

# Culvert Condition Study

Winnwood Road Bridge Class Culvert



Prepared For:

**Town of Addison**

May 2020



# **Bridge Class Culvert Condition Study**

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**Winnwood Road Bridge Class Culvert**

**Town of Addison**

**Addison, Texas**

Prepared by:



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Suite 190  
Frisco, Texas 75034**

**May 28, 2020**

**Garver Project No.: 16087002**



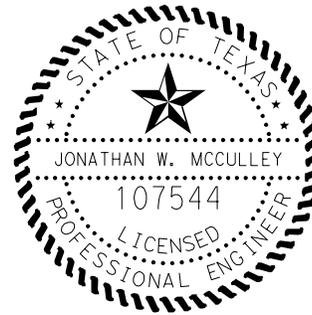
### Engineer's Certification

I hereby certify that this condition survey and improvement study for the Winnwood Road Culvert was prepared by Garver under my direct supervision for the Town of Addison.

5/28/20

Jonathan McCulley, PE  
State of Texas PE License 107544

Garver  
Texas Registration No. F-5713





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## 1.0 Introduction

### 1.1 General

This report has been prepared at the Town of Addison's request for assessing the condition of a bridge class culvert under Winnwood Road at Winnwood Park and determining if the town's programmed replacement is necessary. The subject bridge class culvert is located in east Addison at the intersection of Belt Line Road, and Winnwood Road. The bridge class culvert carries a tributary of White Rock Creek starting at a retention pond at Winnwood Park. See Figure 1 and Figure 2 for a vicinity and location map, respectively.

