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February 9, 2016

Mr. Don Helling
Huitt-Zollars, Inc.
818 Stewart St. Suite 1120
Seattle, WA 98101

Re: Boise Creek Arch Bridge
King County Parks - Foothills Trail
Task 300.4 Structural - Boise Creek Arch Bridge
DRAFT Structural Recommendations Report
Exeltech Project No. 1527

Dear Mr. Helling,

We have completed our task to review available information, perform a site review, and provide recommendations for the repair or replacement of the Boise Creek Arch Bridge.

Background

The existing Boise Creek Arch Bridge is a one span reinforced concrete Luten Arch highway bridge with reinforced concrete retaining walls at the four corners. The bridge type is named for Professor Daniel B. Luten, of Indianapolis, Indiana. Professor Luten's name appears on the lower right hand corner of the Boise Creek Bridge Layout drawing, dated June 29, 1915, as the Designing Engineer.

The bridge consists of a fairly thin curved lightly reinforced concrete slab forming the arch supported by fairly large lightly reinforced concrete footings, with lightly reinforced concrete side walls over the arch and with lightly reinforced concrete retaining walls at the bridge end approaches. The retaining walls are connected with 1 inch diameter steel tie rods. Reinforced concrete traffic barrier railing is attached to and extends the entire length of the walls and bridge on both sides. The entire structure is backfilled with granular fill material and topped with a concrete roadway wearing surface. See enclosed existing bridge drawings, Exhibit 1 and Exhibit 2.

Based on the date of June 29, 1915 on the two existing bridge plans it is assumed the bridge was constructed shortly thereafter. The existing bridge has a 24 foot 0 inch width between the bridge rail base and a 35 foot 0 inch clear span and 16 foot 0 inch rise above the spring line. The current height of the roadway wearing surface above the creek bed below is approximately 24 feet. The bridge is constructed with a 30 degree skew.

The bridge is currently closed to traffic and is not posted. The original road approaches have been abandoned long ago and covered with fill material to support other roadways, so the bridge is currently not accessible to traffic or pedestrian, other than off trail hikers.

The location of Boise Creek Arch Bridge is being considered as one of the trail alignment Phases for the King County Parks Foothills Trail. The trail would cross Boise Creek on the existing bridge, which was originally part of the old State Highway SR 410 alignment, or on a new pedestrian bridge in the vicinity of the existing bridge location.

Site Review

We conducted a walk through bridge site visit reconnaissance on November 30, 2015 at 11:00 am to visually inspect and evaluate the existing bridge site conditions. The weather was overcast and the temperature was just above freezing.

The bridge had recently been rough cleaned, to remove a majority of the overgrown vegetation and soil accumulation from the wall faces and bridge roadway deck, which had made the bridge virtually inaccessible. See enclosed photo No. 1.

We took approximate field measurements to spot check some dimensions shown on the existing bridge plans. We found the basic dimensions of the bridge to be within a reasonable tolerance, of a few inches, from what is shown on the two 1915 bridge drawings, except for the depth of the North Abutment foundation. According to the existing bridge plans the foundations were to be set at 7 feet 0 inch below the Spring Line, however our field observations show the South Abutment is set at 6 feet 7 inch below the Spring Line and the North Abutment is set at approximately 4 feet 5 inch below the Spring Line. This observation is important because along the North Abutment is where significant scour undermining of the North Abutment is taking place. See enclosed photo No. 2.

We observed a pattern of relatively small concrete cracks on the outer surface of both abutments; 1.) Horizontally on the exterior arch surface about 7 feet above the Spring Line, at a point where the vertical reinforcing steel bars on that surface of the arch end and 2.) Diagonally on the exterior abutment / retaining wall surface, following the line of the top of the arch slab. There were also relatively small cracks observed at the vertical joints in the concrete bridge railing and a few transverse cracks in the concrete roadway surface.

The most noticeable observation was that the North Abutment foundation of the bridge has been significantly undermined and the South Abutment is showing initial signs of being undermined by the action of Boise Creek. At the North Abutment there is a scour hole under the foundation extending along the entire 30 foot length of the bridge foundation approximately 2 feet in depth and extending under the foundation from 1 feet to 7 feet. This is a significant observation because 7 feet is the full width of the bridge foundation.

Bank erosion and minor undermining and exposure of the retaining wall footings and the South abutment culvert structure has been observed, along the downstream side of the bridge.

Geotechnical Seismic Considerations

The Boise Creek Arch Bridge site is located in western Washington which is a seismically active area. Based on the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications the bridge site is classified as Site Class D and the peak ground acceleration is 0.370g.

There are no known seismic faults that intersect the trail alignment, so the potential for surface rupture is very small. Shaking due to an earthquake can result in liquefaction and temporary loss of soil strength, however due to the soil types, topography, and ground water level at the bridge site liquefaction or lateral spreading is not expected to occur. The existing bridge does not show any sign of distress that may have been caused by previous seismic activity over the 100 year life of the bridge.

This project involves the repair of the existing bridge and does not change the nature of the structure as it currently exists in any appreciable manner. The new pedestrian railing will add less than 1 percent additional dead load to the bridge structure. WSDOT has a policy for Seismic Analysis and Retrofit that when widening a bridge (adding mass to an existing bridge) has insignificant effects on the existing structure elements, the seismic analysis may be waived with the WSDOT Bridge Design Engineer's approval. As published in the WSDOT Bridge Design Manual, adding less than 10 percent mass without new substructure could be considered insignificant.

