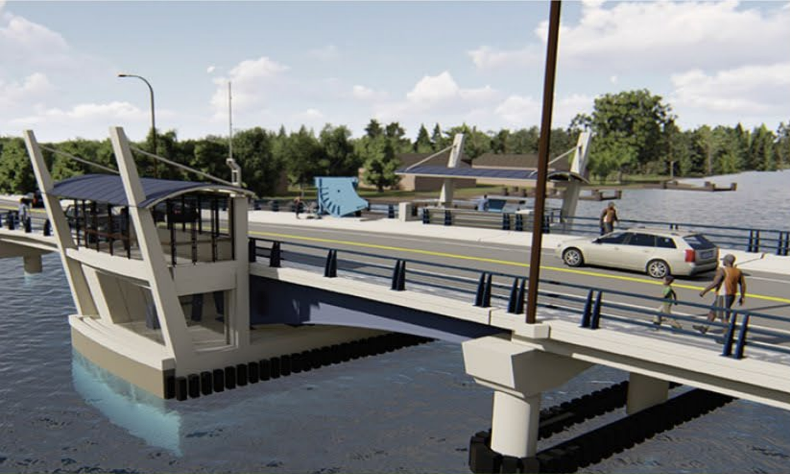
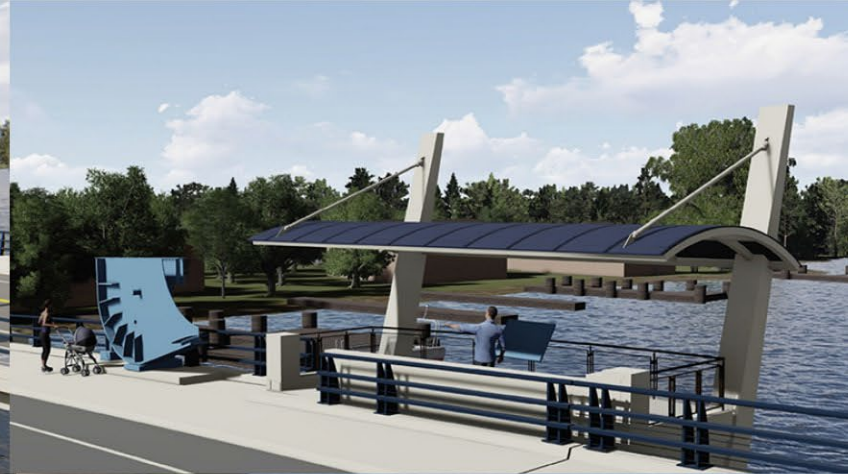




Beckett Bridge Replacement

Tarpon Springs, FL

E. Technical Documents

Bridge Investment Program (BIP)
Grant Application

SEPTEMBER 2022

Contact

Pinellas County Board of County Commissioners

Mona R. Gabriel, P.E., CCM
mgabriel@pinellascounty.org
(727)464-3763

Hardesty &Hanover

Technical Memorandum

JAMES M. PHILLIPS, III
No 36865
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Date:	June 24, 2021
To:	Project File 3231
From:	Jim Phillips, PE
Subject:	**Beckett Bridge (Br. No. 154000)** **Justification to Lower NBI Rating – Substructure**

Objective:

Based on a thorough review of the observed conditions and historical documentation for the Beckett Bridge (Br. No 154000), there are a number of considerations that warrant lowering of the National Bridge Inventory (NBI) Substructure Rating. The following offers background and justification for this recommendation.

Overview:

Beckett Bridge (Br. No. 154000) in north Pinellas County is an existing two-lane bridge along Riverside Drive, also known as North Spring Boulevard, an extension of Tarpon Avenue in Tarpon Springs. The bridge spans Whitcomb Bayou and connects coastal areas to the west and north to downtown Tarpon Springs and major roadways including US 19 to the east. This route is classified as an urban collector and is designated for evacuation. Beckett Bridge is a bascule type movable bridge and must open to allow some boats within Whitcomb Bayou to access the Anclote River and eventually the Gulf of Mexico. (See Figure 1.)

The bridge was originally constructed in 1924, with a total of twenty-five (25) spans and overall length of 398'-0" including a steel bascule span supported on a concrete pier and timber approach spans, with fifteen (15) spans to the west and nine (9) spans to the east, all supported on timber piles. In 1956, the bridge was reconfigured to an overall length of 360'-0" by replacement of the timber approach spans with concrete spans including five (5) spans to the west and four (4) spans to the east of the bascule span. The bascule span has been in service for more than 95 years and approach spans for more than 65 years, a period that far exceeds the 50-year design life.

The bridge was load rated in 1987. Components governing the load rating include the bascule span steel open grid deck and floorbeams. As a result of this load rating, the bridge has had weight restrictions for nearly 35 years, with signs posted for 12-ton limits for single-unit trucks and 15-ton limits for combination trucks.

The bridge is founded on Karst subsurface conditions with a portion of the bridge, including the bascule span and one approach span east of the bascule span, located over a relict sinkhole. The driven pile foundations have a long history of vertical settlement and horizontal movement requiring structural repairs in 1979, major repairs including installation of crutch bents and supplemental piles in 1997, and numerous additional periodic repairs and adjustments subsequent to the crutch bent and supplemental pile installation. The continued settlement and movement requires frequent monitoring, surveying, inspections and maintenance.

Figure 1 - Location Map

Federal regulations establish requirements for bridge inspections and coding of the data to document the condition of each structure carrying highway traffic, collectively known as the National Bridge Inventory (NBI). Procedures for coding of this data is defined in the Federal Highway Administration (FHWA) *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges* (FHWA-PD-96-001), which can be found at the following URL. (https://www.fhwa.dot.gov/bridge/mtguide.pdf).

Inspections of the Beckett Bridge are documented in accordance with these regulations and guidelines in FDOT Bridge Inspection Reports. According to the 2019 Report, dated September 2019, the bridge currently has an NBI Substructure Rating of 6 (Satisfactory Condition) on a scale of 0 to 9. By definition, this rating describes the physical condition of piers, abutments, piles, fenders, and footings including visible signs of distress such as cracking, section loss, settlement, misalignment, scour, collision damage, and corrosion. The NBI Substructure Rating of 6 is inconsistent with other observed conditions and historical documentation not accounted for in the bridge inspection. An NBI Substructure Rating of 4 (Poor Condition) or lower is more appropriate and warranted for the following reasons:

- Foundation design and details (i.e., pile axial capacity and tip elevations) including the structural condition of the more than 95 years old timber piles below the bascule piers, is unknown.
- Existing foundations are unreliable with a long history of vertical settlement and horizontal movement, questionable load carrying capacity and lateral stability, despite implementation of weight restrictions in 1987, addition of supplemental piles at the Bascule Pier, and addition of crutch bents at Bent 6/Rest Pier and Bent 7 in 1997.
- The bridge is founded on Karst subsurface conditions with significant variation, ever changing conditions due to continued degradation of the weathered limestone and calcareous clay, and subsurface features consistent with a relict sinkhole. With a limited

number of available borings and significant variability, there is a risk that actual subsurface conditions at the existing piers are less favorable than that shown in the borings.

- The bridge is considered scour critical with the potential that erosion of the waterway bottom surface material during a major coastal storm event will result in foundation instability and/or further reduce load capacity and result in additional vertical settlement. Foundation stability analysis in the Phase 3 Scour Report from 2006 included a number of unconservative assumptions. The unconservative analysis revealed marginal lateral stability. More accurate assumptions are anticipated to yield a low margin of safety.
- Although the bridge has weight restrictions, there is no mechanism that prevents rogue overweight vehicles from crossing the bridge and overloading the foundation.

The NBI Substructure Rating has a direct effect on the bridge's Sufficiency Rating. The current Sufficiency Rating for Beckett Bridge is 48.3, on a scale of 0 to 100. (NOTE: Sufficiency Rating is a tool used by FHWA, when it allocates federal funds to the states, to help determine whether a bridge that is classified as either Structurally Deficient or Functionally Obsolete should be repaired or replaced.) Update of the NBI Substructure Rating to 4, as recommended, will result in re-classification of the bridge as Structurally Deficient. The bridge currently has a classification of Functionally Obsolete, primarily due to the narrow roadway width. Update of the NBI Substructure Rating will result in a Sufficiency Rating of 18.3, which is more appropriate and consistent with the observed conditions and historical documentation.

The following sections describe the above discussion in greater detail.

Unknown Foundations:

The existing bridge is considered to have "unknown" foundations as there are no pile driving records including pile tip elevations, impact hammer details, blow counts, and preformed hole depths and limited design details including pile design loads and installation criteria required to accurately assess the pile axial capacity and lateral stability including:

- No pile driving records, details or design information for the more than 95 year old timber piles that support the bascule pier, installed in 1924.
- No pile driving records, details or design information for the more than 65 year old 14" square precast, prestressed concrete piles that support the approach spans installed in 1956.
- No pile driving records and limited details and design information for the HP 14x73 steel piles for the crutch bents at Bent 6/Rest Pier and Bent 7, and supplemental steel piles for the Bascule Pier, installed in May 1997 to address vertical settlement and horizontal movement. The piles had a low specified allowable design load of 70 tons, minimum tip elevation for lateral stability of Elev. -35 feet (NGVD) and required pre-formed holes to a depth of Elev. -27 feet that were specified to be grouted after pile driving. The piles for the crutch bents at Bent 6/Rest Pier and Bent 7 are non-redundant with one plumb pile, each side of the bridge (two piles total). The supplemental piles at the Bascule Pier consist of two piles each longitudinally battered at 3 horizontal to 12 vertical on both the north and south sides of the pier footing (four piles total). The piles and connection of the piles to the bascule pier have insufficient capacity to fully support the bridge in the event of complete failure of the existing timber piles. According to 2009 Geotechnical Report, which references an email from Williams Earth Sciences, piles were reportedly driven to depths ranging from Elev. -30 to -200 feet, although there is no copy of the email in the report. The crutch bents

and supplemental piles were, according to the Engineer-of-Record for these repairs, intended as a temporary repair with a maximum service life of ten years. It has been reported by County staff that Bent 7 settled several inches during the installation of adjacent crutch bent piles. Physical evidence of this settlement is evident in the jacking plates installed under the Bent 7 bearings to restore the superstructure to the proper level.

Although a Preliminary Risk Analysis for Reclassifying Unknown Foundations was performed in October 2010, the applicability of this analysis for Beckett Bridge is questionable due to the atypical subsurface conditions and continued observed foundation settlement and movement. The probabilities assumed in the risk analysis are based on typical foundation conditions with no observed distress or geotechnical anomalies.

Weight Restrictions and Load Posting:

The bridge was load rated in 1987. Components governing the load rating include the bascule span steel open grid deck and floorbeams. As a result of this load rating, the bridge has had weight restrictions for nearly 35 years, with signs posted for 12-ton limits for single-unit trucks and 15-ton limits for combination trucks. These rather strict load limits introduce a number of inconveniences to the community with the removal of most trucks and buses from the bridge including school buses, transit buses, garbage trucks, emergency response trucks, delivery trucks, etc. The load restrictions are also inappropriate for an evaluation route. Although the foundations have benefitted from reduced loading, they continue to experience vertical settlement and horizontal movement. There is no mechanism in place to ensure rogue overweight vehicles do not cross the bridge. Occasional trucks suspected to be in excess of the weight restrictions have been observed to cross and may be responsible for the continued settlement. There is risk that a larger settlement event could occur from a heavier rogue vehicle.

History of Foundation Settlement:

Periodic surveys of the bridge have revealed the following periodic movement:

- After addition of crutch bents to Bent 6/Rest Pier, Bascule Pier, and Bent 7 in June 1997, survey indicated initial stable conditions with no settlement through May 1998.
- Between May 1998 and January 2009, surveys indicated vertical settlement of 1/4" at the Bent 6/Rest Pier, 1/2" at the bascule pier, and 5/8" of vertical settlement at Bent 7.
- Corrective action was performed in 2012 to address additional vertical settlement and horizontal movement including bascule span realignment, replacement of span locks, replacement of a cracked pinion shaft hub, installation of a centering device, and limited grinding of the concrete deck and curbs.
- Foundations have remained relatively stable since 2012, while monitoring continues.

Geotechnical:

A series of geotechnical reports including a report by Williams Engineering Sciences, Inc., dated May 2009, corresponding electrical sensitivity imaging survey report by Subsurface Evaluations, Inc., dated April 2009, and a recent report by Tierra, Inc. dated January 2017 for design of a replacement bridge, indicate the presence of Karst features and anomalies including a relict sinkhole within the bridge limits near Bent 6/Rest Pier, Bascule Pier, and Bent 7. Subsurface investigations encountered drilling fluid losses and weight-of-rod conditions that indicate the likelihood of seams and voids within the limestone. The limited number of soil borings indicate significant subsurface variability. Borings BB-3 near Bent 6/Rest Pier and BB-4 near Bascule Pier and Bent 7 show relatively thin layers of stiff to hard weathered limestone alternating with layers of stiff to hard calcareous clay or dense silty sands with loose raveled sandy soils between these strata. With the limited number of borings, significant variability and Karst conditions, there is a risk that subsurface conditions are less favorable than that at the borings. Geotechnical reports also indicate potential for continued "solutioning" (i.e., dissolving) of the Karst limestone and calcareous clay. As such, there is a risk that the existing piles could punch through a thin hard layer due to continuing solutioning.

Without pile driving records, it is not possible to accurately estimate the foundation axial load capacity and margin of safety for lateral stability in these conditions.

Scour and Stability Analysis:

The NBI Substructure Rating is related to the Scour Rating (i.e., vulnerability of a bridge to scour.) [NOTE: A "Scour Critical Bridge" is one with abutment or pier foundations rated as unstable due to (1) observed scour at the bridge site (rating factor of 2, 1, or 0) or (2) scour potential, determined from a scour evaluation study and foundation stability analysis (rating factor of 3).] Although scour at Beckett Bridge is minimal, the bridge is designated as Scour Critical due to potential for foundation instability following a design scour event. This designation considers the unknown foundations.

The following summarizes results from Phase 1 (1994), Phase 2 (1998) and Phase 3 (2006) Scour Evaluation Reports:

- Bridge inspection reports and Phase 1 thru 3 Scour Evaluation Reports indicate that the waterway bottom surface is relatively stable (i.e., no apparent change in bottom surface elevations). There are no scour countermeasures to limit scour, except at the abutments, which include sheet pile bulkheads.
- The Phase 2 Scour Evaluation Report recommended designation of the bridge as Scour Critical, with a notation that "any unknown foundation bridge that was not evaluated thru the UF [University of Florida] studies will become a scour critical bridge. NBI Item 113 is a 3."
- The Phase 3 Scour Evaluation Report reported the following estimated scour depths, used to perform a foundation stability analysis. (See Figure 2 for illustration.):

Scour Data for 100-Year Flood Event					
Pier/Bent No.	Ground Elev. (ft. – NGVD)	Contraction Scour (ft)	Local (Pier) Scour (ft.)	Total Scour (ft.)	Scour Elev. (ft. – NGVD)
Bent 6/ Rest Pier	-7.1	3.6	5.5	9.1	-16.2
Bascule Pier/ Bent 7	-6.8	3.6	17.2	20.8	-27.6
Scour Data for 500-Year Flood Event					
Pier/Bent No.	Ground Elev. (ft. – NGVD)	Contraction Scour (ft)	Local (Pier) Scour (ft.)	Total Scour (ft.)	Scour Elev. (ft. – NGVD)
Bent 6/ Rest Pier	-7.1	6.4	5.7	12.1	-19.2
Bascule Pier/ Bent 7	-6.8	6.4	19.4	25.8	-32.6

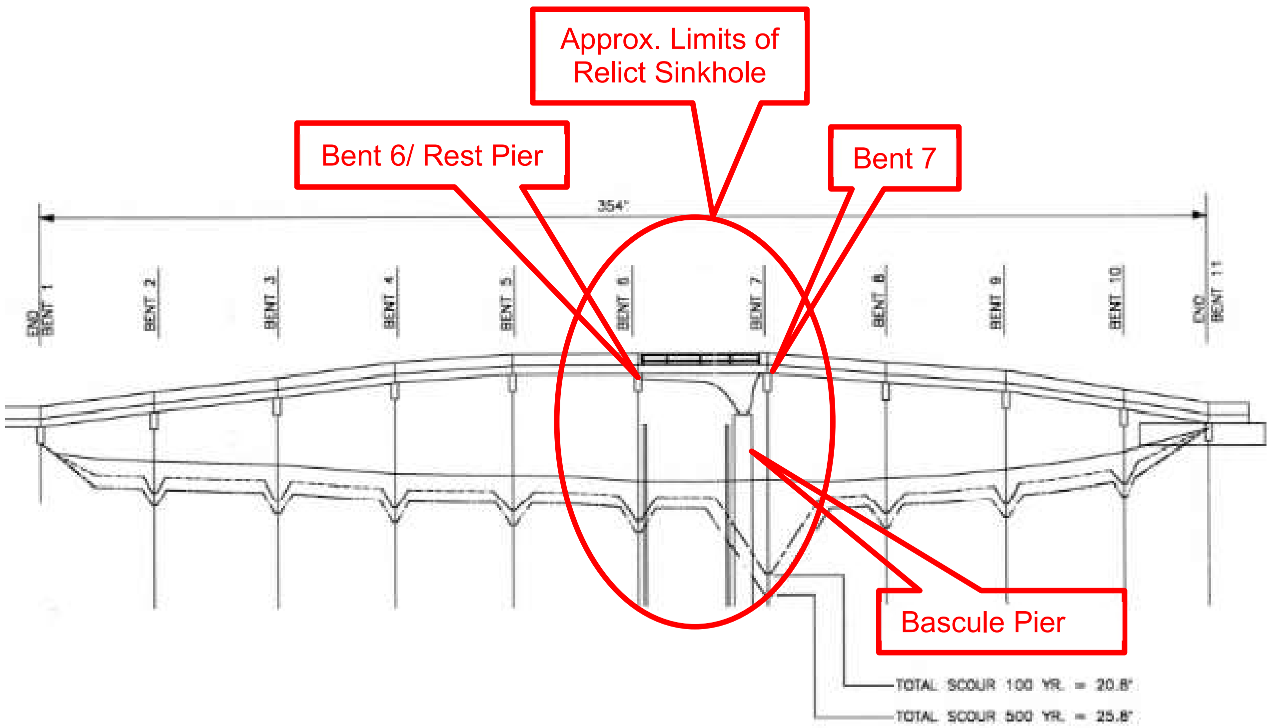


Figure 2 - Longitudinal Section Showing Scour

- The foundation stability analysis in the Phase 3 Scour Evaluation Report was limited in scope, not consistent with current analysis standards, and included several unconservative modelling assumptions:
  - Analysis was performed only for Bent 7 that supports the fixed approach spans immediately east of the Bascule Pier. Bent 7 was identified as the critical pier for the analysis due to the slender bent configuration and maximum scour adjacent to the Bascule Pier. Analysis was not performed for Bent 6/Rest Pier or the Bascule Pier. Stability and alignment of Bent 6/Rest Pier and Bascule Pier are critical for bascule span operation due to strict alignment tolerances. No assessment of lateral movement was performed for these piers.
  - Analysis only evaluated lateral stability and pile structural capacity for the scoured condition (e.g., combined axial and bending forces and buckling potential of the slender piles.) Analysis did not consider loss in skin friction resistance from scour.
  - Analysis for Bent 7 assumed all concrete piles were embedded 1-foot into firm limestone at Elev. -20 feet. Without pile driving records, this assumption cannot be verified. The most recent geotechnical report by Tierra, Inc. dated January 2019 for design of a replacement bridge indicates need for preformed holes through the hard upper limestone and/or dense calcareous clay layers. Based on common pile driving practices in 1956, preformed holes may not have been used and piles may have been driven to the top of the weathered limestone and are not actually embedded into the limestone. There is no discussion or measurement of the existing bridge pile tip elevations in any of the geotechnical reports. Although estimated scour exceeded this depth, the scour depth was capped at the top of the limestone on the basis that

this material is "non-scourable" per an FDOT Guideline dated November 6, 1995. [NOTE: Current practice, outlined in Article 5.2.6 (Rock Scour Rate Determination) of the FDOT Soils and Foundations Handbook, 2021, requires "A rotating erosion test apparatus (RETA) to measure the erosion of intact 4 inch long by 2.4 inch or 4 inch diameter rock core samples. Results from these tests can be used to model the erodibility of cohesive soils and soft rock and estimate scour depths."]

- Analysis does not recognize the presence of the relict sinkhole identified through electrical resistivity imaging performed in 2009, that encompasses Bent 6/Rest Pier, Bascule Pier, and Bent 7 (see Figures 3, 4 and 5).

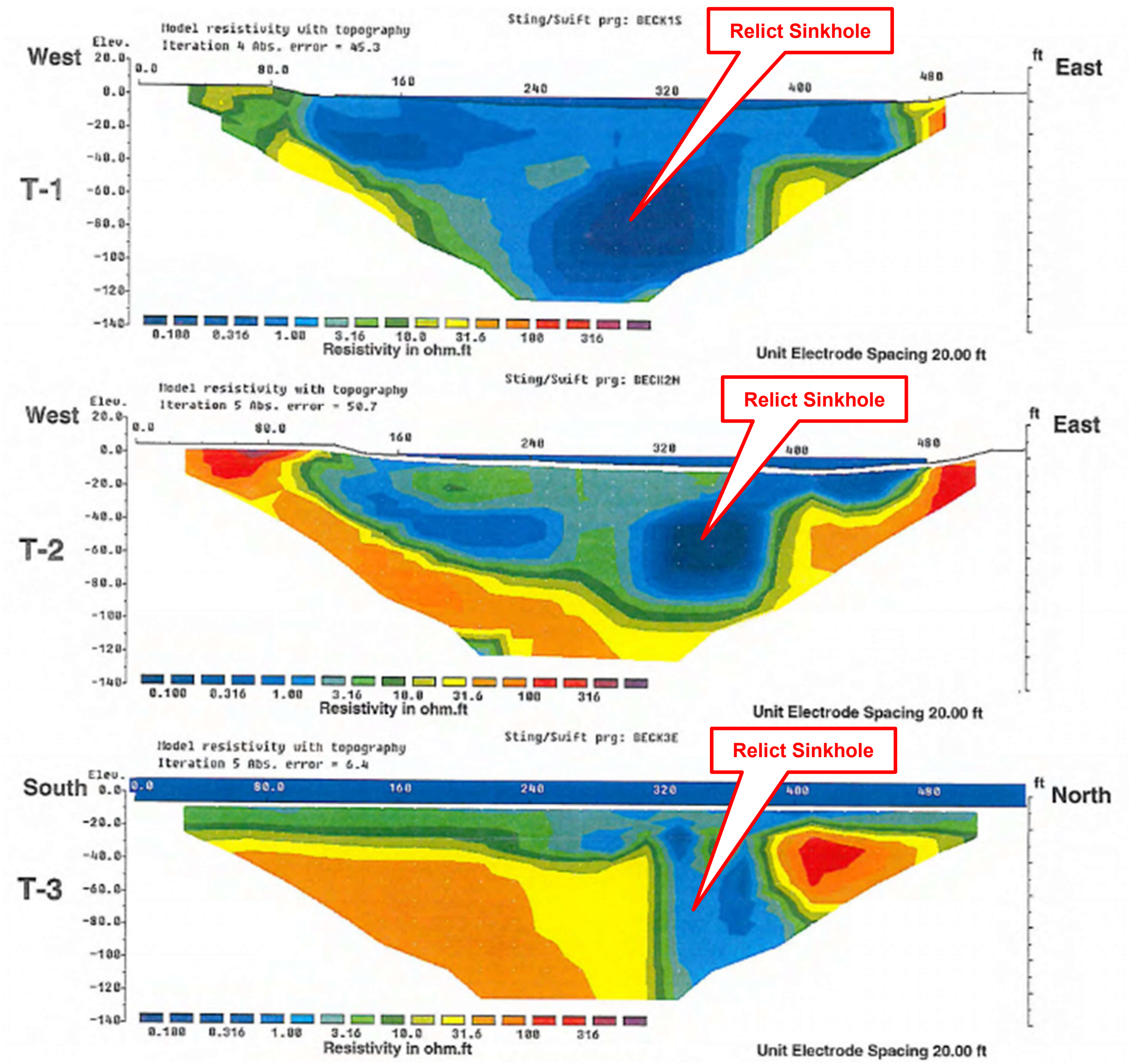


Figure 3A - Electrical Resistivity Imaging Sections

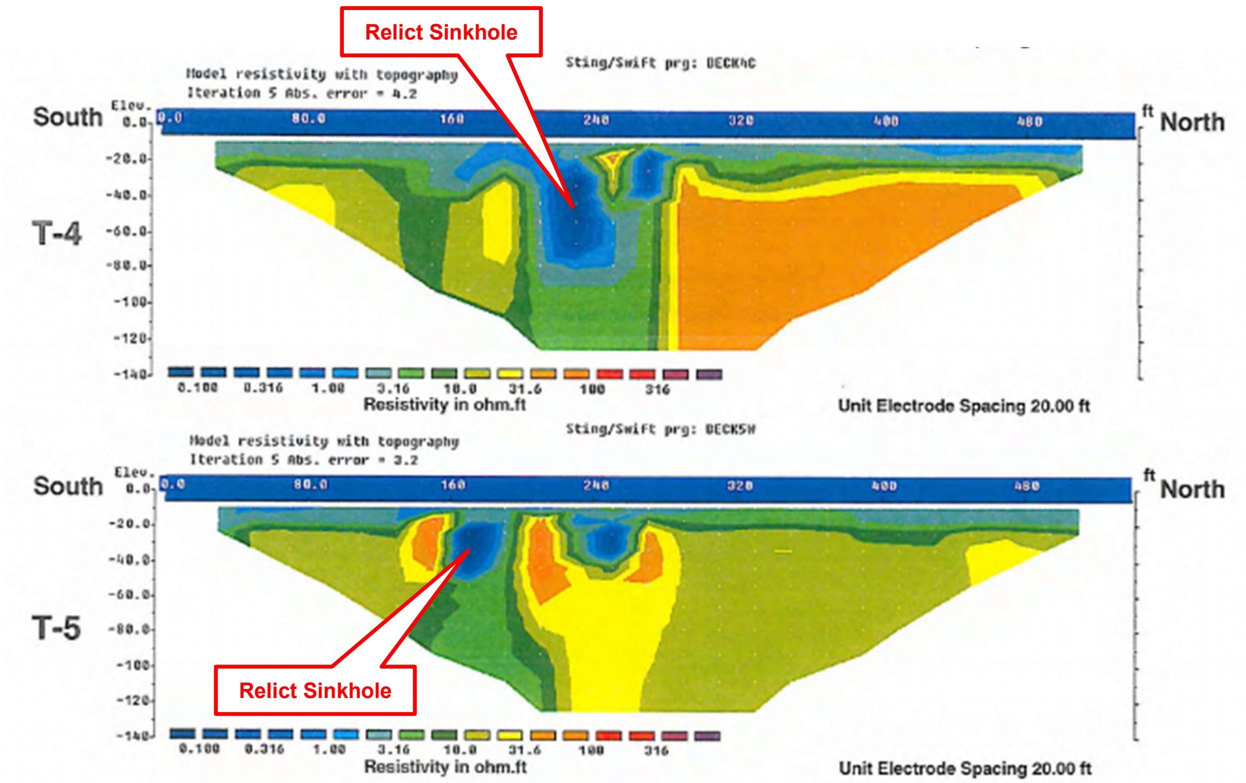


Figure 4 - Electrical Resistivity Imaging Sections (Cont'd)

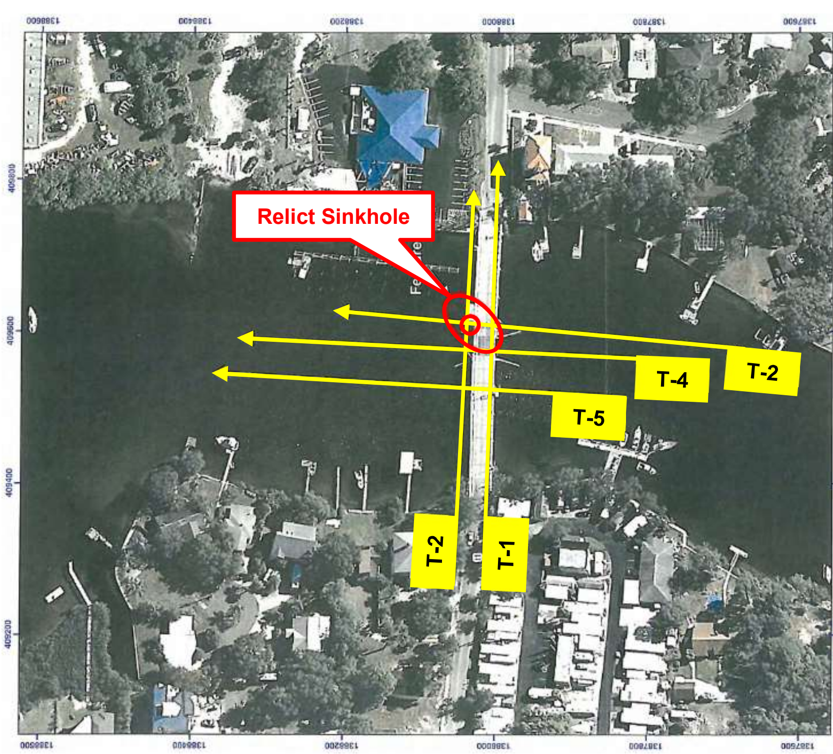


Figure 5 - Electrical Resistivity Imaging Plan View

  - Most recent soil borings, performed by Tierra in 2017 for use in design of a replacement bridge, indicate significant subsurface variability with a combination of thin layers of stiff to hard weathered limestone alternating with layers of stiff to hard calcareous clay or dense silty sands, rather than a single layer of limestone assumed in the analysis.
  - Analysis assumed piles were fixed into the cap, rather than pinned. This is counter to current practice that assumes that a pile embedded only 1-foot into a cap is pinned, not fixed.
  - Analysis only considered lateral forces from stream flow. Wind forces were not included in combination with stream flow forces per standard practice. In addition, longitudinal braking forces were not considered. A small allowance for live load centrifugal force was considered even though the bridge is straight.
  - Analysis considered reduced live loads consistent with weight restrictions and load posting, with no consideration of potential rogue overweight vehicles.
  - Results of the unconservative analysis indicated that the slender concrete piles were at or near the buckling limit with a factor of safety of 2. More accurate loading and boundary condition assumptions are anticipated to yield results with a lower margin of safety.
  - The current foundation margin of safety is unknown.
- The Phase 3 Scour Evaluation Report recommended that a Phase 4 Scour Assessment (i.e., scour countermeasure design) be performed. There are no scour countermeasures that limit scour of the intermediate bents and bascule pier foundations.

CONCLUSIONS AND RECOMMENDATIONS:

The various concerns discussed above support the position that the reliability of the Beckett Bridge foundations is questionable and that the NBI Substructure Rating should be rated 4 (Poor) rather than the current 6 (Satisfactory). The above concerns were not likely considered during preparation of the bridge inspection reports when the NBI Substructure Rating was set. The unique foundation conditions for this bridge warrant consideration in the NBI Substructure Rating.

ATTACHMENTS

1. Bridge Inspection Report (2019)
2. Load Rating Summary (1987)
3. Bridge Plans
   3.1. Permit Sketch (1924)
   3.2. Bridge Repair Plans (1994)
4. Scour Evaluation Reports
   4.1. Phase 1 Scour Evaluation Report (1994)
   4.2. Phase 2 Scour Evaluation Report (1998)
   4.3. Phase 3 Scour Evaluation Report (2006)
5. Settlement Evaluation (2021)
6. Preliminary Risk Analysis for Reclassifying Unknown Foundations (2010)
7. Geotechnical Reports
   7.1. Williams Earth Science Geotechnical Report (2009)
   7.2. Subsurface Evaluations Electrical Resistivity Imaging Report (2009)
   7.3. Tierra Geotechnical Report (2017)
   7.4. Tierra Geotechnical Report (2012)
8. Photos

1. BRIDGE INSPECTION REPORT (2019)

BRIDGE INSPECTION REPORT

PREPARED FOR: FLORIDA DEPARTMENT OF TRANSPORTATION

BRIDGE OWNER: PINELLAS COUNTY

DBi

INSPECTED BY:

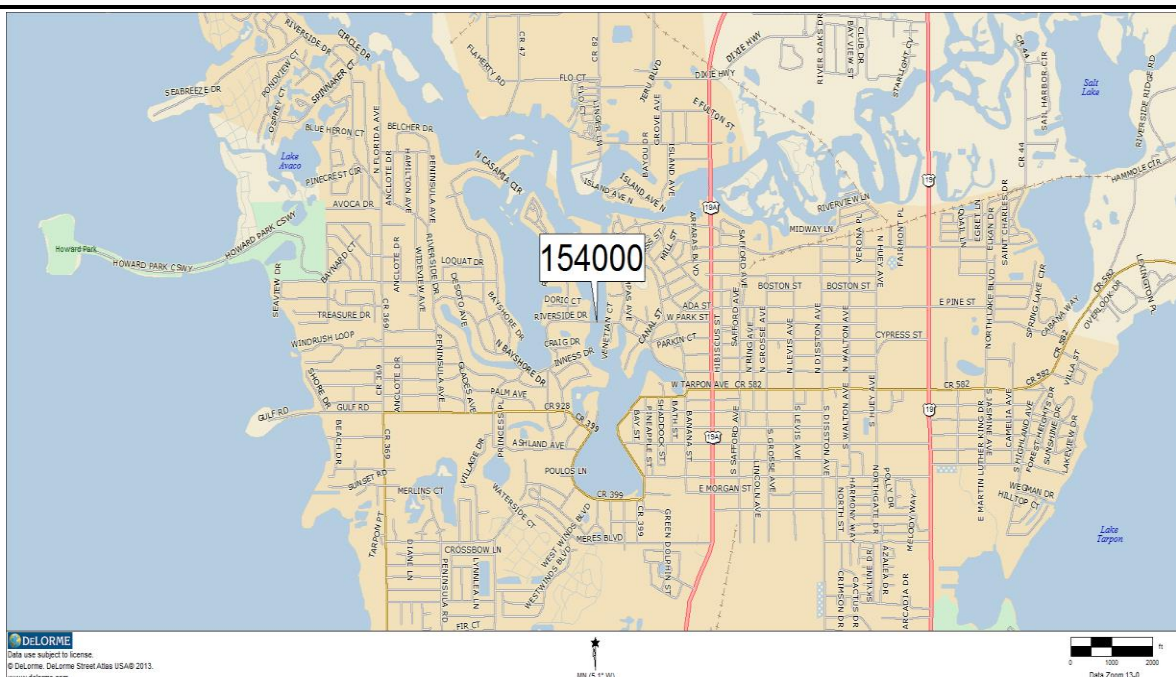
MARLIN ENGINEERING

BRIDGE NO. 154000 | **CONTENTS OF REPORT** | **INSPECTION DATE:** 07/30/2019

	BrM Report	*	U/W Inspection Report
	CIDR		Fracture Critical Data
*	Scour Elevation (Profile)	*	Load Rating Analysis Summary
	Addendum (Element Notes & Photos/Sketches)		

*This section is not included in this report.

BECKETT BRIDGE — **0.4 MI W/O GRAND BLVD**



FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

Structure ID: 154000 **Inspection**

DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

BY:	Marlin Engineering, Inc.	STRUCTURE NAME:	BECKETT BRIDGE
OWNER:	2 County Hwy Agency	YEAR BUILT:	1924
MAINTAINED BY:	2 County Hwy Agency	SECTION NO.:	15 000 004
STRUCTURE TYPE:	3 Steel - 16 Movable-Bascule	MP:	0.766
LOCATION:	0.4 MI W/O GRAND BLVD	ROUTE:	00000
SERV. TYPE ON:	5 Highway-pedestrian	FACILITY CARRIED:	N SPRING BLVD
SERV. TYPE UNDER:	5 Waterway	FEATURE INTERSECTED:	MINETTA BRANCH

[X] FUNCTIONALLY OBSOLETE [ ] STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Special - Movable

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 7/30/2019 UNDERWATER: 6/4/2018

SUFFICIENCY RATING: 48.3
HEALTH INDEX: 83.15

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

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SERV. TYPE ON:	5 Highway-pedestrian	FACILITY CARRIED:	N SPRING BLVD
SERV. TYPE UNDER:	5 Waterway	FEATURE INTERSECTED:	MINETTA BRANCH

[X] THIS BRIDGE CONTAINS FRACTURE CRITICAL COMPONENTS

[X] THIS BRIDGE IS SCOUR CRITICAL

[ ] THIS REPORT IDENTIFIES DEFICIENCIES WHICH REQUIRE PROMPT CORRECTIVE ACTION

[X] FUNCTIONALLY OBSOLETE [ ] STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Special - Movable

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 7/30/2019 UNDERWATER: 6/4/2018

OVERALL NBI RATINGS:

DECK:	7 Good	CHANNEL:	7 Minor Damage
SUPERSTRUCTURE:	6 Satisfactory	CULVERT:	N N/A (NBI)
SUBSTRUCTURE:	6 Satisfactory	SUFF. RATING:	48.3
PERF. RATING:	Good	HEALTH INDEX:	83.15

FIELD PERSONNEL / TITLE / NUMBER: **INITIALS**

Ryan, William - Bridge Inspector (lead)

Jasper, Andrew - Bridge Inspector Assit./BrM Technician

Menne, Karl - Team Leader (CBI #00531) Mechanical and Electrical

Yadav, Nitesh - Assistant Mechanical Bridge Inspector

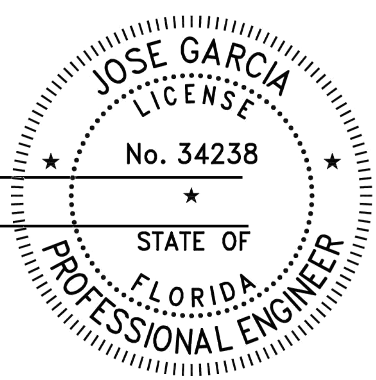
Baraiya, Parthkumar - Assistant Electrical Bridge Inspector

REVIEWING BRIDGE INSPECTION SUPERVISOR:

Fielding, Robert - Senior Project Engineer (PE #53156)

CONFIRMING REGISTERED PROFESSIONAL ENGINEER:

Garcia, Jose - Florida Regional Manager, P.E. # 34238 Consultant - Marlin Engineering, Inc.
1907 N US Highway 301, Suite 160-C
Certificate of Authorization #6104
Tampa Florida 33619



SIGNATURE:

DATE:

The official record of this package has been electronically signed and sealed by Jose Garcia, P.E. on the date adjacent to the seal as required by Rule 61G15-23.004, F.A.C.. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

Structure ID: 154000 **Inspection**

DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

All Elements

DECKS : Decks/Slabs

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	28 / 4	Steel Deck - Open Grid	308	61.6	190	38	2	0.4	0	.	500 sq.ft
0	1000 / 4	Corrosion	0	.	190	100	0	.	0	.	190 sq.ft
0	1020 / 4	Connection	0	.	0	.	2	100	0	.	2 sq.ft
0	8516 / 4	Painted Steel	2721	60.72	1760	39.28	0	.	0	.	4481 sq.ft
0	3420 / 4	Peel/Bub/Crack(Stl Protect Coat)	0	.	600	100	0	.	0	.	600 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	1160	100	0	.	0	.	1160 sq.ft

Element Inspection Notes:

28/4 NOTE: This element quantifies the steel open grid deck of Span 6. Curbs and sidewalks are incidental to the element.

1020; CS3: The open grid deck at the right white shoulder stripe 5ft. west of Floor Beam 6-2 has a 18in. section of the primary bar missing. (2SF)

1000, 3420, 3440; CS2: The grid deck has isolated areas of peeling paint and minor to moderate surface corrosion throughout - INCREASE. (1000 = 150SF ; 3420 = 600SF ; 3440 = 1120SF)

1000, 3440; CS2: Several welds for the open grid deck have moderate surface corrosion intermittently throughout. Refer to Photo 1. REPAIR (1000 = 40SF ; 3440 = 40SF)

INCIDENTAL:
The steel curbs of Span 6 have moderate recurring corrosion in the topside and moderate to heavy corrosion with laminar rust and section loss in the underside. Refer to Photo 2. REPAIR

1000/4 Refer to Parent Element

1020/4 Refer to Parent Element

8516/4 _

3420/4 Refer to Parent Element

3440/4 Refer to Parent Element

DECKS : Decks/Slabs

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	29 / 4	Steel Deck - Conc Fill Grid	266	91.41	20	6.87	5	1.72	0	.	291 sq.ft
0	1000 / 4	Corrosion	0	.	20	100	0	.	0	.	20 sq.ft
0	1080 / 4	Delamination/Spall/Patched Area	0	.	0	.	5	100	0	.	5 sq.ft
0	8518 / 4	Galvanized Steel	9	31.03	20	68.97	0	.	0	.	29 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	20	100	0	.	0	.	20 sq.ft

Element Inspection Notes:

29/4 NOTE: This element quantifies the concrete-filled grid deck of Span 6. The top face of the deck in the eastern 6ft. has been built up in the past to relieve an elevation difference between the deck and concrete filled grid deck.

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

Structure ID: 154000 **Inspection**

DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

CS1: The western 10ft. of the concrete-filled grid deck has minor wear, exposing the tops of the grid deck bars.

1000, 3440; CS2: The tops of the grid deck bars have minor surface corrosion in the exposed areas. (1000 = 20SF ; 3440 = 20SF)

1080, CS3: The eastern portion of the concrete filled deck has spalls up to 26in. x 8in. x 1/2in. - NEW. (5SF)

INCIDENTAL:
The concrete grid deck stay in place forms have heavy corrosion on the outer 3ft. of the north and south ends.

1000/4 Refer to Parent Element

1080/4 Refer to Parent Element

8518/4 _

3440/4 Refer to Parent Element

DECKS : Joints

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	306 / 4	Other Joint	28	53.85	24	46.15	0	.	0	.	52 ft
0	2370 / 4	Metal Deterioration or Damage	0	.	24	100	0	.	0	.	24 ft

Element Inspection Notes:

306/4 NOTE: This element quantifies the armored joint at Rest Pier 6 and the traffic plate joint at Bascule Pier 7.

CS1: The armored angle over Rest Pier 6 is missing 1ft. per side adjacent to the curbs due to two 1ft. x 4in. add-on sections to the open steel grid deck.

2370; CS2: The paint system for both joints is moderately worn with areas of minor surface corrosion. (24FT)

2370/4 Refer to Parent Element

MISCELLANEOUS : Channel

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8290 / 4	Channel	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8290/4 NOTE: This structure is Scour Critical. Refer to Table 1 in the 2018 Addendum for 100ft. offset measurements.

CS1: The main span leaf does not clear the near fender in the full open position.

The following was noted in the 2018 underwater team:

INCIDENTAL:
There is a timber pile stub extending up 4ft. from the groundline abutting the east face (channel side) of the 3rd pile from the north on the east fender. This does not affect vessel traffic.

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SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	205 / 4	Re Conc Column	0	.	0	.	2	100	0	.	2 each
0	1130 / 4	Cracking (RC and Other)	0	.	0	.	2	100	0	.	2 each

Element Inspection Notes:

205/4 NOTE: This element quantifies two columns under the web wall in Bascule Pier 7. (Bent 7 also includes five incidental prestressed piles in the bent just to the east. Refer to Element 226 Pre Conc Pile.)

The following was noted in the 2018 underwater team:

1080; CS3: Column 7-1 northeast corner at top of marine growth has spall/void (combination of several voids), 5ft. 3in. x 18in. x 4in.; the spall extends behind the mounting bracket for the helper piles.

1130, 1120; CS3: Column 7-1 has vertical and horizontal cracks up to 1/16in. wide some with corrosion bleedout that extend a maximum of 8in. into marine growth. (1130 = 1EA.)

1080, 1120; CS3: Column 7-2 at the build out on east face 16in. below top of column has a delamination/spall, 5ft. x 9in. x 1in., with corrosion bleedout.

1120; CS3: There is a construction joint along the west face of Column 7-2 up to 1-1/4in. deep located 10in. below top of marine growth, with corrosion bleedout.

1130, 1120; CS3: Column 7-2 north, west and east faces have vertical and horizontal cracks up to 1/16in. wide with corrosion bleedout that extend a maximum of 8in. into marine growth. (1130 = 1EA)

1130/4 Includes 1080 and 1120.

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	220 / 4	Re Conc Pile Cap/Ftg	27	96.43	0	.	1	3.57	0	.	28 ft
0	1080 / 4	Delamination/Spall/Patched Area	0	.	0	.	1	100	0	.	1 ft

Element Inspection Notes:

220/4 NOTE: This element quantifies the west portion of Bascule Pier 7 which supports the bascule leaf.

1080; CS3: The west face of Bascule Pier 7 at the top of the fender beneath Main Girder 6-1 has a spall/delamination 6in. x 8in. x 1in. with exposed trash steel. (1FT)

1080/4 Refer to Parent Element

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	225 / 4	Steel Pile	3	75	0	.	1	25	0	.	4 (EA)
0	1000 / 4	Corrosion	1	50	0	.	1	50	0	.	2 (EA)
0	8516 / 4	Painted Steel	236	91.47	0	.	22	8.53	0	.	258 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	22	100	0	.	22 sq.ft

Element Inspection Notes:

225/4 NOTE: This element quantifies the two HP-14 piles supporting the Tenders House

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and the two piles below Bascule Pier 7 web wall. The steel H-piles are jacketed HP-14. Below the jacket, the H-piles are coated with epoxy. These piles are in good condition. Refer to Element 8298 Pile Jacket Bare in Unit 0 for additional information.

1000, 3440; CS3: The west Tender House pile has isolated areas of heavy corrosion with laminar rust above water. Refer to Photo 3. REPAIR (1000 = 1EA ; 3440 = 22SF)

1000/4 Refer to Parent Element

8516/4 _

3440/4 Refer to Parent Element

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8298 / 4	Pile Jacket Bare	4	100	0	.	0	.	0	.	4 (EA)

Element Inspection Notes:

8298/4 NOTE: This element quantifies the two jackets for the Tenders House piles and the two jackets for the bascule pier web wall piles.

The two piles under the web wall on Bascule Pier 7 are H-piles (per 1997 report) and have cylindrical jackets. These jackets are in good condition with no washouts or exposed base piles.

Jackets on the steel HP-14 extend to the groundline on the four helper piles (two each) attached to Columns 7-1 and 7-2 outboard faces. The other six H-pile jackets (crutch piles and Tender House) go into the groundline, except each Tender House pile is 12in. above the groundline and Crutch 6-1 within 3in. above groundline.

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8389 / 4	Timber Fender/Dolphin	126	71.19	0	.	51	28.81	0	.	177 ft
0	1140 / 4	Decay/Section Loss	0	.	0	.	51	100	0	.	51 ft

Element Inspection Notes:

8389/4 INCIDENTAL:
The top plank for the west fender, (below the main span) is rotten, deteriorated and is missing the south 6ft. Refer to Photo 4. REPAIR

The southeast fender system has loose catwalk planks intermittently throughout - DECREASE. Refer to Photo 5. REPAIR

East (previously noted as west) fender is missing the lower wale from Piles 6-1 to 6-9, with hardware is in-place. (Could not be verified. Submerged at time of inspection).

The west fender north hand railing 4th post from the north is broken at at the base. Refer to Photo 6. REPAIR

The southernmost handrail for the west fender is loose - NEW. Refer to Photo 7. REPAIR

The following was noted by the 2018 underwater team:
1140; CS3: The piles have marine borer activity with 50% or more section remaining. (49FT)

The north pile on the west fender has up to 25% section remaining. (2FT)

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INCIDENTAL:
The lower wales have marine borer activity with up to 50% section loss.

Between the fender and Pier 7 web wall there are several vertical H-pile spacers with moderate corrosion that extend 6in. below water.

East fender, 3rd panel from the south, lower wale is missing.

CORRECTIVE ACTION TAKEN:
The loose catwalk planks on the west fender and the northern half of the east fender have been repaired.

1140/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8540 / 4	Open Gearing	4	50	4	50	0	.	0	.	8 (EA)
0	9010 / 4	Mechanical Alignment	0	.	1	100	0	.	0	.	1 (EA)
0	9040 / 4	Mechanical Wear/Abrasion	0	.	3	100	0	.	0	.	3 (EA)

Element Inspection Notes:

8540/4 NOTE: This element quantifies the eight gear sets including rack sets. Refer to the Machinery Layout Diagram and Table A in the Addendum.

9040; CS2: Both rack and pinion sets (P/R-5N and P/R-5S) and gear sets P/G-3S and P/G-4S have minor cross bearing wear. (3EA)

The outboard pinions (P-5N and P-5S) have excessive wear due to end loading.

9010; CS2: P-5N has up to 90% contact with the north rack gear, and has axial misalignment up to 11/16in. to the north - (1EA)

9010/4 Includes 9040.

9040/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8541 / 4	Speed Reducers	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8541/4 NOTE: Refer to the Machinery Layout Diagram and Table B in the Addendum.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8542 / 4	Shafts	7	100	0	.	0	.	0	.	7 (EA)

Element Inspection Notes:

8542/4 NOTE: Refer to the Machinery Layout Diagram and Table C in the Addendum.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8543 / 4	Shaft Bearings and Couplings	18	100	0	.	0	.	0	.	18 (EA)

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Element Inspection Notes:

8543/4 NOTE: This element quantifies fifteen bearings and three couplings. Refer to the Machinery Layout Diagram and Table D in the Addendum.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8544 / 4	Brakes	2	100	0	.	0	.	0	.	2 (EA)

Element Inspection Notes:

8544/4 NOTE: The brakes and span locks are hydraulically operated by a common hydraulic power unit (HPU). Refer to Elements 8547, Hydraulic Power Unit and 8548, Hydraulic Piping System, for additional comments on these components. Refer to the Machinery Layout Diagram and Table E in the Addendum.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8546 / 4	Span Drive Motors	2	100	0	.	0	.	0	.	2 (EA)

Element Inspection Notes:

8546/4 NOTE: There is no backup system emergency drive at the bridge site. A truck mounted portable generator is available when needed. The generator switch and outlet are located on the power panel at the northeast corner of the bridge. Refer to Tables F and G and the Machinery Layout Diagram in the Addendum.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8547 / 4	Hydraulic Power Unit	0	.	1	100	0	.	0	.	1 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)

Element Inspection Notes:

8547/4 NOTE: The brakes and span locks are operated by a common hydraulic power unit (HPU). This element quantifies the pump, electric motor, valves, filters, reservoir, manual pump and any accessories as one system. Refer to Table H the Addendum.

1000, CS2: The hydraulic power unit (HPU) motor and manifolds have isolated areas of minor surface corrosion - NEW. (1EA)

1000/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8548 / 4	Hydraulic Piping System	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8548/4 NOTE: The hydraulic piping and flexible hoses that run from the HPU to the brakes and span locks were inspected under this element. Refer to Table H in the Addendum.

CS1: The hydraulic piping for the south span lock is missing a clip at the south attachment under the structure - NEW. Refer to Photo 8. REPAIR

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SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8549 / 4	Hydraulic Cylinders	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	2	100	0	.	0	.	2 (EA)

Element Inspection Notes:

8549/4 NOTE: This element quantifies the cylinders that drive the span locks. Refer to Table I in the Addendum.

1000; CS2: The south and north lock cylinder housings have minor surface corrosion in the fasteners. (2EA)

1000/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8560 / 4	Locks	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)
0	9030 / 4	Clearances	0	.	1	100	0	.	0	.	1 (EA)

Element Inspection Notes:

8560/4 NOTE: Refer to Tables J and K in the Addendum.

9030; CS2: The south lock receiver has excessive clearance up to (0.050in.) - DECREASE. Refer to Photo 9. REPAIR (1EA)

1000; CS2: The north and south lockbars and couplings have areas of minor surface corrosion.

The north lock receiver has laminar rust in one of four fasteners. Refer to Photo 10. REPAIR ALL (1EA)

CORRECTIVE ACTION TAKEN:
The south rear guide bottom shoe have been repaired.

1000/4 Refer to Parent Element

9030/4 Includes 1000.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8561 / 4	Live Load Shoes	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)
0	9030 / 4	Clearances	0	.	1	100	0	.	0	.	1 (EA)

Element Inspection Notes:

8561/4 NOTE: Refer to Table L in the Addendum.

1000; CS2: Both live load shoe assemblies have minor to moderate surface corrosion. REPAIR (1EA)

9030; CS2: The south live load shoe has a 3/16in. gap at rest position with slight movement during live loads. Refer to Photo 11. REPAIR (1EA)

1000/4 Refer to Parent Element

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9030/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8562 / 4	Counterweight Support	0	.	1	100	0	.	0	.	1 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)

Element Inspection Notes:

8562/4 NOTE: This element quantifies the steel frame around the counterweight.

1000; CS2: The bottom east edge of the steel counterweight frame has areas of minor to moderate surface corrosion. (1EA)

1000/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8564 / 4	Counterweight	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8564/4 NOTE: Due to the design configuration, when the span is fully open, the Span 6 counterweight is contacting the rear of the bascule pier.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8565 / 4	Trunnion/Straight & Curved Track	0	.	2	100	0	.	0	.	2 (EA)
0	9030 / 4	Clearances	0	.	2	100	0	.	0	.	2 (EA)

Element Inspection Notes:

8565/4 9030; CS2: Due to attempts at restoration of the pintels through weldments added to increase their area, there is non-uniform contact within the pintel sockets of the curved segmental girders. (2EA)

9030/4 Refer to Parent Element

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8570 / 4	Transformers	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8570/4 _

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8571 / 4	Submarine Cable	2	100	0	.	0	.	0	.	2 (EA)

Element Inspection Notes:

8571/4 NOTE: Two cables enter the groundline at the north end of Bent 6 and the west Tender House H-pile.

INCIDENTAL:
The submarine cable restraint at Rest Pier 6 have minor surface corrosion at the fasteners

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NEW. Refer to Photo 12. REPAIR

The far submarine cable cabinet door has moderate surface corrosion on the interior face.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8574 / 4	Control Console	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8574/4 NOTE: The control console has a selector switch which selects Drive A or Drive B. If this switch is placed in the “Drive B” position, then the Drive A “fault indicator” will illuminate. The control circuit appears to be connected such that the non-selected drive is indicated as a “fault condition” .

CS1: The control console is missing several nameplates for switches and indicator lights. Refer to Photo 13. REPAIR

Both Drive cabinets and MCC have wire nut connections - INCREASE.

The belt sprocket for the span position sensor has heavy surface corrosion. Refer to Photo 14. REPAIR

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8581 / 4	Operator Facilities	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8581/4 NOTE: Refer to Table M in the Addendum.

Table M refers to safety and miscellaneous equipment available at the structure. This bridge is un-manned and additional equipment is present on the County vehicles used when openings are requested.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8590 / 4	Resistance Barriers	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8590/4 NOTE: Refer to Tables N and O in the Addendum.

CS1: Several of the barrier gate lens fasteners have moderate surface corrosion. Refer to Photo 15. REPAIR

The barrier gate cable stay turnbuckles are too short and have missing jam nuts; threads may be run out too far. Refer to Photo 16. REPAIR

The SO cord at the barrier housing is not properly restrained - NEW. Refer to Photo 17. REPAIR

INCIDENTAL:
The tip extension of the barrier gate has minor to moderate recurring corrosion.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8591 / 4	Warning Gates	2	100	0	.	0	.	0	.	2 (EA)

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Element Inspection Notes:

8591/4 NOTE: Refer to Tables P and Q in the Addendum.

CS1: Several of the far warning gate lens fasteners have heavy surface corrosion. Refer to Photo 18. REPAIR

CORRECTIVE ACTION TAKEN:
Loose wire management fasteners at near warning gate has been repaired.

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8592 / 4	Traffic Signals	3	75	1	25	0	.	0	.	4 (EA)
0	9020 / 4	Operation	0	.	1	100	0	.	0	.	1 (EA)

Element Inspection Notes:

8592/4 NOTE: This element quantifies the four traffic signals; one at each corner of the structure.

CS1: All traffic signal light housings have peeling paint.

9020; CS2 : The far left traffic signals are pointed away from roadway - NEW. Refer to Photo 19. REPAIR (1EA)

CORRECTIVE ACTION TAKEN :
The far left traffic signal have been repaired.

9020/4 Refer to Parent Element

SUPERSTRUCTURE : Other Elements

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8572 / 4	Conduit & Junction Box	1	100	0	.	0	.	0	.	1 (EA)

Element Inspection Notes:

8572/4 NOTE: This element quantifies the electrical conduit and junction boxes as one system. The grounding cables are incidental to this element.

The access door of the submarine cable termination cabinet at Rest Pier 6 is partially obstructed by the fender access ladder but is still accessible for inspection/maintenance.

CS1: The traffic signal conduit beneath Span 1 has heavy surface corrosion and laminar rust. Refer to Photo 20. REPAIR

The junction box on the south side of Rest Pier 6 has water ponding in bottom, and there are corroded terminal fasteners - NEW. Refer to Photo 21. REPAIR

INCIDENTAL:
The grounding cables for all warning gates, traffic signals and the resistance barrier are broken or missing. Refer to Photo 22. REPAIR

The far submarine cable cabinet door has moderate surface corrosion on interior stiffener - NEW.

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SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	107 / 4	Steel Opn Girder/Beam	46	55.42	0	.	37	44.58	0	.	83 ft
0	1000 / 4	Corrosion	0	.	0	.	37	100	0	.	37 ft
0	8516 / 4	Painted Steel	0	.	901	83.58	177	16.42	0	.	1078 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	901	100	0	.	0	.	901 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	177	100	0	.	177 sq.ft

Element Inspection Notes:

107/4 NOTE: This element quantifies the main girders of Span 6, which are fracture critical. Refer to the Fracture Critical section in the Addendum. There are welded repair plates in the vicinity of the rolling tracks and drilled holes where the span drive machinery had once been located.

1000, 3440; CS3: The web of Main Girder 6-1 has a 1in. diameter painted corrosion hole with recurring moderate surface corrosion at Floor Beam 6-1. Refer to Photo 23. (1000 = 1FT ; 3440 = 1SF)

The north edge of Main Girder 6-2 top flange has painted-over knife edging with recurring minor surface corrosion intermittently throughout. There are several isolated painted corrosion holes up to 1-1/2in. diameter with minor recurring surface corrosion in the north side of the top flange and web on each side of Floor Beam 6-2. Refer to Photo 24. (1000 = 16FT ; 3440 = 32SF)

The top flanges, lower portions of the webs and bottom flanges have painted-over pitting with corrosion holes to 2in. x 1in. near the curved tracks. (1000 = 6FT ; 3440 = 24SF)

The built-up bottom flanges and lower portions of the webs of the main girders have areas of recurring heavy active corrosion in the vicinity of Floor Beam 6-2 and 6-3 and at the base of several vertical stiffeners. Refer to Photo 25. (1000 = 14FT ; 3440 = 120SF)

REPAIR ALL

3410, CS2: The paint system has chalked - NEW. (901SF)

1000/4 Refer to Parent Element

8516/4 _

3410/4 Refer to Parent Element

3440/4 Refer to Parent Element

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	113 / 4	Steel Stringer	196	79.67	0	.	50	20.33	0	.	246 ft
0	1000 / 4	Corrosion	0	.	0	.	50	100	0	.	50 ft
0	8516 / 4	Painted Steel	0	.	685	87.82	95	12.18	0	.	780 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	685	100	0	.	0	.	685 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	95	100	0	.	95 sq.ft

Element Inspection Notes:

113/4 NOTE: This element quantifies the stringers of Span 6. The sidewalk support channels are incidental to this element.

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CS1: The stringers have 3/4in. drilled holes in the top flanges intermittently throughout.

1000; CS3: The bottom faces of the bottom flanges have painted-over pitting up to 3/16in. deep. (20FT)

1000, 3440; CS3: Stringers 6-2 through 6-6 at Floor Beam 6-2 junctions have areas of moderate to heavy recurring surface corrosion. Refer to Photo 26. REPAIR (1000 = 30FT ; 3440 = 95SF)

3410, CS2: The paint system has chalked - NEW. (685SF)

INCIDENTAL:
The sidewalk support channels have isolated areas of moderate to heavy corrosion with laminar rust. Refer to Photo 27. REPAIR

1000/4 Refer to Parent Element

8516/4 _

3410/4 Refer to Parent Element

3440/4 Refer to Parent Element

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	152 / 4	Steel Floor Beam	17	28.81	0	.	42	71.19	0	.	59 ft
0	1000 / 4	Corrosion	0	.	0	.	42	100	0	.	42 ft
0	8516 / 4	Painted Steel	0	.	330	81.48	75	18.52	0	.	405 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	330	100	0	.	0	.	330 sq.ft
0	3420 / 4	Peel/Bub/Crack(Stl Protect Coat)	0	.	0	.	5	100	0	.	5 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	70	100	0	.	70 sq.ft

Element Inspection Notes:

152/4 NOTE: This element quantifies the floor beams of Span 6, which are fracture critical. Refer to the Fracture Critical section in the Addendum. The gusset plates, lateral bracing and cantilevered sidewalk supports are incidental to this element.

1000; CS3: The floor beams have painted-over pitting up to 1/4in. deep in the bottom faces of the bottom flanges and in the top flanges at the stringer connections. (30FT)

1000, 3420, 3440; CS3: Floor Beam 6-2 has isolated areas of peeling paint with minor to moderate corrosion at centerline and at Main Girder 6-1 and 6-2 junctions. (1000 = 5FT ; 3420 = 5SF ; 3440 = 35SF)

1000, 3440; CS3: Floor Beam 6-2 has areas of heavy corrosion and/or laminar rust at several stringer junctions. Refer to Photo 28. REPAIR (1000 = 5FT ; 3440 = 35SF)

1000; CS3: Floor Beam 6-3, at the southernmost vertical stiffener, has painted corrosion holes up to 1in. x 3/4in.: three in the lower portion of the web and two in the bottom flange. (1FT)

The riveted angle attaching Floor Beam 6-2 to Main Girder 6-1 has heavy delaminative corrosion on the west end - NEW. Refer to Photo 29. REPAIR (1FT)

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

Structure ID: 154000 **Inspection**

DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

3410, CS2: The paint system is chalked - NEW. (330SF)

INCIDENTAL:
The center gusset plate and fasteners at Floor Beam 6-2 lateral bracing have heavy corrosion with knife edge at stringer connection - INCREASE. Refer to Photo 30. REPAIR

The cantilevered sidewalk supports have moderate to heavy corrosion with laminar rust at the sidewalk and curb junctions. Refer to Photo 31. REPAIR

1000/4 Refer to Parent Element

8516/4 _

3410/4 Refer to Parent Element

3420/4 Refer to Parent Element

3440/4 Refer to Parent Element

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	330 / 4	Metal Bridge Railing	74	90.24	8	9.76	0	.	0	.	82 ft
0	1000 / 4	Corrosion	0	.	8	100	0	.	0	.	8 ft
0	8516 / 4	Painted Steel	74	82.22	16	17.78	0	.	0	.	90 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	16	100	0	.	0	.	16 sq.ft

Element Inspection Notes:

330/4 NOTE: This element quantifies the metal bridge rails along Span 6.

1000, 3440; CS2: There are minor scrapes with minor surface corrosion on Posts 6-5 and 6-6 left, due to contact during openings. (1000 = 2FT ; 3440 = 4SF)

The bridge rail has minor surface corrosion intermittently throughout. (1000 = 6FT ; 3440 = 12SF)

1000/4 Refer to Parent Element

8516/4 _

3440/4 Refer to Parent Element

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8563 / 4	Access Ladder & Platform	1	25	2	50	1	25	0	.	4 (EA)
0	1000 / 4	Corrosion	0	.	2	100	0	.	0	.	2 (EA)
0	1020 / 4	Connection	0	.	0	.	1	100	0	.	1 (EA)

Element Inspection Notes:

8563/4 NOTE: This element quantifies the two ladders at Rest Pier 6, one set of stairs at Bascule Pier 7 and one platform on the north side of Bascule Pier 7. Lighting of the machinery area is incidental to this element.

1000; CS2: The two fender access ladders at Pier 6 have minor recurring surface corrosion in the fasteners at the attachment to the deck. (2EA)

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Structure ID: 154000 **Inspection**

DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

1020; CS3: The stair from the Tenders House to the platform on the north side of Bascule Pier 7 has pack rust and broken welds in several of the stair tread to stringer attachments. Refer to Photo 32. REPAIR. (1EA)

1000/4 Refer to Parent Element

1020/4 Refer to Parent Element

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8580 / 4	Navigational Lights	0	.	0	.	1	100	0	.	1 (EA)
0	9020 / 4	Operation	0	.	0	.	1	100	0	.	1 (EA)

Element Inspection Notes:

8580/4 NOTE: This element quantifies the six fender mounted lights, two draw span tip swing lights and two flood lights for the clearance gauges as one system.

9020; CS3: The UPS backup battery system for the navigational lights has been removed. Refer to Photo 33. REPAIR (1EA)

CORRECTIVE ACTION TAKEN:
The northeast fender light has been repaired

9020/4 Refer to Parent Element

Total Number of Elements*: 37
*excluding defects/protective systems

Structure Notes

OWNER: PINELLAS COUNTY

TRAFFIC RESTRICTIONS: This structure is posted at both approaches as follows: Single Unit - 12 tons, Combination - 15 tons and Truck and Trailer - 15 tons.
According to the load rating dated 01/16/1987, the structure should be posted at or below the following: SU2 -12 tons, SU3 - 19 tons, SU4 - 18 tons, C3 - 20 tons, C4 - 21 tons and C5 - 23 tons. Refer to posting photos in the Addendum.

Structure inventoried west to east.

This structure is on a 12 month inspection frequency for Movable and Fracture Critical components and for NBIS Item 70 - Posting being rated 4 or less.

Elements 107 - Paint Stl Opn Girder and 152 - Paint Stl Floor Beam are fracture critical.

The structure is not manned. To obtain an opening, a two (2) hour advance notice is required call (727) 422-5836.

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection/CIDR Report
(OTHER SPECIAL INSPECTION REPORT)

Structure ID: 154000 **Inspection**
DISTRICT: D7 - Tampa **INSPECTION DATE: 7/30/2019 MAQZ**

INSPECTION NOTES: **MAQZ** **7/30/2019**

Sufficiency Rating Calculation Accepted by knmeiwr at 08/14/2019 14:36:14 PM

LOAD CAPACITY EVALUATION:
The load rating dated 01/16/1987 applies to the current condition of this bridge.

This is a Special-Movable Inspection. Only Unit 0 elements are included.

Unit 0 - Quantities will include those bridge elements which are within the limits of the bascule pier and the main span. (i.e., steel bridge rails, bascule pier, mechanical & electrical related operational equipment, tender's facilities, et cetera). Inspections will include the fracture critical elements along with those aforementioned bridge elements which are within the limits of the bascule pier. Traffic control elements related to the movable span (i.e., traffic gate assemblies, traffic signaling assemblies, over-roadway traffic assemblies, et cetera) which are mounted to and/or located on the approach spans will be quantified and inspected when the movable span is scheduled for inspection.

Unit 1 - Quantities will include those bridge elements which are within the limits of the approach spans. (i.e., concrete bridge rails, related expansion joints, elastomeric bearing assemblies, et cetera)

The asphalt overlay on the west half of Spans 1 and 10 is 1/4in. thick.

NON-STRUCTURAL ITEM:

TRAFFIC STOP LINES:
The traffic stop lines are peeling and faded at both ends of the structure. Refer to Photo 34. REPAIR

POSTING SIGNS:
The east posting sign is bent and twisted - NEW. Refer to Photo 35. REPAIR

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM

REPORT ID: INSP005

Inspection/CIDR Report

Structure ID: 154000

CIDR

DATE PRINTED: 9/20/2019

Description

Structure Unit Identification

Bridge/Unit Key: 154000 0
Structure Name: BECKETT BRIDGE
Description: BASCULE SPAN 6
Type: M - Main

Structure Unit Identification

Bridge/Unit Key: 154000 1
Structure Name: BECKETT BRIDGE
Description: FIXED SPANS
Type: A - Approach

Roadway Identification

NBI Structure No (8): 154000
Position/Prefix (5): 1 - Route On Structure
Kind Hwy (Rte Prefix): 4 County Hwy
Design Level of Service: 1 Mainline
Route Number/Suffix: 00000 / 0 N/A (NBI)
Feature Intersect (6): MINETTA BRANCH
Critical Facility: Not Defense-crit
Facility Carried (7): N SPRING BLVD
Mile Point (11): 0.766
Latitude (16): 028d08'60.0" Long (17): 082d45'54.7"

Roadway Traffic and Accidents

Lanes (28): 2 Medians: 0 Speed: 20 mph
ADT Class: 3 ADT Class 3
Recent ADT (29): 3100 Year (30): 2019
Future ADT (114): 3875 Year (115): 2039
Truck % ADT (109): 3
Detour Length (19): 1.9 mi
Detour Speed: 30 mph
Accident Count: -1 Rate:

Roadway Classification

Nat. Hwy Sys (104): 0 Not on NHS
National base Net (12): 0 - Not on Base Network
LRS Inventory Rte (13a): 15 000 004 Sub Rte (13b): 00
Functional Class (26): 17 Urban Collector
Federal Aid System: ON
Defense Hwy (100): 0 Not a STRAHNET hwy
Direction of Traffic (102): 2 2-way traffic
Emergency: [ ]

Roadway Clearances

Vertical (10): 99.99 ft Appr. Road (32): 20.2 ft
Horiz. (47): 20.2 ft Roadway (51): 20.2 ft
Truck Network (110): 0 Not part of natl netwo
Toll Facility (20): 3 On free road
Fed. Lands Hwy (105): 0 N/A (NBI)
School Bus Route: [X]
Transit Route: [ ]

NBI Project Data

Proposed Work (075A): Not Applicable (P)
Work To Be Done By (075B): Not Applicable (P)
Improvement Length (076): 360.89 ft

Improvement Cost (094): $ 1,967,000.00
Roadway Improvement Cost (095): $ 197,000.00
Total Cost (096): $ 2,164,000.00
Year of Estimate (097): 2000

NBI Rating

Channel (61): 7 Minor Damage
Deck (58): 7 Good
Superstructure (59): 6 Satisfactory
Substructure (60): 6 Satisfactory

Culvert (62): N N/A (NBI)
Waterway (71): 8 Equal Desirable
Unrepaired Spalls: -1 sq.ft.
Review Required: [X]

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM

REPORT ID: INSP005

Inspection/CIDR Report

Structure ID: 154000

CIDR

DATE PRINTED: 9/20/2019

Structure Identification

Admin Area: Pinellas County
District (2): D7 - Tampa
County (3): (15)Pinellas
Place Code (4): Tarpon Springs
Location (9): 0.4 MI W/O GRAND BLVD
Border Br St/Reg (98): Not Applicable (P) Share: 0 %
Border Struct No (99):
FIPS State/Region (1): 12 Florida Region 4-Atlanta
NBIS Bridge Len (112): Y - Meets NBI Length

Parallel Structure (101): No || bridge exists
Temp. Structure (103): Not Applicable (P)
Maint. Resp. (21): 2 County Hwy Agency
Owner (22): 2 County Hwy Agency
Historic Signif. (37): 3 Possibly eligible for

Geometrics

Spans in Main Unit (45): 1
Approach Spans (46): 9
Length of Max Span (48): 41.9 ft
Structure Length (49): 358.4 ft
Total Length: 398.4 ft
Deck Area: 10036 sqft
Structure Flared (35): 0 No flare

Age and Service

Year Built (27): 1924
Year Reconstructed (106): 0
Type of Service On (42a): 5 Highway-pedestrian
Under (42b): 5 Waterway
Fracture Critical Details: 1 or 2 Stl-girder systms

Structure Type and Material

Curb/Sidewalk (50): Left: 2.15 ft Right: 2.15 ft
Bridge Median (33): 0 No median
Main Span Material (43A): 3 Steel
Appr Span Material (44A): 5 Prestressed Concrete
Main Span Design (43B): 16 Movable-Bascule
Appr Span Design (44B): 02 Stringer/Girder

Deck Type and Material

Deck Width (52): 28 ft
Skew (34): 0 deg
Deck Type (107): 1 Concrete-Cast-in-Place
Surface (108): 0 None
Membrane: 0 None
Deck Protection: None

Appraisal

Structure Appraisal

Open/Posted/Closed (41): P Posted for load
Deck Geometry (68): 2 Intolerable - Replace
Underclearances (69): N Not applicable (NBI)
Approach Alignment (72): 8-No Speed Red thru Curv
Bridge Railings (36a): 0 Substandard
Transitions (36b): 0 Substandard

Approach Guardrail (36c): 0 Substandard
Approach Guardrail Ends (36d): 0 Substandard
Scour Critical (113): 3 SC - Unstable

Navigation Data

Navigation Control (38): Permit Not Required
Nav Vertical Clr (39): 0 ft
Nav Horizontal Clr (40): 0 ft
Min Vert Lift Clr (116): 0 ft
Pier Protection (111): 4 In-Place, Re-Evaluate

NBI Condition Rating

Sufficiency Rating: 48.3
Health Index: 83.15
Structural Eval (67): 4 Minimum Tolerable
Deficiency: Functionally Obsolete

Minimum Vertical Clearance

Over Structure (53): 99.99 ft
Under (reference) (54a): N Feature not hwy or RR
Under (54b): 0 ft

Minimum Lateral Underclearance

Reference (55a): N Feature not hwy or RR
Right Side (55b): 0 ft
Left Side (56): 0 ft

Schedule

Current Inspection

Inspection Date: 07/30/2019
Inspector: KNMEIWR - William Ryan
Bridge Group: E7J67
Alt. Bridge Group:
Primary Type: Special - Movable
Review Required: X

Next Inspection Date Scheduled

NBI: 07/30/2020
Element: 07/30/2020
Fracture Critical: 07/30/2020
Underwater: 06/04/2020
Other/Special: 07/30/2020
Inventory Photo Update Due:

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM

REPORT ID: INSP005

Inspection/CIDR Report

Structure ID: 154000

CIDR

DATE PRINTED: 9/20/2019

Schedule Cont.

