

# Recent Engineering & Construction along the Chesapeake & Ohio Canal



Chesapeake & Ohio Canal National Historical Park  
U.S. National Park Service – Department of Interior

Presenter: Joe Reed, P.E., CFM (Park Engineer)

Monday, August 30, 2021

# Agenda

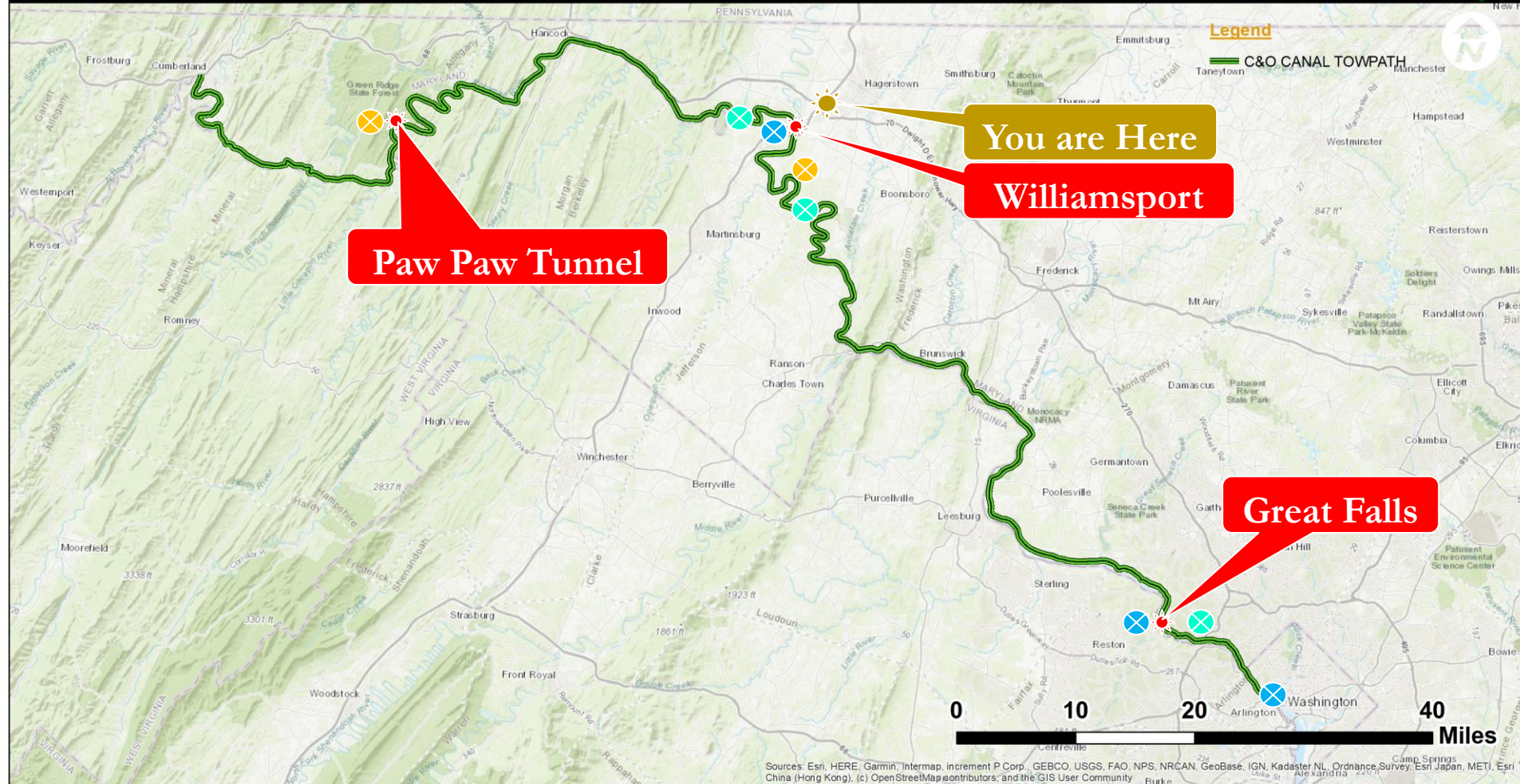
Objective: Provide a summary of some unique engineering aspects of historic structures that have been encountered over the past five years / \$50 million in construction.

- Park Overview
- Recently Completed Work
  - Rehabilitate Lift Locks #3 and #4 in Georgetown, Washington, DC
  - Repair to Various Watered Structures between Locks 5 -22
  - Conococheague Aqueduct
- Work Under Construction
  - Towpath Rehabilitation McMahon's Mill to Lock 42
  - Paw Paw Slope Stabilization
- Planning/Designing for future work
  - Stabilization of Drylaid Stone Wall near Mile Marker 11 (Log Wall)
  - Potomac Dam No. 4 and 5



# Chesapeake & Ohio Canal National Historical Park PARK WIDE MAP

National Park Service  
U.S. Department of the Interior



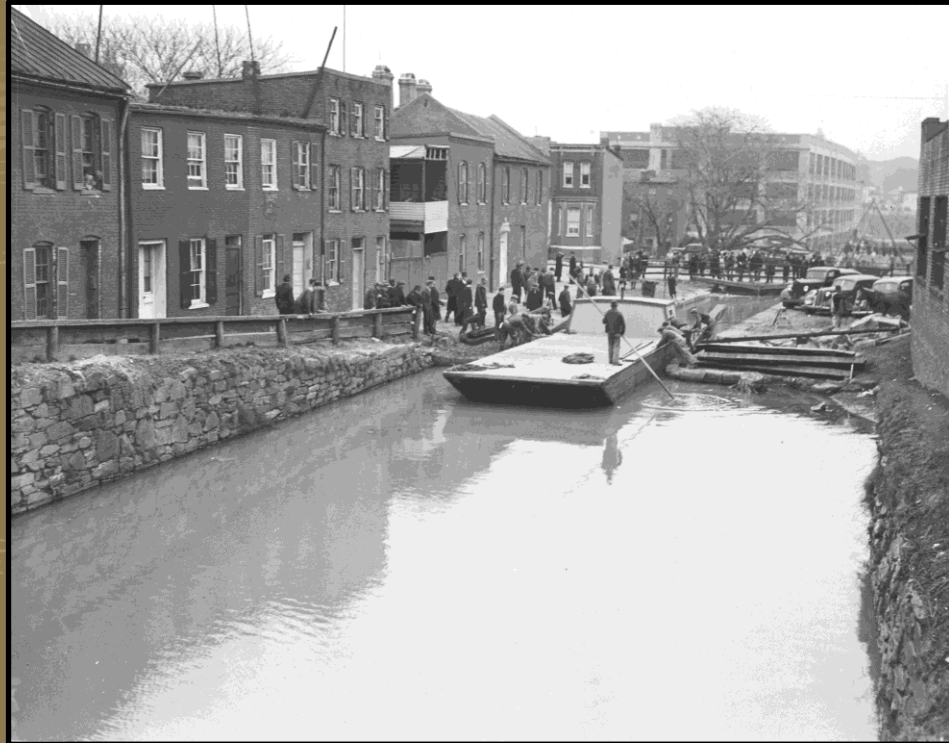
PRODUCED BY: C & O CANAL NHP - ENGINEERING SERVICES

