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SUSTAINABLE STORMWATER MANAGEMENT IN LINEAR TRANSPORTATION PROJECTS

“Powerpoints are the peacocks of the business world: all show, no meat.”

Dwight Schrute – The Office

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Dunder Mifflin

Scranton, PA

ODNR RAINWATER AND LAND DEVELOPMENT

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OEPA NPDES GENERAL PERMIT

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OEPA NPDES GENERAL PERMIT

April 23, 2018– New Ohio EPA Permit Issued

Ohio EPA Permit No.: OHC000005

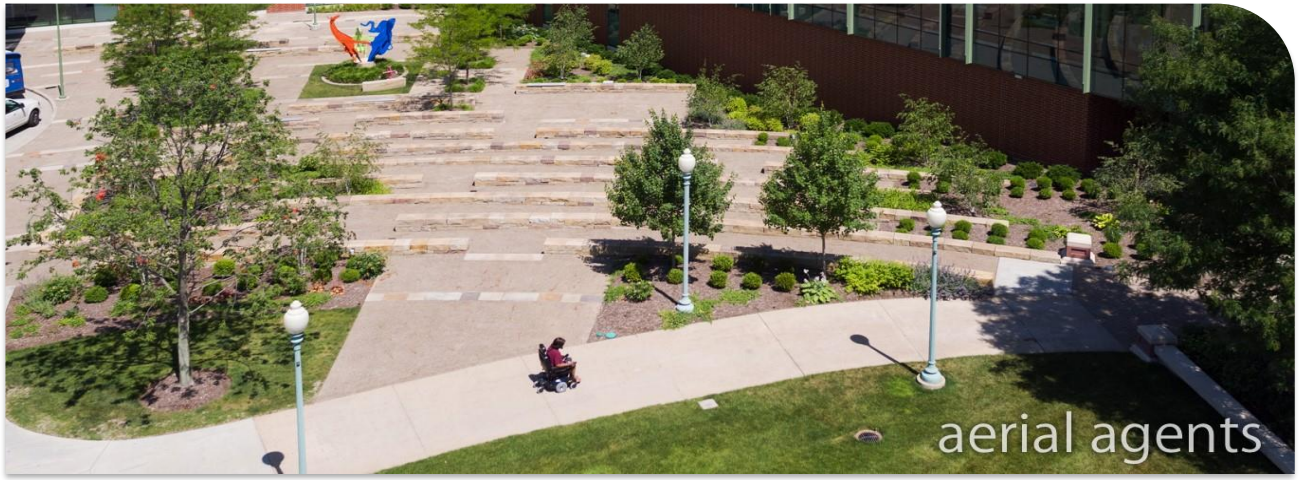
Expires April 22, 2023

$$WQ_v = Rv * P * A / 12 \qquad \text{(Equation 1)}$$

where:
WQ_v = water quality volume in acre-feet
Rv = the volumetric runoff coefficient calculated using equation 2
P = 0.90 inch precipitation depth
A = area draining into the BMP in acres

$$Rv = 0.05 + 0.9i \qquad \text{(Equation 2)}$$

where i = fraction of post-construction impervious surface



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OEPA NPDES GENERAL PERMIT

April 23, 2018– New Ohio EPA Permit Issued

Ohio EPA Permit No.: OHC000005

Expires April 22, 2023

$$WQv = P * A * [(Rv_1*0.2) + (Rv_2 - Rv_1)] / 12 \qquad \text{(Equation 3)}$$

where

P = 0.90 inches
A = area draining into the BMP in acres
Rv_1 = volumetric runoff coefficient for existing conditions (current site impervious area)
Rv_2 = volumetric runoff coefficient for proposed conditions (post-construction site impervious area)

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OEPA NPDES GENERAL PERMIT

April 23, 2018– New Ohio EPA Permit Issued

Grassy Filter Strips removed from approved list of BMPs!

Underground Storage Extended Detention and Infiltration are now approved BMPs!

Ohio EPA Permit No.: OHC000005

Expires April 22, 2023

Table 4a Extended Detention Post-Construction Practices with Minimum Drain Times

Extended Detention Practices	Minimum Drain Time of WQv
Wet Extended Detention Basin[1,2]	24 hours
Constructed Extended Detention Wetland[1,2]	24 hours
Dry Extended Detention Basin[1,3]	48 hours
Permeable Pavement – Extended Detention[1]	24 hours
Underground Storage – Extended Detention[1,4]	24 hours
Sand & Other Media Filtration - Extended Detention[1, 5]	24 hours

Table 4b Infiltration Post-Construction Practices with Maximum Drain Times

Infiltration Practices	Maximum Drain Time of WQv
Bioretention Area/Cell[1,2]	24 hours
Infiltration Basin[2]	24 hours
Infiltration Trench[3]	48 hours
Permeable Pavement – Infiltration[3]	48 hours
Underground Storage – Infiltration[3,4]	48 hours

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ODOT L & D MANUAL Volume Two Drainage Design

ODOT Location and Design Manual (Volume Two, Drainage Design) – Section 1117 = BMP Toolbox

ODOT L & D Manual – Updated January 18, 2019

- Manufactured Systems
- Vegetation Based BMP
- Extended Detention
- Retention Basins
- Bioretention Cells
- Infiltration
- Constructed Wetlands
- Stream Grade Control

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1117.2.1 Vegetated Filter Strips – Roadway Projects

