STATE OF OHIO DEPARTMENT OF TRANSPORTATION

BRIDGE INSPECTION REPORT

1802771 Structure File Number | BRIDGE NUMBER **CUY 00020 2295** | YEAR BUILT **1900**

DIST **12** | Bridge Type **595** | TYPE SERVICE **5 5** | **W BRANCH DUGWAY BROOK**

DECK out/out 0 Deck Area 753 sqft 1. FLOOR N NONE		N NOT APPLICABLE (CULVERT UNDER FILL ETC) 2. WEARING SURFACE Thk 0	
Left N NONE / Right N NONE 3. CURBS, SIDEWALKS AND WALKWAYS		4. MEDIAN Lanes on 4	
5. RAILING N NONE		6. DRAINAGE N NONE	
7. EXPANSION JOINTS N NONE		8. SUMMARY	
SUPERSTRUCTURE 9. ALIGNMENT Max Spans 15		1 N/A (CULVERTS, TRUSSES, ETC.) 10. BEAMS/GIRDERS/SLAB	
11. DIAPHRAGMS or CROSSFRAMES		12. JOISTS/STRINGERS	
13. FLOOR BEAMS		14. FlOOR BEAM CONNECTIONS	
15. VERTICALS		16. DIAGONALS	
17. END POSTS		18. TOP CHORD	
19. LOWER CHORD		20. LOWER LATERAL BRACING	
21. TOP LATERAL BRACING		22. SWAY BRACING	
23. PORTALS		24. BEARING DEVICES N NONE	
25. ARCH		26. ARCH COLUMNS or HANGERS	
27. SPANDREL WALLS		28. PROTECTIVE COATING SYSTEM	
29. PINS/HANGERS/HINGES		30. FATIGUE PRONE CONNECTIONS	
31. LIVE LOAD RESPONSE		32. SUMMARY	
SUBSTRUCTURE 33. ABUTMENTS 1 GRAVITY		1 GRAVITY 34. ABUTMENT SEATS Abutment: NOT ON PILING	
35. PIERS		N NONE 36. PIER SEATS Piers: NOT ON PILING	
37. BACKWALLS		38. WINGWALLS	
Piers = NN NN NN 39. FENDERS and DOLPHINS Spans = 1		40. SCOUR	
41. SLOPE PROTECTION N NONE-NATURAL PROTECTION(GRA		42. SUMMARY Dive Date 10/12/2005	
CULVERTS 43. GENERAL 7 ARCH	2	44. ALIGNMENT	1
45. SHAPE	1	46. SEAMS	
Culvert Length 100 47. HEADWALLS or ENDWALLS	2	Culvert Fill Depth 3 48. SCOUR	2
49.		50. SUMMARY	6
CHANNEL 51. ALIGNMENT	1	52. PROTECTION 0 OTHER-GRASS, BUSHES & TREES	1
8 SLIGHT CHANCE OVERTOPPING 53. WATERWAY ADEQUACY	1	54. SUMMARY	7
APPROACHES 55. PAVEMENT 2 BITUMINOUS	1	56. APPROACH SLABS	
57. GUARDRAIL N NONE		58. RELIEF JOINTS	
59. EMBANKMENT		60. SUMMARY Percent Legal = 150	8
GENERAL 61. NAVIGATION LIGHTS		62. WARNING SIGNS Maint Resp 1 OHIO TRAN DEPT	
Signs on = N 63. SIGN SUPPORTS MVC on = 9999.9		64. UTILITIES	
Under C = 0 65. VERTICAL CLEARANCE Under NC = 0	N	66. GENERAL APPRAISAL & OPERATIONAL STATUS	6 A

67. INSPECTED BY

SIGNED | PE Number | ACP INITIALS

DATE 11/1/2010

68. REVIEWED BY

SIGNED | 59487 PE Number | YSS INITIALS

N N N N N N N N SURVEY

DATE 2/24/2011

CULVERTS

GENERAL: SPALLS. MORTAR CRACKS AND MORTAR MISSING IN SOME AREAS (PROBE AS DEEP AS 13" TO MISSING MORTAR VOIDS). MISSING STONE AT INLET; SEE ATTACHED PHOTO #1 DATED 10/21/04.
HEADWALLS: MORTAR CRACKS AND MORTAR MISSING.
SCOUR: AT UPSTREAM INTERSECTION OF THE TWO CULVERT TYPES, THE REINFORCED CONCRETE BOX CULVERT HAS AN UNDERMINED AREA, UP TO 1.2'X 2.7'X THE WIDTH OF THE CULVERT. SEE ATTACHED DIVER REPORT DATED 11/1/10.

GENERAL

DIVE INSPECTION BY KCI 11/1/10.

