

STRUCTURE C-2-A
INSPECTION DATE: 1/18/2022



Single Barrel, 54" Diameter x 97' Long

Location:	Lake Apopka MFW
	C-2-A
Latitude:	28.6757 N
Longitude:	81.6910 W
Type:	Gated Culvert
No. Barrels:	One
Inspection	
Start Date:	1/18/2022
End Date:	1/18/2022

TEAM MEMBERS	
Lead Engineer	Jeffrey O'Connor, P.E.
Dive Supervisor	Patrick Savadge
Diver	Aaron Willard
Diver – Standby	Charles Peach
Dive Tender	Miguel King
Dive Tender	
Animal Control	TJ McDonagh
SJRWMD Agent	Willie Hughley

Respectfully Submitted,
UNDERWATER ENGINEERING SERVICES, INC.
3306 Enterprise Road
Fort Pierce, FL 34982
(772) 337-3116 Lic. No. CA3703
Jeffrey O'Connor, P.E. (FL 50914)
Vice President
Project Manager



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Aerial View of Structure



No.	Item No.	Inspection Item	Rating	Deficiency
1	DS56	Shoaling/Scour	C-2	Up to 10" of sediment depth in the barrel.
2	DS109	Piers	C-2	Minor concrete scaling on piers.
3	DS115	Culverts	C-2	Barrel construction joints have minor leaks at the joints at 93' and 96' from DS end
4	DS1000	Topside: Piers	C-2	Unfilled block-outs with vegetation on tops of piers.
5	US109	Piers	C-2	Minor concrete scaling on piers.
6	US1000	Topside: Piers	C-2	Unfilled block-outs with vegetation on tops of piers.
7	US1001	Topside: Walkway	C-2	Coating loss and minor corrosion.
8	US1002	Topside: Railing	C-2	Coating loss on railing
9	US1003	Topside: Gates	C-2	Minor corrosion on anchors for gate frame braces.

Structure Description and Method of Underwater Inspection

Structure C-2-A is a gated culvert comprised of one barrel, extending west (gated end) to east. The barrel is a corrugated aluminum pipe (CAP), 54 inches diameter by 97 feet long. The west end has an access pier comprised of a concrete pier and a galvanized and coated superstructure. There is a manual lift gate at the upstream end.

The underwater inspection was performed by a 5-person dive team on January 18, 2022. The dive team worked from a dive trailer, using surface-supplied air, and accessed the structure areas from the bank.

The scope of services included the underwater inspection of the submerged structure components and topside elements.

The air temperature was 60 degrees F. and the weather was mostly clear. The underwater visibility ranged from 0.5 to 2 feet.

Rating System

- C-1: No action needed
- C-2: Monitor condition at next dive inspection (5 years)
- C-3: Schedule repair/replacement (for routine items)
- C-4: Schedule repair/replacement (for safety or operational items)
- C-5: Repair/replace immediately (for structural items)
- C-6: Critical - Repair/replace immediately (for operational items)

Summary of Observations

Items Rated C-5 and Above

There were no items rated C-5 and above.

Items Rated C-4

There were no items rated C-4.

Items Rated C-3

There were no items rated C-3.

Items Rated C-2

- Item DS56: The culvert barrel has up to 10" of sediment throughout the length.
 - Recommended Action: Monitor the sediment build up.
- Item DS109: The piers have minor scaling of 1/16" to 1/8" and exposed aggregate from just above the waterline to the channel bottom.
 - Recommended Action: Monitor the concrete for advanced scaling and aggregate loss.

- Item DS115: The culvert has a minor leak at the construction joint at 93' in from the downstream end. The leak is at the 11:00 to 12:00 position and extends over a 3" length. (2) The culvert has a minor leak at the joint between the barrel and the ring at the gate. The leak is at the 1:00 position and extends over a 2" length.

Repair

○ Recommended Action: Monitor the leaks at 93' and near the gate for higher flows.

- Item DS1000: The piers have two block-outs in the top that are partially filled, but have vegetation growing in them.
 - Recommended Action: Monitor the tops of the piers for cracking. Apply herbicide as necessary to keep vegetation down.
- Item US109: The piers have minor scaling of 1/16" to 1/8" and exposed aggregate from just above the waterline to the channel bottom.
 - Recommended Action: Monitor the concrete for advanced scaling and aggregate loss.
- Item US1000: The piers have two block-outs in the top that are partially filled, but have vegetation growing in them.
 - Recommended Action: Monitor the tops of the piers for cracking. Apply herbicide as necessary to keep vegetation down.
- Item US1001: The walkway angle supports into the ground and to the piers have loss of coating and surface corrosion over 100% of the members. The grating has loss of coating with no corrosion over 100% of its area.
 - Recommended Action: Monitor the grating and supports for advanced corrosion and section loss. Consider applying new protective coating.
- Item US1002: The railings have loss of coating with no corrosion over 30% of the area.
 - Recommended Action: Monitor the railing for advanced corrosion and section loss. Consider applying new protective coating.
- Item US1003: The anchors for the horizontal braces for the gate guides have loss of coating and minor corrosion with minimal section loss.
 - Recommended Action: Monitor the gate guide brace anchor bolts for advanced corrosion and section loss.