The policy states that widening of existing bridges is often challenging, specifically when it comes to determining how to address elements of the existing structure that do not meet current design standards. This policy balances the engineers responsibility to "safeguard life, health, and property" (WAC 196-27A-020) with their responsibility to "achieve the goals and objectives agreed upon with their client or employer" (WAC 196-27A- 020(2)(a)). This policy allows bridge widening projects to be completed without addressing existing seismic risks, provided "No Harm" is done to the existing structure.

Therefore a detailed seismic evaluation and seismic retrofit of the existing bridge will not need to be performed and need not be considered a part of the scope of work for this project.

Structural Analysis

The existing Luten arch bridge was analyzed for its ability to structurally support a segment of the Foothills trail. Acting as a trail bridge, it would need to support its own weight as well as the weight of pedestrians and an occasional small maintenance vehicle. AASHTO criteria for pedestrian bridges and for the load rating of existing vehicular bridges were used in conjunction as a basis for the analysis of the bridge. The analysis found that the reinforced concrete arch has adequate structural resistance to support the trail. The soil bearing resistance at the arch bridge foundations however, was found to be inadequate when using current design criteria, and an empirically based method for determining soil bearing resistance was suggested.

The AASHTO Load and Resistance Factor Rating (LRFR) specification provides a reliability based limit states approach to the load rating and design of bridges. For the safety of the general public bridges are inspected on a regular prescribed basis. Over time bridges age, and for a variety of reasons, they can become deteriorated or structurally deficient during the course of their life. Vehicle bridges that have insufficient load carrying capacity are posted with load restrictions and weight limits are imposed.

The LRFR load rating process provides a way for engineers to check a bridge for critical stress points in bridge spans and piers, and it incorporates resistance and load factors to account for the actual inspected condition of the bridge and the special loads the bridge will see. The AASHTO Manual for Bridge Evaluation (MBE) provides both analytical methods and empirical methods for evaluating the safe maximum live load capacity of vehicle bridges or for assessing their safety under a particular loading condition. Empirical methods are load ratings by load testing.

For analysis of the Luten Arch bridge, the load factors from the MBE were used, so as to meet the standard of care for the load rating of highway bridges. The trail live loads included a 90 psf pedestrian loading and a 10 ton maintenance vehicle loading (single H10 truck) and were taken from the AASHTO LRFD Guide Specification for the Design of Pedestrian Bridges. The resistance factors and resistance equations in the MBE apply to bridge superstructures, and substructures are not typically included in highway bridge load ratings. The AASHTO LRFD Bridge Design

Specifications were therefore used to determine the factored resistance of the Luten Arch bridge foundations.

The analysis to evaluate the structural adequacy of the existing reinforced concrete arch bridge found the concrete arch to have adequate internal structural resistance to support a pedestrian trail after the scour and erosion effects have been repaired as described in the below recommendations. Due to the complex nature of filled spandrel arches such as this, it is very difficult to determine the exact strength of the arch. Simplified methods of analysis were used as a cost effective way to verify the ability of the bridge to support the trail. For this reason, an exact rating value that describes what percentage of additional live loading the bridge can handle was not determined.

The structural analysis of the foundation supports determined that, after the foundation scour has been repaired, the existing concrete footings are not large enough to ensure adequate resistance to a soil bearing failure. The soil bearing resistance provided by the geotechnical engineer was calculated using current AASHTO LRFD design criteria. It is suggested that soil bearing resistance be determined based on an empirical method of analysis.

The recently obtained site survey cross-sections show that approximately one half of the North abutment footing is currently undermined. Therefore, the existing footing is actually supporting the bridge at a higher soil bearing pressure than the AASHTO design criteria would indicate. The current existing condition of the bridge is providing us with an actual load test of the existing bridge for dead load being supported on just one half the footing bearing area. We can use this information, from this empirical method load test, to form some opinion for assessing the safety of the existing bridge to carry load.

Based on the good performance of the existing bridge over the last 100 years, no signs of excessive settlement or cracking, and the empirical information provided by the current performance of the bridge with the North abutment undermined, it seems reasonable to consider raising the AASHTO analytical evaluation factor resistance for the foundation soils under the abutments. Based on our test results and actual dead load and live load determined from our analysis we consider it reasonable to raise the nominal soil bearing resistance from 12.2 ksf to 13.5 ksf and to raise the corresponding AASHTO resistance factor from 0.45 to 0.67. By doing this, the repaired North abutment foundation can be shown to have an adequate resistance to soil bearing failure when used as a pedestrian bridge for the Foothills Trail.

Condition

The results of our bridge condition survey are documented in detail in the Bridge Inspection Report. See enclosed Bridge Inspection Report.

The following are our key findings as reported in the Bridge Inspection Report:

- Deck Overall: Coded “3” for serious condition due to the settling of the deck panel at the NW corner. The panel is undermined from erosion caused by runoff from the approach embankment.
- Superstructure Overall: Coded “6” for satisfactory condition. The concrete cracks were considered to be minor.
- Substructure Overall: Coded “2” for critical condition due to the scour at the North Abutment footing.

- Scour: Coded "2" due to field review that indicates that extensive scour has occurred. Immediate action is required to provide scour countermeasures.
- Retaining Walls: Coded "6" for satisfactory condition. The concrete cracks were considered to be minor.
- At this time we recommend that future bridge inspections be performed on an annual basis.

Foundation undermining has created a situation requiring repair action. Scour protection countermeasures need to be provided which will increase the scour code to satisfactory levels. Countermeasures include addressing hydraulic conditions, structural conditions and monitoring.

Based on the location of the existing ground line at the face of the abutments, shown on the 1915 existing bridge plans, the elevation of the thalweg of the creek appears to have dropped by approximately 4 feet over the last 100 years the bridge has been in existence.