Inspection Report for:

West Branch of Dugway Brook under U.S. Route 20 below Lake View Cemetery in Cleveland, Ohio (Stone Arch and Reinforced Concrete Culvert)

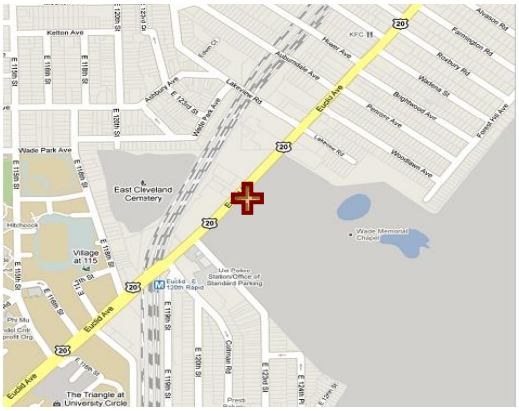
KCI Personnel on site during inspection:

1. Capt. Travis M. Clower MBA, P.E. (Entrant/ Inspector)
2. Mr. Christopher J. Luciani, (Attendant)
3. Mr. William Becka (Supervisor)

ODOT Personnel on site during inspection:

1. Andrea Persanyi

General View of Stone Arch Culvert



Location Map

Prepared for:

ODOT District 12

5500 Transportation Blvd

Garfield Heights, Ohio 44125

Prepared by:

KCI Associates of Ohio, P. A.

388 S. Main Street, Suite 401

Akron, Ohio 44311

Phone: (330) 564-9100

DESCRIPTION

The W. Brach of Dugway Brook Culvert, CUY-20-2295 (SFN 1802771) is located under U.S. Route 20 and Lake View Cemetery in Cleveland, Ohio. The stone arch culvert built in 1900 is connected on the south end to a reinforced concrete box culvert. The culvert was inspected from a manhole at the West Branch of Dugway Brook in Lake View Cemetery.

INSPECTION OPERATIONS

KCI's three-person, OSHA certified, confined space team performed the culvert inspection on 11/01/10. This was a permit required confined space entry. A tripod, winch, harness, and ladder were used for entry into the manhole in Lake View Cemetery. Although the atmosphere contained 21.0% oxygen, the entrant carried an air monitor, breathable air and a Superlite 27 helmet with him for precautionary reasons inside the confined space. The previous inspection report dated 10/21/04 was available for comparison. A visual inspection was performed on the entire internal structure between the entry manhole in the cemetery to the north end of the stone arch culvert. The entrant entered the manhole in the Lake View Cemetery. From there, he traveled north to the end of the stone arch culvert. An inspection station was set up at the south end of the stone arch culvert and the inspection commenced from there. The supervisor was stationed outside the culvert and had hard wire communication with the entrant. The photos were numbered from the south to the north. The photo section within this report has Photos 1-7 as identification photos, Photos 8-18 as inlet pipe photos, and Photos 19-23 as defect photos

Hazards Encountered:	*Difficult entrance, Permit Required Confined Space.*
Inspection Mode:	*Visual*
Flow Direction / Velocity:	*South to North*
Direction of Diver / Inspector:	*Reported findings starting at the Cemetery entry manhole to the north end of the stone arch culvert.*
Culvert Bottom:	*Flat rock and several large 3-foot diameter stones.*
Scour Checked By:	*N/A*
Equipment Used:	*Superlite 27 helmet with hard wire communication to the surface, tripod, winch, gas monitor, harness, lights, ladder*
Elements Cleaned:	*None*
Hydrographic Reference:	*Top of bottom slab of reinforced concrete box culvert.*

OBSERVATIONS

GENERAL

- The stone arch culvert starts at the end of the reinforced concrete box culvert, 106' north of the cemetery entry manhole, and extends 90' north under U.S. Route 20 (see Photos 2-4).
- The arch culvert consists of large stacked cut stones with a smooth stone floor (see Photo 4). There are two large (3' diameter) stones on the floor.
- The stone arch culvert has water depths ranging from 0.5' to 4.3' and flows north into another reinforced concrete box culvert. This is shown in Photo 5 and the Soundings Page. There are two weir walls along the bottom of the box culvert approximately 20' north of the stone arch culvert (see Photo 6).
- There is a manhole entrance into the stone arch culvert in the east side of the crown, 122' north of the cemetery entrance manhole (see Photo 7).
- There are numerous inlet pipes along the crown of the stone arch culvert and the sides of the reinforced concrete box culvert. Photos 8-18 show the size and location of each of these inlet pipes.
- The stone arch culvert has a roughly formed rectangular concrete pour in the crown near the south end with a 3" diameter steel drain pipe (see Photo 19). The concrete pour has scaling and spalling along the edges up to 1" deep. Although the exact purpose of the concrete is unknown, its location (running adjacent to Route 20) suggests that it may be enclosing sewer, water or utility lines.