PHOTOGRAPHS

No C-3 rated deficiencies

APPENDIX

CHECKLISTS

UNDERWATER FIELD RECORD

Structure Name/No.: C-2-A

Structure Location: MFW Lake Apopka
Latitude: N 28.6757
Longitude: W 81.6910

Structure Type/No. Barrels: Gated Culvert/ One Barrel
Culvert Material: CAP

Inspection Details	Day 1	Day 2	Day 3
Date (MM/DD/YYYY)	1/18/2022		
On Site Time (24 Hr)	9:00		
Left Site Time (24 Hr)	12:00		
U/S Elevation [NGVD29]	NA		
D/S Elevation [NGVD29]	NA		
Distance U/S inspected (ft)	NA		
Distance D/S inspected (ft)	NA		
Debris removed	None		
Maintenance Performed	None		

Project Team Members

Lead Engineer	Jeffrey O'Connor, P.E.
Senior Engineer	
Admin / Technician	
Dive Supervisor	Patrick Savadge
Dive Tender	Miguel King
Diver	Aaron Willard
Backup Diver	Charles Peach
Backup Diver	
Animal Control	TJ McDonough
SJRWMD Agent on site	Willie Hughley

Overall Structure Rating: C-2 _____

Underwater Deficiencies
Summary

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Underwater Recommendations
Summary

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Rating Scale
for Individual Components

- C-1: No action needed
- C-2: Monitor Condition at next dive inspection (5 years)
- C-3: Schedule repair/replacement (for routine items)
- C-4: Schedule repair/replacement (for safety or operational items)
- C-5: Repair/replace immediately (for structural items)
- C-6: Critical - Repair/replace immediately (for operational items)

Structure Name/No.: C-2-A

UPSTREAM EROSION CONTROL

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
US1	Slope/Banks of Channel	1	No deficiencies noted		
US2	Rip Rap	NA	None present		
US3	Exposed erosion-Control Fabric	NA	None present		
US4	Evidence of stone displacement (bedding stone)	NA	None present		
US5	Channel Stabilization and erosion control	1	No deficiencies noted		

UPSTREAM GENERAL

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
US50	Structural - General Concrete Condition	2	Minor concrete scaling on piers - refer to US109		
US51	Structural - General Metal Condition	2	Coating loss and minor corrosion. Refer to US1001, US1002, US1003, US1004		
US52	Structural - General Timber Condition	NA	Item not present		
US53	Construction Joints (Bolts, Welds)	NA	Item not present		
US54	Channels for Stoplogs or Flashboards	NA	Item not present		
US55	Settlement	NA	Item not present		
US56	Shoaling/Scour	NA	Item not present		
US57	Fouling/Marine Growth	1	No deficiencies noted		
US58	Debris	NA	Item not present		
US59	Stilling Wells	NA	Item not present		
US60	Underwater Controls/Instruments	NA	Item not present		
US61	Fenders	NA	Item not present		

UPSTREAM STRUCTURE

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
US100	Wingwalls	NA	Item not present		
US101	Buttresses (support arms for wall)	NA	Item not present		
US102	Abutments	NA	Item not present		
US103	Retention Walls	NA	Item not present		
US104	Headwall	NA	Item not present		
US105	Expansion/Construction Joints	NA	Item not present		
US106	Sheetpiles and Bulkheads	NA	Item not present		
US107	Wales/Tiebacks	NA	Item not present		
US108	Intake Bays	NA	Item not present		
US109	Piers	2	The piers have minor scaling of 1/16" to 1/8" and exposed aggregate from just above the waterline to the channel bottom.	Monitor the concrete for advanced scaling and aggregate loss.	The concrete scaling is caused by chemical attack from the water.
US110	Foundation	NA	Item not present		
US111	Weir/Weir crest	NA	Item not present		
US112	Baffles	NA	Item not present		
US113	Underwater Apron Slabs	NA	Item not present		
US114	Structural Support, Bracing or Frames	NA	Item not present		
US115	Culverts	NA	The upstream exterior of the culvert was not exposed.		
US116	Risers	NA	Item not present		

UPSTREAM GATES

Structure Name/No.: C-2-A

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
US151	Structure Gate(s)	1	No deficiencies noted		
US152	Gate Guides and Gate Control	1	No deficiencies noted		
US153	Gate Seals & Mating Surface	1	No deficiencies noted		
US154	Cathodic Protection (entire structure)	NA	Item not present		
US155	Operator/Actuator Components	1	No deficiencies noted		
US156	Emergency Closure Gates	NA	Item not present		
US306	Navigation Lock Miter Gates	NA	Item not present		