ODOT L & D Manual – Updated January 18, 2019

ODOT L & D MANUAL Volume Two Drainage Design

Table 1117-3

Maximum Pavement Width (ft)	Slope (H:V)	Filter Strip Width (ft minimum)
22	3:1 and flatter	15
24	3:1 and flatter	17
26	3:1 and flatter	18.5
28	3:1 and flatter	20.5
30	3:1 and flatter	22
32	3:1 and flatter	24
34	3:1 and flatter	25
48	6:1 and flatter	25

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ODOT L & D MANUAL

1117.2.1 Vegetated Filter Strips – Pedestrian Facilities and Shared Use Paths

For projects that include EDA only associated with pedestrian facilities and shared use paths, with no EDA from planned roadway improvements, widths of Vegetated Filter Strips are allowed to be narrower than those in Table 1117-3. Vegetated Filter Strips are an acceptable post-construction BMP for these projects provided the following criteria are met:

- The minimum Vegetated Filter Strip width is equal to the width of the contributing impervious area.
- The maximum slope of the Vegetated Filter Strip is 3:1.
- All runoff must be sheet flow, with no concentrated flows to the Vegetated Filter Strip.

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Lakefront West

Cleveland, OH

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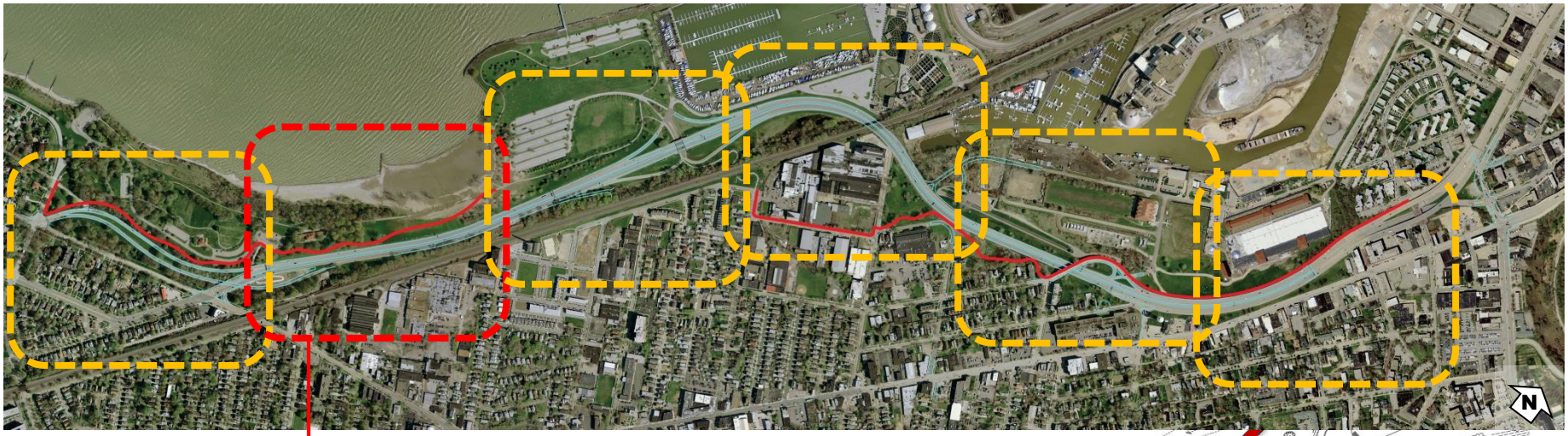
Lakefront West