Inspection Types Performed NBI [ ] Element [X] Fracture Critical [X] Underwater [ ] Other Special [X]

Inspection Intervals	Required (92)	Frequency (92)		Last Date (93)	
Fracture Critical	X	12 mos		07/30/2019	
Underwater	X	24 mos		06/04/2018	
Other Special	X	12 mos		07/30/2019	
NBI		24 mos	(91)	07/30/2018	(90)

Inspection Resources

Crew Hours:	36
Flagger Hours:	0
Helper Hours:	0
Snooper Hours:	0
Special Crew Hours:	0
Special Equip Hours:	0

Bridge Related

General Bridge Information

Parallel Bridge Seq:
Channel Depth: 7.1 ft
Radio Frequency: -1
Phone Number:
Exception Date:
Exception Type: Unknown
Accepted By Maint: 01/01/1924
Warranty Expiration: 00/00/0000
Performance Rating: Good

Bridge Rail 1: Concrete post & beam
Bridge Rail 2: Other
Electrical Devices: Traffic control sys only
Culvert Type: Not applicable
Maintenance Yard: Not FDOT Maintained
FIHS ON / OFF: No Routes on FIHS
Previous Structure:
2nd Previous Structure:
Replacement Structure:

Permitted Utilities: Power [ ] Water [ ] Gas [ ] Fiber Optic [ ] Sewage [ ] Other [X] Steel Conduit

Bridge Load Rating Information

Inventory Type (065): 2 AS Allowable Stress
Operating Type (063): 2 AS Allowable Stress
Original Design Load (031): 0 Unknown
Date: 01/16/1987
Initials: TAL
Load Rating Rev. Recom.: No
Load Rating Plans Status: Field Measurements

Load Rating Notes:

Inventory Rating (066): 17.5 tons
Operating Rating (064): 24.3 tons
FL120 Permit Rating: -1.0 tons
HS20/FL120 Max Span Rating: 24.3 tons
Dynamic Impact in Percent: 30 %
Governing Span Length: 13.5 ft
Minimum Span Length: 13.5 ft
Distribution Method: AASHTO formula

LEGAL LOADS

SU2: 12.5 tons
SU3: 19.3 tons
SU4: 18.9 tons
C3: 20.5 tons
C4: 21.4 tons
C5: 23.4 tons
ST5: -1.0 tons
Posting (070): 0 >39.9% below
Open/Posted/Closed (041): P Posted for load

POSTING

Recom. SU Posting: 13 tons
Recom. C Posting: 20 tons
Recom. ST5 Posting: 99 tons
Actual SU Posting: 12 tons
Actual C Posting: 15 tons
Actual ST5 Posting: 15 tons
Actual Blanket Posting: 99 tons
Emergency Vehicle: 1 EV inapplicable

FLOOR BEAM (FB) FB Present: Yes

FB Span Length, Gov: 19.7 ft
FB Spacing, Gov: 11.8 ft
FB OPR Rating: 24.3 tons
FB SU4 OPR Rating: 18.9 tons
FB FL120 Rating: -1.0 tons

SEGMENTAL (SEG)

SEG Wing-Span: -1.0 ft
SEG Web-to-Web Span: -1.0 ft
SEG Transverse HL93 Operating: -1.00 RF

Bridge Scour and Storm Information

Pile Driving Record: No pile driving records
Foundation Type: No foundation details
Mode of Flow: Tidal
Rating Scour Eval: Scour Critical
Highest Scour Eval: Phase III completed
Scour Evaluation Method: Standard Scour Eval

Scour Recommended I: Perform Phase IV
Scour Recommended II: Perform add'l monitoring
Scour Recommended III: No recommendation
Scour Elevation: -17.8 ft
Action Elevation: -15.8 ft
Storm Frequency: 100

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM

REPORT ID: INSP005

Inspection/CIDR Report

Structure ID: 154000

CIDR

DATE PRINTED: 9/20/2019

Elements

Inspection Date: 07/30/2019 **MAQZ**

DECKS : Decks/Slabs

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	28 / 4	Steel Deck - Open Grid	308	61.6	190	38	2	0.4	0	.	500 sq.ft
0	1000 / 4	Corrosion	0	.	190	100	0	.	0	.	190 sq.ft
0	1020 / 4	Connection	0	.	0	.	2	100	0	.	2 sq.ft
0	8516 / 4	Painted Steel	2721	60.72	1760	39.28	0	.	0	.	4481 sq.ft
0	3420 / 4	Peel/Bub/Crack(Stl Protect Coat)	0	.	600	100	0	.	0	.	600 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	1160	100	0	.	0	.	1160 sq.ft

DECKS : Decks/Slabs

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	29 / 4	Steel Deck - Conc Fill Grid	266	91.41	20	6.87	5	1.72	0	.	291 sq.ft
0	1000 / 4	Corrosion	0	.	20	100	0	.	0	.	20 sq.ft
0	1080 / 4	Delamination/Spall/Patched Area	0	.	0	.	5	100	0	.	5 sq.ft
0	8518 / 4	Galvanized Steel	9	31.03	20	68.97	0	.	0	.	29 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	20	100	0	.	0	.	20 sq.ft

DECKS : Joints

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	306 / 4	Other Joint	28	53.85	24	46.15	0	.	0	.	52 ft
0	2370 / 4	Metal Deterioration or Damage	0	.	24	100	0	.	0	.	24 ft

MISCELLANEOUS : Channel

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8290 / 4	Channel	1	100	0	.	0	.	0	.	1 (EA)

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	205 / 4	Re Conc Column	0	.	0	.	2	100	0	.	2 each
0	1130 / 4	Cracking (RC and Other)	0	.	0	.	2	100	0	.	2 each

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	220 / 4	Re Conc Pile Cap/Ftg	27	96.43	0	.	1	3.57	0	.	28 ft
0	1080 / 4	Delamination/Spall/Patched Area	0	.	0	.	1	100	0	.	1 ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	225 / 4	Steel Pile	3	75	0	.	1	25	0	.	4 (EA)
0	1000 / 4	Corrosion	1	50	0	.	1	50	0	.	2 (EA)
0	8516 / 4	Painted Steel	236	91.47	0	.	22	8.53	0	.	258 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	22	100	0	.	22 sq.ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8298 / 4	Pile Jacket Bare	4	100	0	.	0	.	0	.	4 (EA)

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM

REPORT ID: INSP005

Inspection/CIDR Report

Structure ID: 154000

CIDR

DATE PRINTED: 9/20/2019

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8389 / 4	Timber Fender/Dolphin	126	71.19	0	.	51	28.81	0	.	177 ft
0	1140 / 4	Decay/Section Loss	0	.	0	.	51	100	0	.	51 ft

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8540 / 4	Open Gearing	4	50	4	50	0	.	0	.	8 (EA)
0	9010 / 4	Mechanical Alignment	0	.	1	100	0	.	0	.	1 (EA)
0	9040 / 4	Mechanical Wear/Abrasion	0	.	3	100	0	.	0	.	3 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8541 / 4	Speed Reducers	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8542 / 4	Shafts	7	100	0	.	0	.	0	.	7 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8543 / 4	Shaft Bearings and Couplings	18	100	0	.	0	.	0	.	18 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8544 / 4	Brakes	2	100	0	.	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8546 / 4	Span Drive Motors	2	100	0	.	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8547 / 4	Hydraulic Power Unit	0	.	1	100	0	.	0	.	1 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8548 / 4	Hydraulic Piping System	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8549 / 4	Hydraulic Cylinders	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	2	100	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8560 / 4	Locks	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)
0	9030 / 4	Clearances	0	.	1	100	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8561 / 4	Live Load Shoes	0	.	2	100	0	.	0	.	2 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)
0	9030 / 4	Clearances	0	.	1	100	0	.	0	.	1 (EA)

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SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8562 / 4	Counterweight Support	0	.	1	100	0	.	0	.	1 (EA)
0	1000 / 4	Corrosion	0	.	1	100	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8564 / 4	Counterweight	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8565 / 4	Trunnion/Straight & Curved Track	0	.	2	100	0	.	0	.	2 (EA)
0	9030 / 4	Clearances	0	.	2	100	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8570 / 4	Transformers	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8571 / 4	Submarine Cable	2	100	0	.	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8574 / 4	Control Console	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8581 / 4	Operator Facilities	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8590 / 4	Resistance Barriers	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8591 / 4	Warning Gates	2	100	0	.	0	.	0	.	2 (EA)

SUPERSTRUCTURE : Movable

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8592 / 4	Traffic Signals	3	75	1	25	0	.	0	.	4 (EA)
0	9020 / 4	Operation	0	.	1	100	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Other Elements

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8572 / 4	Conduit & Junction Box	1	100	0	.	0	.	0	.	1 (EA)

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	107 / 4	Steel Opn Girder/Beam	46	55.42	0	.	37	44.58	0	.	83 ft
0	1000 / 4	Corrosion	0	.	0	.	37	100	0	.	37 ft
0	8516 / 4	Painted Steel	0	.	901	83.58	177	16.42	0	.	1078 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	901	100	0	.	0	.	901 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	177	100	0	.	177 sq.ft

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SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	113 / 4	Steel Stringer	196	79.67	0	.	50	20.33	0	.	246 ft
0	1000 / 4	Corrosion	0	.	0	.	50	100	0	.	50 ft
0	8516 / 4	Painted Steel	0	.	685	87.82	95	12.18	0	.	780 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	685	100	0	.	0	.	685 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	95	100	0	.	95 sq.ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	152 / 4	Steel Floor Beam	17	28.81	0	.	42	71.19	0	.	59 ft
0	1000 / 4	Corrosion	0	.	0	.	42	100	0	.	42 ft
0	8516 / 4	Painted Steel	0	.	330	81.48	75	18.52	0	.	405 sq.ft
0	3410 / 4	Chalk(Steel Protect Coatings)	0	.	330	100	0	.	0	.	330 sq.ft
0	3420 / 4	Peel/Bub/Crack(Stl Protect Coat)	0	.	0	.	5	100	0	.	5 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	70	100	0	.	70 sq.ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	330 / 4	Metal Bridge Railing	74	90.24	8	9.76	0	.	0	.	82 ft
0	1000 / 4	Corrosion	0	.	8	100	0	.	0	.	8 ft
0	8516 / 4	Painted Steel	74	82.22	16	17.78	0	.	0	.	90 sq.ft
0	3440 / 4	Eff (Stl Protect Coat)	0	.	16	100	0	.	0	.	16 sq.ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8563 / 4	Access Ladder & Platform	1	25	2	50	1	25	0	.	4 (EA)
0	1000 / 4	Corrosion	0	.	2	100	0	.	0	.	2 (EA)
0	1020 / 4	Connection	0	.	0	.	1	100	0	.	1 (EA)

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
0	8580 / 4	Navigational Lights	0	.	0	.	1	100	0	.	1 (EA)
0	9020 / 4	Operation	0	.	0	.	1	100	0	.	1 (EA)

DECKS : Decks/Slabs

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	12 / 4	Re Concrete Deck	5228	56.5	2516	27.19	1509	16.31	0	.	9253 sq.ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	16	80	4	20	0	.	20 sq.ft
1	1090 / 4	Exposed Rebar	0	.	0	.	5	100	0	.	5 sq.ft
1	1130 / 4	Cracking (RC and Other)	0	.	2500	100	0	.	0	.	2500 sq.ft
1	1190 / 4	Abrasion(PSC/RC)	0	.	0	.	1500	100	0	.	1500 sq.ft
1	510 / 4	Wearing Surfaces	600	100	0	.	0	.	0	.	600 sq.ft

DECKS : Joints

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	301 / 4	Pourable Joint Seal	158	62.45	0	.	95	37.55	0	.	253 ft
1	2320 / 4	Seal Adhesion	0	.	0	.	74	100	0	.	74 ft
1	2360 / 4	Adjacent Deck or Header	0	.	0	.	21	100	0	.	21 ft

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MISCELLANEOUS : Other Elements

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	321 / 4	Re Conc Approach Slab	1120	100	0	.	0	.	0	.	1120 sq.ft
1	510 / 4	Wearing Surfaces	800	100	0	.	0	.	0	.	800 sq.ft

MISCELLANEOUS : Other Elements

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	8474 / 4	Metal Wall	0	.	0	.	13	100	0	.	13 ft
1	1000 / 4	Corrosion	0	.	0	.	13	100	0	.	13 ft

MISCELLANEOUS : Other Elements

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	8475 / 4	R/Conc Walls	15	93.75	0	.	1	6.25	0	.	16 ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	0	.	1	100	0	.	1 ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	215 / 4	Re Conc Abutment	58	98.31	1	1.69	0	.	0	.	59 ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	1	100	0	.	0	.	1 ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	225 / 4	Steel Pile	4	50	0	.	4	50	0	.	8 (EA)
1	1000 / 4	Corrosion	0	.	0	.	4	100	0	.	4 (EA)
1	8516 / 4	Painted Steel	545	94.95	0	.	29	5.05	0	.	574 sq.ft
1	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	29	100	0	.	29 sq.ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	226 / 4	Pre Conc Pile	30	75	6	15	4	10	0	.	40 (EA)
1	1080 / 4	Delamination/Spall/Patched Area	0	.	6	66.67	3	33.33	0	.	9 (EA)
1	1110 / 4	Cracking (PSC)	0	.	0	.	1	100	0	.	1 (EA)

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	231 / 4	Steel Pier Cap	63	87.5	0	.	9	12.5	0	.	72 ft
1	1000 / 4	Corrosion	0	.	0	.	9	100	0	.	9 ft
1	8516 / 4	Painted Steel	0	.	810	96.43	30	3.57	0	.	840 sq.ft
1	3410 / 4	Chalk(Steel Protect Coatings)	0	.	810	100	0	.	0	.	810 sq.ft
1	3440 / 4	Eff (Stl Protect Coat)	0	.	0	.	30	100	0	.	30 sq.ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	234 / 4	Re Conc Pier Cap	193	81.78	26	11.02	17	7.2	0	.	236 ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	25	73.53	9	26.47	0	.	34 ft
1	1130 / 4	Cracking (RC and Other)	0	.	1	11.11	8	88.89	0	.	9 ft

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	8298 / 4	Pile Jacket Bare	8	100	0	.	0	.	0	.	8 (EA)

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SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	8394 / 4	R/Conc Abut Slope Protection	350	87.5	25	6.25	25	6.25	0	.	400 (SF)
1	1130 / 4	Cracking (RC and Other)	0	.	0	.	25	100	0	.	25 (SF)
1	4000 / 4	Settlement	0	.	25	100	0	.	0	.	25 (SF)

SUBSTRUCTURE : Substructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	8396 / 4	Other Abutment Slope Protection	0	.	0	.	172	100	0	.	172 (SF)
1	1220 / 4	Deterioration (Other)	0	.	0	.	172	100	0	.	172 (SF)

SUPERSTRUCTURE : Bearings

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	310 / 4	Elastomeric Bearing	0	.	0	.	5	100	0	.	5 each
1	2230 / 4	Bulging, Splitting or Tearing	0	.	0	.	5	100	0	.	5 each

SUPERSTRUCTURE : Bearings

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	313 / 4	Fixed Bearing	5	50	5	50	0	.	0	.	10 each
1	1000 / 4	Corrosion	0	.	5	100	0	.	0	.	5 each
1	8516 / 4	Painted Steel	40	72.73	15	27.27	0	.	0	.	55 sq.ft
1	3440 / 4	Eff (Stl Protect Coat)	0	.	15	100	0	.	0	.	15 sq.ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	109 / 4	Pre Opn Conc Girder/Beam	1197	75.09	10	0.63	387	24.28	0	.	1594 ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	10	62.5	6	37.5	0	.	16 ft
1	1090 / 4	Exposed Rebar	0	.	0	.	2	100	0	.	2 ft
1	1100 / 4	Exposed Prestressing	0	.	0	.	3	100	0	.	3 ft
1	1110 / 4	Cracking (PSC)	0	.	0	.	376	100	0	.	376 ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	110 / 4	Re Conc Opn Girder/Beam	24	88.89	0	.	3	11.11	0	.	27 ft
1	1090 / 4	Exposed Rebar	0	.	0	.	3	100	0	.	3 ft

SUPERSTRUCTURE : Superstructure

Str Unit	Elem/Env	Description	Qty1	%1	Qty2	%2	Qty3	%3	Qty4	%4	T Qty
1	331 / 4	Re Conc Bridge Railing	629	98.28	3	0.47	8	1.25	0	.	640 ft
1	1080 / 4	Delamination/Spall/Patched Area	0	.	1	100	0	.	0	.	1 ft
1	1090 / 4	Exposed Rebar	0	.	2	100	0	.	0	.	2 ft
1	1120 / 4	Efflorescence/Rust Staining	0	.	0	.	8	100	0	.	8 ft

Total Number of Elements*: 55
*excluding defects/protective systems

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REPORT ID: INSP005 **Inspection/CIDR Report**

Structure ID: 154000 **CIDR** **DATE PRINTED: 9/20/2019**

Inspection Information

Inspection Date: 07/30/2019 **Type:** Special - Movable

Inspector: KNMEIWR - William Ryan

Inspection Notes: Sufficiency Rating Calculation Accepted by knmeiwr at 08/14/2019 14:36:14 PM

LOAD CAPACITY EVALUATION:
The load rating dated 01/16/1987 applies to the current condition of this bridge.

This is a Special-Movable Inspection. Only Unit 0 elements are included.

Unit 0 - Quantities will include those bridge elements which are within the limits of the bascule pier and the main span. (i.e., steel bridge rails, bascule pier, mechanical & electrical related operational equipment, tender's facilities, et cetera). Inspections will include the fracture critical elements along with those aforementioned bridge elements which are within the limits of the bascule pier. Traffic control elements related to the movable span (i.e., traffic gate assemblies, traffic signaling assemblies, over-roadway traffic assemblies, et cetera) which are mounted to and/or located on the approach spans will be quantified and inspected when the movable span is scheduled for inspection.

Unit 1 - Quantities will include those bridge elements which are within the limits of the approach spans. (i.e., concrete bridge rails, related expansion joints, elastomeric bearing assemblies, et cetera)

The asphalt overlay on the west half of Spans 1 and 10 is 1/4in. thick.

NON-STRUCTURAL ITEM:

TRAFFIC STOP LINES:
The traffic stop lines are peeling and faded at both ends of the structure. Refer to Photo 34. REPAIR

POSTING SIGNS:
The east posting sign is bent and twisted - NEW. Refer to Photo 35. REPAIR

Structure Notes

OWNER: PINELLAS COUNTY

TRAFFIC RESTRICTIONS: This structure is posted at both approaches as follows: Single Unit - 12 tons, Combination - 15 tons and Truck and Trailer - 15 tons.
According to the load rating dated 01/16/1987, the structure should be posted at or below the following: SU2 -12 tons, SU3 - 19 tons, SU4 - 18 tons, C3 - 20 tons, C4 - 21 tons and C5 - 23 tons. Refer to posting photos in the Addendum.

Structure inventoried west to east.

This structure is on a 12 month inspection frequency for Movable and Fracture Critical components and for NBIS Item 70 - Posting being rated 4 or less.

Elements 107 - Paint Stl Opn Girder and 152 - Paint Stl Floor Beam are fracture critical.

The structure is not manned. To obtain an opening, a two (2) hour advance notice is required call (727) 422-5836.

Schedule Notes

MOVABLE BRIDGE DATA

Unit 0

PHOTO 1: 28/4 – Steel Deck-Open Grid

Typical moderate corrosion on the grid deck welds (Stringer 6-7 at Floor Beam 6-2 shown).

REPAIR RECOMMENDATION:
Clean and paint the grid deck welds of Span 6.

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MOVABLE BRIDGE DATA

Unit 0

PHOTO 2: 28/4 – Steel Deck-Open Grid

The steel curbs of Span 6 exhibit moderate recurring corrosion in the topside and moderate to heavy corrosion with laminar rust in the underside (left curb underside shown).

REPAIR RECOMMENDATION:
Clean and paint topside and underside of the steel curbs of Span 6.

MOVABLE BRIDGE DATA

Unit 0

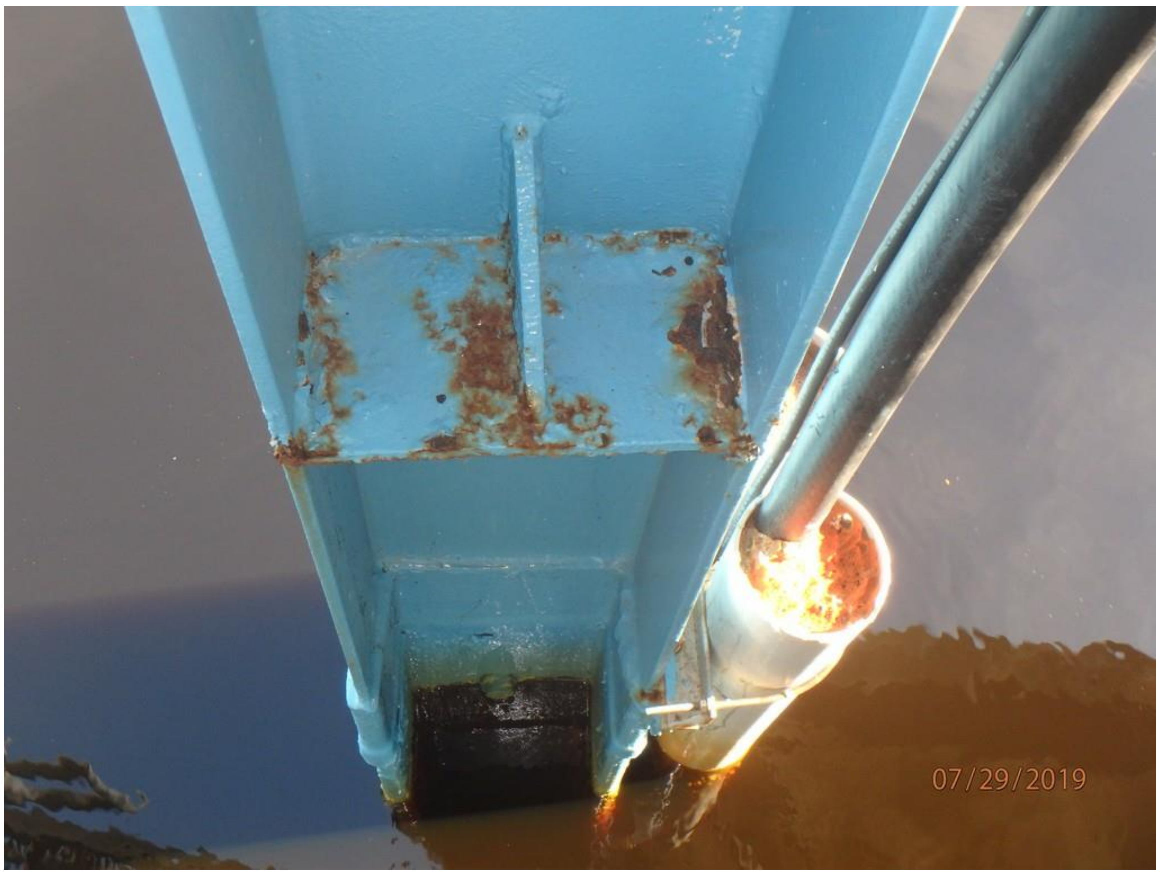

PHOTO 3: 225/4 – Steel Pile

The west Tender House pile exhibits isolated areas of heavy corrosion with laminar rust.

REPAIR RECOMMENDATION:
Clean and spot paint the west Tender House pile.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 4: 8389/4 – Timber Fender/Dolphin

Rotted, deteriorated and missing section of the top plank of the west fender below main span.

REPAIR RECOMMENDATION:
Replace the longitudinal timber plank of the west fender beneath main span.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 5: 8389/4 - Timber Fender/Dolphin

Loose transverse cat walk fender catwalk planks on southeast fender system.

REPAIR RECOMMENDATION:
Repair or replace the loose fender catwalk planks throughout the southeast fender.

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MOVABLE BRIDGE DATA

Unit 0

PHOTO 6: 8389/4 - Timber Fender/Dolphin

Broken west fender handrail post (4th from north end).

REPAIR RECOMMENDATION:
Replace the 4th timber handrail post from north end of west fender.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 7: 8389/4 - Timber Fender/Dolphin

Southernmost handrail for west fender loose.

REPAIR RECOMMENDATION:
Repair the loose handrail at south end of west fender.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 8: 8560/4 – Locks

Excessive clearance in the south lock receiver (to 0.050in.).

REPAIR RECOMMENDATION:
Shim the south lock receiver to proper specifications.

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MOVABLE BRIDGE DATA

Unit 0

PHOTO 9: 8560/4 – Locks

North lock receiver with laminar rust.

REPAIR RECOMMENDATION:
Clean and paint fasteners for the north span lock receiver.
Clean and paint north and south lock bars and couplings.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 10: 8560/4 – Locks

South span lock hydraulic piping missing clip at south attachment under structure.

REPAIR RECOMMENDATION:
Install missing clip for south span lock hydraulic piping at south attachment under structure.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 11: 8561/4 – Live Load Shoes

South live load shoe 3/16in. gap with movement under live loads. Corrosion on live load shoe. Typical.

REPAIR RECOMMENDATION:
Shim south live load shoe to eliminate 3/16in. gap and movement.
Clean and paint both live load shoes.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 12: 8571/4 – Submarine Cable

Corroded fasteners for the submarine cable restraint at Rest Pier 6.

REPAIR RECOMMENDATION:
Clean and paint the submarine cable restraint fasteners at Rest Pier 6.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 13: 8574/4 – Control Console

Missing nameplates for switches and indicator lights on the control console.

REPAIR RECOMMENDATION:
Replace all missing nameplates on control console.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 14: 8574/4 – Control Console

Heavy surface corrosion on belt sprocket for the position sensor.

REPAIR RECOMMENDATION:
Clean and paint belt sprocket for the position sensor.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 15: 8590/4 – Resistance Barriers

Barrier gate has corrosion on the lens fasteners.

REPAIR RECOMMENDATION:
Clean and paint or replace the barrier gate lens fasteners.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 16: 8590/4 – Resistance Barriers

Barrier gate cable stay turnbuckles too short and missing jam nuts. Typical

REPAIR RECOMMENDATION:
Install longer turnbuckles with jam nuts for the barrier gate cable stay turnbuckles.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 17: 8590/4 – Resistance Barriers

SO cord not properly restrained at the barrier housing.

REPAIR RECOMMENDATION:
Properly restrain the SO cord at the barrier housing.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 18: 8591/4 – Warning Gates

Several fasteners of the Far On-Coming warning gate lights exhibit heavy corrosion.

REPAIR RECOMMENDATION:
Replace the corroded light fasteners of the far warning gate.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 19: 8592/4 – Traffic Signals

Far left traffic signal pointing away from roadway.

REPAIR RECOMMENDATION:
Properly position the far left traffic signal.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 20: 8572/4 – Conduit & Junc. Box

The traffic signal conduit under Span 1 exhibits heavy corrosion with laminar rust.

REPAIR RECOMMENDATION:
Replace the traffic signal conduit under Span 1.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 21: 8572/4 – Conduit & Junc. Box

Junction box on south side of Rest Pier 6 has ponding water in the bottom.

REPAIR RECOMMENDATION.
Properly seal the junction box on the south side of Rest Pier 6.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 22: 8572/4 – Conduit & Junc. Box

Typical missing grounding cable (northeast traffic signal shown).

REPAIR RECOMMENDATION:
Replace all missing grounding cables throughout the structure.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 23: 107/4 – Steel Opn Girder/Beam

The web of Main Girder 6-1 exhibits a 1in. diameter painted corrosion hole with recurring corrosion at Floor Beam 6-1.

REPAIR RECOMMENDATION:
Clean and paint the corrosion hole in the web of Main Girder 6-1 at Floor Beam 6-1.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 24: 107/4 – Steel Opn Girder/Beam

The top flange and web of Main Girder 6-2, exhibits isolated painted-over corrosion holes up to 1-1/2 in. diameter with recurring corrosion.

REPAIR RECOMMENDATION:
Clean and paint the corrosion holes in Main Girder 6-2.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 25: 107/4 – Steel Opn Girder/Beam

The built-up bottom flanges and lower portions of the webs of the main girders exhibit areas of recurring active corrosion in the vicinity of Floor Beam 6-2 and 6-3 and at the base of several vertical stiffeners (Main Girder 6-2 at Floor Beam 6-2 shown).

REPAIR RECOMMENDATION:
Clean and paint the areas of active corrosion in the main girders of Span 6.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 26: 113/4 – Steel Stringer

Stringers 6-2 through 6-6 at Floor Beam 6-2 junction exhibit areas of moderate to heavy recurring corrosion (Stringers 6-5 at Floor Beam 6-2 shown).

REPAIR RECOMMENDATION:
Clean and paint Stringers 6-2 through 6-6 at Floor Beam 6-2 junction.

FLORIDA DEPARTMENT OF TRANSPORTATION
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MOVABLE BRIDGE DATA

Unit 0

PHOTO 27: 113/4 – Steel Stringer

The sidewalk support channels exhibit isolated areas of moderate to heavy corrosion with laminar rust.

REPAIR RECOMMENDATION:
Clean and paint the sidewalk support channels.

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MOVABLE BRIDGE DATA

Unit 0

PHOTO 28: 152/4 – Steel Floor Beam

Floor Beam 6-2 exhibits areas of heavy corrosion and/or laminar rust at several stringer junctions (at Stringer 6-6 shown).

REPAIR RECOMMENDATION:
Clean and paint Floor Beam 6-2 at the stringer junctions.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 29: 152/4 – Steel Floor Beam

Heavy delaminative corrosion in west end of angle attaching Floor Beam 6-2 to Main Girder 6-1.

REPAIR RECOMMENDATION:
Clean and paint the angle attaching Floor Beam 6-2 to Main Girder 6-1.

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MOVABLE BRIDGE DATA

Unit 0

PHOTO 30: 152/4 – Steel Floor Beam

Center lateral bracing gusset plate at Floor Beam 6-2 heavy corrosion with knife edging.

REPAIR RECOMMENDATION:
Clean and paint corrosion in center lateral bracing gusset plate at Floor Beam 6-2.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 31: 152/4 – Steel Floor Beam

Cantilever sidewalk support junction to curb and sidewalk have corrosion with laminar rust.

REPAIR RECOMMENDATION:
Clean and paint areas of corrosion in the cantilever sidewalk supports at the sidewalk and curb junctions.

MOVABLE BRIDGE DATA

Unit 0

PHOTO 32: 8563/4 – Access Ladder & Platform

The stairs from the Tenders House to the platform exhibit cracked welds and pack rust.

REPAIR RECOMMENDATION:
Repair the cracked welds on treads and stringers. Clean areas of pack rust and paint the stairs from the Tenders House to the north side of Bascule Pier 7**.**

MOVABLE BRIDGE DATA

Unit 0

PHOTO 33: 8580/4 – Navigational Lights

The UPS backup battery system for the navigational lights has been removed.

REPAIR RECOMMENDATION:
Replace the navigational lights UPS backup battery system.

MOVABLE BRIDGE DATA

PHOTO 34: Inspection Notes

West stop line peeling and faded. Typical.

REPAIR RECOMMENDATION:
Repaint the west and east stop lines.

MOVABLE BRIDGE DATA

PHOTO 35: Inspection Notes

East posting sign bent and twisted.

REPAIR RECOMMENDATION:
Properly install the east posting sign.

MOVABLE BRIDGE DATA

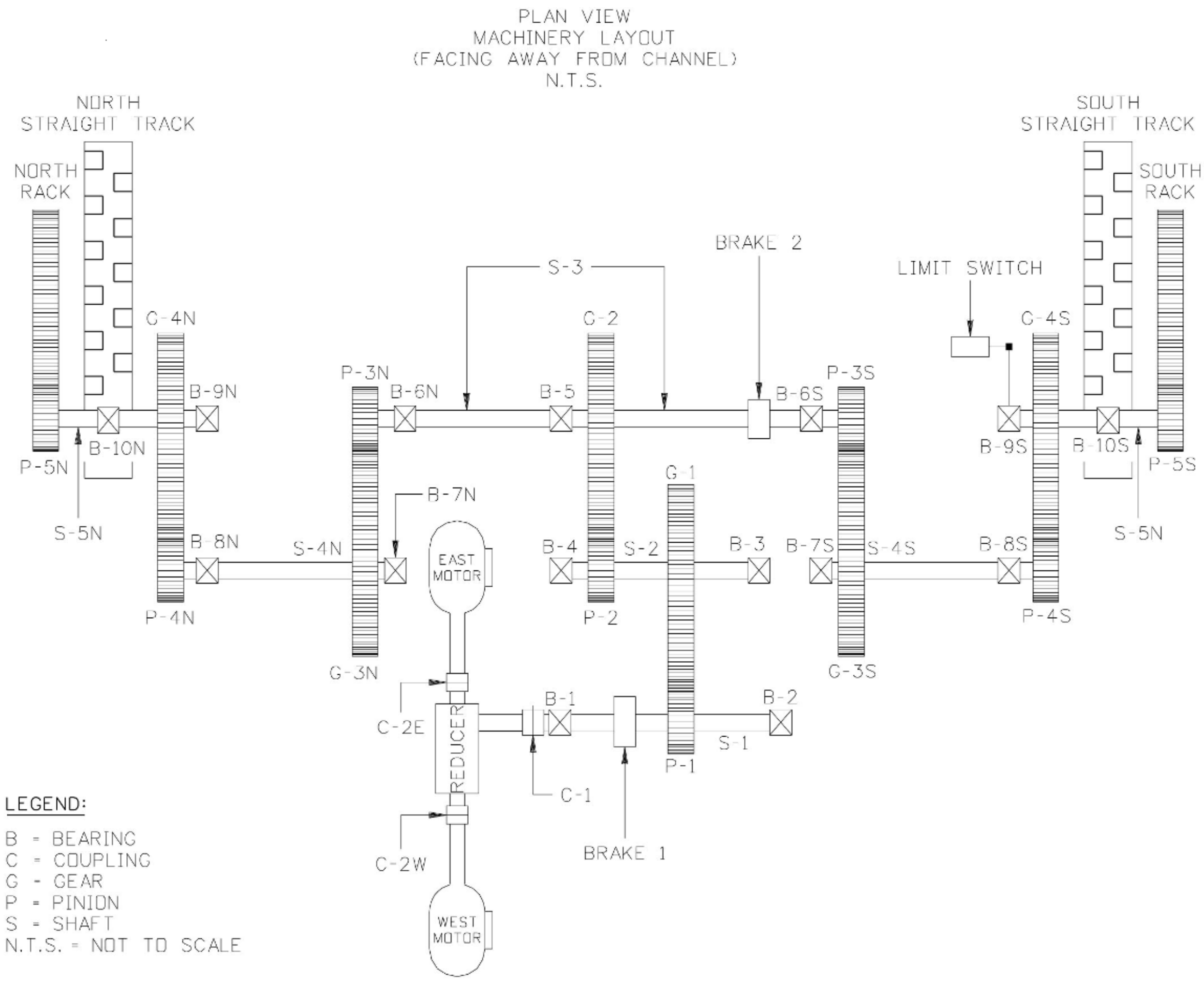
West Posting Sign

MOVABLE BRIDGE DATA

East Posting Sign

MOVABLE BRIDGE DATA

MACHINERY LAYOUT DIAGRAM



KEY FOR RATINGS IN THE FOLLOWING TABLES:

CONDITION	DESCRIPTION
GOOD	No corrective action recommended.
FAIR	Minor deficiencies which may require corrective action. Operation is not affected.
POOR	Major deficiencies that may affect operation or reliability. Repair or replacement is recommended.

MOVABLE BRIDGE DATA

TABLE A
Element 8540/4: Open Gearing

Item	Lubrication	Condition	Comments
P-1	GOOD	GOOD	
G-1	GOOD	GOOD	
P-2	GOOD	GOOD	
G-2	GOOD	GOOD	
P-3N	GOOD	GOOD	
G-3N	GOOD	GOOD	
P-4N	GOOD	GOOD	
G-4N	GOOD	GOOD	
P-5N	GOOD	FAIR	Minor cross bearing wear with end loading. P-5N has axial misalignment up to 11/16in. to the north rack gear with 90% contact.
RACK-N	GOOD	FAIR	Minor cross bearing wear; backlash = 0.071 in.
P-3S	GOOD	GOOD	Minor cross bearing wear.
G-3S	GOOD	GOOD	Minor cross bearing wear.
P-4S	GOOD	GOOD	Minor cross bearing wear.
G-4S	GOOD	GOOD	Minor cross bearing wear.
P-5S	GOOD	GOOD	Minor cross bearing wear with end loading.
RACK-S	GOOD	FAIR	Minor cross bearing wear; backlash = 0.077in.

MOVABLE BRIDGE DATA

TABLE B
Element 8541/4: Speed Reducers

Speed Reducer:

Item	General Conditions and Comments
Fasteners	GOOD
Housing	GOOD
Shaft Seals	GOOD
Gears	GOOD
Lubrication	GOOD
Operation	GOOD: Smooth
Noise	GOOD: No unusual noises noted.
General	GOOD

TABLE C
Element 8542/4: Shafts

SHAFTS:

Item	General Condition	Comments
S-1	GOOD	
S-2	GOOD	
S-3	GOOD	
S-4N	GOOD	
S-5N	GOOD	
S-4S	GOOD	
S-5S	GOOD	

MOVABLE BRIDGE DATA

TABLE D
Element 8543/4: Shaft Bearings and Couplings

SHAFT BEARINGS AND COUPLINGS:

Item	General Condition	Comments
B-1	GOOD	
B-2	GOOD	
B-3	GOOD	
B-4	GOOD	
B-5	GOOD	
B-6N	GOOD	
B-7N	GOOD	
B-8N	GOOD	
B-9N	GOOD	
B-10N	GOOD	
B-6S	GOOD	
B-7S	GOOD	
B-8S	GOOD	
B-9S	GOOD	
B-10S	GOOD	
C-1	GOOD	
C-2W	GOOD	
C-2E	GOOD	

MOVABLE BRIDGE DATA

TABLE E
Element 8544/4: Brakes

Brakes:

Item	Brake 1	Brake 2
Operation	GOOD	GOOD
Noise	GOOD	GOOD
General Condition	GOOD	GOOD

TABLE F
Element 8546/4: Span Drive Motors

	Phase A to B/ Phase A to Gnd. (Volts)	Phase B to C/ Phase B to Gnd. (Volts)	Phase A to C/ Phase C to Gnd. (Volts)
Normal Service – AT REST	245/122	245/212	244/121
Normal Service – RAISE	244/120	244/212	243/121
Normal Service – LOWER	245/120	244/212	243/121
Auxiliary Power – AT REST	240/120	240/208	240/120
Auxiliary Power – RAISE	239/119	239/209	240/120
Auxiliary Power – LOWER	240/119	240/210	239/120

NOTE: Readings taken during 2019 inspection. (A portable generator has been designated specifically for this bridge and was used for the auxiliary power. Hours = 50.5)

MOVABLE BRIDGE DATA

TABLE G
Element 8546/4: Span Drive Motors

Motor Currents (Amps)	Raise	Lower
Span Motor Drive A	6.0	5.4
Span Motor Drive B	6.3	5.3

NOTE: Readings taken during 2019 inspection

<u>Span Drive Motor Data:</u>

Horsepower:	3
Motor Voltage:	230/460
Motor Current:	9.2/4.6
RPM:	1160
Service Factor:	1.15

MOVABLE BRIDGE DATA

TABLE H
Element 8547/4: Hydraulic Power Unit & Element 8548/4: Hydraulic Piping

ITEM	GENERAL CONDITION
OPERATION	GOOD
H.P.U. MAXIMUM OPERATING PRESSURE	GOOD - 1125PSI
BRAKE 1	GOOD - 525 PSI, opening and closing
BRAKE 2	GOOD - 500 PSI, opening and closing
RESERVOIR	GOOD
FILTER	GOOD
PUMP	GOOD
MOTOR	FAIR – Minor surface corrosion
VALVES	GOOD
MANIFOLDS	FAIR – Minor surface corrosion
DISCONNECT & MANUAL PUMP	GOOD
PIPING (BRAKES)	GOOD
PIPING (LOCKS)	GOOD

TABLE I
Element 8549/4: Hydraulic Cylinders

ITEM	NORTH LOCK CYLINDER	SOUTH LOCK CYLINDER
HOUSING	FAIR: Minor surface corrosion in the fasteners	FAIR: Minor surface corrosion in the fasteners
PISTON	GOOD	GOOD
MOUNTS	GOOD	GOOD
OPERATION	GOOD	GOOD

MOVABLE BRIDGE DATA

TABLE J
Element 8560/4: Locks

Motor Currents (Amps)	Pull	Drive
Span Lock Motor	5.6	5.5

Span Lock Motor Data:
Horsepower: 2
Motor Voltage: 208-230/460
Motor Current: 6.5-6.2/3.0
RPM: 1725
Service Factor: 1.15

TABLE K
Element 8560/4: Locks

SPAN LOCK CLEARANCES:

Item	Location	South	North
Receiver	Top	0.050 in.	0.006 in.
	Bottom	No Shoe	No Shoe
Front Guide	Top	0.025 in.	0.010 in.
	Bottom	<0.005 in.	<0.005 in.
Rear Guide	Top	0.022 in.	0.012 in.
	Bottom	<0.005 in.	<0.005 in.

NOTE: Readings and measurements were taken during the 2019 inspection.

MOVABLE BRIDGE DATA

TABLE L
Element 8561/4: Live Load Shoes

Live Load Shoes:

LL Shoe ID	Contact	Bolts	General Condition
North	GOOD: Full	GOOD	FAIR: minor to moderate surface corrosion
South	FAIR: Movement	GOOD	FAIR: minor to moderate surface corrosion. 3/16in. gap.

MOVABLE BRIDGE DATA

TABLE M
Element 8581/4: Operator Facilities

SAFETY AND MISC. EQUIPMENT:

ITEM	NO. SUGGESTED	AVAILABLE	CONDITION	REMARKS
LIFE JACKETS	2	0	--	NEED 2
LIFE RING AND Rope	2	2	GOOD	NEED 1
BINOCULARS	1	0	--	NEED 1
TRAFFIC FLAGS	4	5	GOOD	
TRAFFIC CONES	6	4	GOOD	NEED 2
SAFETY VESTS	2	2	GOOD	
TRAFFIC FLARES	4	0	--	NEED 4
BATTERY OPERATED LIGHTS	4	0	--	NEED 4
EMERGENCY LIGHT SYSTEM	1	YES	GOOD	NONE
FLASHLIGHTS	2	2	--	NEED 1
EXTRA LIGHT BULBS	4	4	GOOD	
COASTGUARD REGULATIONS	--	NO	--	NEED REGULATIONS
FIRE EXTINGUISHERS	2	1	POOR: Expired 10/2016	NEED 1
FIRST AID KIT	1	0	--	NEED 1
RUBBER MAT AT CONSOLE	2	2	GOOD	

NOTE: Additional items are carried by County vehicles used when openings requested.

MOVABLE BRIDGE DATA

TABLE N
Element 8590/4: Resistance Barrier

Resistance Barrier Height (Inches)	Height
Resistance Barrier (center of upper tube)	32-1/2

TABLE O
Element 8590/4: Resistance Barrier

Warming Gate Motor Currents (Amps)	Lower	Raise
Resistance Barrier	1.6	1.7

Resistance Barrier Motor Data
Horsepower: 1.0
Motor Voltage: 208-230/460
Motor Current: 3.2/1.6
RPM: 1725
Service Factor: 1.0

NOTE: Readings and measurements were taken during the 2019 inspection.

MOVABLE BRIDGE DATA

TABLE P
Element 8591/4: Warning Gates

Warning Gate Heights (Inches)	Height
Near Traffic Gate	52
Far Traffic Gate	50

NOTE: FDOT Standard Index 508-T01 requires gate heights to be between 42 in. to 54 in. at the centerline of the gate arm in the down position.

TABLE Q
Element 8591/4: Warning Gates

Warming Gate Motor Currents (Amps)	Lower	Raise
Near Traffic Gate	2.1	1.9
Far Traffic Gate	1.7	1.7

<u>Warning Gate Motor Data</u>
Horsepower: 1.0
Motor Voltage: 208-230/460
Motor Current: 3.2/1.6
RPM: 1725
Service Factor: 1.0

NOTE: Readings and measurements were taken during the 2019 inspection.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

I. DEFINITION

The AASHTO Guide Specifications for Fracture Critical Non-Redundant Steel Bridge Members states that Fracture Critical Members or member components (FCMs) are steel tension members or tension components of members whose failure would be expected to result in partial or complete collapse of the bridge.

II. DESCRIPTION

The bascule span (Span 6) is a single leaf. The leaf frame consists of two main girders, three floor beams, twenty-one stringers, counterweight framing, and lateral bracing. The main girders and Floor Beam 6-3 are built-up “I” sections. Floor Beams 6-1 and 6-2 are rolled members.

Since the leaf only consists of two main load carrying members, the main girders, the leaf was considered fracture critical. Both flanges and the web plate were considered to be in tension since the main girders experience stress reversal depending on their position. For the purpose of this inspection, the bascule leaf floor beams were also considered to be fracture critical members. This approach was taken, because if one floor beam were to fail, adequate redistribution of the deck loads to adjacent floor beams may not occur. Refer to Photo A.

Non-destructive testing was performed on the lateral brace gusset plates between the main girders to measure the section remaining of each plate. Refer to Table 1 within this section for the field measured nominal and actual values for each gusset plate.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

III. INSPECTION PROCEDURES:

A. The first step to the inspection of this structure was to have the plans and previous inspection reports examined by a structural engineer. Note that a complete set of plans with member details are not available. The engineer noted fracture critical/fatigue sensitive details, had sketches created showing their location and then briefed the inspectors about such details.

B. Proper inspection of the built-up members (Main Girders, and Floor Beam 6-3) generally includes the following steps

1. Check all rivets (and any bolts) to determine that they are tight and that the individual components are functioning as one member.

2. Check for corroded, cracked, or missing rivets (or any bolts).

3. Check the main girders around the floor beams and lateral bracing connections for deformation or cracking due to out of plane bending.

4. Check the floor beam around the stringer and lateral bracing connections.

5. Check the entire member length, particularly in the tension zones for buckling. Also, check for cracking which may have originated from fatigue, corrosion, nicks, or gouges. Thoroughly inspect any area with impact damage.

6. Check entire member length for temporary erection welds, tack welds, plug welds, weld repairs, or welded connections.

7. Carefully check members at any deck or handrail attachments.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

III. INSPECTION PROCEDURES (cont.):

C. Proper inspection procedures for the rolled shapes (Floor Beams 6-1 and 6-2) generally included the following steps:

1. Check the areas around the stringer connections.
2. Check the bascule span floor beams around the lateral bracing connections.
3. Check for missing or cracked rivets or rivet heads (and any bolts) at all connections.
4. Check the entire length of the tension flange and web for cracking which may have originated from fatigue, corrosion, nicks, or gouges. Also thoroughly inspect any areas with impact damage.
5. Check entire member length for temporary erection welds, tack welds, plug welds, weld repairs, or welded connections not shown on the plans.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

IV. CATEGORIES

A. Fatigue Categories

1. CATEGORY A: This fatigue category generally refers to plain members or components of plain members which are base metal and are away from any connection details. The components are generally rolled, but may be flame cut with ANSI smoothness of 1,000 or less.

2. CATEGORY B: This fatigue category generally refers to connections using continuous full penetration welds or high strength bolts. The base metal and weld metal are subject to this fatigue category.

3. CATEGORY C: This fatigue category generally refers to base and weld metal used in very short connections.

4. CATEGORY D: This fatigue category generally refers to base and weld metal used in longer fillet welded connections than for Category C. This category also refers to short groove welded connections with fairly sharp transitions as well as riveted connections.

5. CATEGORY E AND E’: This fatigue category generally refers to base and weld metal of welded connections not mentioned in Categories C and D, namely longer fillet and groove welds with sharp transitions.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

Photo A: Bascule Span Framing

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

FRACTURE CRITICAL/FATIGUE SENSITIVE ELEMENTS: **MAIN GIRDERS (2 each)**
CONSTRUCTION: **BUILT-UP PLATE GIRDERS**

DETAIL DESCRIPTION AND LOCATION	FATIGUE CATEGORY	TYPE CONNECTION	TYPE WELD	COMMENTS
Main Girder (A1)	B	N/A	Fillet	Refers to base metal away from member connections. Both main girders have holes in web plates at the locks and rack pinion shafts. Web plates have welds and welded repair plates located in the vicinity of the curved track.
Top flange to web connection (A2)	D	Riveted	N/A	
Bottom flange to web connection (A3)	B/D	Bolted/Riveted	N/A	Connections are riveted where bottom flange changes in section adjacent to live load shoes and from curved track to a point between Floor Beam 6-2 and 6-3.
Curved track connections (A4)	E	Welded	Fillet	A various number of welds, welded repairs and welded attachments are present.
Web splices (A5)	D	Riveted	N/A	Located at floor beams.
Vertical web stiffener connections (A6)	D/B/C	Riveted/ Bolted/ Welded	Tack	Stiffeners were originally riveted. Angles where sidewalk supports are present are riveted and bolted. Some stiffeners have had plates welded to girder bottom flange.
Lateral Bracing connections (A7)	B/D	Bolted/Riveted	N/A	Connection angle at Main Girder 6-1 LT to Floor Beam 6-3 is riveted.
Floor beam connections (A8)	B/D	Bolted/Riveted	N/A	
Primary transverse deck grating supports (A9)	B	Welded	Fillet	
Live load shoe assemblies (A10)	B	Bolted	N/A	
Transverse machinery support to web connection (A11)	B	Welded	Fillet	

( ) = See sketch for detail location

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

FRACTURE CRITICAL/FATIGUE SENSITIVE ELEMENTS: **FLOOR BEAMS 6-1 and 6-2 (2 each)**
CONSTRUCTION: **ROLLED (UNKNOWN SIZE)**

DETAIL DESCRIPTION AND LOCATION	FATIGUE CATEGORY	TYPE CONNECTION	TYPE WELD	COMMENTS
Floor beam (B1)	A	N/A	N/A	Refers to base metal away from member connections.
Stringer to floor beam connections (B2)	D/E	Riveted/Welded	Fillet	Bottom flange of stringers are riveted to top flange of floor beams. Fillet welds are also present. Stringers over Floor Beam 6-2 are continuous.
Floor beam to main girder connection (B3)	B/D	Bolted/Riveted	N/A	Connections are riveted and bolted.
Lateral bracing connection at midpoint of top flange (B4)	B	Bolted	N/A	Only applies to Floor Beam 6-2.
Lateral bracing connection at ends of top flange (B5)	B	Bolted	N/A	Only applies to Floor Beam 6-1
Bottom flange to main girder gusset plate connections (B6)	B	Bolted	N/A	Only applies to Floor Beam 6-1
Original span lock bracing (B7)	C	Welded	Fillet	Welded to web at each end of Floor Beam 6-1.
Bottom Flange (B8)	A	N/A	N/A	Floor Beams 6-1 and 6-2
Lower portion of web (B9)	A	N/A	N/A	Floor Beams 6-1 and 6-2

( ) = See sketch for detail location.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

FRACTURE CRITICAL/FATIGUE SENSITIVE ELEMENTS: **FLOOR BEAM 6-3 (1 each)**
CONSTRUCTION: **BUILT-UP PLATE GIRDER**

DETAIL DESCRIPTION AND LOCATION	FATIGUE CATEGORY	TYPE CONNECTION	TYPE WELD	COMMENTS
Floor beam (C1)	A	N/A	N/A	Refers to the base metal away from member connections.
Stringer to floor beam connections (C2)	B/D	Bolted/Riveted	N/A	Stringers are connected to top flange of floor beam. Stringers on west side of top flange are riveted; stringers on the east side are bolted.
Floor beam to main girder connections (C3)	B/D	Bolted/Riveted	N/A	Connections have both rivets and bolts.
Lateral bracing connections (C4)	B	Bolted	N/A	
Vertical web stiffeners (C5)	D	Riveted	N/A	
Bottom flange to web connection (C6)	D/B	Riveted/Bolted	N/A	Bolts present where rivets were replaced.
Top flange to web connection (C7)	D	Riveted	N/A	
Machinery Supports (C8)	B	Bolted	N/A	Connections are bolted to web plate.

( ) = See sketch for detail location

MOVABLE BRIDGE DATA

Table 1: Non-Destructive Testing
Thickness Measurements

Lateral Brace Gusset Plates:

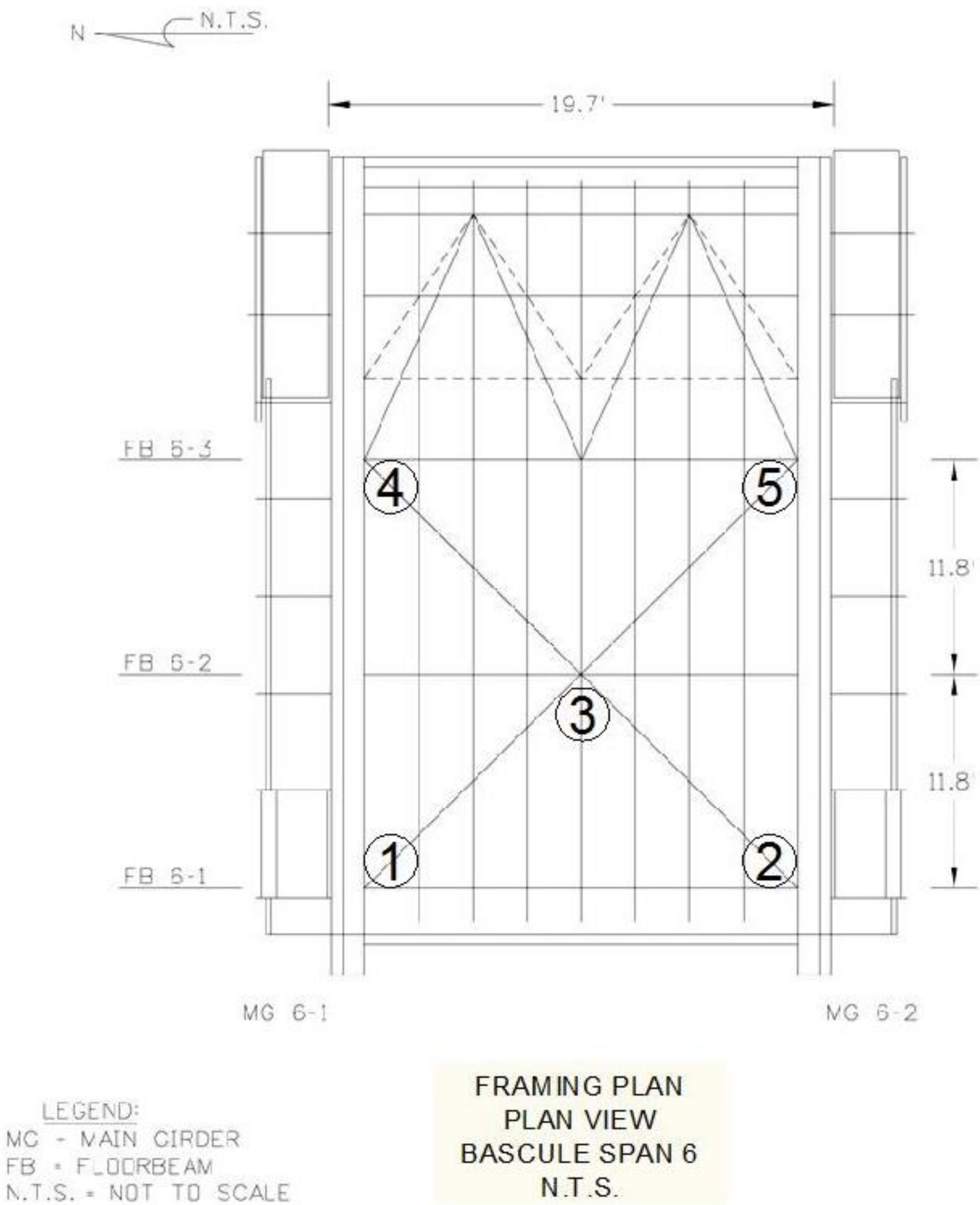
Member ID	Nominal* (in.)	2012 Actual (in.)	2015 Actual (in.)	Comment
6-1	0.371	0.371	0.371	
6-2	0.373	0.373	0.373	
6-3	0.372	0.167	0.154	
6-4	0.371	0.371	0.352	
6-5	0.369	0.369	0.369	

*Nominal thicknesses are field measurements. ‘Nominal’ and ‘Actual’ Measurements were taken for use as ‘baseline’ measurements, using a Krautkramer DMS 2 Ultrasonic Thickness Gauge and a Krautkramer TC-560 Transducer. Collection of lateral brace gusset plate measurements on bascule bridges is not required per FHWA guidelines. These measurements are provided and documented for future reference.

Refer to framing plan sketch for gusset plate locations.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

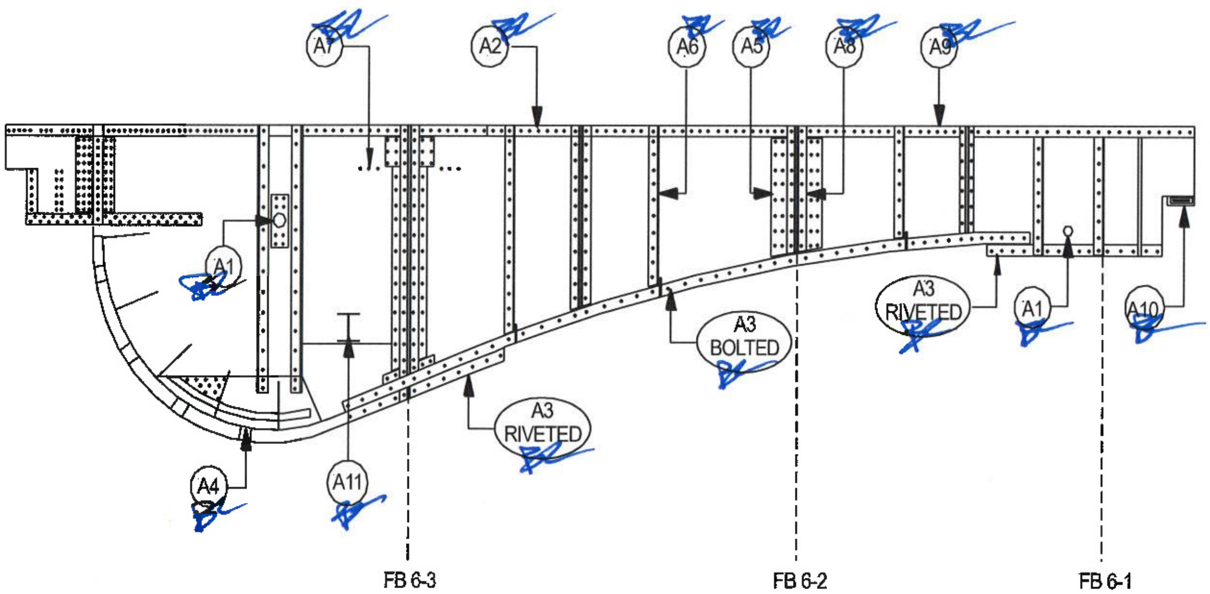


FRAMING PLAN
PLAN VIEW
BASCULE SPAN 6
N.T.S.

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA

(A1) REFERS TO THE BASE METAL AWAY FROM CONNECTION DETAILS



MAIN GIRDER ELEVATION
N.T.S.

LEGEND:

(A1) = TYPICAL FATIGUE SENSITIVE DETAIL

N.T.S. = NOT TO SCALE

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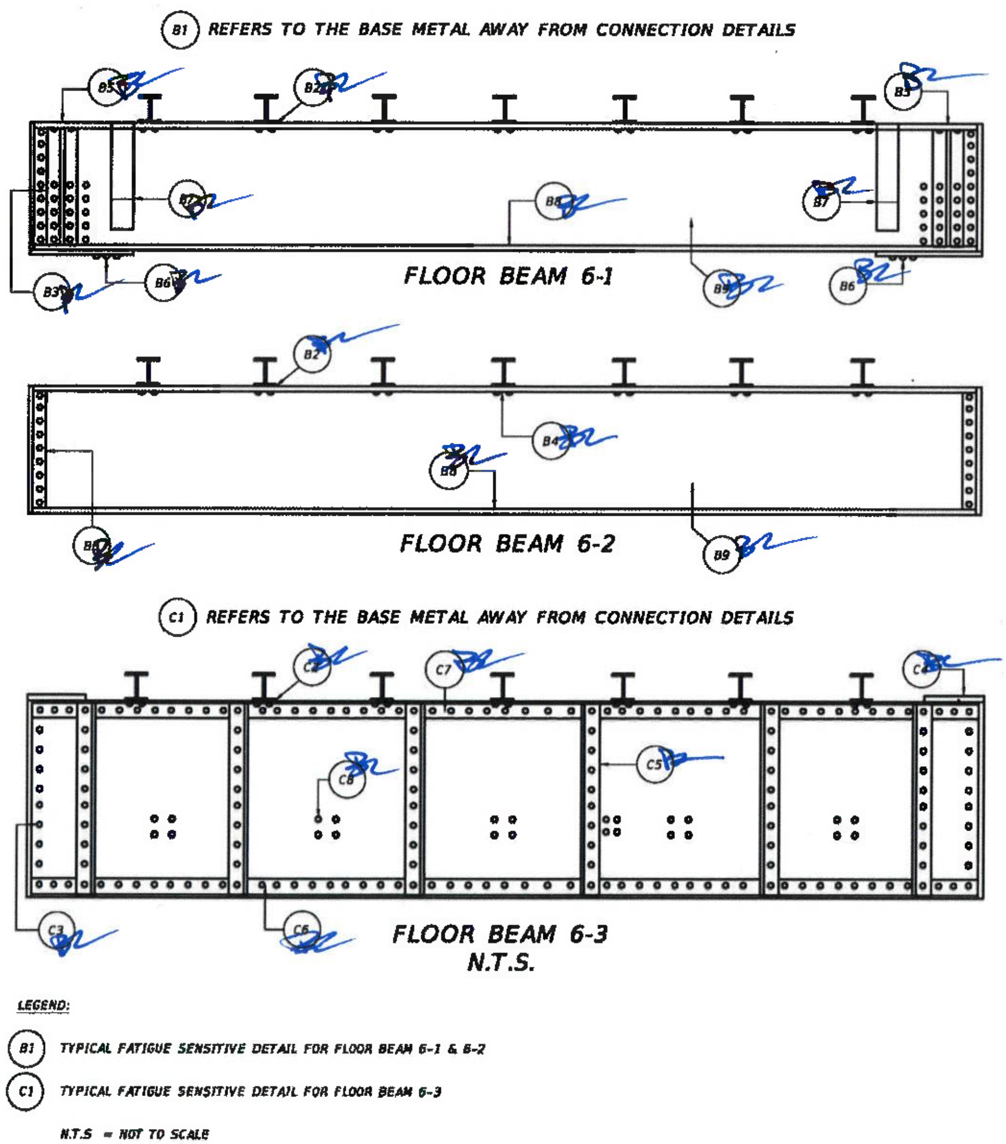
BRIDGE ID: 154000 **PAGE:** A61 OF A61
DISTRICT: 07 Tampa **INSPECTION DATE:** 07/30/2019

MOVABLE BRIDGE DATA

FRACTURE CRITICAL DATA



2. LOAD RATING SUMMARY (1987)

LOAD RATING SUMMARY   Bridge No. 154000

Computations / Computer Coding Performed By: W. G. Howell Date : 1/12/87

Computations / Computer Coding Checked By: J.A. Jolicero P.E.# : 31136

Reviewed by Jorge L. Perez Date: 1/23/90   Date : 1/16/87

CLASS	TYPE OF LOADING	RATING LEVEL	MOMENT RATING- MAIN GIRDER	MOMENT RATING- FLOOR BEAM	MOMENT RATING- STEEL STRINGER	MOMENT RATING- TRANSVERSE DECK BEAM	MOMENT RATING- DECK GRATING	MOMENT RATING- AASHTO GIRDER	CONTROLLING RATINGS
Florida Legal Loading	SU 2	INVENTORY	23.6	11.8	23.7	21.6	9.1	34.5	9.1
	G.V.W. = 17 TONS	OPERATING	39.3	16.6	32.7	29.5	12.5	38.7	12.5
	SU 3	INVENTORY	26.5	13.7	35.2	41.9	17.8	35.8	13.7
	G.V.W. = 33 TONS	OPERATING	44.1	19.3	48.6	57.2	24.2	40.1	19.3
	SU 4	INVENTORY	25.7	13.3	35.6	44.5	18.7	35.3	13.3
	G.V.W. = 35 TONS	OPERATING	42.8	18.9	49.2	60.7	25.5	39.6	18.9
	C 3	INVENTORY	36.5	17.3	39.0	35.6	15.1	52.5	15.1
	G.V.W. = 28 TONS	OPERATING	60.7	24.3	53.9	48.6	20.5	58.9	20.5
	C 4	INVENTORY	34.0	15.3	39.1	46.6	19.7	48.1	15.3
	G.V.W. = 36.6 TONS	OPERATING	56.7	21.4	54.0	63.5	26.9	53.9	21.4
	C 5	INVENTORY	46.2	16.7	42.7	50.8	21.5	51.5	16.7
	G.V.W. = 36.6 TONS	OPERATING	77.0	23.4	58.9	69.4	29.4	57.8	23.4
Design Loading	H 20	INVENTORY							
	G.V.W. = 20 TONS	OPERATING							
	HS 20 [1]	INVENTORY	31.1	17.5	34.6	45.8	20.8	44.7	17.5
	G.V.W. = 36 TONS	OPERATING	51.9	24.3	47.5	62.4	28.4	50.2	24.3

Notes : All ratings are in tons.

* As per the AASHTO Manual For Maintenance Inspection of Bridges 1983 Section 4.1, the load levels indicated by this report represent the upper (Operating Rating) and lower (Inventory Rating) level utilization for posting purposes.

* The Florida Department of Transportation has directed Kisinger Campo and Associates to express the Department's policies to post weight restrictions based on the Operating Ratings. The local government may elect to post a structure based on Inventory Ratings, Operating Ratings, or another rating within the two ratings herein stated. Based on the Operating Ratings, the structure should be posted for the SU2, SU3, SU4, C3, C4, and C5 type vehicles. The structure is currently posted at the Inventory Ratings for the SU2, SU3, SU4, C3, C4, and C5 type vehicles.