23 AUGUST 2021

Data Sources: ESRI Roads,  
NPS Park Data, MD 2011 Imagery, etc



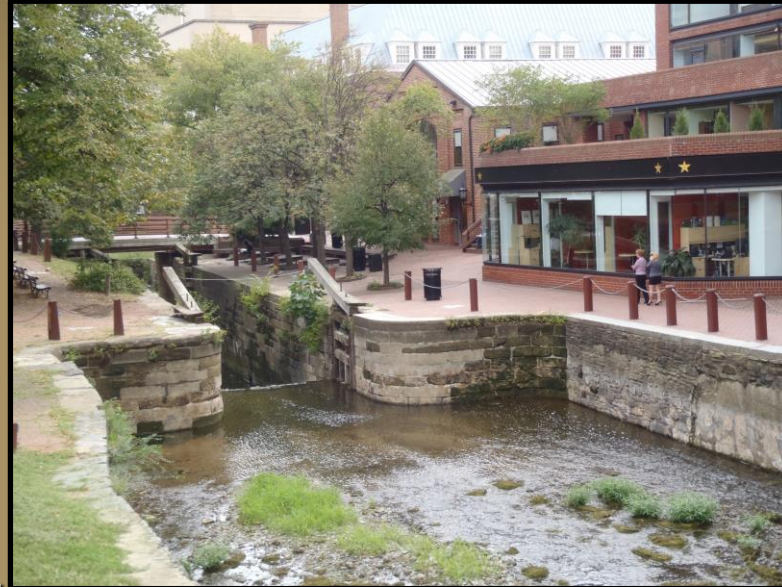
# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC

- Construction contract awarded in September 2016 and substantially completed May 3, 2019.
- Rebuilt Lock #3 from the foundation up and salvaged existing stones where possible, installed stormwater management systems and hardscapes. Performed preservation maintenance on Lock #4.
- Total cost of construction approx. \$7.6 million.



MM: 0.49 – 0.54 (Washington, DC)

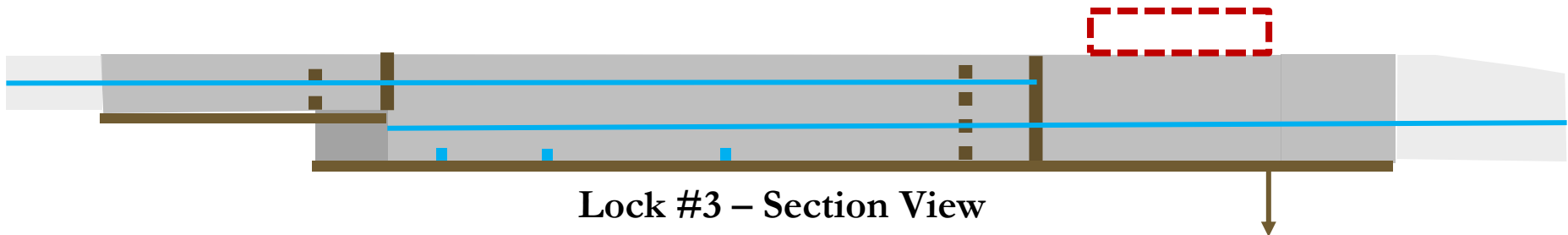
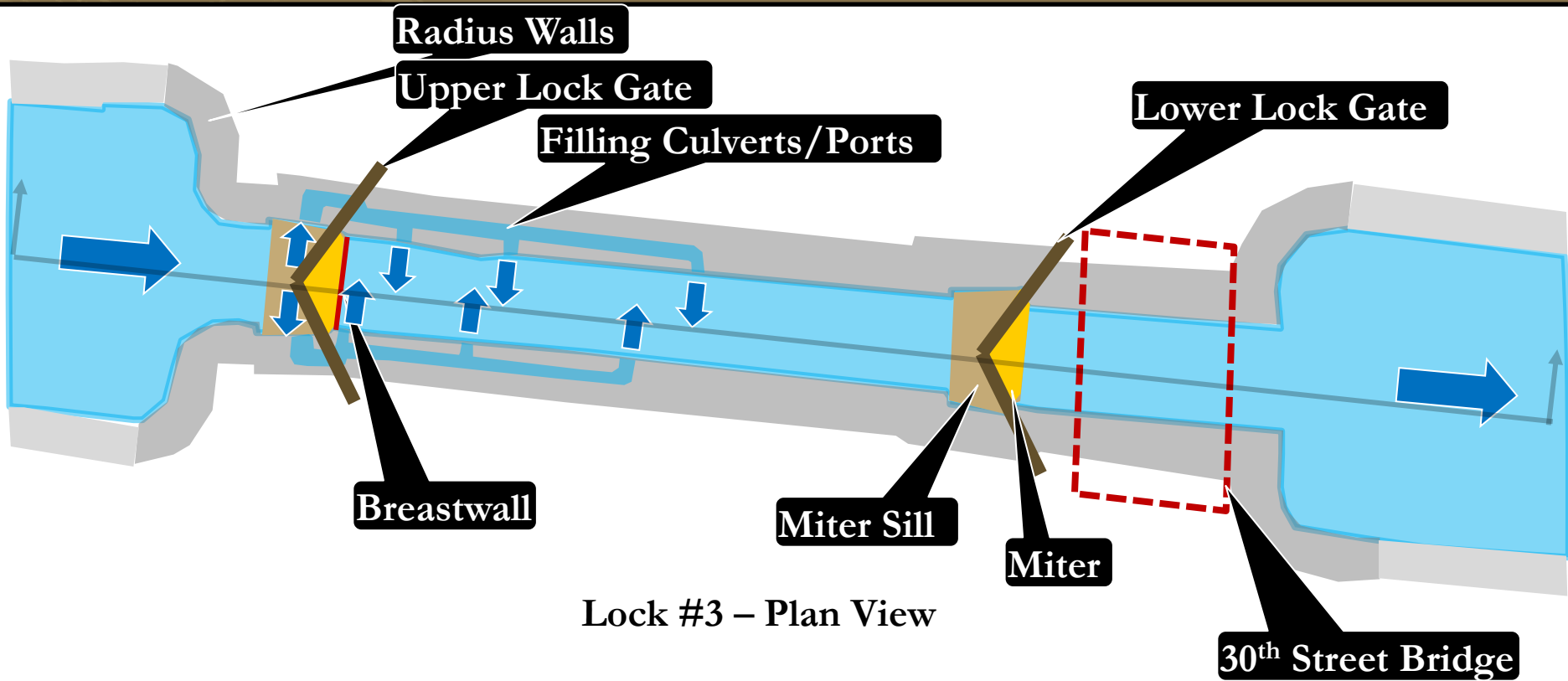


# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Lock Terminology



# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC





# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC

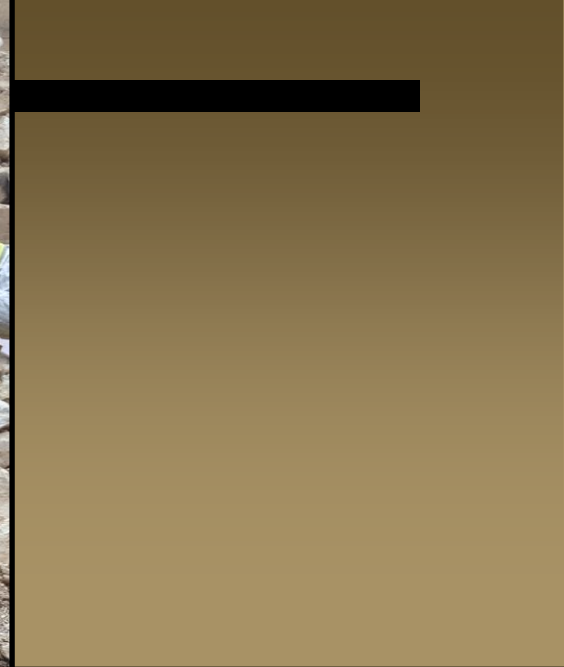




# Recently Completed Work – Rehabilitate Lift Locks 3 & 4 in Georgetown, Washington DC



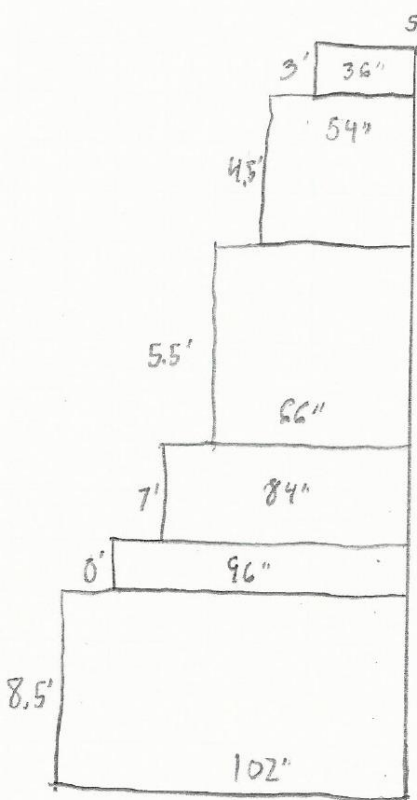




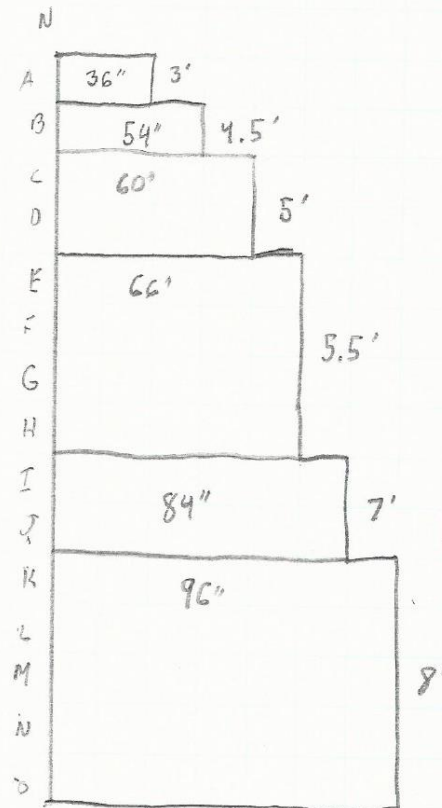








1.03



# TIMBER FOUNDATION OF LOCKS CONSTRUCTED BELOW DAM NO.5

FISK TO BENDER, JUNE 16, 1835.

8.5' 8'

DISASSEMBLE AND SALVAGE  
EXISTING COPING STONE

±13'-2"  
FIELD VERIFY

EL ±28.8'

DISASSEMBLE AND  
SALVAGE EX LOCK WALL  
ASHLAR MASONRY FACE  
CONSISTING OF ORIGINAL  
SAND STONE AS WELL  
AS GRANITE AND BRICK  
REPLACEMENTS

EXISTING RANDOM RUBBLE  
MASONRY BACKING TO BE  
DISASSEMBLED AND SALVAGED

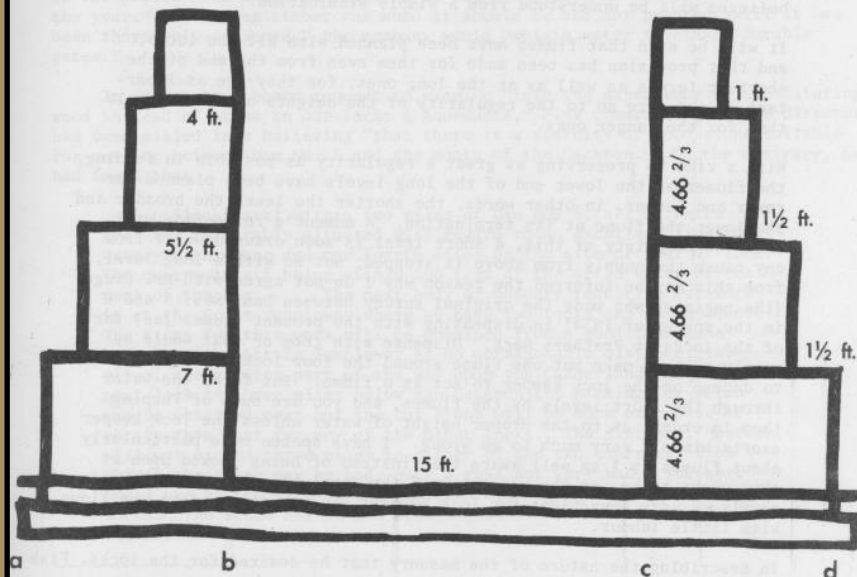
ASSUMED WALL CONFIGURATION IS  
INDICATED. DOCUMENT LOCATION AND  
SIZE BACK OF WALL STEPS. RESET  
RANDOM RUBBLE MASONRY BACKING  
MATCHING ORIG. WALL DIM.

WATER EL.  
VARIES

APPROX. GROUND  
WATER ELEV. SEE  
BORINGS

EXIST. PLANKING AND  
FOUNDATION TIMBERS  
TO BE REMOVED

CULVERT ±7'-0" FIELD VERIFY ±15'-0" FIELD VERIFY ±7'-0" FIELD VERIFY  
CULVERT. DOCUMENT SIZE  
AND LOCATION DURING  
DISASSEMBLY









