

**DRAFT
MEMORANDUM**



Company: Cameron Estates Community Services District

Attention: Joy Reggiardo, General Manager/Secretary

From: Anthony C. Powers, P.E.

Subject: 3066 Flying C Road Culvert Structural Evaluation

Date: July 24, 2023

Introduction

On May 24, 2023, after reviewing information prepared by Youngdahl from their investigation, Anthony (Tony) Powers and Michael Hendry from Dokken Engineering (Dokken) met on site with Joy Reggiardo, Lynn Kissel and Peter Reese, representing the Cameron Estates Community Services District. Dokken performed a hands-on inspection of accessible portions of the Flying C Road culvert at Deer Creek between Brookside Road and Cameron Road (Note: Flying C Road also crosses Deer Creek just north of Strolling Hills Road), but unexpectedly high water (up to 4 feet deep) prevented access beneath the structure. Dokken returned on May 30, 2023, (along with Joy Reggiardo and Lynn Kissel) to complete the inspection using waders and a ladder to access the abutment walls and soffit. Dokken used a geologist's hammer to sound all accessible areas of concrete.

There are no as-built drawings available for this culvert. The attached exhibit provides details of the structure measured in the field. The structure comprises an open-bottom, reinforced concrete culvert with a clear span (measured between abutment walls) of approximately 19'-4" and a width between parapet walls of approximately 28'-0". It appears to be founded on spread footings and has symmetrical flared wingwalls at all four corners, also apparently on spread footings. The tops of wingwalls slope gently away from the culvert. The gently curved roadway surface, which runs roughly east and west across the culvert, is asphalt concrete on aggregate base. There is an 8-inch-diameter water line supported from the north parapet wall.

Condition Assessment

Observations

- There is spalled concrete at several of the railing post locations where the posts were broken out of the culvert by flood debris.
- There is spalled concrete along the bottom corner of soffit at several location on both the north and south sides of the culvert. These appear to be corrosion-related and are surrounded by areas of unsound concrete.
- There are several longitudinal soffit cracks concentrated near each edge of the culvert slab, but also a number closer to the center. Several of these also exhibit substantial areas of unsound concrete along their lengths and extending up to 5 feet from the edge of soffit.
- There is an area approximately 4 feet square centered about 7 feet from the west abutment wall and 12 feet from the south edge of culvert that exhibited an unusually deep noise indicating some level of delamination, but not typical of surface spalling. Dokken was unable to identify the

source of this phenomenon. It may be related to a horizontal plane of delamination closer to mid-depth of the 1'-10" deep slab. Taking cores through the deck would be the most effective way to determine the cause.

- Sounding, along with the rebound hammer tests performed by Youngdahl, indicate generally good-quality concrete of strength likely well above the original design compressive strength (assumed to be $f'_c = 3,250$ psi, the standard for bridges when this culvert was likely constructed).
- The decorative metal pedestrian railing on the north side of the culvert (excepting the portion on the northwest wingwall) was heavily damaged by debris during the New Year's flooding. The railing on the northeast wingwall and the easterly half of the north side railing have been removed. The railing on the south side of the culvert is in good condition, with light rust and minor paint deterioration.
- Footings are exposed but do not show evidence of undermining.

Load Evaluation

Without as-built drawings detailing the reinforcement within the concrete slab and abutment walls, Dokken is unable to determine a quantitative load capacity for the existing culvert. However, based on the estimated age of the structure (approximately 50 years) we expect that it was designed for the American Association of State Highway and Transportation Officials (AASHTO) HS 20-44 truck loading. Based on our field observations, we do not believe that the damage to the culvert poses an immediate threat to its capacity, but we recommend the testing and repairs described below to provide greater certainty.

Conceptual Recommendations for Repair

- Within the next year, take 2 to 3 concrete cores through the deck and have visual and strength analysis performed to determine extent of soffit cracking and delamination.
- Remove unsound concrete along the corners of the deck slab to approximately $\frac{3}{4}$ " beyond the nearest longitudinal bar. Clean reinforcement and treat with corrosion inhibitor. Install drill and bond dowels if spalled areas are greater than 4 inches deep. Patch with material suitable for overhead construction per the Caltrans Authorized Materials List.
- Epoxy-inject soffit cracks.
- If analysis of cores indicates a layer of unsound concrete on the soffit, remove and patch as described above for the deck slab corners.
- Repair spalled areas on parapet and wingwalls created by railing post pullout.
- Replace damaged portion of railing.
- Inspect culvert every two years to monitor crack growth and any new delamination or spalling.