Cleveland, OH



Boulevard Enhancement Area 2

Boulevard Plan

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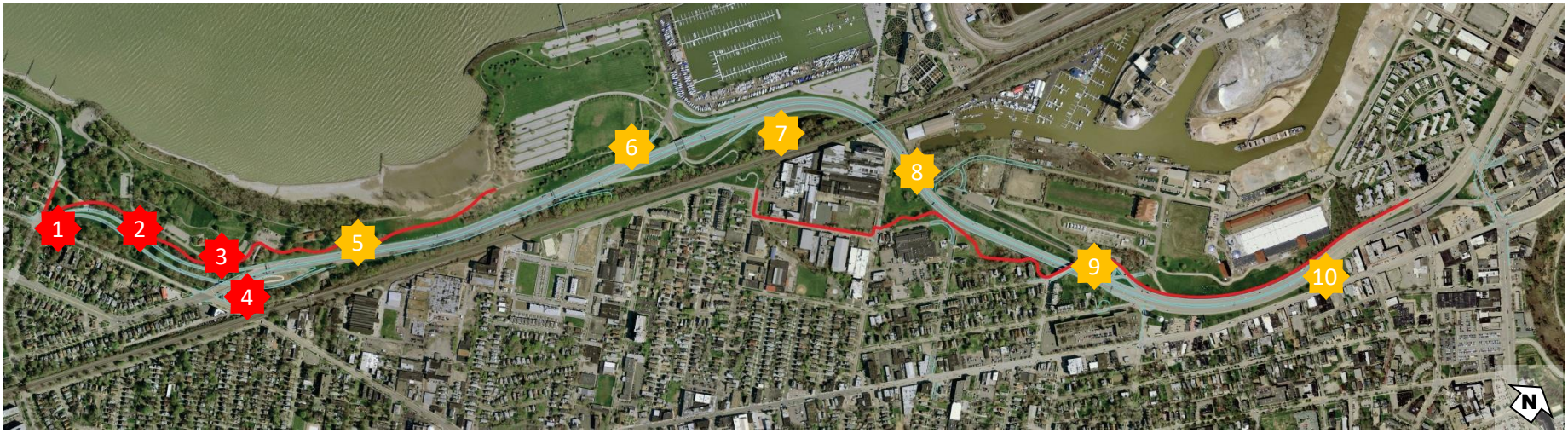
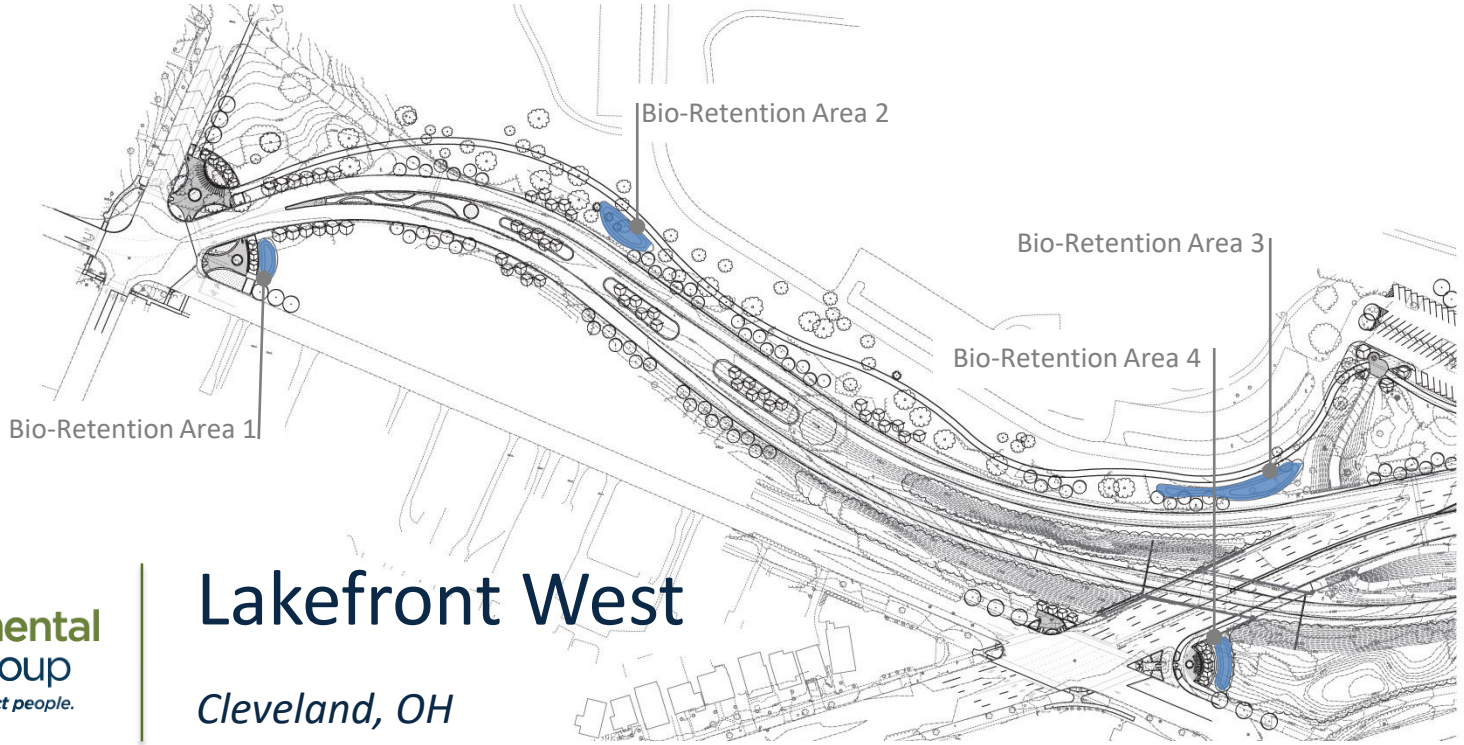
Cleveland, OH





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Lakefront West

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LFW Constructed Wetland

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LFW Dry Detention

Cleveland, OH

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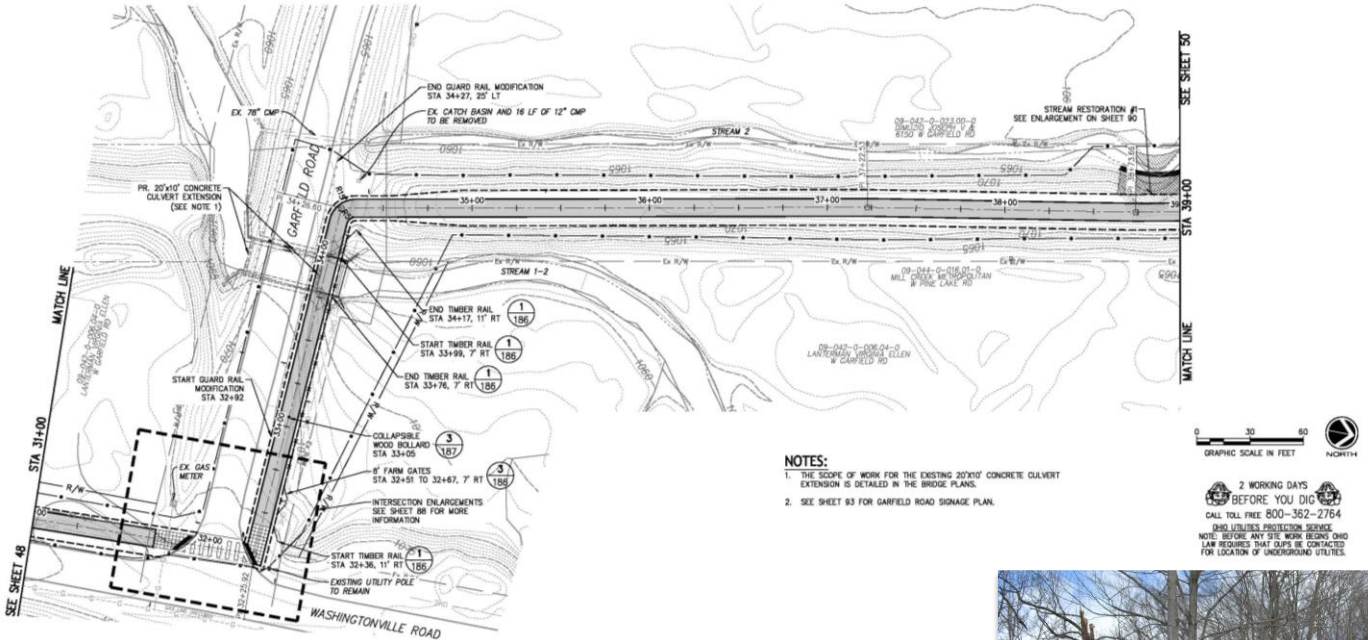