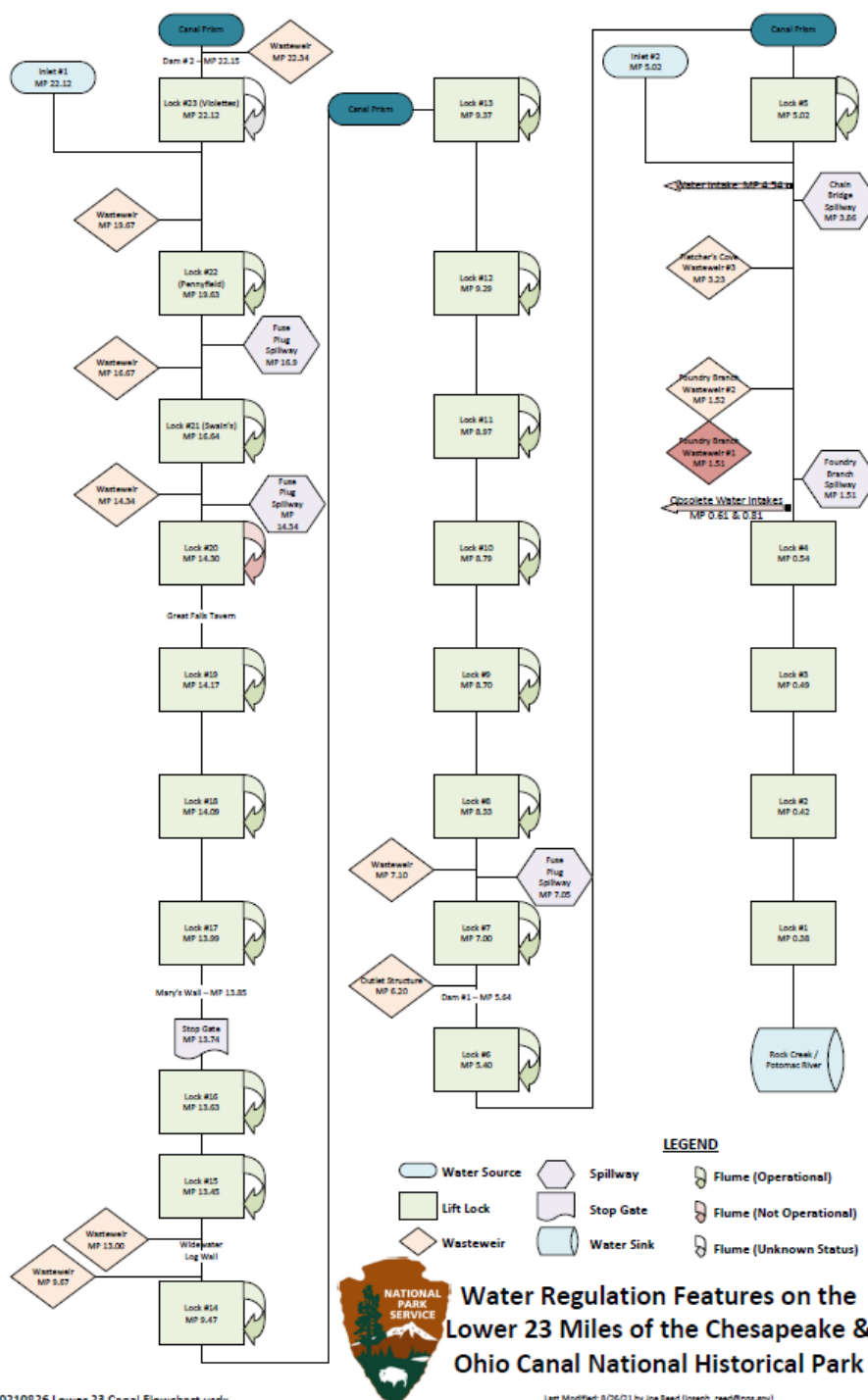




# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22



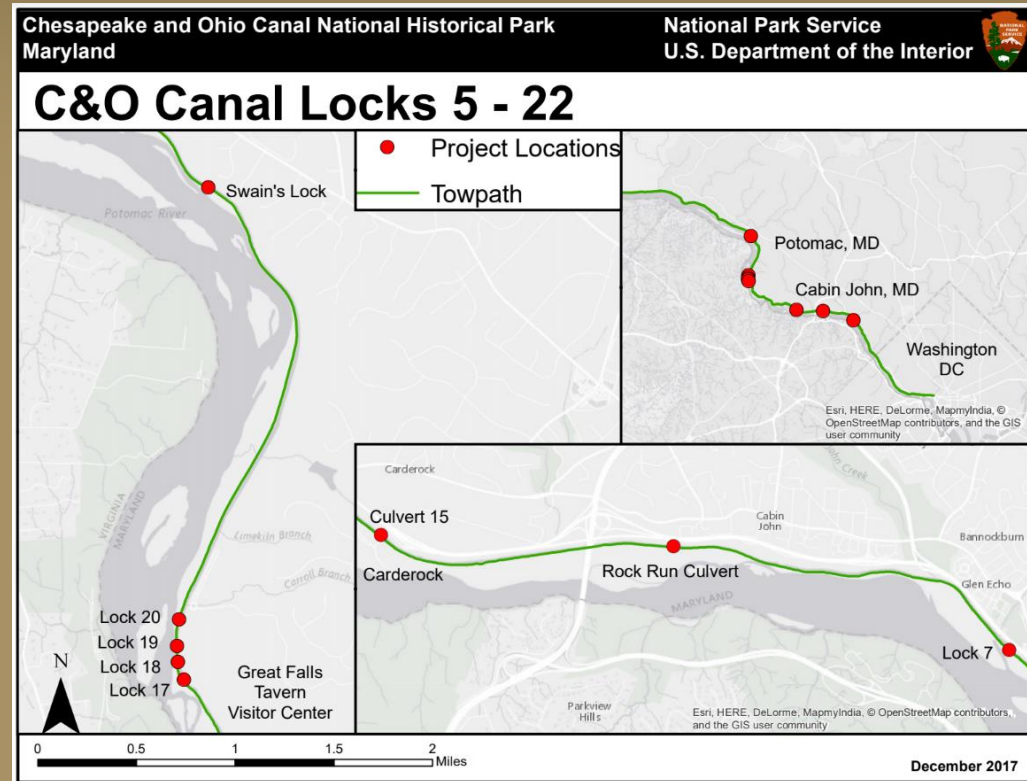






# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

- Construction initiated in December 2017 and completed in September 2020.
- Improved several locks, wasteweirs, bridges, and other water control structures to increase resiliency during flooding and preserve historic structures.
- Total cost of construction approx. \$8.5 million.





# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Level 7 (near Lock #7) Repair

Before



After



Emergency fuse plug spillway also installed just upstream of Lock #7 to increase flood resiliency by providing a protected point of overflow out of the canal!



# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Rock Run (near Lock #10) Repair of Drylaid Stone Wall Supporting the Towpath

Before

After



Canal liner system also restored!



# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Rock Run (near Lock #10) Repair of Drylaid Stone Wall Supporting the Towpath