DEFECTS & DEFICIENCIES STARTING AT THE CEMETERY MANHOLE ENTRY

- All the ladder rungs at the cemetery entry manhole are corroded and have 100% section loss.
- The reinforced concrete box culvert has several spalls up to 2' diameter x 2" deep throughout with exposed rusted reinforcing steel. Photo 20 shows a few of these spalls along the top slab and the west wall.
- There is a 3' diameter x 4" deep spall with exposed corroded reinforcing steel in the top slab of the reinforced concrete box culvert 75' from the cemetery entry manhole (see Photo 20).
- There is a 30" high x 18" wide x 3" deep spall with exposed reinforcing steel in the east wall of the reinforced concrete box culvert, 85' from the cemetery entry manhole (see Photo 21).
- The walls and the top slab of the reinforced concrete box culvert have several wrap-around hairline cracks with efflorescence (see Photo 3).
- The bottom slab of the reinforced concrete box culvert is undermined at the south end of the stone arch culvert. The area of undermining is 1.2' high x 2.7' deep along the full width of the culvert (see Photo 22).
- The stone arch culvert has missing mortar along the waterline and minor efflorescence along the joints (see Photo 23).
- Two 3' diameter stones are present on the floor of the stone arch culvert, one at the southwest corner and one near mid-length.

SCOUR RATINGS AND ASSESSMENT

- The BR86 rating for item #48 (Culvert Scour) is as follows:

Inspection Mode	Condition Rating
3	2

The underwater inspection found the cut stone culvert to have a smooth rock bottom with no signs of scour. At the upstream intersection of the two culvert types, the reinforced concrete box culvert has up to 1.2' high x 2.7' deep x full width undermining of the discharge concrete slab. Although this concrete undermining is not significant enough to jeopardize the structural integrity of the culvert system, it should be monitored and measured with routine inspections.

- The Item #74 - Scour Critical Susceptibility Rating is as follows:

Condition Rating
8

COMPARISON TO PREVIOUS REPORTING AND SUMMARY

The culvert's condition has changed very little since the previous inspection. The undermining at the south end of the stone arch culvert has increased by 0.3'. Two large stones with unknown origin were found along the bottom of the stone arch culvert. There are several wrap-around cracks with efflorescence in the reinforced concrete box culvert. Soundings were taken along the walls and centerline of the stone arch culvert to serve as a benchmark for future inspections to track any changes to the floor of the culvert.

Aerial Photo by Google Maps

Photo 1 – Facing Down. Aerial view showing approximate location of Culvert.

Photo by T. Clower, 11/01/10

Photo 2 – Facing Southeast. Manhole access below the Lake View Cemetery.

Photo by T. Clower, 11/01/10

Photo 3 – Facing South. Concrete Box Culvert. Also showing typical hairline wrap-around cracks.

Photo by T. Clower, 11/01/10

Photo 4 – Facing North. Stone Arch Culvert.

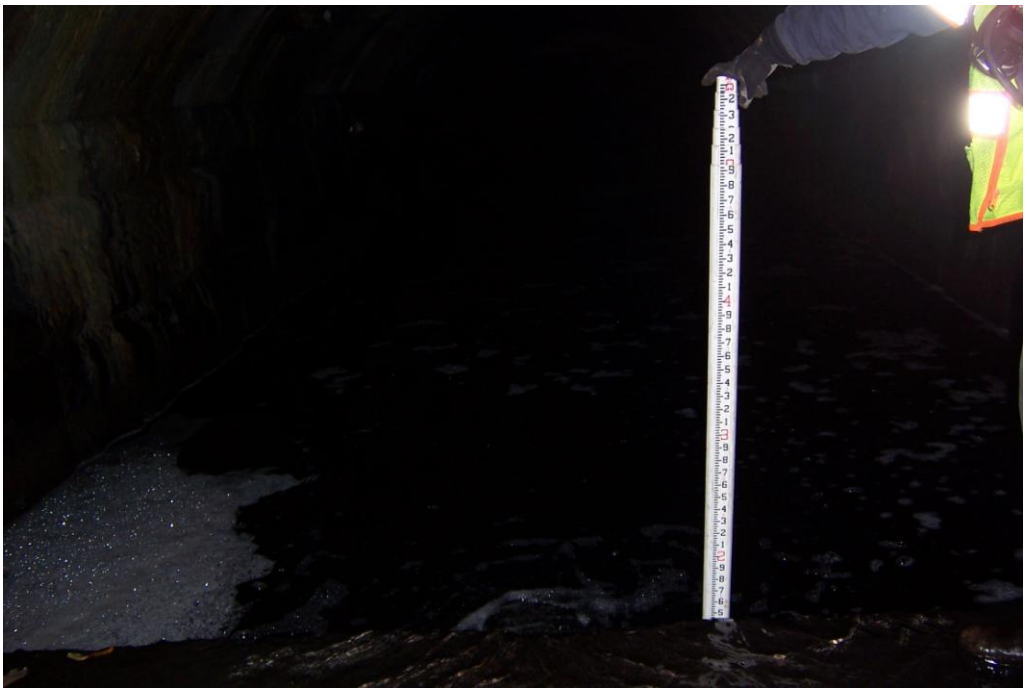


Photo by T. Clower, 11/01/10

Photo 5 – Facing North. Water depth at the south end of the stone arch culvert.

Photo by T. Clower, 11/01/10

Photo 6 – Facing North. Weir walls along the bottom of the concrete box culvert at the north end of the stone arch culvert.