Following hydraulics evaluation of the existing site conditions and design of a scour mitigation plan for the bridge with scour protection along the abutments. This would allow the scour code to be raised, once the bridge it has been re-inspected by the bridge owner.

Recommendations

Based on our findings of the review of the existing available documents, the DRAFT Geotechnical Engineering Design Study, prepared by Hart Crowser dated February 1, 2016, the DRAFT Scour Review Memorandum, prepared by Huitt-Zollars, Inc. dated February 3, 2016, and the Bridge Inspection Report, prepared by Exeltech Consulting, Inc. dated December 31, 2015, we have developed the following recommendations for a bridge repair plan and a bridge replacement plan, including concept level descriptions with sketches.

We believe that repairing and using the existing bridge as an element of the trail project is prudent and feasible.

Our first recommendation is that Repair Phase No. 1 be performed as soon as a design schedule and permitting requirements allow. The repair will preserve the existing bridge and ensure it does not become damaged beyond repair and in the process cause secondary damage to the creek environment. See enclosed repair sketch Exhibit 3.

Repair Phase No. 1

- Construct a structural foundation under the North Abutment where it has been undermined by scour. The following is a description of the construction sequence for Repair Phase No. 1:
    1. Divert the creek away from the North Abutment temporarily using a combination of plastic piping, plastic sheeting, sand bags, or similar acceptable materials.
    2. Remove the existing timber log, loose rock, and other debris from under the North Abutment. Do not remove the rock and concrete which is securely bonded to the face or bottom of the abutment. Do not remove existing stream bed material which appears to be sound.
    3. Set new rock backfill consisting of Rock for Erosion and Scour Protection Class B in front of the abutment, choking the voids, to provide a fairly impermeable surface which will act as formwork for concrete placement, as shown in the plans.
    4. Install horizontal grouting tubes at 6 foot spacing, just below the existing abutment.

5. De-water the resulting creek void space under the abutment. Pump Concrete Class 4000 into the void space under the abutment allowing it to flow into and around the choked voids of the Rock for Erosion and Scour Protection Class B and completely fill the void space, allow the concrete to cure for 3 days.
6. Pressure grout through the grouting tubes with 4000 psi grout to fill voids between the existing abutment footing and the newly placed concrete.

- Repair the bank scour and minor undermining and exposure of the retaining wall footings and the South abutment and the culvert structure along the downstream side of the bridge, using the construction sequence for repair No. 1 listed above.

Our second recommendation is that Repair Phase No. 2 be performed as part of the trail project to make the existing bridge safe for pedestrian use. See enclosed repair sketch, Exhibit 4.

Repair Phase No. 2 (This repair can be completed as part of the future trail project)

- Construct an aesthetically pleasing pedestrian railing to a height of 3'-6" above the walking surface along the entire length of the bridge and retaining walls. We suggest building WSDOT Bridge Railing Type BP on top of the existing reinforced concrete bridge railing.
- Drainage from a 36 inch diameter culvert is currently being directed along the northwestern edge of the Boise Creek Arch bridge structure. Remove and relocate the drainage course away from the Bridge structure in order to reduce the erosion and scour undermining the bridge retaining wall footings and North abutment downstream footing.
- Remove and replace the deck panel at the NW corner of the bridge that has settled due to being undermined from erosion caused by runoff from the approach embankment.
- Clean the exposed surfaces of the existing bridge, retaining walls, and roadway deck.
- Epoxy crack seal the diagonal cracks on the exterior abutment wall / retaining wall surfaces.

Our third recommendation is the replacement of the existing bridge.

Replacement Phase No. 1 (This new bridge can be completed as part of the future trail project)

- Construct a new Bridge Replacement, with a 120 foot span and 16 foot wide curb to curb width, on a slight skew to the creek, on a slightly higher profile than the existing bridge, just upstream of the existing Boise Arch Bridge. This new bridge is envisioned to be a single span prefabricated steel truss bridge supported on drilled shaft or spread footing foundations.
- Demolish existing arch bridge.

Opinion of Probable Cost

We can provide the following conceptual opinion of probable cost estimates for existing bridge Repair Phases No. 1 and 2 and for new trail bridge Replacement Phase No. 1:

Repair Phase No. 1	$75,000.00
Repair Phase No. 2	$100,000.00
Replacement Phase No. 1	$700,000.00

February 9, 2016
Task 300.4 Structural - Boise Creek Arch Bridge

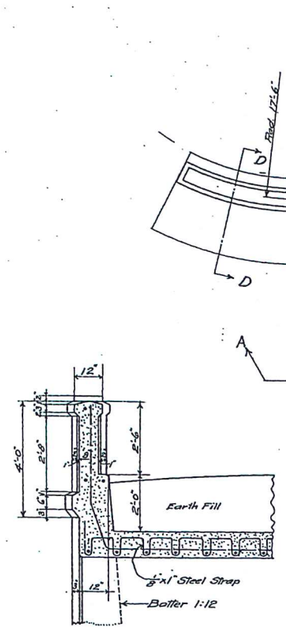
These conceptual estimates for the bridge repair and replacement do not include the trail roadway approach, surface water drainage, project permitting, design engineering, construction engineering, sales tax, mobilization, or contingencies.

It is a pleasure to provide engineering services to Huitt-Zollars, Inc. Please let us know if we can be of further assistance.

Respectfully Submitted,
EXELTECH CONSULTING, INC.

