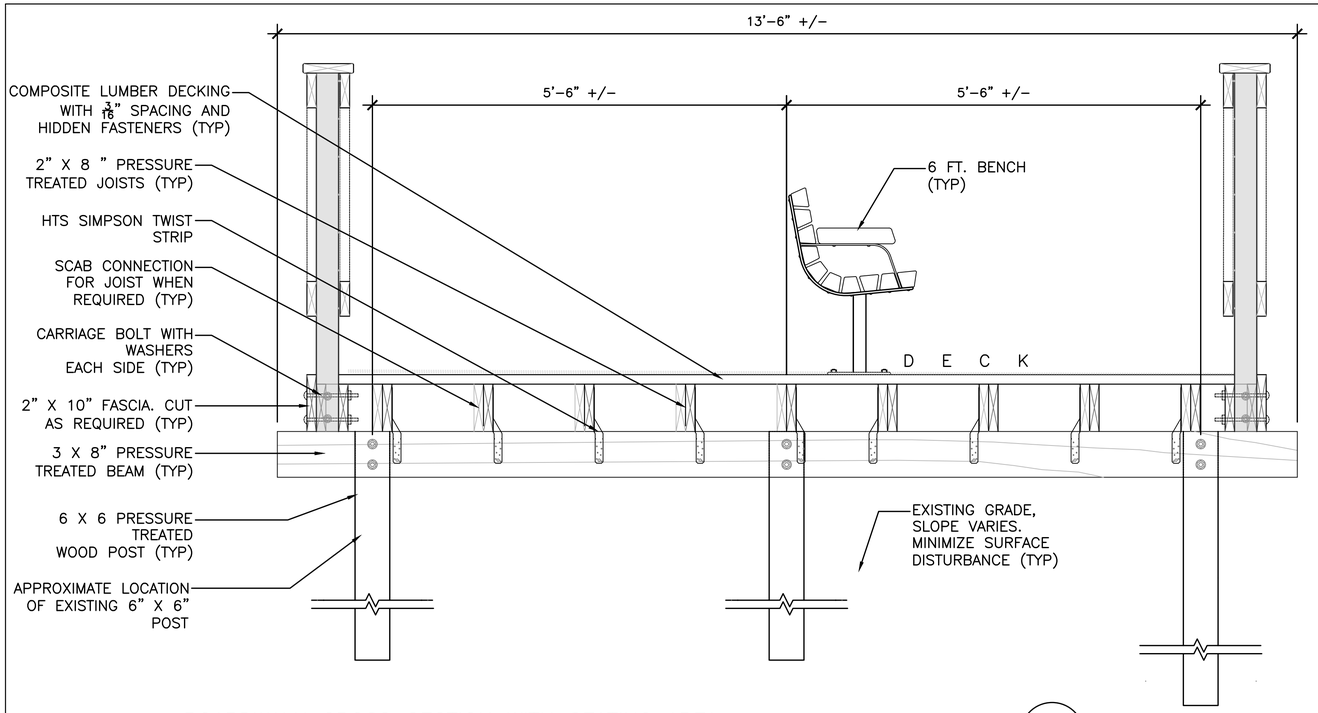
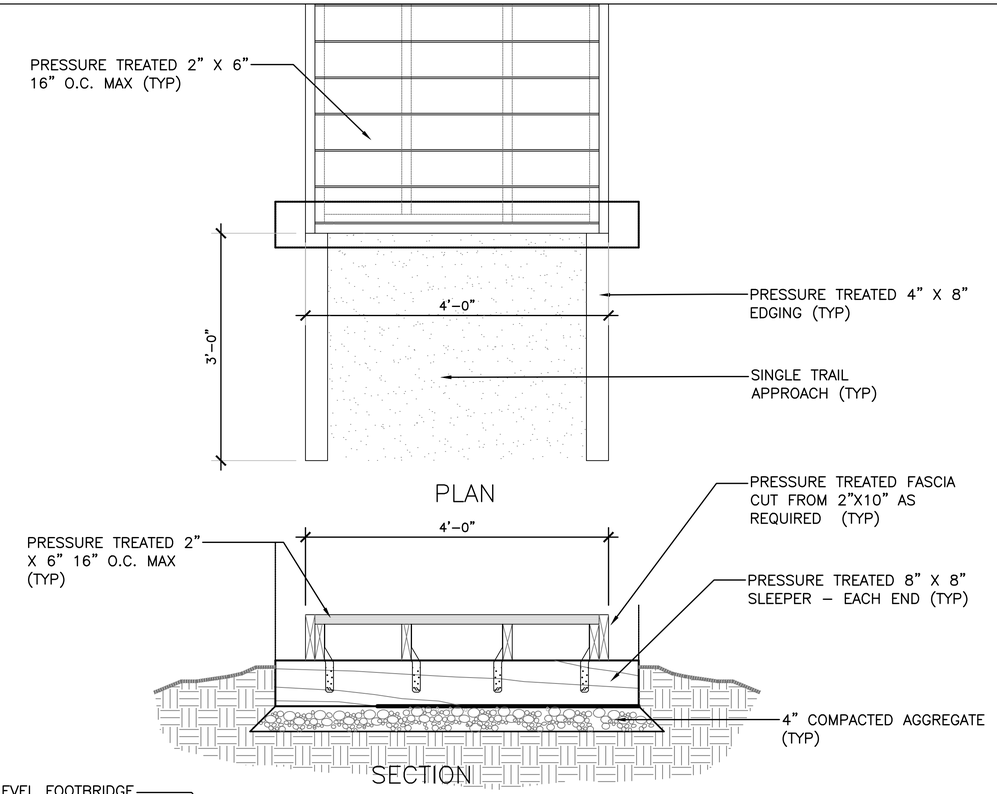
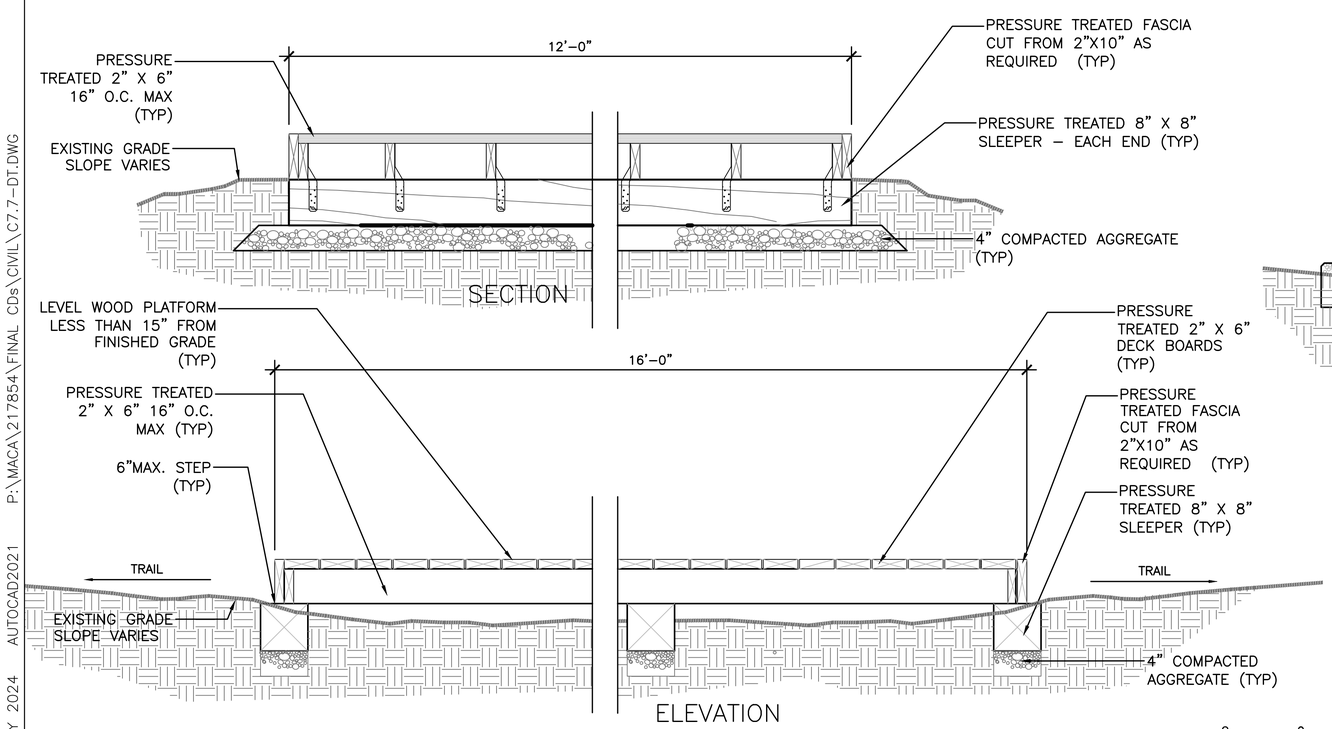


BOARDWALK CROSS SECTION WITH SEATING AREA

SCALE A

1 / C7.7

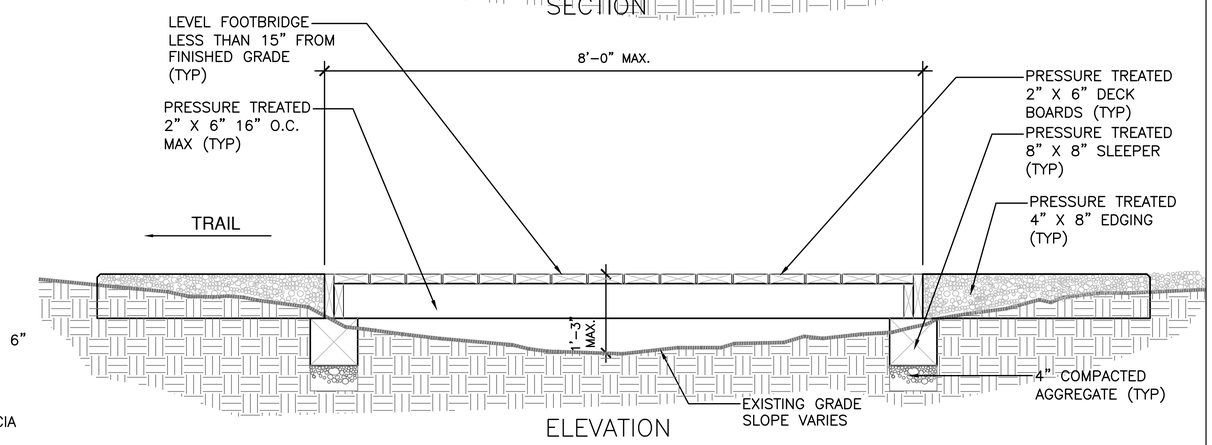




WOOD PLATFORM

NOT TO SCALE

2 / C7.7



FOOTBRIDGE

SCALE A

3 / C7.7

SCALE B 2 0 2 4

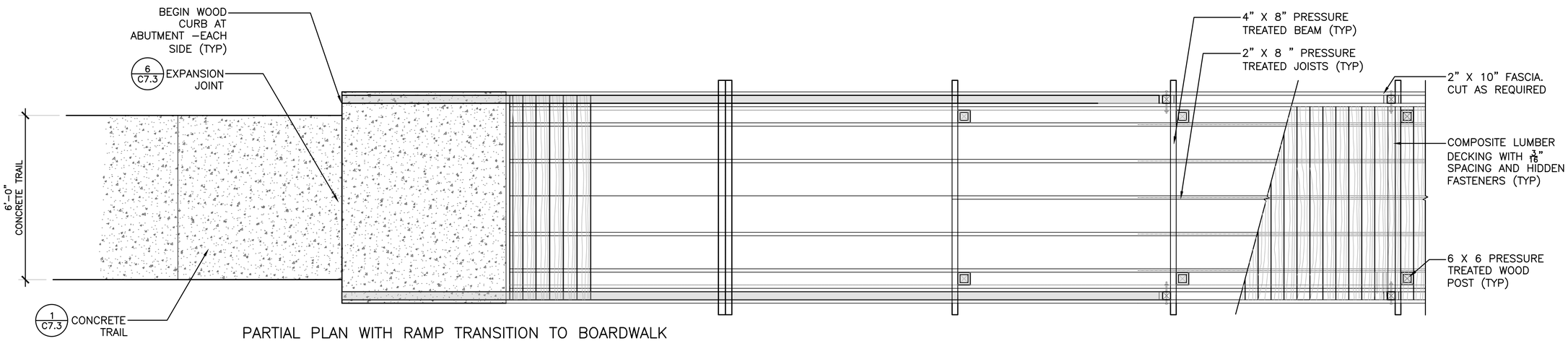
SCALE IN FEET

COMMONWEALTH OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

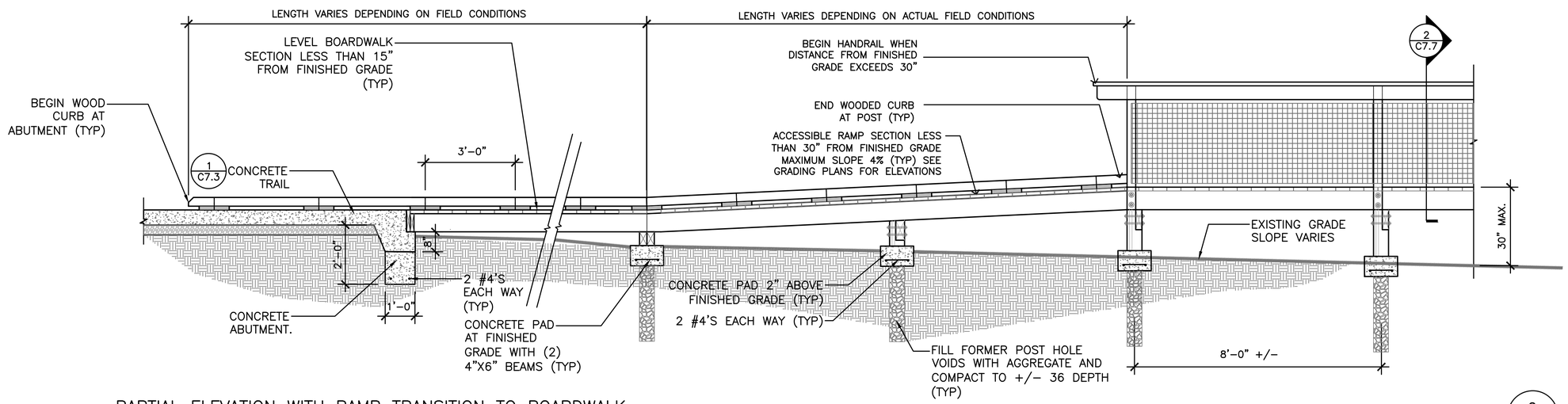
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.7	BOARDWALK DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 43 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C7.7-DT.DWG



