WJE

I-20 / I-26 / I-126 Corridor Improvement (Carolina Crossroads)

Bridge Deck Evaluations

Asset ID 7272 - Bush River Rd over I-20
Asset ID 7586 - St. Andrews Rd over I-26
Asset ID 7937 - Bush River Rd over I-26



August 14, 2023
WJE No. 2023.1990

PREPARED FOR:
HDR Inc.
4400 Leeds Avenue, Suite 450
North Charleston, SC 29405

PREPARED BY:
Wiss, Janney, Elstner Associates, Inc.
8000 Regency Parkway, Suite 410
Cary, North Carolina 27518
984.345.0630 tel

CONTENTS

INTRODUCTION 3

ASSET 7937 - VISUAL AND SOUNDING SURVEY.....4

ASSET 7937 – COMPRESSIVE STRENGTH TESTING 49

ASSET 7937 – CHLORIDE CONTENT TESTING 51

INTRODUCTION

At your request and in accordance with the agreement between HDR Inc. and Wiss, Janney, Elstner Associates, Inc. (WJE) for the I-20/I-26/I-126 Corridor (Carolina Crossroads) Improvement Project, WJE has prepared this report to document concrete evaluation services for the bridge decks of the three overpassing bridge structures listed below:

Asset ID 7272 – Bush River Rd. over I-20 - Built in 1979 - four spans, total approximate length 280 ft.

Asset ID 7586 – St. Andrews Rd. over I-26 - Built in 1981 - four spans, total approximate length 350 ft.

Asset ID 7937 – Bush River Rd. over I-26 - Built in 1985 - four spans, total approximate length 645 ft.

In general, the bridges consist of cast-in-place concrete decks supported by continuous steel plate girders that are supported by cast-in-place concrete bents.

WJE performed the following services as part of onsite investigation and materials evaluation:

- Visual and Sounding Survey
- Coring and Laboratory Examination of Extracted Concrete Core Samples
  - Compressive Strength
  - Chloride Content Evaluation
  - Petrographic Examination (pending)

ASSET 7937 - VISUAL AND SOUNDING SURVEY

WJE visited the site on July 14 and July 15, 2023 to perform visual observations of the exposed concrete bridge deck. During the visual survey, areas of apparent deck spalling, notable cracking, delaminations, and previous repairs were noted on aerial images of the bridge. Representative conditions observed were documented with field notes and digital photographs.

In addition to the visual survey, WJE performed a sounding survey to locate and identify the approximate size of existing delaminations present at the top surface of the deck. WJE performed a chain drag survey, wherein audible differences in the sound created as chains are dragged across the deck surface indicate delaminations. The extent of delaminations were determined and were squared-off to represent likely patch configurations if a patching approach is pursued. Relevant conditions and anomalies observed by WJE were documented on drawings and with photographs and are shown on the following aerial image figure 7937-1. The approximate quantity of observed spalls, delaminations, and prior repairs are reported in the following figure. Photographs of observed spalls, cracking, and previous repairs are provided in the following photograph log.