UPSTREAM TOPSIDE

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
US1000	Topside: Piers	2	The piers have two block-outs in the top that are partially filled, but have vegetation growing in them.	Monitor the tops of the piers for cracking. Apply herbicide as necessary to keep vegetation down.	The block-outs are from construction. It is not known why the voids were not completely filled with grout.
US1001	Topside: Walkway	2	The walkway angle supports into the ground and to the piers have loss of coating and surface corrosion over 100% of the members. The grating has loss of coating with no corrosion over 100% of its area.	Monitor the grating and supports for advanced corrosion and section loss. Consider applying new protective coating.	Protective coating may be near the end of its service life.
US1002	Topside: Railing	2	The railings have loss of coating with no corrosion over 30% of the area.	Monitor the railing for advanced corrosion and section loss. Consider applying new protective coating.	Protective coating may be near the end of its service life.
US1003	Topside: Gates	2	The anchors for the horizontal braces for the gate guides have loss of coating and minor corrosion with minimal section loss.	Monitor the gate guide brace anchor bolts for advanced corrosion and section loss.	The corrosion is galvanic corrosion due to contact of the mild steel anchor bolts and the aluminum brackets.
US1004	Topside: Additional Items and Comments	NA	Item not present		

Structure Name/No.: C-2-A

DOWNSTREAM EROSION CONTROL

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
DS1	Slope/Banks of Channel	1	No deficiencies noted		
DS2	Rip Rap	NA	Item not present		
DS3	Exposed erosion-Control Fabric	NA	Item not present		
DS4	Evidence of stone displacement (bedding stone)	NA	Item not present		
DS5	Channel Stabilization and erosion control	1	No deficiencies noted		

DOWNSTREAM GENERAL

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
DS50	Structural - General Concrete Condition	2	Minor scaling. Refer to DS109		
DS51	Structural - General Metal Condition	NA	Item not present		
DS52	Structural - General Timber Condition	NA	Item not present		
DS53	Construction Joints (Bolts, Welds)	NA	Item not present		
DS54	Channels for Stoplogs or Flashboards	NA	Item not present		
DS55	Settlement	NA	Item not present		
DS56	Shoaling/Scour	2	The culvert barrel has up to 10" of sediment throughout the length.	Monitor the sediment build up.	Sediment deposit is normal coming through the gate and settling with water velocities not high enough to flush out the material.
DS57	Fouling/Marine Growth	1	No deficiencies noted		
DS58	Debris	NA	Item not present		
DS59	Stilling Wells	NA	Item not present		
DS60	Underwater Controls/Instruments	NA	Item not present		
DS61	Fenders	NA	Item not present		

DOWNSTREAM STRUCTURE

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
DS100	Wingwalls	NA	Item not present		
DS101	Buttresses (support arms for wall)	NA	Item not present		
DS102	Abutments	NA	Item not present		
DS103	Retention Walls	NA	Item not present		
DS104	Headwall	NA	Item not present		
DS105	Expansion/Construction Joints	NA	Item not present		
DS106	Sheetpiles and Bulkheads	NA	Item not present		
DS107	Wales/Tiebacks	NA	Item not present		
DS108	Intake Bays	NA	Item not present		
DS109	Piers	2	The piers have minor scaling of 1/16" to 1/8" and exposed aggregate from just above the waterline to the channel bottom.	Monitor the concrete for advanced scaling and aggregate loss.	The concrete scaling is caused by chemical attack from the water.
DS110	Foundation	NA	Item not present		
DS111	Weir/Weir crest	NA	Item not present		
DS112	Baffles	NA	Item not present		
DS113	Underwater Apron Slabs	NA	Item not present		
DS114	Structural Support, Bracing or Frames	NA	Item not present		

Structure Name/No.: C-2-A

DS115	Culverts	2	(1) C-2: The culvert has a minor leak at the construction joint at 93' in from the downstream end. The leak is at the 11:00 to 12:00 position and extends over a 3" length. (2) C-2: The culvert has a minor leak at the joint between the barrel and the ring at the gate. The leak is at the 1:00 position and extends over a 2" length.	Monitor the leaks at 93' and near the gate for higher flows.	The leak at the construction joint and the leak between the ring and the barrel were most likely from construction.
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DOWNSTREAM GATES

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
DS151	Structure Gate(s)	1	No deficiencies noted		
DS152	Gate Guides and Gate Control	NA	Item not present		
DS153	Gate Seals & Mating Surface	1	No deficiencies noted		
DS154	Cathodic Protection (entire structure)	NA	Item not present		
DS155	Operator/Actuator Components	NA	Item not present		
DS156	Emergency Closure Gates	NA	Item not present		
DS157	Navigation Lock Miter Gates	NA	Item not present		

DOWNSTREAM TOPSIDE

Finding #	Inspection Item	Rating	Comments	Recommended action	Probable cause
DS1000	Topside: Piers	2	The piers have two block-outs in the top that are partially filled, but have vegetation growing in them.	Monitor the tops of the piers for cracking. Apply herbicide as necessary to keep vegetation down.	The block-outs are from construction. It is not known why the voids were not completely filled with grout.
US1004	Topside: Additional Items and Comments	NA	None		