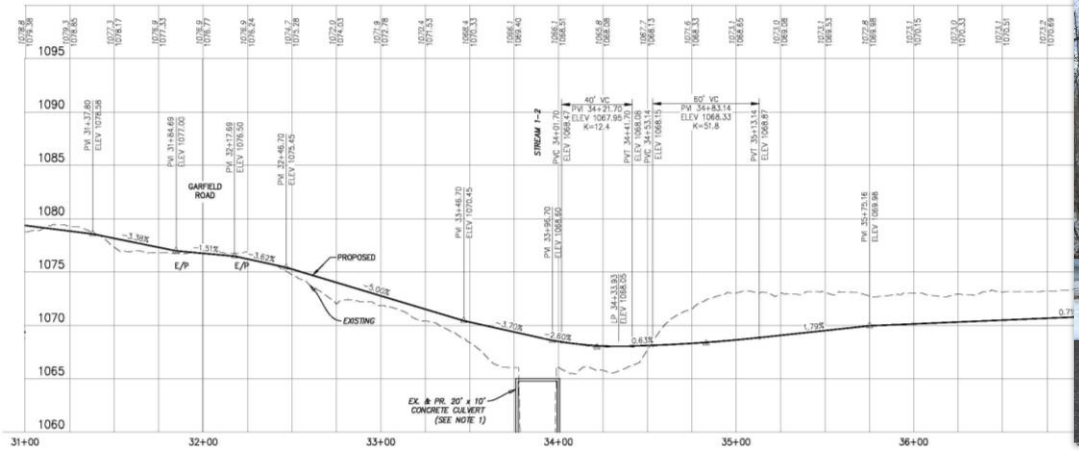

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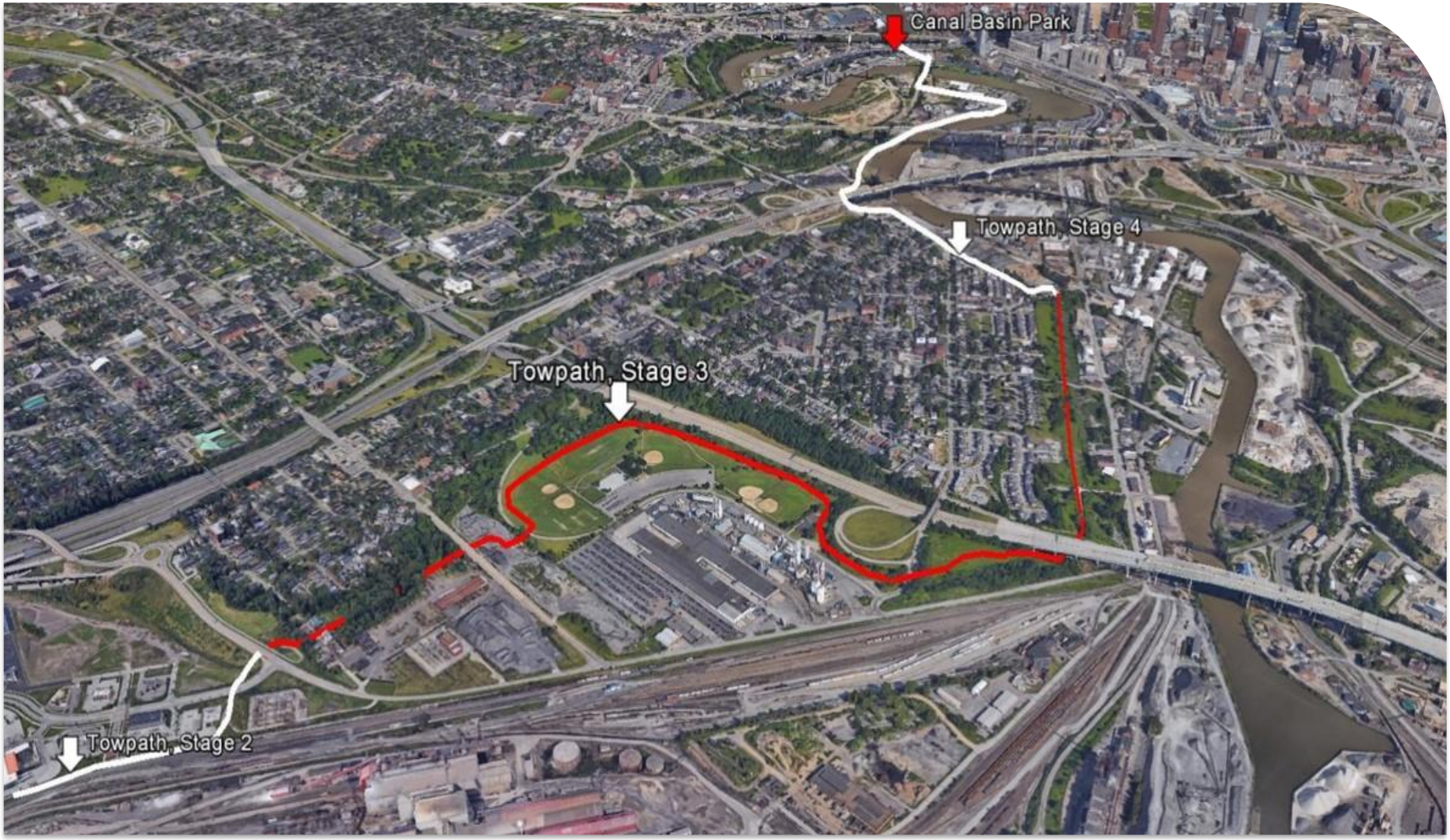
Mill Creek Bikeway