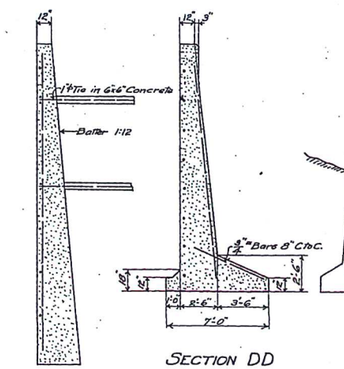
Karl N. Kirker, PE, SE
Senior Project Manager
KNK

Enclosures: Existing Bridge Drawings Exhibit No.'s 1 and 2
Photos No.'s 1 and 2
Bridge Inspection Report
Structural Analysis Memo
Repair Sketches Exhibit No.'s 3 and 4



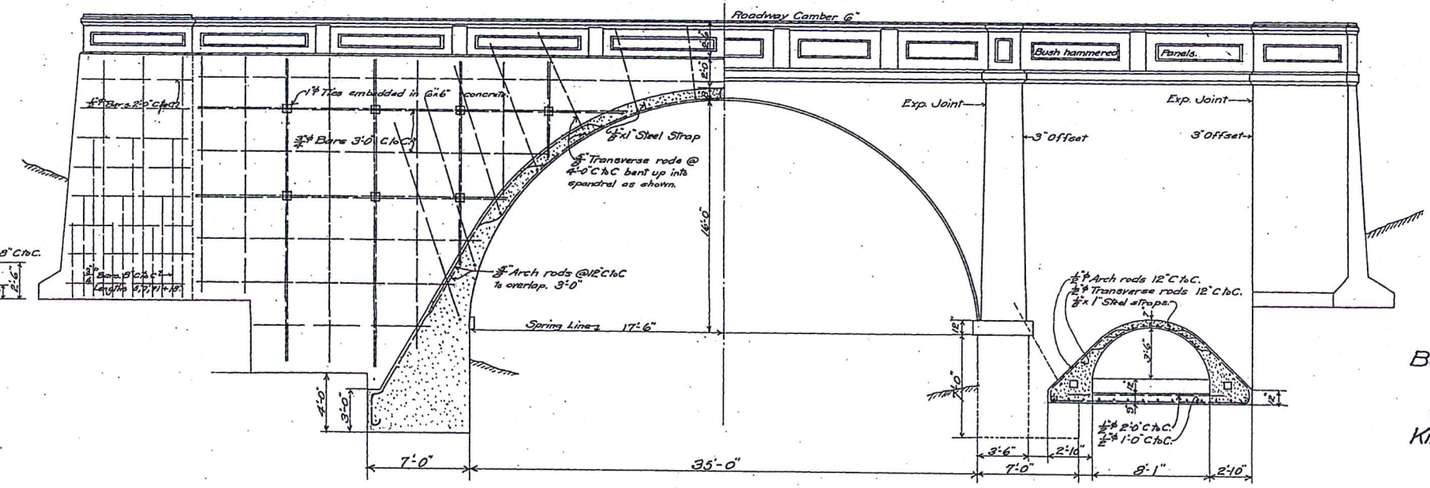
SECTION AT CROWN
Scale 1/2"=1'-0"

FOUNDATION PLAN
Scale 1/4"=1'-0"



SECTION DD
Scale 1/4"=1'-0"

SECTION CC
Scale 1/4"=1'-0"



HALF SECTION AA HALF ELEVATION BB
Scale 1/4"=1'-0"

LUTEN DESIGN
BOISE CREEK BRIDGE
STATION 11+62
SURVEY NO. 63 1/4 C
KING COUNTY, WASH.
JUNE 29, 1915.

Approved:

A.P. Denton,
County Engineer.

State Highway Commissioner.

Daniel B. Luten,
Designing Engineer.
Indianapolis, Indiana.

8033 38-94D

NO.	DATE	REVISION	BY	APPROVED

DESIGNED: DATE:
DRAWN: DATE:
CHECKED: DATE:

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. SCALES SHOWN ARE FOR 22x34 INCH PRINT ONLY.