Photo by T. Clower, 11/01/10

Photo 7 – Facing Northeast at 122' north of the cemetery entry manhole. Manhole entrance into the stone arch culvert.

Photo by T. Clower, 11/01/10

Photo 8 – Facing West. 20' north of the cemetery entry manhole. 6" diameter inlet pipe with an adjacent 8" wide x 16" high x 1" deep spall with exposed corroded reinforcing steel.

Photo by T. Clower, 11/01/10

Photo 9 – Facing East. 20' north of the cemetery entry manhole. 6" diameter inlet pipe with edge spalling.

Photo by T. Clower, 11/01/10

Photo 10 – Facing West. 20' north of the cemetery entry manhole. 18" diameter inlet pipe with an offset section and exposed fill.

Photo by T. Clower, 11/01/10

Photo 11 – Facing West. 106' north of the cemetery entry manhole. 12" diameter inlet pipe in the southwest corner of the stone arch culvert.

Photo by T. Clower, 11/01/10

Photo 12 – Facing East. 106' north of the cemetery entry manhole. 12" diameter inlet pipe in the southeast corner of the stone arch culvert

Photo by T. Clower, 11/01/10

Photo 13 – Facing Northwest. 122' north of the cemetery entry manhole. 12" diameter pipe in the west wall and 18" diameter pipe in the crown.

Photo by T. Clower, 11/01/10

Photo 14 – Facing Northeast. 122' north of the cemetery entry manhole. 12" diameter pipe in the east wall and 18" diameter pipe in the crown.

Photo by T. Clower, 11/01/10

Photo 15 – Facing East. 122' north of the cemetery entry manhole. 18" diameter inlet pipe in the east wall of the stone arch culvert

Photo by T. Clower, 11/01/10

Photo 16 – Facing West. 136' north of the cemetery entry manhole. 20" diameter inlet pipe in the west wall of the stone arch culvert

Photo by T. Clower, 11/01/10

Photo 17 – Facing North. 145' and 155' from the cemetery entry manhole. 12" diameter inlet pipes in the crown of the stone arch culvert.

Photo by T. Clower, 11/01/10

Photo 18 – Facing South. 170' north of the cemetery entry manhole. 12" diameter pipes in the sides and 18" diameter pipe in the top of the stone arch culvert crown.

Photo by T. Clower, 11/01/10

Photo 19 – Facing South. 110' north of the cemetery entry manhole. Concrete pour at the south end of the stone arch culvert.

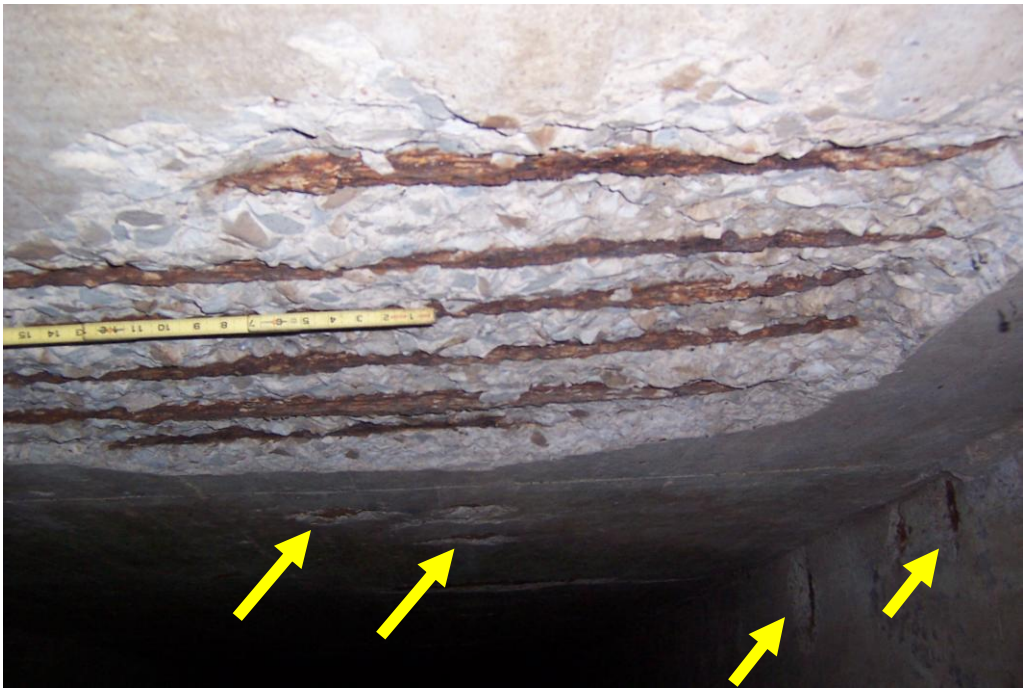


Photo by T. Clower, 11/01/10

Photo 20 – Facing South. 75' north of the cemetery entry manhole. 3' diameter x 4" deep spall with exposed reinforcing steel in the top slab of the box culvert. Also showing typical spalls along the top slab and west wall.