Mahoning County, OH



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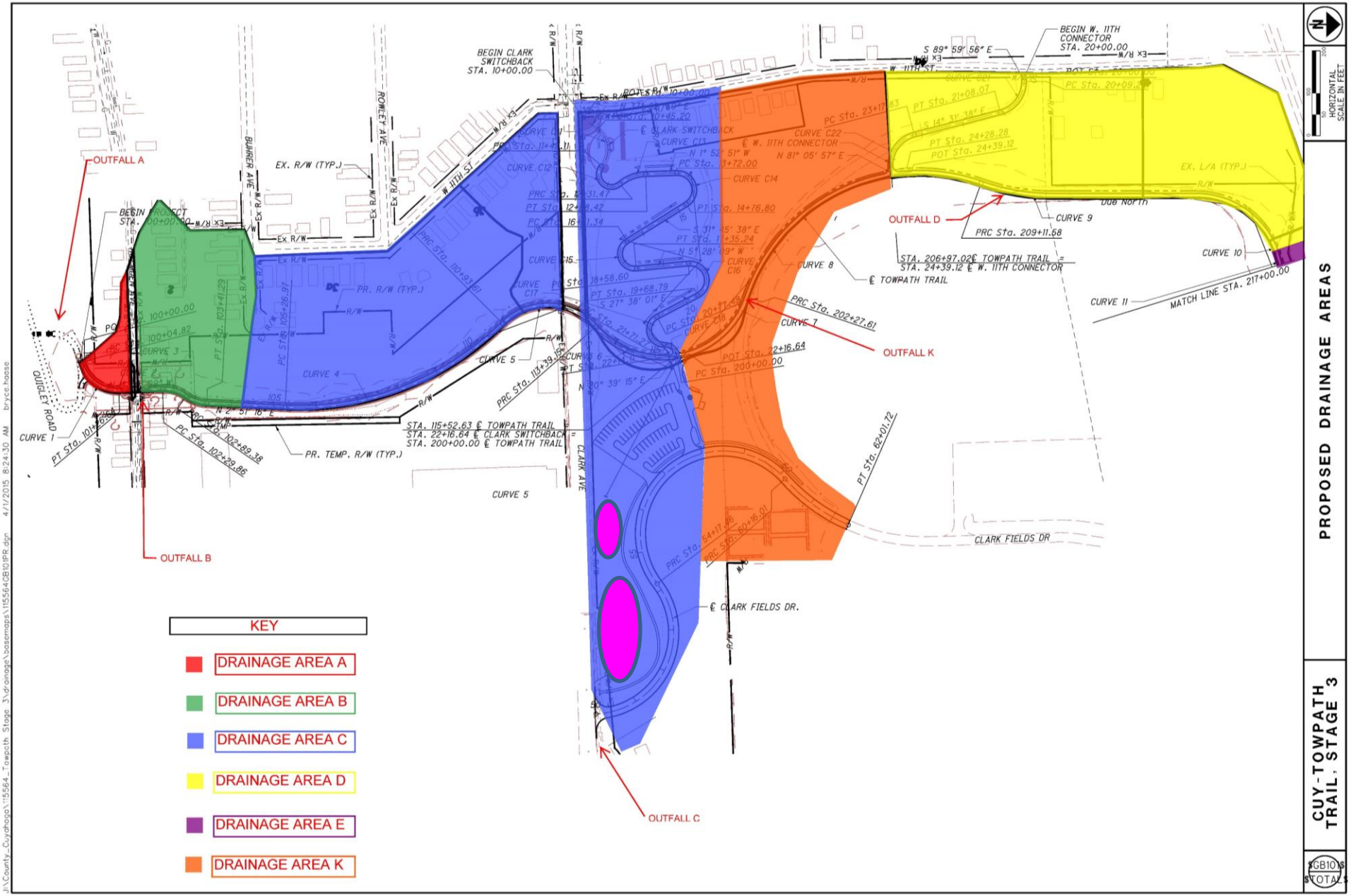
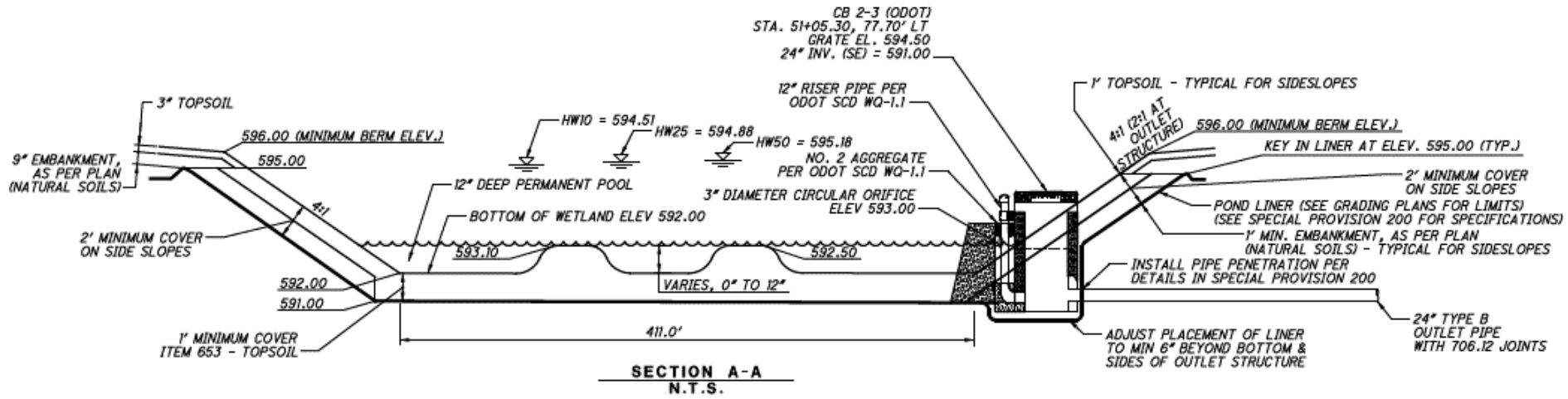
Towpath Stage III