PARTIAL PLAN WITH RAMP TRANSITION TO BOARDWALK



PARTIAL ELEVATION WITH RAMP TRANSITION TO BOARDWALK

SCALE B

2 C7.8

SCALE A 1 0 1 2

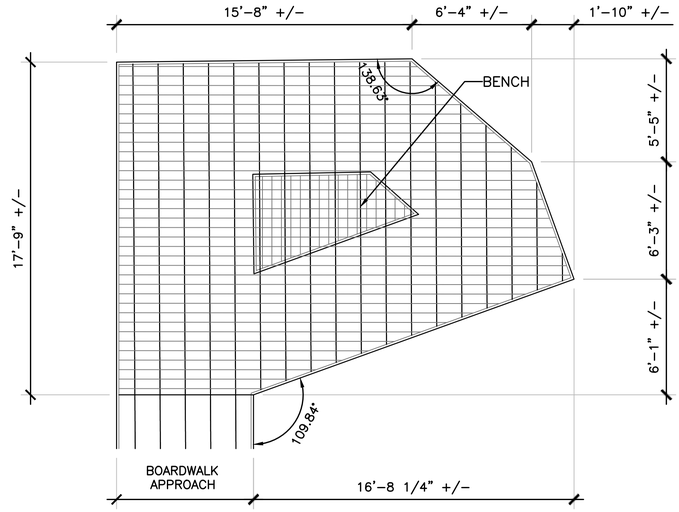
SCALE IN FEET

COMMONWEALTH OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

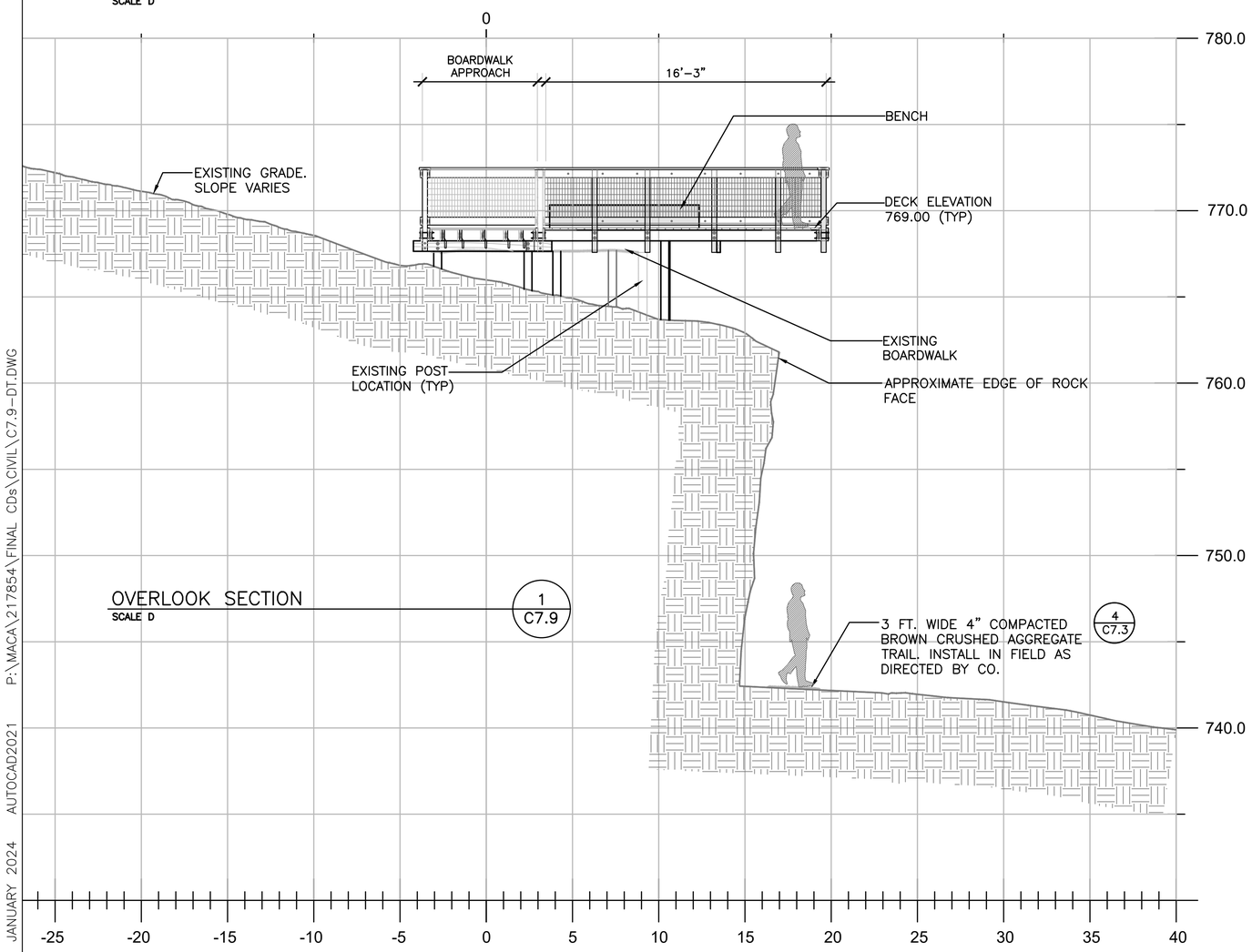
FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.8	BOARDWALK DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 44 OF 56
	DATE: JANUARY 2024			

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\CIVIL\C7.8-DT.DWG



OVERLOOK PLAN
SCALE D



OVERLOOK SECTION
SCALE D

1
C7.9

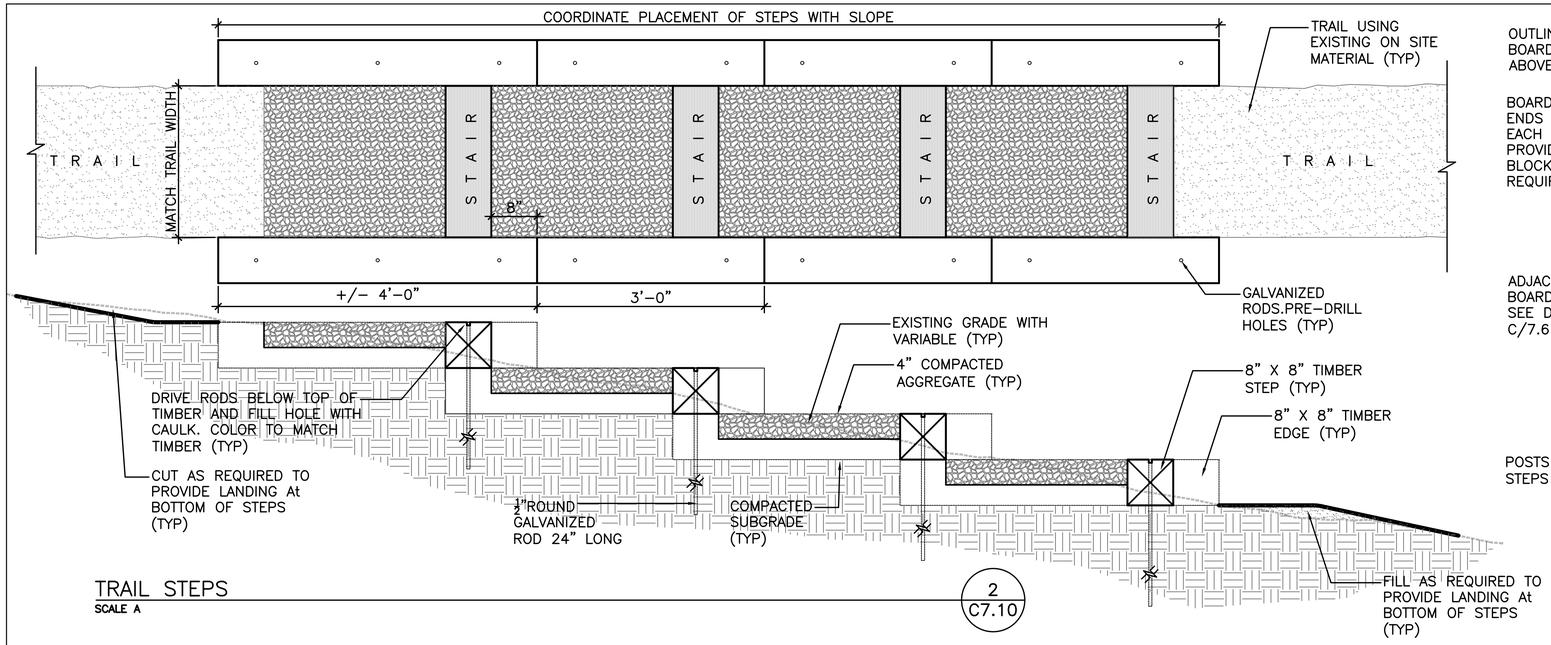
SCALE D 4 0 4 8
SCALE IN FEET

P:\MACA\217854\FINAL CDs\CIVIL\C7.9-DT.DWG
AUTOCAD2021
31 JANUARY 2024

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

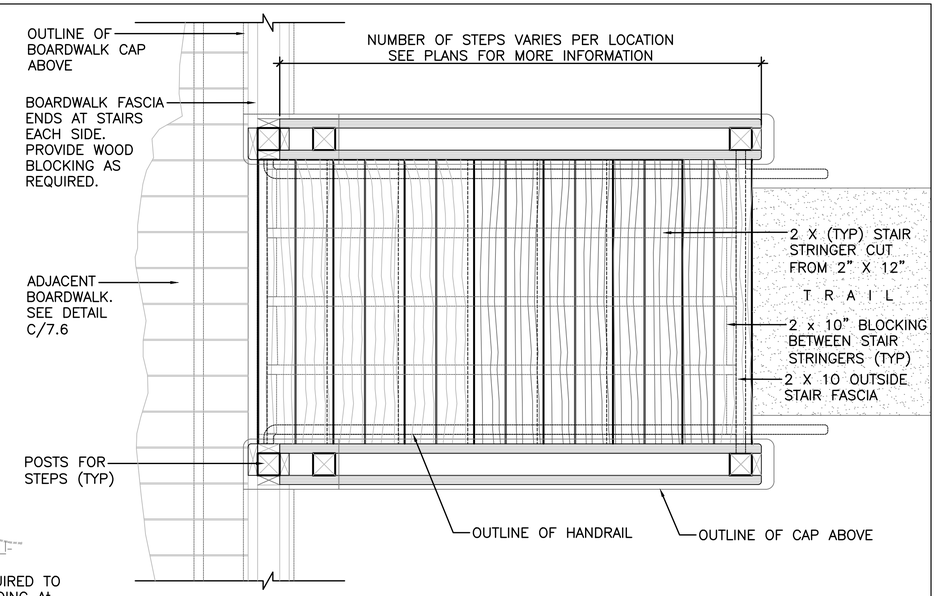
STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.9	OVERLOOK DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 45 OF 56
	DATE: JANUARY 2024			