Proposed Next Steps

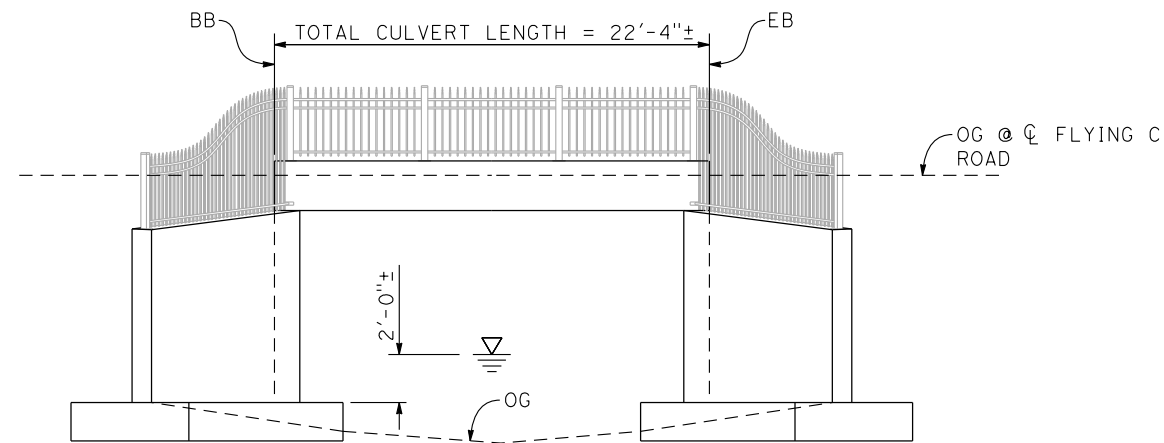
- Extract and test concrete cores from the deck.
- Prepare plans, specifications and estimate for repairs.

Estimated Costs (see attached construction cost estimate)

- Coring and testing - \$10,000
- Preparation of plans, specifications and estimate - \$20,000
- Construction - \$140,000 (\$170,000 if entire railing is replaced with similar decorative railing)

cc: L. Kissel, P. Reese, R. Burns
Attachments

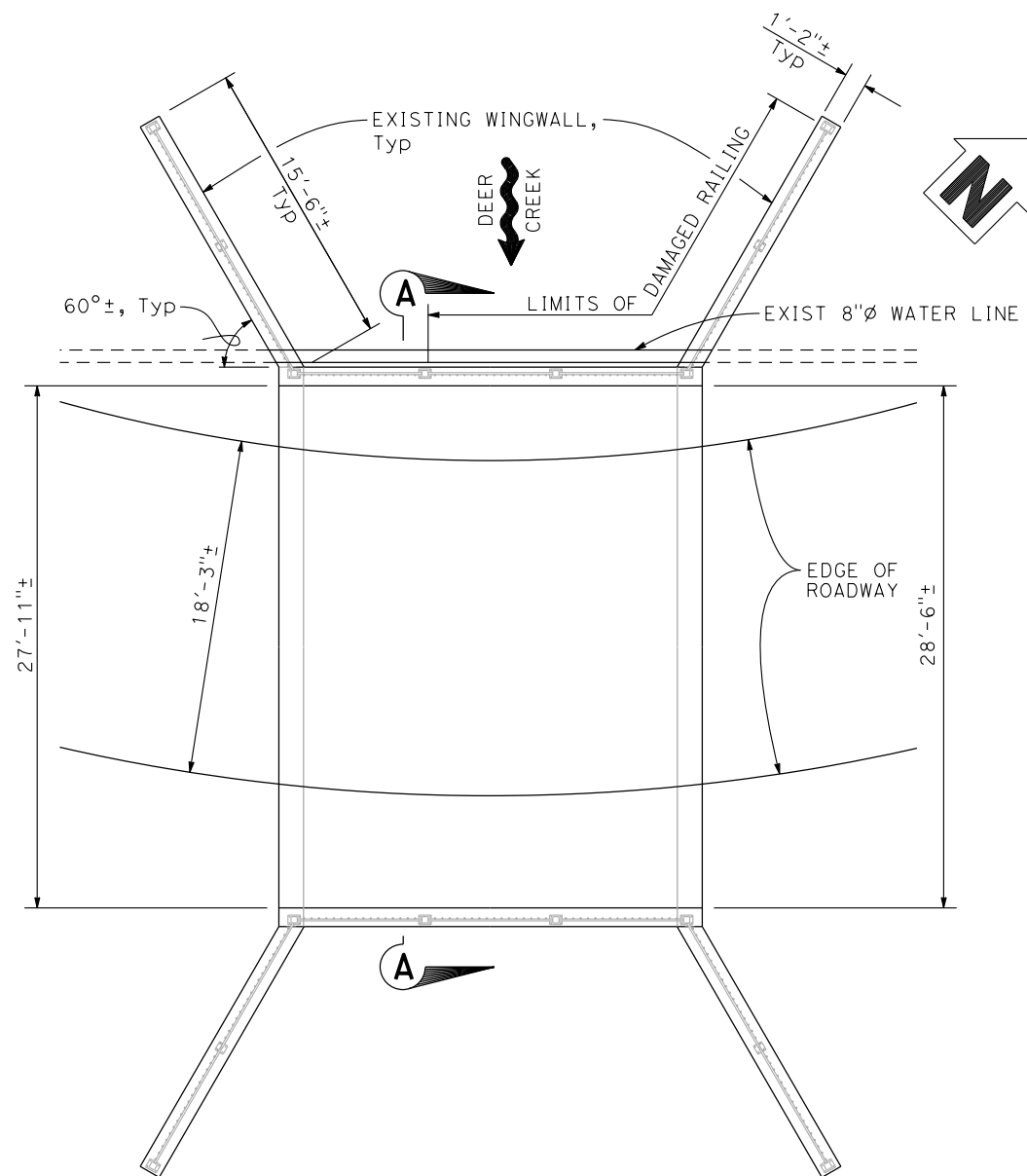
J:\3066_Box_Culvert_Evaluation\300_Correspondence\Memos