[1] Design Vehicle: Unknown

3. BRIDGE PLANS

3.1. PERMIT SKETCH (1924)

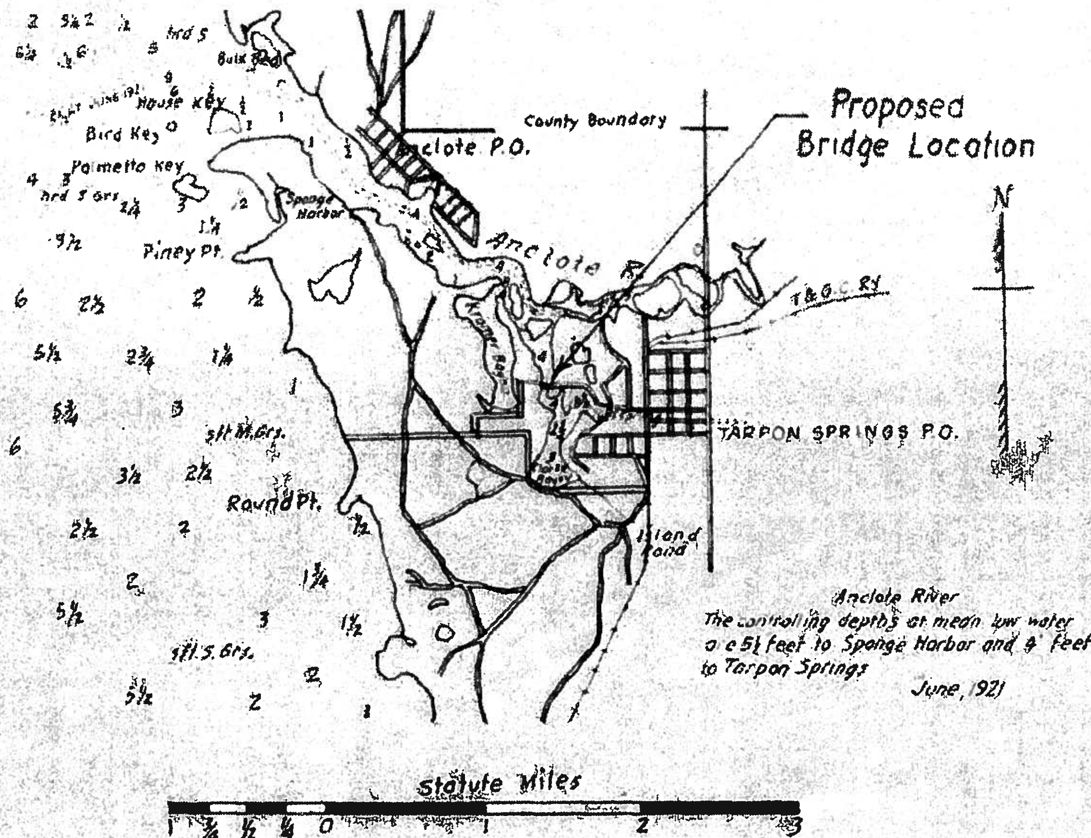
MAP OF

PROPOSED BRIDGE AND LIFT SPAN ACROSS TARPON BAYOU AT TARPON SPRINGS FLORIDA

TO BE ERECTED BY

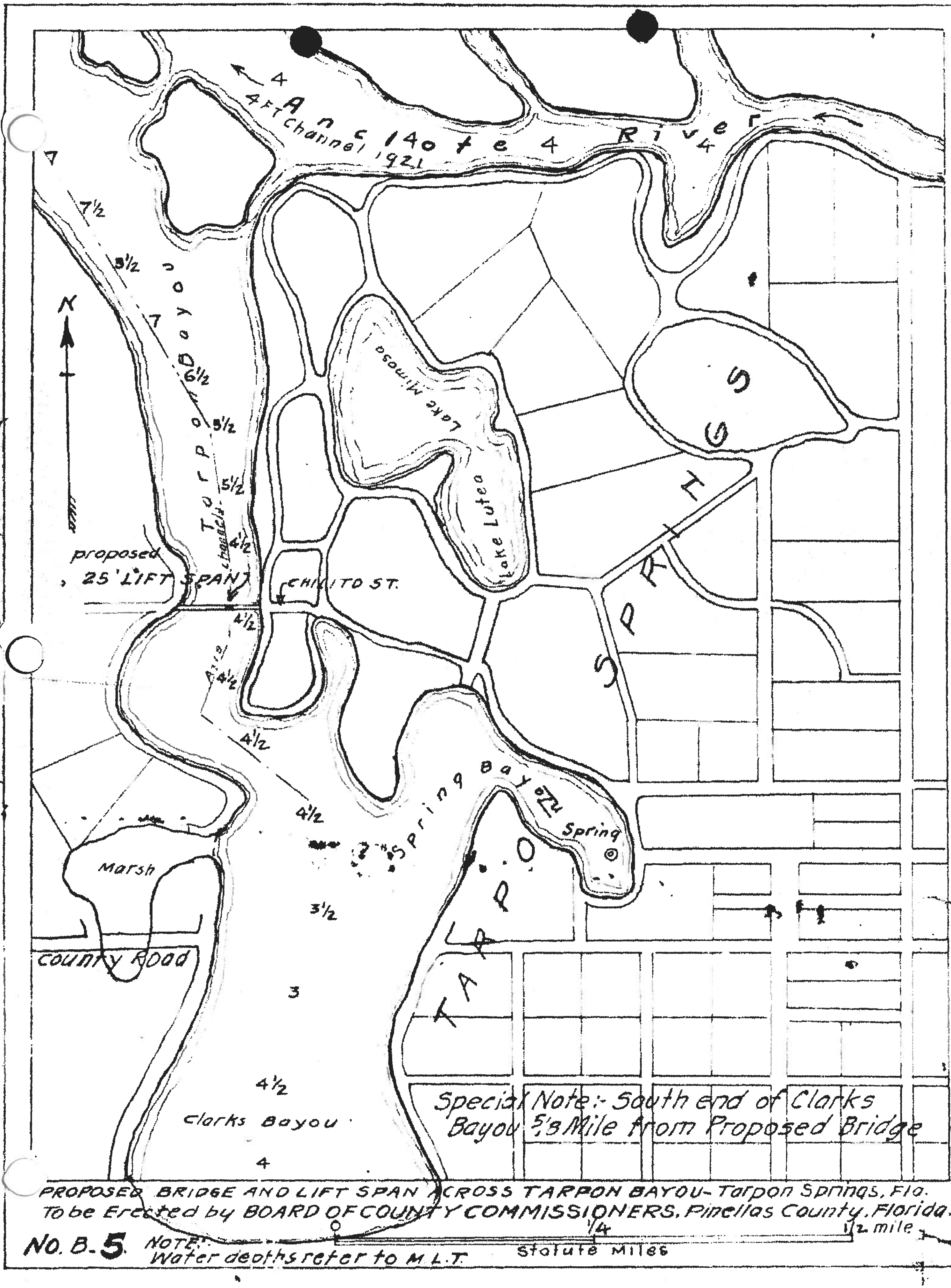
BOARD OF COUNTY COMMISSIONERS - PINELLAS COUNTY, FLORIDA.

Traced from U.S.C. & G.S. Chart No. 178 - Sept. 11, 1923



Engr Certificate #178
State of Florida.

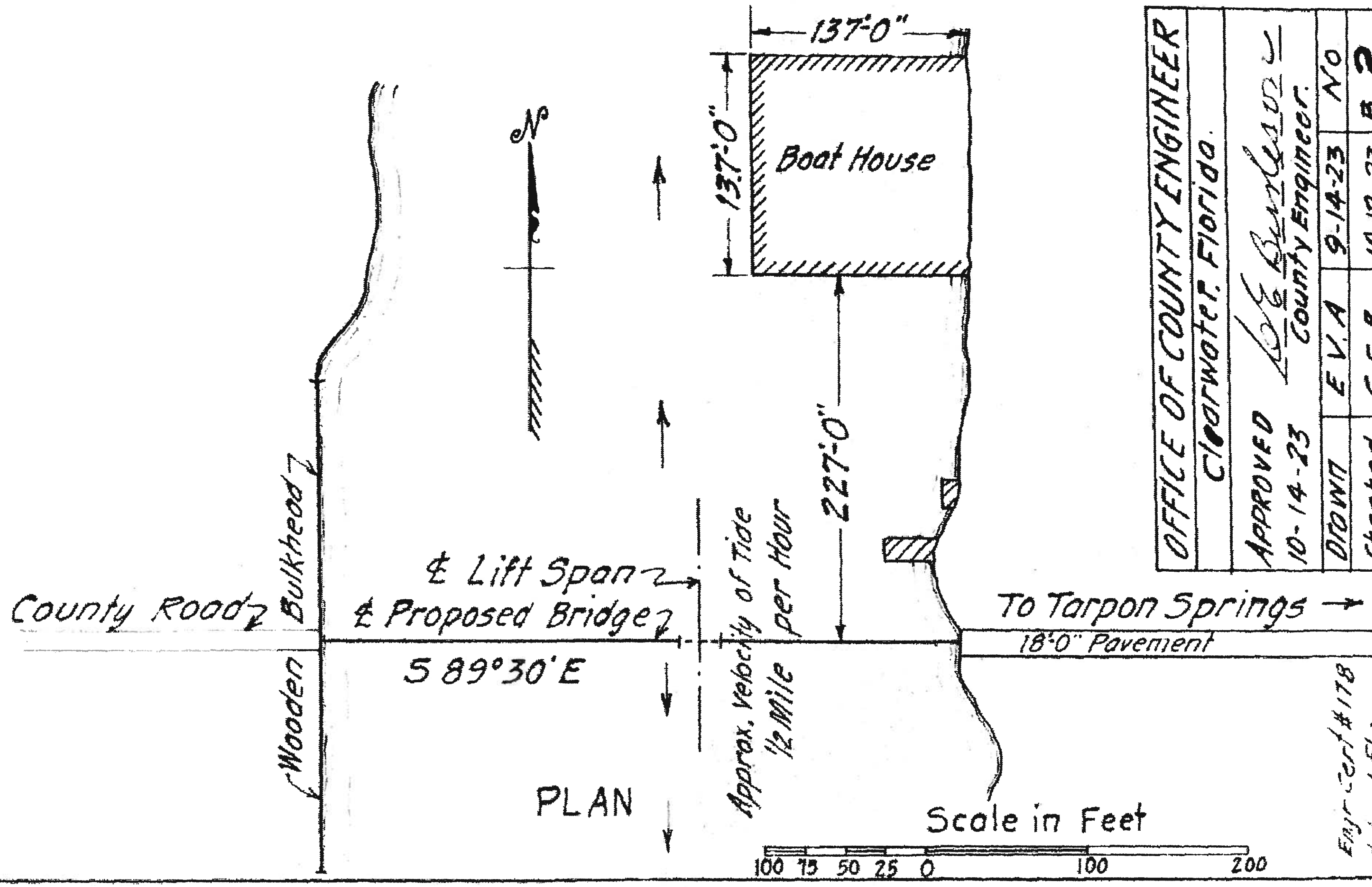
OFFICE OF COUNTY ENGINEER			
Clearwater, Florida.			
APPROVED 10-14-23	L. E. Burleson, County Engineer		
Drawn	E.V.A.	9-14-23	NO
Checked	C.E.B.	10-12-23	8 1



PROPOSED BRIDGE AND LIFT SPAN ACROSS TARPON BAYOU- Tarpon Springs, Fla.
To be Erected by BOARD OF COUNTY COMMISSIONERS, Pinellas County, Florida.

NO. B-5 NOTE: Water depths refer to M.L.T.

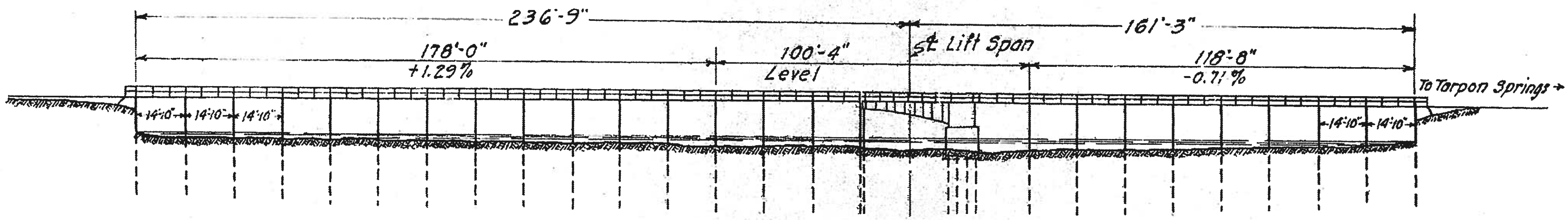
PROPOSED BRIDGE AND LIFT SPAN ACROSS TARPON BAYOU
AT TARPON SPRINGS, FLORIDA
TO BE ERECTED BY
BOARD OF COUNTY COMMISSIONERS - PINELLAS COUNTY, FLORIDA



OFFICE OF COUNTY ENGINEER	
Clearwater, Florida.	
APPROVED 10-14-23	County Engineer.
Drawn E.V.A. 9-14-23	No
Checked C.E.B. 10-12-23	B. 2

Engr Cert #178
State of Fla.

PROPOSED BRIDGE AND LIFT SPAN ACROSS TARPON BAYOU
AT TARPON SPRINGS, FLORIDA
TO BE ERECTED BY
BOARD OF COUNTY COMMISSIONERS- PINELLAS COUNTY, FLORIDA



GENERAL ELEVATION
Scale: 1"=25'-0"

Scale in Feet
25 18¾ 12½ 6¼ 0 25 50

Engr Certificate #178
State of Fla.

OFFICE OF COUNTY ENGINEER			
Clearwater, Florida.			
APPROVED 10-14-23	L. E. Burleson, County Engineer.		
Drawn	E.V.A.	9-12-23	NO
Checked	C.E.B.	10-12-23	B-3.

3.2. BRIDGE REPAIR PLANS (1994)

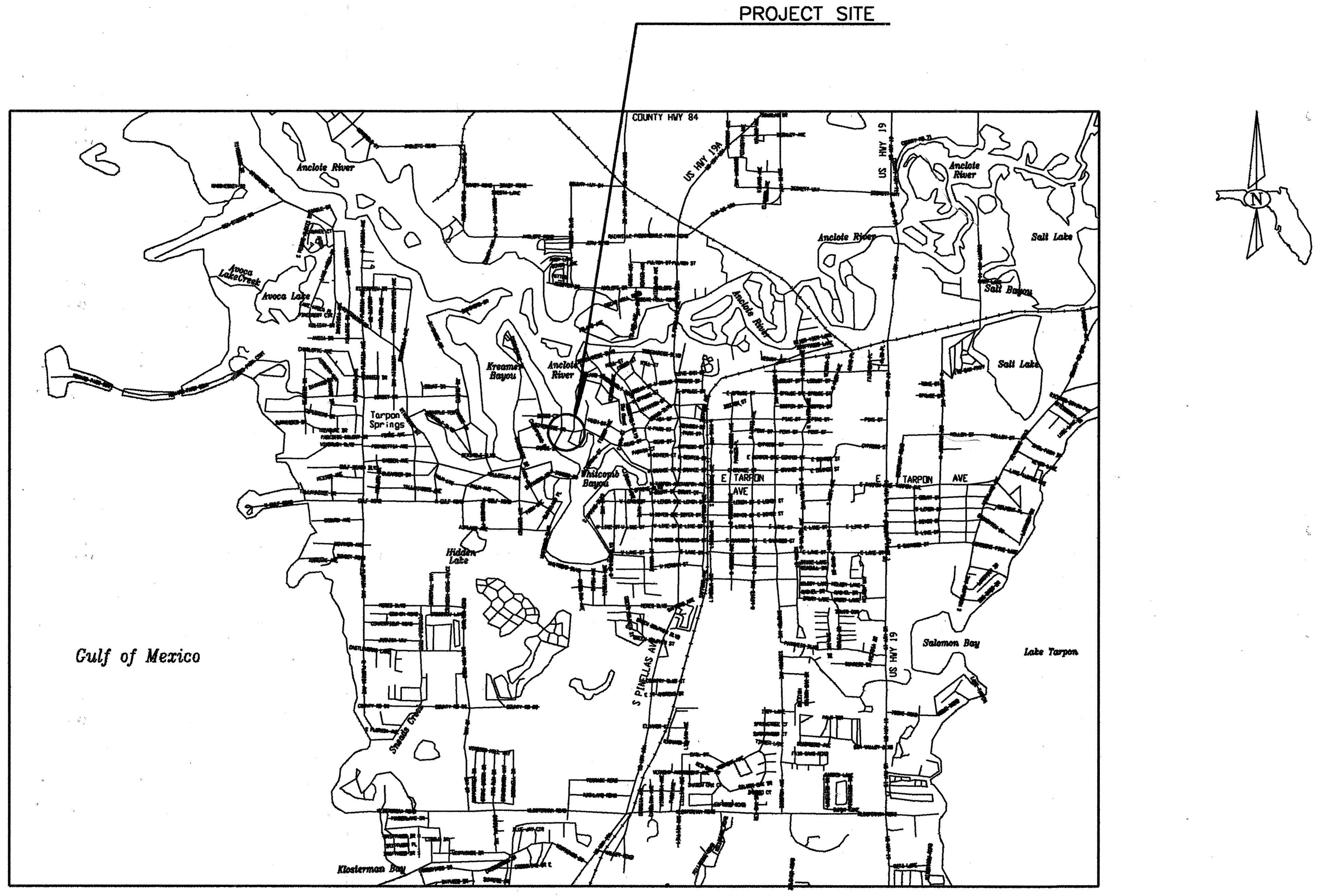
PINELLAS COUNTY
DEPARTMENT OF PUBLIC WORKS

PLANS OF PROPOSED
BECKETT BRIDGE REPAIRS

BRIDGE NO. 154000
P.I.D. NO. 106147
CONTRACT NO. 95002

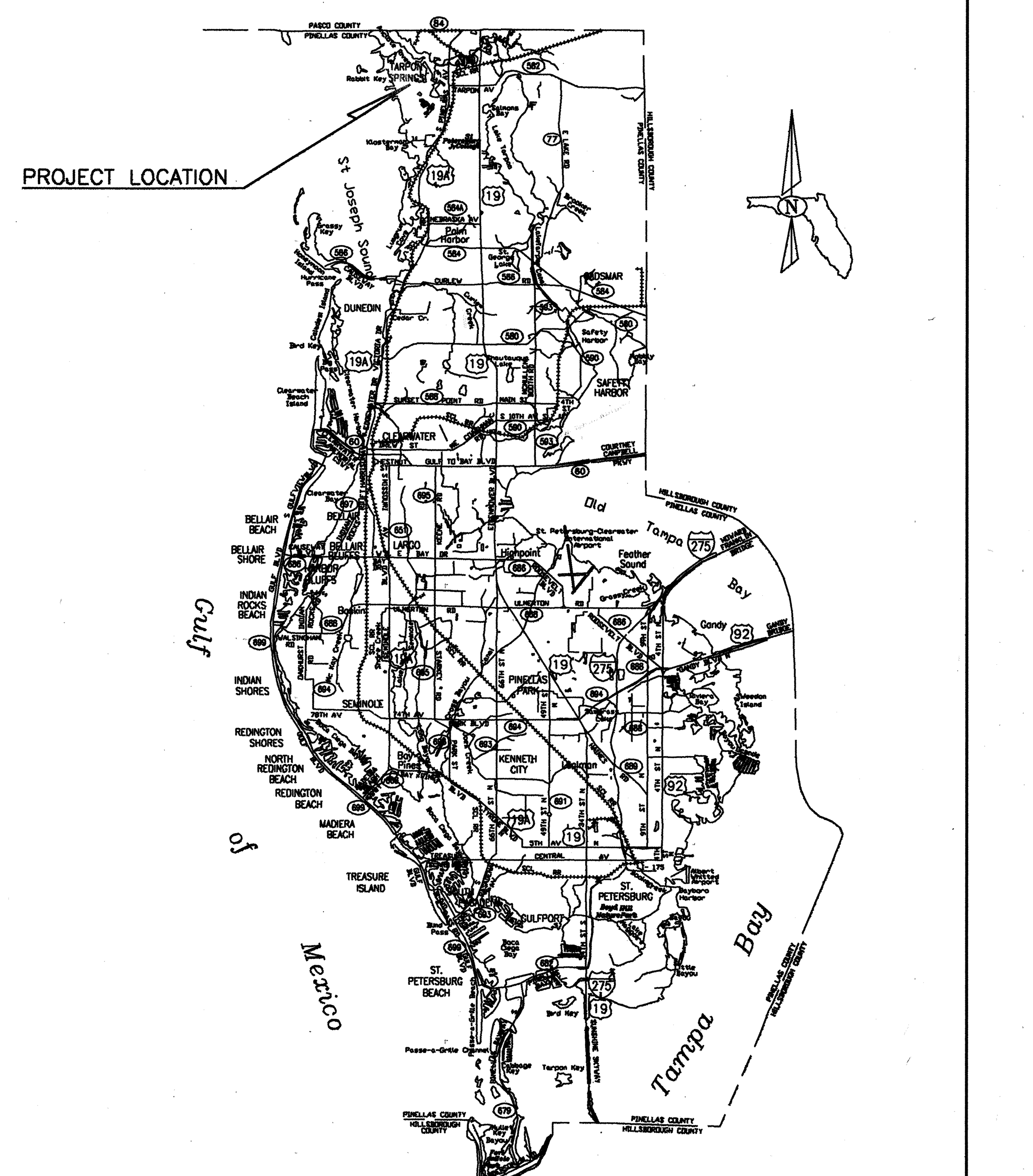
INDEX OF BRIDGE REPAIR PLANS

DRAWING NO.	DESCRIPTION
A-1	TITLE SHEET AND INDEX OF DRAWINGS
A-2	GENERAL NOTES
A-3	SUMMARY OF QUANTITIES
A-4	KEY SHEET
A-5	TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS
A-6	TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS
A-7	NAVIGATION LIGHT SYSTEM DETAILS
A-8	REPORT OF CORE BORINGS
A-9	TRAFFIC CONTROL PLANS (1)
A-10	TRAFFIC CONTROL PLANS (2)
A-11	TRAFFIC CONTROL PLANS (3)
S-1	FOUNDATION LAYOUT
S-2	BULKHEAD DETAILS – END BENT 1
S-3	BULKHEAD DETAILS – END BENT 11
S-4	CRUTCH BENT DETAILS
S-5	BASCULE PIER STABILIZER DETAILS
S-6	CONTROL PLATFORM DETAILS
S-7	CONCRETE REPAIR DETAILS
S-8	BARRIER GATE SUPPORT DETAILS
S-9	TRAFFIC GATE SUPPORT AND PILASTER DETAILS
S-10	ACCESS LADDERS AND PLATFORM DETAILS
S-11	BASCULE SPAN REPAIRS
S-12	BASCULE SPAN – SIDEWALK AND HANDRAIL DETAILS
S-13	STRUCTURAL STEEL REPAIR DETAILS
S-14	COUNTERWEIGHT DETAILS
S-15	CONCRETE DECK REPLACEMENT AND JOINT DETAILS
S-16	APPROACH SLAB DETAILS
S-17	REINFORCING BAR LIST
E-1	ELECTRICAL SYMBOLS AND ABBREVIATIONS
E-2	ELECTRICAL SITE PLAN
E-3	RISER DIAGRAM
E-4	CONDUIT AND CABLE SCHEDULE
E-5	SPAN ELECTRICAL PLAN
E-6	CONTROL PANEL DETAILS & NOTES
E-7	SCHEDULES
E-8	ELECTRICAL DETAILS
E-9	TRAFFIC GATE DETAILS
E-10	BARRIER GATE DETAILS
M-1	MACHINERY PLAN
M-2	MACHINERY PLAN AND SCHEDULES
M-3	SPAN LOCK DETAILS
M-4	SPAN LOCK DETAILS
M-5	MISCELLANEOUS DETAILS
M-6	SECTIONS AND ELEVATIONS
M-7	HYDRAULIC SYSTEM SCHEMATIC
M-8	MECHANICAL SITE PLAN
M-9	MACHINERY DEMOLITION



VICINITY MAP

1 MILE



PINELLAS COUNTY, FLORIDA
LOCATION MAP

REVIEWED BY: Enrique Mazas — ENRIQUE J. MAZAS, P.E., PROJECT MANAGER — 8-14-95 DATE

RECOMMENDED FOR APPROVAL BY: Robert L. Warren — ROBERT L. WARREN, DIRECTOR OF HIGHWAY DEPARTMENT — 8-14-95 DATE

RECOMMENDED FOR APPROVAL BY: JLB 8/14/95 — THOMAS WM. McGREW, P.E., DIRECTOR OF ENGINEERING — 8-18-95 DATE

APPROVED BY: J. Keith Wicks — J. KEITH WICKS, P.E., DIRECTOR OF PUBLIC WORKS — 8/31/95 DATE

R:\94065\CADD\BRIDGE
C:\WORK\TBCOVER 07/31/95 15:40:46 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS			SEAL:
Date	By	Description	Date	By	Description	

	Names	Dates
Drawn by	TJL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: TITLE SHEET AND INDEX OF DRAWINGS

PROJECT NAME: BECKETT BRIDGE REPAIRS

Drawing No. A-1

GENERAL NOTES

SCOPE OF WORK:

THIS CONTRACT REQUIRES WORK WHICH IS DEFINED IN THESE PLANS AND THE CONTRACT SPECIFICATIONS. SOME TASKS ARE PARTIALLY OR COMPLETELY DEFINED IN THE SPECIFICATIONS. REFERENCE TO THE "SPECIFICATIONS" INCLUDES REFERENCE TO ALL SUPPLEMENTAL SPECIFICATIONS, TECHNICAL SPECIAL PROVISIONS, AND STANDARD SPECIFICATIONS REFERENCED THEREIN. CONTRACT WORK INCLUDES THE FOLLOWING ITEMS AS DETAILED IN THESE PLANS AND THE SPECIFICATIONS:

STRUCTURAL:

1. REPAIR STRUCTURAL STEEL AND REPLACE BRACING ON THE BASCULE LEAF.
2. FURNISH AND INSTALL NEW CRUTCH BENTS AT BENTS 6 AND 7.
3. CLEAN AND PAINT STRUCTURAL STEEL AND MACHINERY.
4. REPLACE SIDEWALK AND HANDRAIL ON NORTH SIDE OF BASCULE SPAN. FURNISH AND INSTALL NEW SIDEWALK AND HANDRAIL ON SOUTH SIDE OF BASCULE SPAN.
5. FURNISH AND INSTALL NEW FENDER SYSTEM ACCESS LADDERS.
6. PROVIDE NEW OPERATOR PLATFORM ON THE NORTH SIDE OF SPAN 7.
7. INSTALL NEW SHEET PILE BULKHEADS AT END BENTS 1 AND 11.
8. FURNISH AND INSTALL BASCULE PIER STABILIZER.
9. CONSTRUCT NEW CONCRETE APPROACH SLABS.
10. REPLACE PART OF CONCRETE DECK IN SPAN 7.
11. CLEAN AND SEAL OPEN DECK JOINTS.
12. CLEAN AND PATCH CONCRETE SPALLS.

MACHINERY:

1. REMOVE EXISTING DRIVE MACHINERY AND MISCELLANEOUS COMPONENTS NO LONGER IN USE.
2. REPLACE SPAN LOCKS, GUIDES, AND RECEIVERS. FURNISH AND INSTALL NEW HYDRAULICALLY OPERATED SYSTEM.
3. RECONDITION AND ADJUST ALL LOAD SHOES.
4. REPLACE COUNTERWEIGHT AND BALANCE BASCULE SPAN.
5. FURNISH AND INSTALL NEW GEAR DRIVE SYSTEM.
6. ALIGN MACHINERY AND SPAN.
7. FURNISH AND INSTALL NEW BRAKE SYSTEM.
8. FURNISH AND INSTALL EMERGENCY DRIVE SYSTEM.
9. RECONDITION FLAT TRACK PLATES.
10. PROVIDE A FUNCTIONAL CHECKOUT OF OPERATING SYSTEMS.

ELECTRICAL:

1. REMOVE EXISTING CONTROL SYSTEM AND UTILITY SERVICE.
2. FURNISH AND INSTALL NEW DUAL DRIVE MOTORS.
3. FURNISH AND INSTALL NEW ELECTRICAL SERVICE.
4. REPLACE EXISTING WIRING, CONDUIT, AND JUNCTION BOXES.
5. FURNISH AND INSTALL NEW SUBMARINE CABLE.
6. FURNISH AND INSTALL NEW CONTROL CONSOLE.
7. FURNISH AND INSTALL NEW CONTROL PANEL / MOTOR CONTROLLERS.
8. FURNISH AND INSTALL NEW EMERGENCY POWER RECEPTACLE AND TRANSFER SWITCH.
9. FURNISH AND INSTALL NEW TRAFFIC SIGNALS.
10. FURNISH AND INSTALL NEW TRAFFIC GATES AND A BARRIER GATE.
11. FURNISH AND INSTALL NEW NAVIGATION LIGHTS.
12. FURNISH AND INSTALL LIGHTNING AND SURGE SUPPRESSION DEVICES.
13. FURNISH AND INSTALL NFPA LIGHTNING PROTECTION SYSTEM.

FIELD VERIFICATION OF DIMENSIONS:

DIMENSIONS OF EXISTING STRUCTURES, MECHANICAL AND ELECTRICAL COMPONENTS ARE PROVIDED FOR INFORMATION ONLY. THEY ARE DERIVED FROM OBSERVATIONS AND A FIELD SURVEY. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. DISCREPANCIES FROM THE DIMENSIONS SHOWN IN THE PLANS MUST BE SHOWN IN THE SHOP DRAWINGS. DISCREPANCIES FROM THE DIMENSIONS SHOWN IN THE PLANS OR FAILURE BY THE CONTRACTOR TO VERIFY DIMENSIONS SHALL NOT BE JUSTIFICATION FOR CLAIMS.

CONSTRUCTION SPECIFICATIONS:

FLORIDA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 1991 EDITION, AND SUPPLEMENTS THERETO.

DESIGN SPECIFICATIONS:

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO), STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1992 EDITION WITH INTERIMS THROUGH 1994.

STANDARD SPECIFICATIONS FOR MOVABLE HIGHWAY BRIDGES, 1988 AND ALL APPLICABLE INTERIMS THROUGH 1991.

FDOT STRUCTURES DESIGN GUIDELINES, 1987, WITH REVISIONS THROUGH UPDATE "H".

SHOP DRAWINGS:

THE CONTRACTOR SHALL SUBMIT DETAILED SHOP DRAWINGS AND/OR CATALOG CUTS OF ALL NEW STRUCTURES, WELDMENTS, CASTINGS, SHIM PLATES, WEAR PLATES, PINS, TURNED BOLTS, LUBE LINES, LUBE FITTINGS, COMPONENTS, AND INCIDENTALS. SUCH DRAWINGS SHALL INCLUDE FITS, FINISHES, DIMENSIONS, AND MATERIALS FOR FABRICATED AND MANUFACTURED ELEMENTS. DIMENSIONS OF EXISTING ELEMENTS SUPPORTING OR CONTACTING THE NEW PARTS SHALL ALSO BE SHOWN. SEE THE SPECIFICATIONS FOR DETAILS ON SHOP DRAWING PREPARATION AND SUBMITTAL.

DESIGN LOADS:

THE ORIGINAL BRIDGE DESIGN LOAD IS UNKNOWN. REHABILITATION DESIGN LOAD BASED ON AASHTO HS-20.

PLATFORM LOADS: 85 psf. LIVE LOAD

OPERATIONAL REQUIREMENTS:

MOVABLE SPAN OPERATIONS CRITERIA FOR DESIGN AND REHABILITATION IS AS FOLLOWS:

TIME FOR "NORMAL OPERATION" = 60 SECONDS
SPAN ROTATION TO FULL OPEN = 49 DEGREES
EMERGENCY STOP TIME = 5 SECONDS (NORMAL SPEED)

ENVIRONMENT:

DESCRIPTION: SUPERSTRUCTURE CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE CORROSIVE (EXTREMELY AGGRESSIVE)
LOCATION: COASTAL

MATERIALS:

THE FOLLOWING GENERAL MATERIAL REQUIREMENTS SHALL APPLY. WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REFERENCED SPECIFICATIONS WHERE APPLICABLE.

STRUCTURAL STEEL:

STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ASTM A709, GRADE 36 OR AS DETAILED IN THE PLANS. STRUCTURAL STEEL SHALL BE PAINTED OR GALVANIZED AS DETAILED IN THE PLANS.

STRUCTURAL STEEL WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 460 OF THE STANDARD SPECIFICATIONS.

BOLTS:

WHERE NOTED, BOLTS FOR FASTENING OF MACHINERY COMPONENTS SHALL BE ASTM A-325 TURNED BOLTS, MACHINED TO AN ANSI B46.1 SURFACE FINISH OF 63 MICROINCHES AND AN ANSI B4.1 LC-6 FIT. BOLTS SHALL BE PROVIDED WITH A POSITIVE MEANS OF NUT RESTRAINT (BY COTTER PIN, SET SCREW, ETC.) OR SHALL BE SUPPLIED WITH DOUBLE NUTS.

BOLTS FOR STRUCTURAL STEEL CONNECTIONS SHALL BE 3/4"ø ASTM A325 TYPE 1, HIGH STRENGTH BLACK BOLTS UNLESS OTHERWISE NOTED. ALL BOLTED CONNECTIONS ARE FRICTION TYPE.

INSTALLATION OF BOLTS SHALL BE IN ACCORDANCE WITH SECTION 460 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL:

REINFORCING STEEL SHALL BE ASTM A615, GRADE 60. ALLOWABLE TENSILE STRESS = 24,000 PSI. REINFORCING STEEL SHALL BE UNCOATED. ALL DIMENSIONS SHOWN ARE TO CENTERLINE OF BARS EXCEPT WHERE THE CLEAR DIMENSION IS SHOWN FROM FACE OF CONCRETE TO OUTSIDE EDGE OF BAR. REINFORCING DETAIL DIMENSIONS ARE OUT-TO-OUT OF BARS.

PLACING OF REINFORCING STEEL SHALL BE IN ACCORDANCE WITH SECTION 415 OF THE STANDARD SPECIFICATIONS.

CONCRETE:

ITEM	CONCRETE CLASS (FDOT)	MIN. 28-DAY COMP. STRENGTH (PSI)	MAX. COMP. STRESS (PSI)	DESIGN MODULUS OF ELASTICITY **
DECK SLABS, APPROACH SLABS, CONTROL PLATFORM AND OTHER SUPERSTRUCTURE DETAILS	IV	f'c = 5,500 *	fc = 2,200	3,900
SUBSTRUCTURE COMPONENTS	IV	f'c = 5,500 *	fc = 2,200	3,900
CONCRETE COUNTERWEIGHT	II	f'c = 3,400	fc = 1,400	3,000

* ACTUAL DESIGN WAS BASED ON 3,400 PSI
** ASSUMES FLORIDA LIMEROCK AGGREGATE

CONCRETE SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 346 OF THE SUPPLEMENTAL SPECIFICATIONS.

CONCRETE WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 400 OF THE STANDARD SPECIFICATIONS.

PLATFORM GRATING:

PLATFORM GRATING SHALL BE PRESSURE LOCKED RECTANGULAR DESIGN, TYPE B, AS MANUFACTURED BY IKG INDUSTRIES OR AN APPROVED EQUAL. MATERIAL TO BE ASTM A-569 STEEL. MAIN BARS TO BE 1 1/2" X 1/8" SPACED 1 3/16" CENTER TO CENTER. CROSS BARS TO BE OF RECTANGULAR CROSS SECTION, FLUSH TOP AND SPACED 4 INCHES CENTER TO CENTER. MAIN BARS AND CROSS BARS TO BE SLOTTED AT THEIR INTERSECTIONS SO AS NOT TO REMOVE EXCESSIVE MATERIAL FROM THE LOAD SUSTAINING MEMBERS. MAIN BARS TO BE DOVETAIL SLOTTED AND HAVE THEIR SLOTS SOLIDLY FILLED BY THE CROSS BARS. GRATING SHALL BE BOLTED TO SUPPORTING MEMBERS WITH FASTENERS SUPPLIED BY THE MANUFACTURER. FINISH SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123. GRATING SHALL WEIGH APPROXIMATELY 7.6 LB/SQ FT.

SIDEWALK PLATE:

SIDEWALK PLATE SHALL BE 3/8" ALUMINUM TREAD PLATE OF ALUMINUM ALLOY 6061-T6. ALUMINUM: fy = 35,000 psi, fo = 15,000 psi. THE CONTACT SURFACES BETWEEN THE ALUMINUM PLATE AND STEEL MEMBERS SHALL BE COATED WITH CHROMATE PAINT. THE ALUMINUM PLATE SHALL BE FASTENED TO THE STEEL MEMBERS WITH 1/2" DIAMETER COUNTERSUNK STAINLESS STEEL BOLTS AT 2'-0" SPACING ALONG THE MEMBER.

STEEL SHEET PILES:

STEEL SHEET PILES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 328 (fy = 38,500 psi).

ALLOWABLE DESIGN STRESS = 25,000 psi.

STEEL SHEET PILES SHALL BE INSTALLED IN ACCORDANCE WITH SECTION A455 OF THE SUPPLEMENTAL SPECIFICATIONS.

PAINTING:

PAINT ON THE EXISTING STRUCTURE CONTAINS LEAD. THE EXISTING STRUCTURE SHALL BE CLEANED AND PAINTED IN ACCORDANCE WITH SECTION 561 OF THE TECHNICAL SPECIAL PROVISIONS.

NEW STRUCTURAL STEEL SHALL BE PAINTED IN ACCORDANCE WITH SECTION 561 OF THE TECHNICAL SPECIAL PROVISIONS.

GALVANIZING:

ALL LADDERS, PLATFORMS, HANDRAILS, AND STRUCTURAL AND MISCELLANEOUS STEEL AS DESIGNATED IN THE PLANS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123.

ALL NUTS, BOLTS, WASHERS, ANCHOR BOLTS, AND MISCELLANEOUS CONNECTION PIECES FOR THE ABOVE ITEMS SHALL BE HOT DIP GALVANIZED WITH ASTM A153.

PIPE HANDRAIL:

RAILS AND POSTS SHALL BE MADE OF SCHEDULE 40 STEEL PIPE OF THE SIZE SHOWN IN THE PLANS AND SHALL MEET THE REQUIREMENTS OF ASTM A53 FOR STANDARD WEIGHT PIPE. POSTS SHALL BE ATTACHED TO SUPPORTING MEMBERS BY DETAILS SHOWN IN THE PLANS AT INTERVALS SHOWN IN THE PLANS. RAIL TO POST CONNECTIONS SHALL BE MADE BY ELECTRIC ARE WELDING. FINISH SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123.

STEEL PILING;

STEEL PILES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36. SEE THE FOUNDATION LAYOUT SHEET FOR PILE LOAD INFORMATION.

STEEL PILES SHALL BE INSTALLED IN ACCORDANCE WITH SECTION A455 OF THE SUPPLEMENTAL SPECIFICATIONS AND THESE PLANS.

LUBRICATION:

PIPING FOR LUBRICATION SHALL BE ASTM B-43 BRONZE AND FITTINGS SHALL BE ASTM B-62 BRONZE.

LUBRIICATION REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTION 465 OF THE TECHNICAL SPECIFICATIONS.

WELDING:

EXCEPT AS NOTED IN THE PLANS OR SPECIFICATIONS, FIELD WELDING IS PROHIBITED. ALL WELDING AND NON DESTRUCTIVE TESTING OF WELDS SHALL BE IN ACCORDANCE WITH THE SPECIAL PROVISIONS AND THE ANSI/AASHTO/AWS D1.5-92 BRIDGE WELDING CODE. UNLESS OTHERWISE NOTED, ALL WELDS SHALL BE 5/16" CONTINUOUS FILLET WELDS.

WELD INSPECTION:

WELDS ARE TO BE INSPECTED BY NON DESTRUCTIVE METHODS AS REQUIRED BY THE SPECIFICATIONS.

MAINTENANCE OF TRAFFIC PLANS:

REHABILITATION MUST BE COORDINATED WITH THE MOT PLAN. SEE PLANS AND SPECIFICATIONS FOR DETAILS.

BRIDGE TENDER:

THE CONTRACTOR SHALL HAVE A QUALIFIED BRIDGE TENDER ON CALL DURING ALL PHASES OF CONSTRUCTION FOR WHICH THE BRIDGE IS OPERATIONAL.

OPERATION TESTING:

OPERATIONAL TESTING OF REHABILITATED MACHINERY IS REQUIRED, SEE TECHNICAL SPECIAL PROVISIONS FOR DETAILS.

BASIS OF PAYMENT:

FOR A DETAILED DEFINITION OF THE BASIS OF PAYMENT, SEE EACH WORK ITEM IN THE SPECIFICATIONS.

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	KTL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: GENERAL NOTES

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET A-2

BID ITEM NOTES:

1. PAYMENT FOR INCIDENTAL ITEMS NOT SPECIFICALLY COVERED IN THE INDIVIDUAL PAY (BID) ITEMS SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE FOR PAY (BID) ITEMS.
2. FOR MAINTENANCE OF TRAFFIC NOTES, SEE "TRAFFIC CONTROL PLANS."
3. THE TOTAL PLAN AREA OF THE APPROACH SLABS REQUIRED IS 115 S.Y. FOR DETAILS, SEE "APPROACH SLAB DETAILS."
4. COST OF SIDEWALK PLATE SHALL BE INCLUDED IN ITEM NO. 460-2-5, STRUCTURAL STEEL (BASCULE LEAVES).
5. PAYMENT FOR CONCRETE TO FILL BASCULE LEAF GRATING SHALL BE INCLUDED IN ITEM NO. 400-4-4, CONCRETE (SUPERSTRUCTURE).

SUMMARY OF QUANTITIES

PAY ITEM NO.	PAY ITEM	UNIT	ORIGINAL QUANTITY	FINAL QUANTITY
101-1	MOBILIZATION	LS	1	
102-1	MAINTENANCE OF TRAFFIC (180 CONSTRUCTION DAYS)	LS	1	
102-74-1	BARRICADE (TEMPORARY-TYPE I, II, VP & DRUM)	ED	574	
102-74-2	BARRICADE (TEMPORARY-TYPE III) (6)	ED	1,680	
102-75	CONSTRUCTION SIGNS (TEMPORARY-POST MOUNTED)	ED	2,534	
102-77	HIGH INTENSITY FLASHING LIGHTS (TEMPORARY-TYPE B)	ED	2,428	
102-90	BRIDGE OPERATOR	DA	7	
102-96	TEMPORARY REGULATORY SIGNS (POST MOUNTED)	ED	600	
102-99	SIGN VARIABLE MESSAGE (TEMPORARY)	ED	260	
104-11	TURBIDITY BARRIER FLOATING	LF	440	
350-72	CLEANING AND RESEALING DECK JOINTS	LF	252	
360-1	APPROACH SLABS CONCRETE	EA	2	
400-2-6	CONCRETE CLASS II (COUNTERWEIGHT)	CY	18.0	
400-4-4	CONCRETE CLASS IV (SUPERSTRUCTURE)	CY	10.3	
400-135	INJECT AND SEAL CRACKS	LF	10	
401-70-1	RESTORE SPALLED AREAS	CF	10	
415-1-4	REINFORCING STEEL (SUPERSTRUCTURE)	LB	3,145	
455-7-5	PILING FURNISHED (HP 14x73)	LF	428	
455-8-5	PILING DRIVEN (HP 14x73)	LF	428	
455-133	SHEET PILING STEEL (FURNISHED & INSTALLED)	SF	853	
456-1	PILE ENCAPSULATION	LF	40	
460-2-1	STRUCTURAL STEEL (CARBON)	LB	25,500	
460-2-5	STRUCTURAL STEEL (BASCULE LEAVES)	LB	14,000	
460-3-101	MACHINERY & CASTINGS (F&I)(SPEED REDUCER AND GEAR TRAIN)	LS	1	
460-3-106	MACHINERY & CASTINGS (RECONDITION)(COMPONENTS)	LS	1	
460-3-108	MACHINERY AND CASTINGS (F&I)(LIVE LOAD SHOES)	LS	1	
460-3-401	MACHINERY AND CASTINGS (REMOVE)(GEAR TRAIN)	LS	1	
460-3-506	MACHINERY & CASTINGS (ALIGN)(COMPONENTS)	LS	1	
460-3-810	MACHINERY AND CASTINGS (RECONDITION) (FLAT TRACKS)	LS	1	
461-6	ACCESS LADDERS, PLATFORMS, HANDRAILS	LB	3,900	
460-7-42	EXPANSION JOINT	LF	20	
460-101-121	HYDRAULIC SYSTEM (F&I)(PERMANANT SYSTEM)	LS	1	
460-101-124	HYDRAULIC SYSTEM (F&I) (SPAN LOCK)	EA	2	
460-121-50	COUNTERWEIGHT MOVABLE BRIDGE (BALANCE)	EA	1	
465-71-1	MOVABLE BRIDGE FUNCTIONAL CHECKOUT	LS	1	
508-70-1	ELECTRICAL SYSTEM (F&I)	LS	1	
508-70-4	EXISTING ELECTRICAL SYSTEM (REMOVE)	LS	1	
508-73-1	SUBMARINE CABLE ASSEMBLY (F&I)	LF	85	
508-76-1	SPAN MOTORS AND AUXILLARY (F&I)	LS	1	
508-79-1	CONTROL CONSOLE (F&I)	EA	1	
508-80-1	BRAKE SYSTEM (F&I)	EA	2	
508-81-1	LIMIT SWITCHES (F&I) (LIMIT AND SEATING)	EA	8	
508-82-1	CONTROL PANEL / MOTOR CONTROL (F&I)	EA	1	
510-1	NAVIGATION LIGHTS	LS	1	
512-1	TENDER FACILITIES AND EQUIPMENT	LS	1	
524-2-1	SLOPE PAVEMENT CONCRETE	SY	18	
560-1	PAINT STRUCTURAL STEEL	TN	34	
712-70-111	MOVABLE BRIDGE TRAFFIC SIGNALS	EA	6	
712-71-13	MOVABLE BRIDGE TRAFFIC GATES (F&I)	AS	2	
712-72-122	MOVABLE BRIDGE BARRIER GATE (F&I)	AS	1	
750-711-100	LIGHTNING PROTECTION SYSTEM (POINT DISCHARGE) (F&I)	EA	1	
750-711-332	LIGHTNING PROTECTION (SURGE SUPPRESSION) (F&I)	LS	1	
900-1	OFFICE FOR THE ENGINEER	LS	1	

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	KTL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	BGW	5-95
Approved by	T.J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

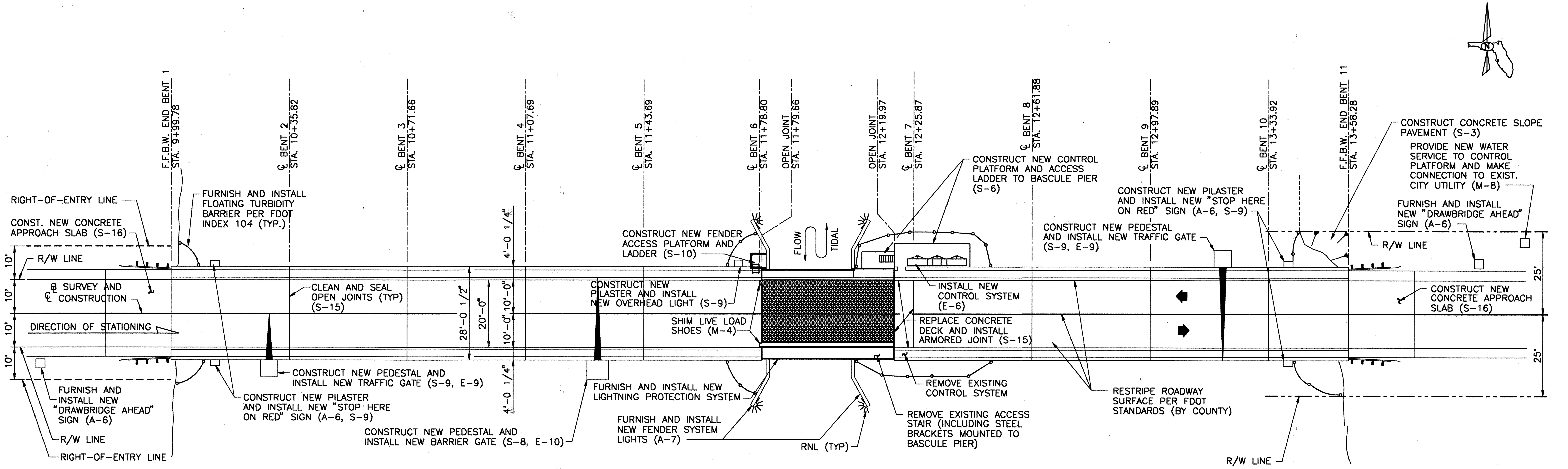
PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

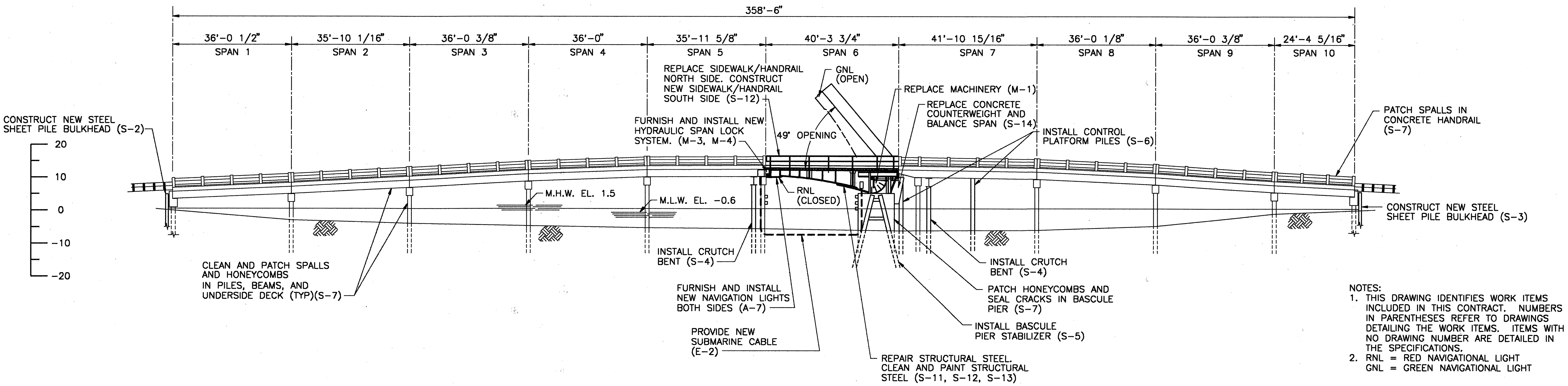
SHEET TITLE: SUMMARY OF QUANTITIES

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET A-3



PLAN



NOTES:
1. THIS DRAWING IDENTIFIES WORK ITEMS INCLUDED IN THIS CONTRACT. NUMBERS IN PARENTHESES REFER TO DRAWINGS DETAILING THE WORK ITEMS. ITEMS WITH NO DRAWING NUMBER ARE DETAILED IN THE SPECIFICATIONS.
2. RNL = RED NAVIGATIONAL LIGHT
GNL = GREEN NAVIGATIONAL LIGHT

ELEVATION

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BRIDGE NO. 154000

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	TJF	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

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2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
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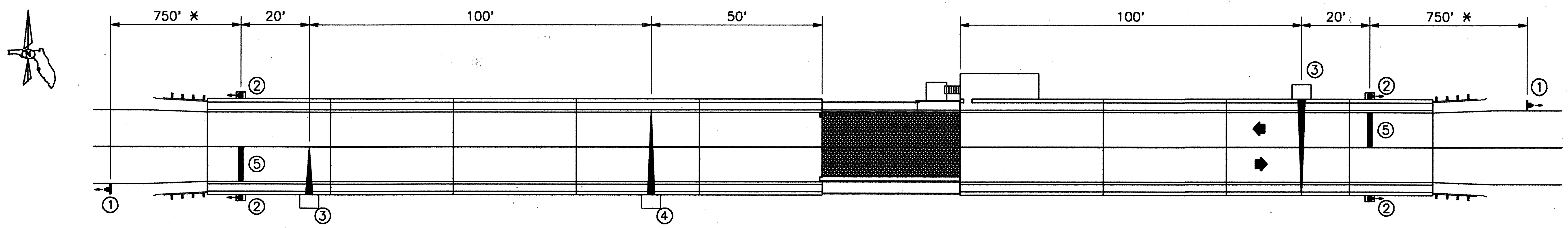
SHEET TITLE: KEY SHEET

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET A-4

Timothy J. Farrell

BRIDGE MOUNTS

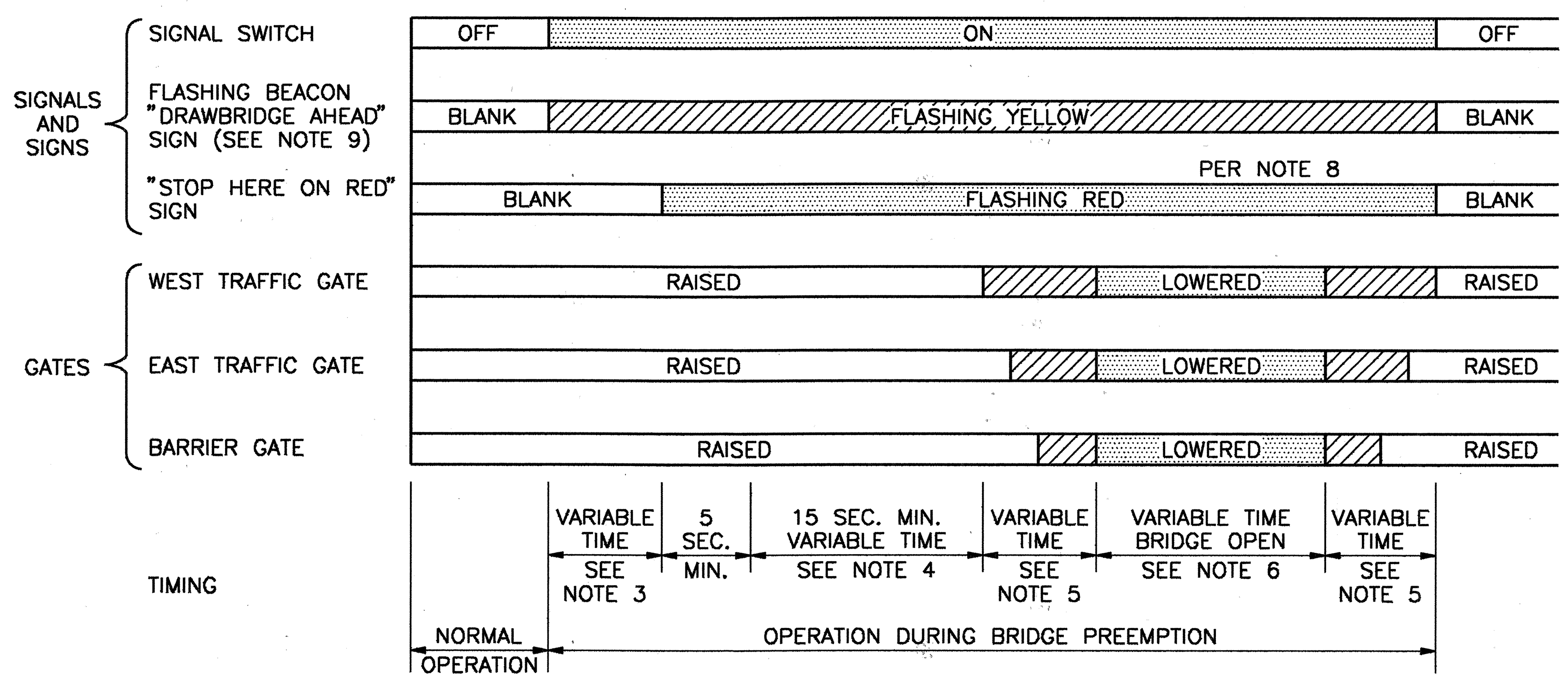


✱ = FIELD CONDITIONS MAY REQUIRE ADJUSTMENT OF THIS STANDARD DISTANCE.

PLAN

LEGEND

① "DRAWBRIDGE AHEAD" SIGN
② "STOP HERE ON RED" SIGN
③ TRAFFIC GATE
④ BARRIER GATE
⑤ 24" THERMOPLASTIC STOP BAR



SEQUENCE CHART

NOTES:
1. THE OPERATOR FOR THIS BRIDGE IS ON CALL.
2. A KEY LOCK SWITCH SHALL BE INSTALLED TO OVERRIDE EACH TIMING INTERVAL IN CASE OF MALFUNCTION.
3. THE TIME BETWEEN BEGINNING OF FLASHING YELLOW ON "DRAWBRIDGE AHEAD" SIGN AND THE CLEARANCE OF THE TRAFFIC SIGNAL TO RED, OR BEGINNING OF FLASHING RED, SHOULD NOT BE LESS THAN THE TRAVEL TIME OF A PASSENGER CAR, FROM THE SIGN LOCATION TO THE STOP LINE, TRAVELING AT THE 85 PERCENTILE APPROACH SPEED.
4. BEGINNING OF OPERATION OF DRAWBRIDGE GATES SHALL NOT BE LESS THAN 15 SECONDS AFTER STEADY RED OR 20 SECONDS AFTER FLASHING RED (ACTUAL TIME MAY BE DETERMINED BY THE BRIDGE TENDER).
5. TIME OF GATE LOWERING AND RAISING IS DEPENDENT UPON GATE TYPE.
6. TIME OF BRIDGE OPENING IS DETERMINED BY THE BRIDGE TENDER.
7. EACH GATE SHALL BE OPERATED BY A SEPARATE SWITCH.
8. ON EACH APPROACH , ALL FOUR RED SIGNALS SHALL BE ON THE SAME TWO CIRCUIT FLASHER, WITH THE TWO TOP SIGNALS ON ONE CIRCUIT AND THE TWO BOTTOM SIGNALS ON THE ALTERNATELY FLASHING CIRCUIT.
9. A "DRAWBRIDGE AHEAD" SIGN IS REQUIRED FOR BOTH TYPES OF SIGNAL OPERATION. HOWEVER, A FLASHING BEACON SHALL BE ADDED TO THE SIGN WHEN PHYSICAL CONDITIONS PREVENT A DRIVER TRAVELING AT THE 85 PERCENT APPROACH SPEED FROM HAVING CONTINUOUS VIEW OF AT LEAST ONE SIGNAL INDICATION FOR APPROXIMATELY 10 SECONDS.
10. REQUIREMENTS ON GATE INSTALLATION ARE CONTAINED IN SECTION 4E-14 THROUGH 4E-17 OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AS REVISED BY OFFICIAL RULINGS, VOLUME VII RULING SG 67.

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Designed by	TJF	5-95
Checked by	RMC	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

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DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

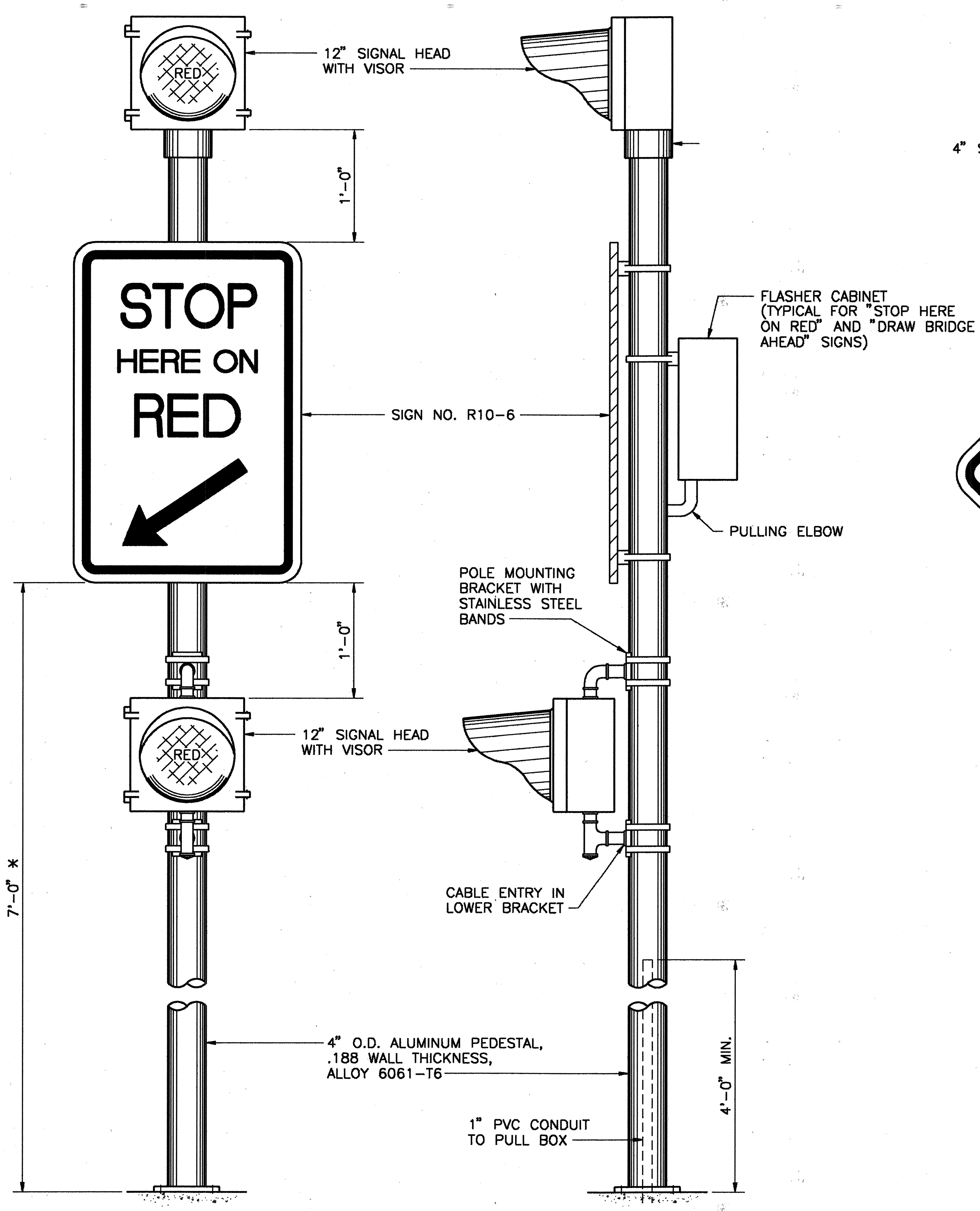
PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

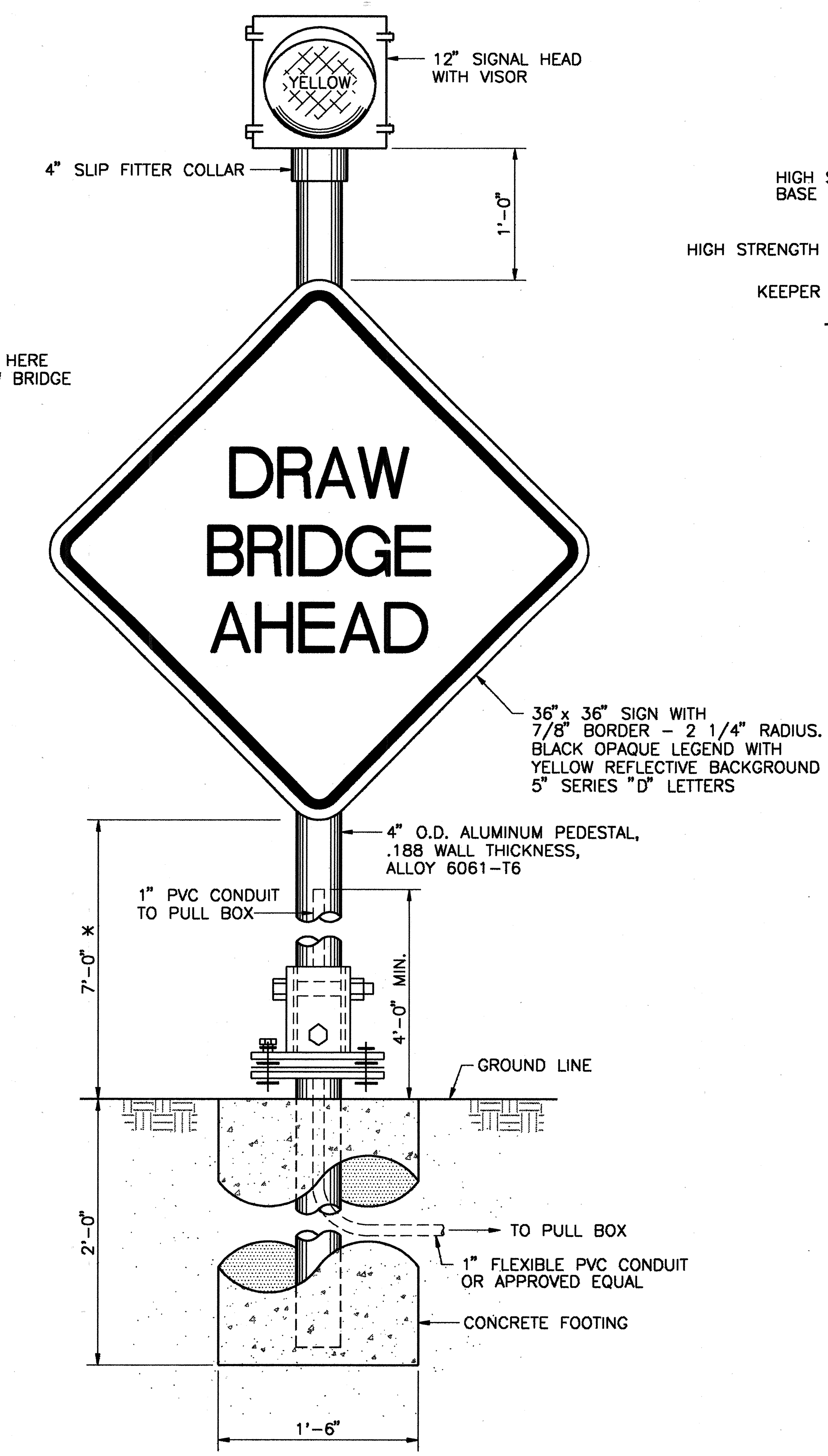
SHEET TITLE:
TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS

PROJECT NAME:
BECKETT BRIDGE REPAIRS

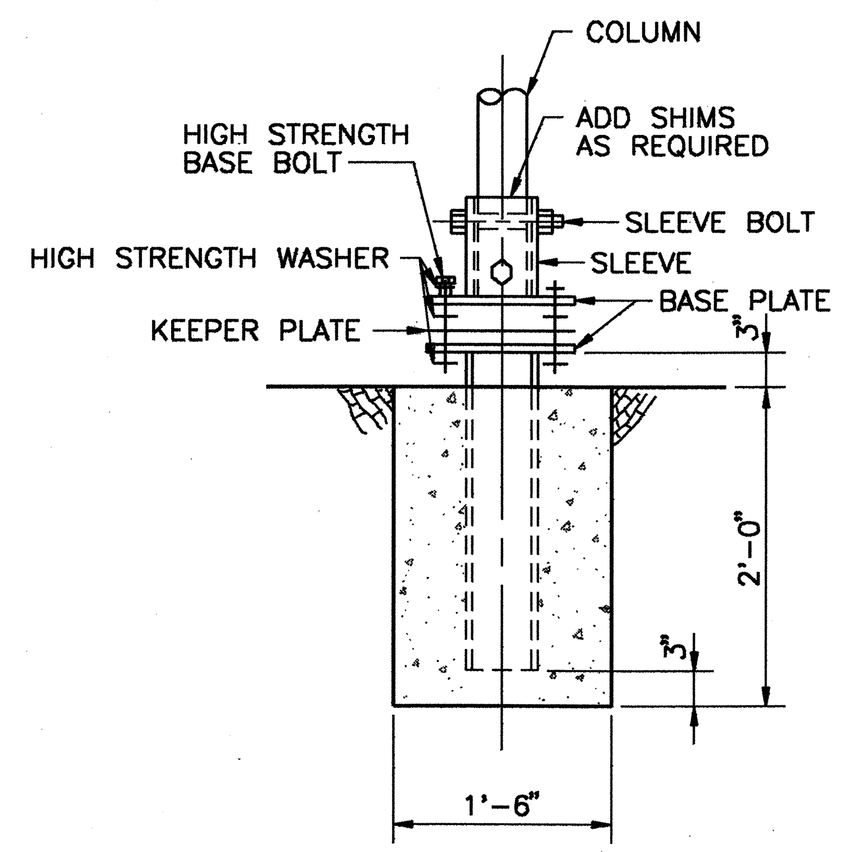
SHEET
A-5



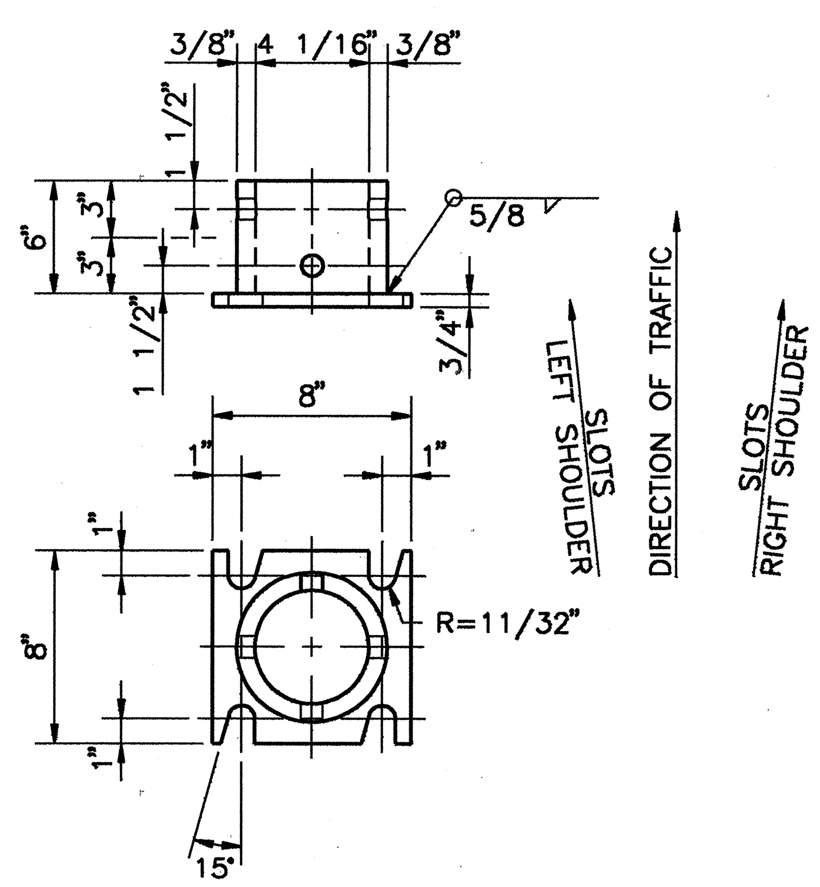
"STOP HERE ON RED" SIGN
(SEE PLANS FOR BRIDGE MOUNTING DETAILS)



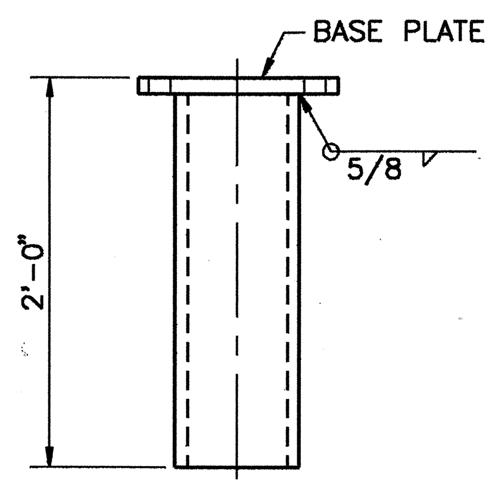
"DRAW BRIDGE AHEAD" SIGN



BASE DETAIL

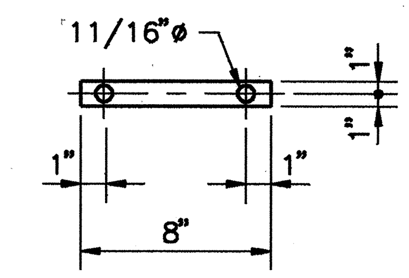


SLEEVE AND BASE PLATE DETAILS



STUB SIZE EQUALS MIN.
SLEEVE SIZE OR LONGER

STUB DETAIL



20 GA. OR 0.040" THICK
ALUMINUM STRIP - 2 REQ'D.
PER BASE

BOLT KEEPER DETAIL

SIGN POST BREAK AWAY DETAILS

✻ = MEASURED FROM THE BOTTOM OF THE SIGN TO THE NEAR EDGE OF THE PAVEMENT. HORIZONTAL DISTANCE BETWEEN EDGE OF PAVEMENT AND INSIDE EDGE OF SIGN WILL VARY WITH CONDITION AT JOB SITE.