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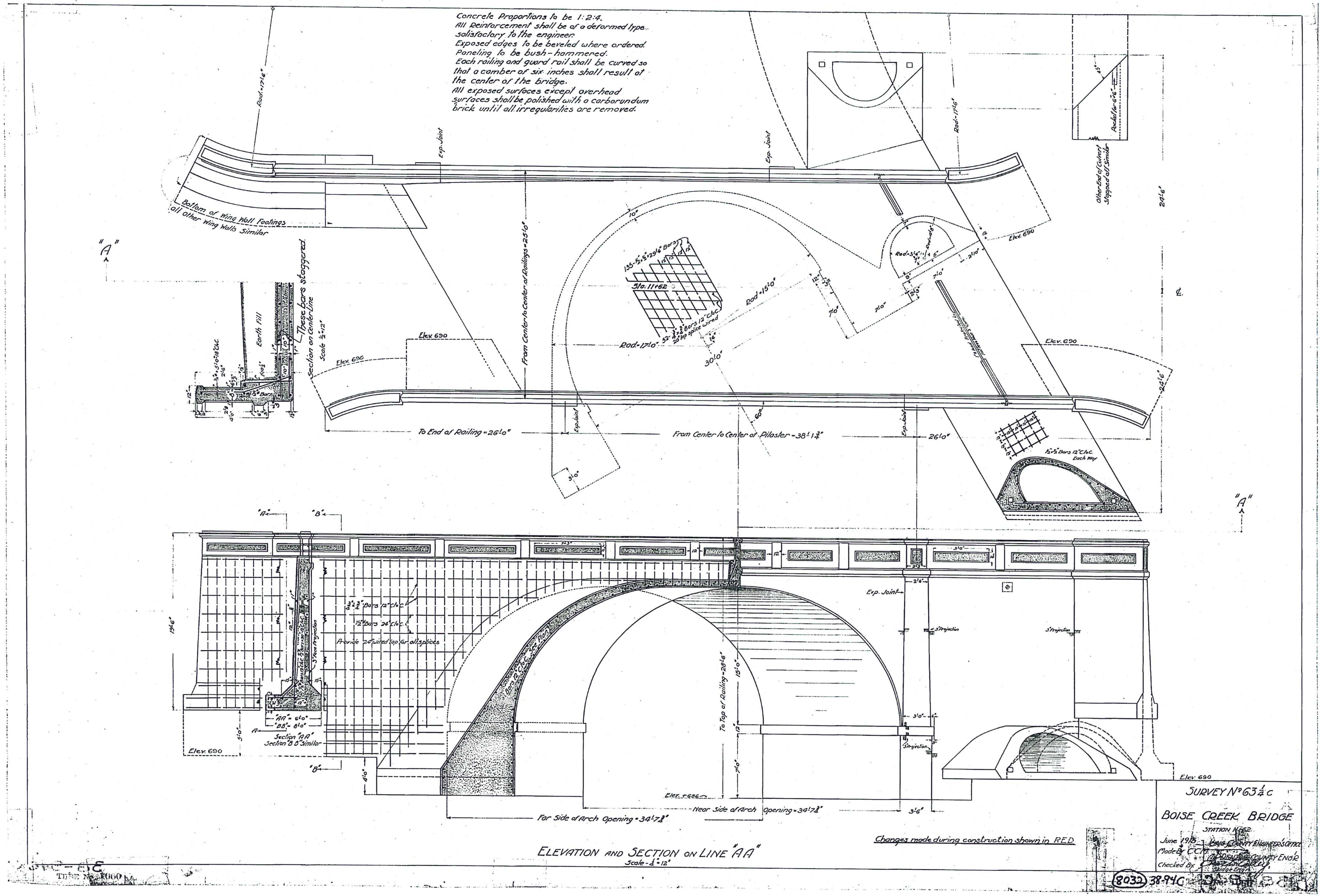
TASK 300.4 STURCTURAL
BOISE CREEK ARCH BRIDGE
STRUCTURAL RECOMMENDATIONS REPORT

EXHIBIT 1 - EXISTING BRIDGE LAYOUT

PROJECT NO.

SHEET NO.
EXH-1



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TASK 300.4 STURCTURAL
BOISE CREEK ARCH BRIDGE
STRUCTURAL RECOMMENDATIONS REPORT

EXHIBIT 2 - EXISTING BRIDGE DETAILS

PROJECT NO.

SHEET NO.
EXH-2

P:\2015\1527 Hall Zollars Boise Creek Arch Bridge\02-CADD\Exhibits\Exh-2 - Boise Creek Arch Br - Ex Foundation Plan - Half Elev.dwg, 12-14-15, 11:51am, jbrown, 1


11.30.2015
Photo No. 1


PM 4:48 NOV/ 8/2015
Photo No. 2

BRIDGE INSPECTION REPORT

Ver Date: 11/30/2015 Agency: King County

Status: Work Printed On: 12/01/20 Program Mgr: Roman G. Peralta

Bridge No. 1000000 Page: 1/2 **Structure Type** CA

Bridge Name Boise Creek Arch Bridge **Route** 30110 **Location** 1.8 S ENUMCLAW

Structure ID XA104400 **MilePost** 2.50 **Intersecting** BOISE CREEK

Inspector's Signature RLS IDent# A1044 Co-Inspector's Signature KNK

	Structural Adqcy	(657)	N	Pier/Abut/Protect	(679)	1915	Year Built	(332)	**Inspections Performed**				
9	Deck Geometry	(658)	2	Scour	(680)	0	Year Rebuilt	(336)	**IT**	**NT**	**HRS**	**Date**	**Rep Type**
9	Underclearance	(659)	6	Retaining Walls	(682)		Oper Rating	(551)					Routine
0	Operating Level	(660)	9	Pier Protection	(683)		Inv Rating	(554)					Fract Crit
9	Alignment Adqcy	(661)	0	Bridge Rails	(684)	K	Open Close	(293)					Underwater
8	WaterwayAdqcy	(662)	N	Transition	(685)	9999	Vert Over Deck	(360)	**0**	**60**	**1.5**	**11/30/2015**	**Special**
3	Deck Overall	(663)	N	Guardrails	(686)	0000	Vert Under	(374)					Interim
9	Drains Condition	(664)	N	Terminals	(687)	N	Vert Und Code	(378)					Equipment
6	Superstructure	(671)	Y	Revise Rating	(688)	0.00	Asphalt Depth						Damage
0	Number Utilities	(675)		Photos Flag	(691)	0	Speed Limit						Safety
2	Substructure	(676)	Y	Soundings Flag	(693)								Short Span
4	Chan/Protection	(677)		Measure Clearance	(694)				Total: 1.5				
9	Culvert	(678)							Suff Rating:				

BMS Elements

Element	Element Description	Total	Units	State 1	State 2	State 3	State 4
14	Fully Supported Concrete Deck	1176	SF	936	0	0	240
145	Earth Filled Concrete Arch	35	LF	35	0	0	0
331	Concrete Bridge Railing	176	LF	176	0	0	0
361	Scour	2	EA	0	1	0	1