ELEVATION

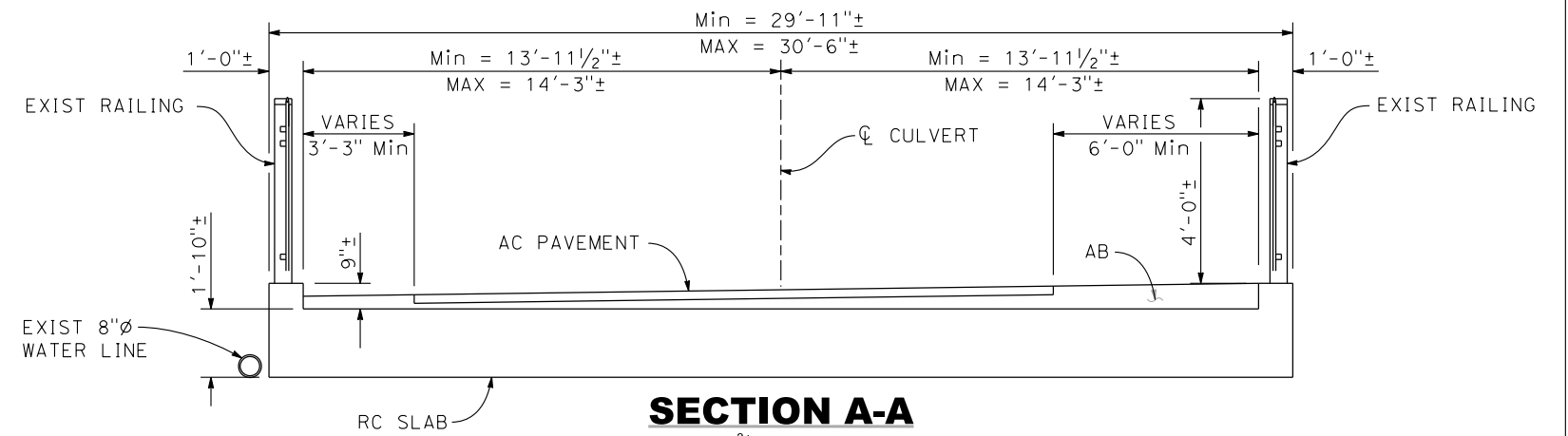
1" = 10'