Photo by T. Clower, 11/01/10

Photo 21 – Facing East. 85' north of the cemetery entry manhole. 30" high x 18" wide x 3" deep spall with exposed reinforcing steel.

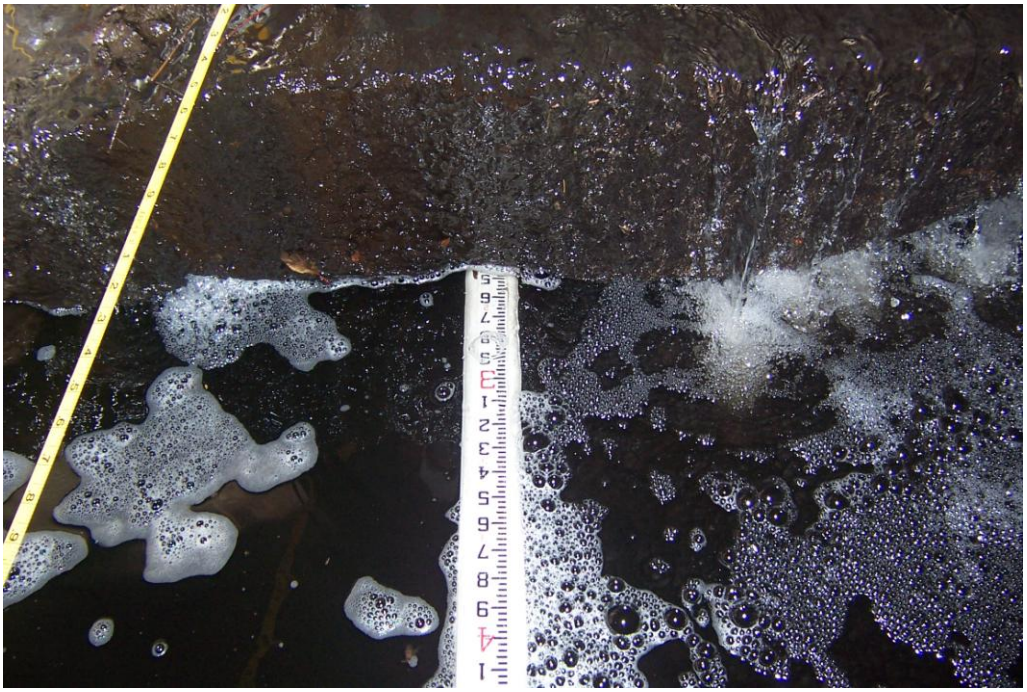


Photo by T. Clower, 11/01/10

Photo 22 – Facing South. 106' north of the cemetery entry manhole. Undermining of the bottom slab of the concrete box culvert at the south end of the stone arch culvert (1.2' high x 2.7' deep x full width)

Photo by T. Clower, 11/01/10

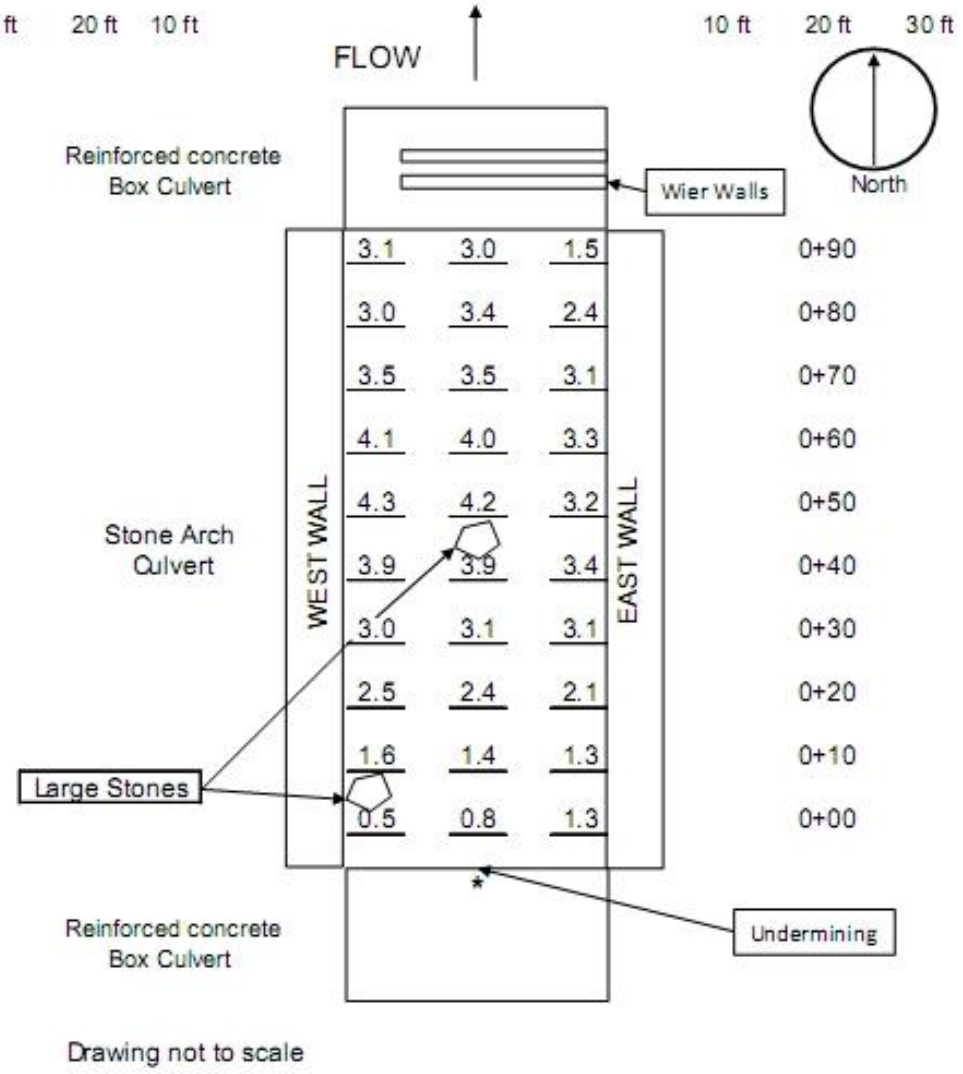
Photo 23 – Facing West. Typical missing mortar along the waterline of the stone arch culvert.