Cleveland, OH





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Constructed Wetland

Cleveland, OH

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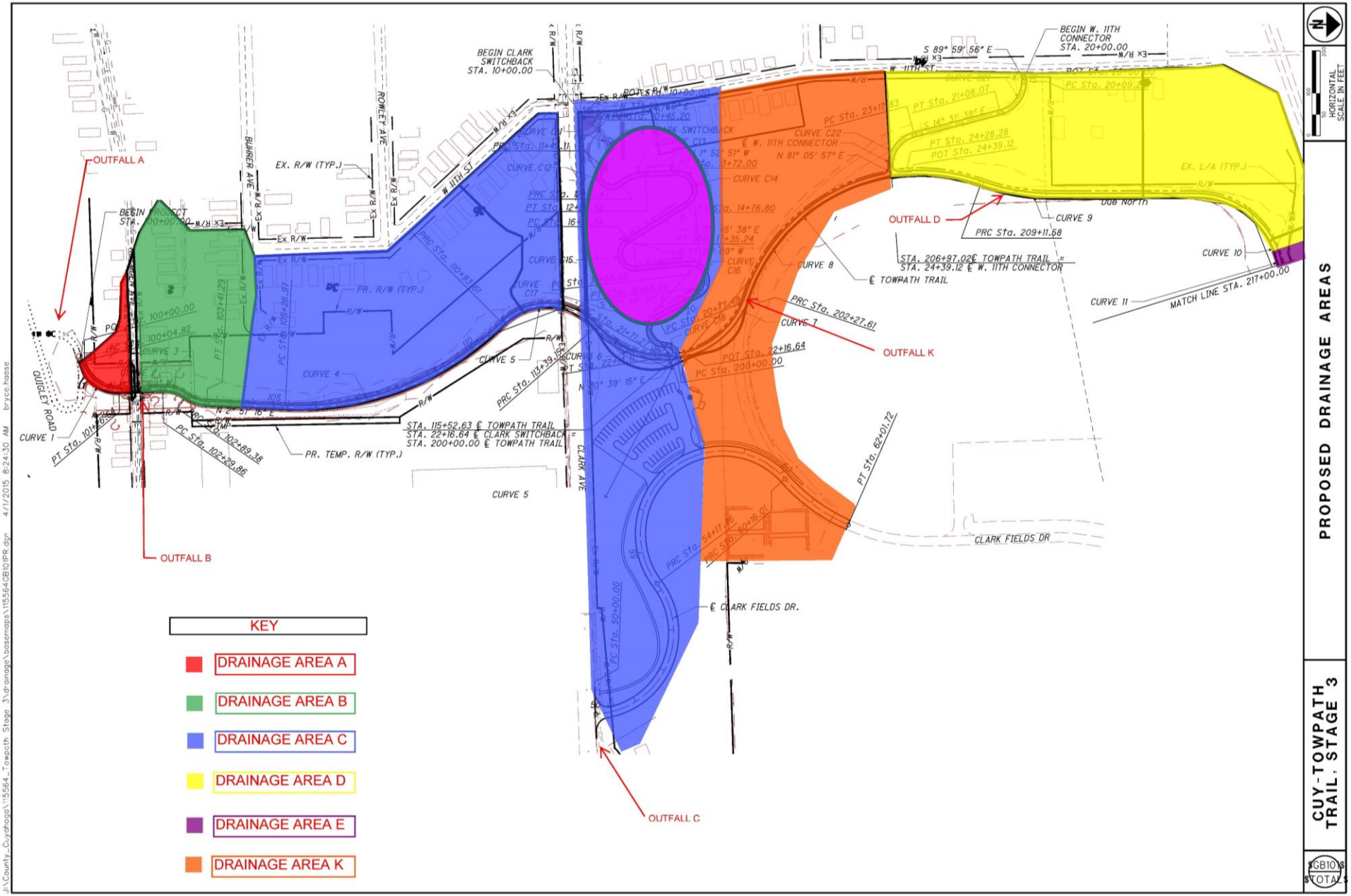
Constructed Wetland – Plant Protection