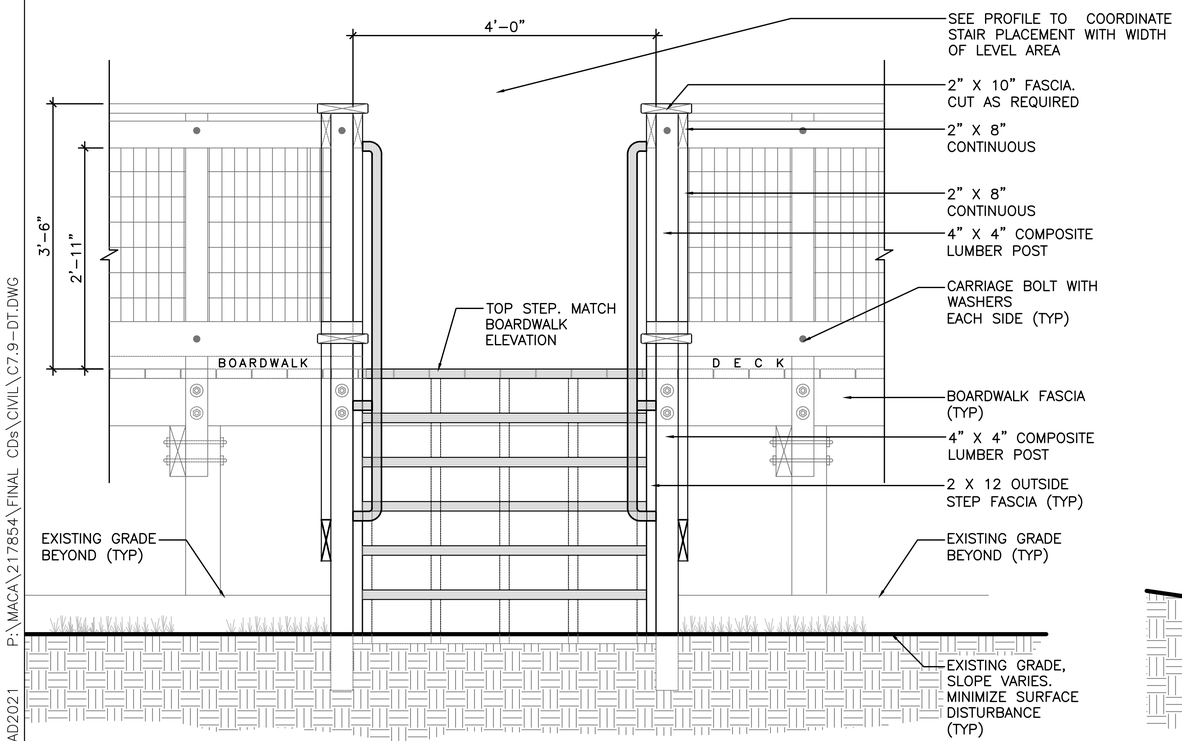


TRAIL STEPS
SCALE A

2
C7.10



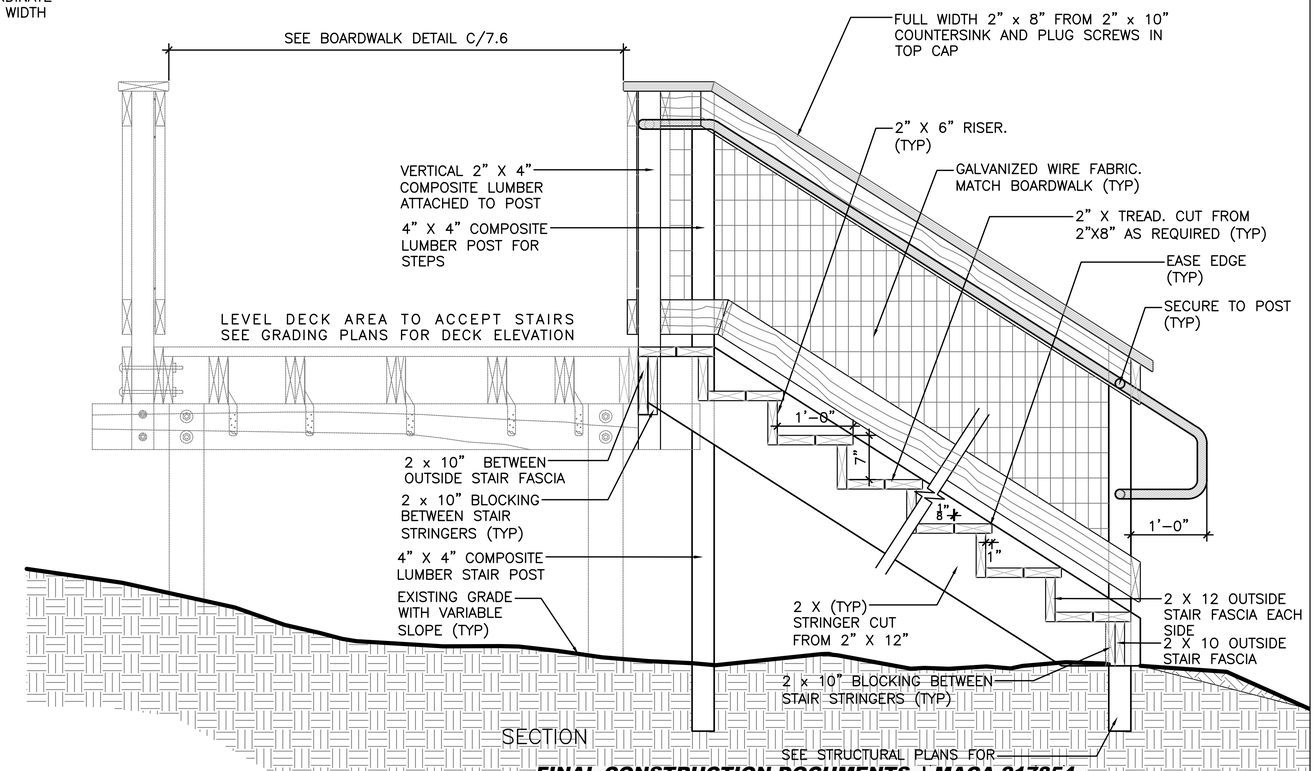
PARTIAL PLAN



PARTIAL ELEVATION

WOOD STEPS DOWN TO GRADE
SCALE A

1
C7.10



SECTION

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

SCALE A 1 0 1 2
SCALE IN FEET

STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	C7.10	WOOD STEPS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 46 OF 56
	DATE: JANUARY 2024			

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STRUCTURAL STEEL NOTES:

–STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING MATERIAL SPECIFICATIONS:

WIDE FLANGES AND SHAPES CUT FROM THEM	ASTM A992
S–BEAMS, CHANNELS, ANGLES AND PLATES	ASTM A36
HOLLOW STRUCTURAL SECTIONS	ASTM A500 GRADE B
STEEL PIPE	ASTM A53 GRADE B
HIGH STRENGTH BOLTS	ASTM A325–X OR ASTM F1852–X
NUTS	ASTM A563
WASHERS	ASTM F436
WELD ELECTRODES	E70XX

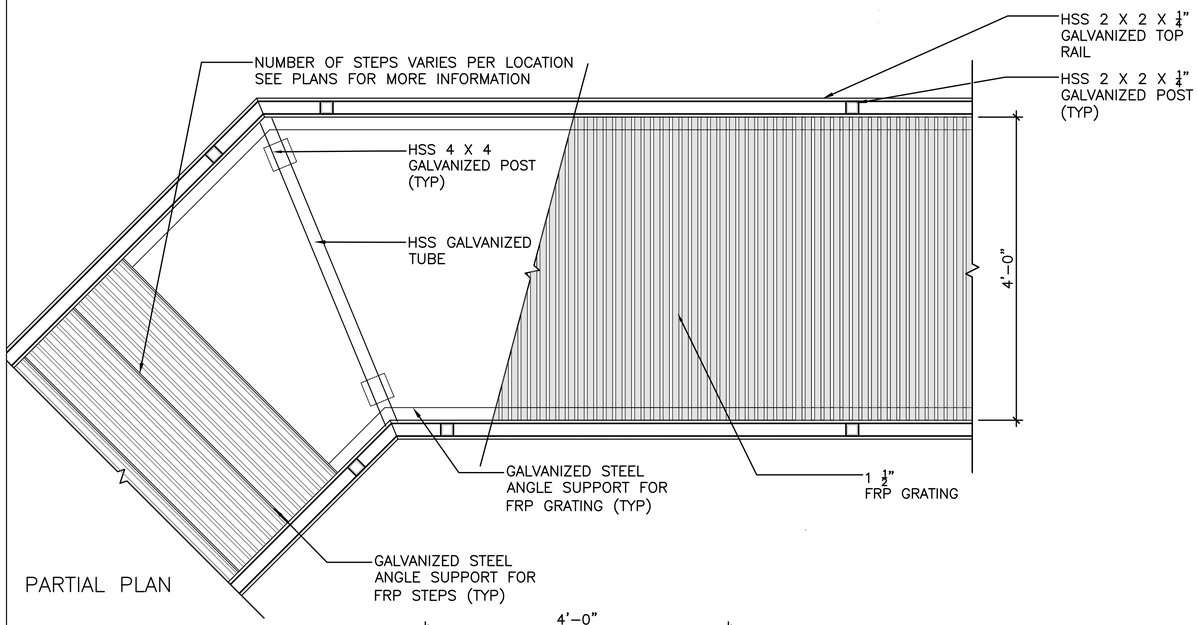
–HIGH STRENGTH BOLTS SHALL BE ¾" DIAMETER, TYPE 1, HOT DIPPED GALVANIZED PER ASTM F2329 AND BE SNUG TIGHTENED WITH THREADS EXCLUDED FROM THE SHEAR PLANE

–WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1 BY QUALIFIED WELDERS AS DEFINED BY AWS D1.1

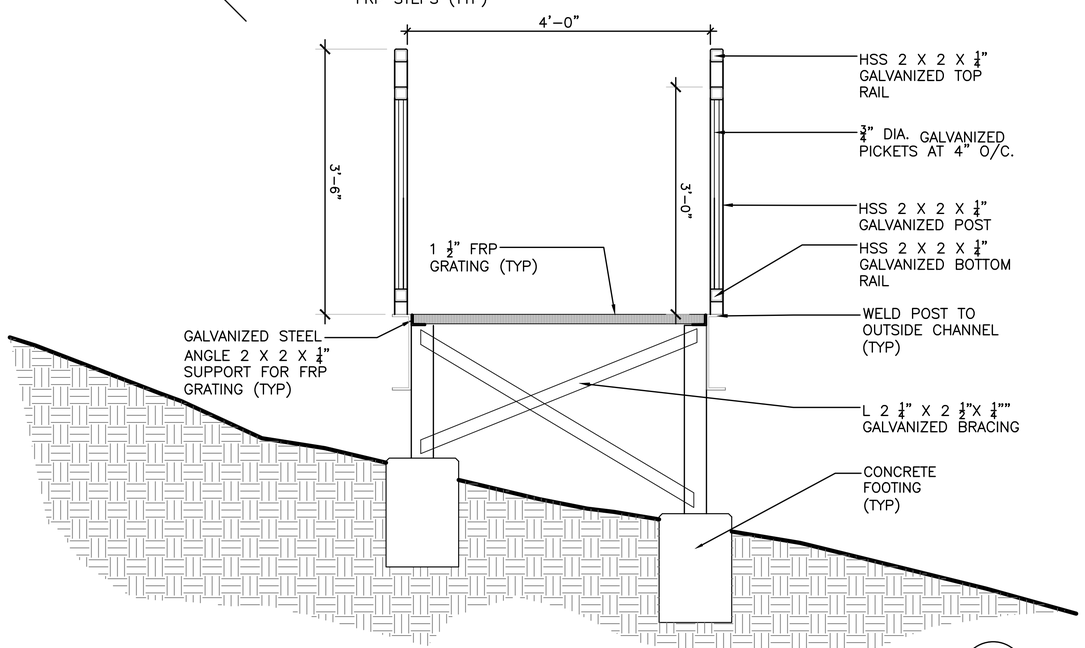
–BEAMS SHALL BE FABRICATED WITH THE NATURAL CAMBER UP

–ALL WORK SHALL CONFORM TO THE AISC "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" LATEST EDITION

–ALL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED PER ASTM123.