SOUNDING SHEET

(All measurements are in feet)

Bridge No.: CUY-00020-2295
Inspectors: TC\CL\BB
Inspection Date: 11/1/2010
Clearance Location: ★ 1.0 to Top of Reinforced Concrete Box Culvert Bottom Slab at South end of Arch Culvert.

Clearance is the distance measured from the water surface to the clearance location.



Drawing not to scale

CONFINED SPACE ENTRY PERMIT

Date and Time Issued: *11/1/10 13:00 hrs*

Date and Time Expires: *11/1/10 16:00 hrs*

Job Site/ Space I.D.: Dugway Brook Supervisor: *Bill Becka*

Equipment to be worked on: *N/A* Work Performed: *Inspection*

Checklist:

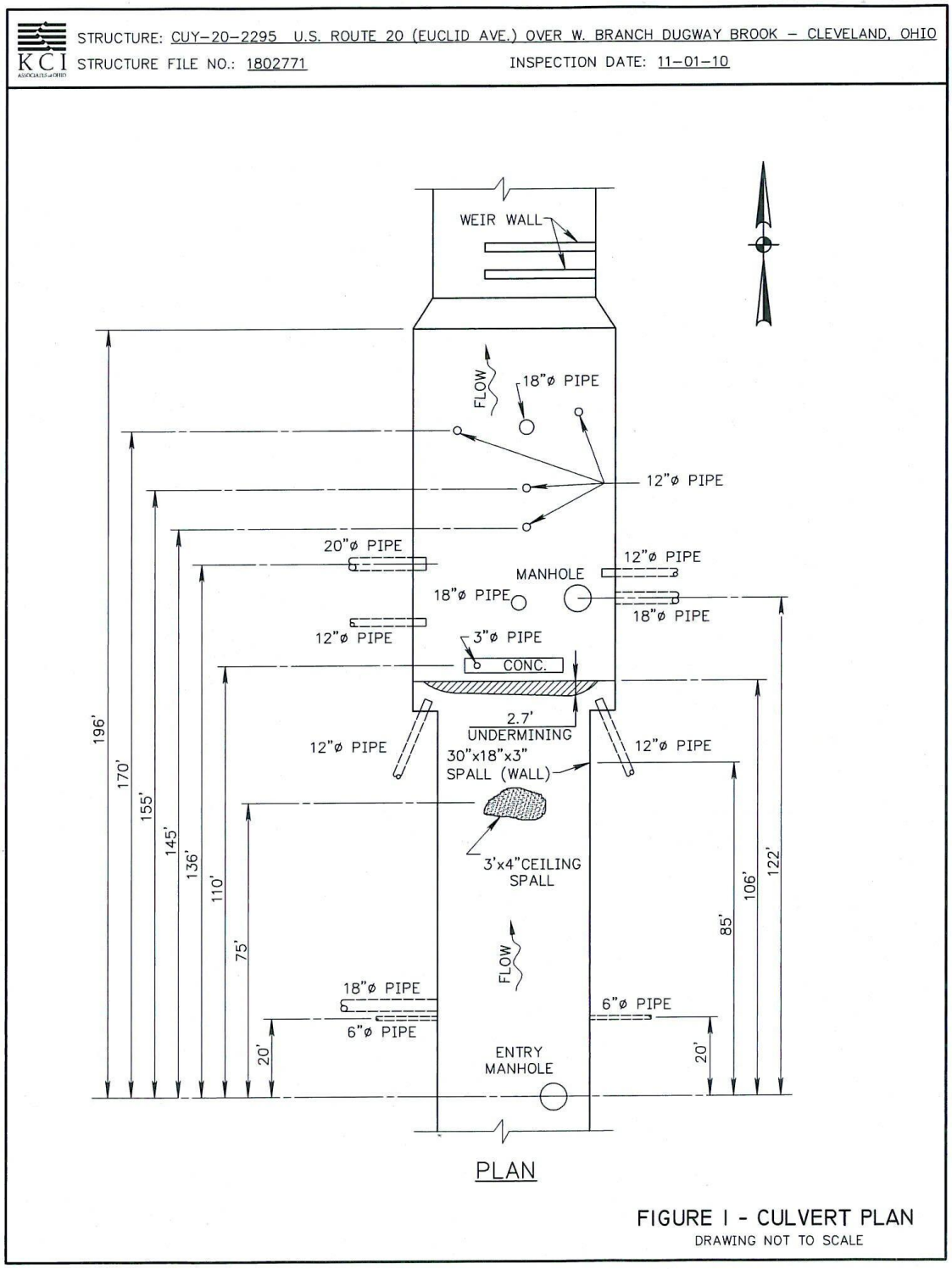
- Personnel trained in Confined Space Entry, CPR, and First Aid *(yes)*
- Communications: *Line tended entrant with hard wire communications*
- Method of Egress: *Tripod, winch and harness*
- Natural Ventilation: *(yes)* and/or Forced Ventilation (_____)
- Is Lock Out/Tag Out and/or Weather an Important Issue? *(must have no rain)*
- Is SCBA or Surface Supplied Air being used? *(SCUBA tank with dive helmet)*
- Monitor Atmosphere (Top, Middle, Bottom) every 20 minutes
  - Oxygen *(~~19.4% too low~~ 21%)* must be between 19.5 and 23.5% to breath
  - Explosive % *(0%)* must be < 10% LEL
  - Toxic PPM *(0%)* must be < 10 PPM H(2)S
  - Times Checked *(continuous)*