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	Names	Dates
Drawn by	KTL	5-95
Checked by	MRC	5-95
Designed by	TJF	5-95
Checked by	RMC	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

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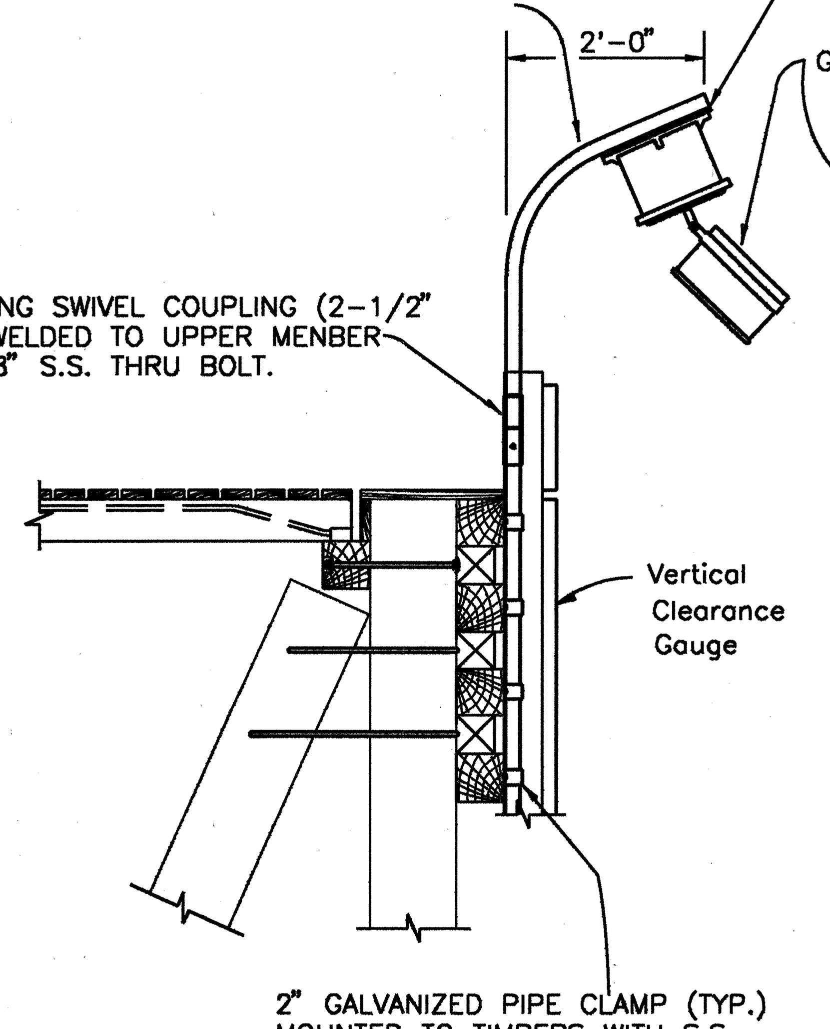
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

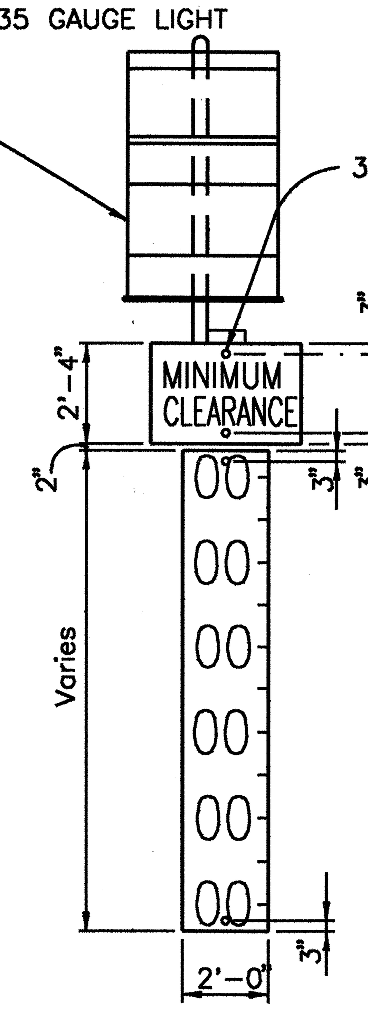
SHEET TITLE:
TRAFFIC CONTROL DEVICES FOR
MOVABLE SPAN BRIDGE SIGNALS

PROJECT NAME:
BECKETT BRIDGE REPAIRS

SHEET
A-6

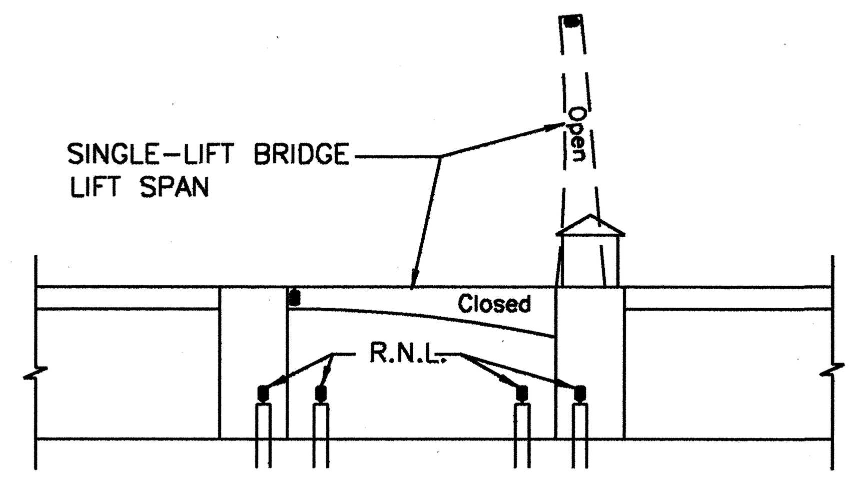


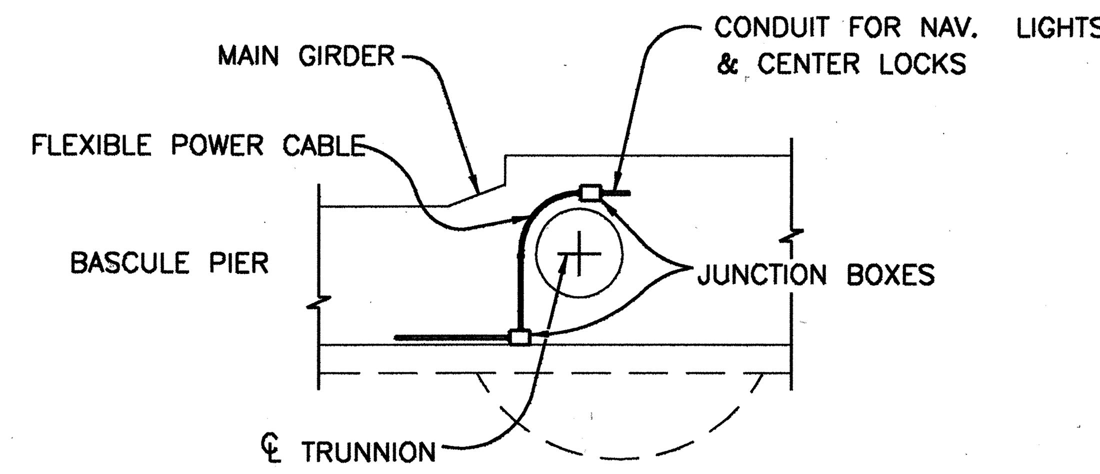
GAUGE LIGHT



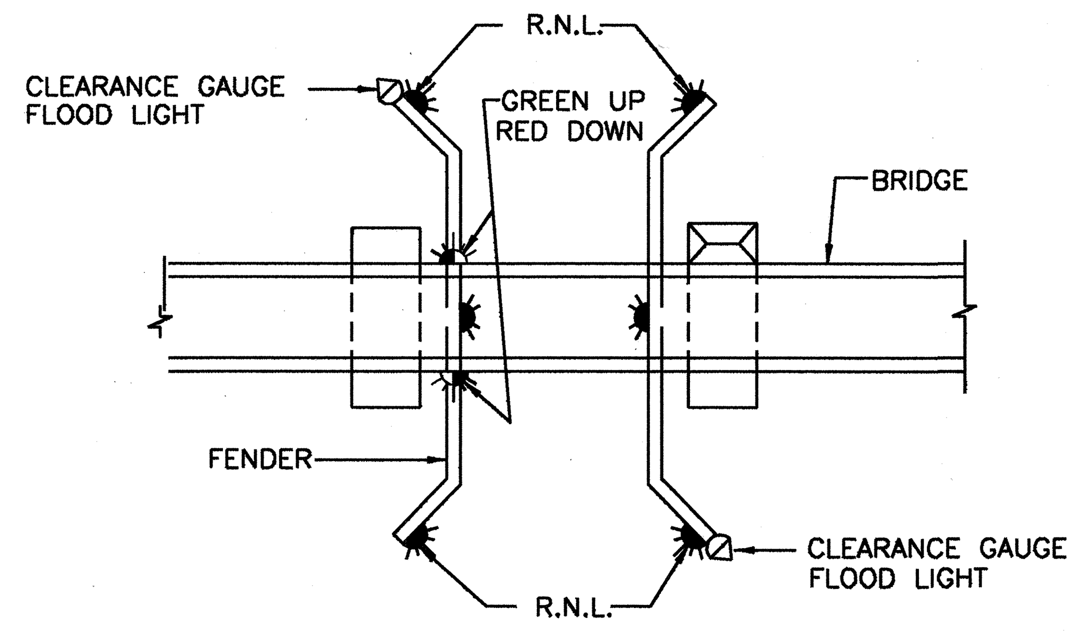
CLEARANCE GAUGE DETAILS

NUMBERED CLEARANCE GAUGE TO BE FURNISHED BY THE CONTRACTOR. CONTRACTOR SHALL VERIFY IN FIELD THAT THE CLEARANCE OF THE BRIDGE AGREES WITH READINGS OF TARGET. IF NOT, THE TARGET WILL BE RESET.



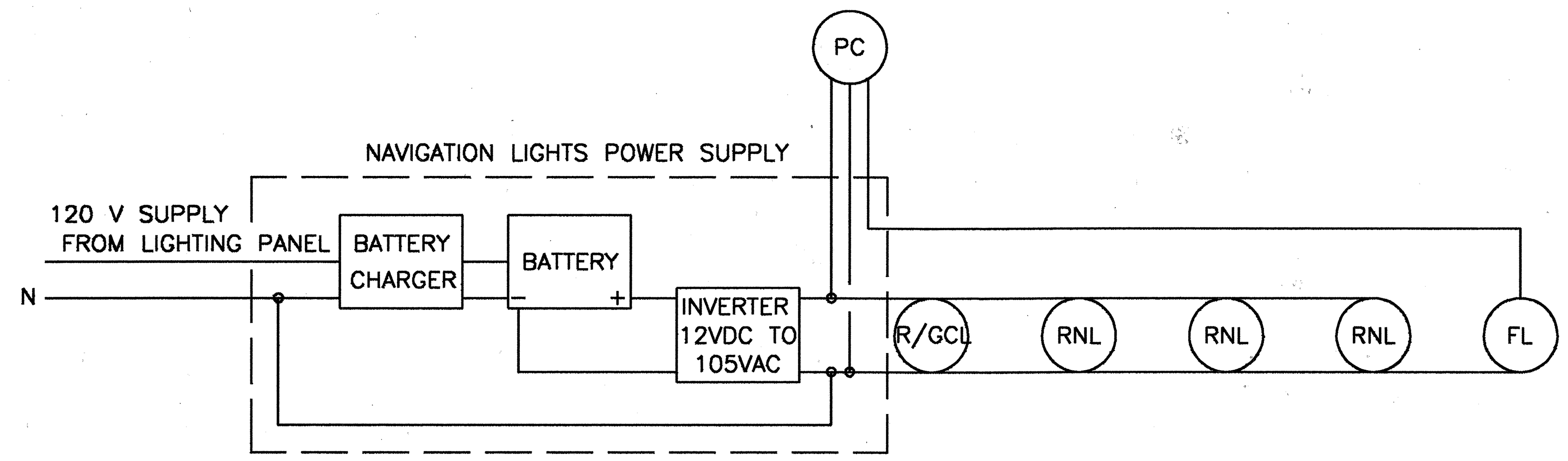


BASCULE BRIDGE FLEXIBLE CABLE ARRANGEMENT



TYPICAL BASCULE BRIDGE NAVIGATION LIGHT SYSTEM SINGLE LEAF

NOTE: SEE FENDER SYSTEM DRAWINGS & CONTROL HOUSE DRAWINGS FOR THEIR ACTUAL CONFIGURATION & LOCATION.



1. OUTPUT VOLTAGE SHALL BE ADJUSTABLE BETWEEN 120 VOLTS.
2. BATTERY SHALL BE SIZED FOR 12 HOURS OF FULL, CONTINUOUS LOAD.
3. INVERTER SHALL BE SIZED FOR 1.25 TIMES THE CALCULATED LOAD.
4. BATTERY CHARGER SHALL BE RATED TO FULLY RECHARGE BATTERIES IN 12 HOURS.
5. EQUIP EACH NAV. LIGHT CIRCUIT WITH A LAMP-OUT INDICATOR.

R/GCL - RED/GREEN CHANNEL LIGHT RNL - RED NAVIGATION LIGHT
FL - CLEARANCE GAUGE FLOODLIGHT PC - PHOTOCELL

TYPICAL LAYOUT OF NAVIGATION LIGHTS FOR BASCULE BRIDGE

NOTES FOR BASCULE BRIDGES

RED NAVIGATION LIGHT: 180°, 120 VOLT, 60 WATT, MINIMUM 155 MM FRESNEL LENS, VANDAL PROOF. LUMINOUS INTENSITY FOR HORIZONTAL BEAM 30 CANDELA (MIN.). VERTICAL DIVERGENCE AT 15 CD INTENSITY, 6" MAXIMUM. SHALL BE EQUIPPED WITH A DUAL LAMP AND TRANSFER RELAY OPTION AND BULBS RATED MINIMUM 32,000 HOURS EXTENDED LIFE @ 110 VOLTS. LANTERN SHALL BE MOUNTED ON A STAINLESS STEEL POST INCLUDING FITTINGS WITH A TOTAL HEIGHT OF 24" ABOVE FENDER.

RED/GREEN CHANNEL LIGHT: RED 180° LENS, GREEN 180° LENS, 120 VOLT, 60 WATT, MINIMUM 155 MM FRESNEL LENS. LUMINOUS INTENSITY FOR HORIZONTAL BEAM 30 CANDELA (MIN.). VERTICAL DIVERGENCE AT 15 CD INTENSITY, 6" MAXIMUM. SHALL BE EQUIPPED WITH A DUAL LAMP AND TRANSFER RELAY OPTION AND BULBS RATED MINIMUM 32,000 HOURS EXTENDED LIFE @ 110 VOLTS. EQUIP WITH A PIVOT MOUNT AND RETRIEVAL CHAIN SO THAT THE BASE CAN BE MOUNTED OUTSIDE OF BRIDGE BARRIER AND LANTERN CAN BE SERVICED BY REACHING OVER THE BARRIER FROM INSIDE. HANGER STEM SHALL BE LONG ENOUGH SO THAT LANTERN DOES NOT EXTEND BELOW THE BOTTOM OF THE GIRDER.

CLEARANCE GAUGE LIGHT: ANGLE OF ILLUMINATION DEPENDING ON FIXTURE CONTOUR. BALLAST WITH HIGH POWER FACTOR USING A 35 WATT HIGH PRESSURE SODIUM LAMP. ENCLOSURE TO BE NEMA 3R CAST ALUMINUM HOUSING WITH EPOXY FINISH ENAMEL. JUNCTION BOX SHALL BE HEAVY CAST ALUMINUM WITH HEAVY CAST COVER, ALL HARDWARE SHALL BE STAINLESS STEEL. FIXTURE SHALL BE B&B #GL-35-115V OR APPROVED EQUAL. VOLTAGE SHALL BE 115 VOLTS, 60 HZ.

NAVIGATION LIGHT SYSTEM SHALL COMPLY WITH THE LATEST EDITION OF THE CODE OF FEDERAL REGULATIONS, NAVIGATION AND NAVIGABLE WATERS, CFR 33 PART 118, BRIDGE LIGHTING AND OTHER SIGNALS.

THE NAVIGATION LIGHT SYSTEM SHALL HAVE ITS OWN ELECTRICAL SYSTEM, INDEPENDENT FROM OTHER LIGHTING SYSTEMS.

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	Names	Dates
Drawn by	AEV	5-95
Checked by	TJF	5-95
Designed by	GMM	5-95
Checked by	RMC	5-95
Approved by	T.J. FARRELL	

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

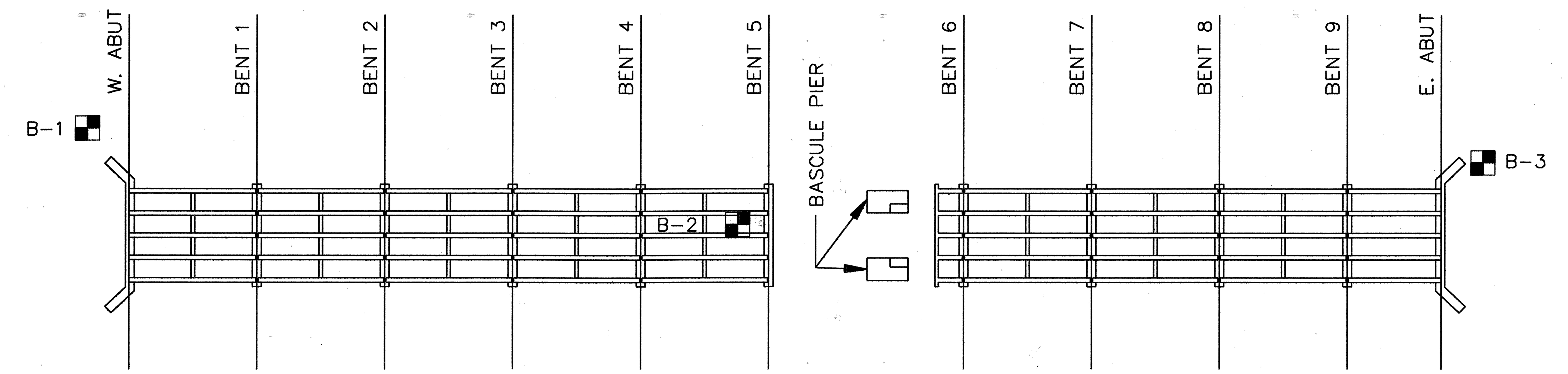
PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: NAVIGATION LIGHT SYSTEM DETAILS

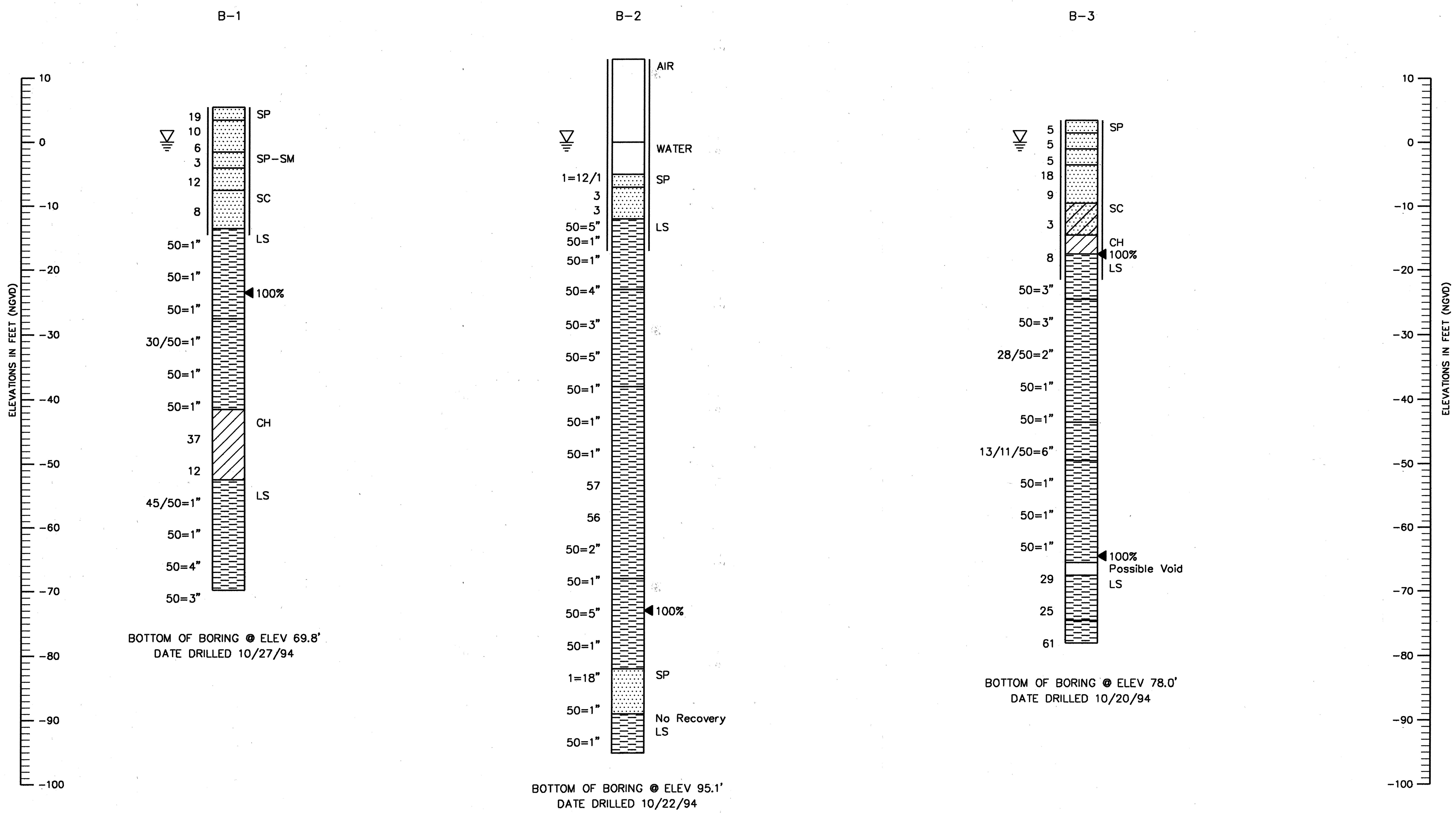
PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET A-7

Gene M. Mosanko



PLAN



LEGEND

- = SP, SP-SM and SP-SC, Sands and slightly clayey sands
- = CH, Inorganic clays of low plasticity
- = SC, Clayey sands and very sandy clays
- = LS, Limestone

GENERAL NOTES

DRILL AND PENETRATION TESTING WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. NUMBER TO LEFT OF BORING INDICATES BLOWS OF 1 3/8" I.D., 2" O.D. SPLIT-SPOON FOR 12" OF PENETRATION (UNLESS OTHERWISE NOTED) WITH A 140 LB. HAMMER DROPPED 30 INCHES.

THE BORING LOGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITION, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING.

ELEVATIONS SHOWN ARE APPROXIMATED BY WATER LEVEL AND WATER TABLE MEASURED AT TIME AND DATE BORINGS WERE COMPLETED.

REFER TO FINAL REPORT FOR ADDITIONAL BORING INFORMATION.

CREW CHIEF: SPOON
DRILLER: PATTERSON
DRILL RIG TYPE: FAILING 250

LEGEND

- ▽ = Water Table @ end of drilling
- = Casing used
- = Shelby Tube
- ◀100% = Percent Loss of Circulation

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)

Granular Materials– Relative Density	SPT (Blows/Ft)
Very Loose	Less than 4
Loose	4 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	Greater than 50

Silts and Clays– Consistency	SPT (Blows/Ft)
Very Soft	Less than 2
Soft	2 – 4
Firm	5 – 8
Stiff	9 – 15
Very Stiff	16 – 30
Hard	Greater than 30

R:\94085\CADD\BRIDGE SOILBORE

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	TEJ	11-94
Checked by	LDS	11-94
Designed by	LDS	11-94
Checked by	KDB	11-94
Approved by	K. D. BENNETT	

WILLIAMS EARTH SCIENCES, INC.
CORPORATE OFFICE: 10600 Endeavour Way, Largo, FL 34647
Largo: (813) 541-3444 FAX: (813) 541-1510
Jacksonville: (904) 262-8852 FAX: (904) 262-8864
Panama City: (904) 747-9419 FAX: (904) 763-2454

PINELLAS COUNTY FLORIDA — BOARD OF COUNTY COMMISSIONERS

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET A-8

8/15/95

TRAFFIC CONTROL NOTES

GENERAL NOTES:

1. THE CONTRACTOR SHALL, AT ALL TIMES, ADHERE TO THE REQUIREMENTS SET FORTH IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD, 1988) AND FDOT'S ROADWAY AND TRAFFIC DESIGN STANDARDS (JANUARY 1994, AS AMENDED).

2. IT IS NOT THE INTENT OF THESE PLANS TO SHOW ALL TEMPORARY DRAINAGE AND INCIDENTAL CONSTRUCTION NECESSARY TO MAINTAIN TRAFFIC. THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE TEMPORARY DRAINAGE. THERE WILL BE NO DIRECT PAY FOR THIS WORK.

3. THE WORK AREA SHALL BE PROTECTED BY BARRIERS, WARNING DEVICES, PAVEMENT MARKINGS AND SIGNS SHOWN IN THE TRAFFIC CONTROL PLANS AND AS DIRECTED BY THE ENGINEER. ALL SIGNING AND TEMPORARY PAVEMENT MARKINGS FOR A PHASE SHALL BE INSTALLED AND APPROVED BY THE ENGINEER BEFORE CONSTRUCTION OF THAT PHASE COMMENCES AND SHALL BE MAINTAINED IN ACCORDANCE WITH INDEX 600.

4. WHENEVER CONSTRUCTION EQUIPMENT IS BEING DRIVEN OR TRANSPORTED ON THE OPEN TRAVEL LANES. THE CONTRACTOR SHALL UTILIZE FDOT STANDARD INDEX 627.

5. DESIRABLE LANE WIDTHS FOR MAINTENANCE OF TWO-WAY TRAFFIC SHOULD BE 10' BUT NOT LESS THAN LANE WIDTHS OF THE EXISTING FACILITY.

6. THE LOCATION OF SIGNS, AND BARRICADES ARE APPROXIMATE ONLY AND SHALL BE PLACED ACCORDING TO CONSTRUCTION REQUIREMENTS WITH THE APPROVAL OF THE ENGINEER IN CHARGE.

7. THE CONTRACTOR SHALL PLACE TYPE I OR TYPE II BARRICADES TO OUTLINE THE RADIUS AREA FOR DRIVEWAYS FOR ACCESS AND TO PREVENT TRAFFIC IN THE CONSTRUCTION AREA.

8. TRAFFIC SHALL BE MAINTAINED ON PAVED SURFACES AT ALL TIMES.

9. THE CONTRACTOR SHALL NOTIFY ALL LOCAL LAW ENFORCEMENT AGENCIES AND MEDIA APPROXIMATELY ONE MONTH PRIOR TO THE BRIDGE CLOSURE.

10. CONFLICTING OR EXISTING PAVEMENT MARKINGS SHALL BE REMOVED BY WATERBLASTING OR OTHER METHODS APPROVED BY THE ENGINEER. ALL EXISTING PAVEMENT MARKINGS OUTSIDE THE LIMITS OF CONSTRUCTION WHICH ARE ALTERED SHALL BE REPLACED UPON COMPLETION OF THE PROJECT. ALL COSTS FOR REMOVAL SHALL BE INCLUDED IN THE BID PRICE FOR MAINTENANCE OF TRAFFIC. THE REPLACEMENT OF MARKINGS SHALL BE PAID FOR UNDER THE APPROPRIATE BID ITEM.

11. REGULATORY SPEEDS OF THE EXISTING ROADWAYS SHALL BE MAINTAINED. WHEN NECESSARY, SUPPLEMENTAL SIGNS SHALL BE ADDED WITHIN THE LIMITS OF THE DETOUR.

12. EXISTING SIGNS THAT CONFLICT WITH THE DETOUR ROUTE SHALL BE ADJUSTED, COVERED OR REMOVED DURING THE DETOUR ROUTE AND REPLACED IN THEIR ORIGINAL CONDITION UPON COMPLETION.

13. THE DETOUR ROUTE MAY AFFECT SOME SIGNALIZED INTERSECTIONS. AT THOSE LOCATIONS THE CONTRACTOR SHALL COORDINATE WITH THE CITY OF TARPON SPRINGS OR PINELLAS COUNTY TRAFFIC OPERATIONS TO DETERMINE IF ANY NECESSARY SEQUENCE ADJUSTMENTS ARE TO BE MADE DURING THE DETOUR.

14. UPON COMPLETION OF THE DETOUR ROUTE THE CONTRACTOR SHALL RESTORE THE ENTIRE ROUTE BACK TO ITS ORIGINAL CONDITION. ALL COSTS SHALL BE INCLUDED IN THE BID ITEM # 102-1, MAINTENANCE OF TRAFFIC (LUMP SUM).

15. THE CONTRACTOR SHALL MAINTAIN A SAFE PASSAGE THROUGH THE CONSTRUCTION AREA AT ALL TIMES FOR PEDESTRIANS IN ACCORDANCE WITH INDEX # 660, WITH THE EXCEPTION OF THE BRIDGE CLOSURE, WHERE PEDESTRIANS SHALL NOT BE ALLOWED TO CROSS THE BRIDGE. ALL COSTS ASSOCIATED SHALL BE INCLUDED IN THE BID ITEM 102-1, MAINTENANCE OF TRAFFIC (LUMP SUM).

FDOT SPECIAL USE PERMIT STIPULATIONS:

1. ALL SIGNS ERECTED ON FDOT R/W SHALL BE ERECTED PER FDOT SIGN INDEX #17302, COSTS TO BE INCLUDED IN MAINTENANCE OF TRAFFIC LUMP SUM, BID ITEM 102-1.

2. NO SIGN PLACEMENT SHALL BE PERMITTED WITHIN THE LIMITS OF THE PEDESTRIAN SIDEWALK AREAS. SHOULD SUCH SIGN PLACEMENT BECOME NECESSARY PRIOR APPROVAL OF THE LOCAL MAINTENANCE ENGINEER IS NECESSARY.

3. ANY DAMAGED CONCRETE CAUSED BY SIGN INSTALLATION SHALL BE REMOVED AND REPLACED BY SAW OUT OR TOOLED AT 5' INTERVALS (BY SECTION) WITH EXPANSION REQUIRED AT ALL COLD JOINTS, COSTS TO BE INCLUDED IN THE MAINTENANCE OF TRAFFIC LUMP SUM BID ITEM # 102-1.

4. THIS LOCAL MAINTENANCE OFFICE SHALL BE NOTIFIED 48 HOURS PRIOR TO IMPLEMENTATION OF THE MAINTENANCE OF TRAFFIC PLAN ON FDOT R/W :

FLORIDA DEPARTMENT OF TRANSPORTATION
5211 ULMERTON ROAD
CLEARWATER, FLORIDA 34620
PH. (813) 560-5101

TRAFFIC CONTROL NOTES

THE DETOUR SHALL REMAIN IN EFFECT FOR 120 CALENDAR DAYS AND THE TOTAL PROJECT CALENDAR DAYS ARE 180. THEREFORE MORE THAN ONE OPERATION MAY BE REQUIRED TO BE UNDER CONSTRUCTION AT A TIME IN ORDER TO COMPLETE THIS PROJECT WITH THESE CONSTRAINTS.

PHASE I

1. THE EXISTING VEHICULAR TRAFFIC PATTERN ACROSS BECKETT BRIDGE SHALL REMAIN THE SAME DURING THE FOLLOWING CONSTRUCTION ACTIVITIES.

2. ADVANCE SIGNING FOR PHASE I SHALL CONSIST OF THE FOLLOWING AND SHALL BE PLACED PRIOR TO PHASE I CONSTRUCTION AND REMOVED FOR PHASE II CONSTRUCTION:

2 - " ROAD CONSTRUCTION 1000 FT " W20 1B
2 - " ROAD CONSTRUCTION 500 FT " W20 1A

THESE SIGNS SHALL BE PLACED PRIOR TO BECKETT BRIDGE AND SUPPLEMENTED WITH A HIGH INTENSITY LIGHT AND AN 18"x18" ORANGE FLAG.

2 - " END CONSTRUCTION " G20 2

THESE SIGNS SHALL BE PLACED 500 FEET BEYOND BECKETT BRIDGE.

3. THE CONTRACTOR SHALL COORDINATE NAVIGATIONAL TRAFFIC WITH THE APPROPRIATE AGENCIES DURING THESE CONSTRUCTION ACTIVITIES. REFER TO THE SPECIFICATIONS FOR AGENCIES RESPONSIBLE FOR REGULATION OF THIS WATERWAY.

4. THERE SHALL BE A BRIDGE OPERATOR PRESENT DURING THIS PHASE OF WORK.

5. THE FOLLOWING CONSTRUCTION ACTIVITIES SHALL BE PERFORMED FROM A BARGE:

CLEAN AND PATCH SPALLS AND HONEYCOMBS IN PILES, BEAMS AND UNDERSIDE DECK

INSTALL CRUTCH BENTS
FURNISH AND INSTALL NEW NAVIGATION LIGHTS
PROVIDE NEW SUBMARINE CABLE
INSTALL BASCULE PIER STABILIZER
PATCH HONEYCOMBS AND SEAL CRACKS IN BASCULE PIER

PHASE II

1. THE CONTRACTOR SHALL REMOVE OR COVER CONFLICTING EXISTING SIGNS AND PLACE DETOUR SIGNS (SEE PLAN VIEW) ALONG THE DETOUR ROUTE IN ACCORDANCE WITH F.D.O.T. INDEX #602, PRIOR TO REROUTING THE EXISTING TRAFFIC.

2. REROUTE TRAFFIC TO THE DETOUR ROUTE.

3. DURING DISABLED MACHINERY THE BASCULE LEAF SHALL BE MAINTAINED IN AN OPEN POSITION AND SECURED, A BRIDGE OPERATOR SHALL NOT BE NECESSARY DURING THIS PHASE.

4. THE FOLLOWING CONSTRUCTION ACTIVITIES SHALL BE PERFORMED DURING THE DETOUR :

- INSTALL NEW "DRAWBRIDGE AHEAD" SIGNS
- INSTALL NEW "STOP AHEAD" SIGNS
- REPAIR SLOPE PROTECTION
- DRIVE SHEET PILING
- CONSTRUCT NEW PEDESTALS AND NEW TRAFFIC GATES
- REPAIR CONCRETE DECK AND INSTALL ARMORED JOINT
- INSTALL NEW CONTROL SYSTEM
- REMOVE EXISTING CONTROL SYSTEM AND ACCESS STAIR TO BASCULE PIER
- INSTALL NEW CONTROL PLATFORM AND ACCESS LADDER TO BASCULE PIER
- CLEAN AND SEAL OPEN JOINTS
- EXPANSION JOINTS
- REMOVE AND REPLACE COUNTER WEIGHT
- PATCH SPALLS IN CONCRETE HANDRAIL
- REMOVAL OF PAINT
- PAINT
- COMPLETE NECESSARY REPAIR, REPLACEMENT AND REMOVAL OF MACHINERY
- PAVEMENT MARKINGS

PHASE III

1. THE CONTRACTOR SHALL REMOVE SIGNS AND ANY INCIDENTAL ITEMS ALONG THE DETOUR ROUTE IN ACCORDANCE WITH F.D.O.T. INDEX # 602.

IMPORTANT !!!

REQUIRED BRIDGE OPENINGS:

MARINE TRAFFIC:
THE BRIDGE LEAF IS REQUIRED TO BE OPEN TO ALLOW BOAT TRAFFIC TO PASS ON DECEMBER 16, 1995.

THE BRIDGE IS REQUIRED TO BE OPEN TO ALLOW BOTH VEHICULAR AND PEDESTRIAN TRAFFIC TO CROSS ON JANUARY 6, 1996.

SUMMARY OF MAINTENANCE OF TRAFFIC
(PAY ITEM 102-1)

ITEM	UNIT	QUANTITY P	QUANTITY F
SPECIAL SIGNS < 12 SF	EA	60	
SPECIAL SIGNS 12-25 SF	EA	18	
CONSTRUCTION SIGNS < 9 SF - 107 @120 DAYS	EA	12840	
MISC. CONCRETE	CY	1	

R:\94065\CADD\DETOUR
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REVISIONS Date	By	Description	REVISIONS Date	By	Description	SEAL:

	Names	Dates
Drawn by	BST	5-95
Checked by	AAS	5-95
Designed by	BST	5-95
Checked by	AAS	5-95
Approved by	ALAN SOROORY	

A Soroory

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

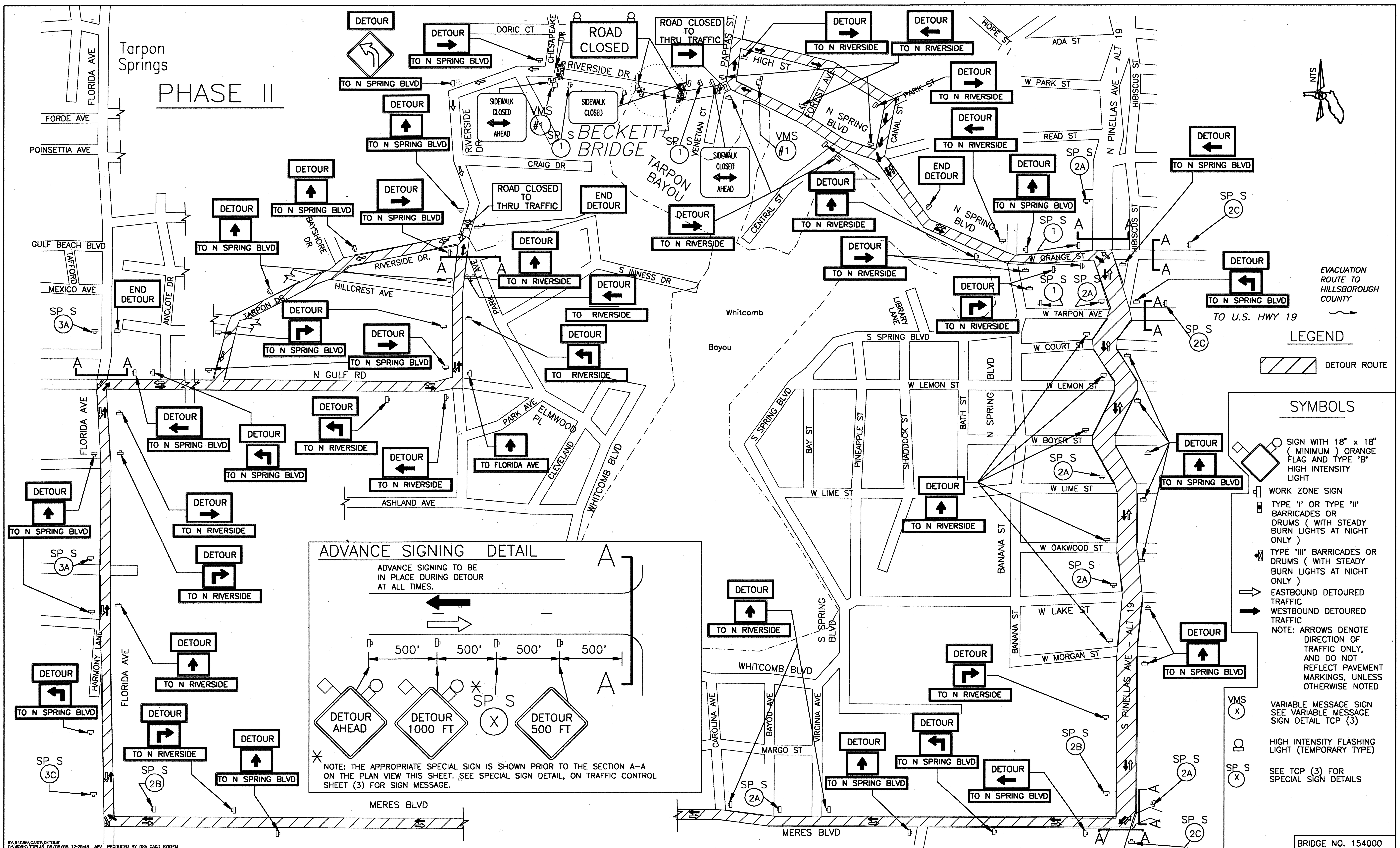
PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

BRIDGE NO. 154000

SHEET TITLE: TRAFFIC CONTROL PLAN (1)

PROJECT NAME: BECKETT BRIDGE REPAIRS

Drawing No. A-9



R:\94065\CADD\DETOUR C:\WORK\7DPLAN 06/08/95 12:29:48 AEV PRODUCED BY DSA CADD SYSTEM

BRIDGE NO. 154000

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	BST	5-95
Checked by	AAS	5-95
Designed by	BST	5-95
Checked by	AAS	5-95
Approved by	ALAN SOROORY	

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: TRAFFIC CONTROL PLAN (2)

PROJECT NAME: BECKETT BRIDGE REPAIRS

Drawing No. A-10

VARIABLE MESSAGE SIGN DETAIL

VMS #1 PRIOR

VARIABLE MESSAGE SIGN	
DISPLAY 1	DISPLAY 2
BRIDGE WILL BE CLOSED	SEPT XX THROUGH JAN XX

STEP 1

THIS SIGN SHALL BE IN PLACE 10 DAYS PRIOR TO BRIDGE CLOSING.THE MESSAGE SHALL CHANGE TO THE STEP 2 MESSAGE DURING THE BRIDGE CLOSURE.

VMS #1 DURING

VARIABLE MESSAGE SIGN		
DISPLAY 1	DISPLAY 2	DISPLAY 3
BECKETT BRIDGE CLOSED	USE ALT ROUTE	FOLLOW DETOUR

STEP 2

TO BE IN PLACE DURING DETOUR

GENERAL NOTES

1. SEE SYMBOL ON PLAN VIEW FOR LOCATION,. SEE TCP (2).
2. ANY ADJUSTMENTS TO MESSAGES SHALL BE INCLUDED IN THE COST OF THE VARIABLE MESSAGE SIGN (TEMP) BID ITEM # 102-99.

SP S 2X

60"

DETOUR FOR:
TARPON SPRINGS
FRED HOWARD PARK
SUNSET BEACH
N. RIVERSIDE DR.

6" 2" 4" 2" 4" 2" 4" 2" 4" 2" 17" 2" 53"

30.0"

SEE ARROW DETAIL A,B OR C FOR DIMENSIONS

LETTER DENOTES WHICH ARROW TO BE UTILIZED, SEE ARROW DETAILS BELOW

SP S 3X

60"

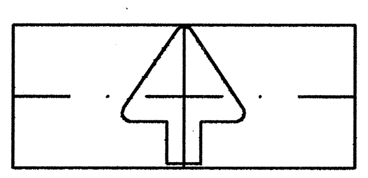
DETOUR FOR:
ALT. 19
N. SPRING BLVD.

6" 2" 4" 2" 4" 2" 17" 2" 47"

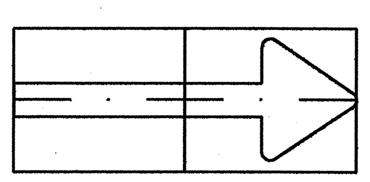
30.0"

LETTER DENOTES WHICH ARROW TO BE UTILIZED, SEE ARROW DETAILS BELOW

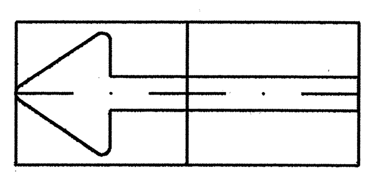
DETAILS



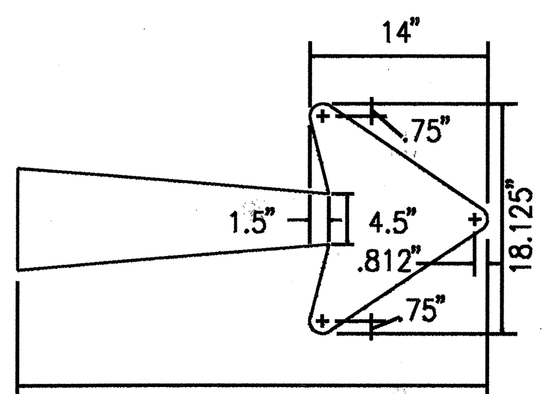
A — STRAIGHT ARROW



B — RIGHT ARROW



C — LEFT ARROW



A = 17"
B & C = 25"

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SPECIAL SIGN DETAIL

SP S 1

72"

BECKETT BRIDGE
CLOSED
SEPT XX 1995
THROUGH
JAN XX 1996

3" 6" 3" 6" 3" 6" 3" 6" 3" 6" 3" 48"

6" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION														RT MARGIN
	B	E	C	K	E	T	T		B	R	I	D	G	E	
2.45"	5.5	4.8	5.2	5.3	4.4	4.4	3.7	6	5.5	5.5	2.4	5.2	5.5	3.7	2.45"
	C	L	O	S	E	D									
21.2"	5.2	4.8	5.3	5.5	4.8	4.0									21.2"
	S	E	P	T		X	X		1	9	9	5			
7.4"	5.5	4.8	4.8	3.7	6	4.8	4.0	6	2.9	5.2	5.5	4.0			7.4"
	T	H	R	O	U	G	H								
17.95"	4.8	5.5	5.2	5.6	5.5	5.5	4.0								17.95"
	J	A	N		X	X		1	9	9	6				
9.45"	4.9	6.1	4.0	6	4.8	4.0	6	2.9	5.2	5.2	4.0				9.45"

6" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION										RT MARGIN
	D	E	T	O	U	R		F	O	R	:	
2.9"	5.5	4.4	4.8	5.6	5.5	4.0	6	4.8	5.6	4.0	4.0	2.9"

4" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION																RT MARG
	T	A	R	P	O	N		S	P	R	I	N	G	S			
6.8"	2.7	4.1	3.6	3.4	3.8	2.7	4	3.6	3.6	3.6	1.6	3.6	3.4	2.7			6.8"
	F	R	E	D		H	O	W	A	R	D		P	A	R	K	
2.3"	3.2	3.6	3.2	2.7	4	3.6	3.6	3.8	4.1	3.6	2.7	4	2.9	4.1	3.6	2.8	2.2"
	S	U	N	S	E	T		B	E	A	C	H					
9.8"	3.6	3.6	3.6	3.6	2.9	2.4	4.0	3.6	2.9	4.1	3.4	2.7					9.8"
	N		R	I	V	E	R	S	I	D	E		D	R			
8.2"	2.7	4.0	3.6	1.4	3.8	3.2	3.4	3.6	1.6	3.6	2.4	4.0	3.6	2.7			8.2"
	A	L	T		1	9											
21.1"	4.1	2.7	2.4	4.0	1.9	2.7											21.1"
	N		S	P	R	I	N	G		B	L	V	D				
8.9"	2.7	4.0	3.6	3.6	3.6	1.6	3.6	2.7	4.0	3.6	2.7	3.8	2.7				8.9"

56"

TO N SPRING BLVD

2" 4" 2" 8"

4" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION																RT MARGIN
	T	O		N		S	P	R	I	N	G		B	L	V	D	
1.9"	3.2	2.8	4	2.7	4	3.6	3.6	3.6	1.6	3.6	2.7	4	3.6	2.7	3.8	2.7	1.9"

71"

TO FLORIDA AVE

3" 6" 3" 12"

6" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION														RT MARGIN
	T	O		F	L	O	R	I	D	A		A	V	E	
1.2"	4.8	4.2	6	4.8	4.8	5.3	5.5	2.4	5.2	5	6	5.4	5.6	3.7	1.2"

46"

TO ALT 19

3" 6" 3" 12"

6" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION									RT MARGIN
	T	O		A	L	T		1	9	
2.15"	4.8	4.2	6	6.1	4.0	3.7	6	2.9	4.0	2.15"

47"

TO N RIVERSIDE

2" 4" 2" 8"

4" D SERIES LETTERING

LT MARGIN	LETTERS/DIMENSION														RT MARGIN
	T	O		N		R	I	V	E	R	S	I	D	E	
1.85"	3.2	2.8	4	2.7	4	3.6	1.4	3.8	3.2	3.4	3.6	1.6	3.6	2.4	1.85"

GENERAL NOTES

1. ALL SPECIAL SIGNS CONSIST OF BLACK MESSAGE AND BORDER ON REFLECTORIZED ORANGE BACKGROUND
2. ALL COSTS FOR FABRICATION OF THESE SIGNS. ARE TO BE INCLUDED IN THE PRICE FOR MAINTENANCE OF TRAFFIC (ITEM 102-1, LUMP SUM).
3. SEE SYMBOL ON PLAN VIEW FOR LOCATION,. SEE TCP (2).

BRIDGE NO. 154000

REVISIONS			REVISIONS			SEAL:
Date	By	Description	Date	By	Description	

	Names	Dates
Drawn by	BST	5-95
Checked by	AAS	5-95
Designed by	BST	5-95
Checked by	AAS	5-95
Approved by	ALAN SOROORY	

DSA GROUP INC.

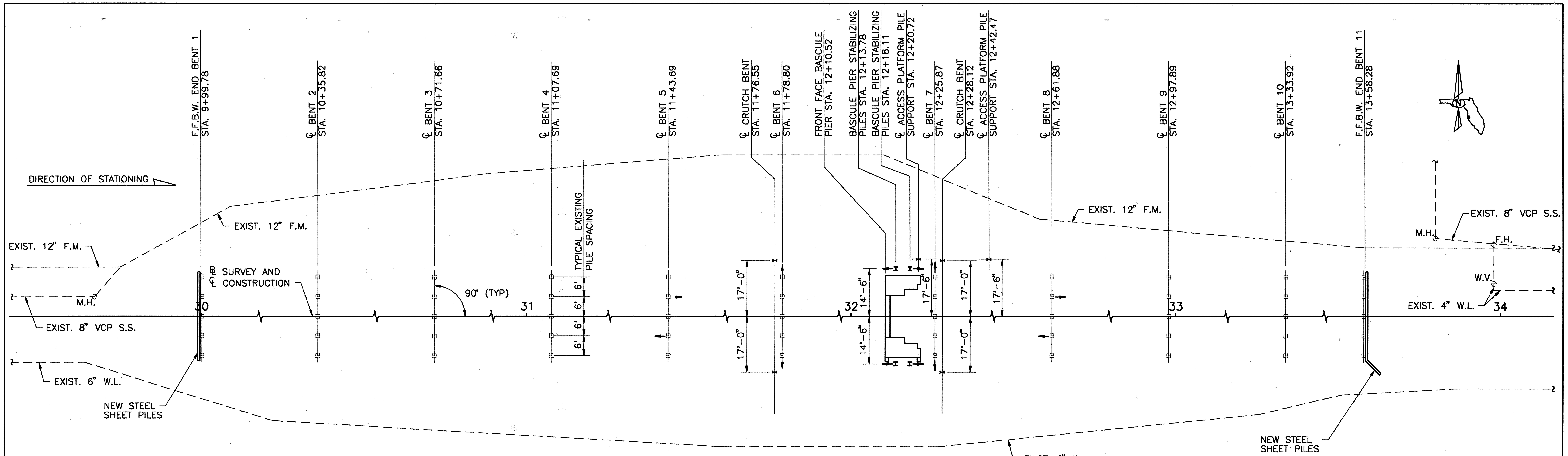
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

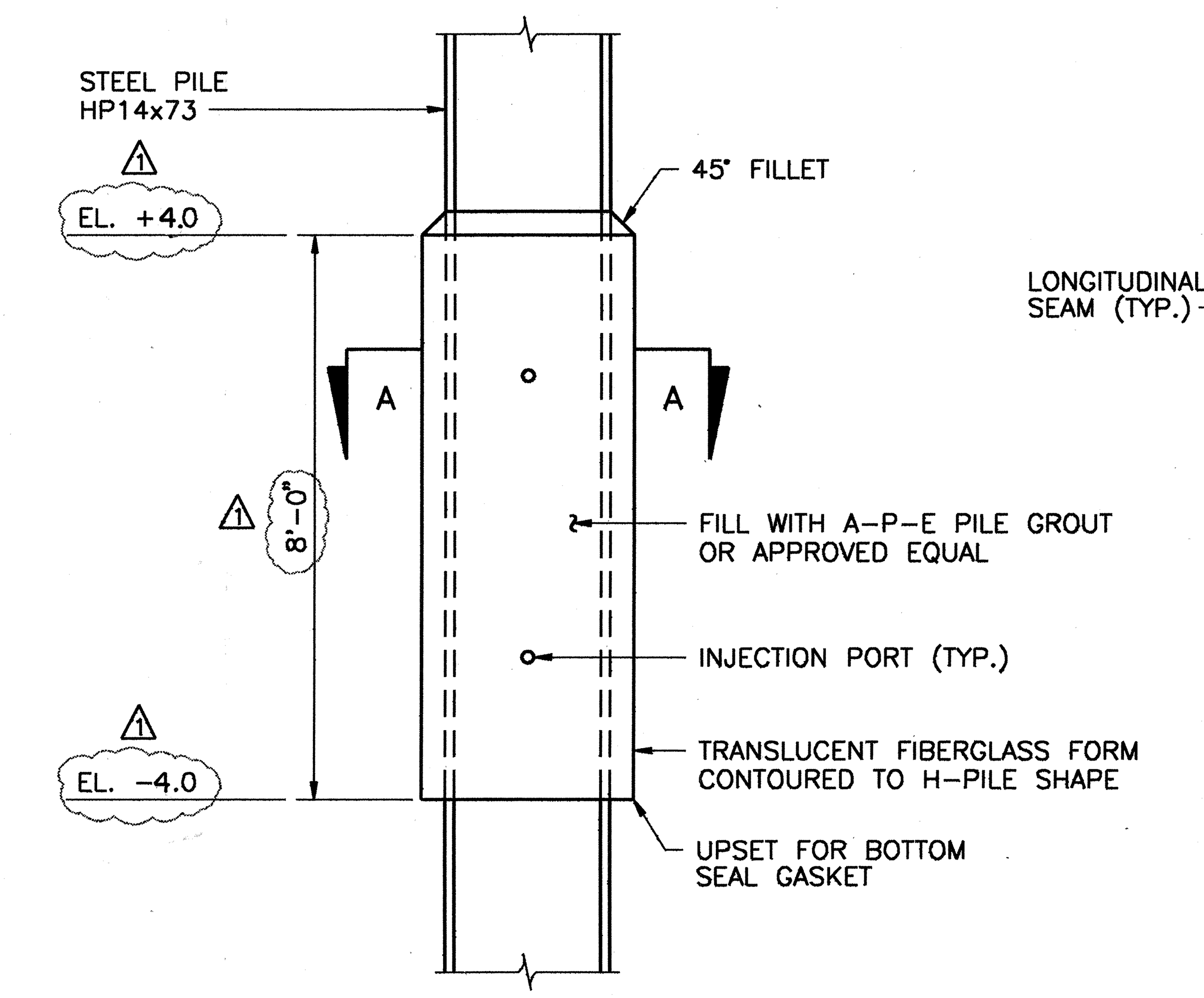
SHEET TITLE: TRAFFIC CONTROL PLAN (3)

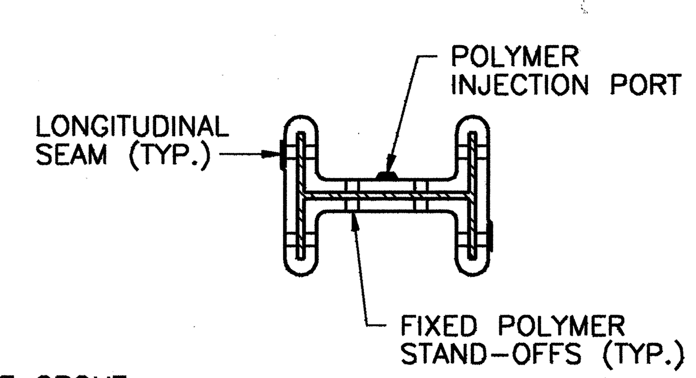
PROJECT NAME: BECKETT BRIDGE REPAIRS

Drawing No. A-11



FOUNDATION LAYOUT
(NOT TO SCALE)





SECTION A-A

STEEL PILE JACKET DETAILS

PILE INSTALLATION TABLE				
LOCATION	STATION	PILE SIZE (IN.)	DESIGN LOAD (TONS)	MIN. TIP EL. (FT.)
CRUTCH BENT-BENT 6	11+76.55	HP14x73	70	-35.0
BASCULE PIER STABILIZING	12+13.78	HP14x73	70	-35.0
BASCULE PIER STABILIZING	12+18.11	HP14x73	70	-35.0
ACCESS PLATFORM	12+20.72	HP14x73	70	-35.0
ACCESS PLATFORM	12+42.47	HP14x73	70	-35.0
CRUTCH BENT-BENT 7	12+28.12	HP14x73	70	-35.0

NOTES:
1. ⊡ = EXISTING 14" SQUARE PRESTRESSED CONCRETE PILE.
2. → INDICATES THE DIRECTION OF BATTER OF THE PILES.
3. I = NEW STEEL HP 14x73 PILE
4. I→ INDICATES 3" PER FOOT BATTER
5. ALL NEW STEEL PILES TO HAVE PROTECTIVE JACKETS, SEE DETAILS, THIS SHEET.
6. FOR REPORT OF CORE BORINGS, SEE SHEET "REPORT OF CORE BORINGS."
7. PILE SPACING GIVEN AT PILE CUT OFF ELEVATIONS.
8. FOR STEEL SHEET PILE INSTALLATION DETAILS, SEE SHEETS "BULKHEAD DETAILS – END BENT 1" AND "BULKHEAD DETAILS – END BENT 11."
9. EXPOSED PARTS OF STEEL PILING, BRACING AND CONNECTIONS SHALL BE PAINTED IN ACCORDANCE WITH THE PROVISIONS FOR PAINTING STRUCTURAL STEEL, AS SPECIFIED IN SECTION 561 OF THE SPECIFICATIONS. A THREE COAT SYSTEM IS REQUIRED (EACH COAT SHALL HAVE A COLOR CONTRAST TO THE PREVIOUS COAT).
10. A MINIMUM OF ONE PDA TEST PILE SHALL BE PERFORMED. DRIVE ONE STEEL HP14x73 UNLOADED TEST PILE (LENGTH = 50 FT.) IN THE POSITION OF A PERMANENT PLUMB PILE. THE LOCATION SHALL BE APPROVED BY THE ENGINEER. THE UNLOADED TEST PILE SHALL BE EVALUATED USING A PILE DRIVING ANALYZER (PDA). PAYMENT FOR THE TEST PILE SHALL BE INCLUDED IN ITEM NO. 455-8-5.
11. THE CONTRACTOR SHALL USE PROTECTIVE DEVICES FOR PILE TIPS TO AVOID DAMAGE TO PILES DURING DRIVING OPERATION. REQUIREMENTS FOR PILE TIPS SHALL BE IN ACCORDANCE WITH SUBARTICLE A455-6.5 OF THE SUPPLEMENTAL SPECIFICATIONS. PAYMENT FOR PILE TIPS SHALL BE INCLUDED IN ITEM NO. 455-7-5.

R:\94065\CADD\BRIDGE C:\WORK\BLFL 02/12/96 09:40:07 ALC PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description
2/12/96	RMC	⚠1 PILE JACKET DIMENSION INCREASED ADDENDUM NO. 2			

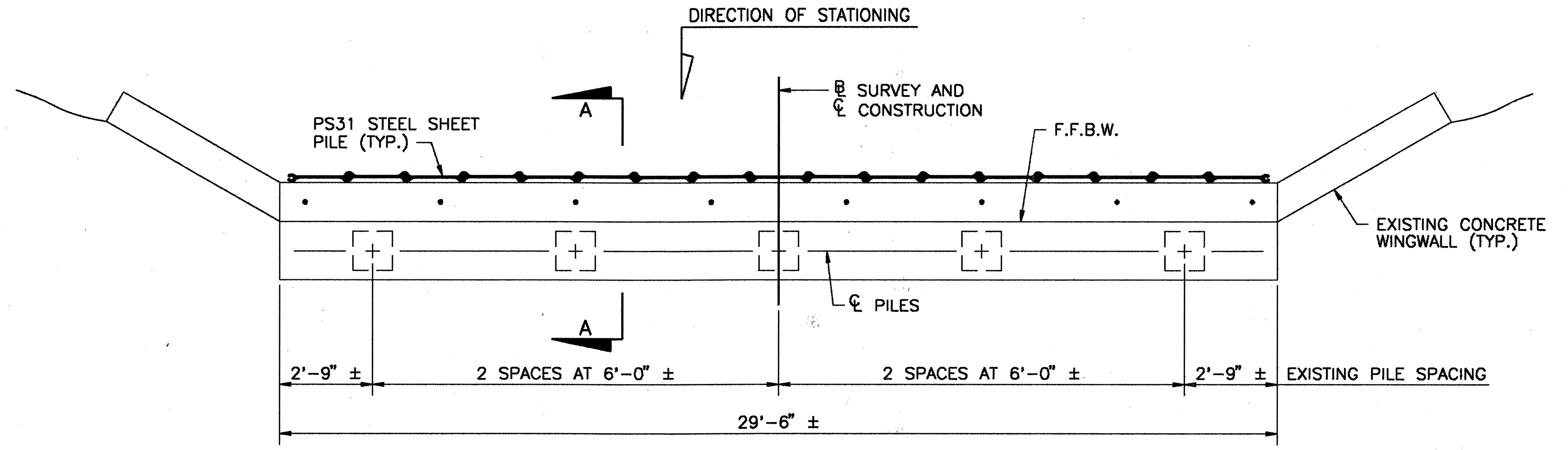
SEAL: (signature) 2/12/96

	Names	Dates
Drawn by	TJL	5-95
Checked by	TJF	5-95
Designed by	MRC	5-95
Checked by	BGW	5-95
Approved by	T. J. FARRELL	

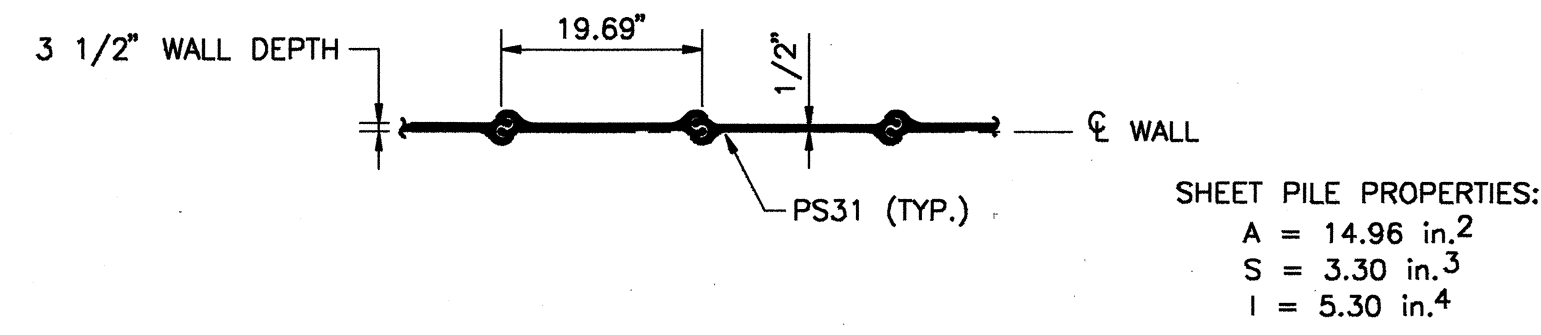
DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

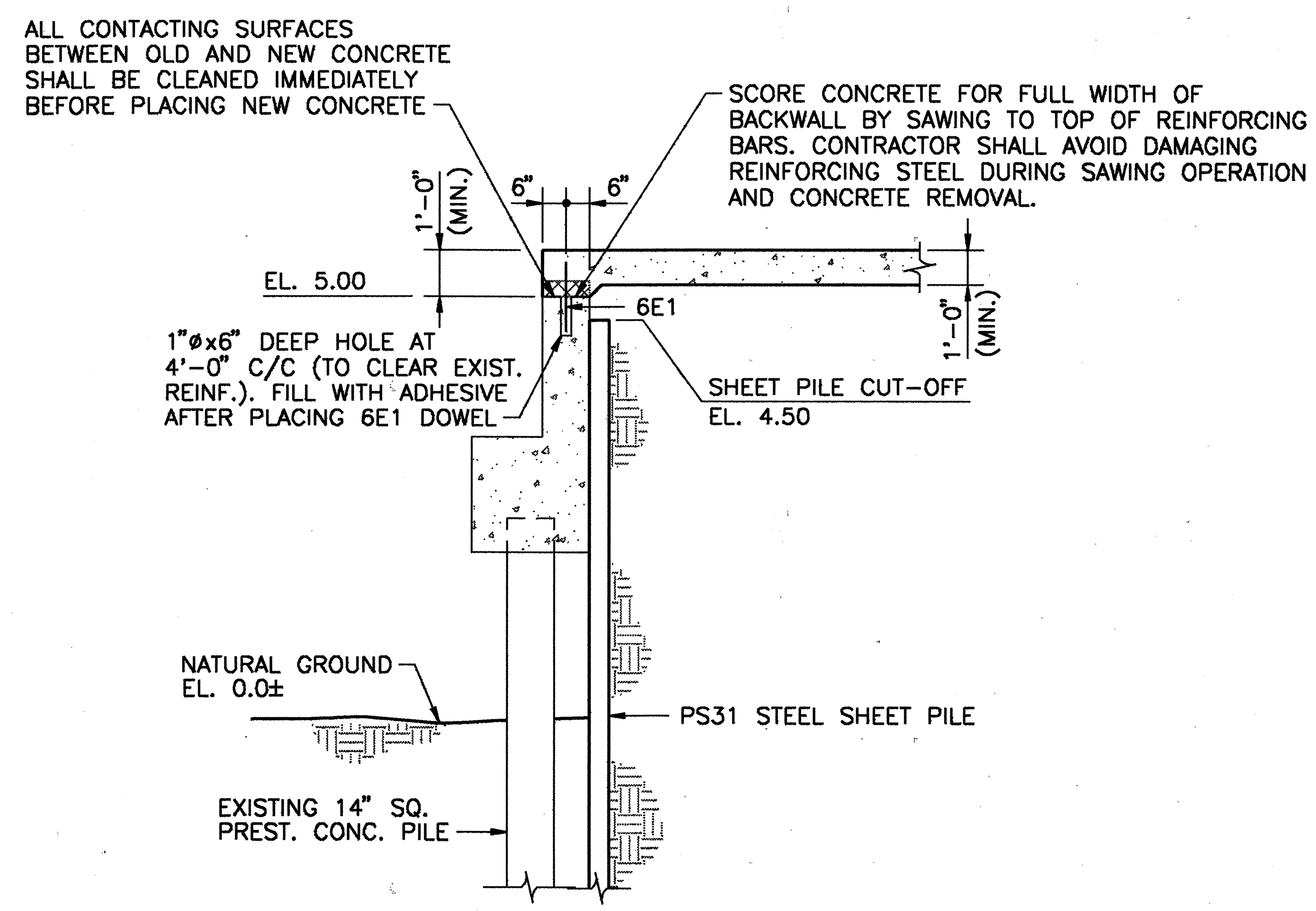
SHEET TITLE: FOUNDATION LAYOUT AND PILE JACKET DETAILS
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET S-1



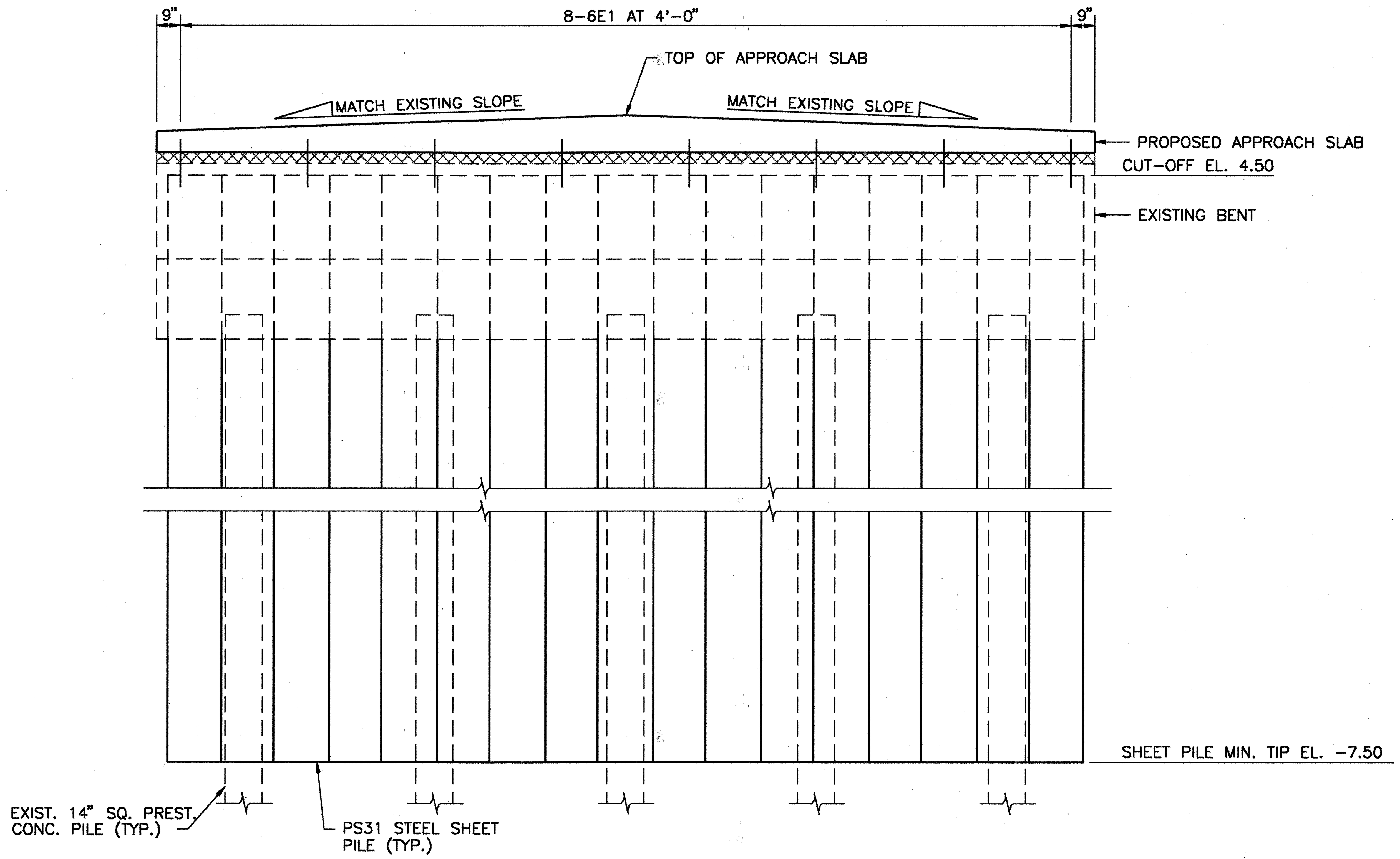
PLAN



STEEL SHEET PILE DETAILS



SECTION A–A



ELEVATION

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
SHEET PILING STEEL	SF	335

NOTES:
1. ⊠ DENOTES EXISTING CONCRETE TO BE REMOVED.
2. TOP OF APPROACH SLAB SHALL MATCH TOP OF CONCRETE DECK AT FFBW.
3. COST OF CONCRETE REMOVAL SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE FOR APPROACH SLABS CONCRETE, ITEM NO. 360-1.
4. FOR APPROACH SLAB DETAILS, SEE SHEET S-16.