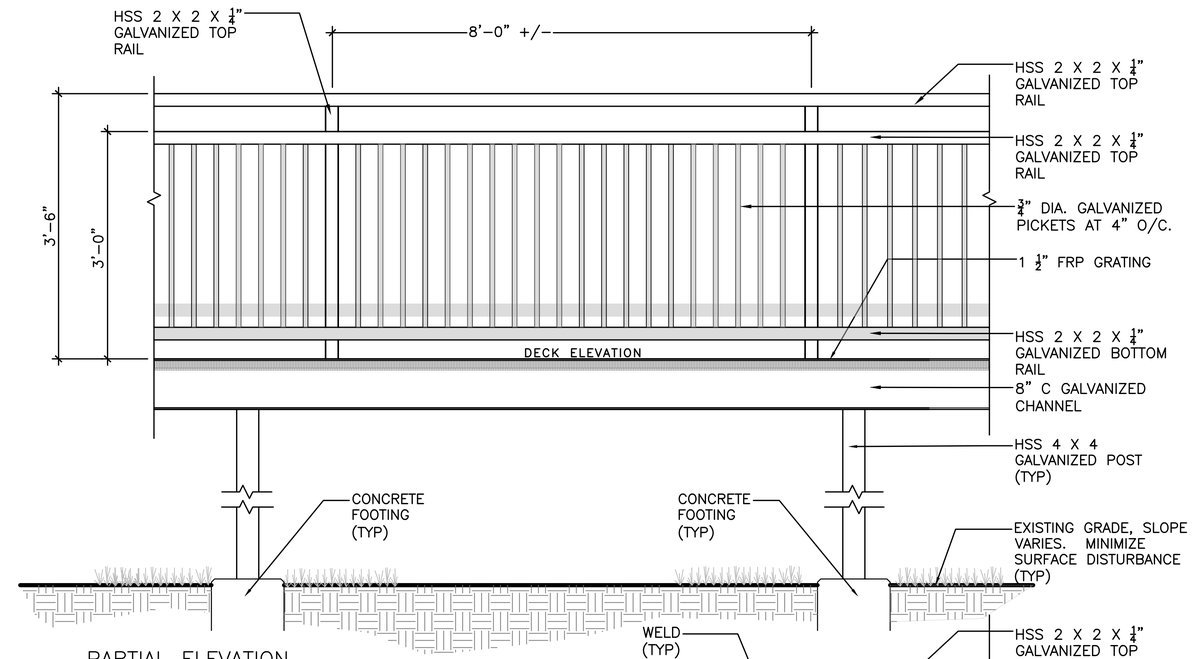
PARTIAL PLAN



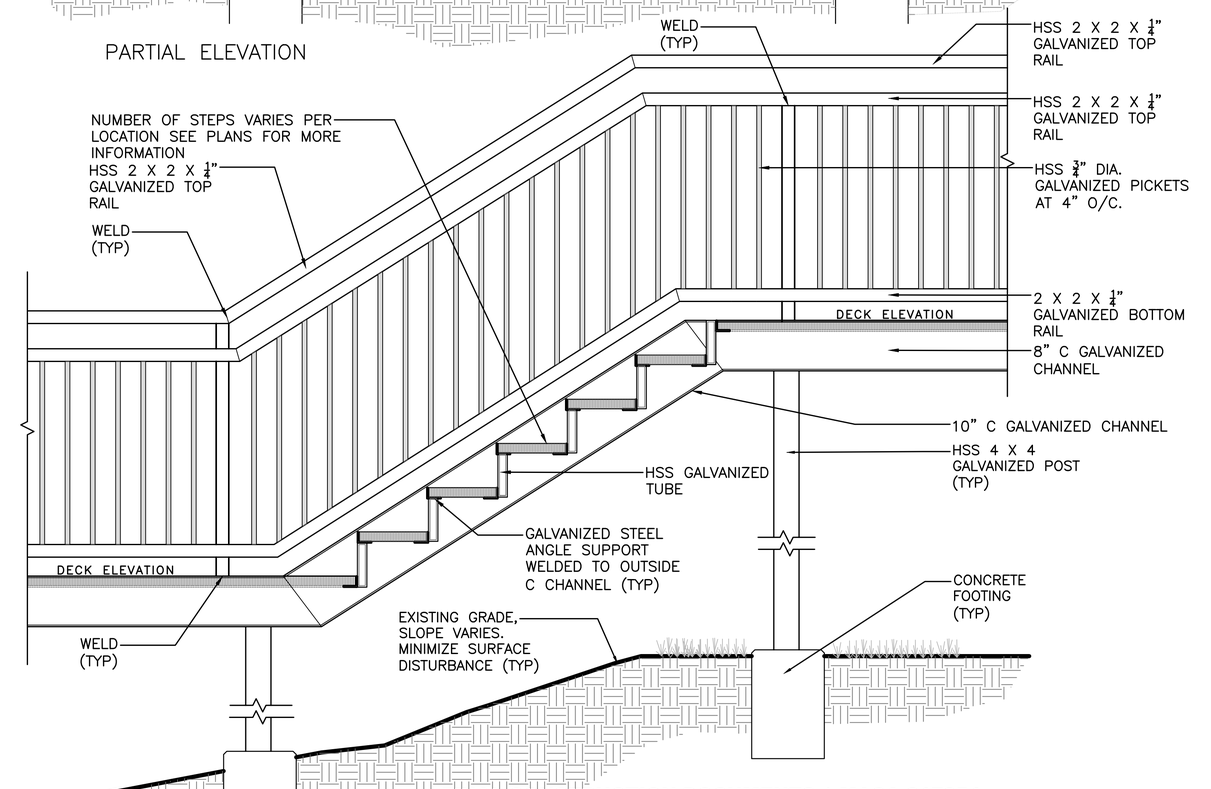
METAL STAIRS (DELEGATED DESIGN)

SCALE A

1 / C7.11



PARTIAL ELEVATION



SCALE A 1 0 1 2

SCALE IN FEET

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA SUB: AMI VIRGINIA, MI AEI MADISON, WI	DM/ST CADD LY/ST TECH. REVIEW: TH DATE: JANUARY 2024	C7.11	METAL STAIRS RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	135 PMIS/PKG NO. 217854 SHEET 47 OF 56

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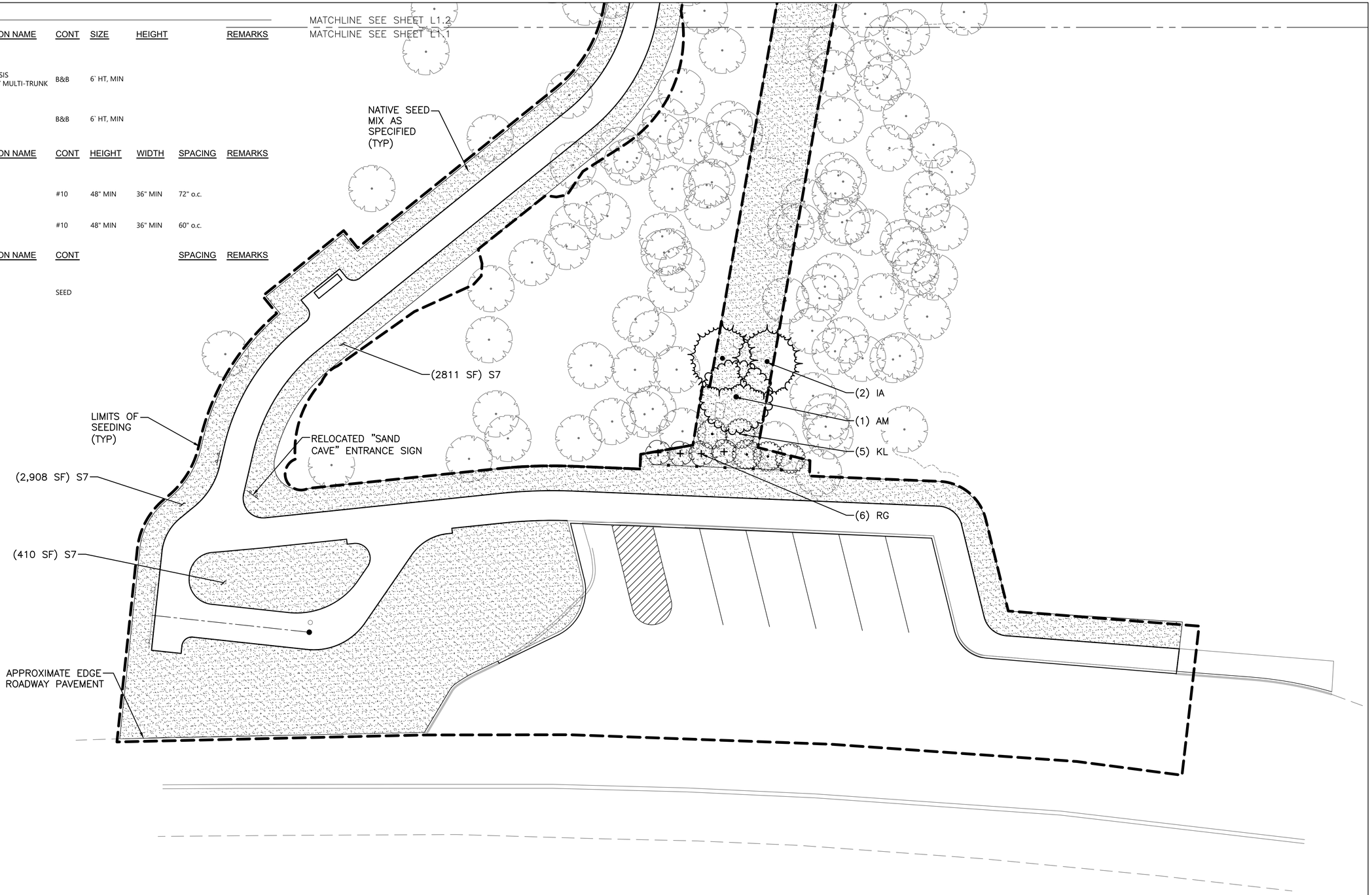
PLANT SCHEDULE 1

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SIZE	HEIGHT	REMARKS
TREES							
	AM	2	AMELANCHIER CANADENSIS CANADIAN SERVICEBERRY MULTI-TRUNK	B&B	6` HT, MIN		
	IA	4	ILEX OPACA AMERICAN HOLLY	B&B	6` HT, MIN		

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	HEIGHT	WIDTH	SPACING	REMARKS
SHRUBS								
	KL	13	KALMIA LATIFOLIA MOUNTAIN LAUREL	#10	48" MIN	36" MIN	72" o.c.	
	RG	11	RHUS GLABRA SMOOTH SUMAC	#10	48" MIN	36" MIN	60" o.c.	

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SPACING	REMARKS
SOD/SEED						
	S7	9,676 SF	NATIVE SEED MIX	SEED		



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STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA SUB: AMI VIRGINIA, MI; AEI MADISON, WI	DM/ST CADD LY/ST TECH. REVIEW: TH DATE: JANUARY 2024	L1.1	LANDSCAPE PLAN RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	135 PMIS/PKG NO. 217854 SHEET 48 OF 56

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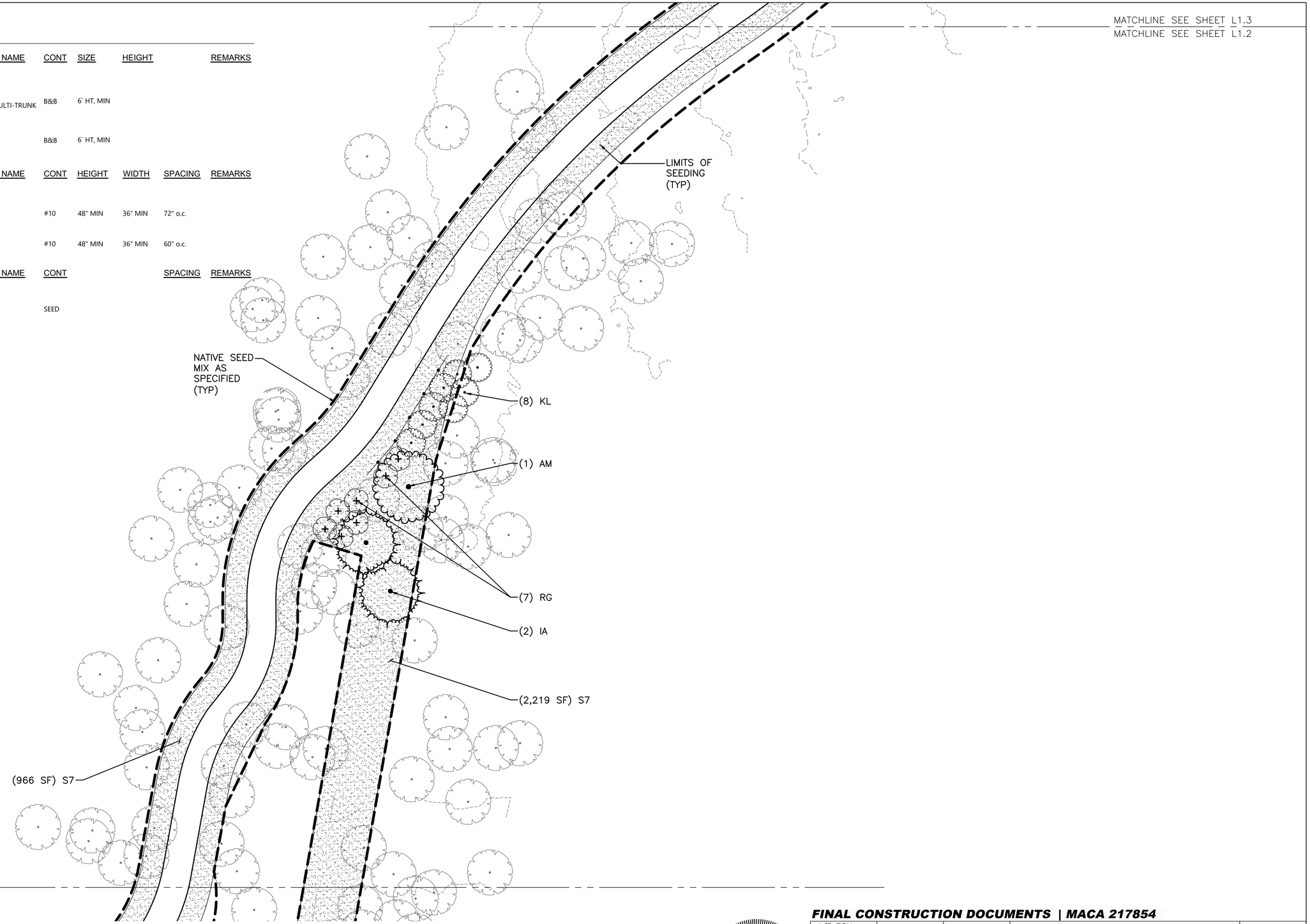
PLANT SCHEDULE 2

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SIZE	HEIGHT	REMARKS
TREES							
	AM	1	AMELANCHIER CANADENSIS CANADIAN SERVICEBERRY MULTI-TRUNK	B&B	6` HT, MIN		
	IA	2	ILEX OPACA AMERICAN HOLLY	B&B	6` HT, MIN		

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	HEIGHT	WIDTH	SPACING	REMARKS
SHRUBS								
	KL	8	KALMIA LATIFOLIA MOUNTAIN LAUREL	#10	48" MIN	36" MIN	72" o.c.	
	RG	7	RHUS GLABRA SMOOTH SUMAC	#10	48" MIN	36" MIN	60" o.c.	