PREVIOUS REPAIRS

DELAMINATED CONCRETE

SPALLED CONCRETE

COMBINATION SPALL, REPAIRS AND/OR DELAMINATIONS

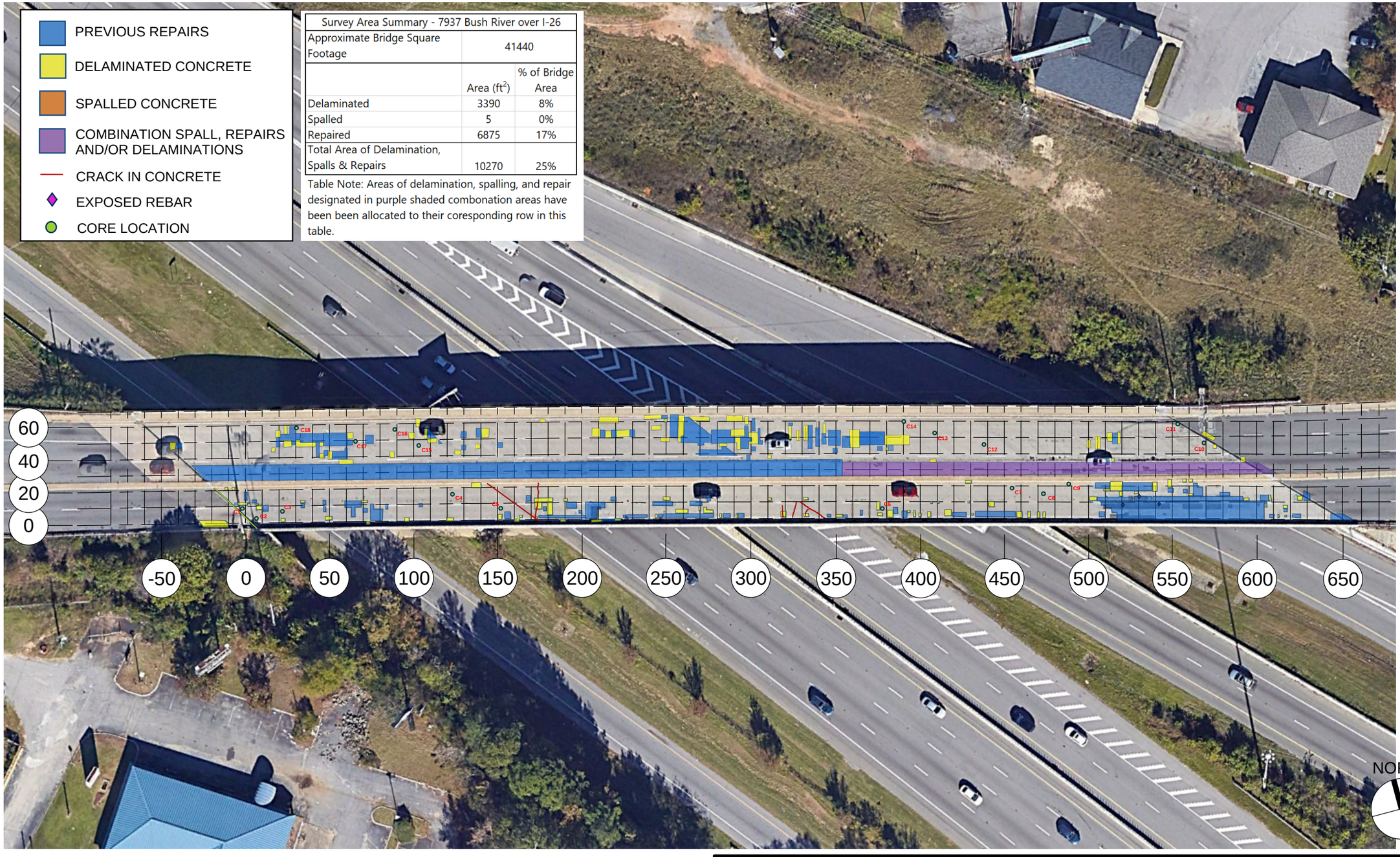
CRACK IN CONCRETE

EXPOSED REBAR

CORE LOCATION

Survey Area Summary - 7937 Bush River over I-26		
Approximate Bridge Square Footage	41440	
	Area (ft^2)	% of Bridge Area
Delaminated	3390	8%
Spalled	5	0%
Repaired	6875	17%
Total Area of Delamination, Spalls & Repairs	10270	25%

Table Note: Areas of delamination, spalling, and repair designated in purple shaded combonation areas have been been allocated to their coresponding row in this table.



LEGEND

GRID LINES

X — X-COORDINATE (FEET)

X — Y-COORDINATE (FEET)

0 1/2" 1"

THIS SHEET PLOTS FULL SIZE AT 11x17 (INCHES)

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

Wiss, Janney, Elstner Associates, Inc.
4000 Regency Parkway, Suite 410
Cary, North Carolina 27518
919.654.3037 tel
www.wje.com

Project: SCDOT - ASSET 7937 DECK SURVEY

Sheet Title: BUSH RIVER RD. OVER I-26

Proj. No. 2023.1990.0

Date 08/10/2023

Drawn JZ

Checked JL

Scale Not to scale

Sheet No. 7937-1

© Copyright 2018. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Wiss, Janney, Elstner Associates, Inc. (WJE). WJE disclaims any responsibility for its unauthorized use.