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	KTL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

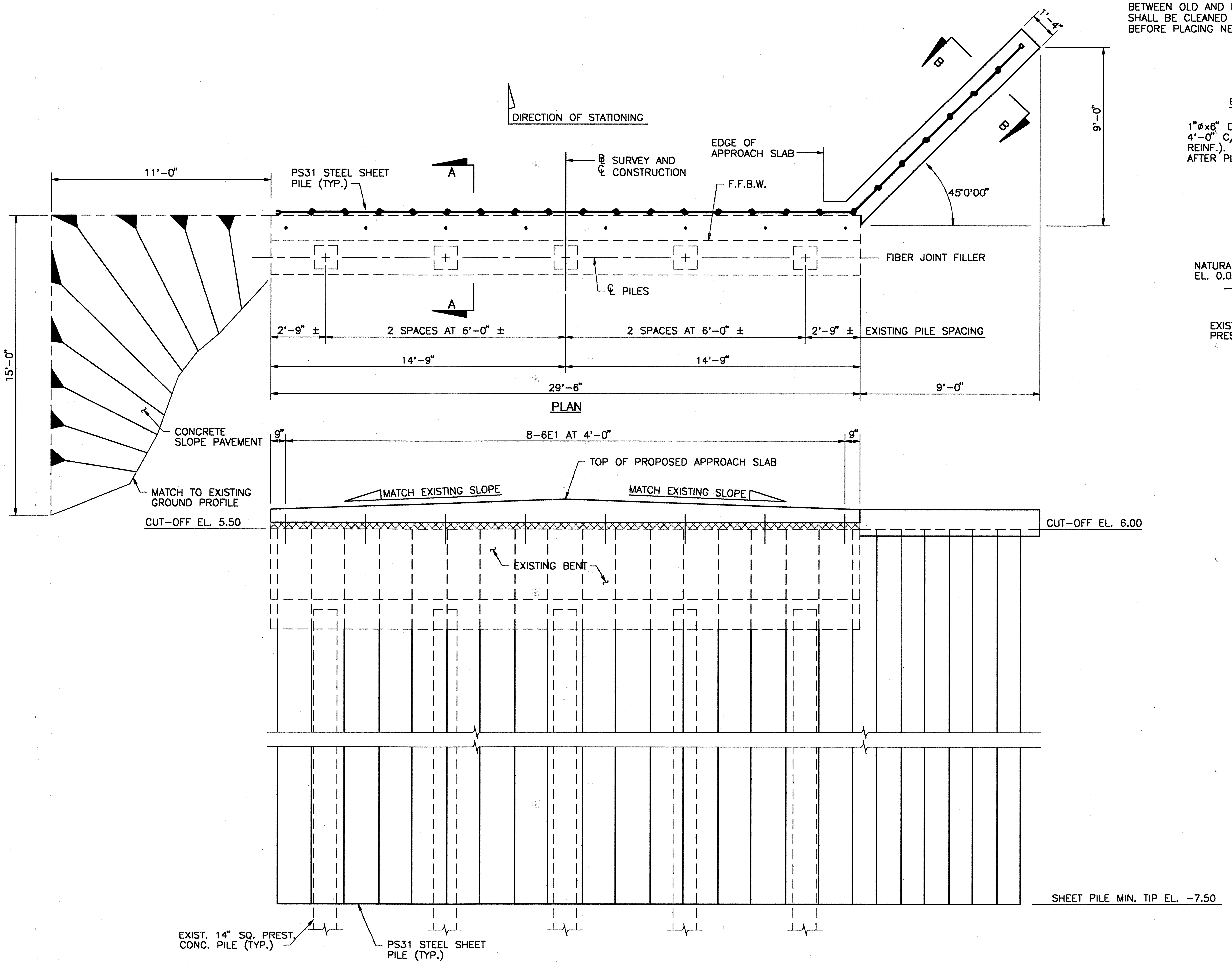
PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

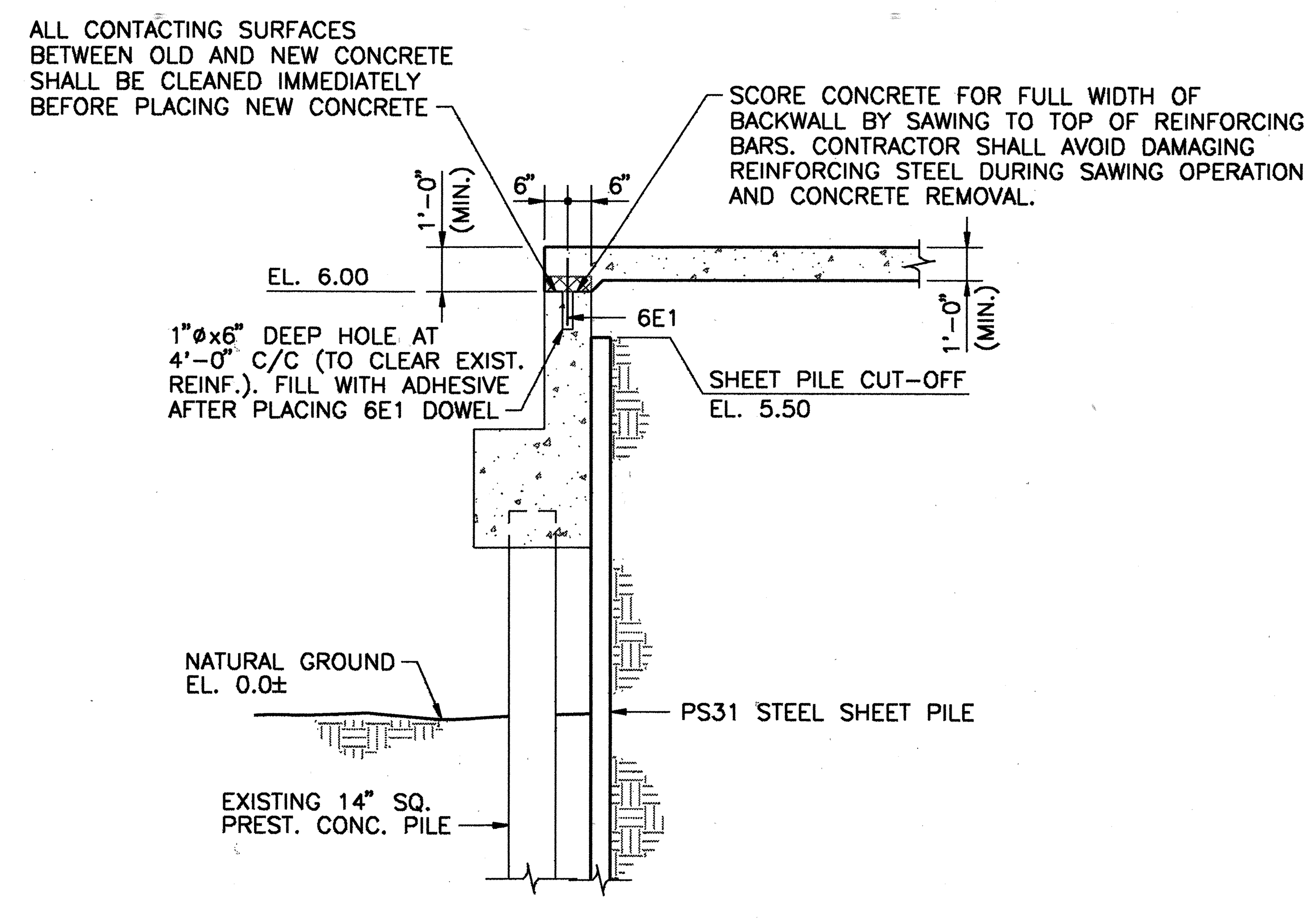
SHEET TITLE: BULKHEAD DETAILS END BENT 1

PROJECT NAME: BECKETT BRIDGE REPAIRS

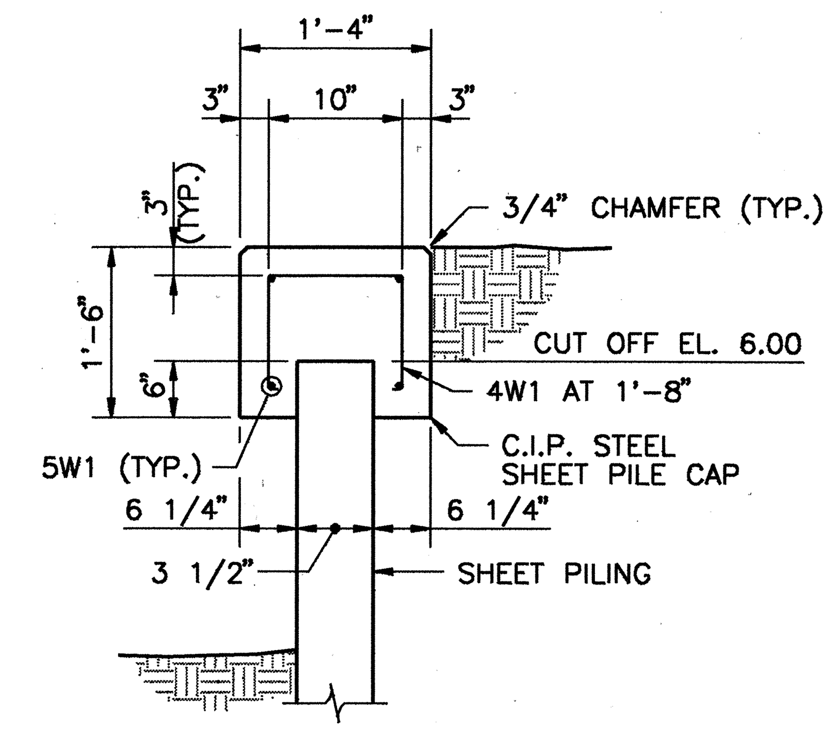
SHEET S-2



ELEVATION
(SLOPE PAVEMENT NOT SHOWN)



SECTION A-A



SECTION B-B

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
SHEET PILING STEEL	SF	518
SLOPE PAVEMENT CONCRETE	SY	18

NOTES:
1. FOR STEEL SHEET PILE DETAILS SEE SHEET S-2
2. COST OF C.I.P. STEEL SHEET PILE CAP INCLUDING REINFORCING STEEL SHALL BE INCLUDED IN UNIT COST FOR SHEET PILING STEEL ITEM NO. 455-133.
3. COST OF CONCRETE REMOVAL SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE FOR APPROACH SLABS CONCRETE, ITEM NO. 360-1.

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REVISIONS			REVISIONS			SEAL:
Date	By	Description	Date	By	Description	

	Names	Dates
Drawn by	KTL	5-95
Checked by	TJF	5-95
Designed by	BGW	5-95
Checked by	MRC	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

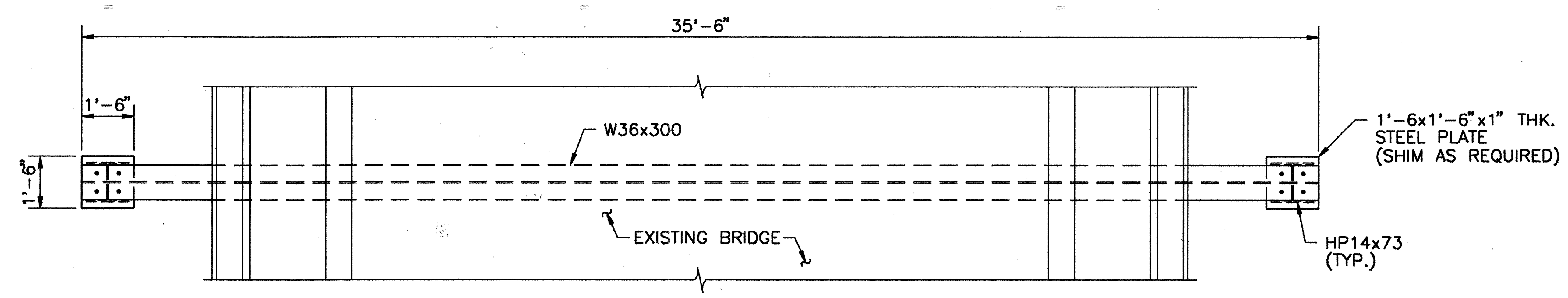
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

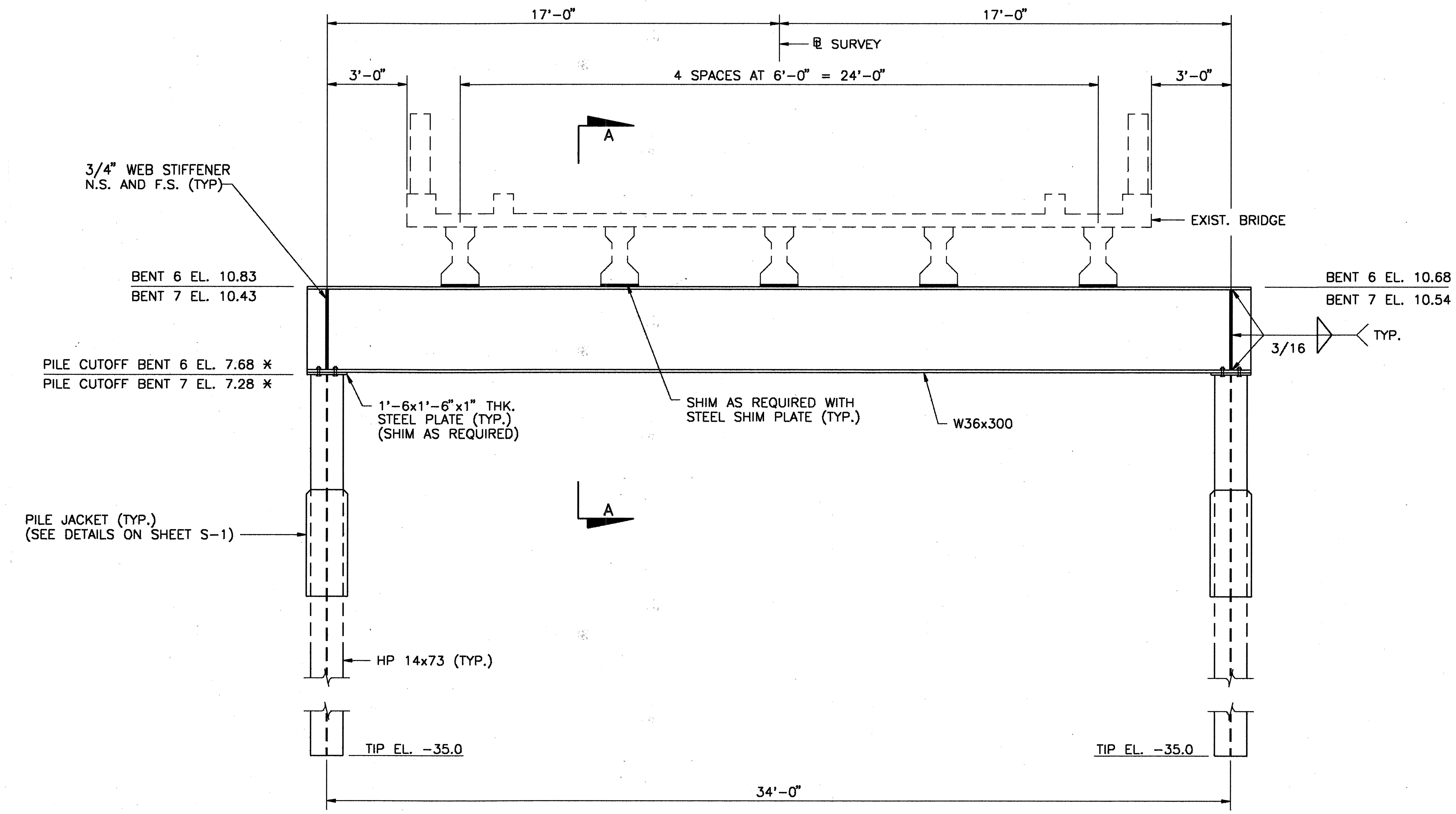
SHEET TITLE: BULKHEAD DETAILS END BENT 11

PROJECT NAME: BECKETT BRIDGE REPAIRS

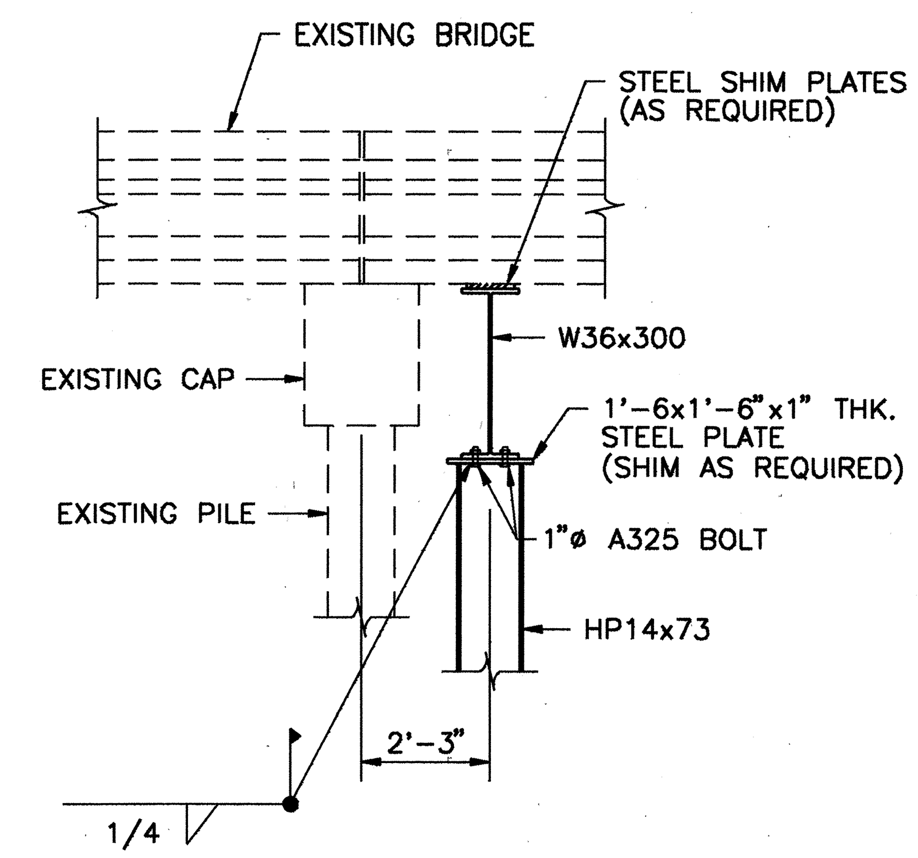
SHEET S-3



PLAN



ELEVATION



SECTION A-A

* THE CONTRACTOR SHALL ADJUST THESE ELEVATIONS IN ORDER TO ATTAIN FULL CONTACT BETWEEN THE EXISTING PRESTRESSED CONCRETE BEAMS AND THE W36x300.

R:\94065\CADD\BRIDGE
C:\WORK\1BBEB1 07/31/95 15:51:25 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	TJL	4-95
Checked by	MRC	4-95
Designed by	MRC	4-95
Checked by	BGW	4-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

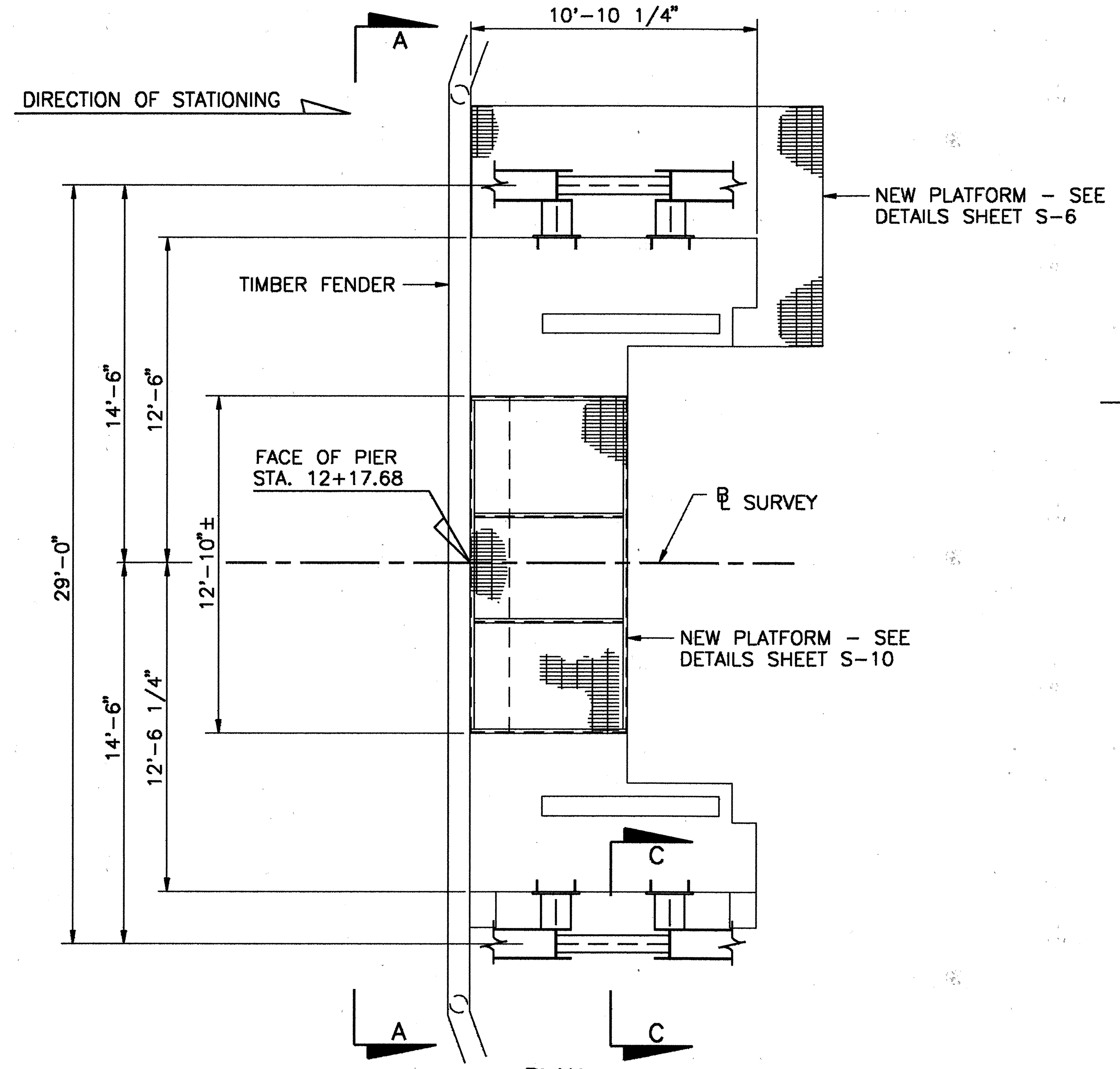
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: CRUTCH BENT DETAILS

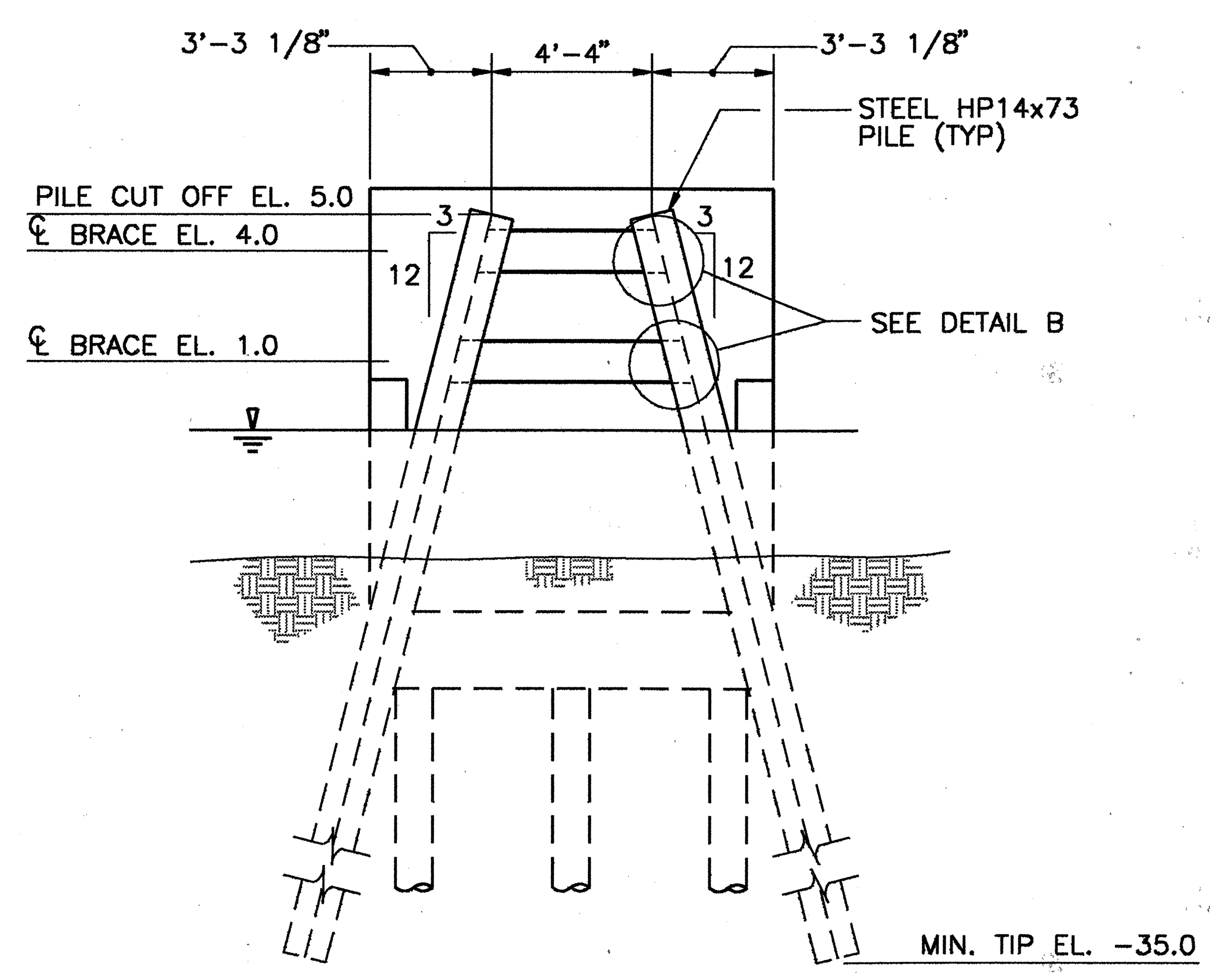
PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-4

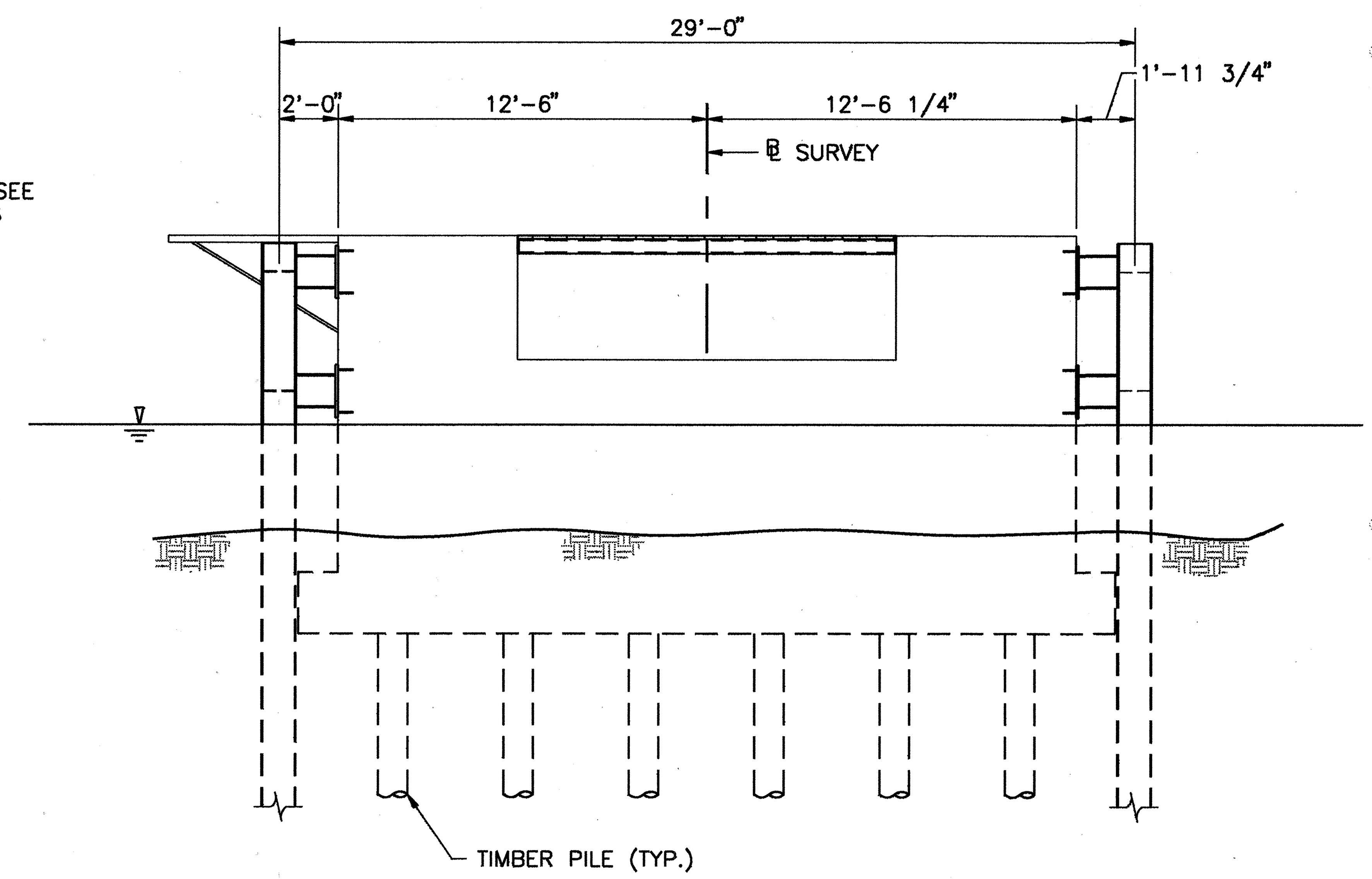


PLAN

(SUPERSTRUCTURE OMITTED FOR CLARITY)



ELEVATION



VIEW A-A

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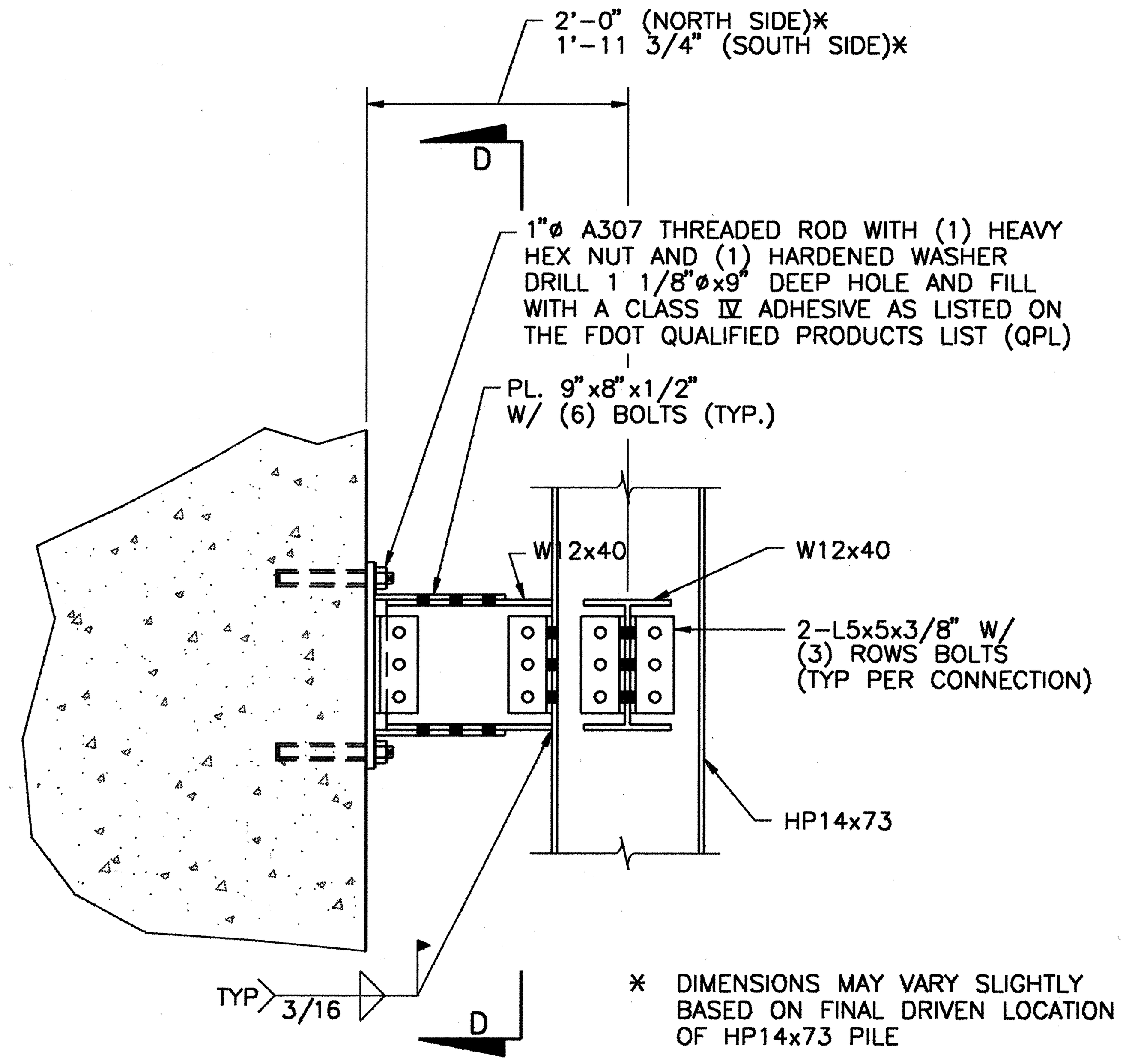
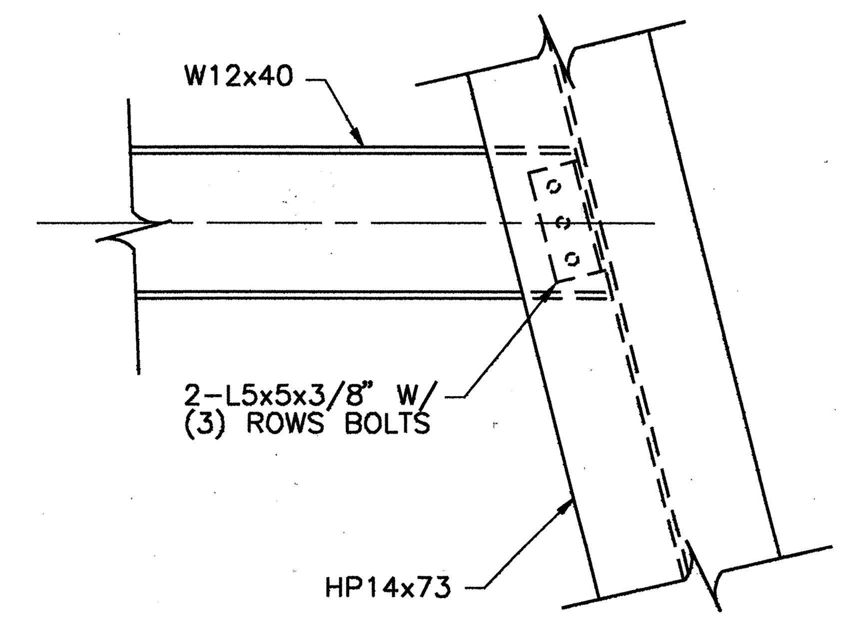
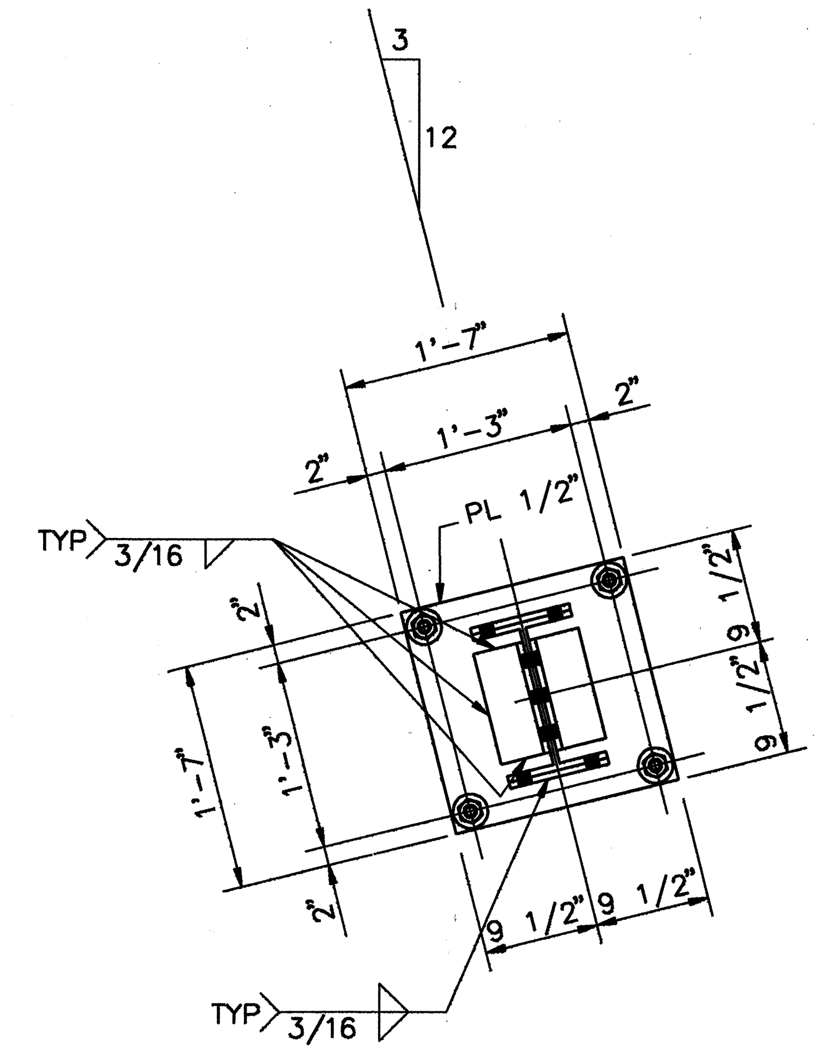


* DIMENSIONS MAY VARY SLIGHTLY BASED ON FINAL DRIVEN LOCATION OF HP14x73 PILE

SECTION C-C



DETAIL B



SECTION D-D

NOTE:
1. PAYMENT FOR BASCULE PIER STABILIZER BRACING AND CONNECTIONS SHALL BE PAID FOR UNDER PAY ITEM NO. 460-2-5 "STRUCTURAL STEEL (BASCULE LEAVES)".

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Designed by	TJF	5-95
Checked by	TJF	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

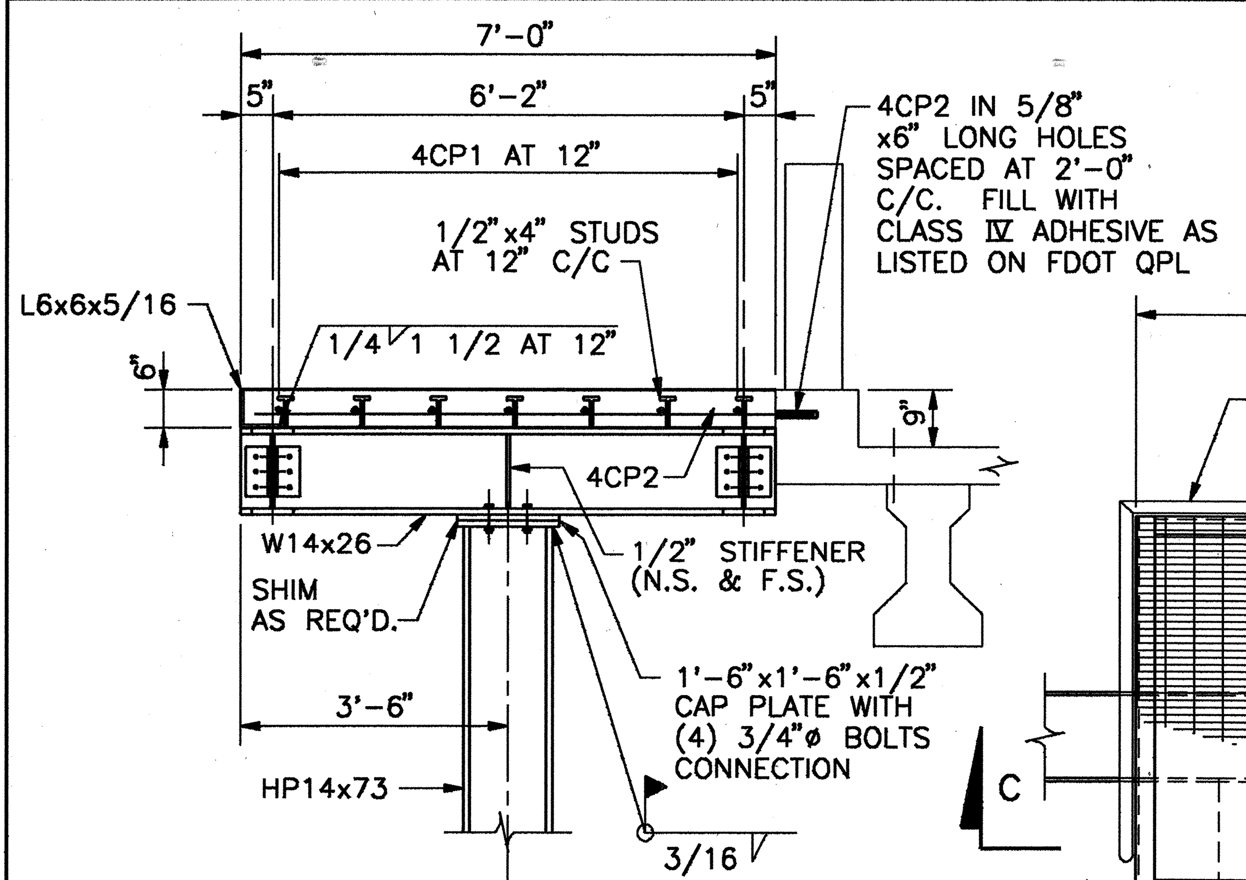
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

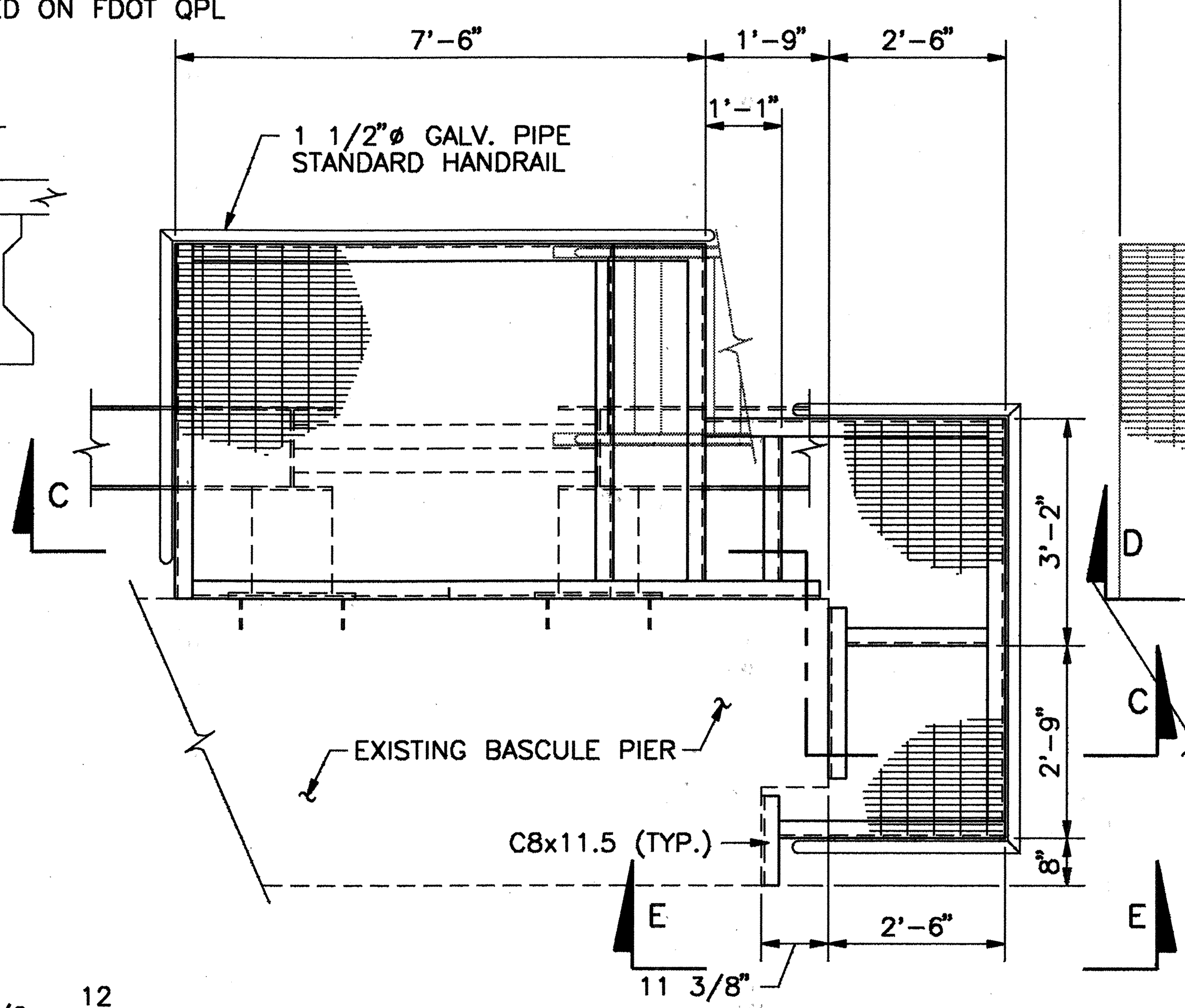
SHEET TITLE: BASCULE PIER STABILIZING DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

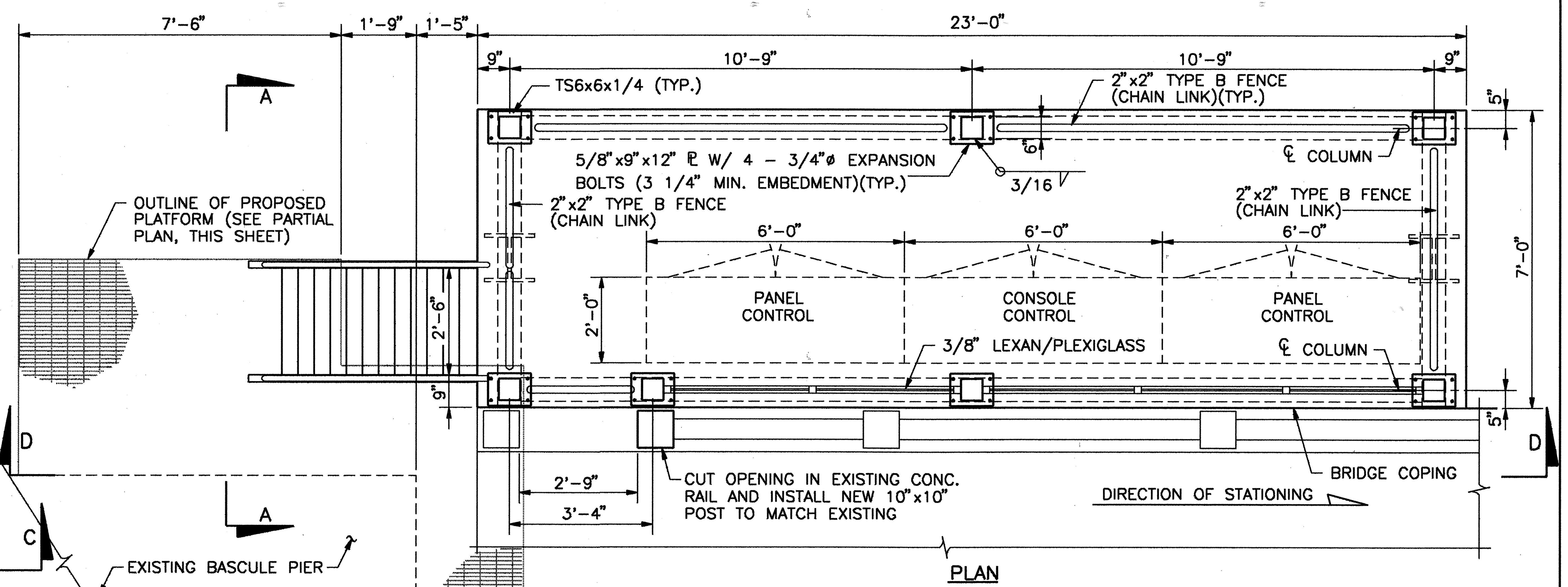
SHEET S-5



TYPICAL SLAB CROSS SECTION

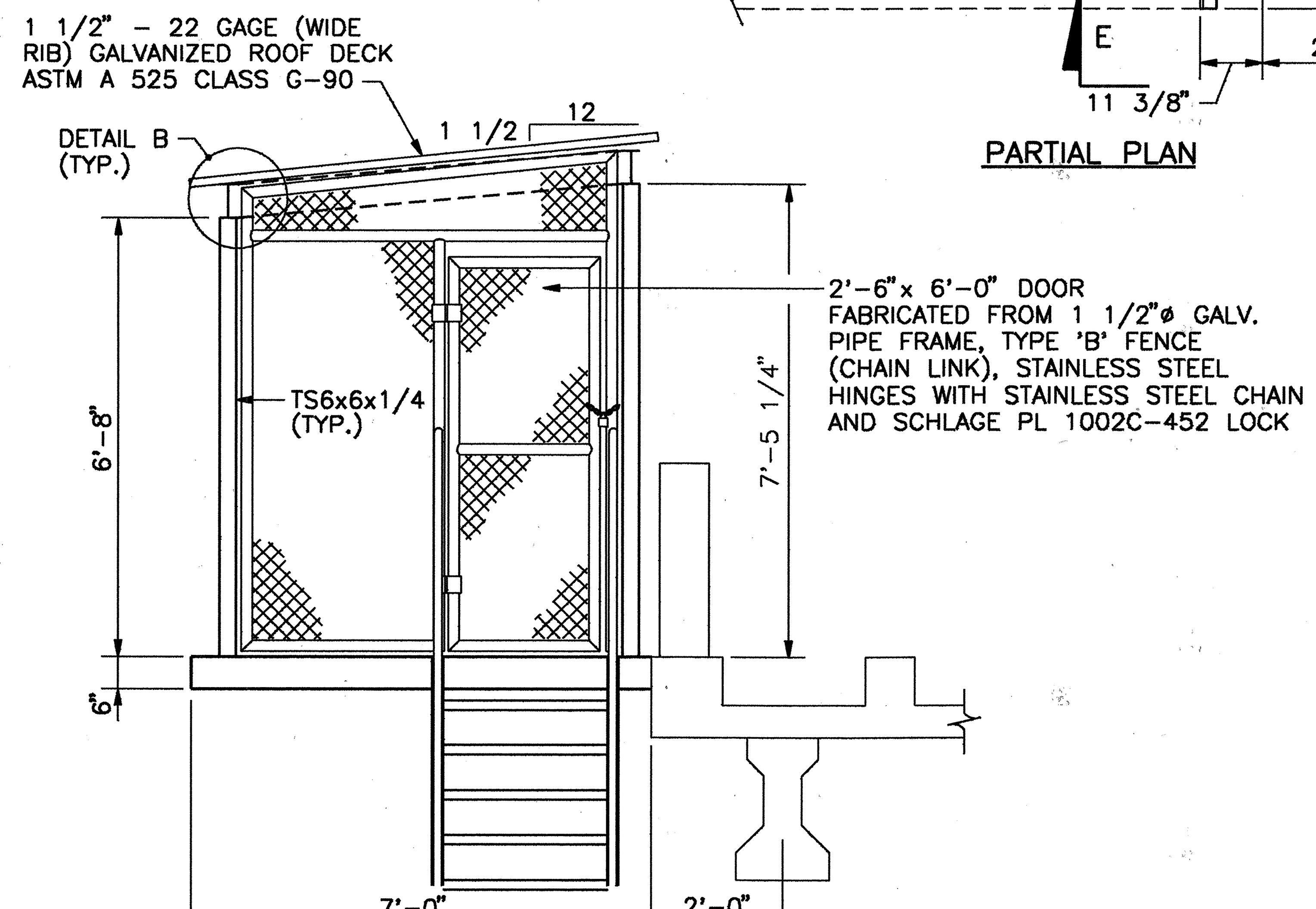


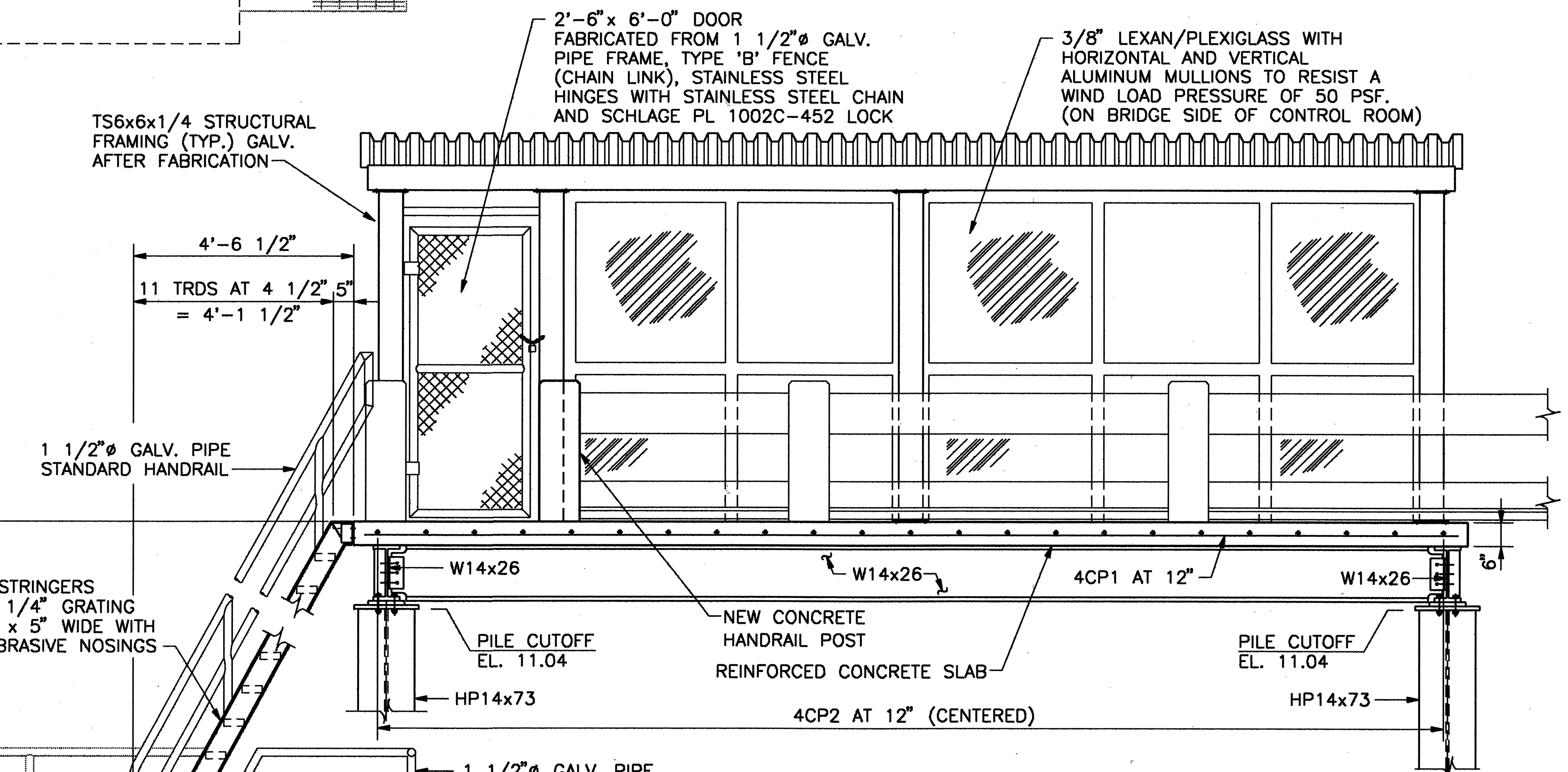
PARTIAL PLAN



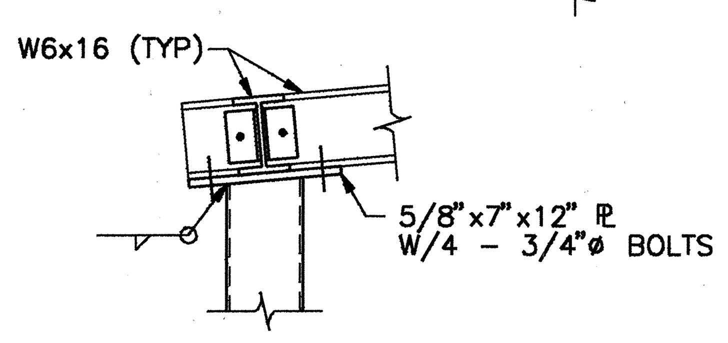
PLAN

(ROOF DECK NOT SHOWN FOR CLARITY)

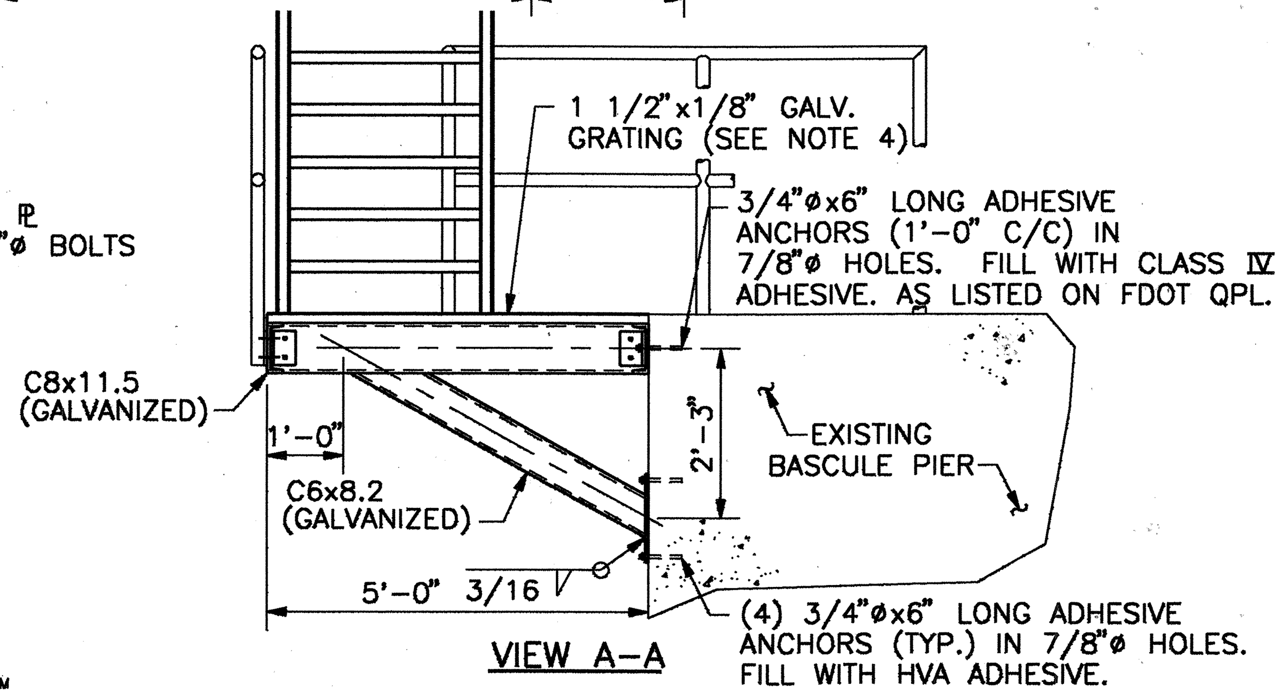




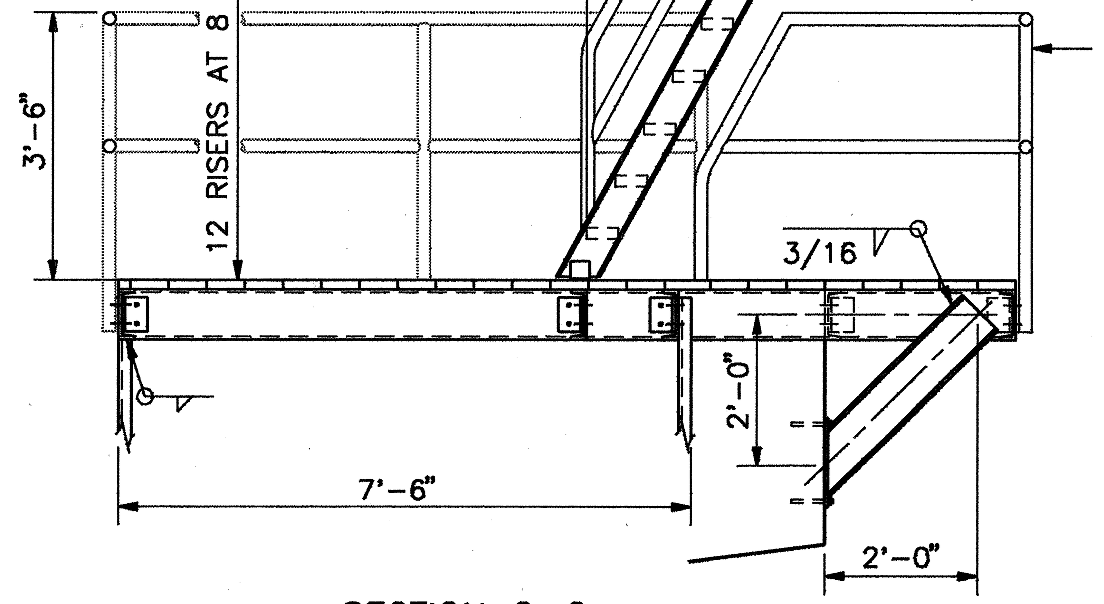
SECTION D-D



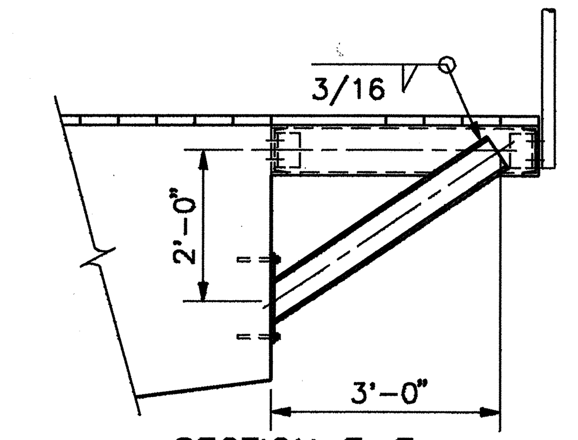
DETAIL B



VIEW A-A



SECTION C-C



SECTION E-E

NOTES:
1. ALL MATERIAL TO BE ASTM A-36.
2. ALL MATERIAL TO BE GALVANIZED PER ASTM A 123 AND A 153.
3. ALL BOLTS TO BE 3/4"ø A 325.
4. PAYMENT FOR 1 1/2" x 1/8" GALV. GRATING AND SUPPORTING STEEL SHALL BE MADE UNDER ITEM NO. 460-6 "ACCESS LADDERS, PLATFORMS AND HANDRAILS".
5. PAYMENT FOR CONTROL PLATFORM STEEL FRAMING SHALL BE INCLUDED IN ITEM NO. 460-2-1 "STRUCTURAL STEEL (CARBON)".
6. PAYMENT FOR LEXAN, MULLIONS, CHAIN LINK FENCE, ROOF DECK, HANDRAIL POST MODIFICATION AND MISCELLANEOUS HARDWARE SHALL BE PAID FOR UNDER ITEM NO. 512-1 "TENDER FACILITIES AND EQUIPMENT".
7. PAYMENT FOR CONCRETE SLAB SHALL BE INCLUDED IN ITEM NO. 400-4-4 "CONCRETE CLASS IV (SUPERSTRUCTURE).