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SPACING	REMARKS
SOD/SEED						
	S7	3,272 SF	NATIVE SEED MIX	SEED		



REMARKS

0 5 10 20 Feet

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	L1.2	LANDSCAPE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 49 OF 56
	DATE: JANUARY 2024			

STATE OF KENTUCKY TIMOTHY J. HOGAN 26364 1/31/2024 LICENSED PROFESSIONAL ENGINEER

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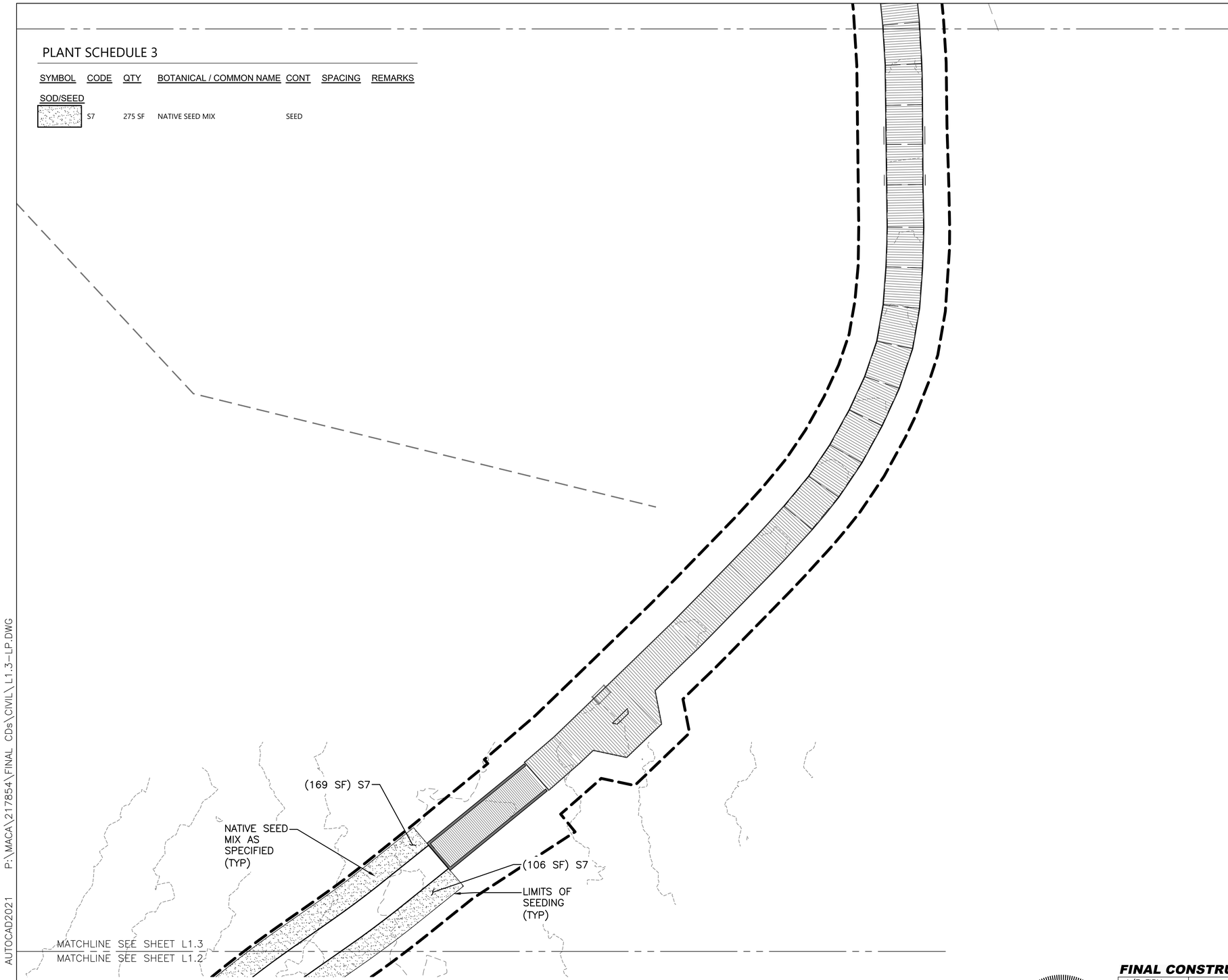
PLANT SCHEDULE 3

SYMBOL	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SPACING	REMARKS
SOD/SEED						
	S7	275 SF	NATIVE SEED MIX	SEED		



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STATE OF KENTUCKY
TIMOTHY J. HOGAN
26364
1/31/2024
LICENSED PROFESSIONAL ENGINEER

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	L1.3	LANDSCAPE PLAN	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 50 OF 56
	DATE: JANUARY 2024			

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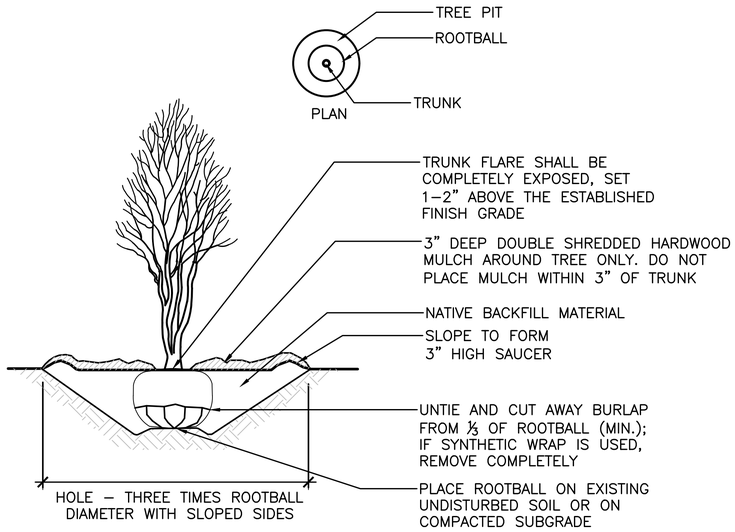
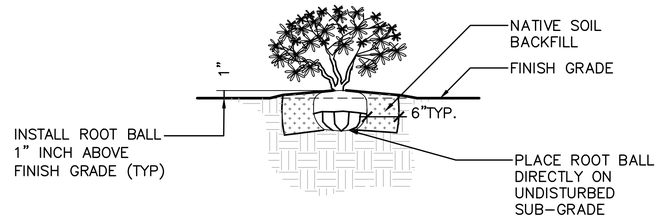
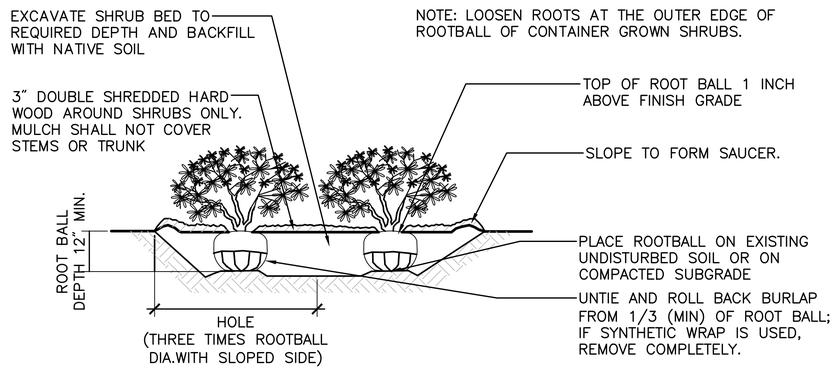


UNDERSTORY TREE PLANTING (1 / L1.4)
No Scale



SHRUB PLANTING DETAIL (2 / L1.4)
No Scale



SHRUB BED PLANTING (3 / L1.4)
No Scale

LANDSCAPE NOTES:

1. ALL PLANT MATERIALS INSTALLED SHALL MEET THE SPECIFICATIONS OF THE "AMERICAN STANDARDS FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN AND CONTRACT DOCUMENTS.
2. ALL NEW PLANTS TO BE BALLED & BURLAPPED OR CONTAINER–GROWN UNLESS OTHERWISE NOTED ON PLANT LIST.
3. ALL PROPOSED PLANTING LOCATIONS SHALL BE STAKED AS SHOWN ON THE PLANS FOR FIELD REVIEW AND APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.
4. ALL PLANTING BACKFILL AND DISTURBED AREAS SHALL BE NATIVE SAND MATERIAL FROM ON SITE OR NATIVE BORROW MATERIAL. SAND ONLY; NO TOPSOIL.
5. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING & NEW UTILITY LINES PRIOR TO PLANTING & SHALL REPORT ANY CONFLICTS TO THE NPS.
6. NO PLANT MATERIALS SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA. CONTRACTOR SHALL NOTIFY OWNER'S REPRESENTATIVE OF ANY CONFLICT.
7. A 3–INCH DEEP ORGANIC MULCH LAYER SHALL BE INSTALLED UNDER ALL TREES AND SHRUBS, AND IN ALL PLANTING BEDS, UNLESS OTHERWISE INDICATED ON THE PLANS, OR AS DIRECTED BY CO.
8. ALL TREES SHALL BE BALLED AND BURLAPPED (B&B), UNLESS OTHERWISE NOTED IN THE DRAWINGS OR SPECIFICATION, OR APPROVED BY THE CO.
9. FINAL QUANTITY FOR EACH PLANT TYPE SHALL BE AS GRAPHICALLY SHOWN ON THE PLAN. THIS NUMBER SHALL TAKE PRECEDENCE IN CASE OF ANY DISCREPANCY BETWEEN QUANTITIES SHOWN ON THE PLANT LIST AND ON THE PLAN. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES BETWEEN THE NUMBER OF PLANTS SHOWN ON THE PLANT LIST AND PLANT LABELS PRIOR TO BIDDING.
10. ANY PROPOSED PLANT SUBSTITUTIONS MUST BE REVIEWED BY CO AND APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE.
11. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
12. THIS PLAN IS INTENDED FOR PLANTING PURPOSES. REFER TO SITE / CIVIL DRAWINGS FOR ALL OTHER SITE CONSTRUCTION INFORMATION.
13. ANY PROPOSED SUBSTITUTIONS OF PLANT SPECIES SHALL BE MADE W/ PLANTS OF EQUIVALENT OVERALL FORM, HEIGHT, BRANCHING HABIT, FLOWER, LEAF, COLOR, FRUIT & CULTURE, AND ONLY AS APPROVED BY THE NPS.
14. WHERE PLANT SIZE IS INDICATED AS A RANGE, THE PLANTS PROVIDED SHALL BE A FAIR REPRESENTATION OF THAT RANGE.
15. PREPARE ALL PLANTING BEDS TO MIN. OVERALL DEPTHS SHOWN ON PLANTING DETAILS.
16. ALL PLANTS HAVE BEEN LOCATED WITH RESPECT TO PROPOSED AND/OR EXISTING UTILITIES. HOWEVER, THE COMPLETENESS OR ACCURACY OF UTILITY LOCATIONS IS NOT GUARANTEED. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE LOCATION AND ELEVATION OF EXISTING UTILITIES AT HIS/HER OWN EXPENSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGES TO EXISTING UTILITIES.
17. VERIFICATION OF PLANT QUANTITIES AS SHOWN IN THE PLANT LIST SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND THE KEYED PLAN SHALL GOVERN.
18. PLANTS AND ROOTS SHALL BE KEPT MOIST BEFORE AND DURING PLANTING.
19. PLANTING SEASON: AS DIRECTED BY CO.
20. REMOVE ALL TAGS AND LABELS FROM TREES AND SHRUBS DURING FINAL INSPECTION.
21. ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GRADE AS THEY DID IN THEIR PREVIOUS LOCATION

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STATE OF KENTUCKY
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FINAL CONSTRUCTION DOCUMENTS | MACA 217854

A/E FIRM	DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	DM/ST	L1.4	LANDSCAPE DETAILS	135
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD LY/ST			PMIS/PKG NO. 217854
	TECH. REVIEW: TH		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	SHEET 51 OF 56
	DATE: JANUARY 2024			

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DESIGN CRITERIA

- DESIGNED IN ACCORDANCE WITH THE 2021 INTERNATIONAL BUILDING CODE AND ASCE–16.
- DESIGN LOADS

SOIL DENSITY	
ALLOWABLE BEARING CAPACITY	3000 PSF ENG FILL
	5000 PSF BEDROCK
LIVE LOADS	100 PSF (UNIFORM)
	300 LB (CONCENTRATED)
SEISMIC LOADS	N/A

GENERAL

- THE STRUCTURAL DRAWINGS ARE TO BE WORKED TOGETHER WITH CIVIL DRAWINGS AND FOR ALL INTER–DISCIPLINE INTERFACE WORK WHICH MAY NOT BE INCLUSIVE ON THE STRUCTURAL DRAWINGS. CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND SHALL REPORT ANY DISCREPANCY TO THE CONTRACTING OFFICER (CO) PRIOR TO COMMENCING THE WORK.
- OPENINGS AND PENETRATIONS NOT SHOWN IN THE CONTRACT DOCUMENTS THROUGH ANY STRUCTURAL ELEMENTS OR ITEMS EMBEDDED IN THE STRUCTURAL ELEMENTS SHALL BE SUBMITTED TO THE CO FOR REVIEW AND APPROVAL PRIOR TO IMPLEMENTING THE WORK.
- ALL PRE–ENGINEERED COMPONENTS AND SYSTEMS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PLANS, SECTIONS AND DETAILS SHALL NOT BE SCALED FOR DETERMINATION OF SIZE, QUANTITIES, LENGTHS, ETC.
- DO NOT PLACE MATERIALS OR EQUIPMENT ON COMPLETED FLOORS OR ROOFS IN EXCESS OF THE INDICATED DESIGN LIVE LOADS. AVOID IMPACT LOADING.
- ALL MEMBERS ARE DESIGNED TO RESIST THE DESIGN LOADS WITHIN THE COMPLETED STRUCTURAL SYSTEM. CONTRACTOR IS RESPONSIBLE FOR ADEQUATE SHORING, BRACING, ETC DURING CONSTRUCTION.
- CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF ANY AND ALL STREETS, UTILITIES, EXISTING STRUCTURES, EQUIPMENT, ETC.
- EXISTING CONDITIONS AND RELATED DIMENSIONS INDICATED IN THE CONTRACT DOCUMENTS SHALL BE FIELD VERIFIED. ANY VERIFIED CONDITIONS THAT DIFFER FROM THAT INDICATED IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED TO THE CO FOR REVIEW AND APPROVAL PRIOR TO PRODUCTION OF SHOP DRAWINGS OR EXECUTION OF WORK IN THE FIELD.
- CONTRACTOR SHALL COORDINATE ALL WORK AS NEEDED WITH CO'S SPECIAL INSPECTOR TO ENSURE ALL REQUIREMENTS OF SPECIAL INSPECTION PROGRAM ARE MET.

REINFORCING STEEL

- ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, WITH A MINIMUM YIELD POINT OF 60,000 PSI. REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH ASTM A775 IF NOTED ON PLANS.
- ALL REINFORCING BAR DIMENSIONS SHOWN ON THE DRAWINGS ARE TO CENTERLINE OF BARS UNLESS NOTED OTHERWISE.
- DETAIL REINFORCING STEEL IN ACCORDANCE WITH "ACI DETAILING MANUAL" ACI MNL66 AND "CRSI: MANUAL OF STANDARD PRACTICE" AND "CRSI: PLACING REINFORCING BARS", EXCEPT WHERE SHOWN OTHERWISE.
- DEVELOPMENT LENGTH AND LAP SPLICE LENGTH OF REINFORCING BARS SHALL BE AS SHOWN ON THE PLANS. ALL REINFORCING BAR SPLICES SHALL BE CLASS "B" TENSION LAP SPLICES, UNLESS NOTED OTHERWISE.
- WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
- REINFORCING MEETING ASTM A615 SHALL NOT BE WELDED WITHOUT PRIOR APPROVAL FROM ENGINEER.
- REINFORCING TO BE WELDED SHALL BE WELDABLE REBAR MEETING ASTM A706 SPECIFICATION OR DEFORM BAR ANCHORS MEETING ASTM A496 STANDARD. ALL WELDING OF REBAR SHALL BE SUBMITTED FOR APPROVAL TO CO PRIOR TO WELDING.