Cleveland, OH


PROPOSED DRAINAGE AREAS
CUY-TOWPATH TRAIL, STAGE 3
KEY
DRAINAGE AREA A
DRAINAGE AREA B
DRAINAGE AREA C
DRAINAGE AREA D
DRAINAGE AREA E
DRAINAGE AREA K
OUTFALL A
OUTFALL B
OUTFALL C
OUTFALL D
OUTFALL K
BEGIN CLARK SWITCHBACK STA. 10+00.00
BEGIN W. 11TH CONNECTOR STA. 20+00.00
BEGIN PROJECT
EX. R/W (TYP.)
PR. R/W (TYP.)
PR. TEMP. R/W (TYP.)
EX. L/A (TYP.)
W. 11TH ST
BURRER AVE
ROWLEY AVE
CLARK AVE
QUIGLEY ROAD
CLARK FIELDS DR
℄ TOWPATH TRAIL
℄ W. 11TH CONNECTOR
℄ CLARK FIELDS DR.
STA. 115+52.63 ℄ TOWPATH TRAIL =
STA. 22+16.64 ℄ CLARK SWITCHBACK =
STA. 200+00.00 ℄ TOWPATH TRAIL
STA. 206+97.02 ℄ TOWPATH TRAIL =
STA. 24+39.12 ℄ W. 11TH CONNECTOR
MATCH LINE STA. 217+00.00
HORIZONTAL SCALE IN FEET

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Towpath Stage III

Cleveland, OH

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Towpath Stage III

Cleveland, OH

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B & O Corridor Wetlands

Cleveland, OH

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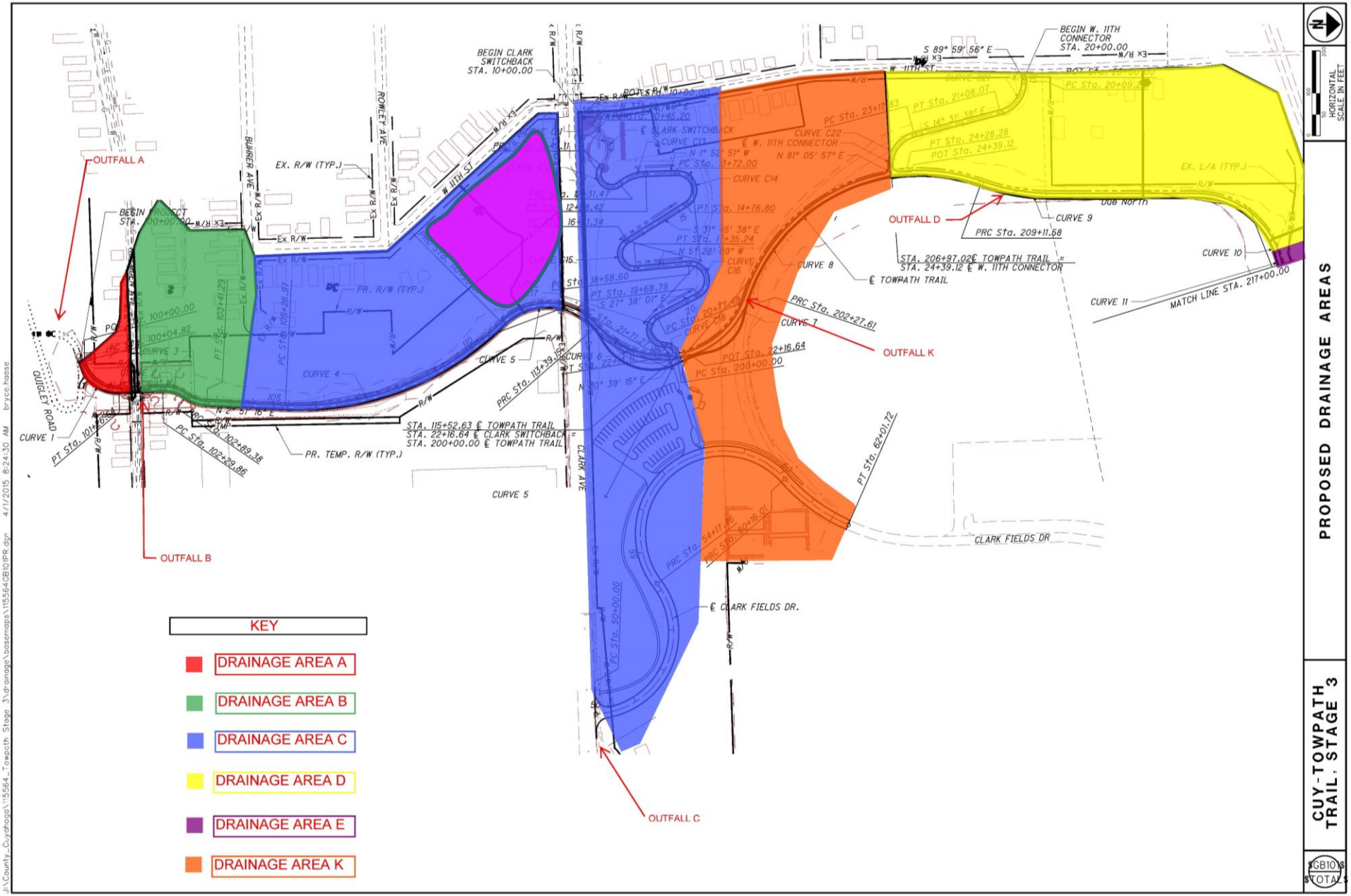
PROPOSED DRAINAGE AREAS
CUY-TOWPATH TRAIL, STAGE 3
KEY
DRAINAGE AREA A
DRAINAGE AREA B
DRAINAGE AREA C
DRAINAGE AREA D
DRAINAGE AREA E
DRAINAGE AREA K
OUTFALL A
OUTFALL B
OUTFALL C
OUTFALL D
OUTFALL K
BEGIN CLARK SWITCHBACK STA. 10+00.00
BEGIN W. 11TH CONNECTOR STA. 20+00.00
BEGIN PROJECT STA. 100+00.00
EX. R/W (TYP.)
PR. R/W (TYP.)
PR. TEMP. R/W (TYP.)
EX. L/A (TYP.)
BURRER AVE
ROWLEY AVE
W. 11TH ST
QUIGLEY ROAD
CLARK AVE
CLARK FIELDS DR
℄ CLARK FIELDS DR.
℄ TOWPATH TRAIL
℄ CLARK SWITCHBACK
℄ W. 11TH CONNECTOR
STA. 115+52.63 ℄ TOWPATH TRAIL = STA. 22+16.64 ℄ CLARK SWITCHBACK = STA. 200+00.00 ℄ TOWPATH TRAIL
STA. 206+97.02 ℄ TOWPATH TRAIL = STA. 24+39.12 ℄ W. 11TH CONNECTOR
MATCH LINE STA. 217+00.00
CURVE 1
CURVE 3
CURVE 4
CURVE 5
CURVE 7
CURVE 8
CURVE 9
CURVE 10
CURVE 11
CURVE C13
CURVE C14
CURVE C16
CURVE C18
CURVE C22
HORIZONTAL SCALE IN FEET