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Checked by	JMR	5-95
Approved by	T. J. FARRELL	

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

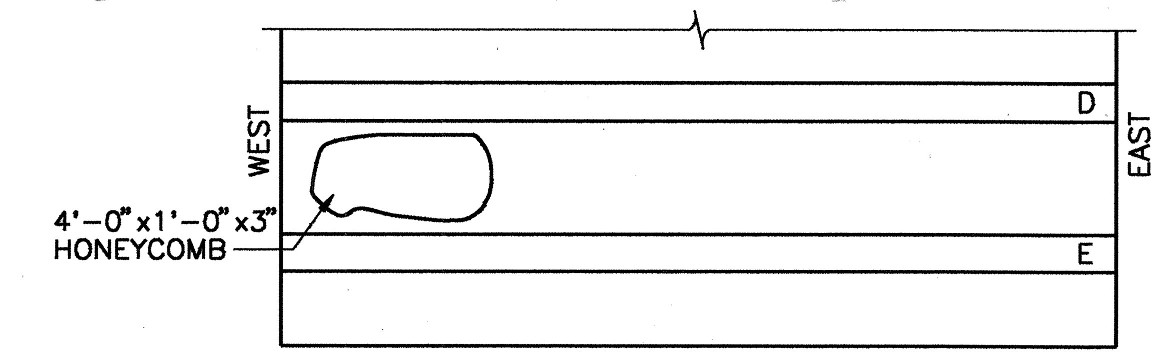
PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: CONTROL PLATFORM DETAILS

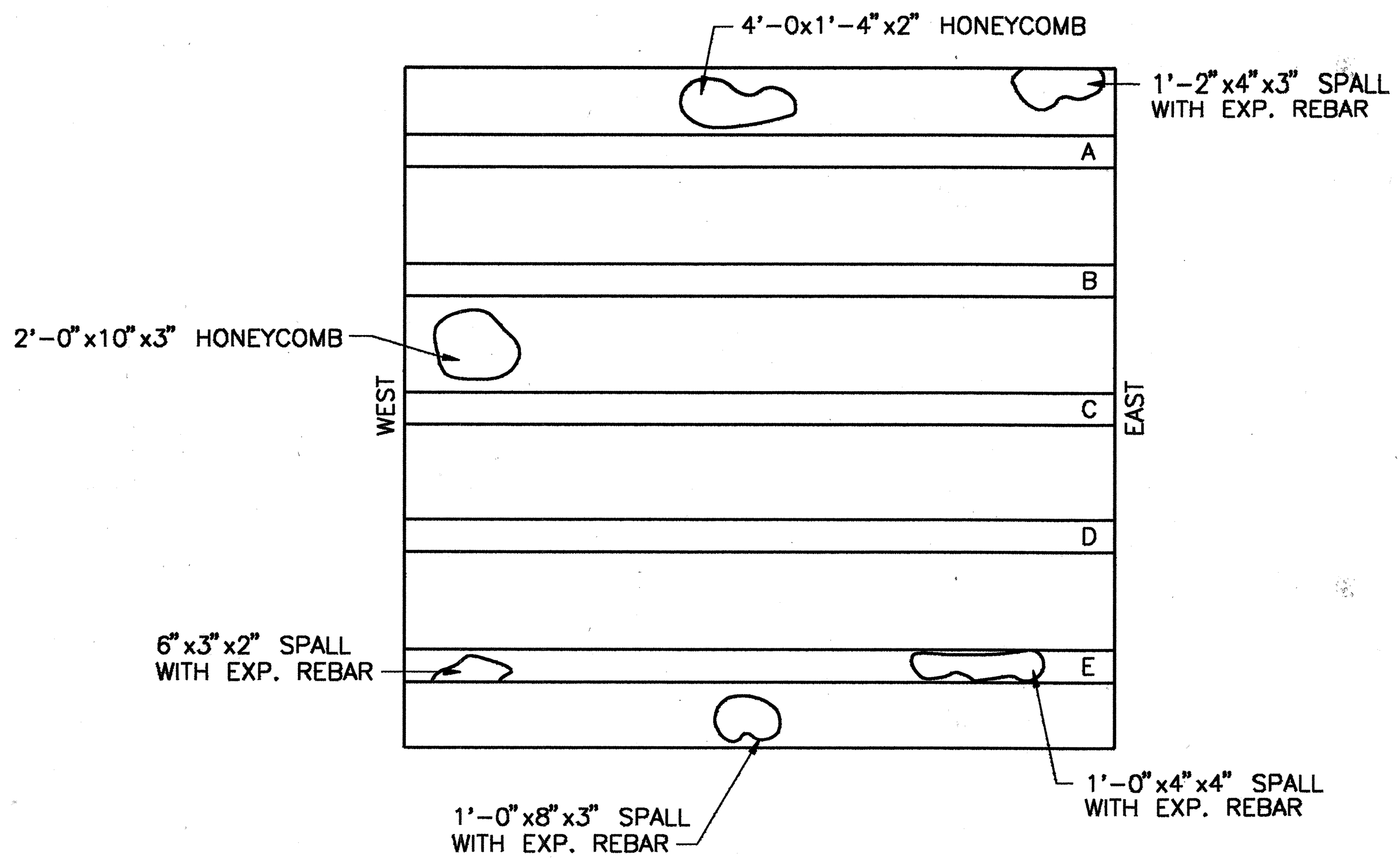
PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET: S-6

Timothy J. Farrell



BOTTOM OF DECK-SPAN 2
(REFLECTED VIEW)



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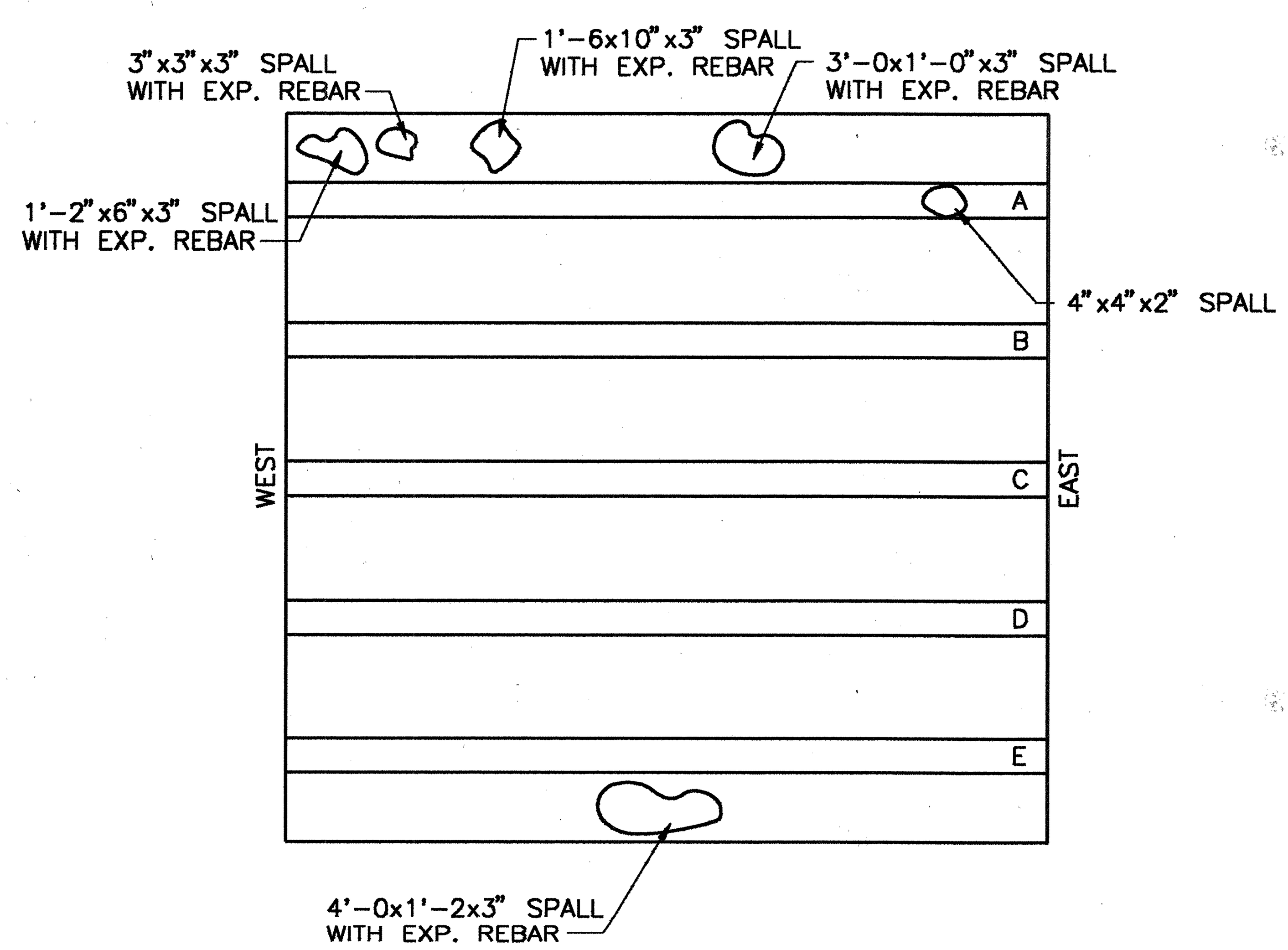

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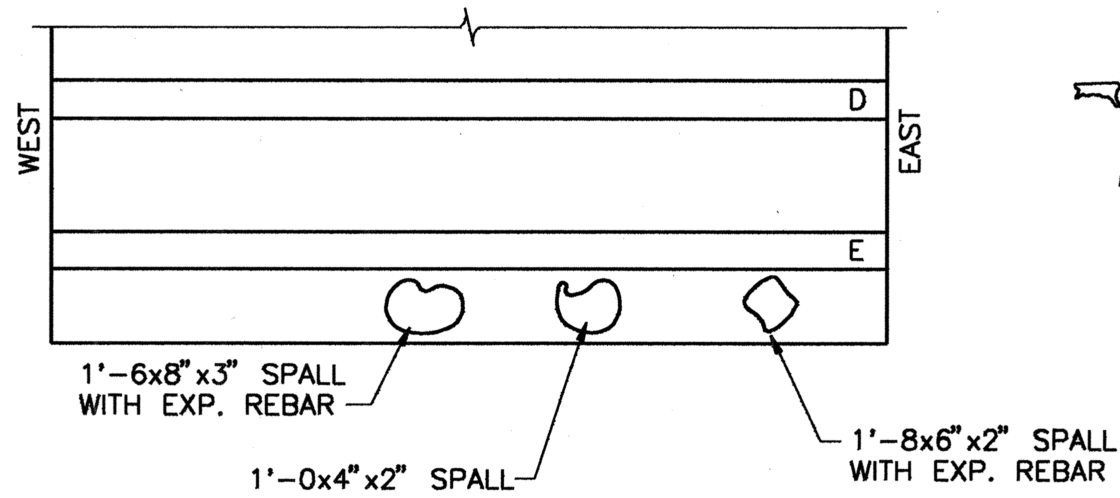

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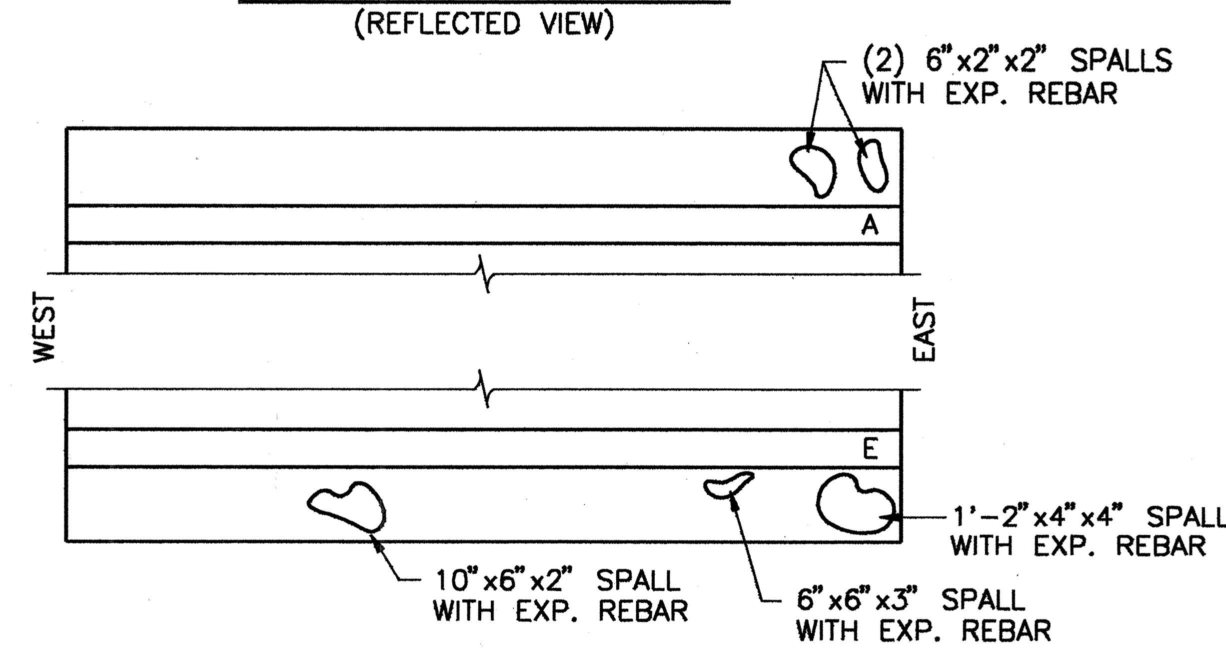

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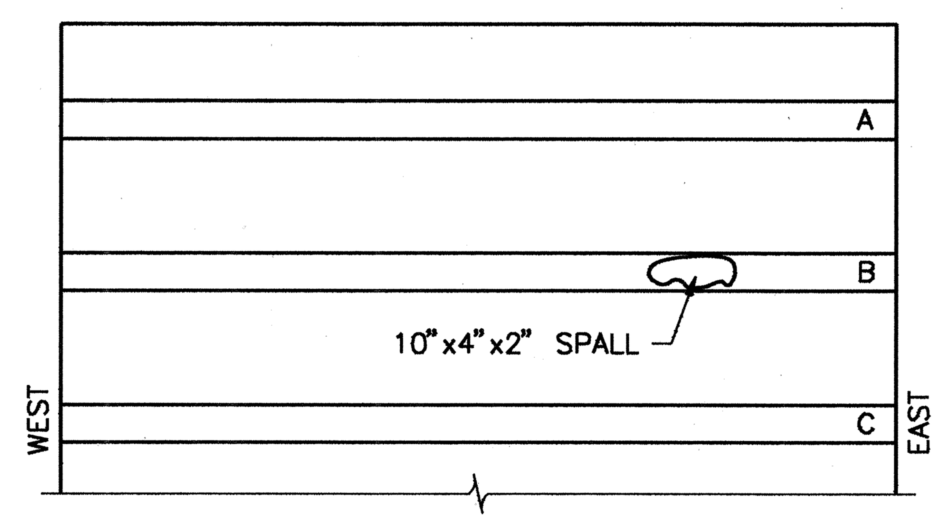

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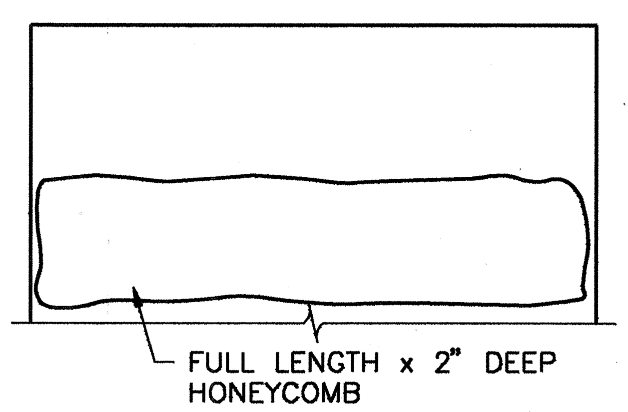
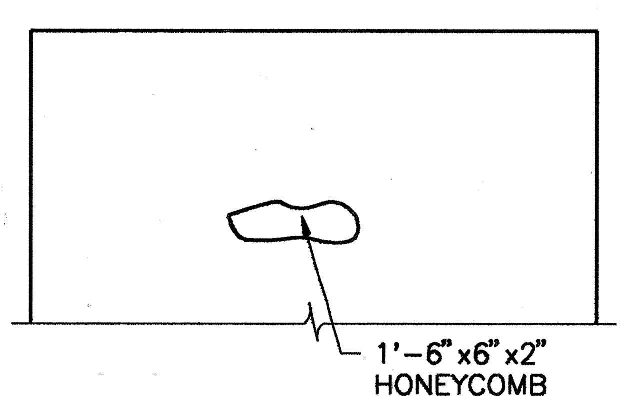
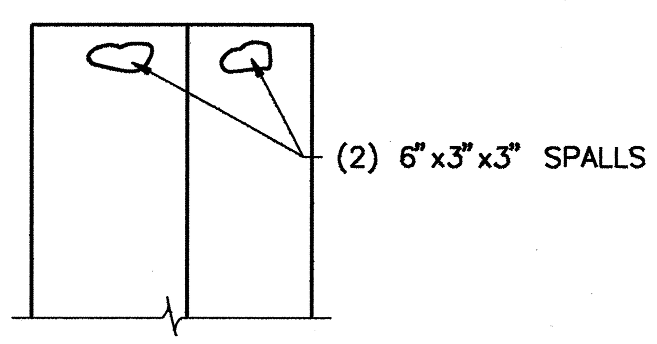


NORTH BASCULE PIER - NORTH FACE



SOUTH BASCULE PIER - SOUTH FACE



SOUTH BASCULE PIER - WEST FACE

REPAIR NOTES

PATCHING OF CONCRETE SPALLS:

SPALL WITHOUT EXPOSED REINFORCING STEEL: REPAIRING SPALLED CONCRETE SHALL INCLUDE ALL WORK REQUIRED TO REPAIR DETERIORATED CONCRETE SURFACES WHERE INDICATED OR AS DIRECTED BY THE ENGINEER, AND CONFORM TO MANUFACTURER'S SPECIFICATIONS. THIS WORK CONSISTS OF THE REMOVAL AND DISPOSAL OF LOOSE AND DISINTEGRATED CONCRETE, SAW-CUTTING, THE PREPARATION OF THE SURFACE AND PLACING OF POLYMER MODIFIED MORTAR. THE FOLLOWING STEPS SHALL BE USED IN ADDITION TO MANUFACTURER'S RECOMENDATIONS:

A. REMOVE UNSOUND CONCRETE FROM SPALLED AREA. POWER CHIPPING TOOLS MAY BE USED. BUT NOT TO EXCEED 30 POUNDS.

B. CLEAN CONCRETE SURFACES OF ALL LOOSE CONCRETE, DUST, AND ANY OTHER FOREIGN MATERIAL. BE SURE REPAIR AREA IS NOT LESS THAN 1/2 IN. IN DEPTH. PREPARE AREA TO OBTAIN AN AGGREGATE FRACTURED SURFACE WITH A MINIMUM SURFACE PROFILE OF ± 1/16 IN.

C. USE A POLYMER MODIFIED MORTAR (MASTERPATCH 230 VP AS MANUFACTURED BY MASTER BUILDERS, INC. OR APPROVED EQUAL) WHILE STILL TACKY. THE MATERIAL SHALL COMPLETELY FILL THE AREA. THOROUGHLY COMPACT THE COMPOUND ELIMINATING ALL AIR POCKETS. ALLOW THE MATERIAL TO STIFFEN ENOUGH BETWEEN LIFTS TO SUPPORT ITS OWN WEIGHT.

D. AFTER THE NEW CONCRETE IS IN PLACE, THE SURFACE SHALL BE FINISHED TO MATCH THE ADJACENT EXISTING AREAS.

SPALL WITH EXPOSED REINFORCING STEEL: REPAIRING SPALLED CONCRETE SHALL INCLUDE ALL WORK REQUIRED TO REPAIR DETERIORATED CONCRETE SURFACES WHERE INDICATED OR AS DIRECTED BY THE ENGINEER, AND CONFORM TO MANUFACTURER'S SPECIFICATIONS. THIS WORK CONSISTS OF THE REMOVAL AND DISPOSAL OF LOOSE AND DISINTEGRATED CONCRETE, SAW-CUTTING, THE PREPARATION OF THE SURFACE AND PLACING OF A POLYMER MODIFIED MORTAR. THE FOLLOWING STEPS SHALL BE USED IN ADDITION TO MANUFACTURER'S RECOMMENDATIONS:

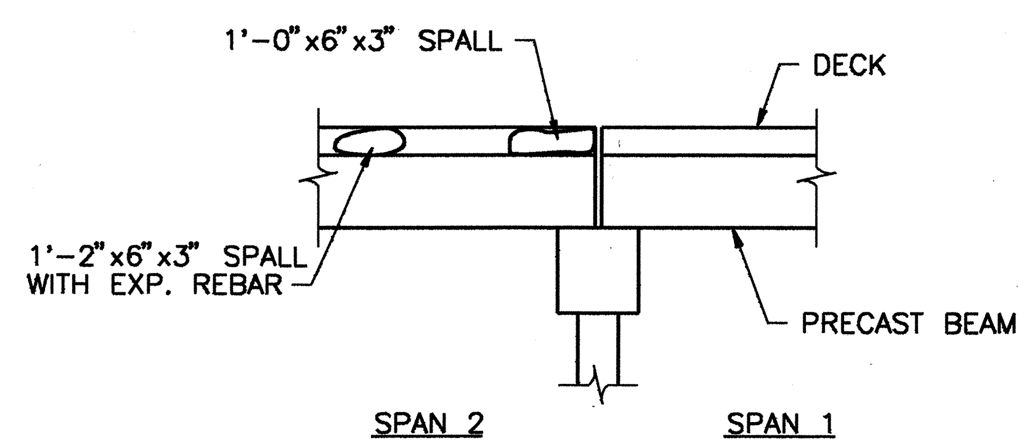
A. REMOVE UNSOUND CONCRETE FROM SPALLED AREA. PNEUMATIC TOOLS SHALL NOT BE PLACED IN DIRECT CONTACT WITH THE REINFORCING STEEL. EXTREME CARE SHALL BE TAKEN AS NOT TO DAMAGE THE STEEL OR ITS BOND IN THE SURROUNDING SOUND CONCRETE.

B. THE REMOVAL SHALL CONTINUE UNTIL AT LEAST 3/4 OF THE BAR'S CIRCUMFERENCE IS EXPOSED. IF UNSOUND CONCRETE IS ENCOUNTERED AT OR BELOW THE MID-DEPTH OF REINFORCEMENT BARS, REMOVAL SHALL EXTEND TO AT LEAST 3/4 INCHES BEYOND BARS.

C. CLEAN CONCRETE SURFACE AND EXPOSED REINFORCING STEEL OF ALL LOOSE CONCRETE, DUST, AND ANY FOREIGN MATERIAL. RUST SCALE SHALL BE REMOVED BY HYDROBLASTING.

D. THE REMAINING STEPS ARE SIMILAR TO THOSE USED FOR REPAIRING SPALLS WITHOUT EXPOSED REINFORCING STEEL. THE MATERIAL USED TO REPAIR CONCRETE SPALLS SHALL BE THE SAME TYPE USED FOR REPAIRING SPALLS WITHOUT EXPOSED REINFORCING STEEL.

E. WHEN REMOVING SPALLS AND UNSOUND CONCRETE, EDGES SHALL REMAIN VERTICAL (HORIZONTAL) WITH A MINIMUM DEPTH (WIDTH) OF 1/4" SUCH THAT THE NEW CEMENT IS NOT FEATHERED TO MATCH THE EXISTING CONCRETE SURFACE.



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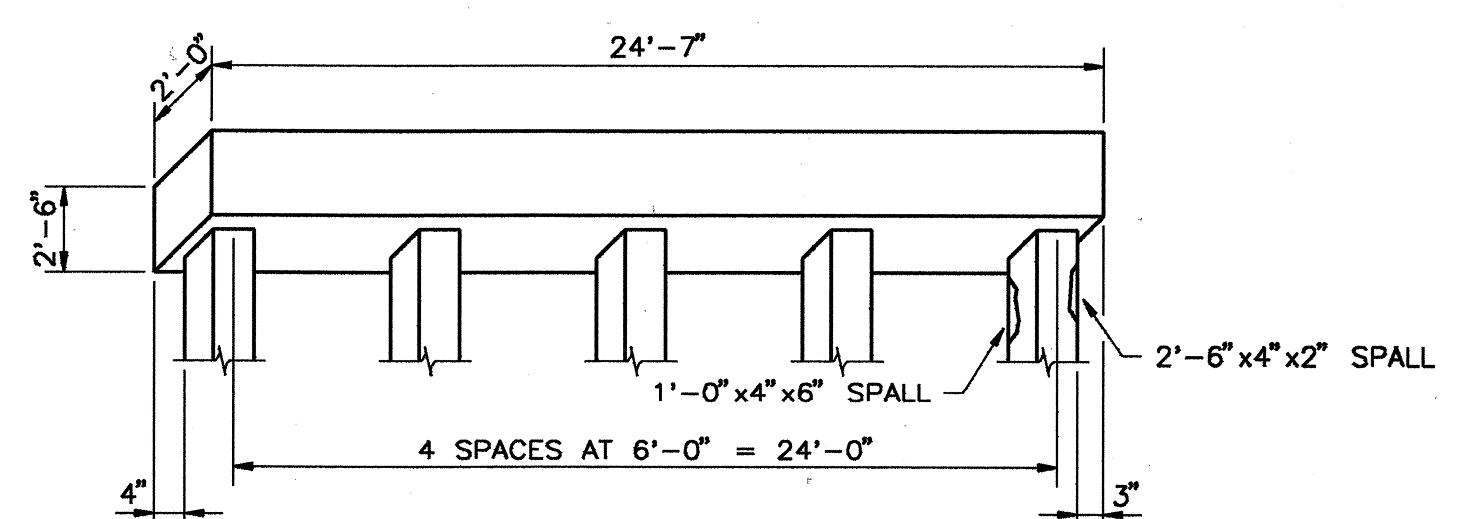

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Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

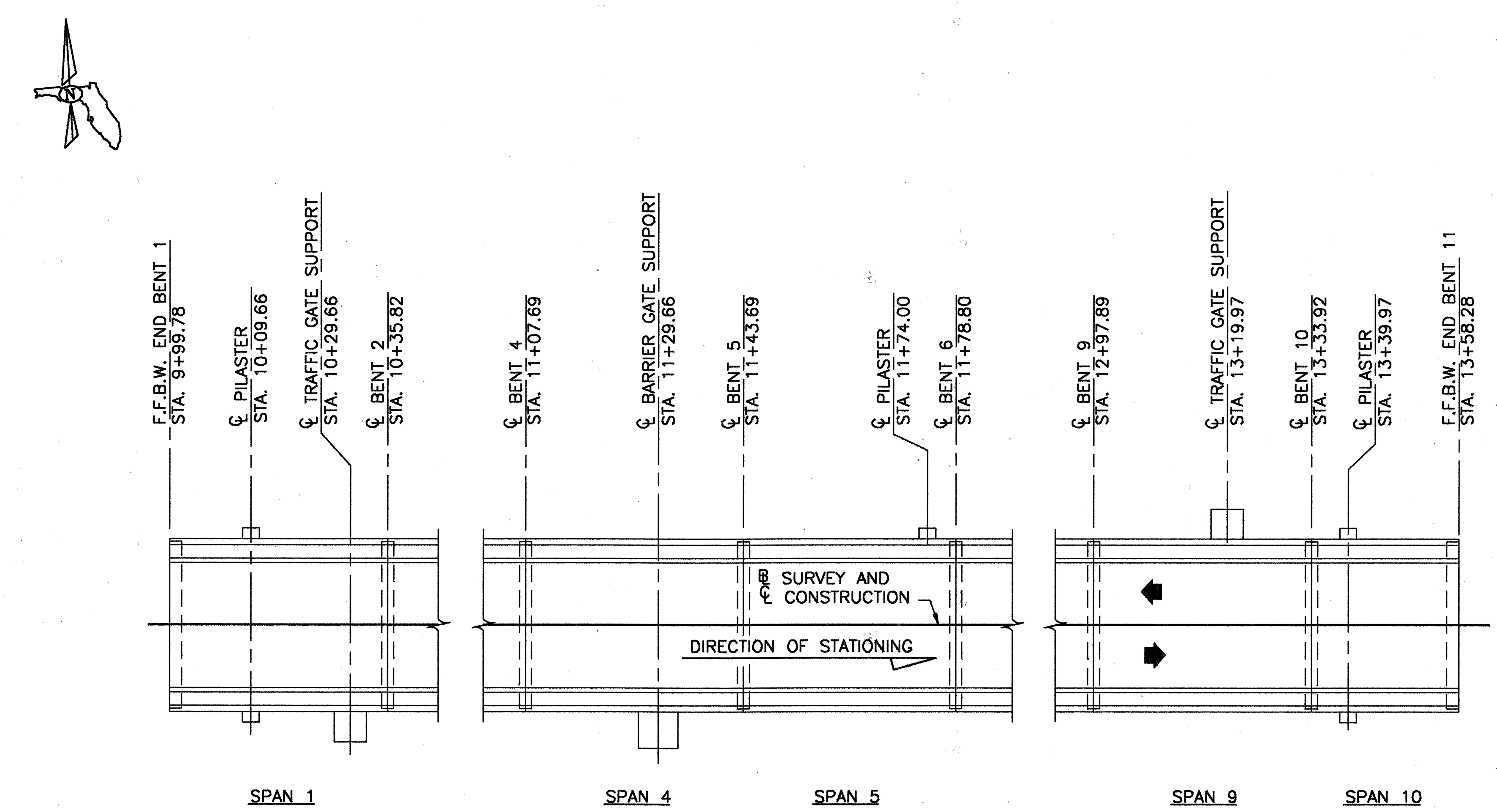
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

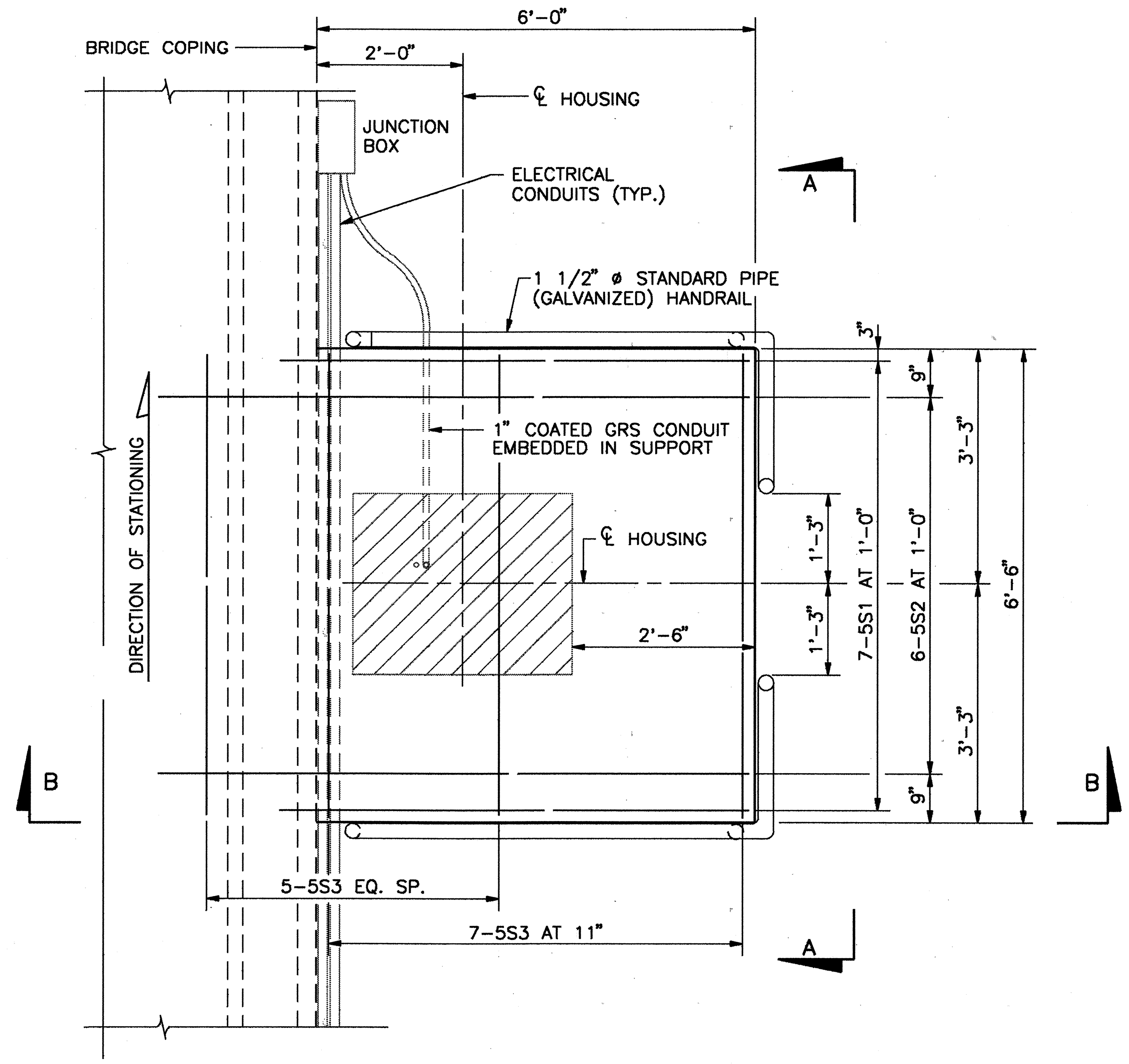
SHEET TITLE: CONCRETE REPAIR DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-7



PLAN

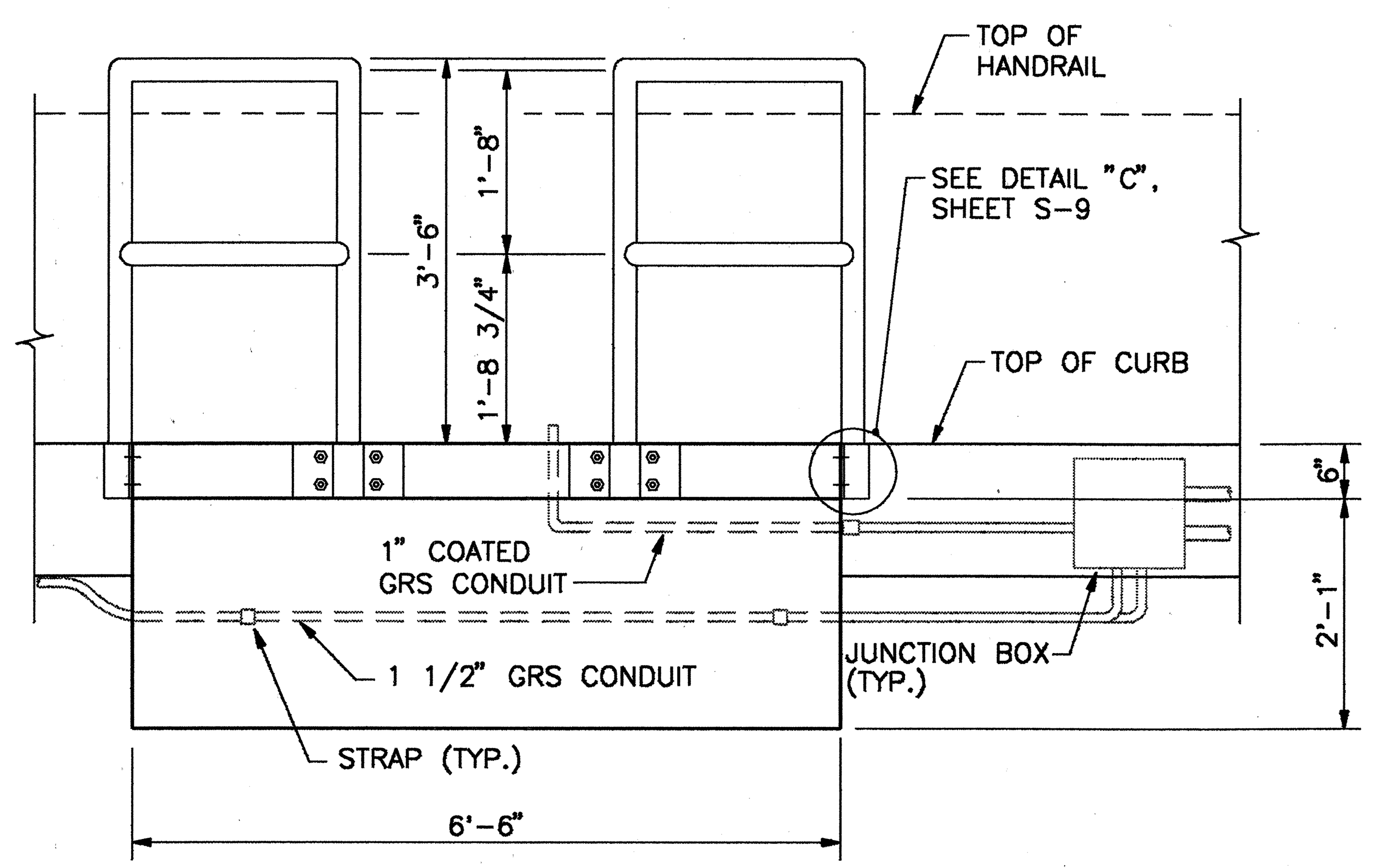


PLAN-BARRIER GATE SUPPORT

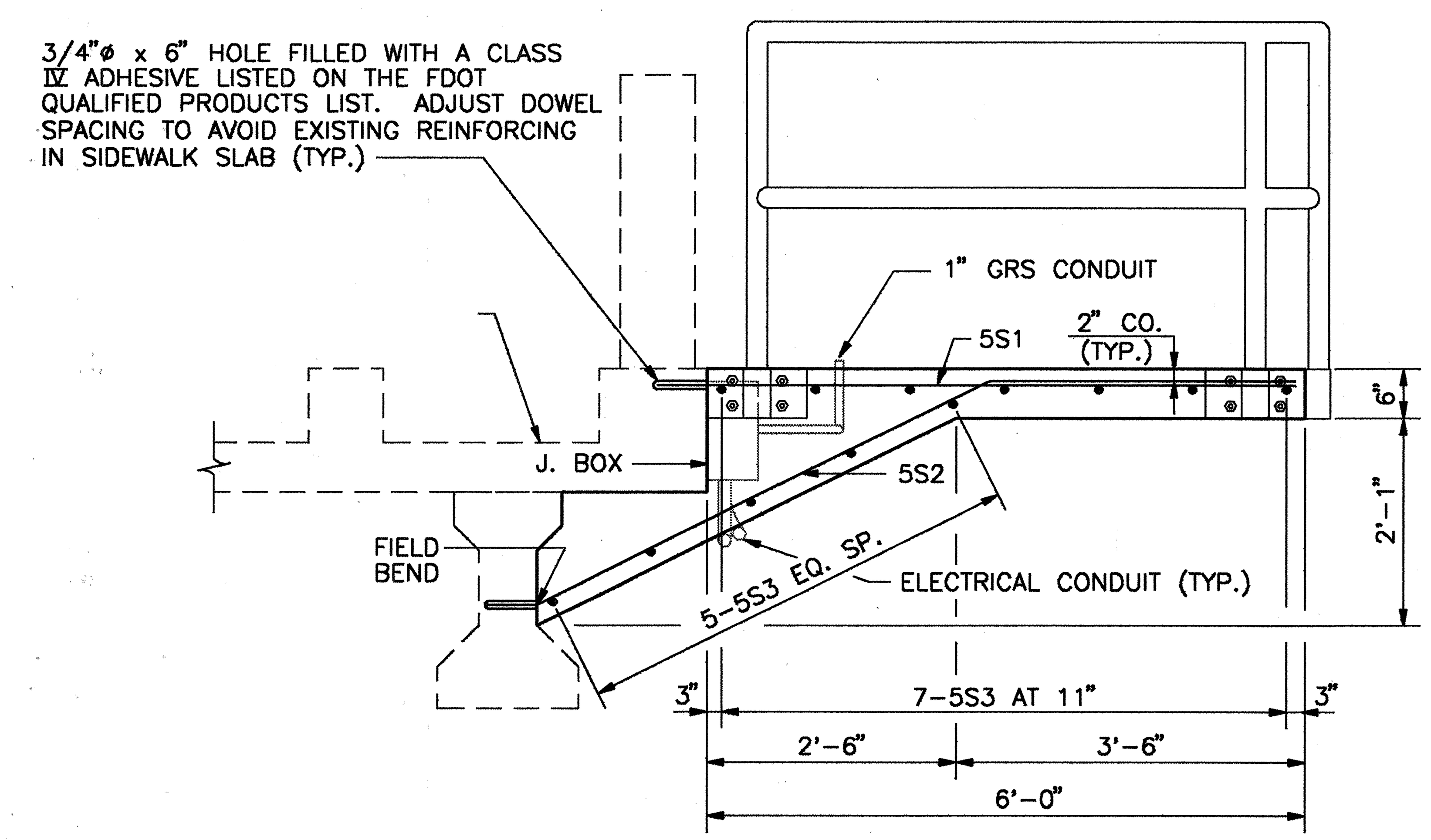
* ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
CONCRETE CLASS IV (SUPERSTRUCTURE)	CY	5.1
REINFORCING STEEL (SUPERSTRUCTURE)	LB	796
HANDRAILS	LB	400

* QUANTITIES INCLUDE BARRIER GATE SUPPORT, TRAFFIC GATE SUPPORTS AND PILASTERS.

NOTES:
1. FOR HANDRAIL NOTES, LIGHT POLE PILASTER DETAILS AND DETAIL 'C', SEE SHEET S-9.
2. FOR REINFORCING BAR LIST, SEE SHEET S-16.
3. COST FOR PIPE HANDRAIL AND MISCELLANEOUS CONNECTION PIECES SHALL BE PAID FOR UNDER THE CONTRACT PRICE FOR ACCESS LADDERS, PLATFORMS, HANDRAILS, ITEM NO. 460-6.



VIEW A-A



SECTION B-B

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Approved by	T. J. FARRELL	

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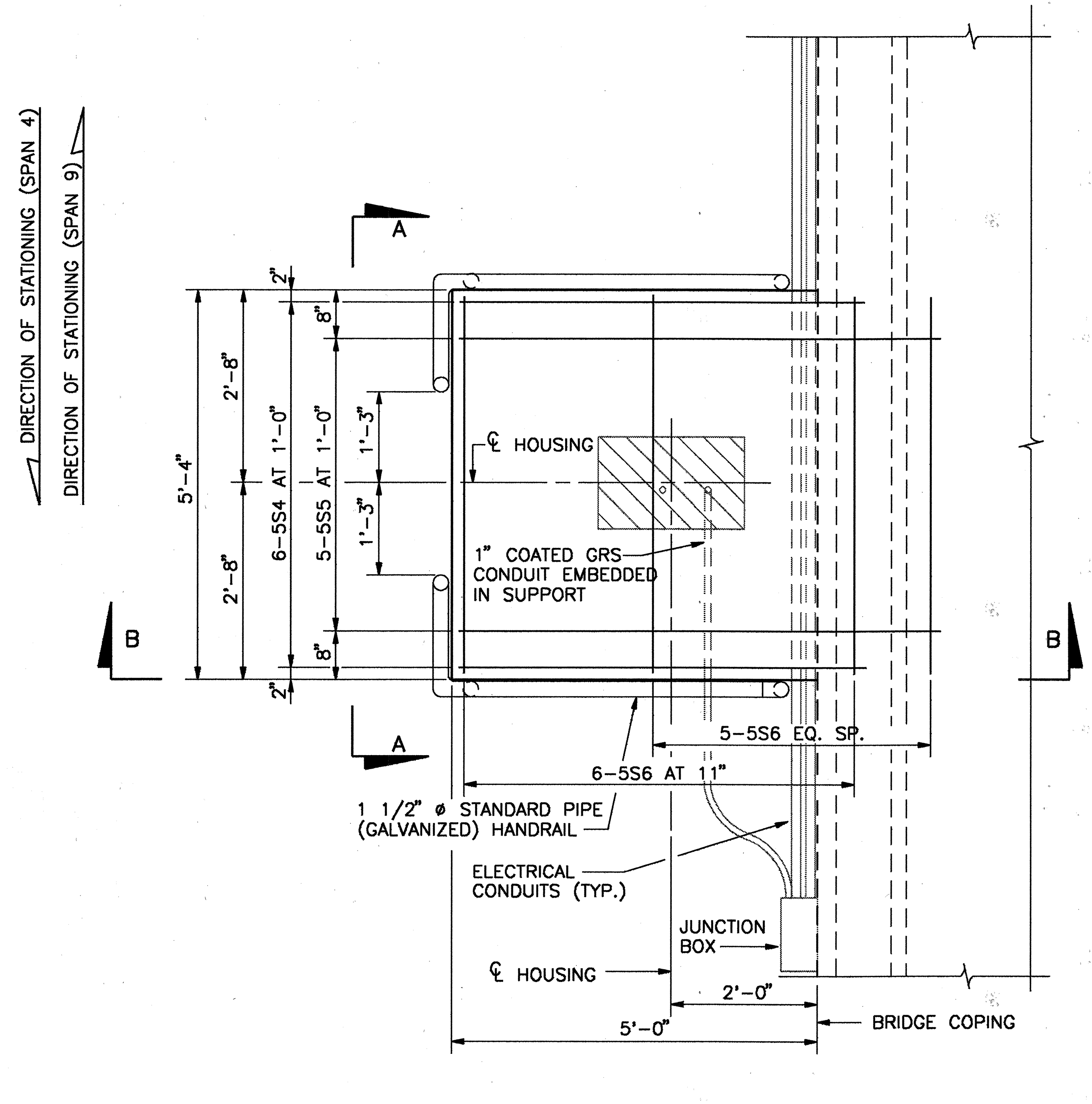
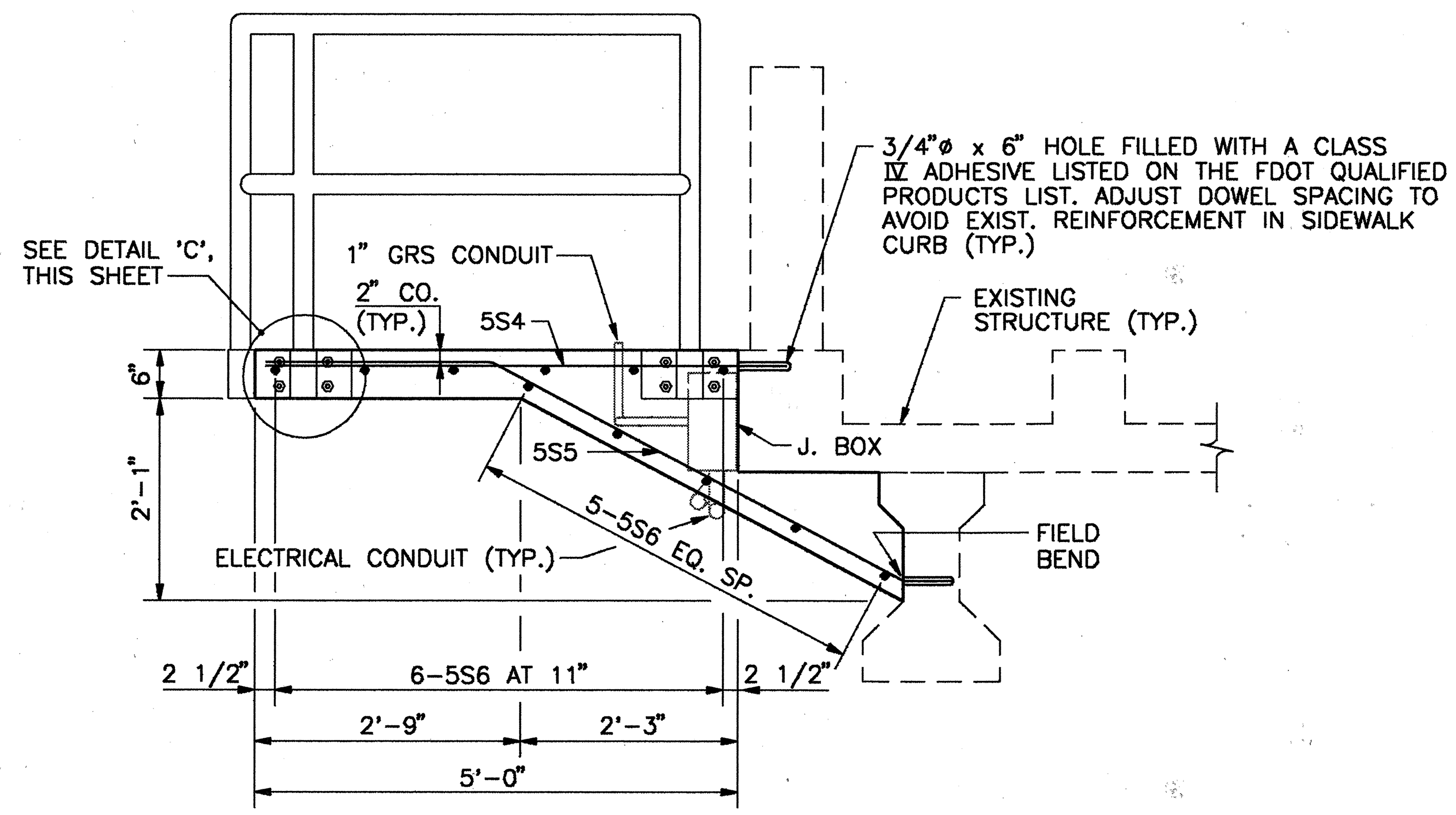
DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

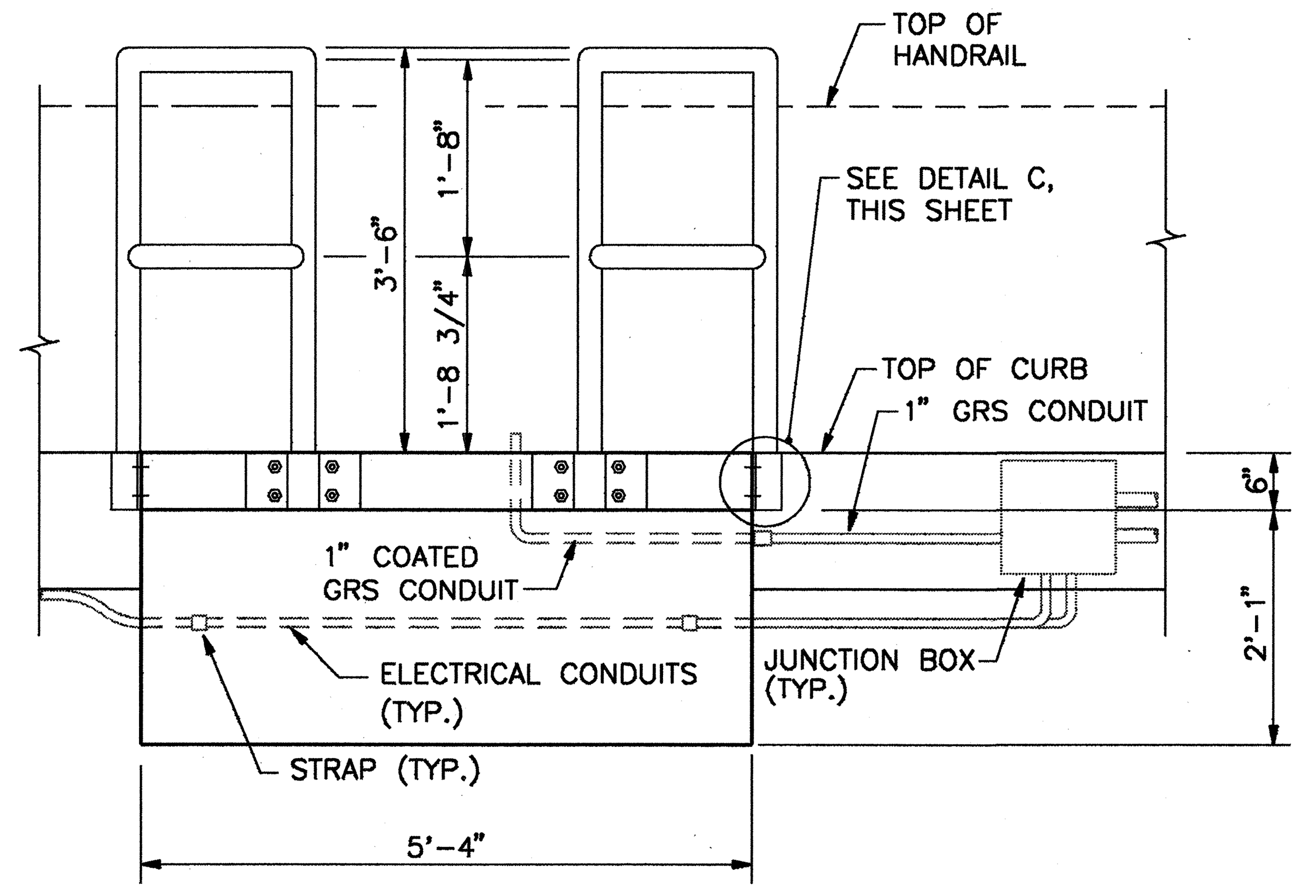
SHEET TITLE: BARRIER GATE SUPPORT DETAILS
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET S-8



PLAN – TRAFFIC GATE SUPPORT



SECTION B–B



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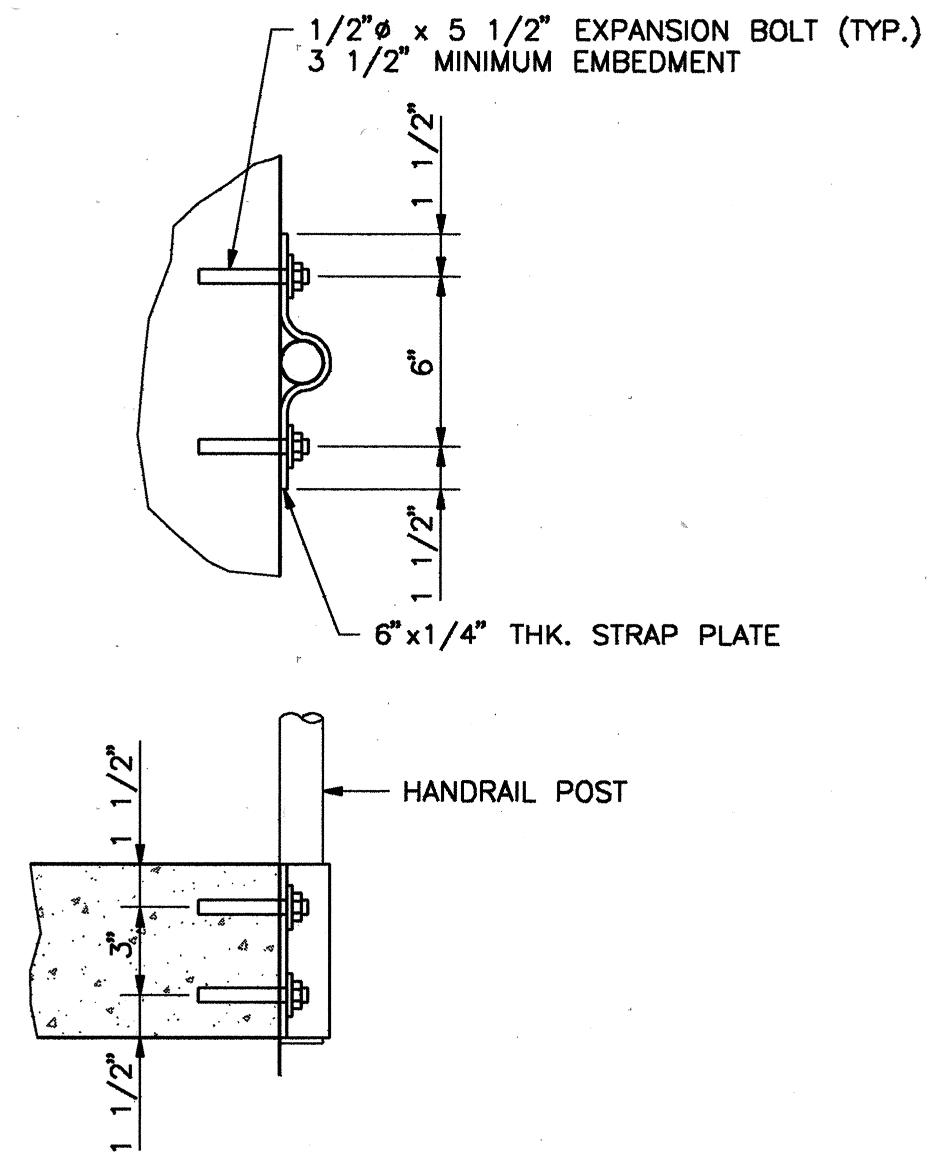
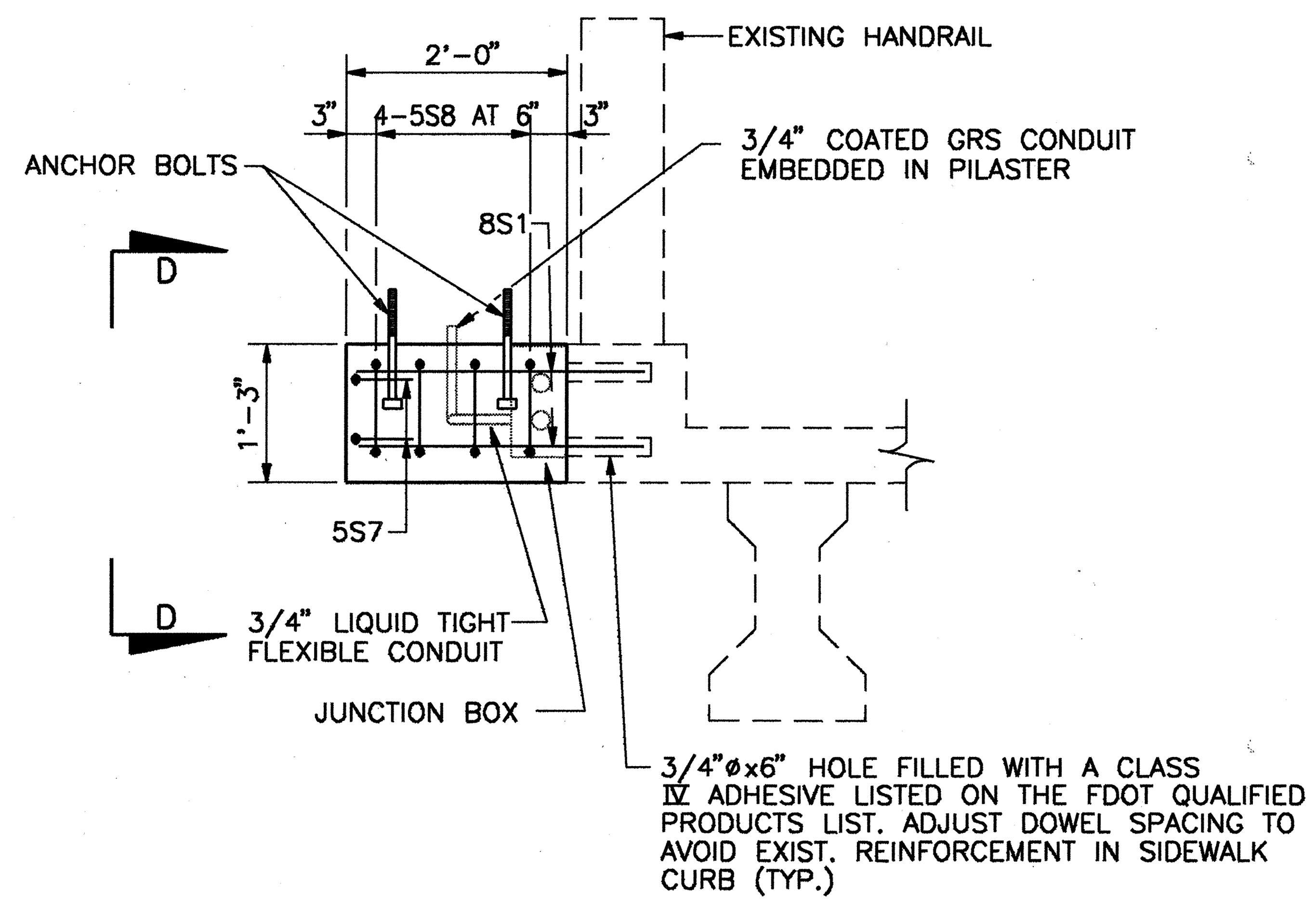
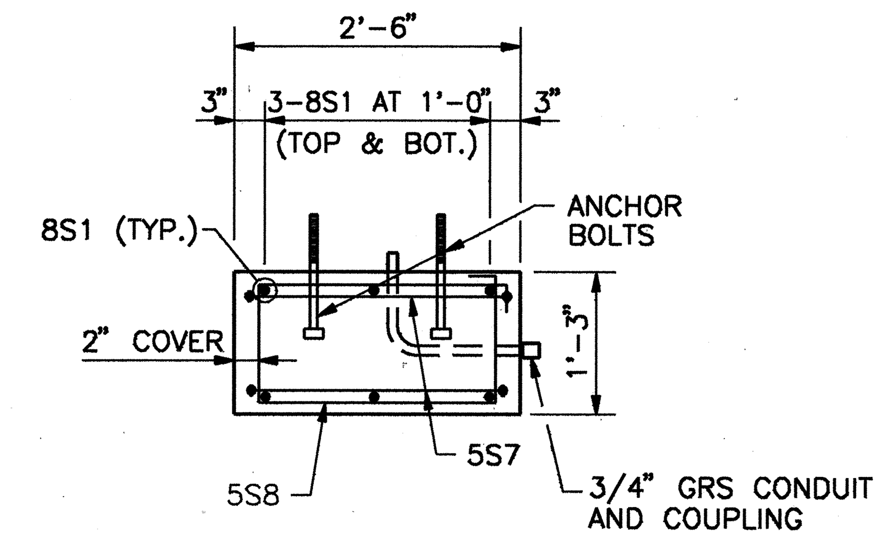


DETAIL C



TYPICAL PILASTER SECTION



VIEW D–D

NOTES:
1. ANCHOR BOLTS TO BE HEADED BOLTS WITH A MINIMUM EMBEDMENT OF 6". ANCHOR BOLT SIZE AND LOCATION BASED ON LIGHT POLE AND TRAFFIC SIGNAL MANUFACTURER'S MOUNTING DETAILS.
2. AFTER NUTS HAVE BEEN TIGHTENED, ALL EXTERIOR HANDRAIL SUBJECT TO POSSIBLE VANDALISM SHALL HAVE THE THREADS ON THE ANCHOR BOLTS KNURLED TO PREVENT REMOVAL OF THE NUTS.
3. FOR REINFORCING BAR LIST, SEE SHEET S-16.
4. COST FOR HANDRAIL AND MISCELLANEOUS CONNECTION PIECES SHALL BE PAID FOR UNDER THE CONTRACT PRICE FOR ACCESS LADDERS, PLATFORMS, HANDRAILS, ITEM NO. 460-6.
5. FOR ESTIMATED QUANTITIES, SEE SHEET S-8.

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Checked by	BGW	5-95
Approved by	T. J. FARRELL	

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DSA GROUP INC.

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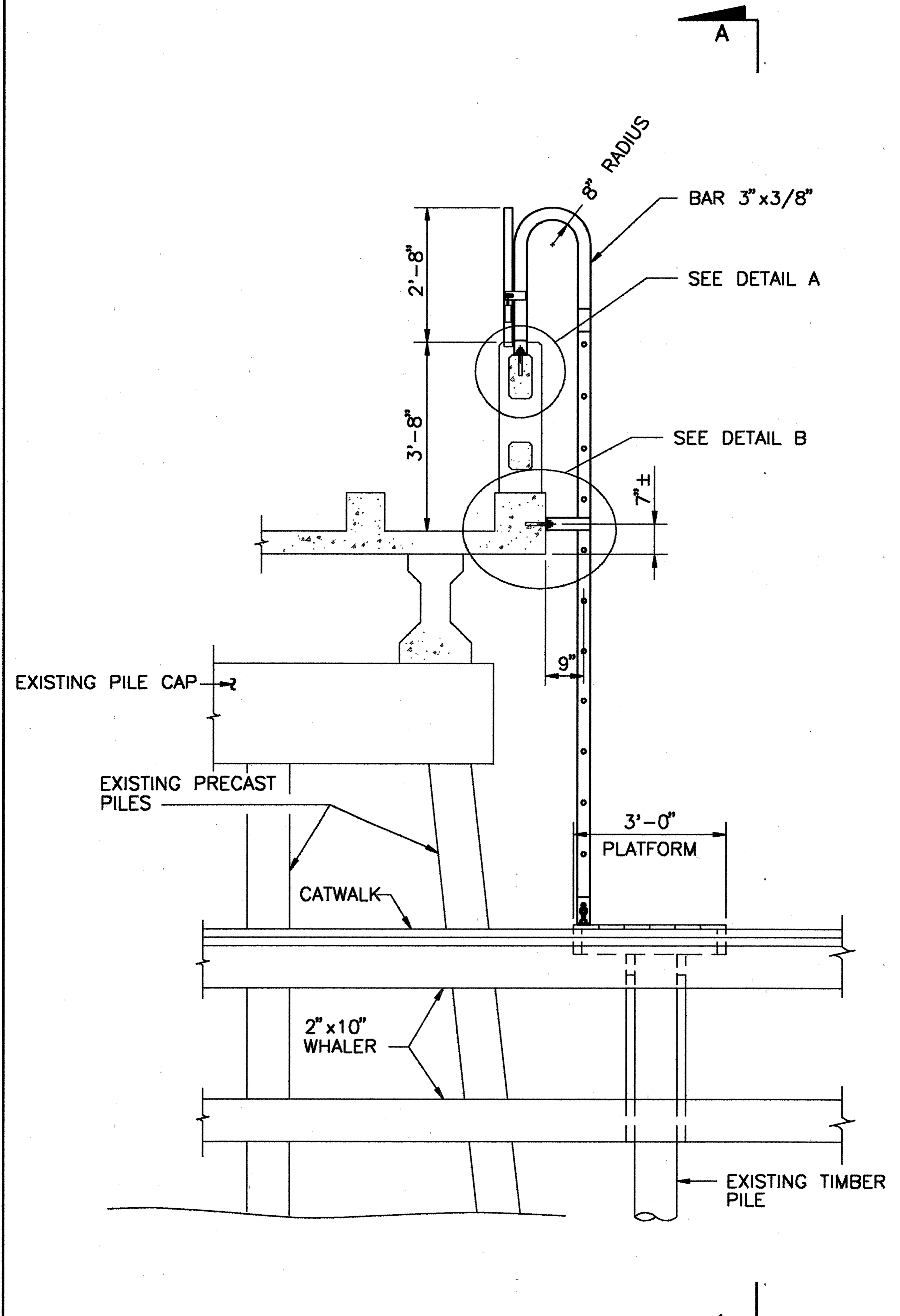
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: TRAFFIC GATE SUPPORT AND PILASTER DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-9



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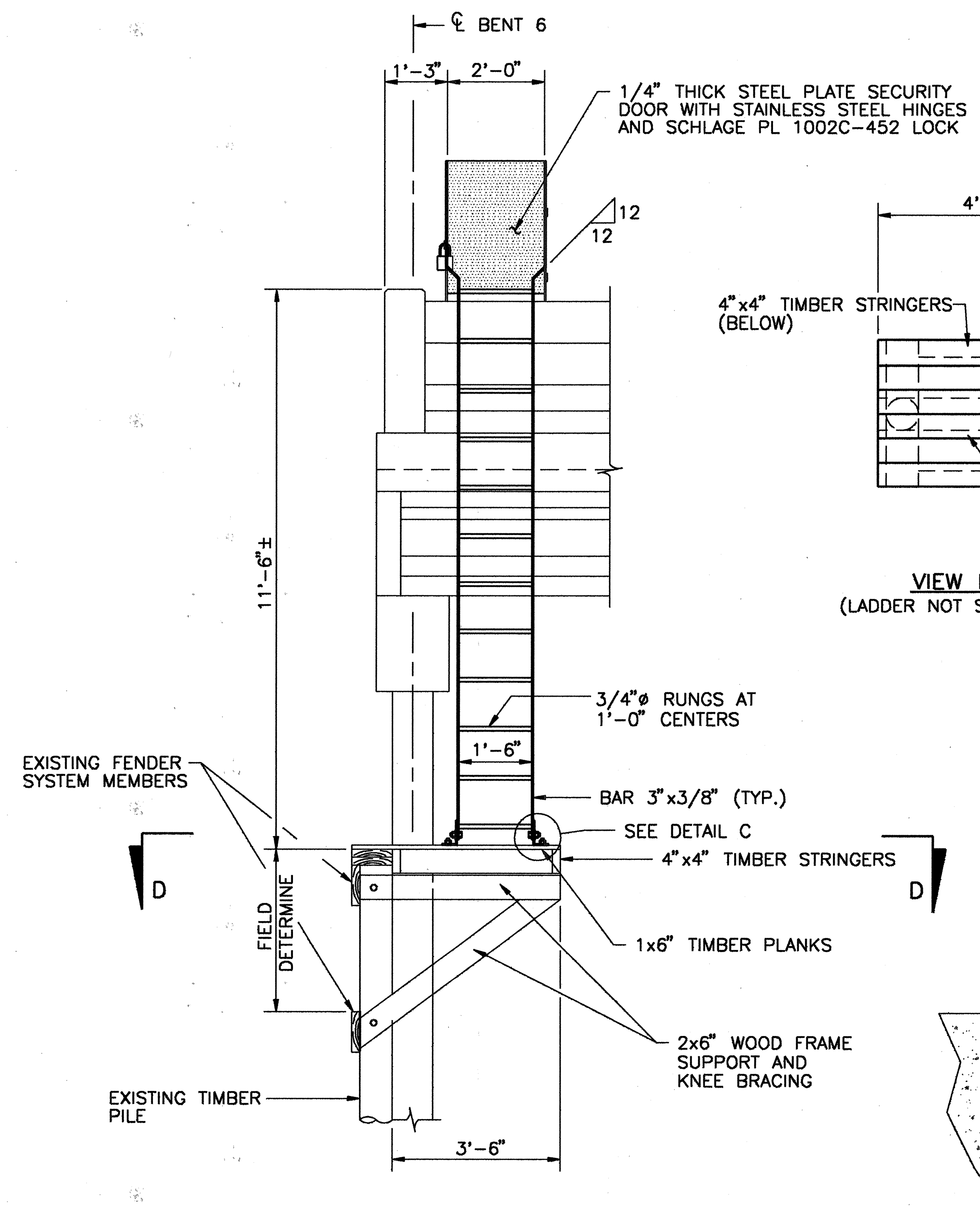
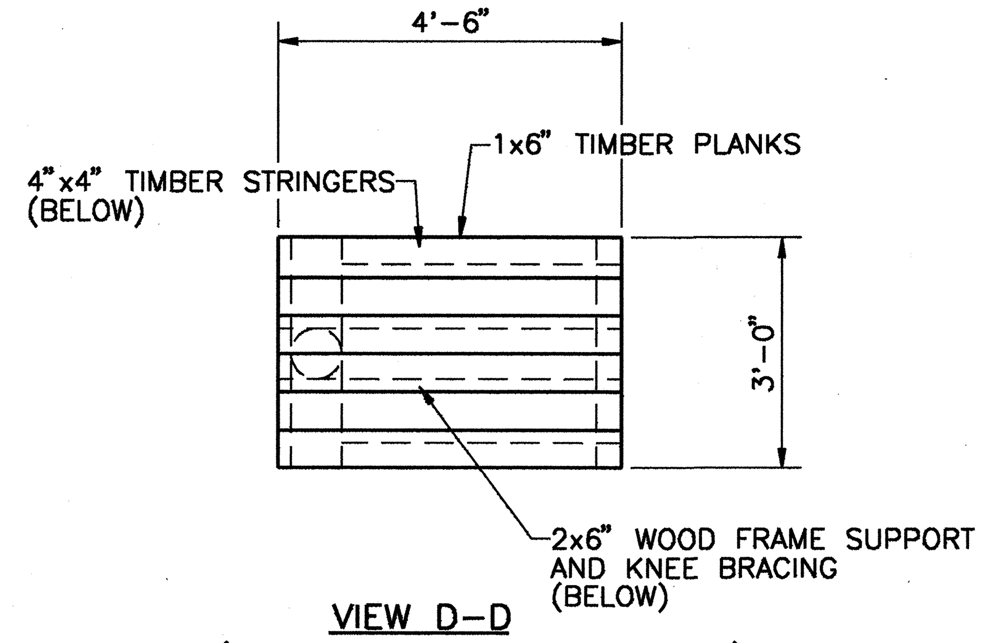


VIEW A–A



VIEW D–D
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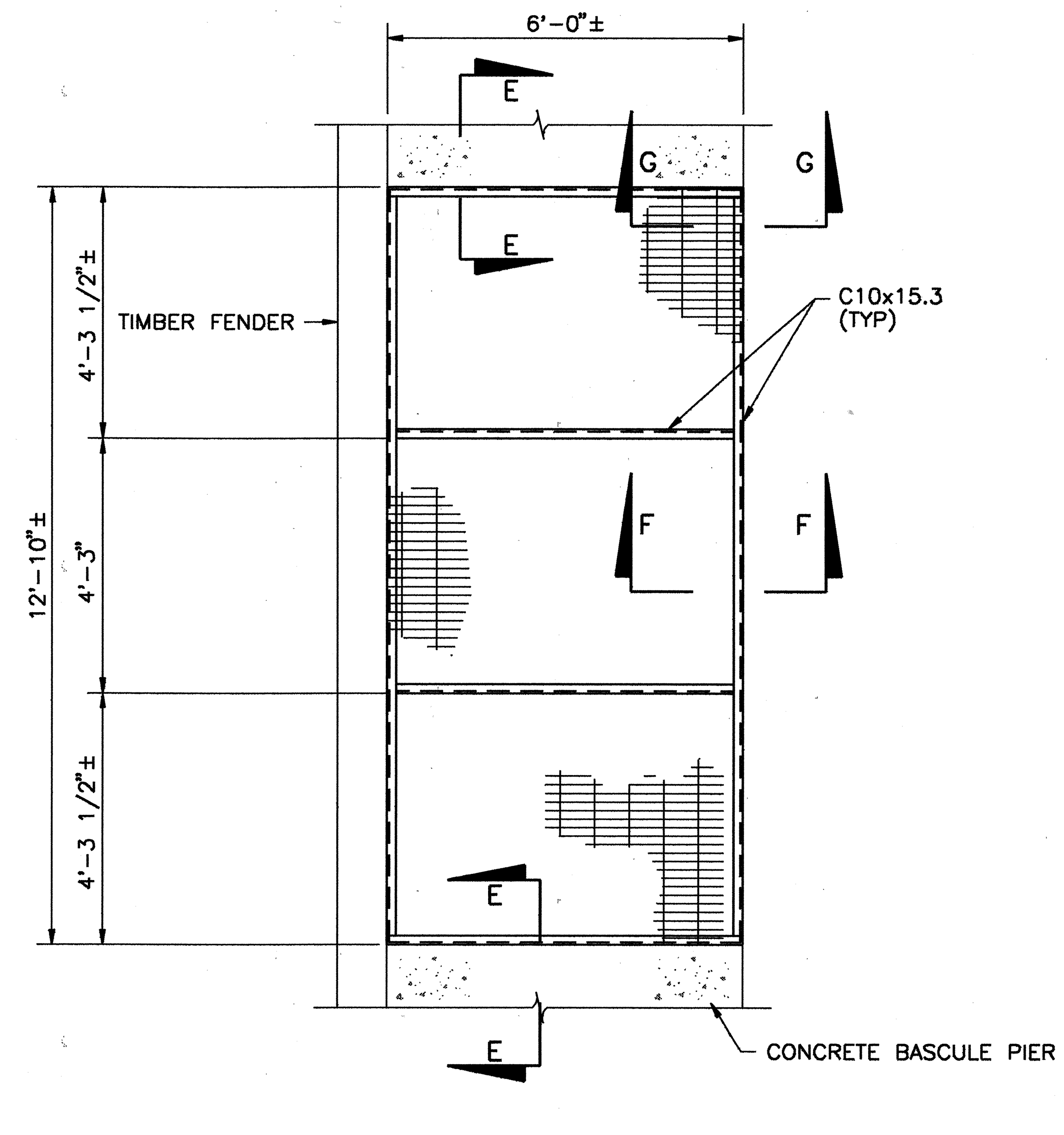
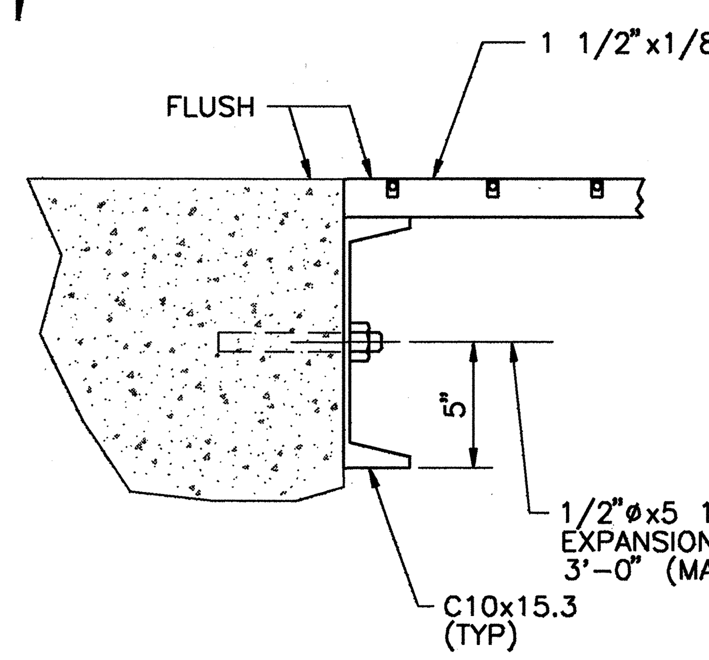
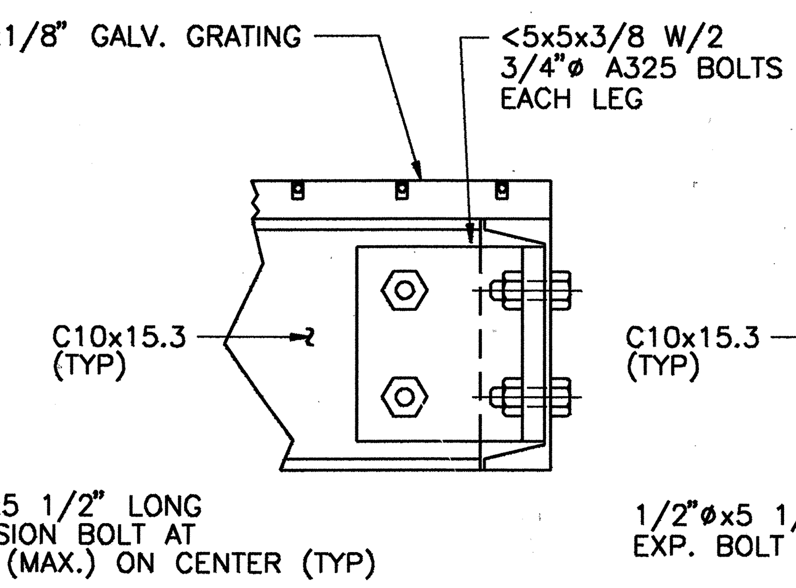


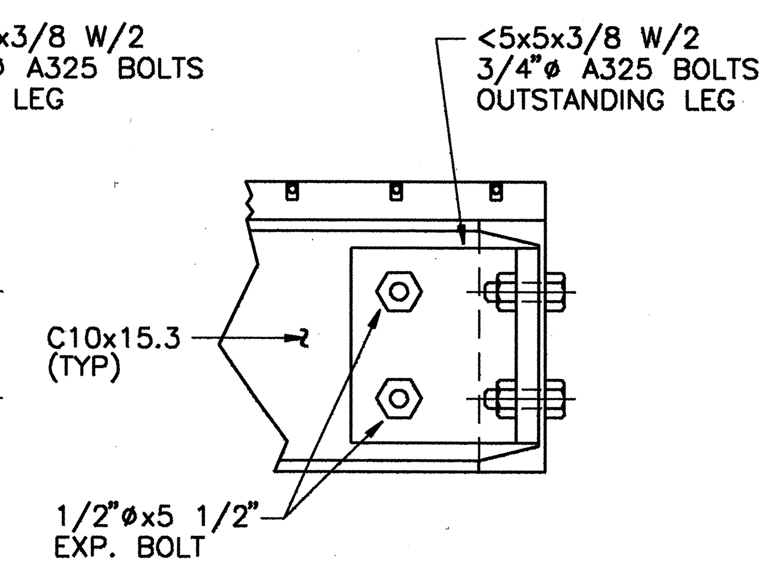
BASCULE PIER PLATFORM DETAIL



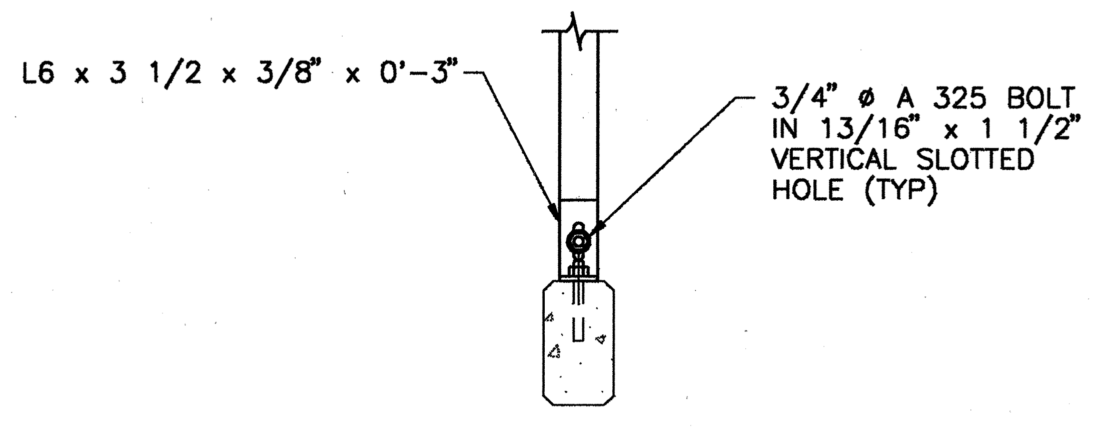
SECTION E–E



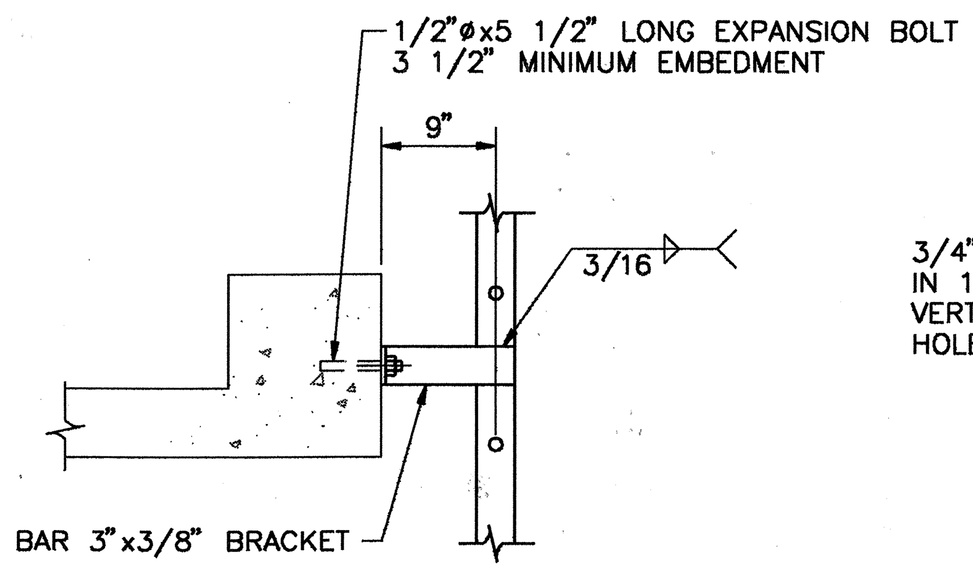
SECTION F–F



SECTION G–G



DETAIL A



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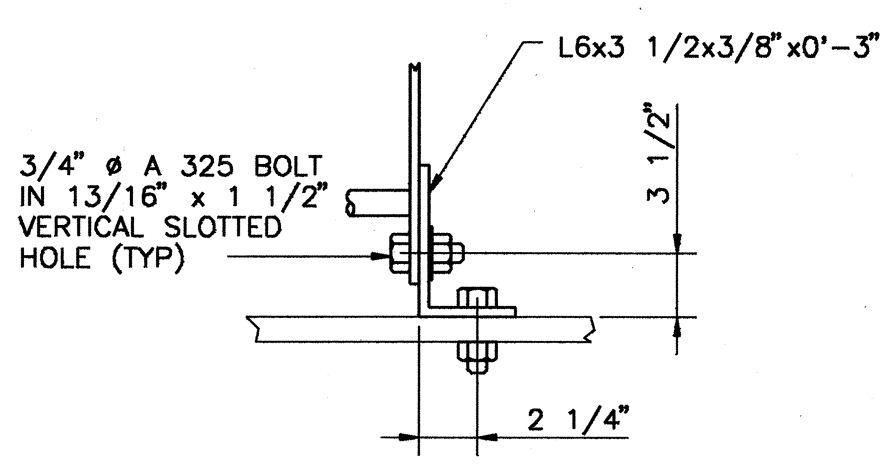

DETAIL C

NOTES:

1. ALL STEEL MATERIAL TO BE ASTM A 36 HOT DIP GALVANIZED PER ASTM A123.
2. THE LOCATION OF TIMBER LANDING SHOWN IS APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND MODIFY THE PLATFORM AS REQUIRED WITH PRIOR APPROVAL OF THE ENGINEER.
3. ALL DIMENSIONS TO BE FIELD VERIFIED PRIOR TO THE START OF ANY FABRICATION.
4. ALL TIMBER SHALL BE ROUGH AND TREATED IN ACCORDANCE WITH SECTION 955 OF THE STANDARD SPECIFICATIONS.
5. ALL TIMBER SHALL BE CUT TO DIMENSIONS REQUIRED PRIOR TO TREATMENT.
6. ALL HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH A.S.T.M. A153.
7. DOMEHEAD BOLTS SHALL BE PROVIDED WITH FINS OR SQUARE SHANKS TO PREVENT UNWANTED TURNING.
8. DOMEHEAD BOLTS AND DRIVE SPIKES SHALL HAVE SLOTS OR HOLES ON HEADS FOR 6d NAILS. DRIVE SPIKES SHALL BE 7/8"ø.
9. NO SEPARATE PAYMENT SHALL BE MADE FOR THE TIMBER LANDING PLATFORM OR SECURITY DOOR AND THE COST THEREOF SHALL BE INCLUDED UNDER "LADDERS, PLATFORMS, HANDRAILS, PAY ITEM NO. 460-6
10. PAYMENT FOR BASCULE PIER PLATFORM AND SUPPORTING STEEL SHALL BE MADE UNDER ITEM NO. 460-6 "ACCESS LADDERS, PLATFORMS, HANDRAILS)".