We have reviewed the work authorized by this permit and the information contained here-in. Instructions, safety and rescue procedures have been reviewed and understood.

Entrant(s) Signature: Travis M Clower
Travis M. Clower, P.E.

Attendant(s) Signature:
Chris Luciani

Supervisor Signature: Bill Becka
Bill Becka


STRUCTURE: CUY-20-2295 U.S. ROUTE 20 (EUCLID AVE.) OVER W. BRANCH DUGWAY BROOK - CLEVELAND, OHIO
STRUCTURE FILE NO.: 1802771
INSPECTION DATE: 11-01-10
WEIR WALL
FLOW
18"ø PIPE
12"ø PIPE
20"ø PIPE
MANHOLE
12"ø PIPE
18"ø PIPE
18"ø PIPE
12"ø PIPE
3"ø PIPE
CONC.
2.7'
UNDERMINING
12"ø PIPE
30"x18"x3"
SPALL (WALL)
12"ø PIPE
3'x4"CEILING
SPALL
FLOW
18"ø PIPE
6"ø PIPE
6"ø PIPE
ENTRY
MANHOLE
196'
170'
155'
145'
136'
110'
75'
20'
85'
106'
122'
20'
PLAN
FIGURE I - CULVERT PLAN
DRAWING NOT TO SCALE

APPENDIX

SCOUR SUSCEPTIBILITY WORKSHEET

	OFFICE ASSESSMENT
Structure Information	
Bridge Number	CUY-020-2295
SFN	1802771
Feature Intersected	W. Branch Dugway Brook
Assessment Team Members	Bill Becka, Chris Luciani, Travis Clower, PE

Office Check - Step 1/6 - Performed by:

1) Condition Rating History

A) Culvert - ***Year***		2010				
43	General - Concrete, Masonry	2				
44	Alignment	1				
45	Shape	1				
46	Seams	1				
47	Headwalls or Endwalls	1				
48	Scour	3 2				
49	Abutment	1				
50	SUMMARY	8				

2) Overtopping Y N

A) Inventory - Waterway Adequacy Rating - **Item 88:**

B) History of Overtopping

Remote - Greater than 100 years	Y	
Slight - Between 11 and 100 years		N
Occasional - Between 3 and 10 years		N
Frequent - Within 3 years		N

Screening - Step 2/6 - Performed by:

1) Low Risk	Y	N
A) Is the structure a culvert (excluding 3 sided culverts)?	Y	
B) Are all abutment and pier footings keyed into rock?		N/A
C) Are all drilled shafts embedded into rock?		N/A
2) Scour Susceptible		
A) Is there scour or a history of scour problems?	Y	
B) Are the foundations spread footings or unknown foundations?		N/A
C) Is the structure nonredundant, simple span or 3 sided culvert?		N/A
D) Does the structure have an inadequate waterway opening or design that collects ice and/or debris?		N/A
E) Is the streambed experiencing active degradation or aggradation?		N/A
F) is the streambed experiencing active lateral movement of bank erosion?		N/A
G) Do the banks have steep slopes or is there high stream velocity?		N/A
H) Are there in-stream mining operations in the vicinity of the structure?		N/A
I) Does the structure have a history of flood damage to the structure?		N/A
J) Does the structure cross near stream confluences?		N/A
K) Does the structure cross sharp bends?		N/A
L) Is the structure located in alluvial fans?		N/A