7937 EB - IMG_0001



7937 EB - IMG_0002



7937 EB - IMG_0003



7937 EB - IMG_0004



7937 EB - IMG_0005



7937 EB - IMG_0006



7937 EB - IMG_0007



7937 EB - IMG_0008



7937 EB - IMG_0009



7937 EB - IMG_0010



7937 EB - IMG_0011



7937 EB - IMG_0012



7937 EB - IMG_0013



7937 EB - IMG_0014



7937 EB - IMG_0015



7937 EB - IMG_0016



7937 EB - IMG_0017



7937 EB - IMG_0018



7937 EB - IMG_0019



7937 EB - IMG_0020



7937 EB - IMG_0021



7937 EB - IMG_0022



7937 EB - IMG_0023



7937 EB - IMG_0024



7937 EB - IMG_0025



7937 EB - IMG_0026



7937 EB - IMG_0027



7937 EB - IMG_0028



7937 EB - IMG_0029



7937 EB - IMG_0030



7937 EB - IMG_0031



7937 EB - IMG_0032



7937 EB - IMG_0033



7937 EB - IMG_0034



7937 EB - IMG_0035



7937 EB - IMG_0036



7937 EB - IMG_0037



7937 EB - IMG_0038



7937 EB - IMG_0039



7937 EB - IMG_0040



7937 EB - IMG_0041



7937 EB - IMG_0042



7937 EB - IMG_0043



7937 EB - IMG_0044



7937 EB - IMG_0045



7937 EB - IMG_0046



7937 WB - IMG_0001



7937 WB - IMG_0002



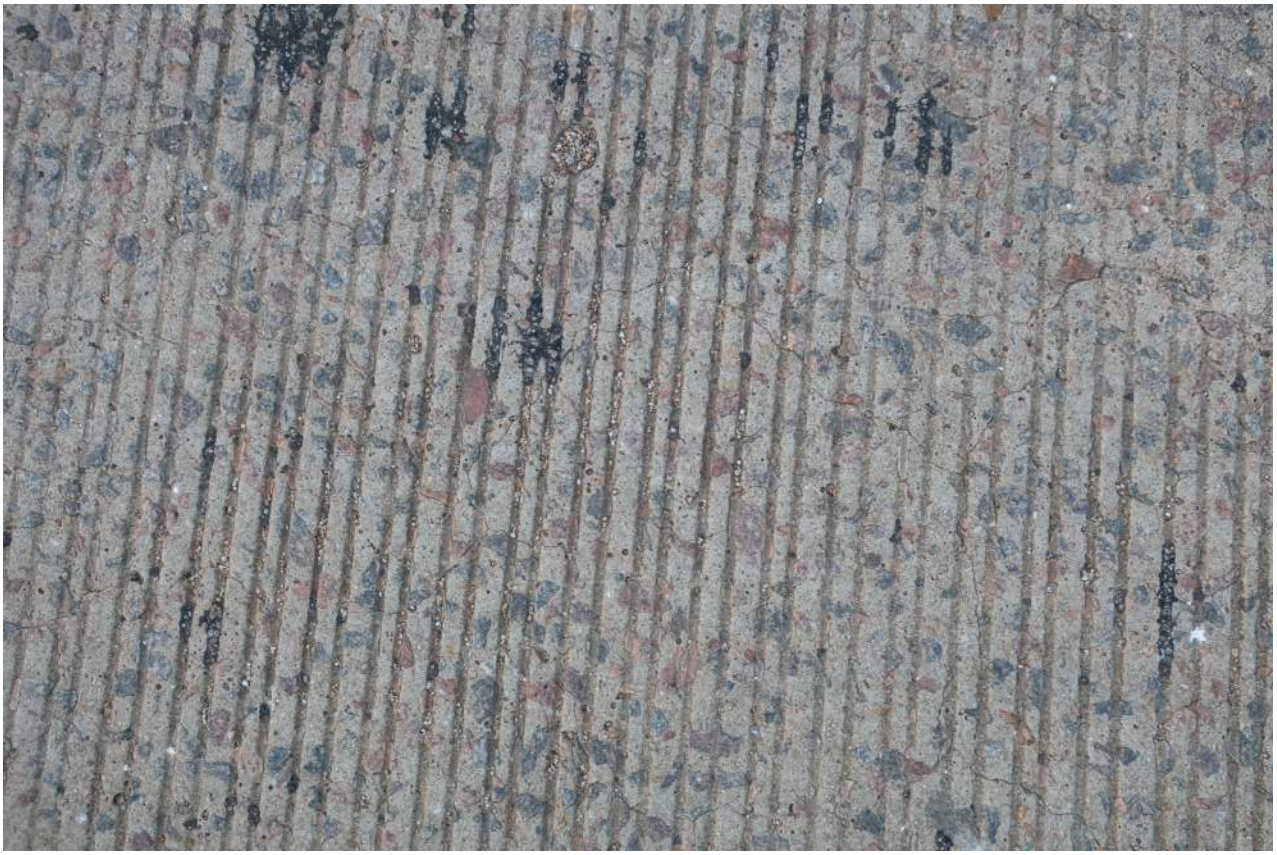
7937 WB - IMG_0003



7937 WB - IMG_0004



7937 WB - IMG_0005



7937 WB - IMG_0006



7937 WB - IMG_0007



7937 WB - IMG_0008



7937 WB - IMG_0009



7937 WB - IMG_0010



7937 WB - IMG_0011



7937 WB - IMG_0012



7937 WB - IMG_0013



7937 WB - IMG_0014



7937 WB - IMG_0015



7937 WB - IMG_0016



7937 WB - IMG_0017



7937 WB - IMG_0018



7937 WB - IMG_0019



7937 WB - IMG_0020



7937 WB - IMG_0021