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REVISIONS			REVISIONS			SEAL:
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	Names	Dates
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Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

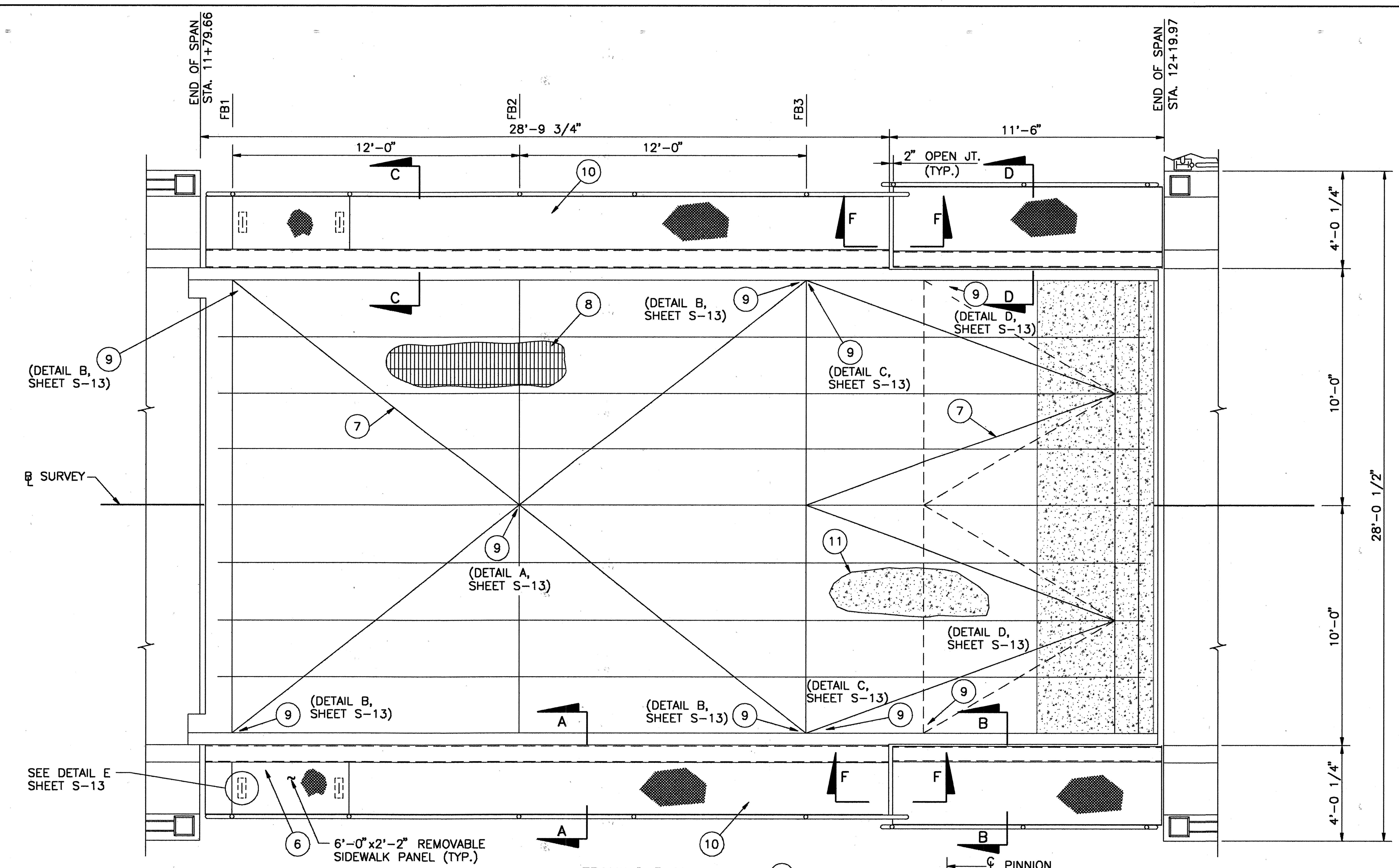
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

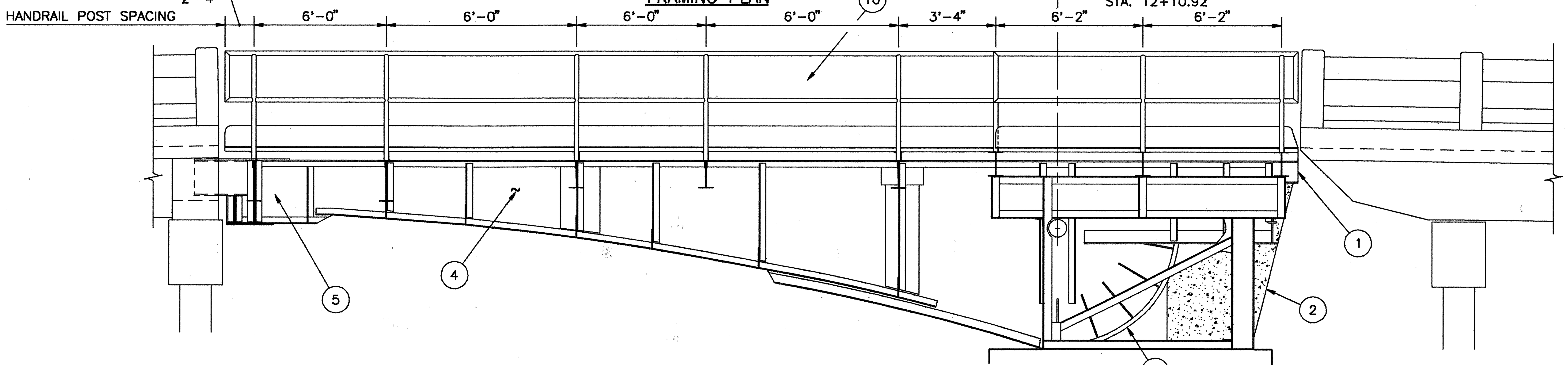
SHEET TITLE: ACCESS LADDERS AND PLATFORM DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-10



FRAMING PLAN



MAIN GIRDER ELEVATION

LEGEND

1. REPLACE DETERIORATED COUNTERWEIGHT SUPPORT MEMBERS.
2. REPLACE CONCRETE COUNTERWEIGHT.
3. REHABILITATE WEAR PLATES.
4. CLEAN AND PAINT STRUCTURAL STEEL
5. FURNISH AND INSTALL NEW NAVIGATION LIGHTS.
6. REMOVE EXISTING HAND OPERATED SPAN LOCK SYSTEM.
7. REPLACE STEEL BRACING ANGLES (TYP.).
8. CLEAN AND PAINT OPEN STEEL GRATING.
9. REPLACE DIAGONAL BRACING GUSSET PLATES.
10. FURNISH AND INSTALL NEW SIDEWALK AND HANDRAILS.
11. FILL EXISTING OPEN STEEL GRATING WITH CONCRETE TO FB3

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
STRUCTURAL STEEL (BASCULE LEAVES)	LBS.	11,750
PAINT STRUCTURAL STEEL	TN.	34

NOTE:
FOR SECTIONS A-A, B-B, C-C, D-D AND F-F, SEE SHEET S-12.

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Date	By	Description

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Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

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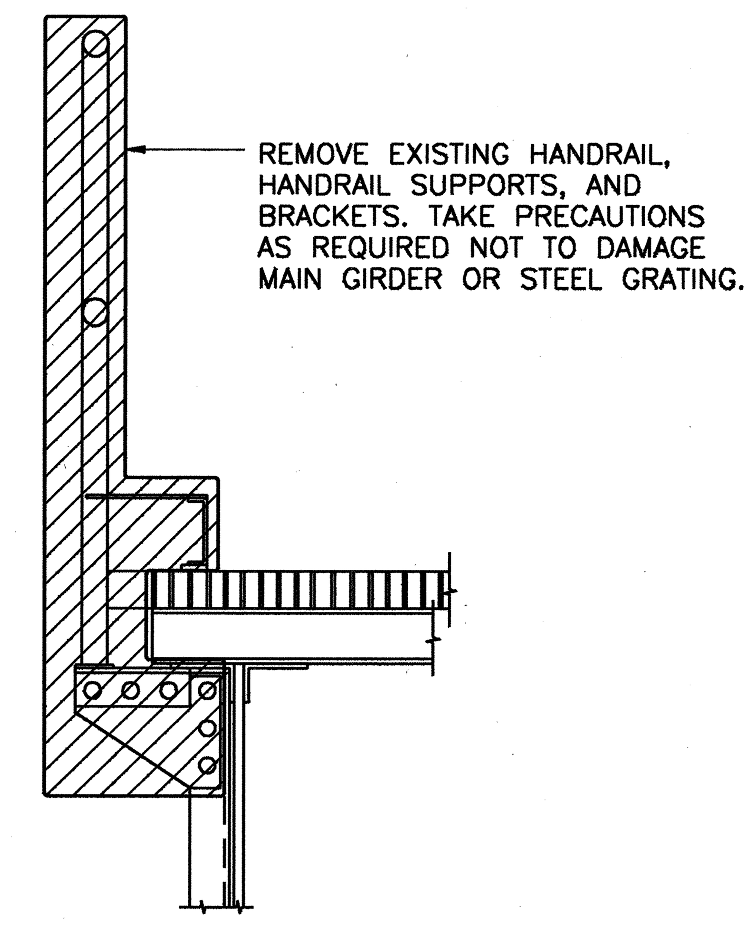
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

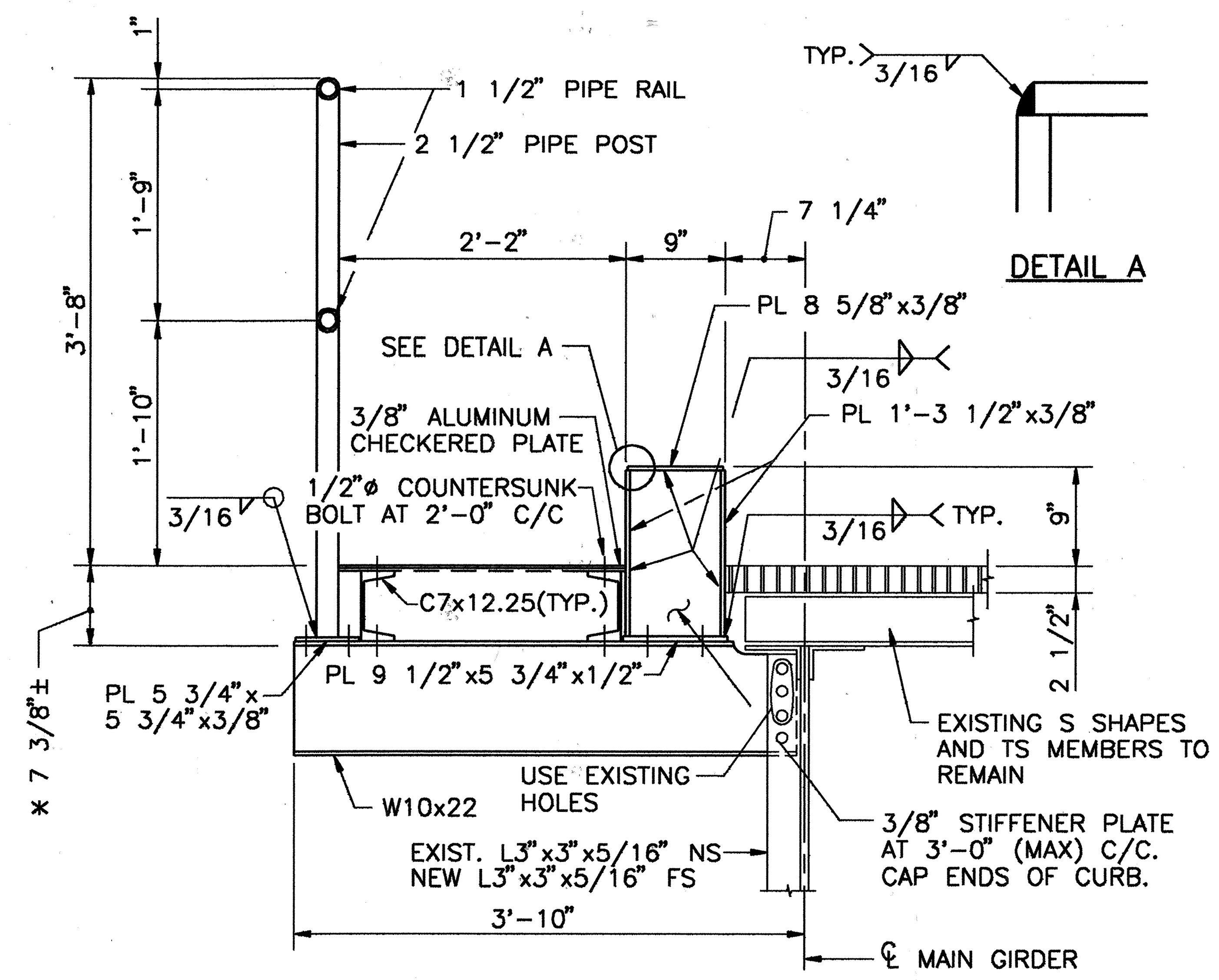
SHEET TITLE: BASCULE SPAN REPAIRS

PROJECT NAME: BECKETT BRIDGE REPAIRS

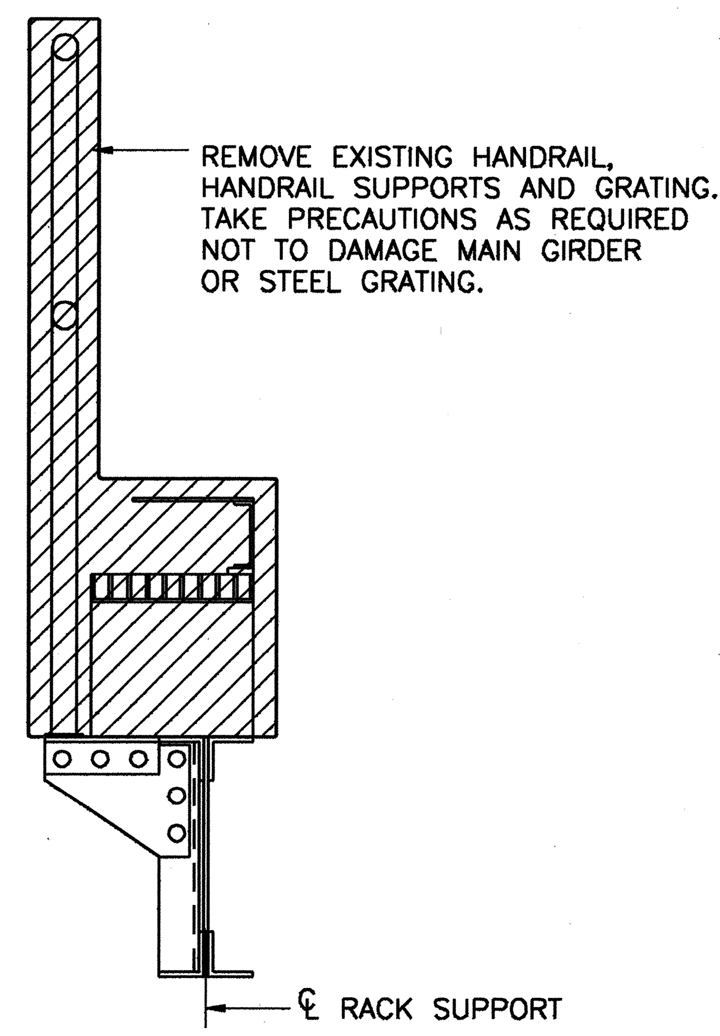
SHEET S-11



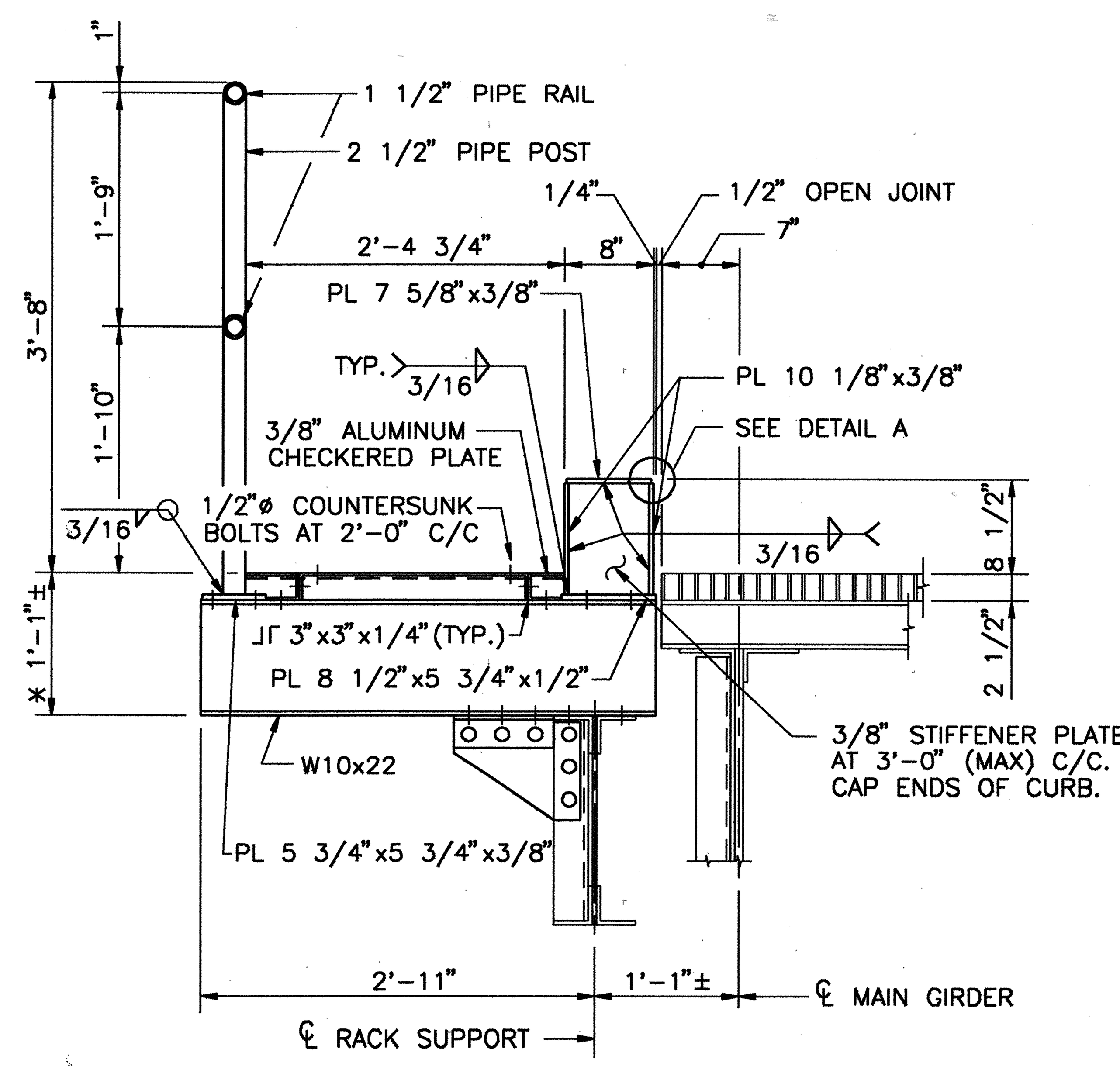
SECTION A–A DEMOLITION



SECTION A–A REHABILITATION
(REQ'D. AT 3 LOCATIONS)



SECTION B–B DEMOLITION



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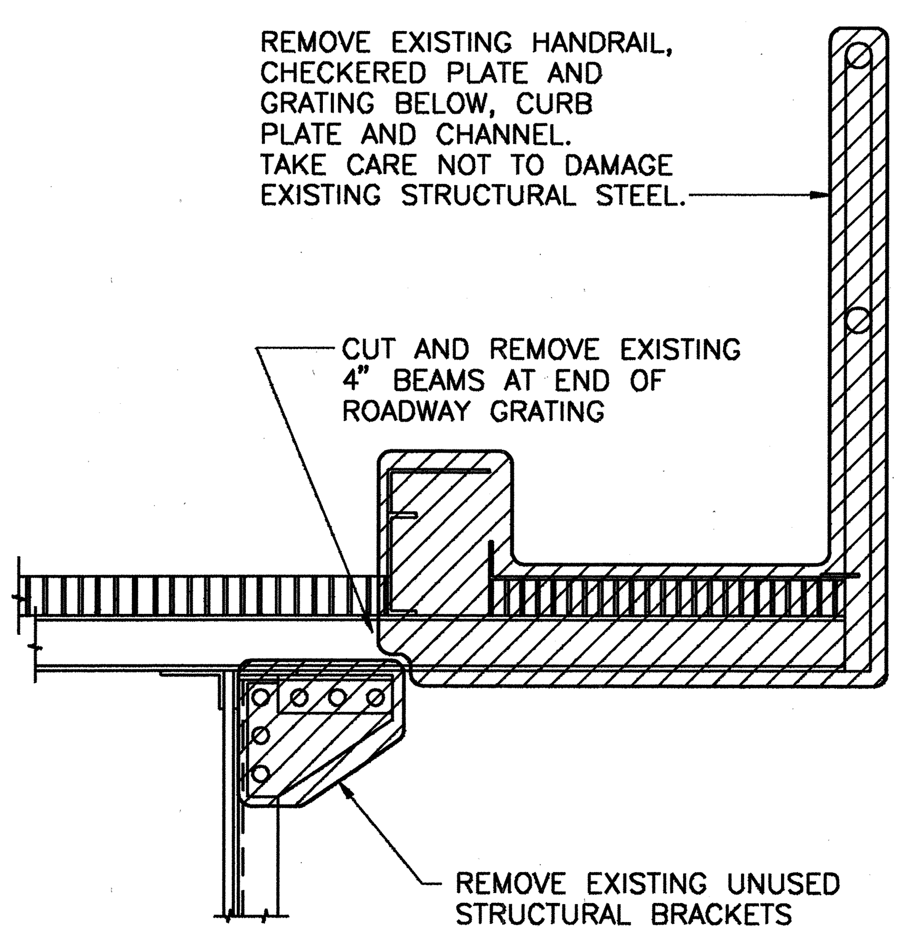
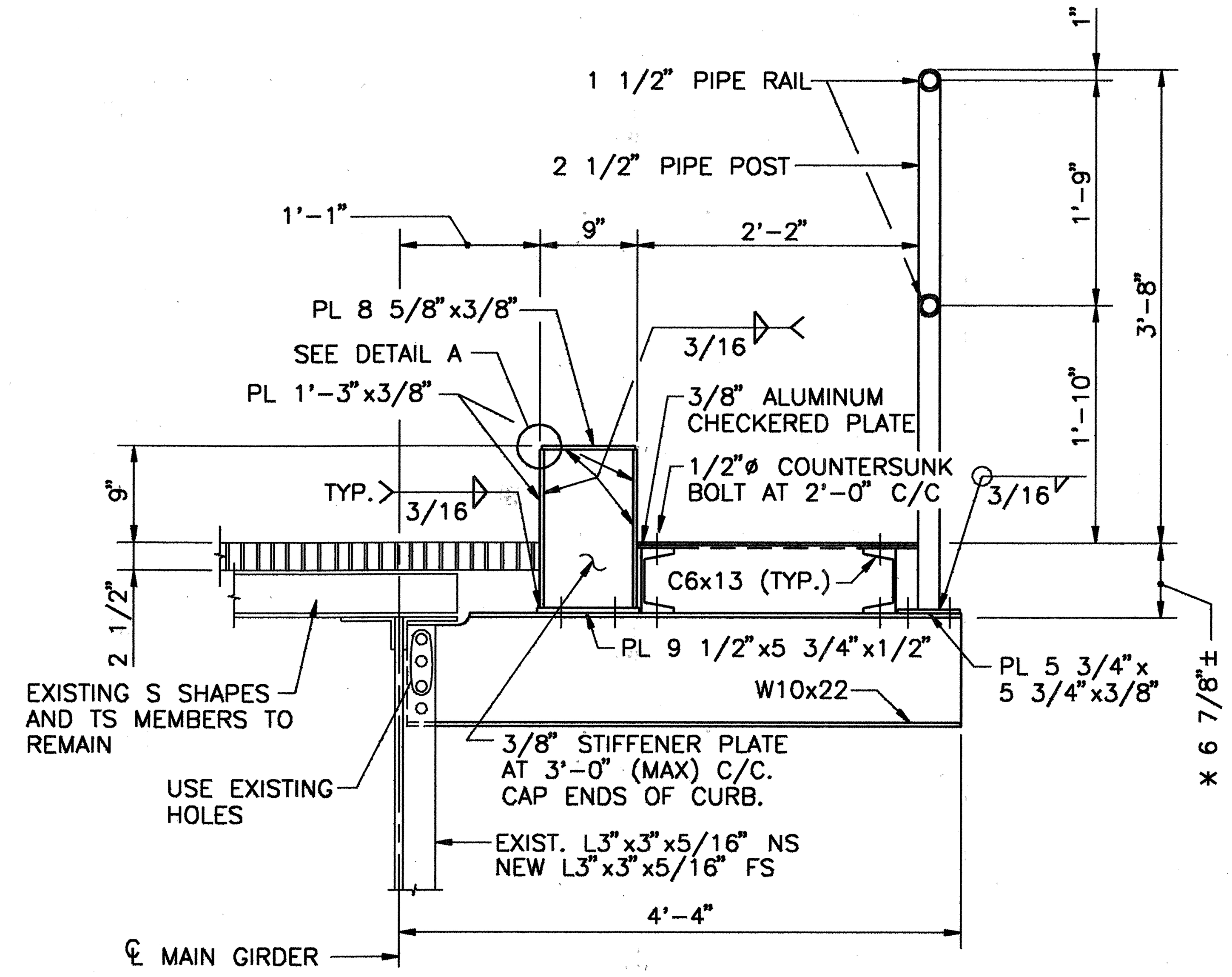


SECTION C–C DEMOLITION



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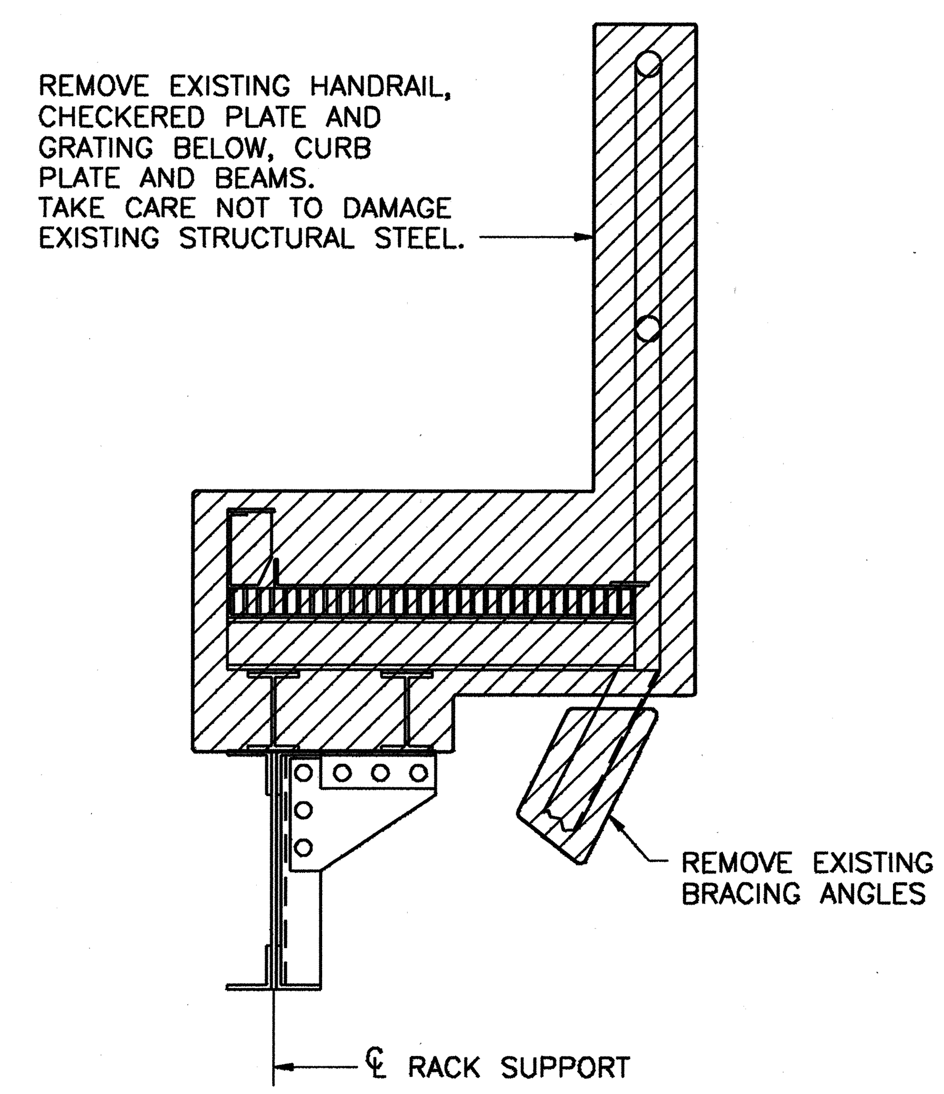

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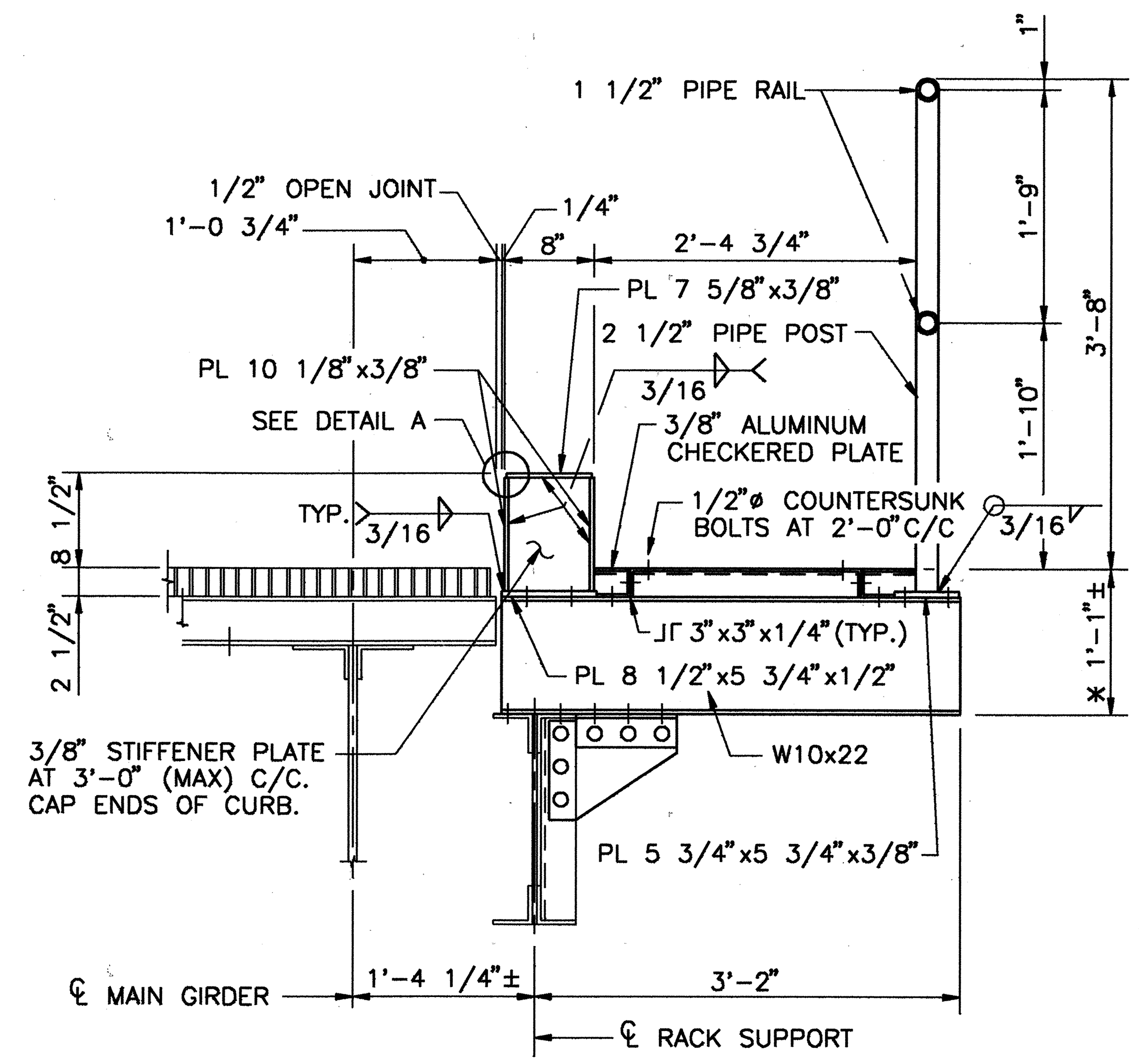

SECTION D–D REHABILITATION
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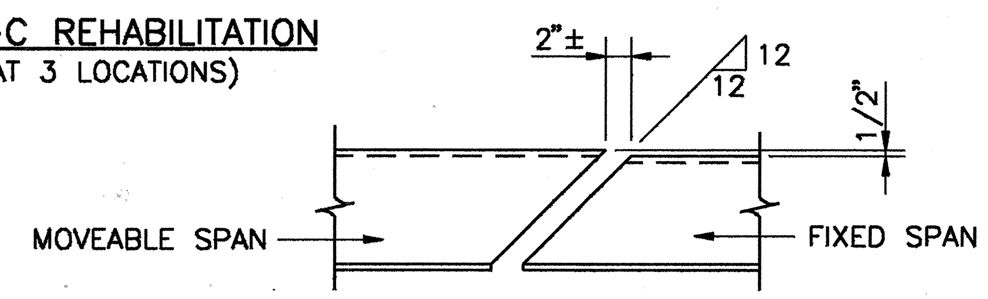

VIEW F–F

* CONTRACTOR SHALL ADJUST THIS DIMENSION SUCH THAT THE TOP OF BASCULE SPAN SIDEWALK IS LEVEL WITH THE TOP OF CONCRETE APPROACH SPAN SIDEWALK BY PROVIDING FULL BEARING SHIMS BETWEEN W10x22 AND SIDEWALK SUPPORT MEMBERS.

NOTES:
1. SEE SHEET A-2 FOR GENERAL NOTES REGARDING MATERIAL AND FABRICATION REQUIREMENTS.
2. ALL BOLTED CONNECTIONS TO BE FRICTION TYPE UTILIZING 3/4"ø A325 BOLTS (TYPE I).
3. SEE SHEET M-3 FOR SIDEWALK BRACKET DETAILS AT SPAN LOCKS.
4. COST OF PIPE RAILS AND POSTS SHALL BE INCLUDED IN ITEM NO. 460-2-5, "STRUCTURAL STEEL (BASCULE LEAVES)".

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REVISIONS			REVISIONS		
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Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

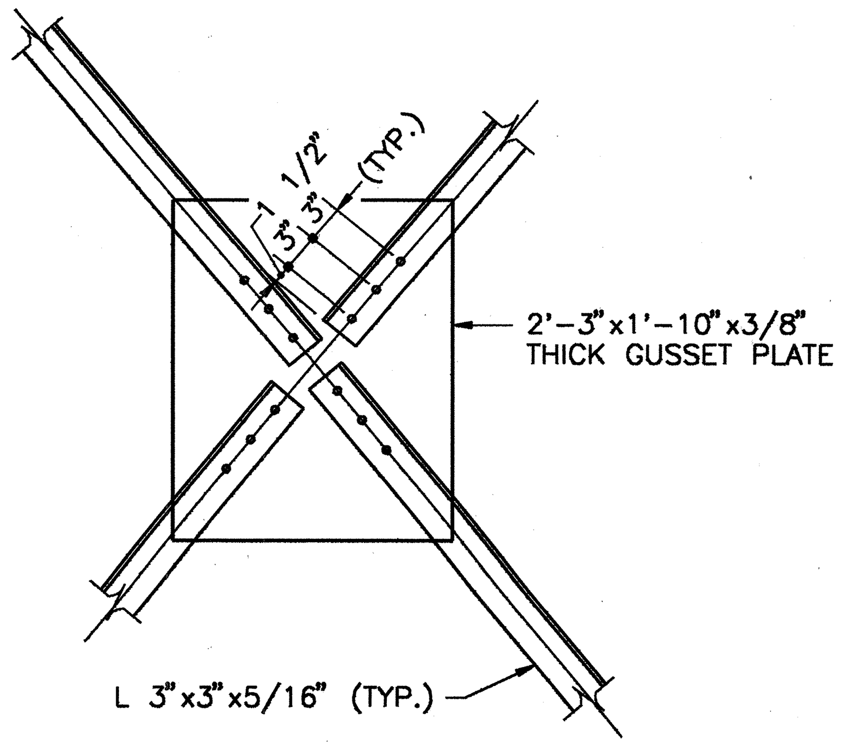
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

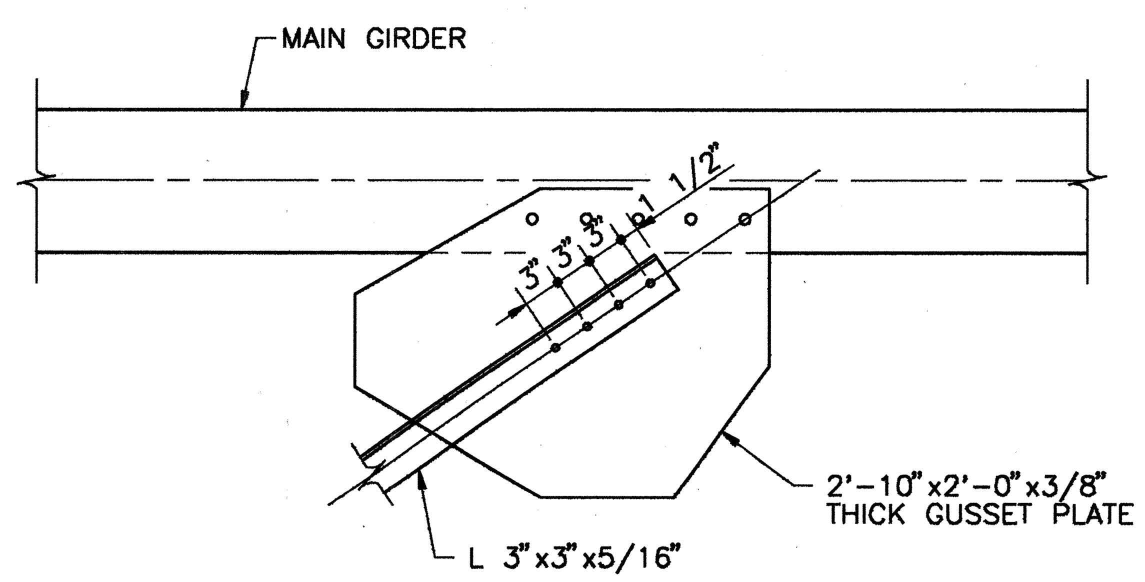
SHEET TITLE: BASCULE SPAN– SIDEWALK AND HANDRAIL DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-12



DETAIL "A"



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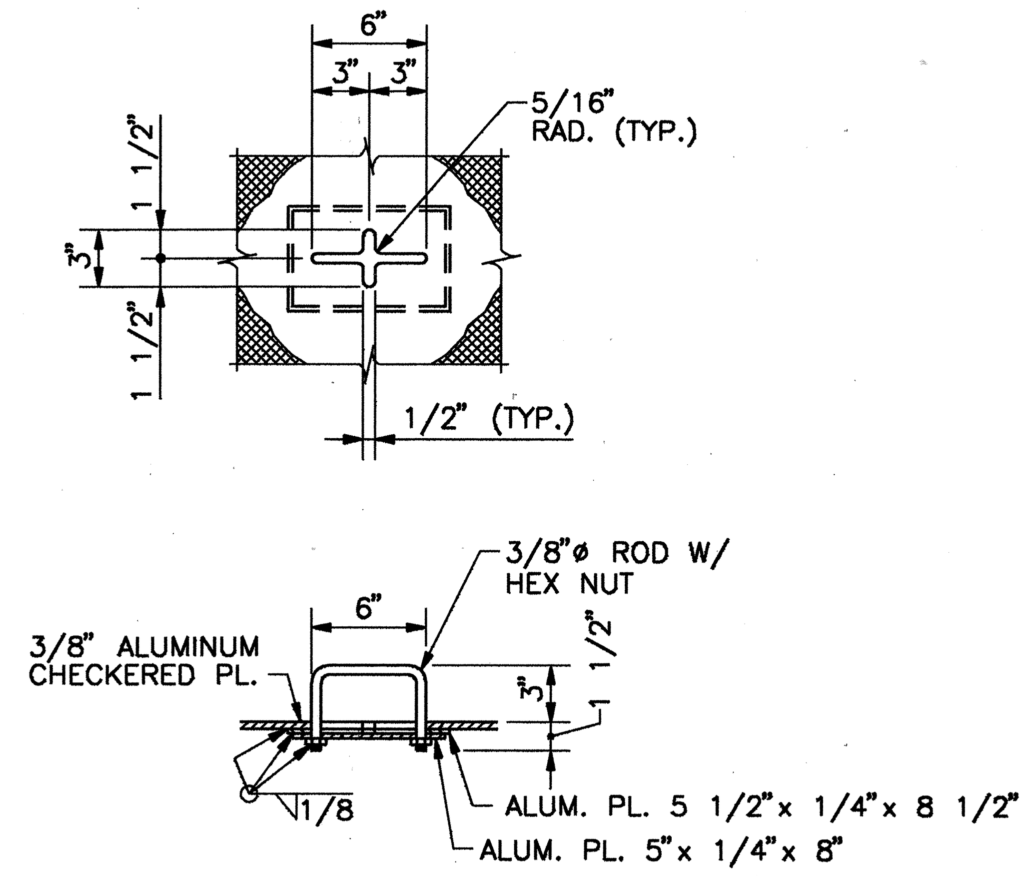
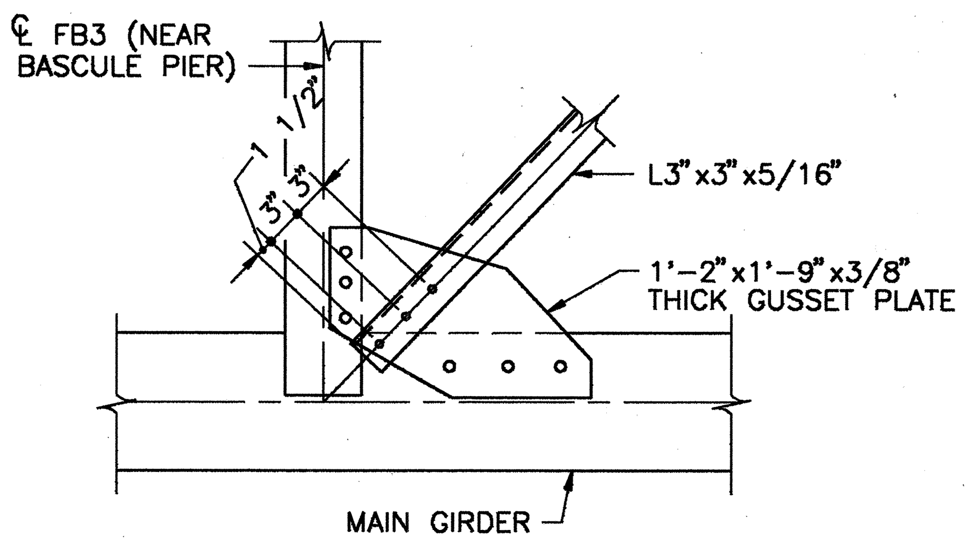


DETAIL E



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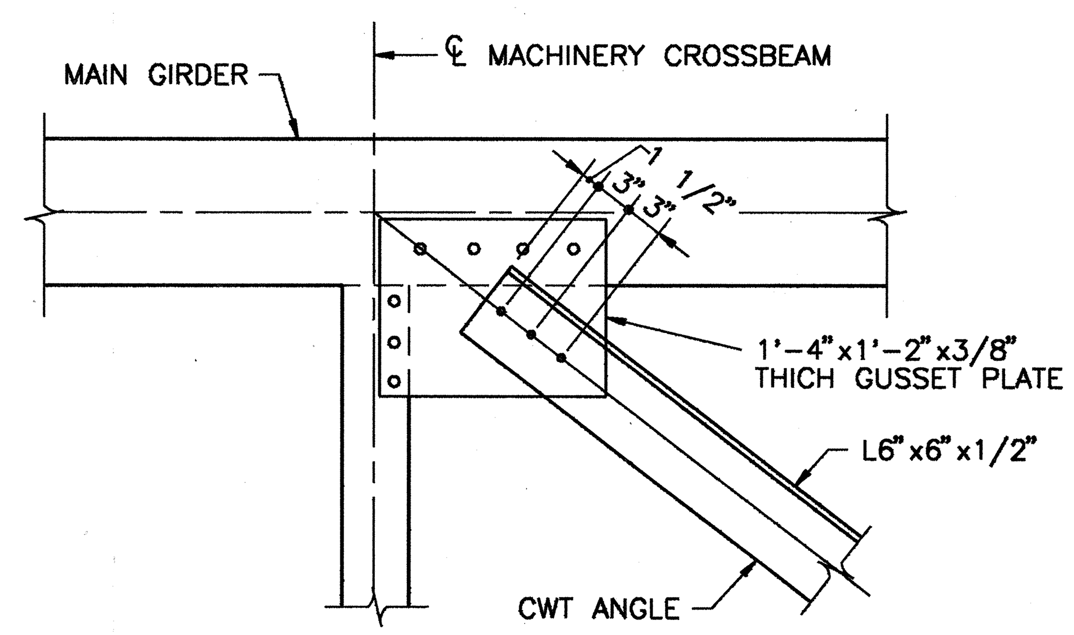

DETAIL "D"

NOTES:
1. THE NEW BRACING GUSSET PLATES SHALL BE CONSTRUCTED FROM ASTM A709 GRADE 36 STEEL.
2. REMOVE EXISTING RIVETS IN LATERAL BRACING AS REQUIRED. RIVETS SHALL BE REPLACED BY 7/8"ø HIGH STRENGTH BOLTS.
3. NEW HOLES IN EXISTING BRACING ANGLES AND CORRESPONDING HOLES IN NEW GUSSET PLATES SHALL BE FIELD DRILLED.
4. FOR FRAMING PLAN, SEE SHEET S-11.

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	Names	Dates
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Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

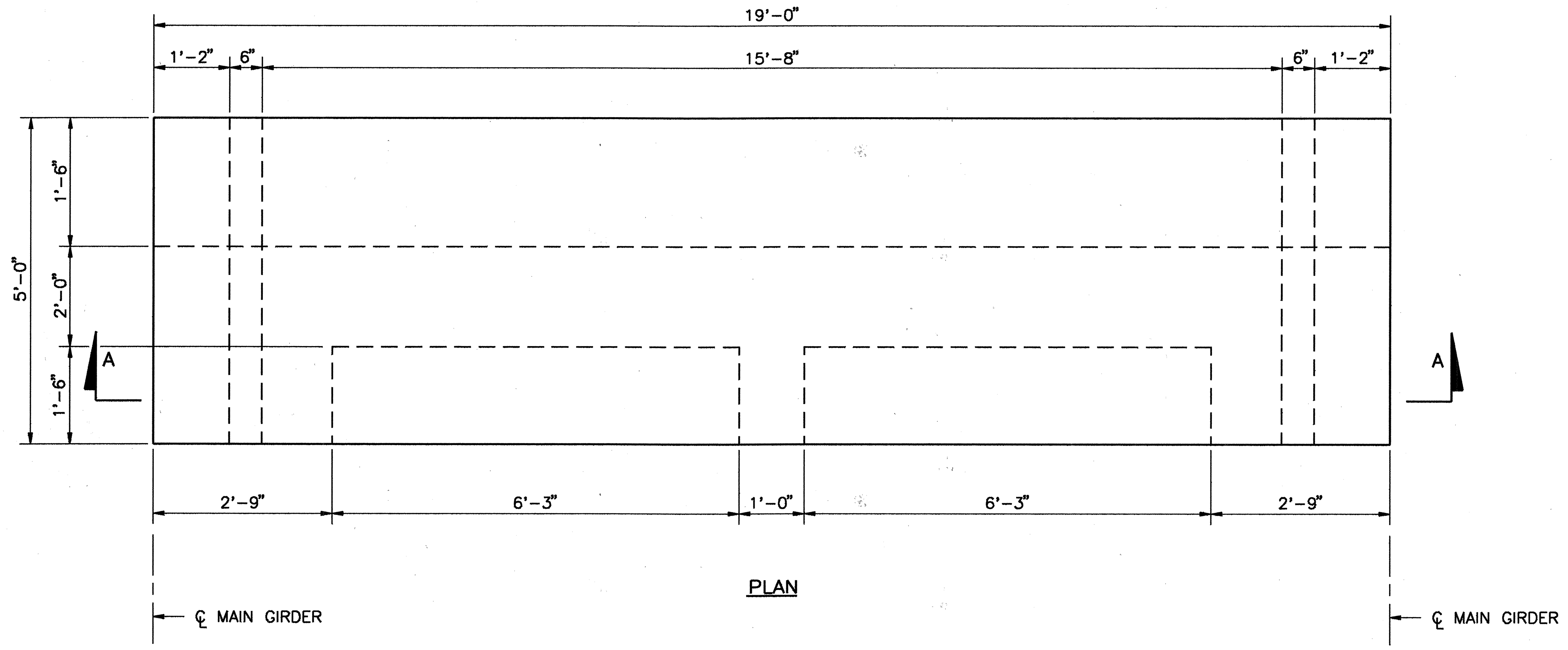
PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: STRUCTURAL STEEL REPAIR DETAILS

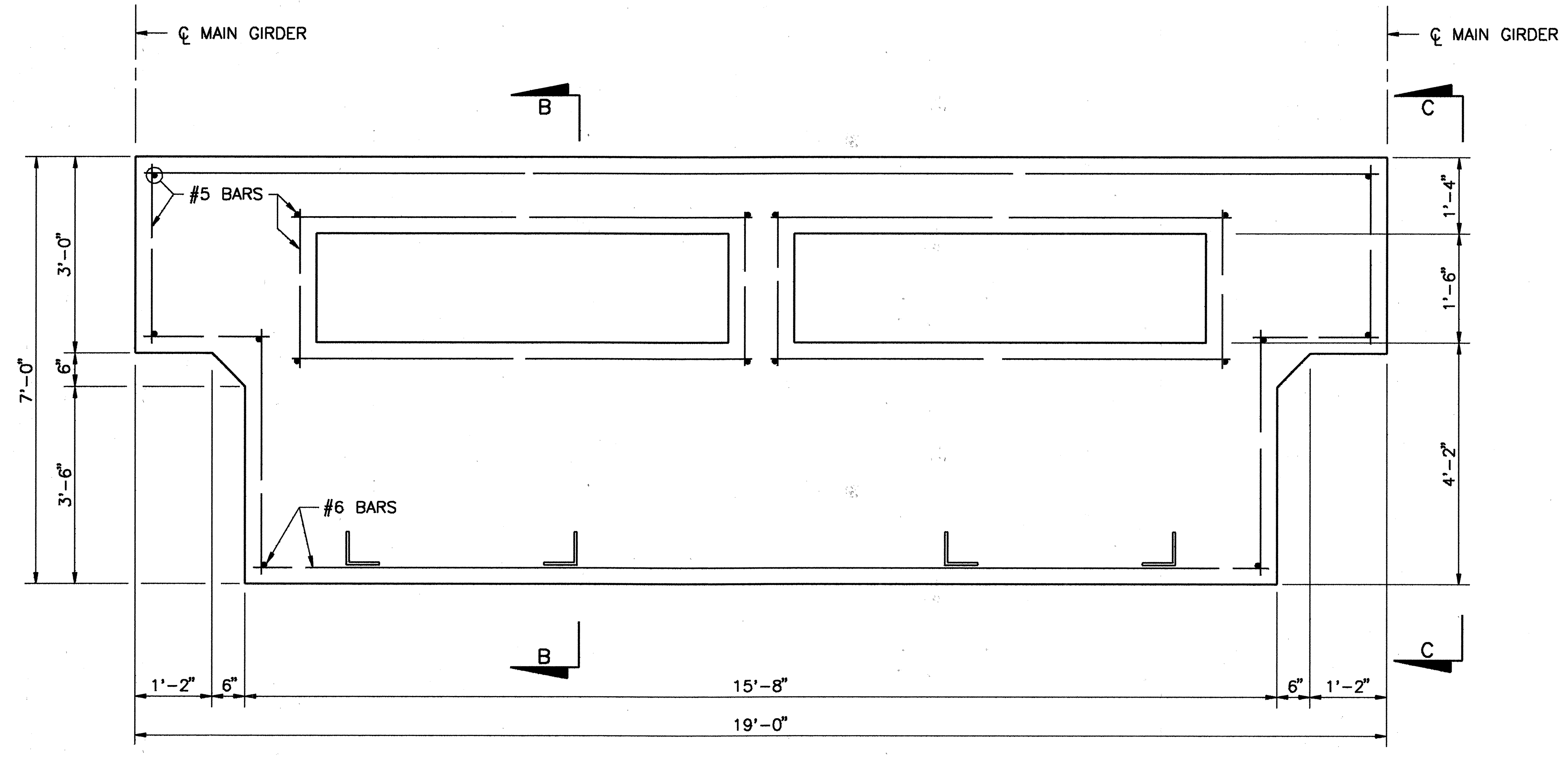
PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-13

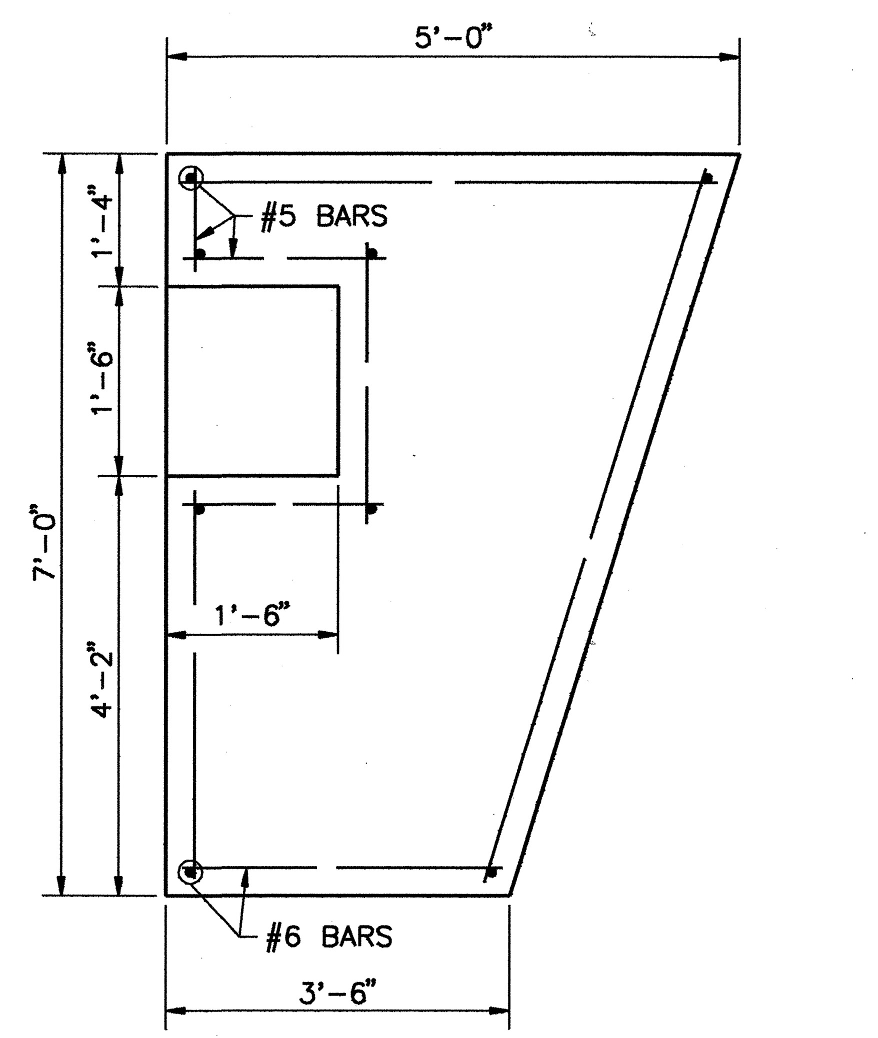
NOTES:
1. FOR GENERAL NOTES, SEE SHEET A-2.
2. ALL REINFORCING SHALL HAVE 3" COVER UNLESS OTHERWISE SHOWN.
3. REINFORCING: #5 BARS AT 12" SPACING (TOP AND AROUND POCKETS); #6 BARS AT 6" SPACING (BOTTOM).
4. COUNTERWEIGHT DIMENSIONS AND CENTER OF GRAVITY SHALL BE CHECKED BY THE CONTRACTOR USING WEIGHT DETERMINED FROM APPROVED SHOP DRAWINGS (SEE SECTION 481 OF THE TECHNICAL SPECIAL PROVISIONS).
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL BALANCING OF LEAF (SEE SECTION 481 OF THE TECHNICAL SPECIAL PROVISIONS).
6. THIS SHEET IS INTENDED AS A GUIDE ONLY. CONTRACTOR WILL BE REQUIRED TO SUBMIT SHOP DRAWINGS SHOWING DETAILS OF COUNTERWEIGHT AND SHALL SUBMIT CALCULATIONS SHOWING BALANCE OF LEAF (SEE SECTION 481 OF THE TECHNICAL SPECIAL PROVISIONS).
7. DESIGN CALCULATIONS TO DETERMINE THE DIMENSIONS OF THE COUNTERWEIGHT CONCRETE NECESSARY TO BALANCE THE MOMENT PRODUCED BY THE STRUCTURAL STEEL AND MACHINERY ASSUME A UNIT WEIGHT OF 245 POUNDS PER CUBIC FOOT FOR CONCRETE. THE CONTRACTOR SHALL ADJUST THE DIMENSIONS OF THE COUNTERWEIGHT BASED ON THE DESIGN CALCULATIONS TO PRODUCE A MOMENT BALANCE USING THE ACTUAL UNIT WEIGHT OF THE CONCRETE TO BE USED IN THE CONSTRUCTION OF THE COUNTERWEIGHT. IRON ORE OR STEEL PUNCHINGS OR FILINGS OR OTHER HEAVY MATERIAL SHALL BE MIXED WITH THE AGGREGATE TO ASCERTAIN THE REQUIRED WEIGHT OF CONCRETE. STEEL PLATES (6'-0" x 1'-4" x 1/4" THK.) SHALL BE USED IN THE POCKETS TO BALANCE THE LEAF. PLATES EQUAL TO 5% OF CALCULATED COUNTERWEIGHT SHALL BE PROVIDED. METHODS OF MIXING AND PLACING SHALL BE DEVISED TO GIVE CLOSE CONTROL AND UNIFORMITY OF UNIT WEIGHT OF THE CONCRETE THROUGHOUT THE COUNTERWEIGHT CONCRETE MASS. THE CONCRETE SHALL BE PLACED IN LAYERS AND CONSOLIDATED WITH VIBRATORS OR TAMPERS. THE CONCRETE IN THE COUNTERWEIGHT SHALL HAVE A 28 DAY STRENGTH OF 3,400 PSI.
8. THE CONTRACTOR MAY USE OTHER METHODS OF PROVIDING THE COUNTERWEIGHT MASS PROVIDED THEY MEET THE REQUIREMENTS OF THESE GENERAL NOTES AND ARE APPROVED BY THE ENGINEER.
9. COST OF BALANCING STEEL PLATES AND REINFORCING STEEL SHALL BE INCUDED IN ITEM NO. 400-2-6 "CONCRETE CLASS II (COUNTERWEIGHT)".