FIELD ASSESSMENT

Upstream Condition - Step 3/6 - Performed by:

A) Banks	Y	N
1) Stable: Natural Vegetation, trees, bank stabilization measures such as riprap, paving, gabions, channel stabilization measures such as dikes and jetties		N/A
2) Unstable Bank sloughing, undermining, evidence of lateral movement, damage to stream stabilization measures.		N/A
B) Main Channel		
1) Clear and open with good approach flow conditions?	Y	
2) Does channel meander or is it braided with main channel at an angle to the orientation of the bridge?		N/A
3) Existence of island, bars, debris, cattle guards and fence that may affect flow?		N/A
4) Aggrading or degrading of streambed?		N/A
5) Evidence of movement of channel with respect to the bridge?		N/A
C) Flood Plain		
1) Evidence of significant flow on floodplain?		N/A
2) Floodplain flow patterns - does flow overtop road and/or return to main channel?		N/A
3) Is there hydraulic adequacy of the relief bridge (if relief bridges are obstructed, they will affect flow patterns at the main channel bridge)?		N/A
4) Is the floodplain development and any obstruction to flows approaching the bridge and its approaches?		N/A
5) Evidence of overtopping approach roads (debris, erosion of embankments slopes, damage to riprap or pavement, etc.)?		N/A
D) Debris		
1) Large Amounts of debris obstructing or hung on substructure.		N/A
2) Small amounts of debris obstructing or hung on substructure.		N/A
3) No debris obstructing flow or hung up on substructure.		N/A

Condition at Bridge - Step 4/6 - Performed by:

	Y	N
A) Substructure		
1) Are there evidence of scour and/or undermining of the abutments or pier footings?	Y	
2) Is the main current attacking piers or abutments at an angle (approx. angle)?		N/A
3) Has riprap been removed and replaced by bed-load material?		N/A
4) Can displaced riprap be seen below the bridge?		N/A
5) Are guidebanks in place? *Are guidebanks in place?*		N/A
Are guidebanks in good working order?		N/A
Have scour or erosion damaged the guidebanks?		N/A
6) Is there evidence of scour and erosion of streambeds and banks, especially *adjacent to piers and abutments?*		N/A
7) Has the stream cross section changed since the last measurement? *In what way?*		N/A
B) Superstructure		
1) Is there evidence of overtopping (debris in cross frames, railing anchors etc.)?		N/A
3) Is the superstructure tied down to the substructure to prevent displacement during floods?		N/A
5) Is the superstructure a simple span configuration and/or nonredundant load path?		N/A

Downstream Condition - Step 5/6 - Performed by:

	Y	N
A) Banks		
1) Stable: Natural Vegetation, trees, bank stabilization measures such as riprap, paving, gabions, channel stabilization measures such as dikes and jetties		N/A
2) Unstable Bank sloughing, undermining, evidence of lateral movement, damage to stream stabilization measures, etc.		N/A
B) Main Channel		
1) Clear and open with good "getaway" conditions?		N/A
2) Does channel meander?		N/A
3) Is the channel braided with bends?		N/A
4) Does the channel have islands or bars?		N/A
5) Are there cattle guards or fences restricting flow?		N/A
6) Aggrading or degrading stream bed?		N/A
7) Evidence of movement of channel with respect to the bridge?		N/A
C) Flood Plain		
1) Clear and open so that contracted flow at the bridge will return smoothly to the floodplain?		N/A
2) Is the floodplain restricted by dikes, developed trees, debris or other obstruction?		N/A
3) Evidence of scour and erosion due to downstream turbulence?		N/A

CONCLUSION - Step 6/6 - Performed by:	Y	N
1) Field Review Completed	Y	
2) SCOUR CRITICAL SUSCEPTIBILITY - ITEM #74 - Assessment with Field Review		
A) Recommend **one** of the following codes according to this Assessment		
6 - Not Yet Evaluated (the Purpose of this assessment is to remove this coding)		
T - Low Risk - Not yet evaluated, bridge over Tidal Waters		
9 - Low Risk - Stable; Bridge, including piles, are well above flood elevations		
8 - Low Risk - Stable; Scour is above top of footing and/or on rock that will resist scour throughout life	Y	
7 - Low Risk - Stable; Scour POA countermeasures implemented		
5 - Low Risk - Stable; scour within limits of known foundation		
4 - Low Risk - Stable; field review found exposed foundations where action is required		
U - High Risk - Unknown foundation - *develop POA*		
3 - High Risk - Unstable; field review found undermining - *develop POA*		
2 - High Risk - Unstable; extensive scour at bridge foundation - *develop POA, revise Scour Rating*		
1 - Higher Risk - Unstable; failure imminent, close bridge - *develop POA*		
0 - Highest Risk - Unstable; bridge has failed - *develop POA*		
Follow Up		
Update Item #74 in BMS		
Assessment placed in the Bridge Files		