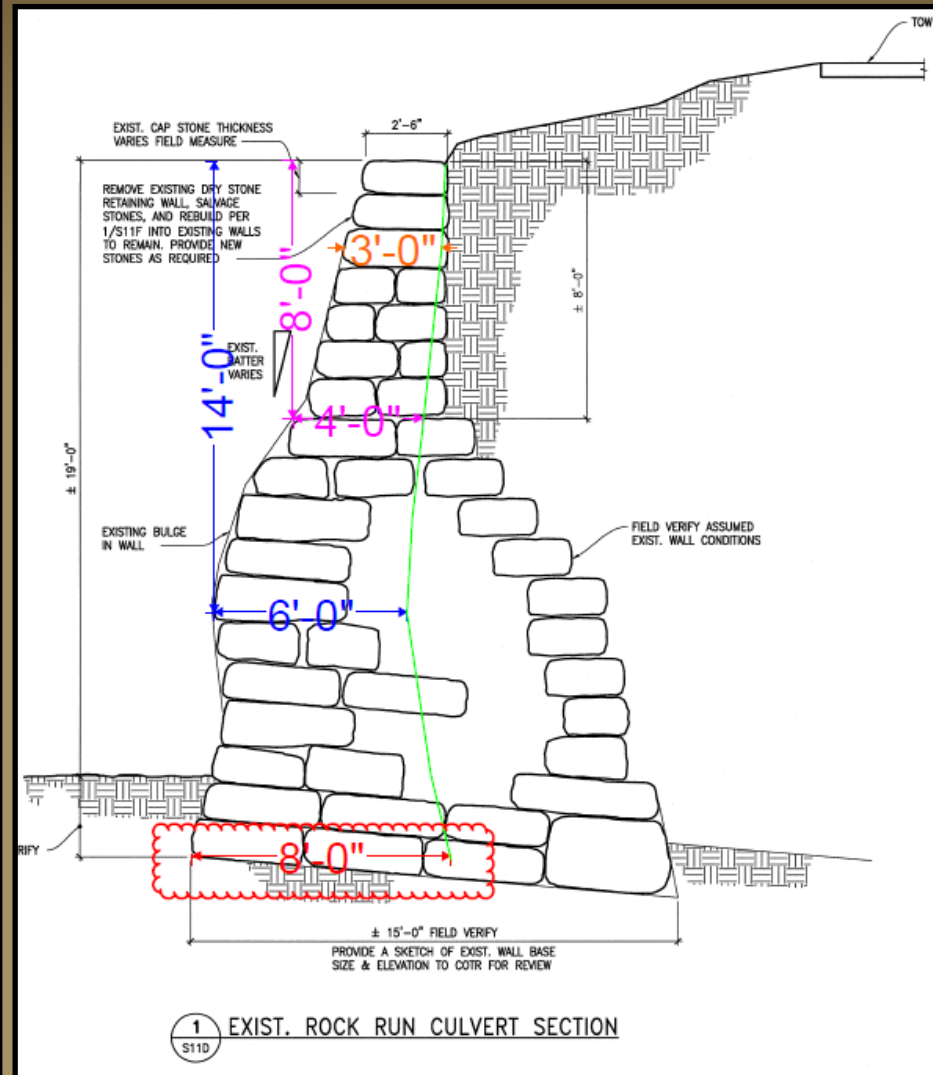
Before



After













# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22



Before

Culvert 15 (near Carderock) Repair

After



Cofferdams and bypassing pipe removed from canal, regraded liner installed, sinkhole filled, and underlying historic masonry culvert repointed!



# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Lock #17 Riverside Wall Repair

Before

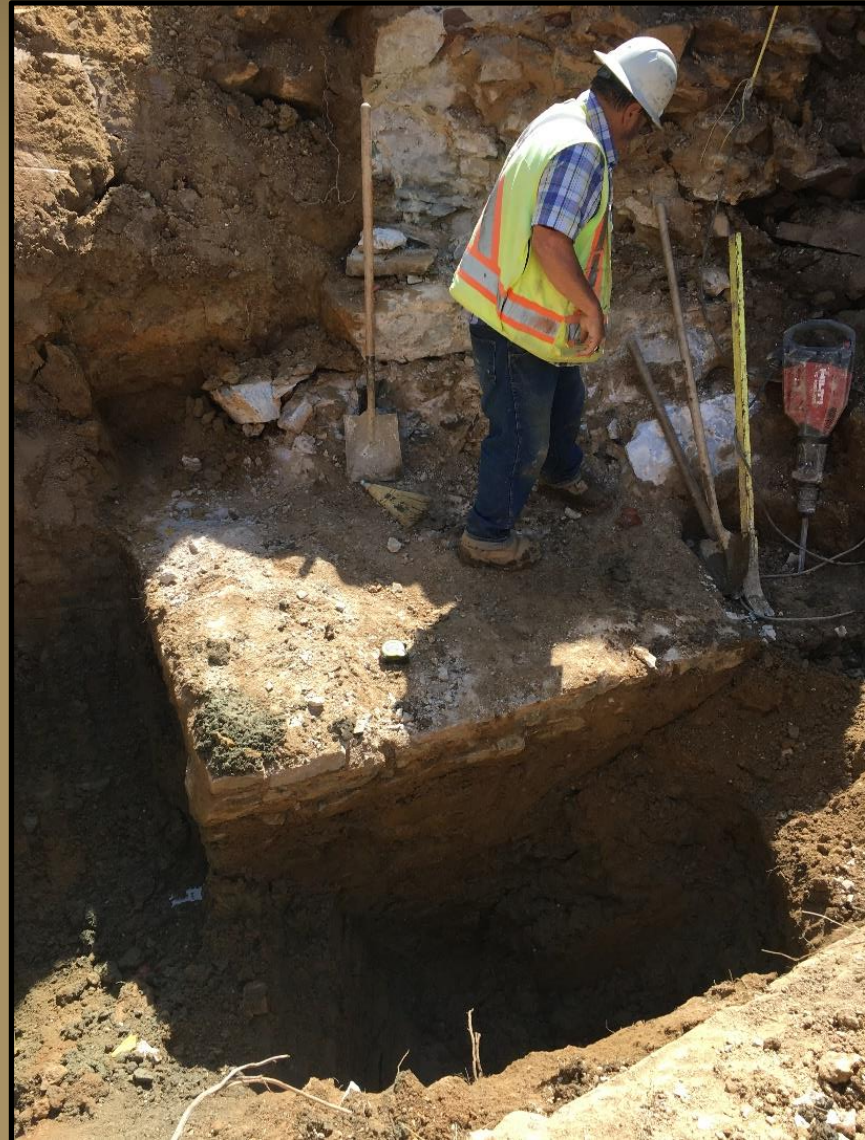


After



Lock gates replaced and masonry repairs were also completed!







# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Lock #18 Riverside Wall Repair

Before

After



Lock gates replaced and masonry repairs were also completed!



# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Towpath Retaining Wall Downstream of Lock #19 Repair

Before

After





# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Lock #19 Canal Wall Repair

Before

After



Bridges over lock and flume replaced, flume walls rebuilt, lower lock gate replaced and upper repaired, and masonry repairs were also completed!



# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Level #20 Wastew weir Repair

Before



After





# Recently Completed Work - Repair to Various Watered Structures between Locks 5 -22

Fuse Plug Installation near Swain's Lock

Before



After

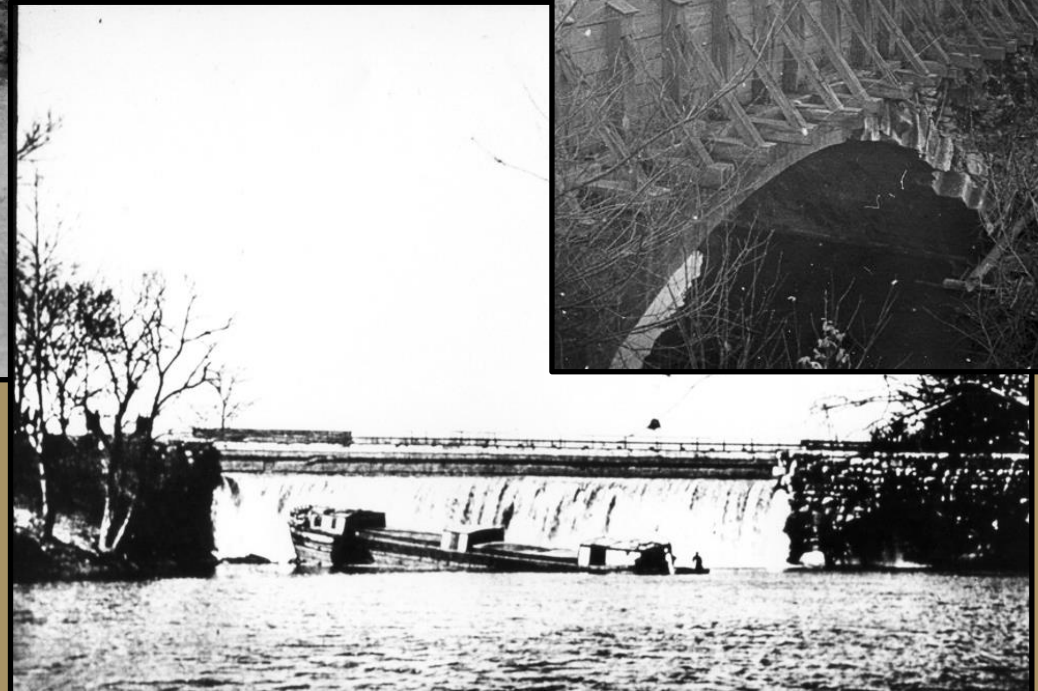
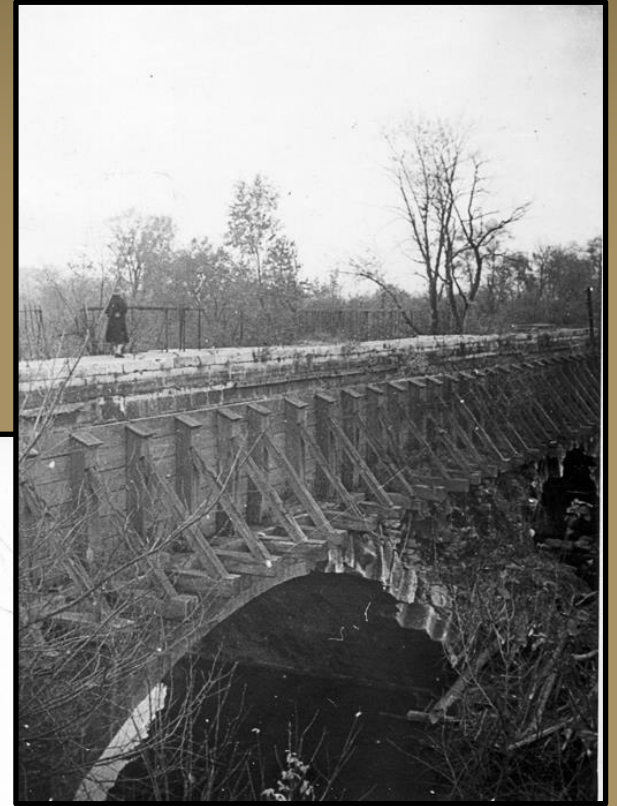
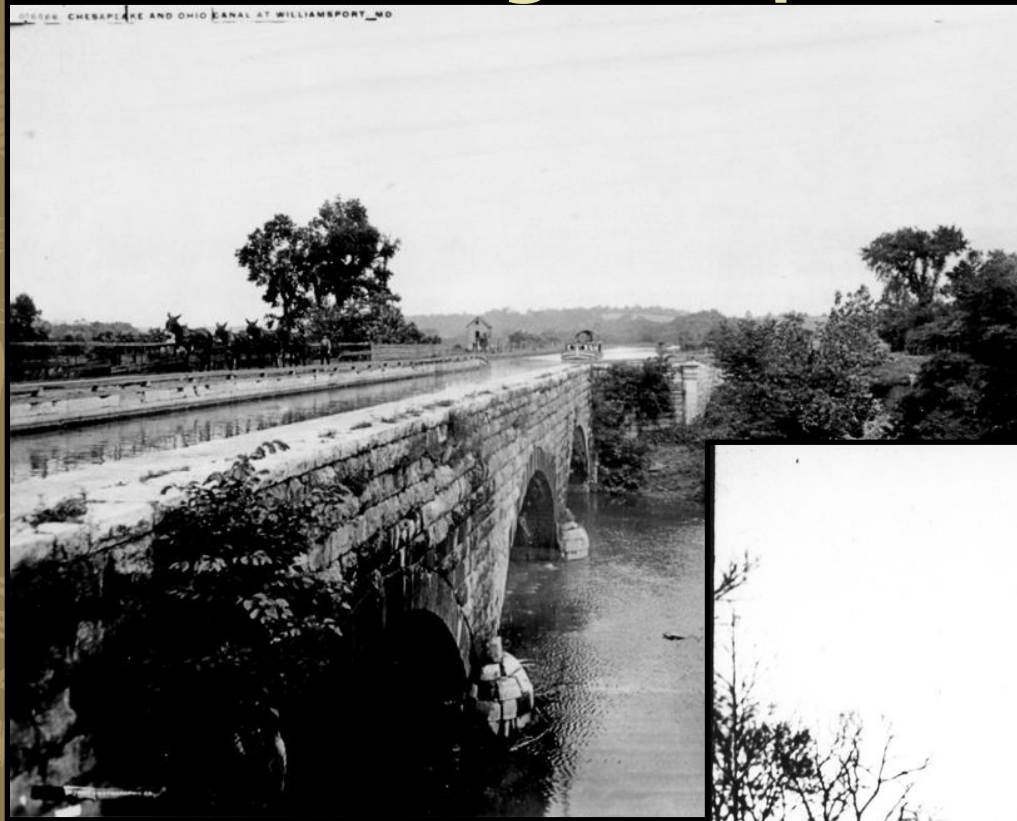


During





# Recently Completed Work – Rehabilitation of Conococheague Aqueduct



<https://www.nps.gov/choh/conococheague-aqueduct.htm>



# Recently Completed Work – Rehabilitation of Conococheague Aqueduct

- Construction contract awarded in June 2017 and ribbon cutting held August 2019.
- Stabilized aqueduct, restored canal prism, and constructed concrete liner through the aqueduct to facilitate rewatering.
- Total cost of construction approx. \$10 million.