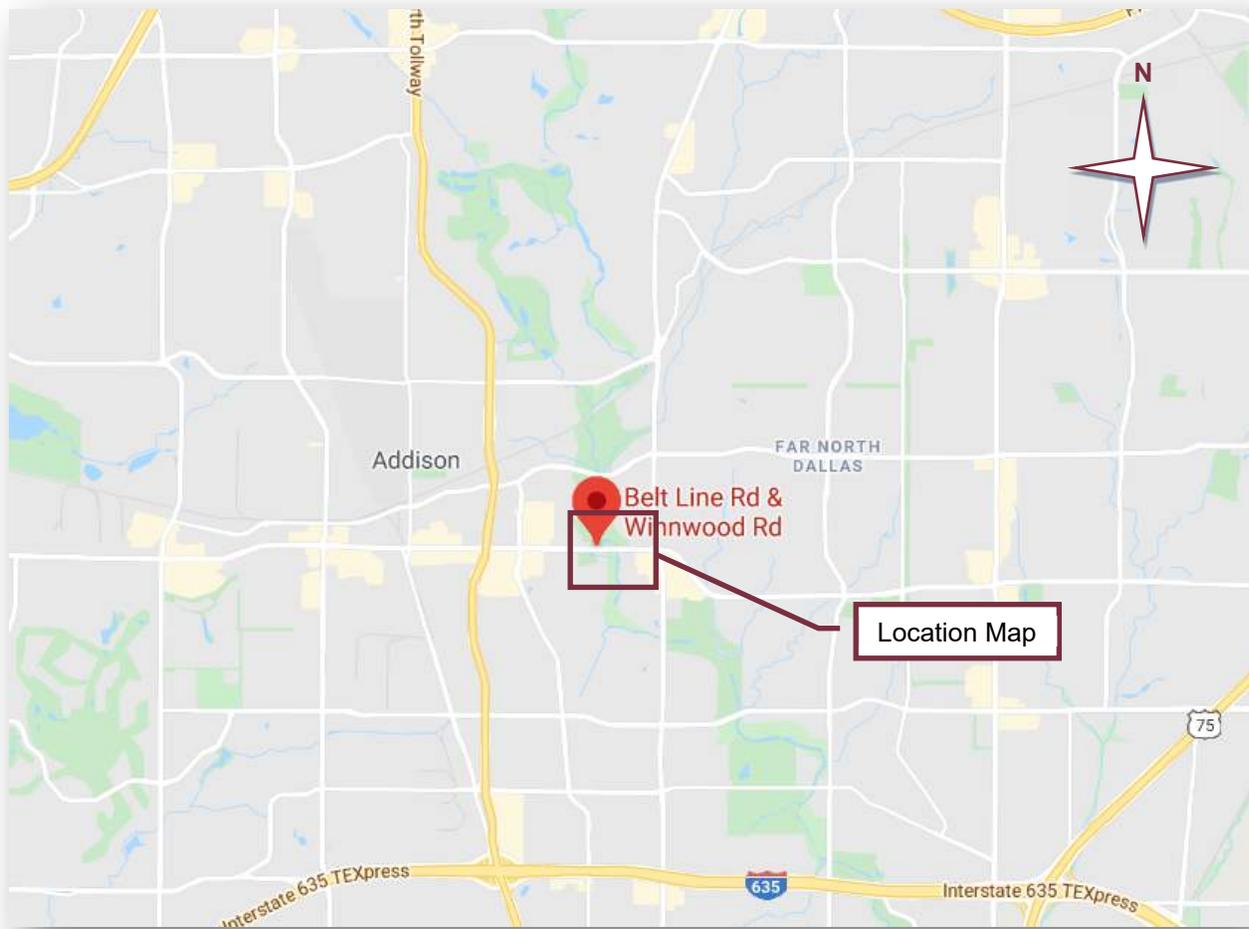


Figure 1: Vicinity Map





Figure 2: Location Map



## 1.2 Culvert Information

Presented below is a brief summary of the information available for this bridge class culvert based on the latest TxDOT bridge inspection report prepared in 2017.

Location:	Winnwood Road at White Rock Creek Tributary
NBI Number:	18-057-0-P001-50-001
Year Built:	Circa 1988
Culvert Length:	166 feet (measured along centerline)
Culvert Size:	2 – 10'x10' MBC
Clear Roadway Width:	46 feet (2 – 16ft. travel lanes w/ 14ft median)
Sidewalk Width:	5'-6"
Substructure Type:	Bridge Class Culvert w/ Extension Supported on Concrete Columns
Rail Type:	Custom Aesthetic Pedestrian Rail (Does not meet TxDOT standards)
Channel Rating (Item 61):	7
Culverts Rating (Item 62):	7
Approaches Rating (Item 65):	7
Inventory Rating:	HS-20
Operating Rating:	HS-33.4
Load Posting Limit:	None

## 1.3 Roadway Information

Presented below is pertinent information associated with the classification and geometrics of Winnwood Road.

Functional Classification:	Local road (Residential)
Number of Lanes:	Two Lanes
Posted Speed:	20 mph
Average Daily Traffic:	Unknown



## 2.0 Existing Conditions

The information presented in the following sections and supporting discussion is based upon data obtained from TxDOT bridge inspection reports and a site visit made by Garver on 04/22/2020 where a visual “arms reach” observation was performed. Copies of the as-built bridge class culvert plans and the available inspection reports from 2015 and 2017 are provided in Appendices B and C. Select photos from Garver’s site visit may be found in Appendix A.

### 2.1 General Discussion of Existing Conditions

In general, Garver’s assessment of this structure reveals that no major functional or structural deficiencies exist. Only minor deficiencies were found which include minor cracks with efflorescence in the culvert top slab, minimal debris build up, and moderate scour and erosion at the downstream outlet. Hydraulic sufficiency has not been assessed and should be confirmed with appropriate hydraulic modeling at the crossing if desired. No underwater observations were made in Garver’s visual inspection. Garver did not inspect the spillway.

### 2.2 Structure Description

The Winnwood Road Bridge Class Culvert, constructed circa 1988, is a 166’ long (measured along the centerline), 10’x10’ double-barrel, multi-box structure with the interior segment at the spillway supported on columns. The bridge class culvert runs under a 35’-0” wide, two-lane road with a median separating the SB and NB lanes that enter and exit a neighborhood of Addison. The bridge class culvert carries runoff from a retention pond to the west via an integral spillway with the culvert structure. It outfalls to an unlined channel of a tributary of White Rock Creek.

### 2.3 Survey Observations

#### 2.3.1 Deck (Item 58)

##### 2.3.1.1 Railing

The custom aesthetic pedestrian rail appears to be in good condition. It is not a standard TxDOT rail and is not likely crashworthy. A detailed inspection of the brick veneer was not performed, but no major structural deficiencies were observed. The end of the rail at the north approach has no end treatment for protection (See Photo 7 in Appendix A), but it is offset from the roadway 5’-6”. The desirable offset (Per TxDOT Roadway Design Manual) is 6’, but the minimum is 4’ for curbed sections; therefore, the existing condition would satisfy the minimum requirements for an obstruction being located outside the clear zone. There is no protection, however, for errant vehicles that may mount the sidewalk and approach the retention pond slopes.