FOUNDATION

- PREPARE ALL SOILS BENEATH SLABS AND FOOTINGS IN ACCORDANCE WITH TERRACON GEOTECHNICAL REPORT PROJECT NUMBER N1225082
- CONTRACTOR SHALL LOCATE ALL EXISTING UNDERGROUND UTILITIES BEFORE BEGINNING FOUNDATION EXCAVATIONS
- PROVIDE FOOTING DOWELS TO MATCH MASONRY AND CONCRETE FOUNDATION WALL REINFORCING. IF MASONRY OR CONCRETE WALL REINFORCING IS NOT SPECIFIED, PROVIDE #5 DOWELS AT 2'–6" OC FOR CONCRETE WALL (48" OC FOR MASONRY WALL) EXTENDING A MINIMUM OF 24" ABOVE THE TOP OF FOOTING
- CONCRETE SHALL NOT BE PLACED INTO OR AGAINST SOIL CONTAINING FREE WATER, FROST OR ICE. SHOULD WATER ENTER OR ICE FORM IN A STRUCTURAL EXCAVATION AFTER BEING APPROVED, THE SOIL SHALL BE RE–INSPECTED AFTER REMOVAL OF WATER OR ICE AND RECOMPACTION TO COMPLY WITH GEOTECHNICAL REPORT
- FOUNDATION WALLS SHALL BE BACKFILLED IN EQUAL LIFTS ON EACH SIDE OF THE WALL TO AVOID DAMAGE

WOOD NOTES

- CONTRACTOR SHALL SUBMIT CERTIFICATION FORMS FOR WOOD DECKING TO CONTRACTING OFFICER FOR APPROVAL PRIOR TO PROCUREMENT.
- ALL WOOD THAT DOES NOT CONFORM TO THE SPECIFICATIONS OUTLINED HEREIN (LOOSE KNOTS, HOLES, WANES, ETC.) SHALL BE REMOVED AND REPLACED AT CONTRACTOR'S EXPENSE.
- CONTRACTOR SHALL FOLLOW THE PROVISIONS OF SECTION 2308: CONVENTIONAL LIGHT–FRAME CONSTRUCTION IN THE IBC, THE CONSTRUCTION DRAWINGS AND PROJECT SPECIFICATIONS.
- WOOD MEMBERS SHALL MEET THE FOLLOWING REQUIREMENTS:
  - A. TREATED LUMBER SHALL HAVE NO LOOSE KNOTS, HOLES OR WANE.
  - B. ALL EXTERIOR EXPOSED STRUCTURAL MEMBERS SHALL BE TREATED SOUTHERN PINE GRADE NO. 1 OR BETTER OR NOTED OTHERWISE
  - C. WOOD DECKING CONCENTRATED LIVE LOAD = 300–LB ON ANY $1FT^2$
  - D. ENGINEERED TREATED LUMBER:
    - LVL'S SHALL HAVE THE FOLLOWING MINIMUM PROPERTIES:
      - MODULUS OF ELASTICITY E = 2.0 X 10^6 PSI
      - FLEXURAL STRESS Fb (MIN) = 2,800 PSI
      - HORIZONTAL SHEAR (JOIST) Fv (MIN) = 285 PSI
      - COMPRESSION PERPENDICULAR TO GRAIN (JOIST) Fc(PERP) = 750 PSI
      - COMPRESSION PARALLEL TO GRAIN FC(PARA) = 2,635 PSI
- WOOD WALKWAY JOISTS AND POSTS SHALL BE TREATED IN ACCORDANCE WITH AWPA U1, USE CATEGORY UC4A, WATER–BORNE COPPER BASED SUSPENSION PRESERVATIVES. (MICRONIZED COPPER)
  - A. THE PRESERVATIVE SHALL HAVE A RETENTION ASSAY IN ACCORDANCE WITH AWPA UC4A.
  - B. TREATMENT PROCESS SHALL INCLUDE A WATER–REPELLANT TREATMENT.
  - C. ALL DECKING SHALL BE KILN DRIED AFTER TREATMENT TO THE MOISTURE CONTENT AS PER ASSOCIATION RULES.
  - D. ALL SAW CUT ENDS AND BOLT HOLES DRILLED AFTER TREATMENT SHALL RECEIVE TWO COATS OF WOOD PRESERVATIVE ON ALL EXPOSED SURFACES (DOES NOT APPLY TO DECK FASTENERS).
- ALL DECKING SHALL BE COMPOSITE LUMBER AS SPECIFIED IN THE SPECIFICATIONS SECTION 061063, EXTERIOR CARPENTRY.
- FASTENERS USED WITH TREATED WOOD SHALL BE STAINLESS STEEL
- BOLTED FASTENERS SHALL NOT BE OVER TIGHTENED. LAG BOLT CONNECTIONS SHALL BE TIGHTENED SO THAT ELEMENTS COME TOGETHER WITHOUT STRIPPING OUT THE WOOD IN THE PRE–DRILLED HOLES. THROUGH BOLT CONNECTIONS SHALL BE TIGHTENED SO THAT WASHERS JUST START TO PRESS INTO THE WOOD SUBSTRATE. ALL THROUGH BOLT CONNECTIONS SHALL HAVE A WASHER ON BOTH SIDES AND LOCK WASHER UNDER ALL NUTS.
- BLOCKING SHALL BE FASTENED WITH SCREWS UNLESS OTHERWISE INDICATED.
- TREATED WOOD CONNECTORS SHALL BE 316 STAINLESS STEEL OR HOT–DIPPED GALVANIZED AS NOTED ON DRAWINGS.

SUBMITTALS

THE FOLLOWING ITEMS SHALL BE SUBMITTED AND APPROVED BY THE CO OR CO'S REPRESENTATIVE PRIOR TO THE PURCHASE AND INSTALLATION OF THE ITEM

- BASELINE PROJECT SCHEDULE AND FOREMAN CONTACT INFORMATION
- PRE–CONSTRUCTION PHOTOGRAPHS, VIDEOS, AND RELEVANT DOCUMENTATION
- QUALITY CONTROL TEST RESULTS SHALL BE SUBMITTED WEEKLY FOR ALL QUALITY CONTROL TESTS PERFORMED BY CONTRACTOR
- CONCRETE
  - A. MIX DESIGNS AND MATERIAL SPECIFICATIONS INCLUDING NON–SHRINK GROUT
  - B. STEEL REINFORCING MATERIAL SPECIFICATIONS AND PLACEMENT DRAWINGS THAT DETAIL FABRICATION, BENDING, PLACEMENT, BAR SIZES, LENGTHS, AND SPLICE LENGTHS
  - C. HOT/COLD WEATHER CONSTRUCTION PROCEDURES
  - D. EPOXY ADHESIVE PRODUCT, SPECIFICATIONS, AND INSTALLATION PROCEDURES
  - E. CONCRETE CURING PROCEDURE AND MATERIALS
  - F. FORM–RELEASE AGENT
  - G. PATCHING MATERIALS INCLUDING BONDING AGENT
  - H. JOINT LAYOUT
  - I. COMPRESSIBLE FILLER BOARD
  - J. SILICONE JOINT SEALER
  - K. CONCRETE FINISH

CONCRETE

- ALL CONCRETE AND CONCRETE MATERIALS TO BE DESIGNED, MIXED AND PLACED IN ACCORDANCE WITH THE STANDARDS AND RECOMMENDATIONS OF THE LATEST ACI–318 CODE FOR REINFORCED CONCRETE.
- CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 5000 PSI.
- CONCRETE SLUMP SHALL BE 4" ± 1" WITH ALLOWANCE TO USE SUPERPLASTICIZING ADMIXTURE TO INCREASE UP TO 8" IF DESIRED.
- ENTRAINED AIR SHALL BE 6% ± 1.5% (MEASURED AT TRUCK DISCHARGE).
- MAXIMUM COARSE–AGGREGATE SIZE OF SHALL BE ¾".
- CONCRETE SHALL BE DESIGNED TO A MINIMUM WATER–CEMENTITIOUS MATERIAL RATIO TO LIMIT SHRINKAGE AND PRODUCE MAXIMUM DURABILITY. MAXIMUM WATER–CEMENTITIOUS RATIO SHALL BE 0.40.
- CEMENT USED SHALL BE PORTLAND CEMENT MEETING THE REQUIREMENTS OF ASTM C150, TYPE II.
- ALL AGGREGATES SHALL CONFORM TO ASTM C33.
- ALL FLY ASH INCLUDED IN THE CONCRETE SHALL BE TYPE F MEETING THE REQUIREMENTS OF ASTM C618.
- ALL SLAG CEMENT INCLUDED IN THE CONCRETE SHALL MEET THE REQUIREMENTS OF ASTM C989.
- ALL SILICA FUME INCLUDED IN THE CONCRETE SHALL MEET THE REQUIREMENTS OF ASTM C1240.
- ALL HORIZONTAL REINFORCING BARS SHALL BE CONTINUOUS AROUND CORNERS.
- WATER USED TO BE POTABLE AND FREE OF DEBRIS, OIL, AND OTHER DELETERIOUS SUBSTANCES AND MEET THE REQUIREMENTS OF ASTM C1602.
- CONCRETE PLACED SHALL BE THOROUGHLY COMPACTED DURING PLACEMENT BY VIBRATING.
- FOLLOW ACI 305 AND ACI 306 FOR HOT AND COLD WEATHER CONSTRUCTION WHEN APPLICABLE.
- ALL FORMING SHALL BE TRUE AND STRAIGHT IN ACCORDANCE WITH ACI STANDARDS.
- ALL HORIZONTAL CONCRETE SURFACES SHALL HAVE A BROOM FINISH. ALL OTHER EXPOSED, OR THAT COULD POTENTIALLY BECOME EXPOSED, SURFACES SHALL GRINDED SMOOTH AND HAVE A SACK RUB FINISH APPROVED BY THE CO. ALL NON–EXPOSED SURFACES SHALL HAVE SMOOTH FORM FINISH APPROVED BY THE CO; THIS FINISH SHALL NOT HAVE HONEYCOMBING, BUG HOLES OVER ¼", AND SHALL COMPLY WITH ACI SMOOTH FORM FINISH GUIDELINES.
- SUFFICIENT CURING SHALL BE PROVIDED FOR CONCRETE. WET CURE WITH BURLAP AND WATER IMMEDIATELY AFTER FINISHING AND FOR A MINIMUM OF 7 DAYS. ALTERNATELY USE CURING COMPOUND ON FORMED SIDES, ONLY AFTER REMOVAL OF FORMS. CURE AS PER ACI STANDARDS.
- ALL EMBEDDED ITEMS AND OPENINGS REQUIRED FOR UTILITY, ELECTRICAL, AND MECHANICAL SERVICES SHALL BE INCORPORATED INTO THE STRUCTURES WHETHER OR NOT THEY ARE DETAILED OR INDICATED ON THE CIVIL DRAWINGS. ALL OPENING DIMENSIONS SHOWN ON THE DRAWINGS FOR MECHANICAL OR ELECTRICAL EQUIPMENT SHALL BE COORDINATED WITH THE ACTUAL EQUIPMENT TO BE USED, AND THE DIMENSIONS ADJUSTED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. REFER TO THE OTHER DISCIPLINE DRAWINGS FOR FLOOR FINISHES, SLOPES, DRAINS, DEPRESSIONS, CELLS, EQUIPMENT PADS, ETC.
- ALL ITEMS EMBEDDED INTO CONCRETE SHALL BE CLEANED TO REMOVE ALL LOOSE SCALE, RUST, AND MARINE GROWTH. REFER TO THE RESPECTIVE DRAWINGS FOR THE DETAILS OF EMBEDDED ITEMS AND OPENINGS.
- ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED ¾" BY ¾" UNLESS SHOWN OTHERWISE.
- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CO'S REPRESENTATIVE FOR REINFORCING STEEL BEFORE PROCEEDING WITH FABRICATION.
- ALL OPENING DIMENSIONS SHOWN ON THE DRAWINGS FOR MECHANICAL OR ELECTRICAL EQUIPMENT SHALL BE COORDINATED WITH THE ACTUAL EQUIPMENT TO BE USED, AND THE DIMENSIONS ADJUSTED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. REFER TO THE OTHER DISCIPLINE DRAWINGS FOR FLOOR FINISHES, SLOPES, DRAINS, DEPRESSIONS, CELLS, EQUIPMENT PADS, ETC.
- ALL LAP SPLICES SHALL BE CLASS B LAP SPLICES UNLESS NOTED OTHERWISE.