7937 WB - IMG_0022



7937 WB - IMG_0023



7937 WB - IMG_0024



7937 WB - IMG_0025



7937 WB - IMG_0026



7937 WB - IMG_0027



7937 WB - IMG_0028



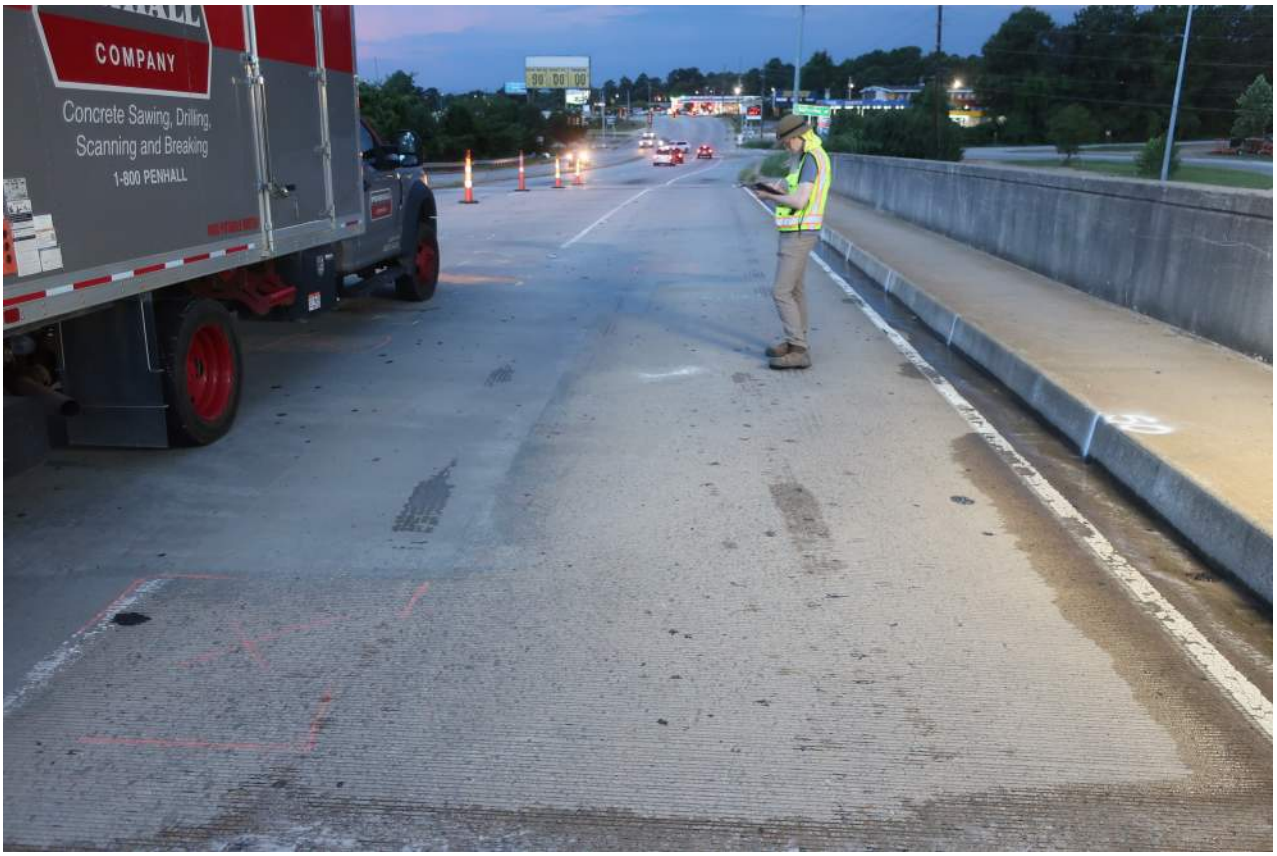
7937 WB - IMG_0029



7937 WB - IMG_0030



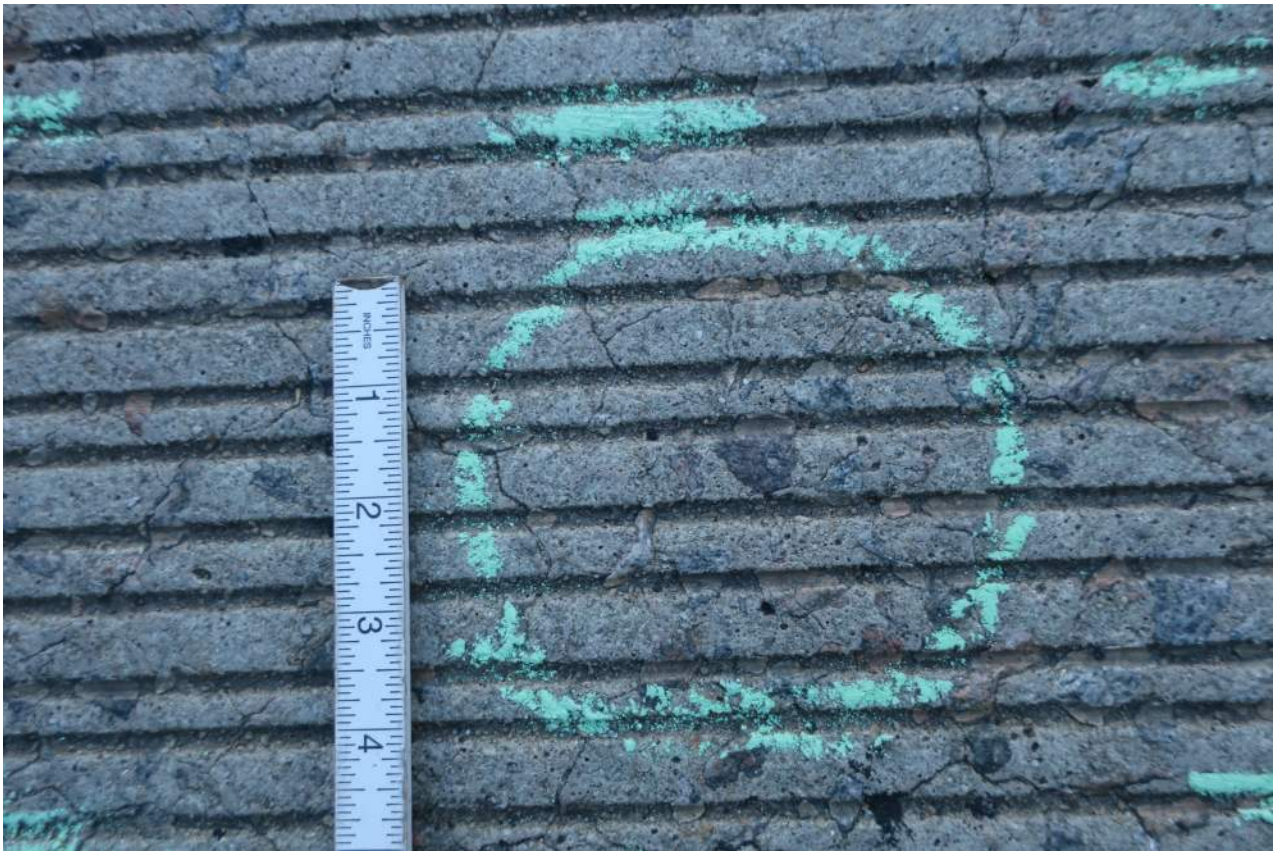
7937 WB - IMG_0031



7937 WB - IMG_0032



7937 WB - IMG_0033



7937 WB - IMG_0034



7937 WB - IMG_0035



7937 WB - IMG_0036



7937 WB - IMG_0037



7937 WB - IMG_0038



7937 WB - IMG_0039



7937 WB - IMG_0040

ASSET 7937 – COMPRESSIVE STRENGTH TESTING

Compressive strength testing was performed on cores to evaluate the strength of the concrete. Cores were extracted and tested in general accordance with ASTM C42 *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*.