#### 2.3.2 Channel (Item 61)

##### 2.3.2.1 Scour

The upstream end of the bridge class culvert is a retention pond. The pond slopes at the bridge class culvert are grass lined and show no significant erosion (See Photos 9 and 10 in Appendix A).





The existing channel bed at the downstream end consists of exposed weathered limestone rock overlain with sediment (See Photos 11 and 12 in Appendix A). As detailed in the 2015 and 2017 inspection reports, moderate scour and undermining at the outlet toewall and wingwalls is present (See Photo 13 in Appendix A). Garver's site visit confirmed these conditions. Furthermore, it appears, at some time, there was concrete riprap between the bridge class culvert wingwalls and toewall but has been dislodged at least since the 2015 inspection (See Photo 14 in Appendix A).

Minor debris build-up is present at the upstream spillway (See Photo 15 in Appendix A) and at the downstream outfall (See Photo 16 in Appendix A).

### 2.3.3 Culverts (Item 62)

#### 2.3.3.1 Columns

As detailed in the 2015 and 2017 inspection reports, the interior columns have minor scaling at the bottom. Garver's site visit did not reveal any major structural deficiencies with the columns.

#### 2.3.3.2 Culvert Slabs & Walls

As detailed in the 2015 and 2017 inspection reports, there are minor vertical and horizontal hairline cracks with efflorescence in the culvert walls and slabs which are common in culverts of this age. Garver's site visit confirmed these cracks (See Photos 17 and 18 in Appendix A) and did not reveal any major structural deterioration.

#### 2.3.3.3 Culvert Headwall & Wingwalls

As detailed in the 2015 and 2017 inspection reports, the west headwall has minor impact spalls. The east headwall has a minor vertical crack. Garver's site visit did not reveal any major structural deficiencies with the wingwalls and headwall.

### 2.3.4 Approaches (Item 65)

Concrete pavement approaches exist at the bridge class culvert ends. As detailed in the 2015 and 2017 inspection reports, there is minor cracking and light wearing of the pavement. Garver's site visit confirmed these conditions but did not observe any structural concerns for the integrity of the bridge class culvert itself. The sidewalk at the south approach has a gap of about 2 inches from the back of curb (see Photo 8 in Appendix A). This gap closes as the sidewalk continues north. It does not appear that the embankment walls and pedestrian rail adjacent to the sidewalk are moving to cause this separation; rather it appears the sidewalk was not constructed to its full width at this location. No structural concerns exist with the sidewalk separation; however, it may provide a tripping hazard for pedestrians.

### 2.3.5 Asbestos and Lead Paint

No asbestos or lead paint testing was performed for this Condition Study.





### 2.3.6 Utilities

Electrical conduit for lighting runs through the pedestrian rail to light poles mounted to the top of the rail. Other utilities running under the culvert include: two 8-inch sanitary sewer lines, one 12-inch waterline, and one 54-inch waterline.

## 2.4 Load Rating

Below are the condition ratings reported in the 2017 routine bridge inspection report.

- Channel Rating (Item 61): 7
- Culverts Rating (Item 62): 7
- Approaches (Item 65): 7

Our inspection findings indicate that none of the principal structural elements have a condition rating below a value of "5". This indicates that the bridge elements, in their current state, continue to maintain structural capacity equivalent to the original design. Therefore, new load rating calculations for this structure are not required. The assumed load ratings provided in the 2015 and 2017 inspection reports were most likely made without access to the Record Drawings. The corrected Inventory and Operating Ratings shown below are based on the Record Drawing design.

- Inventory Rating: HS-20 (Assigned per Record Drawings)
- Operating Rating: HS-33.4 (Assigned per Record Drawings)





### 3.0 Recommended Repairs, Maintenance & Improvements

Based on the 2015 and 2017 inspection reports and Garver's site visit, the structure condition is best described as "good".

Only minor (non-critical/urgent) deficiencies were found during the site inspection. These include hairline cracks in various elements, moderate scour with dislodged concrete riprap, and minor debris.

End treatment of the north end of the pedestrian rail is not required; however, safety improvements for slope protection are provided in this study for the Town's consideration.

#### 3.1 Follow-up Action

##### 3.1.1 Repair: Concrete Cracking

No repairs are necessary or recommended at this time for the minor cracks observed. Routine inspection will continue to monitor the concrete elements and elevate the need for repairs should advanced distress be observed.