# Recently Completed Work – Rehabilitation of Conococheague Aqueduct





# Rehabilitation of Conococheague





# Rehabilitation of Conococheague



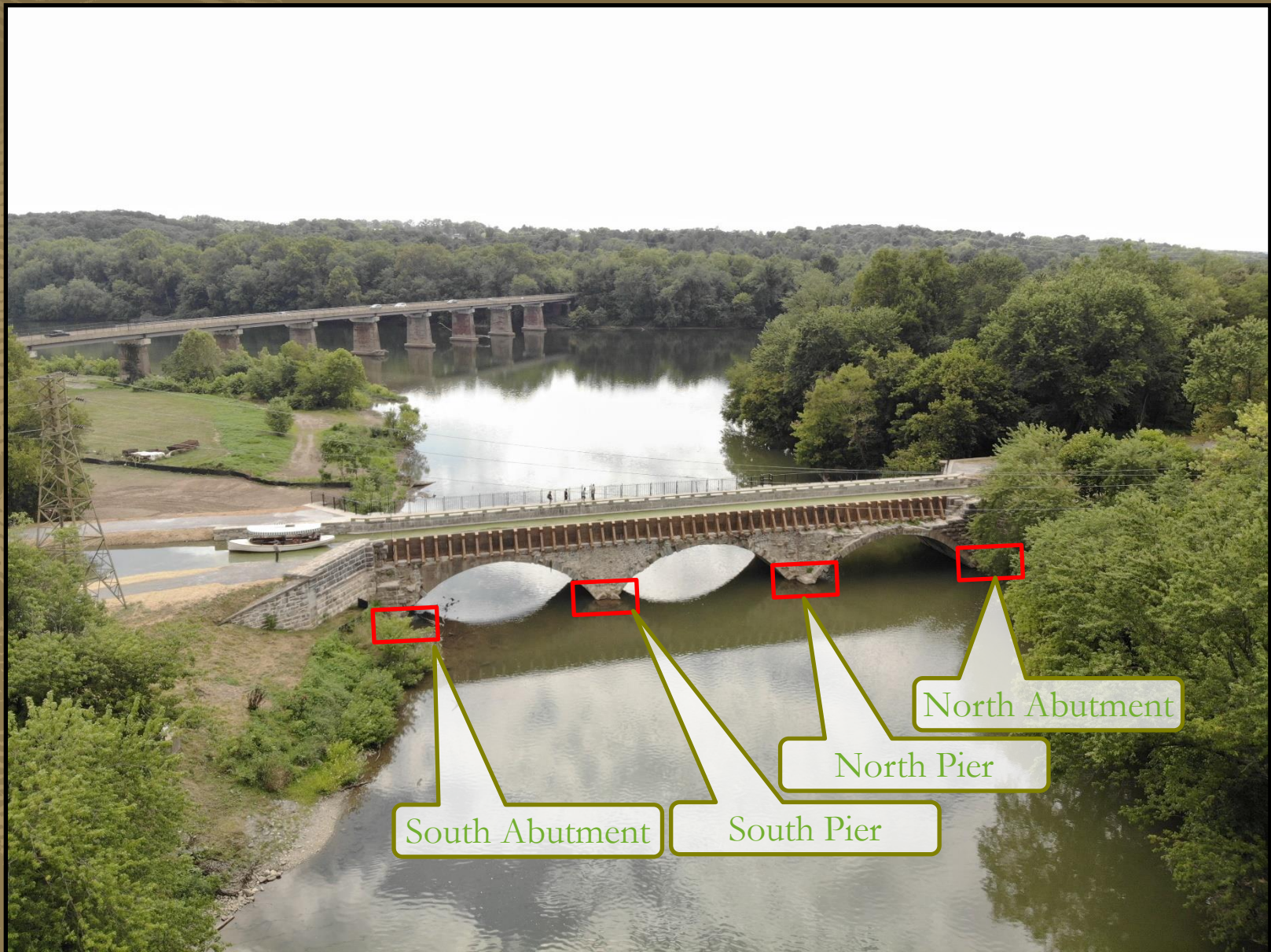


# Rehabilitation of Conococheague





# Rehabilitation of Conococheague





# Rehabilitation of Conococheague









# Rehabilitation of Conococheague

CHOH

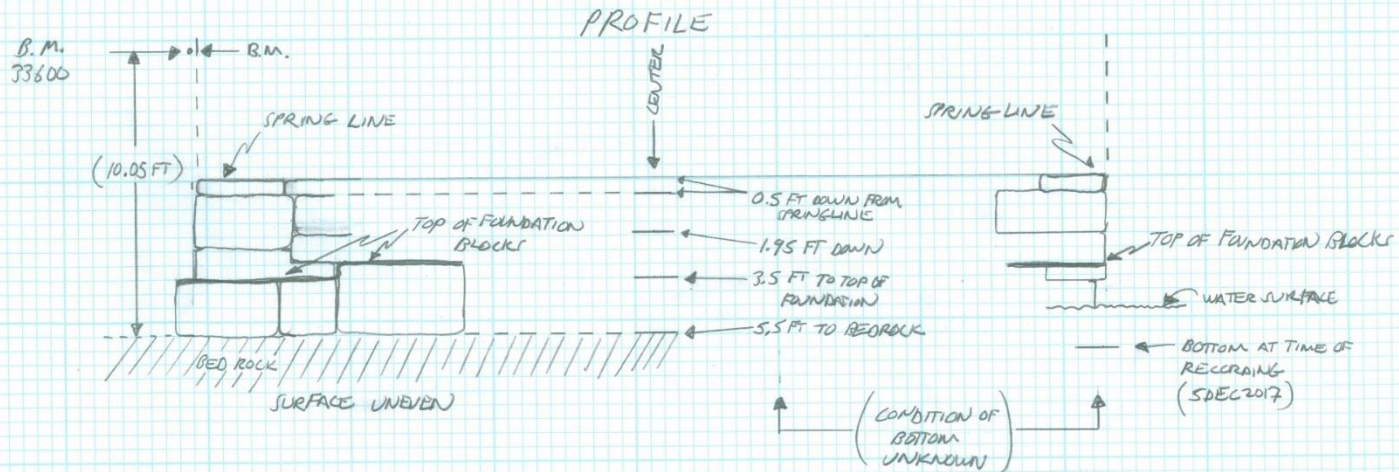
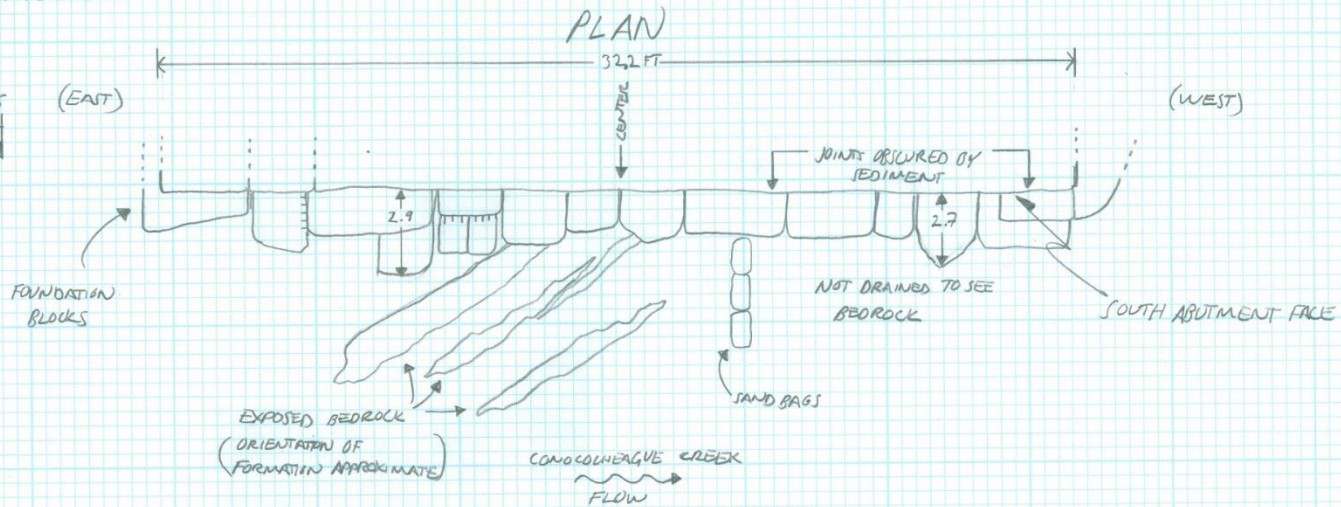
CONOCOCHEAQUE AQUEDUCT  
SOUTH ABUTMENT  
EXISTING CONDITIONS SKETCH