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Pre-Construction Towpath Mounds

Cleveland, OH

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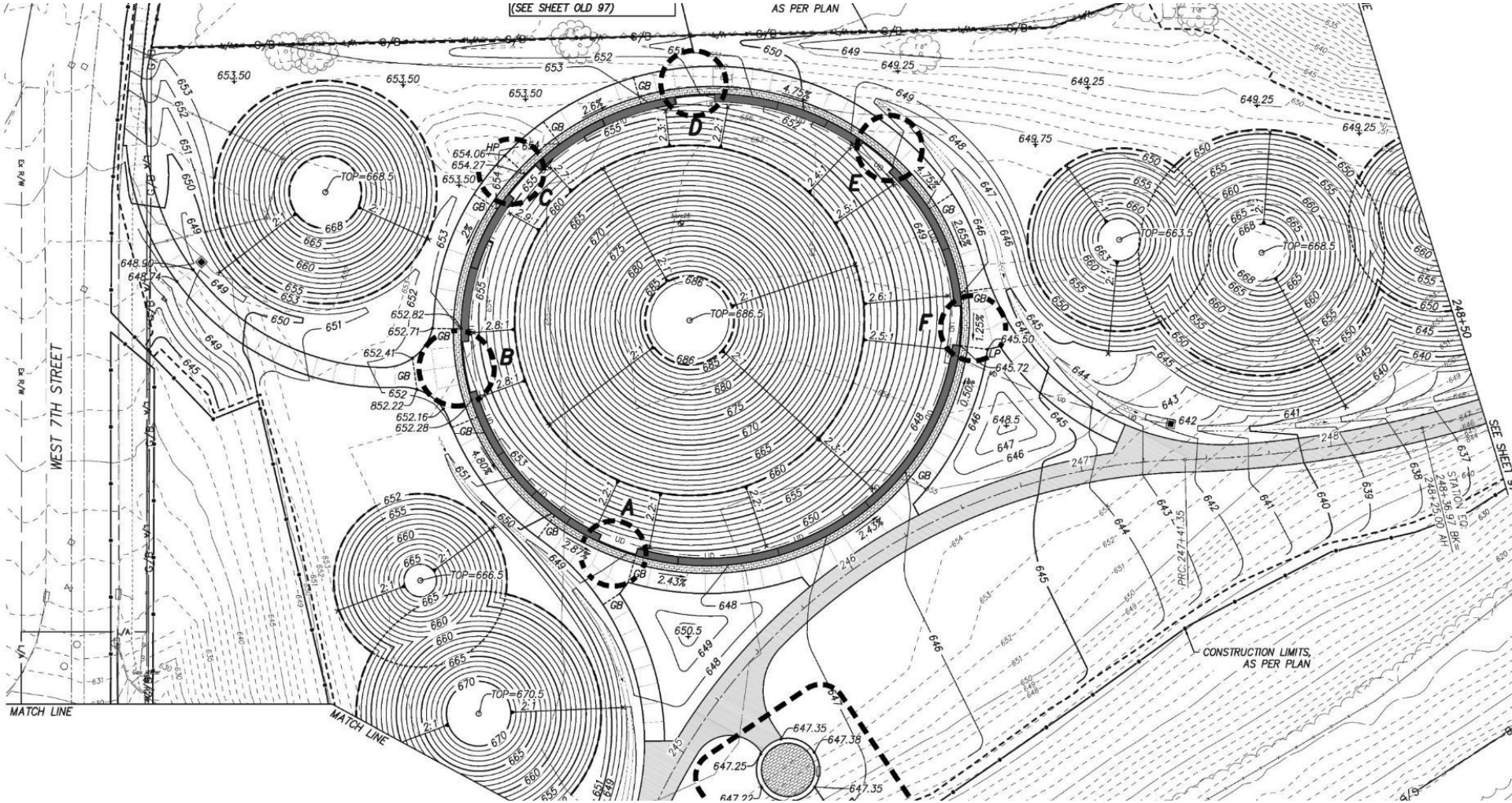

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Valley View Bluffs Mounds

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Towpath Mounds Rendering

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Pre-Construction Towpath Mounds

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Total Earth Moved During Project

Cleveland, OH

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During Construction Towpath Mounds

Cleveland, OH

Funding

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Q & A