##### 3.1.2 Repair: Scour & Undermining

Garver recommends removing the dislodged concrete riprap at the downstream end of the bridge class culvert. New riprap in the form of concrete apron, stone protection, or a combination of the two should be constructed with a key into the existing channel to protect against further scour and undermining of the wingwalls and toewall. A hydraulic analysis should be performed to determine the outfall velocities so that the riprap can be sized appropriately. The progression of the scour since 2015 and 2017, based on photos in the inspection reports, has not worsened appreciably, and repair is not urgent. However, the condition of the channel banks and erosion should be monitored with routine inspections to determine if immediate action is needed.

##### 3.1.3 Maintenance: Minor Debris Removal

The debris at the upstream spillway and at the downstream wingwalls should be cleared to provide a clear path for hydraulic flow.

##### 3.1.4 Improvement: Provide Slope Protection at North End of Pedestrian Rail

The end of the pedestrian rail at the intersection of Winnwood Road and Belt Line has no end treatment and retention pond slopes are not protected with any means to keep errant vehicles from exiting the roadway and continuing down the slopes to the retention pond. The slopes are outside of the minimum clear zone for a curbed section, however Garver recommends extending the pedestrian rail on its own independent foundation (spread footing or grade beam) and wrapping around to the west along the sidewalk adjacent to Belt Line. This recommendation is not necessary or urgent but would provide additional safety for the traveling public.



# APPENDIX A

## Site Visit Photos





Photo 1: Upstream Looking West



Photo 2: Upstream Looking Northeast



Photo 3: Downstream Looking West



Photo 4: Downstream Looking East





Photo 5: Roadway Looking North



Photo 6: Roadway Looking South

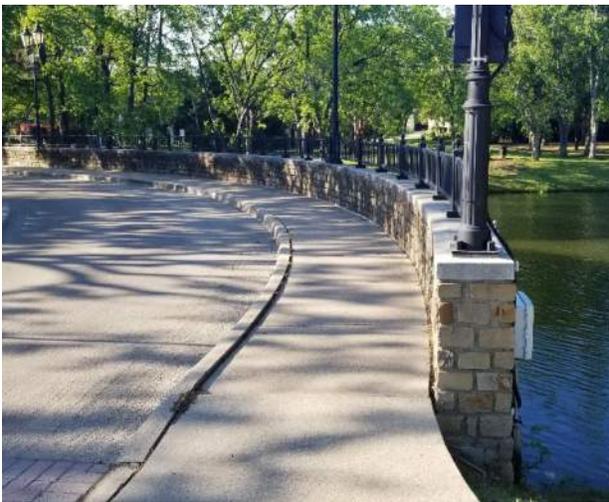


Photo 7: Rail End

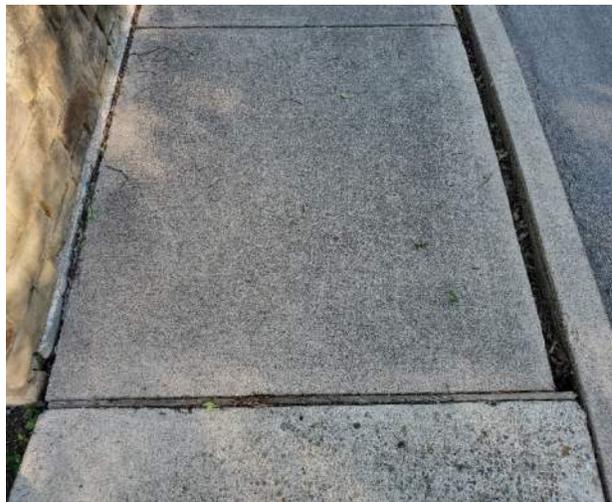


Photo 8: Sidewalk Joint



Photo 9: Upstream Channel Banks (North)



Photo 10: Upstream Channel Banks (South)



Photo 11: Downstream Channel Banks (North)



Photo 12: Downstream Channel Banks (South)



**Photo 13: Scour and Undermining**



**Photo 14: Dislodged Riprap**



**Photo 15: Spillway Debris**



**Photo 16: Downstream Debris**



Photo 17: Vertical Crack in Wall With Efflorescence Build-Up



Photo 18: Transverse Crack in Top Slab with Efflorescence



Photo 19: Wingwall and Headwall



Photo 20: Culvert Columns at Spillway



BRIDGE ROADWAY LOOKING NORTH



BRIDGE ELEVATION LOOKING NORTHWEST

Feature Carried: WINNWOOD RD

Feature Crossed: WHITE ROCK CREEK TRIB

District No.	County No.	Control-Section	Structure No.	Date
18	057	P001-50	001	07/14/2015