Notes

0	Bridge orientation is south to north. Stream flow is east to west.
3	Special inspection to determine the structures ability to support a pedestrian trail.
14	Concrete deck on fill. Deck is poured in place panels with longitudinal construction joint at centerline and transverse joints at approx. 20' spacing. The NW panel has been undermined at the NW corner. This has caused the panel to settle at the NW and rise approx. 3" at the SE corner. Several of the panels have small full width cracks.
145	The arch soffit has a full width horizontal hairline crack 6.5' above the springline on both the north and south. The soffit has a few short hairline leaching cracks scattered near the crown. Each spandrel wall has a diagonal crack that follows the top of the arch ring starting at groundline. The cracks are approx. 6' long starting as hairline cracks that are open to approx. 1/8" at the groundline. The largest cracks were at the NE and SW walls.There is heavy leaching at these two cracks.The tail walls have a few scattered hairline leaching cracks.
331	The rails have vertical cracks at the four locations where the vertical expansion joint between the spandrel walls and the pilaster walls extends to the rails. The largest crack is less than 1/8".

BRIDGE INSPECTION REPORT

Ver Date: 11/30/2015 | Agency: King County

Status: Work | Printed On: 12/01/20 | Program Mgr: Roman G. Peralta

Bridge No. 1000000 **Structure Type** CA

Bridge Name Boise Creek Arch Bridge **Route** 30110 **Location** 1.8 S ENUMCLAW

Structure ID XA104400 **MilePost** 2.50 **Intersecting** BOISE CREEK

361	The north footing is undermined 7' horizontal x 4' vertical starting at the west end. This degree of scour extends the length of the west half of the footing and then decreased to approx. 2' horizontal x 4' vertical at the east end. A large log is wedged under the footing near the east end. The south footing is undermined 2' horizontal x 1' vertical for 4' starting at the west end.
663	The deck is coded "3" due to the settling that has occured to the NW panel.
676	The substructure is coded "2" due to the scour at the north footing.

Repairs

Repair No	Pr	R	Repair Description	Noted	Maint	Verified
10000	1	S	Repair the scour at the north footing. The footing is undermined 7' horiz. x 4' vertical.	11/30/15		
10001	3	J	Replace the roadway slab at the NW corner. The NW panel has settled and is undermined.	11/30/15		
10002	3	S	Repair the scour at the south footing. The footing is undermined 2' horiz. x 1' vertical.	11/30/15		

Inspections Performed and Resources Required

Report Type	Date	IT	Frq	Hrs	Insp	CertNo	Coinsp	Note
Special	11/30/15	0	60	1.5	RLS	A1044	KNK	

Resources	Use	Hour	Min	Req	Max	Notes

BRIDGE INSPECTION REPORT

	WO	CC	WE	PD
BAM	1	0	0	0

Status: Work

Ver Date: 11/30/2015
Printed on: 12/1/2015

Agency: King County
Program Mgr: Roman G. Peralta

Bridge No. 1000000
Bridge Name Boise Creek Arch Bridge
Structure ID XA104400

Route 30110
MilePost 2.50

Structure Type CA
Intersecting BOISE CREEK
Location 1.8 S ENUMCLAW

DSCN0605
Photographs
Photo Type: D - Deck
Orientation: N
Dates: 11/30/2015
Repairs: 10001
Deck

DSCN0598
Photographs
Photo Type: D - Deck
Orientation: S
Dates: 11/30/2015
Repairs:
Deck

BRIDGE INSPECTION REPORT

	WO	CC	WE	PD
BAM	1	0	0	0

Status: Work

Ver Date: 11/30/2015
Printed on: 12/1/2015

Agency: King County
Program Mgr: Roman G. Peralta

Bridge No. 1000000
Bridge Name Boise Creek Arch Bridge
Structure ID XA104400

Route 30110
MilePost 2.50

Structure Type CA
Intersecting BOISE CREEK
Location 1.8 S ENUMCLAW

DSCN0599
Photographs
Photo Type: E - Elevation
Orientation: NW
Dates: 11/30/2015
Repairs:
NE corner

DSCN0600
Photographs
Photo Type: G - General
Orientation: UP
Dates: 11/30/2015
Repairs:
North soffit

BRIDGE INSPECTION REPORT

	WO	CC	WE	PD
BAM	1	0	0	0

Status: Work

Ver Date: 11/30/2015
Printed on: 12/1/2015

Agency: King County
Program Mgr: Roman G. Peralta

Bridge No. 1000000
Bridge Name Boise Creek Arch Bridge
Structure ID XA104400

Route 30110
MilePost 2.50

Structure Type CA
Intersecting BOISE CREEK
Location 1.8 S ENUMCLAW

DSCN0601
Photographs
Photo Type: E - Elevation
Orientation: SW
Dates: 11/30/2015
Repairs:
SE corner

DSCN0603
Photographs
Photo Type: S - Scour
Orientation: N
Dates: 11/30/2015
Repairs: 10000
Scour - North footing west end

BRIDGE INSPECTION REPORT

	WO	CC	WE	PD			
BAM	1	0	0	0	Status: Work	Ver Date: 11/30/2015 Printed on: 12/1/2015	Agency: King County Program Mgr: Roman G. Peralta

Bridge No. 1000000 | Page 4 of 5 | **Structure Type** CA

Bridge Name Boise Creek Arch Bridge | **Route** 30110 | **Intersecting** BOISE CREEK

Structure ID XA104400 | **MilePost** 2.50 | **Location** 1.8 S ENUMCLAW

DSCN0602
Photographs
Photo Type: S - Scour
Orientation: N
Dates: 11/30/2015
Repairs: 10000
Scour - North footing east end

BRIDGE INSPECTION REPORT

	WO	CC	WE	PD			
BAM	1	0	0	0	Status: Work	Ver Date: 11/30/2015	Agency: King County
						Printed on: 12/1/2015	Program Mgr: Roman G. Peralta