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY — CRAIG JOHN — 30092 — LICENSED PROFESSIONAL ENGINEER
1–31–24

A/E FIRM	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
PRIME: VHB WILLIAMSBURG, VA	SEE	S0.0	STRUCTURAL NOTES	135 XXXXXX
SUB: AMI VIRGINIA, MI; AEI MADISON, WI	CADD DLB			PMIS/PKG NO. 217854
	TECH. REVIEW: TH			SHEET 52 OF 56
	DATE: JANUARY 2024		RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	

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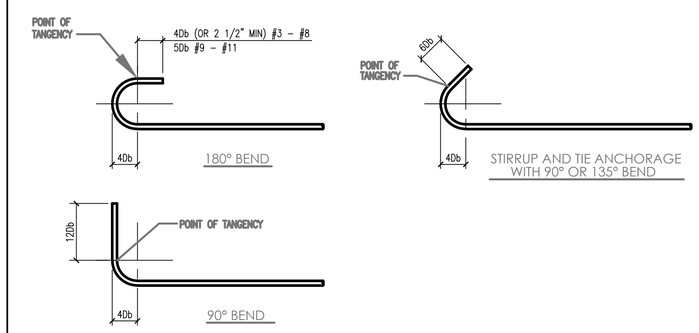
STRUCTURAL ABBREVIATIONS

ADDL	ADDITIONAL
ALT	ALTERNATE
ANCH	ANCHOR (ANCHORAGE)
AB	ANCHOR BOLT
ARCH	ARCHITECT, ARCHITECTURAL
BSMT	BASEMENT
BM	BEAM
BRG	BEARING
BTWN	BETWEEN
BLK	BLOCK
BB	BOND BEAM
BOT	BOTTOM
BFE	BOTTOM OF FOOTING ELEVATION
BLDG	BUILDING
CANT	CANTILEVER
CIP	CAST IN PLACE
CLG	CEILING
CTR	CENTER
CL ORL C	CENTERLINE
CLR	CLEAR
COL	COLUMN
COMP	COMPOSITE
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONSTR JT	CONSTRUCTION JOINT
CONT	CONTINUOUS
CONTR	CONTRACTOR
CJT	CONTROL JOINT
DL	DEAD LOAD
D	DEPTH
DBA	DEFORMED BAR ANCHOR
DET	DETAIL
DIAG	DIAGONAL
DIA	DIAMETER
DIM	DIMENSION
DWLS	DOWELS
DN	DOWN
DWG	DRAWING
EA	EACH
EA END	EACH END
EF	EACH FACE
EW	EACH WAY
ELEC	ELECTRICAL
EL	ELEVATION
ELEV	ELEVATOR
EQ	EQUAL
EQ SP	EQUALLY SPACED
EQUIP	EQUIPMENT
ERECT	ERECTION
EXIST	EXISTING
EXP	EXPANSION
EXP ANCH	EXPANSION ANCHOR
EXP BOLT	EXPANSION BOLT
EXP JT	EXPANSION JOINT
EXT	EXTERIOR
FF	FAR FACE
FS	FAR SIDE
FIN	FINISH
FLR	FLOOR
FT	FOOT (FEET)
FTG	FOOTING
FDN	FOUNDATION
FRMG	FRAMING
GALV	GALVANIZED
GA	GAUGE
GC	GENERAL CONTRACTOR
GB	GRADE BEAM
GL	GLULAM
HDR	HEADER
HK	HOOK
HS	HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
HORIZ	HORIZONTAL
IN	INCH/INCHES
ID	INSIDE DIAMETER
IF	INSIDE FACE
INT	INTERIOR
JT	JOINT
JST	JOIST
JBE	JOIST BEARING ELEVATION
JH	JOIST HEADER
K	KIP (1000 POUNDS)
KO	KNOCK OUT
L	ANGLE
LB	POUND
LG	LENGTH, LONG
LT WT	LIGHTWEIGHT
LL	LIVE LOAD
LOC	LOCATION
LONG	LONGITUDINAL
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LLBB	LONG LEG BACK TO BACK
LW	LONG WAY
LGS	LIGHT GAUGE STEEL
MFR	MANUFACTURER
MAS	MASONRY
MCJ	MASONRY CONTROL JOINT
MO	MASONRY OPENING
MAX	MAXIMUM
MECH	MECHANICAL
MEMB	MEMBRANE
MTL	METAL
MEZZ	MEZZANINE
MIN	MINIMUM
MISC	MISCELLANEOUS
MONO	MONOLITHIC
NS	NEAR SIDE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
NFS	NON FROST SUSCEPTIBLE
OC	ON CENTER
OPNG	OPENING
OPP	OPPOSITE
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OH	OVERHEAD
PERP	PERPENDICULAR
PL	PLATE
PT	POINT
PVC	POLYVINYL CHLORIDE
PT	POST–TENSIONED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PC	PRECAST
PROJ	PROJECTION
R	RADIUS, REACTION
REF	REFERENCE
REINF	REINFORCE, REINFORCING
REQD	REQUIRED
REV	REVERSE OR REVISION
RD	ROOF DRAIN
RO	ROUGH OPENING
RTU	ROOF TOP UNIT
R/W	REINFORCED WITH
SC	SLIP CRITICAL
SCHED	SCHEDULE
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SLBB	SHORT LEG BACK TO BACK
SOG	SLAB ON GRADE
SP @	SPACED AT
SPA	SPACES
SPEC	SPECIFICATIONS
SQ	SQUARE
SF	SQUARE FOOT/FEET
STD	STANDARD
STL	STEEL
STL JST	STEEL JOIST
STIFF	STIFFENER
STIR	STIRRUPS
STRUCT	STRUCTURAL
SW	SHORT WAY
SYM	SYMMETRICAL
TEMP STL	TEMPERATURE STEEL
T & B	TOP AND BOTTOM
TO OR T/	TOP OF
TFE	TOP OF FOOTING ELEVATION
TSE	TOP OF STEEL ELEVATION
TL	TOTAL LOAD
TRANS	TRANSVERSE
TOS	TOP OF SLAB ELEVATION
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
WND	WINDOW
WT	WEIGHT
WWF	WELDED WIRE FABRIC
W	WIDTH
W/	WITH
W/O	WITHOUT
WP	WORK POINT

STANDARD REINFORCING HOOKS



CONCRETE REINFORCEMENT TENSION DEVELOPMENT AND LAP SPLICE LENGTHS

BAR SIZE	LAP SPLICE CLASS	CONCRETE COVER = 0.75"		CONCRETE COVER = 1.00"		CONCRETE COVER = 1.50"		CONCRETE COVER ≥ 2.00"	
		TOP	OTHER	TOP	OTHER	TOP	OTHER	TOP	OTHER
#3	A	12	12	12	12	12	12	12	12
	B	16	16	16	16	16	16	16	16
#4	A	19	15	15	12	15	12	15	12
	B	24	19	20	16	20	16	20	16
#5	A	28	21	22	17	19	15	19	15
	B	36	28	29	22	24	19	24	19
#6	A	37	29	31	24	22	17	22	17
	B	48	37	40	31	29	22	29	22
#7	A	60	46	50	38	37	28	33	25
	B	78	60	64	50	48	37	42	33
#8	A	74	57	62	48	47	36	37	29
	B	96	74	80	62	60	47	48	37
#9	A	90	69	76	58	57	44	46	36
	B	117	90	98	76	74	57	60	46
#10	A	108	83	92	70	70	54	57	44
	B	140	108	119	92	91	70	74	57
#11	A	127	98	108	83	84	64	68	53
	B	165	127	141	108	109	84	89	68

NOTES:
1. TABULATED VALUES ARE BASED ON GRADE 60 UNCOATED REINFORCING BARS AND 4000 PSI NORMAL WEIGHT CONCRETE. LENGTHS ARE IN INCHES.
2. TENSION DEVELOPMENT LENGTH AND LAP SPLICE LENGTHS ARE CALCULATED PER ACI 318–05, SECTIONS 12.2.3 AND 12.15.
3. TENSION DEVELOPMENT LENGTH = 1.0 x CLASS A LAP SPLICE
4. FOR 3000 PSI AND 5000 PSI CONCRETE, MULTIPLY THE TABULATED VALUES BY 1.16 AND 0.90 RESPECTIVELY.
5. BAR c. – c. SPACING WAS ASSUMED TO BE GREATER THAN TWICE THE CONCRETE COVER PLUS ONE BAR DIAMETER.
6. TOP BARS ARE DEFINED AS HORIZONTAL BARS WITH MORE THAN 12 INCHES OF CONCRETE CAST BELOW THE BARS.
7. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE TABULATED VALUES BY 1.3.
8. FOR EPOXY COATED REBAR, MULTIPLY THE TABULATED VALUES BY 1.3.
9. FOR LAP SPLICE LENGTHS IN MASONRY SEE MASONRY NOTES.
10. COVER IS CLEAR DISTANCE FROM THE CONCRETE SURFACE TO OUTERMOST SURFACE OF REINFORCING.

CONCRETE REINFORCEMENT PROTECTION

EXPOSURE	STRUCTURAL ELEMENTS	BAR SIZE	CLEAR COVER
CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH	ALL	ALL	3"
CONCRETE EXPOSED TO EARTH OR WEATHER	ALL	NO. 6 THRU NO. 18 BARS	2"
		NO. 5 BAR, W31 OR D31 WIRE AND SMALLER	1 1/2"
CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	SLABS, WALLS, JOISTS	NO. 14 AND NO. 18 BARS	1 1/2"
		NO. 11 BAR AND SMALLER	3/4"
	BEAMS, COLUMNS	PRIMARY REINFORCEMENT, TIES, STIRRUPS, SPIRALS	1 1/2"

STRUCTURAL SYMBOLS

&	AND
@	AT
℄	CENTERLINE
ø	DIAMETER
#	NUMBER OR POUND
/	PER
⅊	PLATE
±	PLUS OR MINUS

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY — CRAIG JOHN TH — 30092 — LICENSED PROFESSIONAL ENGINEER
1–31–24

A/E FIRM
PRIME: VHB WILLIAMSBURG, VA
SUB: AMI VIRGINIA, MI; AEI MADISON, WI

DESIGNED: SEE
CADD: DLB
TECH. REVIEW: TH
DATE: JANUARY 2024

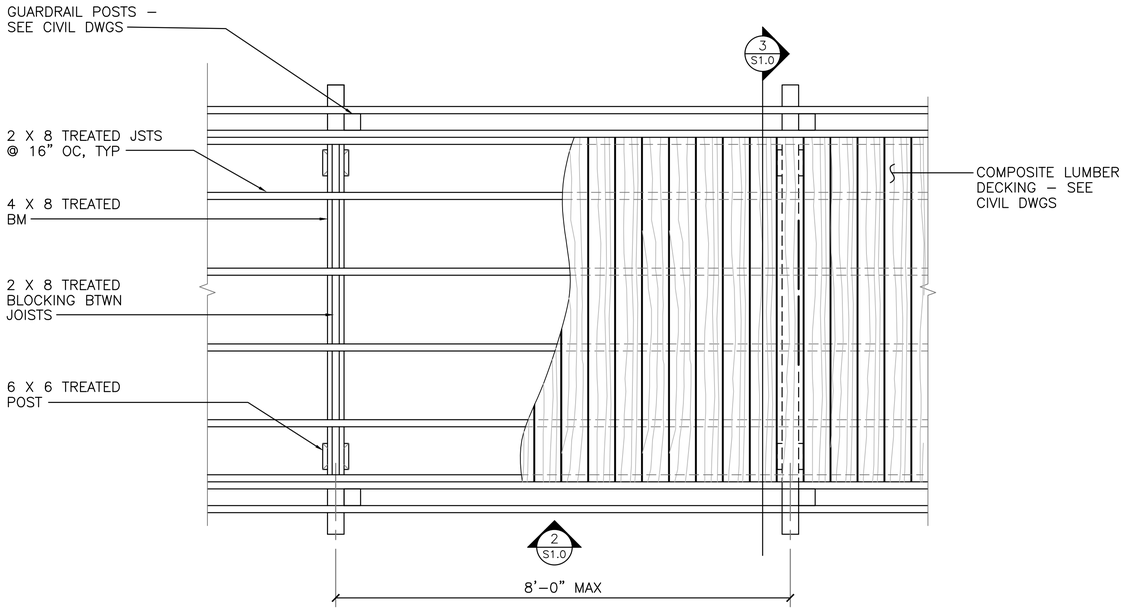
SUB SHEET NO: S0.1

TITLE OF SHEET: SCHEDULES

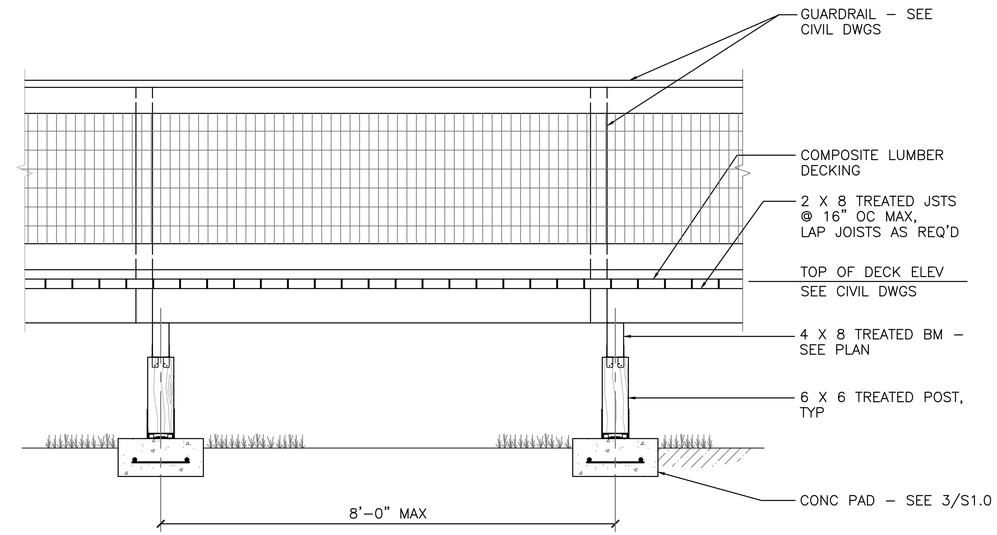
RECONSTRUCT SAND CAVE TRAIL
MAMMOTH CAVE NATIONAL PARK

DRAWING NO. 135 XXXXXX
PMIS/PKG NO. 217854
SHEET 53 OF 56

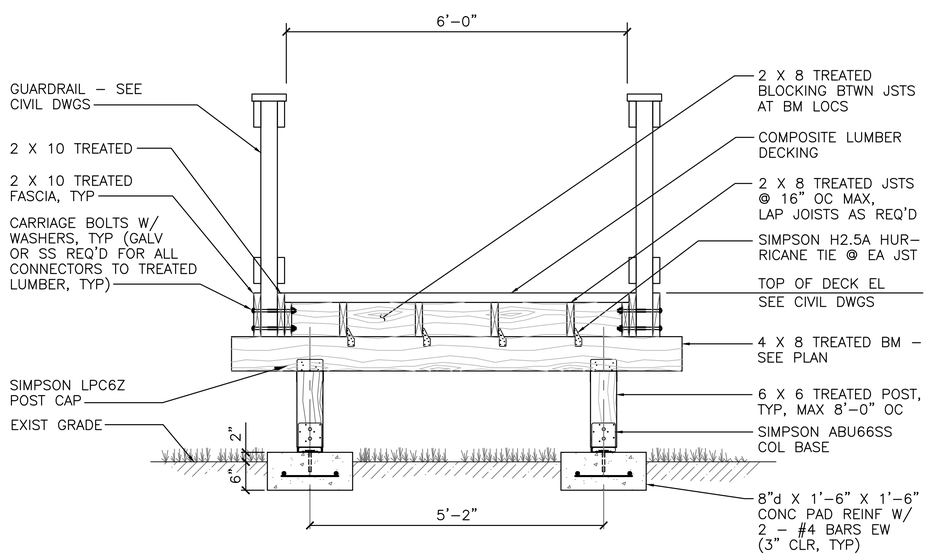
31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\STRUCTURAL\S0.1