5 DEC 2017

JPE/JR



SCALE IN  
FEET





# Rehabilitation of Conococheague





# Rehabilitation of Conococheague













# Rehabilitation of Conococheague









# Under Construction – Towpath Stabilization McMahon's Mill to Lock 42

- Awarded construction project to rehabilitate & stabilize an approximately 0.9 mile stretch of towpath along the Potomac River. Towpath is currently closed & detour activated. Construction expected to continue into Spring 2023 (weather dependent).
- The work generally includes:
  - Site clearing and grubbing – Tree removal
  - Repair of existing mortared and dry laid stone wall
    - Stone infilling, chinking, and/or scour repair
  - Reconstruction of missing or failing dry laid stone wall to match existing
  - Raising of stone wall and towpath
  - Culvert Replacement
  - Laid Back Stone Revetment Repair
  - Excavation and Backfill
  - Towpath repair and resurfacing
  - Site Restoration/Stabilization



MM: 88.1 - 89 (Washington County, MD)



# Under Construction – Paw Paw Slope Stabilization

- Design-Build contract ongoing with construction started. Towpath currently CLOSED.
- Project will address unstable rock masses by stabilizing the highest risk rock slope areas:
  - Rock Scaling
  - Rock Bolting
  - Pinned Netting
  - Shear Keys
  - Drainage Improvements
  - Replacement of Boardwalk





# Design – Stabilization of Drylaid Stone Wall Near Mile Marker 11

- Currently developing complete construction documents for the stabilization of an approximately 1,015-LF long drylaid stone wall that varies in height up to 35' tall which was constructed in the 1830's. Construction expected to begin within the next year once design can be finished and permits acquired.
- Sediment will also be removed from the canal to restore the flow capacity and replace the canal liner system.
- To see the wall in 3D use this link:  
<https://skfb.ly/6SruX>





# Design – Stabilization of Drylaid Stone Wall Near Mile Marker 11

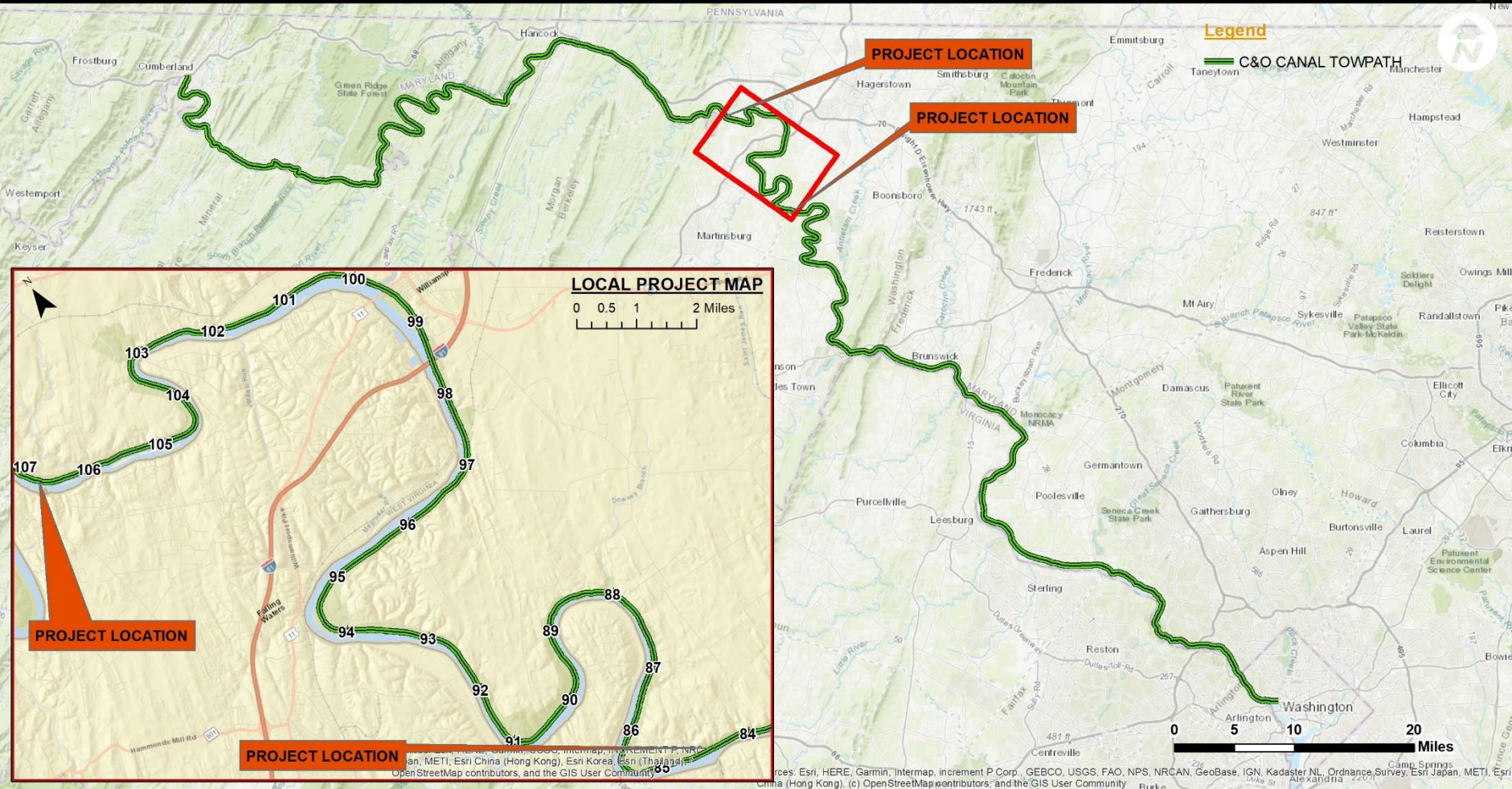




# Planning – Potomac Dam No. 4 & 5

Chesapeake & Ohio Canal National Historical Park  
CHOH 282411 - POTOMAC DAM NO. 4 & 5

National Park Service  
U.S. Department of the Interior





## Planning – Potomac Dam No. 4 & 5







# Thank You

Chesapeake & Ohio Canal NHP  
Region #1 -National Capital Area

Presenter:

Joe Reed, P.E., CFM – Park Engineer

Presentation Date: August 30, 2021

[Joseph\\_reed@nps.gov](mailto:Joseph_reed@nps.gov)

## Questions?