Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TECHNICAL MEMORANDUM

PLANNING

ENGINEERING

PROGRAM MANAGEMENT

Est. 1935

DATE: 10-19-11

SUBJECT: **Bunker Hill Road Crossing on W140-01-00**

This memo summarizes the geometry and hydraulics of the original and current Bunker Hill Bridges over W140-01-00 (Briar Branch Creek). Items discussed include the original geometry of the Bunker Hill Bridge, current geometry of the Bunker Hill Bridge, hydraulics of the bridges, and a summary.

Analysis Summary

TCB Inc. analyzed the bridge hydraulics in the *Bunker Hill Road Drainage Design and Hydrologic and Hydraulic Impact Analysis Report* in May 2007. This project utilized and built upon the FEMA Effective model. The TCB Inc. study demonstrated no impact to the 100-year and 10-year water surface elevations and to the adjacent community. This impact analysis report was reviewed and approved by the appropriate regulatory agencies.

The following table summarizes the hydraulic data for the original and current crossings.

	Original Structure	Current Structure	Delta Current-Original
100-YR Flow at Upstream Bridge in RAS Model	515	515	0
100-YR WSEL Upstream (US)	79.02	78.54	-0.48
Top of Bridge/Headwall Elevation	79.82	79.25	-0.57
Bottom of Structure (Flowline)	69.44	66.11	-3.33
Structure Depth from Bridge Deck (ft)	8.8	12.5	3.7
Open Area (SF) Below Bridge	112.0	84.0*	-28.0
Manning's n Roughness	0.040	0.015	-0.025

Table 1: Comparison of Bridge Hydraulic Data

*Note: Open area = 84 square feet (12" steel pipe encasement runs through the culvert reducing the surface area from 94 square feet).

2925 BRIARPARK DRIVE
SUITE 400
HOUSTON, TX 77042
PH: 713.266.6900
FAX: 713.266.7596

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TECHNICAL MEMORANDUM

PLANNING

ENGINEERING

PROGRAM MANAGEMENT

Est. 1935

The 2007 TCB Inc. impact analysis was based on the following geometric hydraulic conditions for the original and current structures:

Original Bunker Hill Road Bridge

- Timber construction
- Earthen channel with broken concrete
- Open area = 112 square feet*
- Roughness coefficient (Manning's n value) = 0.04

*See **Attachment 1** for original surveyors drawing of bridge.

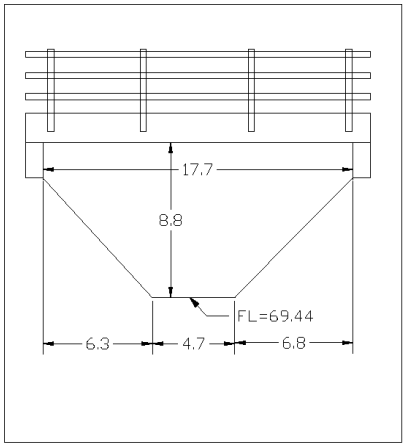

Exhibit 1: Original Bunker Hill Road Bridge Dimensions

Current Bunker Hill Road Bridge

- (2)-7'x7' concrete box culverts
- Efficient entrance and exit headwall
- Open area = 84 square feet (12" steel pipe encasement runs through the culvert reducing the surface area from 94 square feet)
- Roughness coefficient (Manning's n value) = 0.015

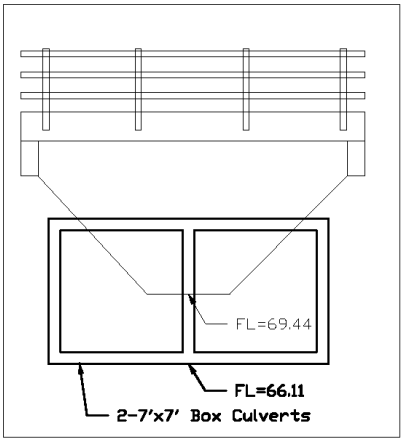

Exhibit 2: Original and Current Bunker Hill Road Bridge Overlay

Summary

1. The current structure is reduced in size relative to the original structure, but is significantly more efficient. The increased efficiency is achieved through the smooth concrete finish and the lower opening depth of the current structure.

2. The current structure was modeled as part of the impact analysis for the Bunker Hill Roadway improvements and was determined to have no impact. This impact analysis report was reviewed and approved by the appropriate regulatory agencies.

2925 BRIARPARK DRIVE
SUITE 400
HOUSTON, TX 77042
PH: 713.266.6900
FAX: 713.266.7596

Attachment 1

Surveyor Field Book Sketch of original Bunker Hill Road Crossing over W140-01-00