Bridge No. 1000000 | Page 5 of 5 | **Structure Type** CA

Bridge Name Boise Creek Arch Bridge | **Route** 30110 | **Intersecting** BOISE CREEK

Structure ID XA104400 | **MilePost** 2.50 | **Location** 1.8 S ENUMCLAW

Entry Name	Folder Name	Type	Repairs	Page
DSCN0598	Photographs	D		1
DSCN0599	Photographs	E		2
DSCN0600	Photographs	G		2
DSCN0601	Photographs	E		3
DSCN0602	Photographs	S	10000	4
DSCN0603	Photographs	S	10000	3
DSCN0605	Photographs	D	10001	1

Washington State Department of Transportation

WSBIS Inventory Report

12/1/2015

Structure Identifier	Bridge Number	Owner Code	County Number	City Number	Update
XA104400	1000000	02	17	0000	0

WB71

Bridge Name	Location	Section	Township	Range	Latitude	Longitude
Boise Creek Arch Bridge	1.8 S ENUMCLAW	34	20	06E	47°10'33.90"	122°01'06.50"

WB72

Feature Intersected	Facilities Carried	Region	FIPS Place Code	Legis District (1)	Legis District (2)	Toll	Custodian	Parallel Structure	Temporary Structure	Critical Facility	Median	Hist Sig	Open Closed	Program Year
BOISE CREEK	ABANDONED SR 410	NW	00000	31	0	3	02	N		☒	0	4	K	0

WB73

Year Built	Year ReBuilt	Bridge Length	NBIS Length	Maximum Span Length	Lanes On	Lanes Under	Curb to Curb Deck Width	Out to Out Deck Width	Sidewalk Curb Left	Sidewalk Curb Right	Min Vert Clearance Over Deck	Min Vert Clearance Under Bridge	Code	Min Lat UnderClr Right	Code	Min Lat UnderClr Left	Navigation Control	Navigation Vertical Clearance	Navigation Horizontal Clrnce	Vert Lift Min Clrnce	Appr Roadway Width	Skew Angle	Flare
1915	0	35		35	0	0	23.6	26.0	0.5	0.5	99'99"	0"	N	0.0	N	0.0	0	0'	0'		24'	30°	N

WB74

On Under	High way Class	Service Level	Route Number	Mile Post	ADT on Inventory Route	Truck ADT PCT	ADT Year	Future ADT	Future ADT Year	Linear Referencing System Route	LRS Sub Route	Fed Aid Route	Nat Hwy System	Base Hwy Network	Strahnet	Fed Lands Highway	Fed Funct Class	National Truck Net	Lane Use Direction	Horizontal Clearance Route Dir	Horizontal Clearance Reverse Dir	Max Vertical Clearance Route Dir	Detour Length
0	8	0	30110	2.50	0	0	2015	0	2035			0000	0	0	0	0	09	N	0	24'06"			2

WB75

Main Span Material	Main Span Design	Appr Span Material	Appr Span Design	Number of Main Spans	Number of Appr Spans	Service On	Service Under	Deck Type	Wearing Surface	Membrane	Fed Deck Protection	Design Load	Oper Rtng Method	Oper Rtng Tons	Invt Rtng Method	Invt Rtng Tons	Design Exception Date	Federal Aid Project	Border State Code	Border State PCT	Border State Structure Identifier
1	11	0	00	1	0	0	5	1	1	0	0	0	N		N						

WB76

Routine Inspection

Freq	Last Inspection Date	Hours On Site	Inspector	Inspection Identification No	Co-Inspector

Structural Adequacy	Deck Geometry	Underclrnce Adequacy	Operating Level	Alignment Adequacy	Waterway Adequacy	Deck Overall	Drain Cond	Drains	Scaling Severity	Scaling Percent	Deck Rutting	Exposed Reinf Steel	Superstruct Overall	Curb	Sidewalks	Paint	Number of Utilities	Substruct Overall	Channel Protection	Culvert	Pier Abutment	Scour	Approach Roadway	Retaining Walls	Pier Protection	Traffic Safety: Bridge Rail	Traffic Safety: Trans	Traffic Safety: Guard Rail	Traffic Safety: Term	Revise Rating	Repair Status	Card Check	Photos	Season	Soundings	Clearances	Monitor Structure
☒	☒	☒	0	9	8	3	9	0	N		8	8	6	7	9	9	0	2	4	9	N	2	9	6	9	0	N	N	N	Y	Y	N		L	Y		N

Sufficiency Rating:

WB77

Fracture Critical / UBIT Inspection

Type	Freq	Last Inspection Date	Hours On Site	Inspector	Inspection Identification No	Co-Inspector

Underwater Inspection

Type	Freq	Last Inspection Date	Hours On Site	Inspector	Inspection Identification No	Co-Inspector

Other Special Inspections

Type	Freq	Last Inspection Date	Hours On Site	Inspector	Inspection Identification No	Co-Inspector
0	60	11/30/2015	1.5	RLS	A1044	KNK