The following cores were tested for compressive strength:

- 7937 – C3
- 7937 – C4
- 7937 – C8
- 7937 – C12
- 7937 – C17

Please see the Visual and Sounding Survey Figure for core locations.

ASTM C42 COMPRESSIVE STRENGTH OF CONCRETE CORES

Project No: 2023.1990 **Project Coordinator:** S. Garrett

Operator: M. Haddad **Date:** 7/23/2023

Checked by: S. Garrett **Date:** 7/28/2023

Capping Method ☐ Sulfur ☑ Lapped ☐ Unbonded

Direction of Load ☐ Perpendicular ☐ Parallel ☑ Not Known

Capping ☑ Plane ☐ Sound ☐ Acceptable

Conditioning ☐ As Received ☐ Saturated ☑ ASTM C42 / ACI 318

Max Size of Agg ☑ 3/4" ☐ 1/2" ☐ Other

Calipers ☑ 12/060107 ☐ B65697 ☐ Other

Test Machine ☑ Test Mark SN# 11005 ☐ Satec ID: 120HLVC1240 ☐ Other

Cast Date: not known

Date and Time Cored and Sampled: 7/14/2023 and 7/15/2023

Date and Time of End Preparation: 7/18/23 6:00 PM

Sample ID	Pre-Capped Length (in.)	Capped Length (in.)	Diameter (Avg. in.)	Area (in.²)	Correction		Max Load (lbs)	Density (lb/ft³)	Compressive Strength (psi)	Corrected Compressive Strength (psi)	Fracture Type	Defects	Age of Sample (days)
					L/D	Factor							
7937 - C3	4.66	4.66	2.74	5.90	1.70	0.98	31,110	144.6	5,280	5,150	2	None	not known
7937 - C4	4.96	4.96	2.73	5.87	1.81	none	30,480	143.2	5,190	5,190	1	None	not known
7937 - C8	5.09	5.09	2.74	5.88	1.86	out of range*	36,640	144.5	6,240	--	1	None	not known
7937 - C12	4.89	4.89	2.74	5.90	1.79	none	30,830	142.3	5,230	5,230	2	None	not known
7937 - C17	4.88	4.88	2.74	5.90	1.78	none	28,600	146.5	4,850	4,850	1	None	not known

* Per ASTM C42, L/D correction factors are only applicable to low-density and normal density concretes having strengths between 2,000 and 6,000 psi.

Comments:

ASSET 7937 – CHLORIDE CONTENT TESTING

WJE performed chloride content analysis of the concrete samples. WJE measured chloride content near depths of 3/4", 1-1/4", 2-1/4", and 4" (approximately mid-depth of the slab). WJE performed testing in general accordance with AASHTO T 260 *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials*. Material sampling was obtained via coring and cores were subdivided into layers in the laboratory for testing.

Please see the Visual and Sounding Survey Figure for core locations.

WJE

MEMORANDUM | August 14, 2023

I-20 / I-26 / I-126 Corridor Improvement (Carolina Crossroads)

AASHTO T260 Chloride Analysis - Asset 7937

WJE PROJECT NO. 2023.1990

SAMPLES

Slices taken from three or four depths in ten concrete cores were received for acid-soluble chloride analysis.

TESTING AND RESULTS

As requested, the acid-soluble chloride contents were determined at depths proposed. The acid-soluble chloride analysis was performed essentially according to Procedure A of AASHTO T 260, *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials*. The results are listed in Table 1.

Table 1. Acid Soluble Chloride Results for Various Depths – Asset 7937

Core ID	Acid Soluble Chloride, % by mass of sample			
	$^{5}/_{8}$ – $^{7}/_{8}$ in.	$1^{1}/_{8}$-$1^{3}/_{8}$ in.	$2^{1}/_{8}$-$2^{3}/_{8}$ in.	$3^{7}/_{8}$-$4^{1}/_{8}$ in.
Core 1	0.055	0.031	0.024	0.003
Core 2	0.073	0.050	0.029	0.008
Core 5	0.026	0.013	0.007	-
Core 7	0.118	0.062	0.030	0.023
Core 9	0.098	0.055	0.028	-
Core 10	0.073	0.050	0.026	0.007
Core 13	0.123	0.051	0.023	0.004
Core 14	0.096	0.063	0.005	0.006
Core 15	0.046	0.025	0.005	<0.003
Core 18	0.080	0.045	0.023	<0.003

(As requested by HDR, measurements above 0.050 percent are shown as red text)