Approx. WATER SURFACE ELEVATION



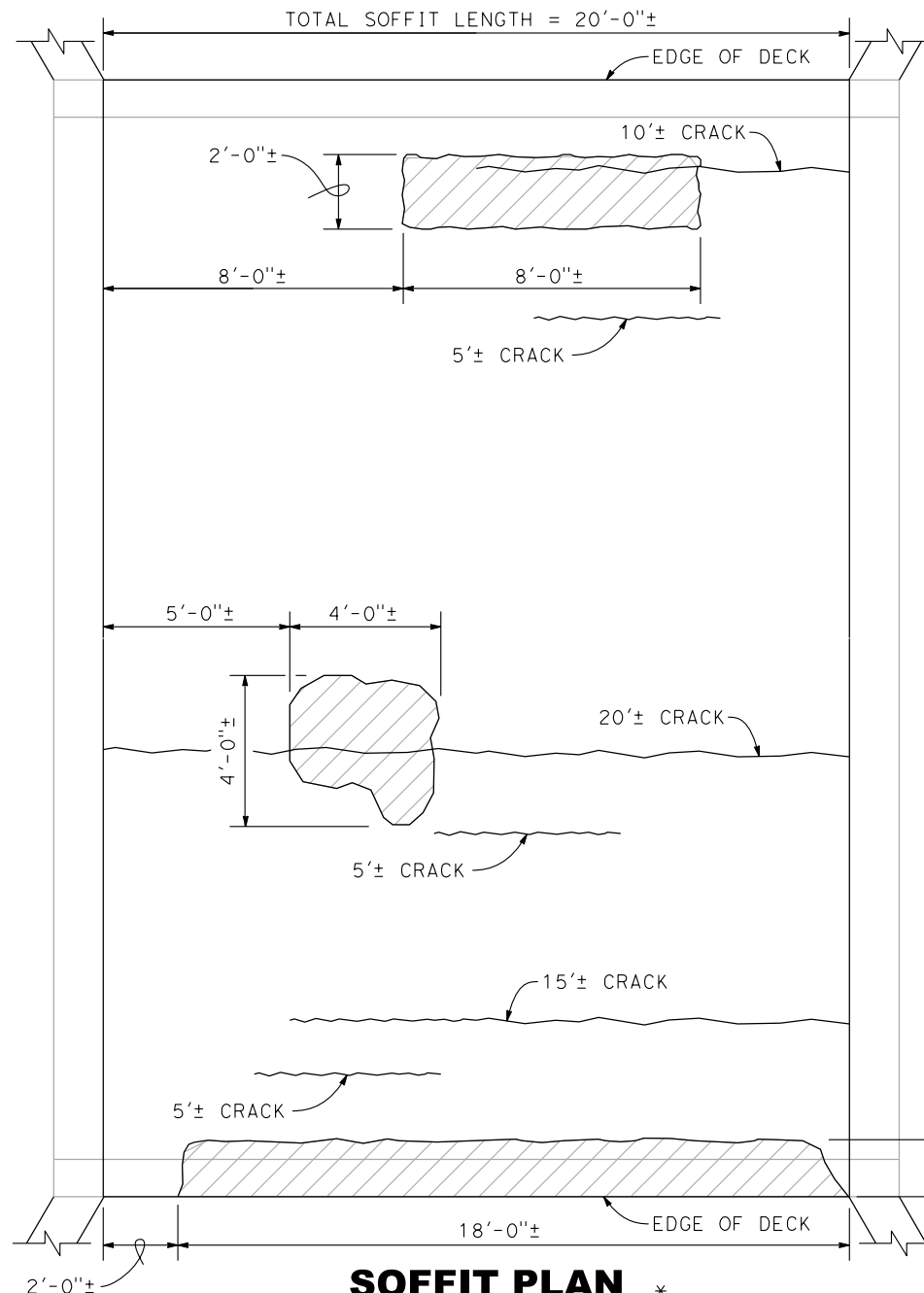
PLAN

1" = 10'



SECTION A-A

3/16" = 1'-0"



SOFFIT PLAN

1" = 5'

*SEE NOTE 1

LEGEND

 SPALLED SURFACE AREA

NOTES

1. SPALLING ASSOCIATED WITH THE RAILING DAMAGE NOT SHOWN. CRACKING ON VERTICAL FACES OF SLAB NOT SHOWN.
2. INFORMATION SHOWN BASED ON INSPECTIONS PERFORMED ON MAY 24th AND MAY 30th, 2023

Project: Flying C Road Culvert Repair**BR. No.:**

N/A

Date: 7/24/2023

Prepared by:	Dokken Engineering
PRICES BY :	A. Powers
PRICES CHECKED BY :	R. Burns
QUANTITIES BY:	M. Hendry

Item No.	CONTRACT ITEMS	UNIT	QUANTITY	UNIT PRICE	AMOUNT
130100	Job Site Management	LS	1	\$5,000.00	\$5,000.00
130201A	Water Pollution Control	LS	1	\$2,500.00	\$2,500.00
480450A	Temporary Work Platform	LS	1	\$15,000.00	\$15,000.00
170103	Clearing and Grubbing	LS	1	\$5,000.00	\$5,000.00
60003	Inject Crack (Epoxy)	LF	60	\$250.00	\$15,000.00
600013	Repair Spalled Surface Area	SQFT	100	\$450.00	\$45,000.00
839791A	Reconstruct Decorative Metal Railing	LF	30	\$300.00	\$9,000.00
999990	Mobilization	LS	1	\$15,000.00	\$15,000.00

SUBTOTAL		\$111,500
CONTINGENCIES	25%	\$27,875
TOTAL COST (ROUNDED)		\$140,000