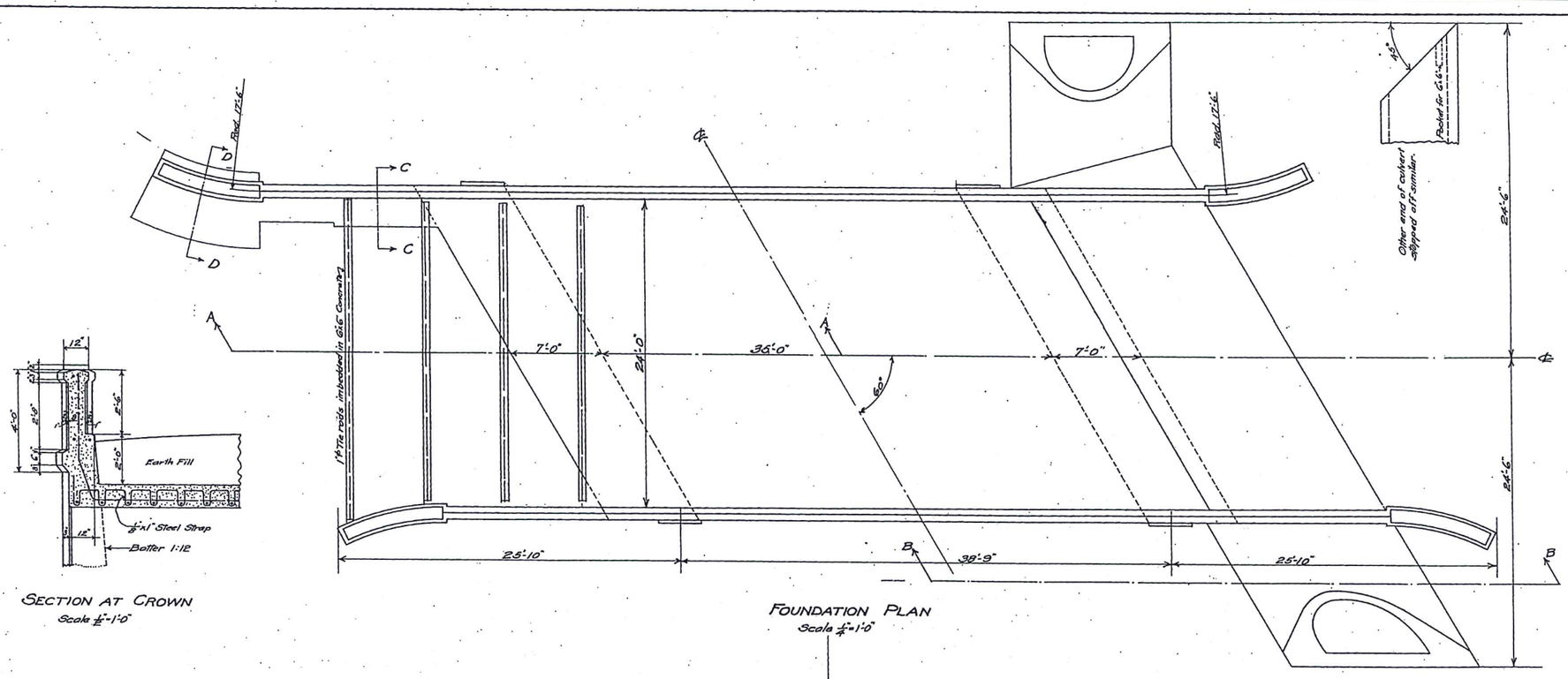
WB78

Water Type	Flood Plain Intrusion	Flood Control	Scour History	Scour Material	Streambed Material	Substruct Stability	Waterway Obstruction	Streambed Stability	Streambed Anabranch	Piers in Water
F	B	N	C	5	1	A	A	N	2	

Proposed Improvements

Service On	Service Under	Work Type	Work Metho	Structure Improve Length	Roadway Width	Lanes On	Lanes Under	Total Costs In Thousands	Structure Cost In Thousands	Roadway Cost In Thousands	Estimate Year	Calc

Inspecting Agency: Code	Inspecting Agency: Number	Seismic Status-Superstruct: Main Biennium	Seismic Status-Superstruct: Approach Biennium	Seismic Status-Substruct: Main Biennium	Seismic Status-Substruct: Approach Biennium



NO.	DATE	REVISION	BY	APPROVED

DESIGNED: DATE:
DRAWN: DATE:
CHECKED: DATE:

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. SCALES SHOWN ARE FOR 22x34 INCH

exeltech
8729 Commerce Pl. Dr. NE
(360) 357-8289

Exhibit No. 3

TASK 300.4 STURCTURAL
BOISE CREEK ARCH BRIDGE
STRUCTURAL RECOMMENDATIONS REPORT

PROJECT NO.

SHEET NO.
EXH-1

Replace Deck Panel

Pedestrian Rail

Pedestrian Rail

Clean Concrete Surfaces

Epoxy Crack Seal

Repair Phase No. 2

SECTION AT CROWN
Scale 1/2"=1'-0"

FOUNDATION PLAN
Scale 1/4"=1'-0"

SECTION CC
Scale 1/2"=1'-0"

SECTION DD
Scale 1/2"=1'-0"

HALF SECTION AA HALF ELEVATION BB
Scale 1/4"=1'-0"

LUTEN DESIGN
BOISE CREEK BRIDGE
STATION 11+62
SURVEY NO. 63 & C
KING COUNTY, WASH.
JUNE 29, 1915.

Approved:
State Highway Commissioner.

A.P. Denton,
County Engineer.

Daniel B. Luten,
Designing Engineer,
Indianapolis, Indiana.

8033 38-94D

NO	DATE	REVISION	BY	APPROVED

DESIGNED: DATE:
DRAWN: DATE:
CHECKED: DATE:

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
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Exhibit No. 4

TASK 300.4 STURCTURAL
BOISE CREEK ARCH BRIDGE
STRUCTURAL RECOMMENDATIONS REPORT

PROJECT NO.

SHEET NO.
EXH-1

EXHIBIT 1 - EXISTING BRIDGE LAYOUT