AIA Engineers, LTD. Houston, Texas

Dallas District



UPSTREAM VIEW FROM BRIDGE LOOKING WEST



DOWNSTREAM VIEW FROM BRIDGE LOOKING EAST

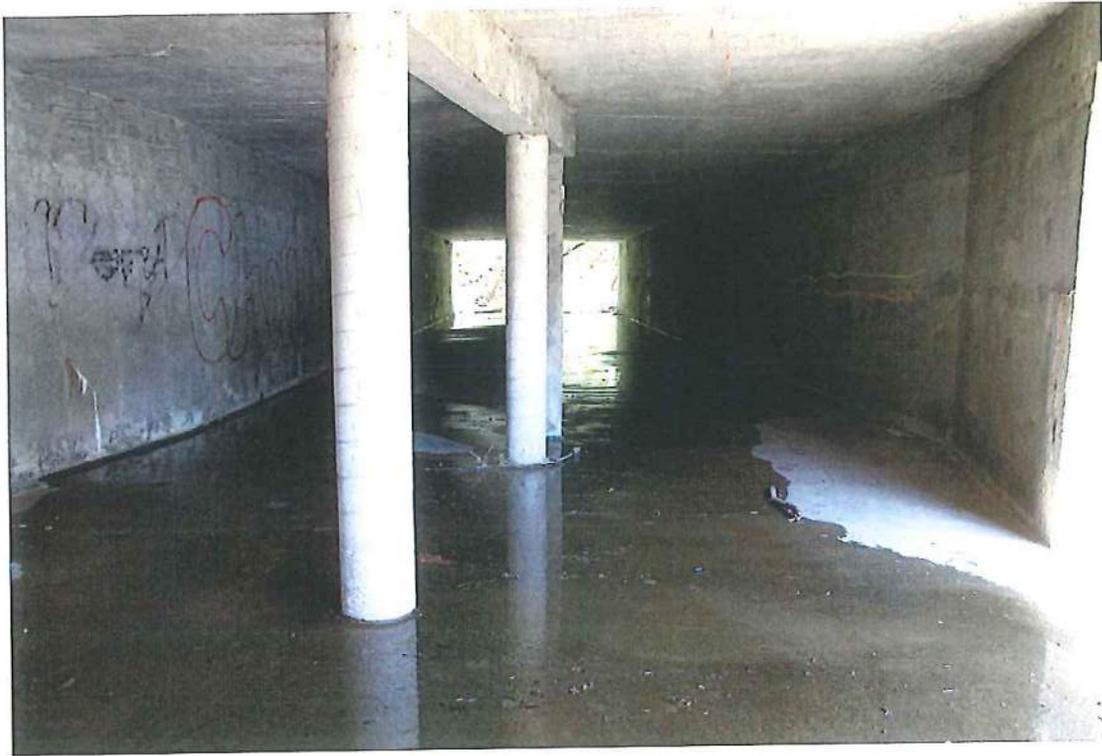
Feature Carried: WINNWOOD RD

Feature Crossed: WHITE ROCK CREEK TRIB

District No.	County No.	Control-Section	Structure No.	Date
18	057	P001-50	001	07/14/2015

AIA Engineers, LTD. Houston, Texas

Dallas District



STREAM VIEW LOOKING EAST

Feature Carried: WINNWOOD RD

Feature Crossed: WHITE ROCK CREEK TRIB

District No.	County No.	Control-Section	Structure No.	Date
18	057	P001-50	001	07/14/2015

AIA Engineers, LTD. Houston, Texas

Dallas District



ROADWAY VIEW

Looking North



SIDE VIEW

Looking West

Dallas County

Bridge No.: P001-50-001

Date: May 23, 2017

**LMB Engineering, Inc. (F-3456)**



STREAM  
UNDER BRIDGE

Looking West

Dallas County

Bridge No.: P001-50-001

Date: May 23, 2017

***LMB Engineering, Inc. (F-3456)***



UPSTREAM  
CHANNEL

Looking West



DOWNSTREAM  
CHANNEL

Looking East

Dallas County

Bridge No.: P001-50-001

Date: May 23, 2017

**LMB Engineering, Inc. (F-3456)**