1 S1.0 BOARDWALK PARTIAL PLAN
SCALE C



2 S1.0 BOARDWALK PARTIAL ELEVATION
SCALE C



3 S1.0 BOARDWALK CROSS SECTION
SCALE C

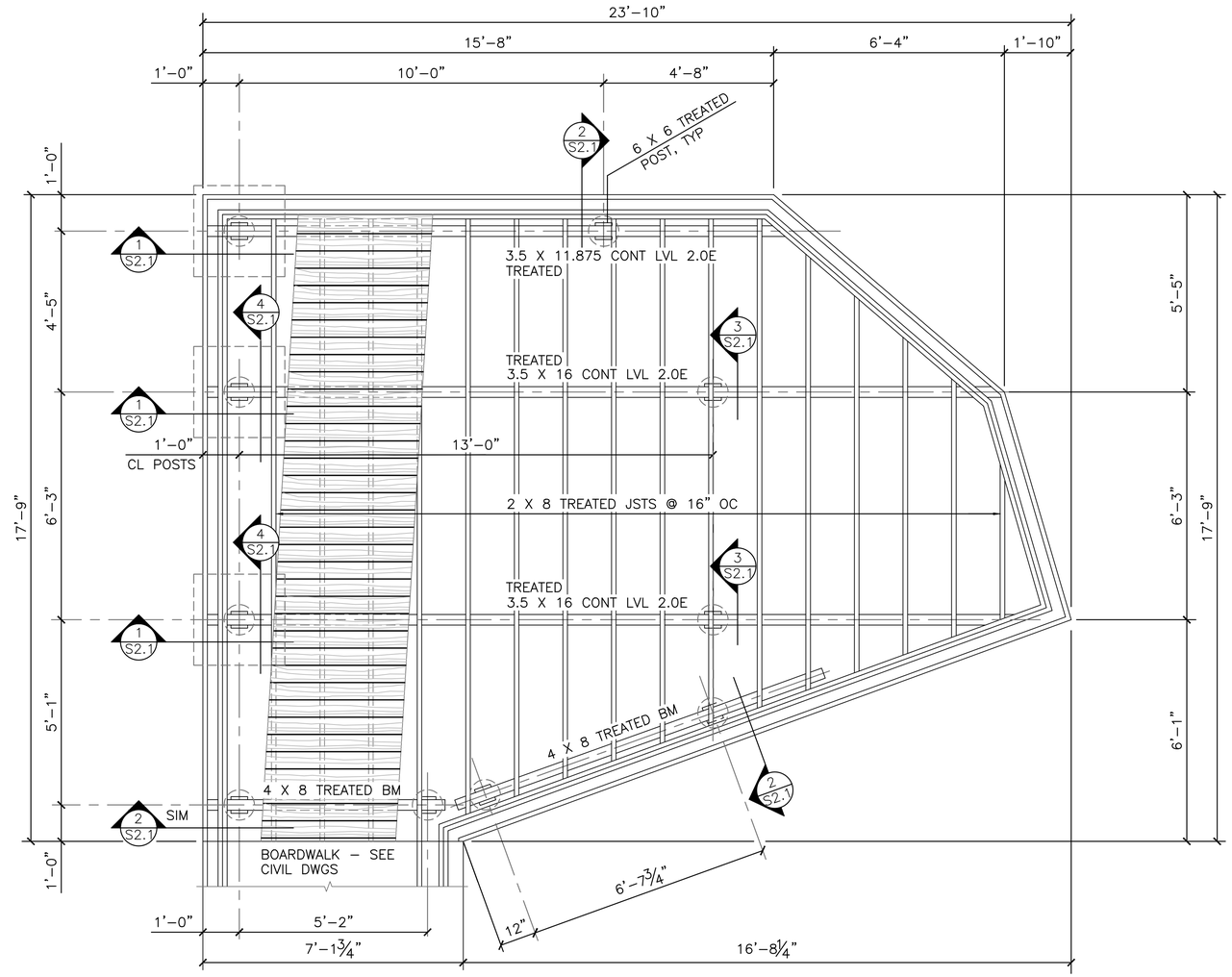
NOTES:
1. SEE CIVIL PLANS FOR CONC TRAIL DEPTH, WIDTH, AND LOCATION.
2. ALL DIMENSIONS AND ELEVA–TIONS ARE TO BE FIELD VERIFIED BY CONTRACTOR PRIOR TO FABRICATION.

SCALE © 1 0 1 2 3
SCALE OF FEET

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY CRAIG JOHN 30092 LICENSED PROFESSIONAL ENGINEER 1–31–24	A/E FIRM PRIME: VHB WILLIAMSBURG, VA SUB: AMI VIRGINIA, MI AEI MADISON, WI	DESIGNED: SEE CADD DLB TECH. REVIEW: TH DATE: JANUARY 2024	SUB SHEET NO S1.0	TITLE OF SHEET BOARDWALK PLAN, SECTION, ELEV RECONSTRUCT SAND CAVE TRAIL MAMMOTH CAVE NATIONAL PARK	DRAWING NO. 135 XXXXXX PMIS/PKG NO. 217854 SHEET 54 OF 56

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\STRUCTURAL\S1.0



1 / S1.0 SAND CAVE PLATFORM FRAMING PLAN

SCALE B

1. PROVIDE 2 X 8 TREATED SOLID BLOCKING BTWN JOISTS AT EACH BEAMLINE.

NOTES:

1. SEE CIVIL PLANS FOR CONC TRAIL DEPTH, WIDTH, AND LOCATION.
2. ALL DIMENSIONS AND ELEVATIONS ARE TO BE FIELD VERIFIED BY CONTRACTOR PRIOR TO FABRICATION.

SCALE (B) 2 0 2 4
SCALE OF FEET

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY CRAIG JOSEPH 30092 LICENSED PROFESSIONAL ENGINEER
1–31–24

A/E FIRM
PRIME: VHB WILLIAMSBURG, VA
SUB: AMI VIRGINIA, MI; AEI MADISON, WI

DESIGNED: SEE
CADD: DLB
TECH. REVIEW: TH
DATE: JANUARY 2024

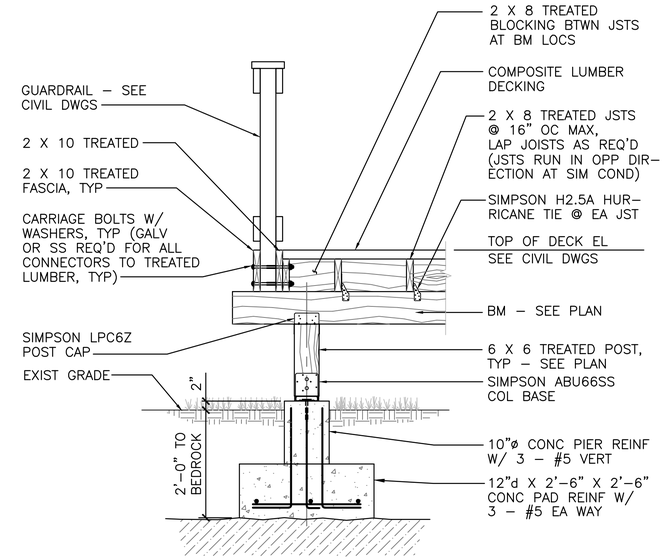
SUB SHEET NO: S2.0

TITLE OF SHEET: OUTLOOK PLATFORM FRAMING PLAN

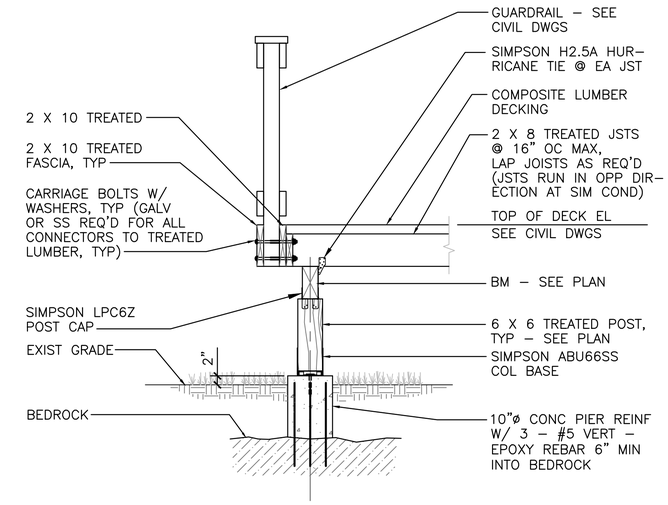
RECONSTRUCT SAND CAVE TRAIL
MAMMOTH CAVE NATIONAL PARK

DRAWING NO. 135 XXXXXX
PMIS/PKG NO. 217854
SHEET 55 OF 56

31 JANUARY 2024 AUTOCAD2021 P:\MACA\217854\FINAL CDs\STRUCTURAL\S2.0



1 S2.1 SECTION
SCALE C



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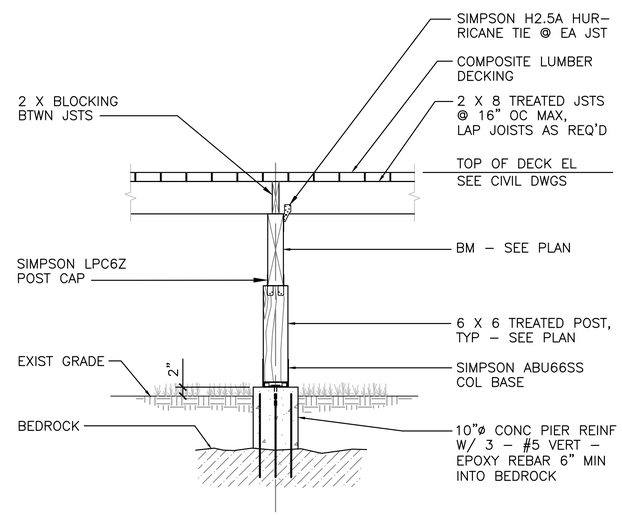

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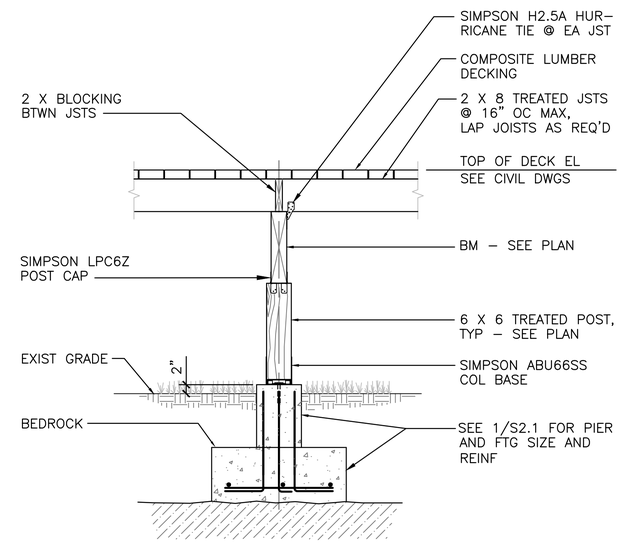

4 S2.1 SECTION
SCALE C

NOTES:

1. SEE CIVIL PLANS FOR CONC TRAIL DEPTH, WIDTH, AND LOCATION.
2. ALL DIMENSIONS AND ELEVA–TIONS ARE TO BE FIELD VERIFIED BY CONTRACTOR PRIOR TO FABRICATION.

SCALE © 1 0 1 2 3
SCALE OF FEET

FINAL CONSTRUCTION DOCUMENTS | MACA 217854

STATE OF KENTUCKY CRAIG JOSEPH 30092 LICENSED PROFESSIONAL ENGINEER
1–31–24

A/E FIRM
PRIME: VHB WILLIAMSBURG, VA
SUB: AMI VIRGINIA, MI
AEI MADISON, WI

DESIGNED: SEE
CADD DLB
TECH. REVIEW: TH
DATE: JANUARY 2024

SUB SHEET NO S2.1

TITLE OF SHEET
OUTLOOK PLATFORM SECTIONS

RECONSTRUCT SAND CAVE TRAIL
MAMMOTH CAVE NATIONAL PARK

DRAWING NO. 135 XXXXXX
PMIS/PKG NO. 217854
SHEET 56 OF 56

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