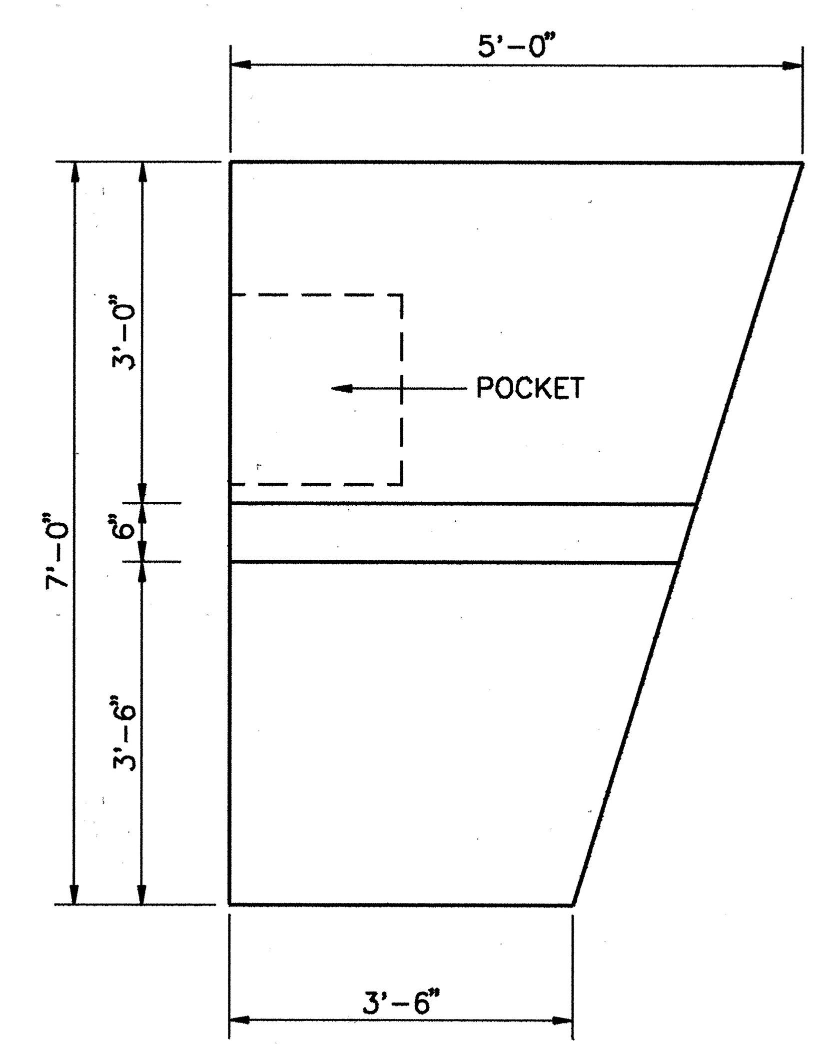
PLAN



SECTION A-A



SECTION B-B



VIEW C-C

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
CONCRETE – COUNTERWEIGHT	CY	18.0
REINFORCING STEEL	LBS	1,800

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	Names	Dates
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Designed by	MRC	5-95
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Approved by	T. J. FARRELL	

Timothy J. Farrell

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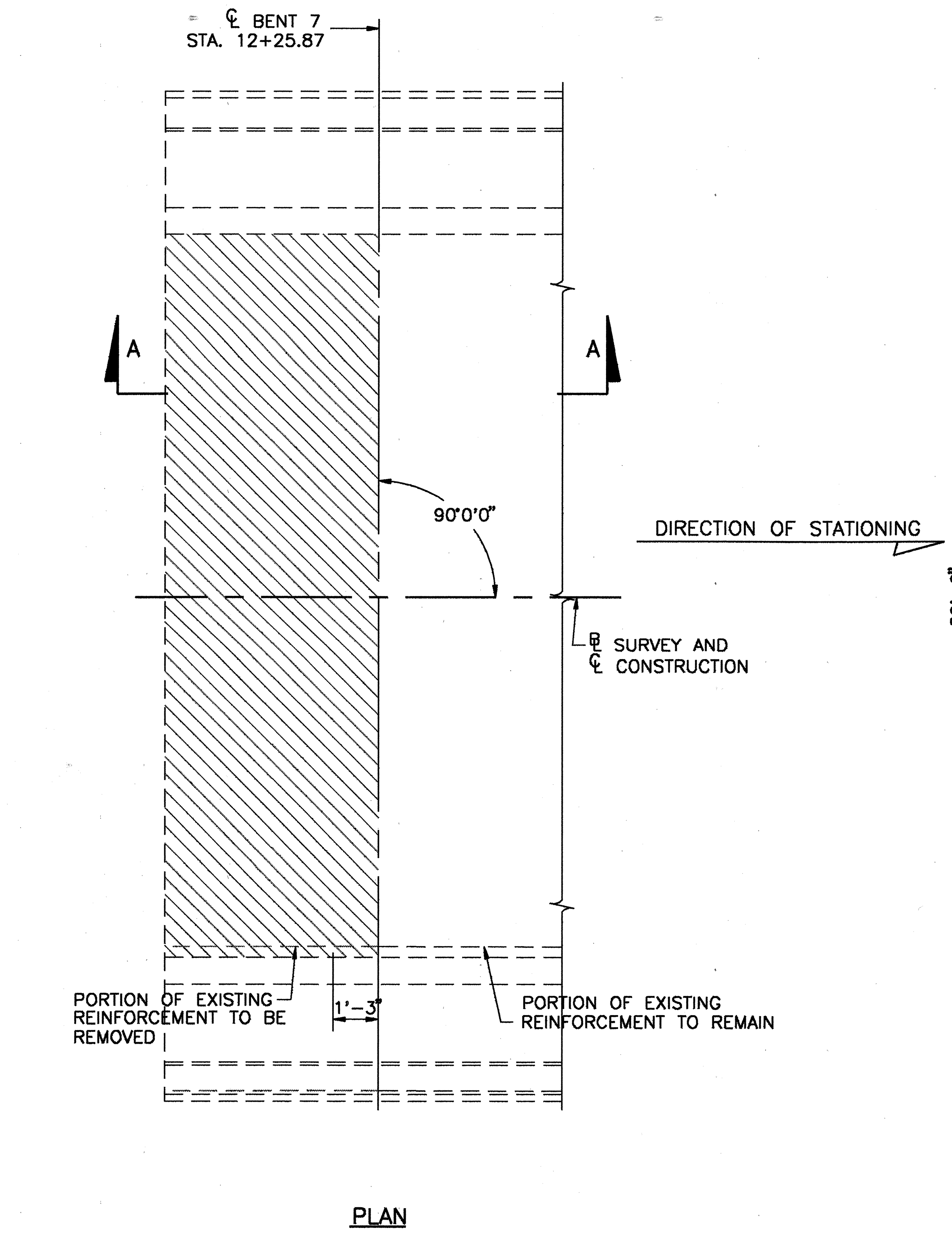
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: COUNTERWEIGHT DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-14



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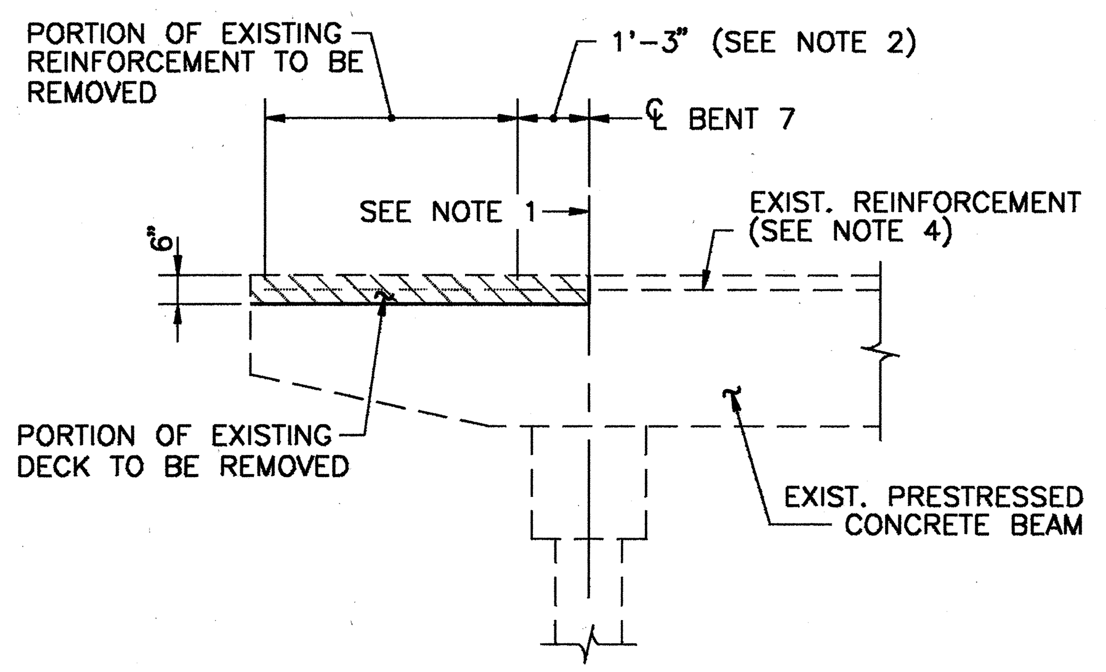
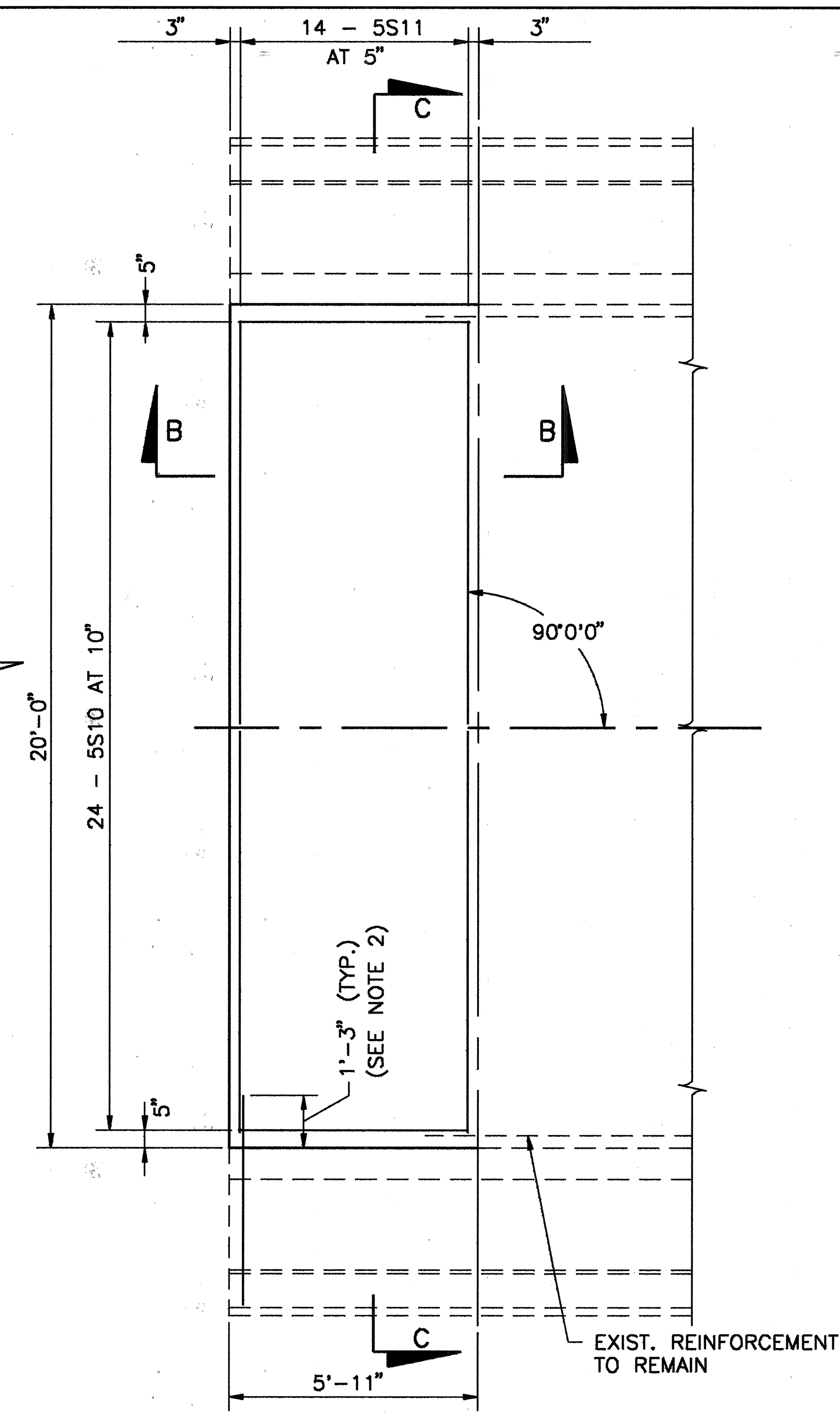


SECTION A–A

DEMOLITION PHASE



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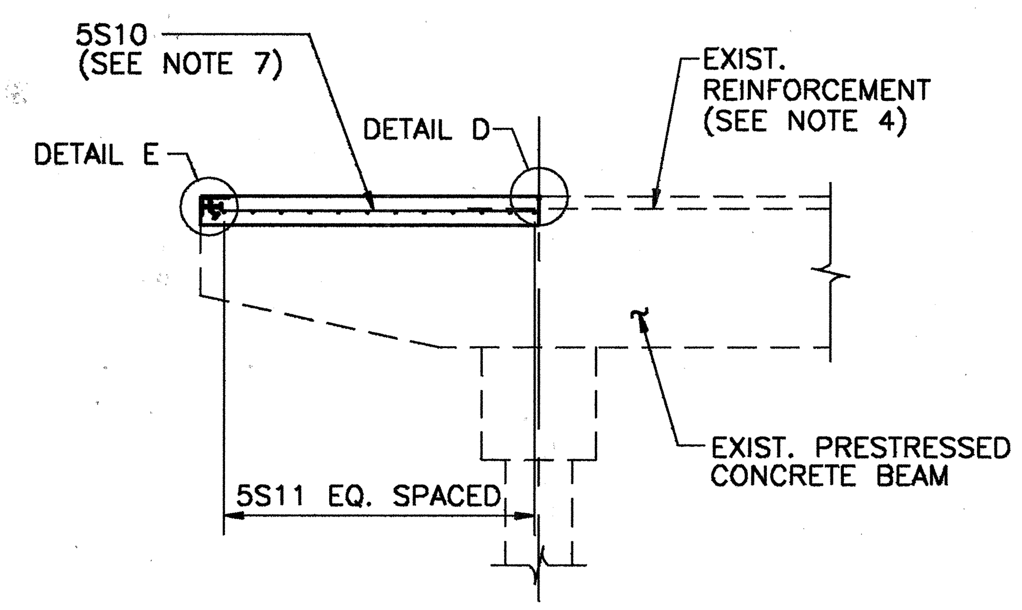
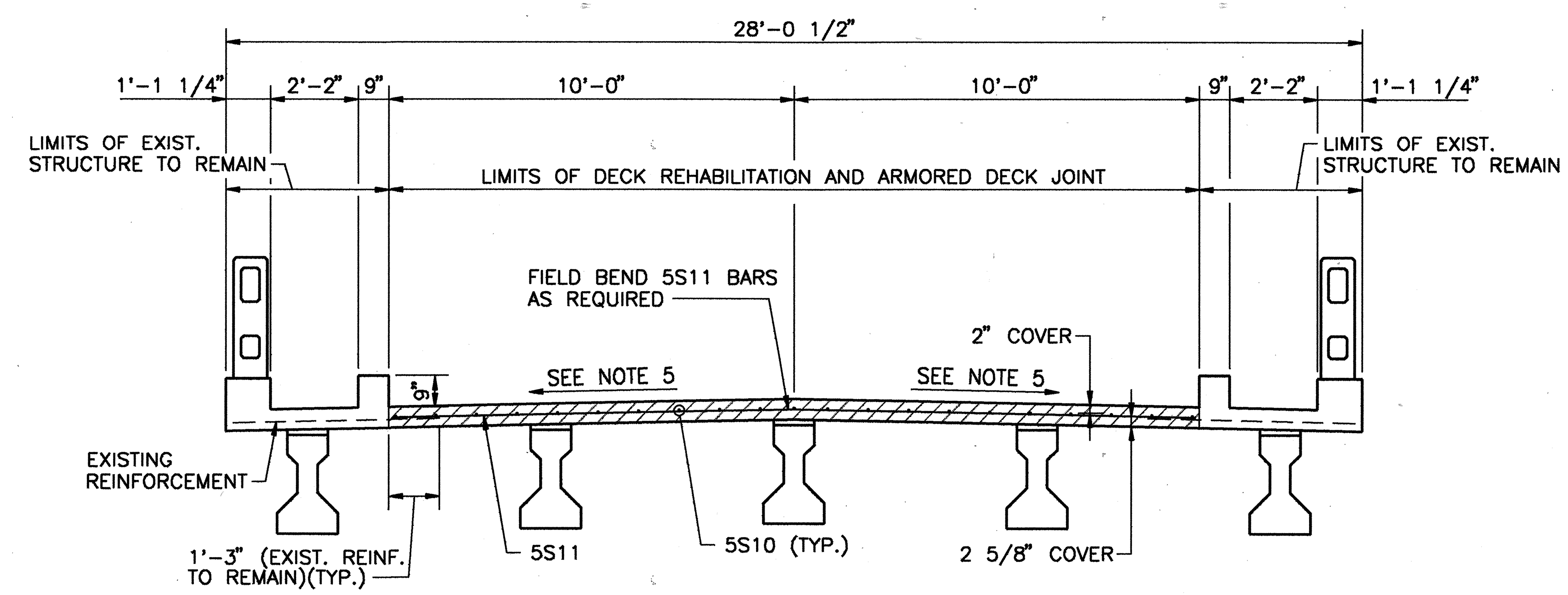
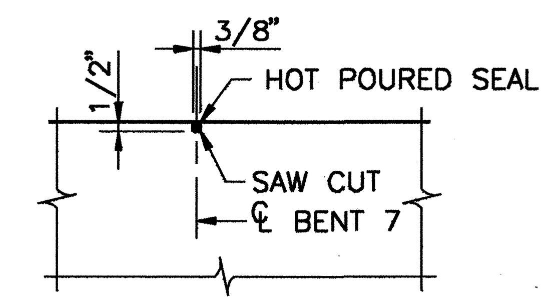


SECTION B–B

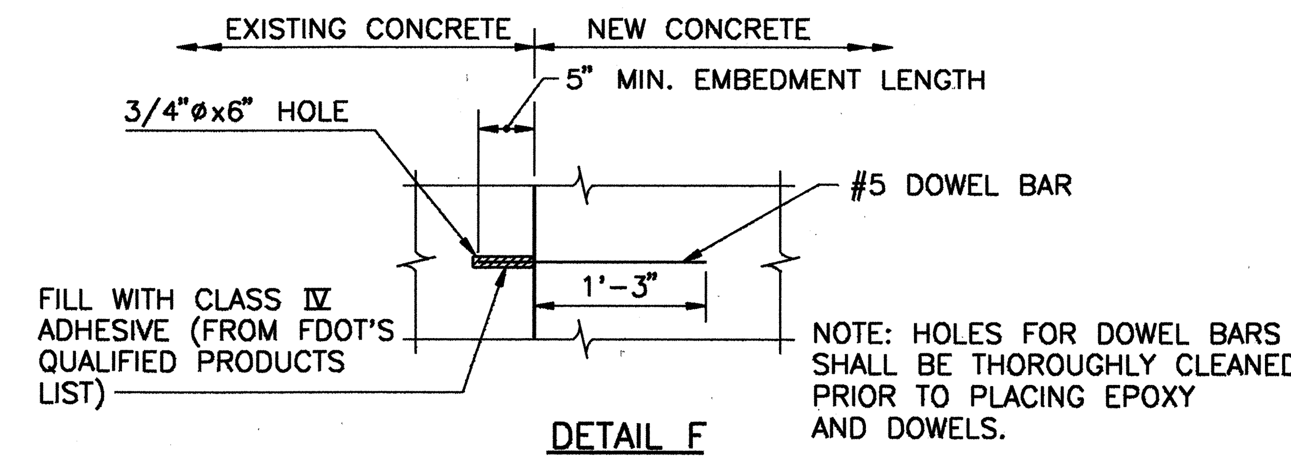
CONSTRUCTION PHASE



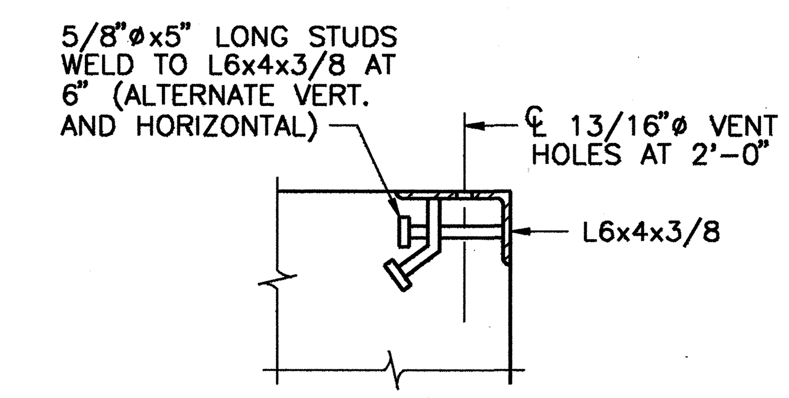
SECTION C–C



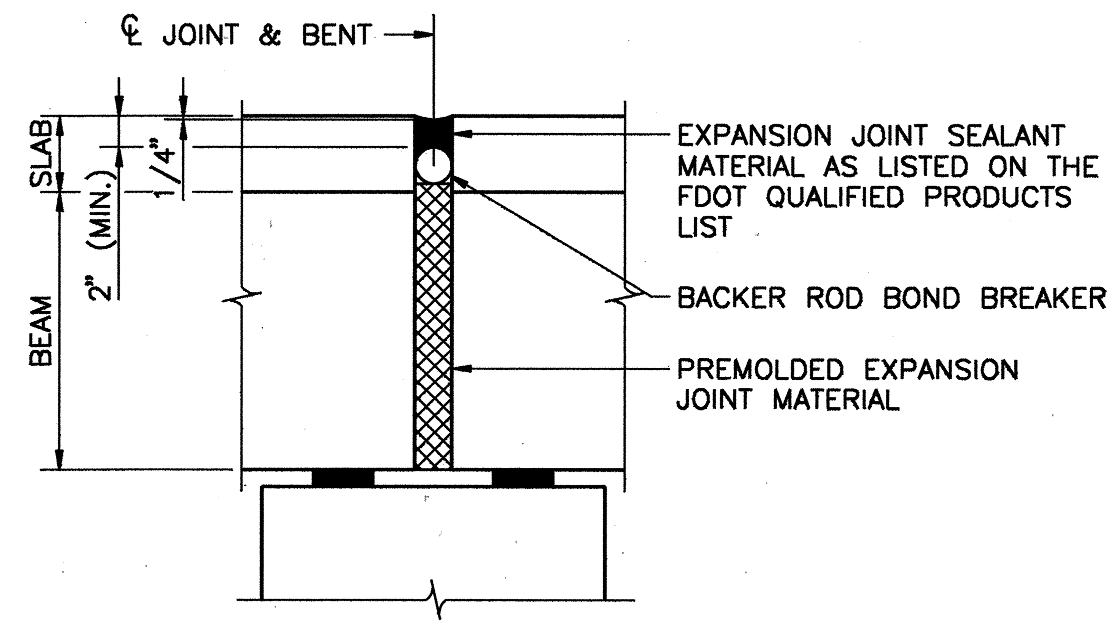
DETAIL D



DETAIL F



DETAIL E



OPEN JOINT REPAIR DETAIL
(REQ'D. AT EB1, BENTS 2,3,4,5,8,9,10, EB11)

NOTES:
1. SCORE CONCRETE FOR FULL LENGTH OF SPAN BEING REPLACED BY SCORING TO THE TOP OF REINFORCING BARS. CONTRACTOR SHALL AVOID DAMAGE TO REINFORCING STEEL DURING SCORING OPERATION AND SLAB REMOVAL.
2. THE CONTRACTOR SHALL REMOVE THE DECK IN THE AREA SHOWN, LEAVING THE EXISTING REINFORCEMENT. THE EXPOSED REINFORCEMENT SHALL BE WIRE BRUSH CLEANED, STRAIGHTENED AND EMBEDDED IN NEW SLAB. IF BARS ARE BROKEN OR OTHERWISE DETERMINED TO BE UNSATISFACTORY BY THE ENGINEER, THEY SHALL BE REPLACED BY DOWEL BARS (SEE DETAIL F).
3. ALL CONTACTING SURFACES BETWEEN OLD AND NEW CONCRETE SHALL BE CLEANED IMMEDIATELY BEFORE CASTING CONCRETE.
4. THE EXISTING REINFORCEMENT IS ASSUMED TO BE #4 BARS AT 12". THE CONTRACTOR SHALL FIELD VERIFY AND ADJUST THE SPACING OF NEW REINFORCEMENT TO SPLICE WITH EXISTING REINFORCEMENT.
5. MATCH DIMENSIONS, CROSS SLOPE AND LONGITUDINAL SLOPE WITH THE EXISTING DECK.
6. ▨ DENOTES EXISTING STRUCTURE TO BE REMOVED.
7. IF THE EXISTING REINFORCEMENT SPACING DOES NOT ACCOMODATE THE PROPOSED REINFORCEMENT SPACING, THE CONTRACTOR SHALL SUBMIT THE DECK SLAB DESIGN (BASED ON THE SPACING OF THE EXISTING REINFORCEMENT) TO THE ENGINEER FOR APPROVAL (OR) THE CONTRACTOR SHALL MEET THE FOLLOWING CRITERIA:
   A. MAIN REINFORCEMENT (PERPENDICULAR TO TRAFFIC) = 0.74 SQ. IN. PER FT. WIDTH OF SLAB.
   B. DISTRIBUTION REINFORCEMENT (LONGITUDINAL TO TRAFFIC = 0.33 SQ. IN. PER FT WIDTH OF SLAB.

* ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
CONCRETE CLASS IV (SUPERSTRUCTURE)	CY	13.40
REINFORCING STEEL (SUPERSTRUCTURE)	LB	1,100
CLEANING AND SEALING DECK JOINTS	LF	252
EXPANSION JOINT	LF	20

* QUANTITIES ARE FOR DECK REPAIRS ONLY.

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Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T.J. FARRELL	

DSA GROUP INC.

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2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
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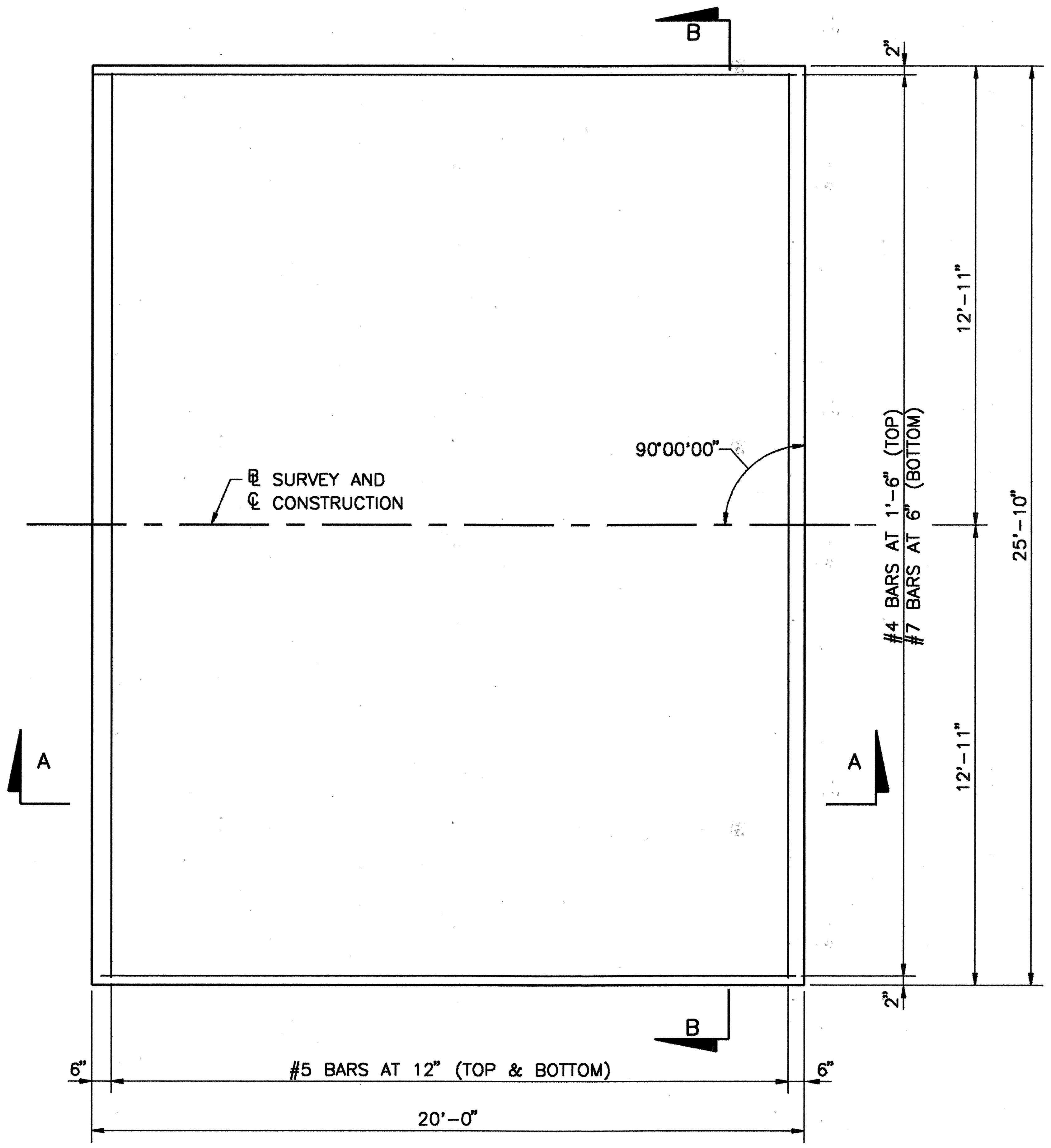
SHEET TITLE: CONCRETE DECK REPLACEMENT AND JOINT DETAILS

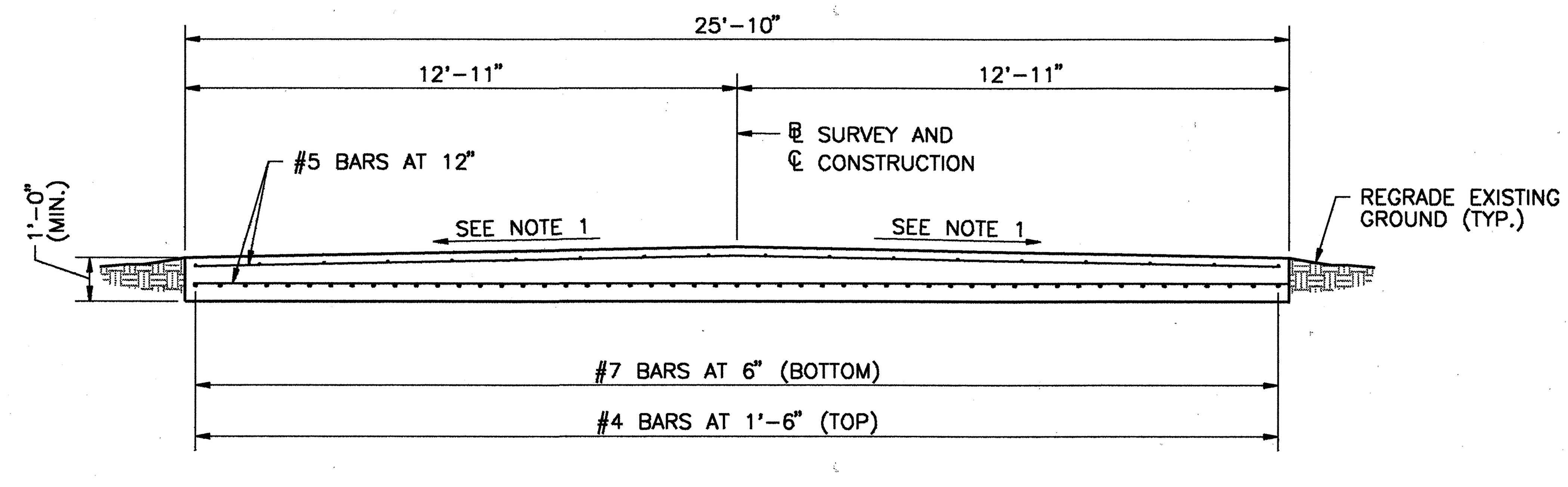
PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-15

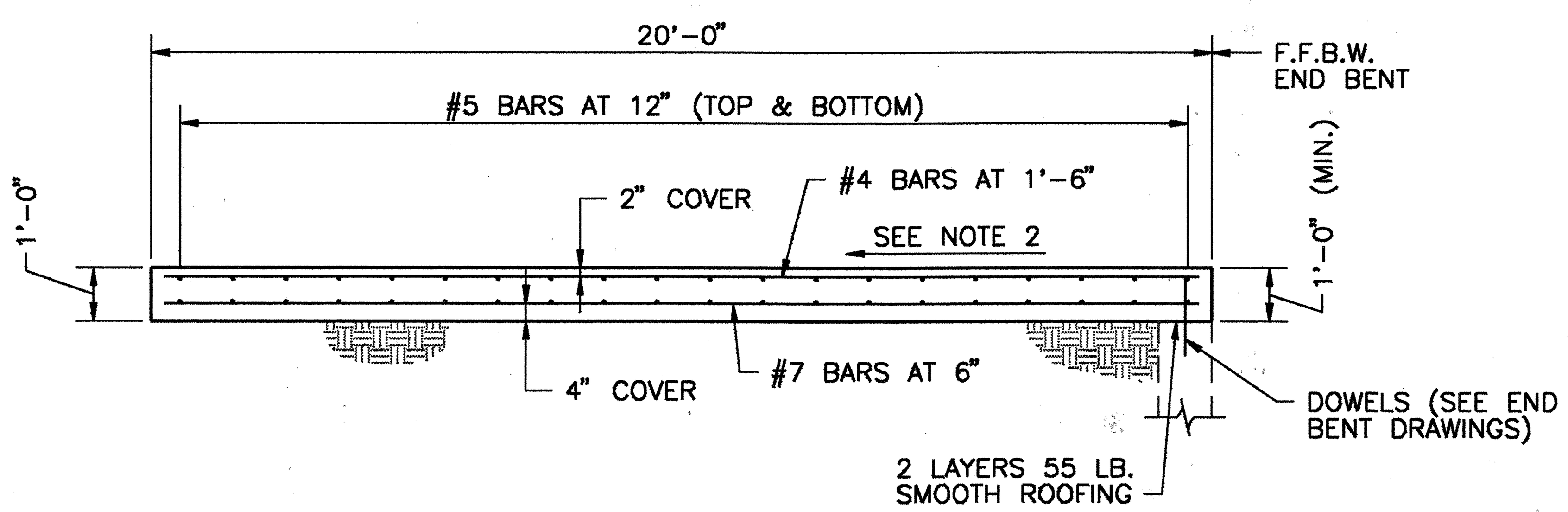
Timothy J. Farrell



PLAN



SECTION B–B



SECTION A–A

* ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
CONCRETE	CY	19.1
REINFORCING STEEL	LB	3,111

* QUANTITIES FOR ONE APPROACH SLAB ONLY

NOTES:
1. MATCH WITH EXISTING CROSS SLOPE.
2. MATCH WITH EXISTING LONGITUDINAL SLOPE.
3. PAYMENT FOR APPROACH SLAB CONCRETE, REINFORCING STEEL AND THE INCIDENTALS RELATING THERETO SHALL BE PAID UNDER UNIT PRICE FOR APPROACH SLABS, ITEM NO. 360-1.
4. THE COST FOR REGRADING THE EXISTING GROUND TO THE ELEVATION OF APPROACH SLABS SHALL BE INCLUDED IN THE UNIT PRICE FOR APPROACH SLABS.

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	TJL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T. J. FARRELL	

Timothy J. Farrell

DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
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SHEET TITLE: APPROACH SLAB DETAILS
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET S-16

BARRIER GATE SUPPORT (NO. REQ'D. = 1)

MARK SIZE	MARK DES.	LENGTH FT.-IN.	NO. BARS	TYPE BAR	STYLE A	STYLE G	B FT.-IN.	C FT.-IN.	D FT.-IN.	E FT.-IN.	F FT.-IN.	H FT.-IN.	J FT.-IN.	K FT.-IN.	N NO.	θ ANG.
5	S1	5-8	7	1			5-8									
5	S2	8-9	6	12			3-4	5-5								30
5	S3	6-2	12	1			6-2									

TRAFFIC GATE SUPPORT (NO. REQ'D. = 2)

MARK SIZE	MARK DES.	LENGTH FT.-IN.	NO. BARS	TYPE BAR	STYLE A	STYLE G	B FT.-IN.	C FT.-IN.	D FT.-IN.	E FT.-IN.	F FT.-IN.	H FT.-IN.	J FT.-IN.	K FT.-IN.	N NO.	θ ANG.
5	S4	4-8	6	1			4-8									
5	S5	7-9	5	12			2-7	5-2								31
5	S6	5-0	11	1			5-0									

LIGHT POLE PILASTERS (NO. REQ'D. = 1)

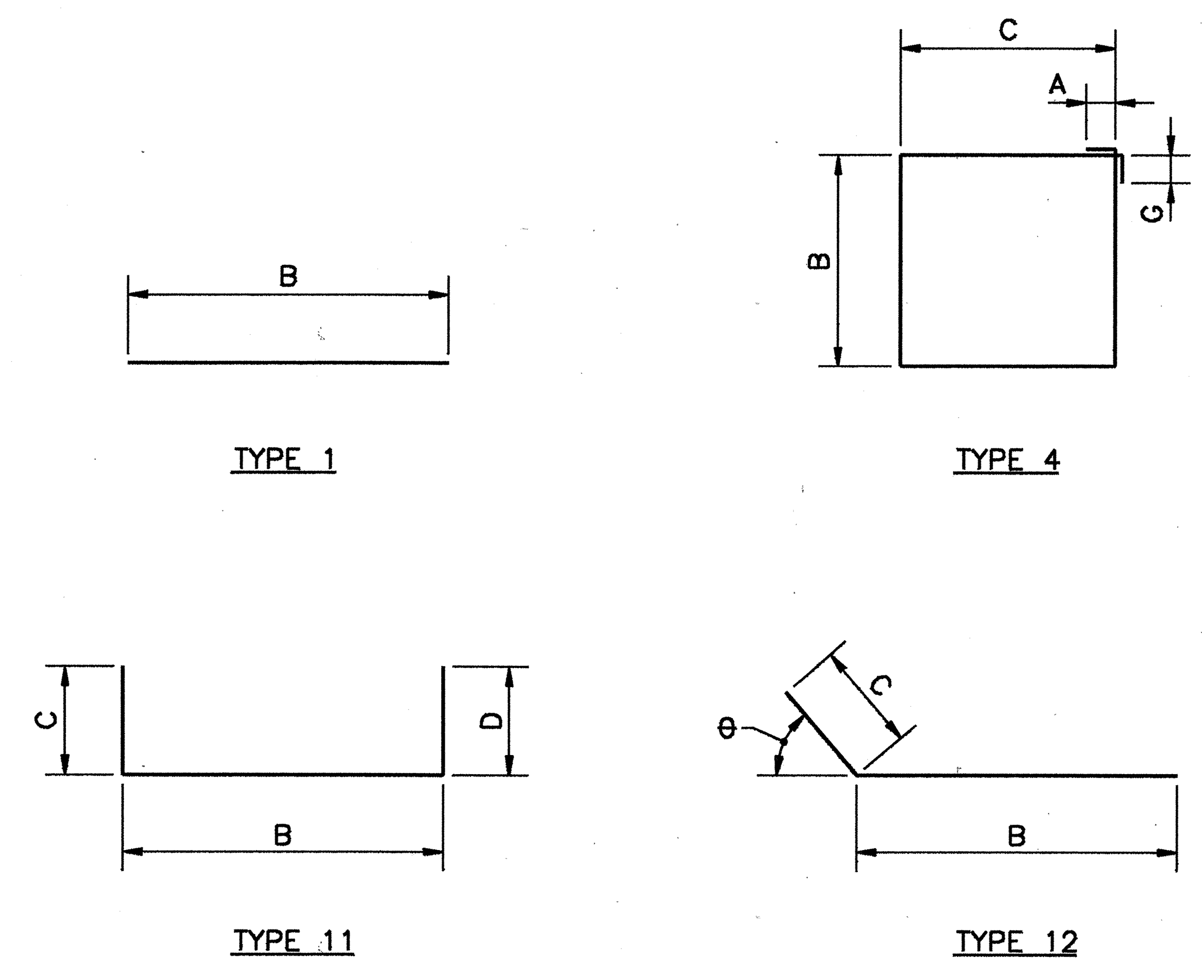
MARK SIZE	MARK DES.	LENGTH FT.-IN.	NO. BARS	TYPE BAR	STYLE A	STYLE G	B FT.-IN.	C FT.-IN.	D FT.-IN.	E FT.-IN.	F FT.-IN.	H FT.-IN.	J FT.-IN.	K FT.-IN.	N NO.	θ ANG.
5	S7	3-2	2	11			2-2	0-6	0-6							
5	S8	7-2	4	4	6	6	0-11	2-2								
8	S1	2-4	6	1			2-4									

DECK SLAB - SPAN 7 (NO. REQ'D. = 1)

MARK SIZE	MARK DES.	LENGTH FT.-IN.	NO. BARS	TYPE BAR	STYLE A	STYLE G	B FT.-IN.	C FT.-IN.	D FT.-IN.	E FT.-IN.	F FT.-IN.	H FT.-IN.	J FT.-IN.	K FT.-IN.	N NO.	θ ANG.
5	S10	5-7	24	1			5-7									
5	S11	20-0	14	1			20-0									

CONTROL PLATFORM (NO. REQ'D. = 1)

MARK SIZE	MARK DES.	LENGTH FT.-IN.	NO. BARS	TYPE BAR	STYLE A	STYLE G	B FT.-IN.	C FT.-IN.	D FT.-IN.	E FT.-IN.	F FT.-IN.	H FT.-IN.	J FT.-IN.	K FT.-IN.	N NO.	θ ANG.
4	CP1	22-6	7	1			22-6									
4	CP2	7-3	23	1			7-3									



BAR BENDING DETAILS

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

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	Names	Dates
Drawn by	TJL	5-95
Checked by	MRC	5-95
Designed by	MRC	5-95
Checked by	TJF	5-95
Approved by	T. J. FARRELL	

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2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

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SHEET TITLE: REINFORCING BAR LIST

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET S-17

ELECTRICAL SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION	MOUNTING
	FENDER NAVIGATION LIGHT (RED)	FENDERS
	CLEARANCE GUAGE FLOODLIGHT, (ARROW SHOWS AIMING)	FENDERS
	LIGHTING FIXTURE, (SQUARE) CEILING TYPE	SEE FIXTURE SCHEDULE
	LIGHTING FIXTURE, WALL BRACKET TYPE	SEE FIXTURE SCHEDULE
	FLUORESCENT FIXTURE	SEE FIXTURE SCHEDULE
	FLUORESCENT STRIP	SEE FIXTURE SCHEDULE
	INDICATOR LIGHT – WALL BRACKET TYPE	SEE FIXTURE SCHEDULE
$\$_a$	SINGLE POLE SWITCH – LETTER IF SHOWN INDICATES LIGHT CONTROLLED, 20A	℄ 48" AFF OR AS NOTED
$\$_3$	THREE-WAY SWITCH, 20A	℄ 48" AFF OR AS NOTED
$\$_K$	KEY OPERATED SWITCH, 20A	℄ 48" AFF OR AS NOTED
	SWITCH WITH PILOT LIGHT, 20A	℄ 48" AFF OR AS NOTED
	DUPLEX RECEPTACLE, 125V, 20A	℄ 18" AFF OR AS NOTED
	QUADRAPLEX RECEPTACLE,125V,20A	AS NOTED
	RECEPTACLE, 250V, 30A	℄ 18" AFF OR AS NOTED
	SPECIAL RECEPTACLE AS NOTED	℄ 18" AFF OR AS NOTED

SYMBOL	DESCRIPTION	MOUNTING
	ELECTRICAL PANEL 480 VOLT	SEE PANEL SCHEDULE
	ELECTRICAL PANEL 208 OR 240 VOLT	SEE PANEL SCHEDULE
T	TRANSFORMER	AS REQUIRED
3 30 NF 3R	HEAVY DUTY DISCONNECT SWITCH -INDICATES FUSE SIZE, NF=NONFUSED, X=SIZE PER MOTOR NAMEPLATE -INDICATES NEMA TYPE ENCLOSURE, IF NONE SHOWN=NEMA 1 -INDICATES FRAME SIZE -INDICATES # OF POLES	AS REQUIRED
M	MANUAL MOTOR STARTER	AS REQUIRED
	MAGNETIC MOTOR STARTER	AS REQUIRED
3 1 NF 3R	COMBINATION MAGNETIC MOTOR STARTER -INDICATES FUSE OR CIRCUIT BREAKER SIZE, NF=NONFUSED -INDICATES NEMA TYPE ENCLOSURE, IF NONE SHOWN=1 -INDICATES STARTER SIZE -INDICATES # OF POLES	AS REQUIRED
3^S_F	FRACTIONAL HORSEPOWER RATED TOGGLE SWITCH, WITH THERMAL ELEMENTS, # = POLES	AS REQUIRED
5	MOTOR, CONNECTION, NUMERIAL = H.P. F = FRACTIONAL	AS REQUIRED
W	TELEPHONE OUTLET WITH MIN. 3/4" CONDUIT TO TELEPHONE TERMINAL BOARD U.O.N.	℄ 18" AFF W = ℄ 48" AFF
PS	TELEPHONE OUTLET (P.S. FOR PAY STATION) W/MIN. 3/4"C. TO TELE. TER. BOARD U.O.N.	℄ 54" AFF OR AS NOTED
	INTERCOM OUTLET AND DESK SET	℄ 18" AFF OR AS NOTED
	INTERCOM SET, WALL MOUNTED	℄ 54" AFF OR AS NOTED
B	ALARM BELL OR GONG	AS REQUIRED

SYMBOL	DESCRIPTION	MOUNTING
C	CONTACTOR	AS REQUIRED
PE	PHOTO ELECTRIC CONTROL	CEILING MOUNTED
R	RELAY	AS REQUIRED
J	JUNCTION BOX	AS REQUIRED
PB	PULL BOX	AS REQUIRED
	DRIVEN GROUND, 3/4" x 10' COPPERWELD U.O.N.	
	CONDUIT, CONCEALED IN CEILING SPACE, WALL OR FLOOR	
UG	CONDUIT RUN UNDERGROUND	
	CONDUIT RUN EXPOSED	
	HOME RUN TO PANEL (NO. OF CKT'S ARE INDICATED BY NO. OF ARROWS)	
	CONDUIT RUN-UP OR RUN-DOWN	
T	HOME RUN TO TELEPHONE TERMINAL CABINET	
PHASE NEUTRAL	NO. OF SLASHES EQUAL NO. OF WIRES NO. SLASHES=2 #12 AWG MIN. W/GROUND, OTHER SIZES NOTED. EQUIPMENT GREEN GRND. WIRE NOT SHOWN BUT REQUIRED AS SPECIFIED.	

SYMBOL	DESCRIPTION	MOUNTING
	FUSED SWITCH	AS REQUIRED
	MOLDED CASE CIRCUIT BREAKER TRIP AND FRAME RATING AS INDICATED	AS REQUIRED
	FUSE	AS REQUIRED
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR, GROUNDED	AS REQUIRED
VS	VOLTMETER SWITCH	AS REQUIRED
AS	AMMETER SWITCH	AS REQUIRED
A	AMMETER	AS REQUIRED
V	VOLTMETER	AS REQUIRED
KW	KILOWATT METER	AS REQUIRED
WH	WATT-HOUR METER	AS REQUIRED
	LIGHTNING ARRESTOR	AS REQUIRED
	PUSH-BUTTON STATION OR SWITCH K = KEY OPERATED	AS REQUIRED
	POTENTIAL, CONTROL OR POWER TRANSFORMER	AS REQUIRED
	3/4"øx10' LG. COPPERWELD GROUND ROD.	MOUNTED MINIMUM 18" BELOW GRADE
	CADWELD CONNECTION	
	AIR TERMINAL	AS REQUIRED
1	GENERAL NOTE NO.	
	CONTACTOR OR CONTACT	
	MANUAL CONTROLLERS ON-OFF / START-STOP	
LS	LIMIT SWITCH	
TF	TACHOMETER FEEDBACK	

ABBREVIATIONS:

- AF – AMPERE FRAME
- AFF – ABOVE FINISHED FLOOR
- AT – AMPERE TRIP
- ATS – AUTOMATIC TRANSFER SWITCH
- BFG – BELOW FINISHED GRADE
- C – CONDUIT
- CB,C/B – CIRCUIT BREAKER
- CKT – CIRCUIT
- CLF – CURRENT LIMITING FUSE
- CLG – CEILING
- CPT – CONTROL POWER XFMR.
- DISC – DISCONNECT
- DN – DOWN
- ELEC – ELECTRIC
- EMERG – EMERGENCY
- ENCL – ENCLOSURE
- EP – EMERGENCY PANEL
- EQ – EQUIPMENT
- EX – EXPLOSION PROOF
- EXIST – EXISTING
- FA – FIRE ALARM
- FAA – FIRE ALARM ANNUNCIATOR
- FACP – FIRE ALARM CONTROL PANEL
- FC – FLEX CABLE
- FIXT – FIXTURE
- FLA – FULL LOAD AMPERES
- FS – FLOAT SWITCH
- G – GROUNDED, GROUNDING
- GRND – GROUND
- GFI – GROUND FAULT INTERRUPTER
- GRS – GALVANIZED RIGID STEEL
- HID – HIGH INTENSITY DISCHARGE
- d – DEDICATED OUTLET/CIRCUIT
- HOA – HAND OFF AUTOMATIC
- HP – HORSEPOWER
- HORIZ – HORIZONTAL
- JB – JUNCTION BOX
- LRA – LOCKED ROTOR AMPERES
- LS – LIMIT SWITCH
- LTG – LIGHTING
- LTS – LIGHTS
- MCB – MAIN CIRCUIT BREAKER
- MCC – MOTOR CONTROL CENTER
- MCP – MOTOR CIRCUIT PROTECTOR
- MH – MANHOLE
- MLO – MAIN LUGS ONLY
- MS – MOTOR STARTER
- MTD – MOUNTED
- MTG – MOUNTING
- N – NEUTRAL
- NO. – NUMBER
- OL – OVERLOAD
- PB – PULL BOX
- P/D – PULLED/DRIVEN
- PL – PILOT LIGHT
- PNL – PANEL
- PWR – POWER
- RC – REEL CABLE
- RECEPT – RECEPTACLE
- SC – SUBMARINE CABLE
- SPEC – SPECIFICATIONS
- SW – SWITCH
- TEL – TELEPHONE
- TF – TACHOMETER FEEDBACK
- TL – TWISTLOCK
- TVSS – TRANSIENT VOLTAGE SURGE SUPPRESSOR
- U.O.N. – UNLESS OTHERWISE NOTED
- UPS – UNINTERRUPTIBLE POWER SUPPLY
- VSD – VARIABLE SPEED DRIVE
- VERT – VERTICAL
- W/G – PROTECTIVE WIRE GUARD
- WHM – WATT HOUR METER
- WP – WEATHER PROOF
- XDCR – TRANSDUCER
- XFMR – TRANSFORMER
- 3P – 3 POLES
- 3W – 3 WIRES

SCHEMATIC DIAGRAM SYMBOLS

TERMINALS

- MOTOR STARTER
- 1 CONTROL PANEL
- 2 CONTROL DESK
- D DRIVE SYSTEM PANEL
- G GATE OPERATOR
- L SPANLOCK OPERATOR
- S SUBMARINE CABLE (CABINET-CABLE-CABINET)
- PANEL WIRING
- FIELD WIRING

LIMIT SWITCH – LS

- NORMALLY CLOSED
- NORMALLY CLOSED HELD OPEN
- NORMALLY OPEN
- NORMALLY OPEN HELD CLOSED

(LIMIT SWITCHES ARE SHOWN WITH BRIDGE DOWN, LOCKS DRIVEN AND TRAFFIC GATES UP)

PRESSURE OR VACUUM SWITCH – PS

- NORMALLY OPEN CLOSES ON RISING PRESSURE
- NORMALLY CLOSED OPENS ON RISING PRESSURE

TEMPERATURE SWITCH OR THERMOSTAT – TS

- NORMALLY OPEN CLOSES ON RISING TEMPERATURE
- NORMALLY CLOSED OPENS ON RISING TEMPERATURE

FLOAT SWITCH – FS

- NORMALLY OPEN CLOSES ON RISING LEVEL
- NORMALLY CLOSED OPENS ON RISING LEVEL

TIME DELAY RELAY CONTACTS

- TIME DELAY CLOSE ON ENERGIZATION
- TIME DELAY OPEN ON ENERGIZATION
- TIME DELAY CLOSE ON DEENERGIZATION
- TIME DELAY OPEN ON DEENERGIZATION

HAND SWITCH – HS

- TOGGLE SWITCH
- HOA — HAND-OFF-AUTO (LOCAL-OFF-REMOTE)

PUSHBUTTON

- NORMALLY OPEN
- NORMALLY CLOSED

INDICATOR LIGHT – IL

R
- R – RED
- G – GREEN
- A – AMBER
- O – ORANGE
- B – BLUE
- W – WHITE

RELAY COIL

MR
- 27 UNDERVOLTAGE
- CR CONTROL RELAY
- TR TIME DELAY RELAY
- M MOTOR CONTACTOR
- MF MOTOR FORWARD CONTACTOR
- MR MOTOR REVERSE CONTACTOR
- PE PHOTOELECTRIC RELAY

RELAY CONTACTS

- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT

NEMA STYLE OPERATORS

- MUSHROOM HEAD BUTTON PUSH/PULL OPERATION
- PUSHBUTTON STATION MOMENTARY OPERATION
- SELECTOR SWITCH, POSITIONS AS INDICATED
- KEY OPERATED SWITCH

NOTES:

1. ALL SYMBOLS SHOWN ON DRAWINGS IN DASHED LINES OR WITH (E) ARE EXISTING. U.O.N.
2. EQUIPMENT AND DEVICES SHOWN HATCHED SHALL BE REMOVED.
3. THESE ARE STANDARD SYMBOLS AND MAY NOT APPEAR ON THE PROJECT DRAWINGS; HOWEVER, WHEREVER THE SYMBOL ON THE PROJECT DRAWING OCCURS, THE ITEM SHALL BE PROVIDED AND INSTALLED.

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	ALC	5-95
Checked by	GMM	5-95
Designed by	GMM	5-95
Checked by	RMC	5-95
Approved by	G.M. MOSCINSKI	

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2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

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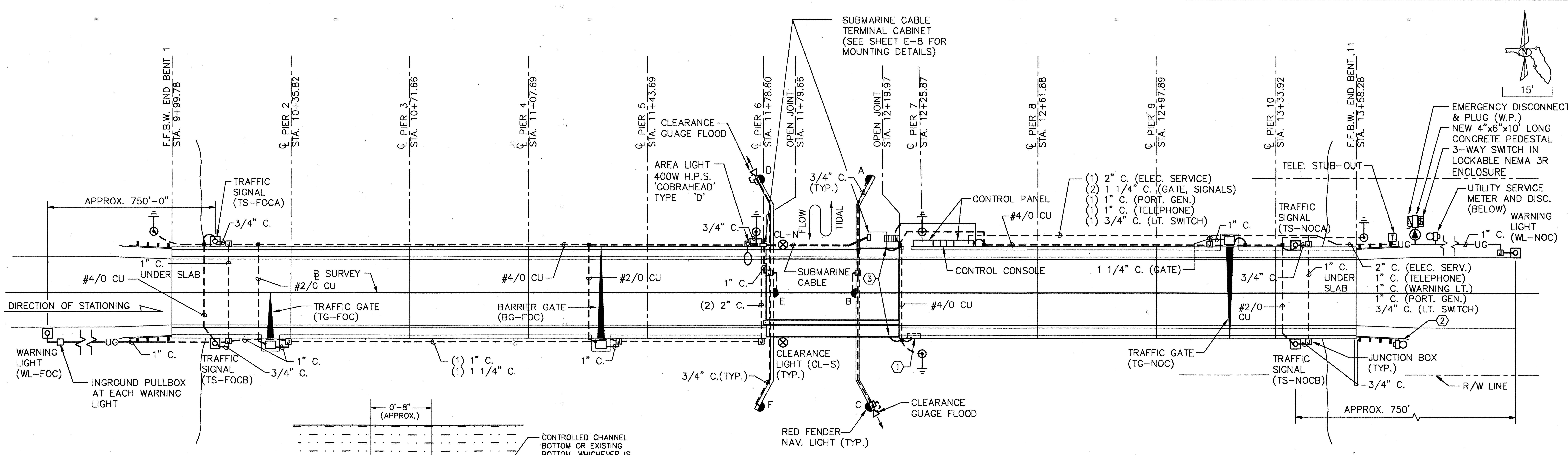
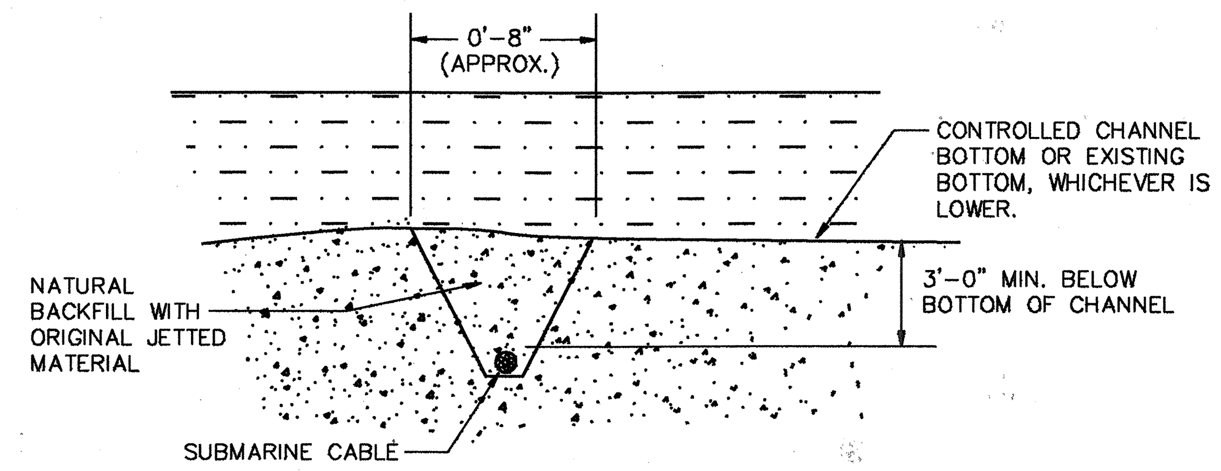
SHEET TITLE: ELECTRICAL SYMBOLS AND ABBREVIATIONS

PROJECT NAME: BECKETT BRIDGE REPAIRS

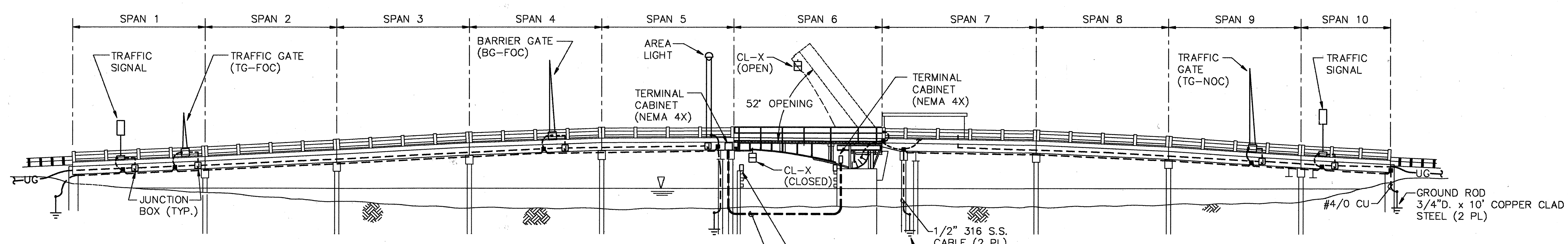
SHEET E-1



PLAN
SCALE: 1"=15'



SUBMARINE CABLE INSTALLATION DETAIL
SCALE: NONE



ELEVATION
SCALE: 1"=15'

NOTES:

1. REFER TO SHEET S-8 & S-9 FOR CONDUIT AND JUNCTION BOX LOCATIONS UNDER BRIDGE, AT GATES AND AT SIGNALS.
2. PROVISION SHALL BE MADE TO RE-USE THE EXISTING SERVICE ALONG WITH A NEW STARTER FOR THE EMERGENCY DRIVE MOTOR TO OPERATE THE BRIDGE DURING THE CONSTRUCTION PHASE. NEW STARTER SHALL BE SIZE 1, REVERSING COMBINATION TYPE IN NEMA 4X ENCLOSURE WITH LOCKABLE DISCONNECT AND SURFACE MOUNTED CONTROLS.

DRAWING NOTES:

(1) EXISTING CONTROL CABINET, ALL CONDUIT AND WIRING, INCLUDING FEEDS TO EXISTING DRIVE MOTOR, FENDER LIGHTS AND TRAFFIC SIGNALS TO BE DEMOLISHED AFTER NEW OR TEMPORARY SERVICE IS IN OPERATION. LOCATE NEW EMERG. STARTER IN EXIST. CABINET FOR TEMPORARY BRIDGE OPERATION DURING CONSTRUCTION.

(2) EXISTING UTILITY SERVICE LOCATION. METER AND FEEDER TO BE DEMOLISHED UPON COMPLETION OF NEW SERVICE, CONTROLS AND DRIVE MOTOR INSTALLATION.

(3) PROVIDE FLEXIBLE BOND AT TRUNNION. BOND ALL METAL HANDRAILS, CONTROL SHED AND PANELS.

BRIDGE NO. 154000

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Drawn by	ALC	5-95
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Approved by	G.M. MOSCINSKI	

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TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA

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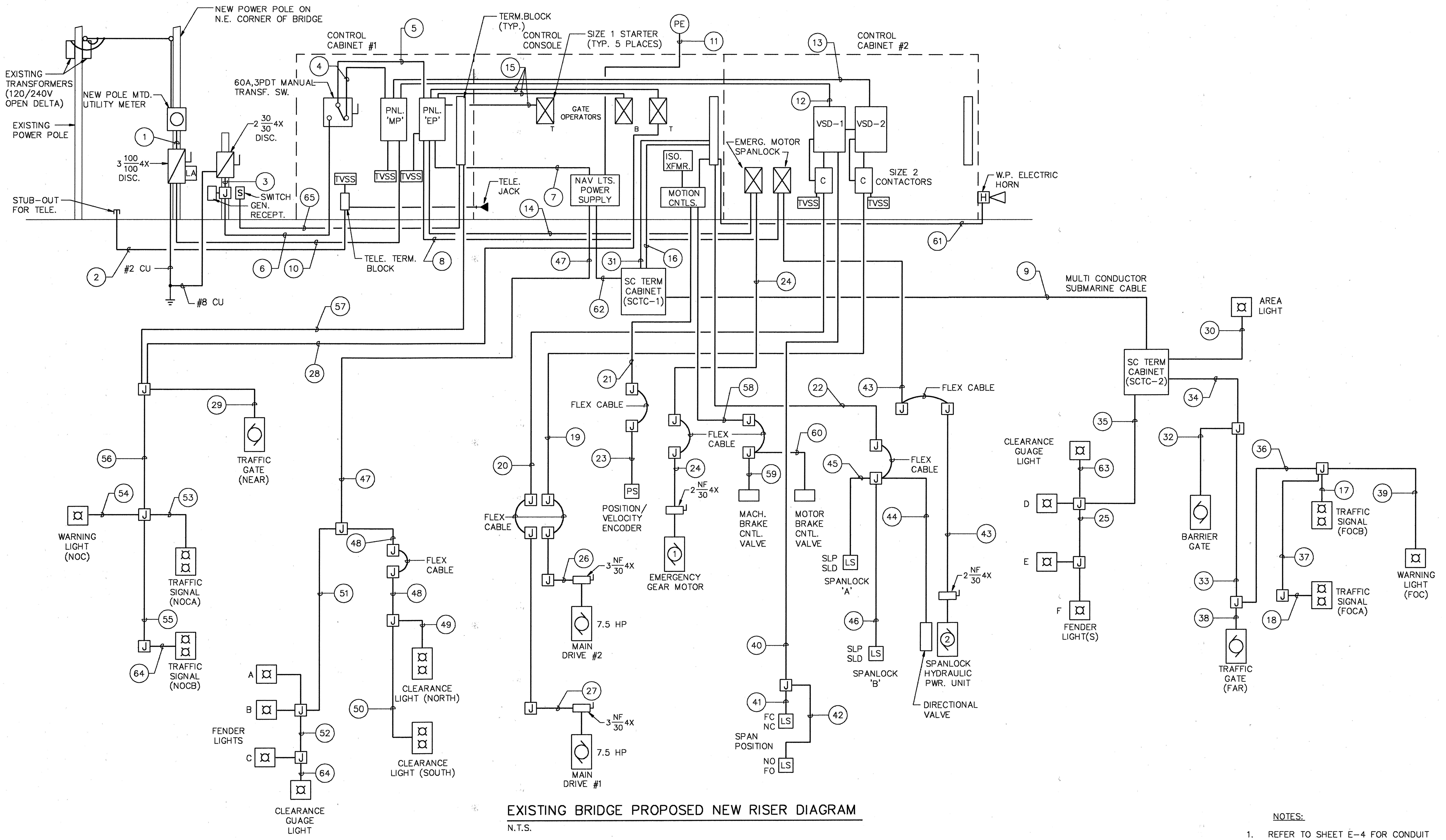
SHEET TITLE: ELECTRICAL SITE PLAN

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-2



EXISTING BRIDGE PROPOSED NEW RISER DIAGRAM

N.T.S.

NOTES:

1. REFER TO SHEET E-4 FOR CONDUIT AND CABLE SCHEDULE.

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PINELLAS COUNTY
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SHEET TITLE: RISER DIAGRAM

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-3

COND. NO.	SIZE	FROM	TO	CONDUCTORS NO.	CONDUCTORS SIZE	CONDUCTORS DESIGNATION	
1	2	UTILITY METER	SERVICE DISCONNECT (NORMAL)	4	1/0	L1,L2,L3,N	
				1	2	GND	
2	1	TELEPHONE PEDESTAL	TEL. TERM. BLOCK	6 PR	24	TELEPHONE	
3	3/4	EMERG. RECEPTACLE	EMERG. DISCONNECT	3	10	E1,E2,N	
				1	10	GND	
4	1	PANEL 'MP'	MAN. XFER. SWITCH	3	6	MP-2,4,N	
				1	10	GND	
5	1	MAN. XFER. SWITCH	EMERG. PANEL 'EP'	3	6	X1,X2,N	
				1	10	GND	
6	1	EMERG. DISCONNECT 3-WAY SWITCH	MAN. XFER. SWITCH CONTROL CONSOLE	3	6	E1,E2,N	
				1	10	GND	
7	(2)	EMERG. PANEL 'EP'	NAV. LTS. POWER SUPPLY	2	12	EP-13,N	
				1	12	GND	
8	(2)	EMERG. PANEL 'EP'	EMERG. DRIVE STARTER	2	10	EP-10,12	
				1	12	GND	
9	SUBM. CABLE	SCTC-1	SCTC-2	24	10	POWER (9 SPARE)	
				48	12	CONTROL (12 SPARE)	
				4	10	GND (1 SPARE)	
10	2	SERVICE DISCONNECT	SERVICE PANEL 'MP'	4	1/0	L1,L2,L3,N	
				1	2	GND	
11	1/2	NAV. LTS. POWER SUPPLY	P.E. SWITCH	3	14	–	
				1	12	GND	
12	(2)	SERVICE PANEL 'MP'	VSD-1	3	10	MP-1,3,5	
				1	10	GND	
13	(2)	SERVICE PANEL 'MP'	VSD-2	3	10	MP-7,9,11	
				1	10	GND	
14	(2)	EMERG. PANEL 'EP'	SPANLOCK STARTER	2	10	EP-2,4	
				1	12	GND	
15	(2)	EMERG. PANEL 'EP'	GATE OPERATOR STARTER (TYP.)	2	10	EP-1,3 (EP-5,7) (EP-9,11)	
				1	12	GND	
16	2	CONTROL CONSOLE	SCTC-1	12	10	NAV-1,N,EP-5,7,9,11,N,TS-1,WS-1,N, MP-12,SW,N	
				6	10	SPARE	
				4	10	GND	
17	3/4	JUNCTION BOX	TRAFFIC SIGNAL (FOCB)	2	10	TS-1,N	
				2	12	CONTROL	
				1	10	GND	
18	3/4	JUNCTION BOX	TRAFFIC SIGNAL (FOCB)	2	10	TS-1,N	
				2	12	CONTROL	
				1	10	GND	
19	3/4	VSD-2 CONTACTOR	JUNCTION BOX	3	10	MP-7,9,11	
				1	10	GND	
20	3/4	VSD-1 CONTACTOR	JUNCTION BOX	3	10	MP-1,3,5	
				1	10	GND	
21	3/4	MOTION CONTROLLER	JUNCTION BOX (OPTICAL ENCODER)			PER ENCODER MFR. REQMT'S	
22	1	JUNCTION BOX (SPANLOCK)	TERMINAL BLOCK	19	14	SPANLOCK LIMIT SW'S, DIR. VALVE	
23	3/4	JUNCTION BOX	POSITION/VELOCITY ENCODER	4	18 SH	ENCODER SIGNALS	
24	3/4	EMERG. MOTOR STARTER	DISCONNECT SWITCH (EMERG. GEAR MOTOR)	2	10	EP-10,12	
				1	12	GND	
25	3/4	JUNCTION BOX	(JUNCTION BOX) (FENDER LIGHTS, CLEARANCE GAUGE LIGHT)	3	10	NAV-1,PE,N	
				2	12	CONTROL	
				1	10	GND	
26	3/4	JUNCTION BOX	DISCONNECT SWITCH (MAIN DRIVE #2)	3	10	MP-7,9,11	
				1	10	GND	
27	3/4	JUNCTION BOX	DISCONNECT SWITCH (MAIN DRIVE #1)	3	10	MP-1,3,5	
				1	10	GND	
28	1 1/4	GATE OPERATOR STARTER (NEAR TRAFFIC)	JUNCTION BOX	2	10	EP-1,3	
				8	12	CONTROL	
				1	12	GND	
29	1	JUNCTION BOX	NEAR TRAFFIC GATE	2	10	EP-1,3	
				8	12	CONTROL	
				1	12	GND	
30	3/4	SCTC-2	AREA LIGHT	3	10	MP-12,SW,N	
				1	12	GND	
31	2	SCTC-1	CONTROL CONSOLE	48	12	CONTROLS	
32	1 1/4	JUNCTION BOX	BARRIER GATE	3	10	EP-9,11,N	
				16	12	CONTROL	
				1	10	GND	
33	1 1/4	JUNCTION BOX	JUNCTION BOX (GATE, SIGNALS, WARNING LIGHT)	7	10	EP-5,7,N,TS-1,N,WS-1,N	
				12	12	CONTROL	
				2	10	GND	
34	(2) 2	SCTC-2	JUNCTION BOX (GATES, SIGNALS)	9	10	EP-5,7,9,11,N,TS-1,N,WS-1,N	
				32	12	CONTROL	
				3	10	GND	
35	1	SCTC-2	JUNCTION BOX (FENDER LIGHTS AND CLEARANCE GUAGE LIGHT)	3	10	NAV-1,PE,N	
				4	12	CONTROL	
				1	10	GND	
36	1	JUNCTION BOX	JUNCTION BOX (TRAFFIC SIGNALS, WARNING LIGHT)	4	10	TS-1,N,WS-1,N	
				4	12	CONTROL	
				1	10	GND	
37	1	JUNCTION BOX	JUNCTION BOX TRAFFIC SIGNAL (FOCA) (FOCB)	2	10	TS-1,N	
				2	12	CONTROL	
				1	10	GND	
38	1	JUNCTION BOX	TRAFFIC GATE (FAR)	3	10	EP-5,7,N	
				8	12	CONTROL	
				1	10	GND	
39	1	JUNCTION BOX	WARNING LIGHT (FOC)	2	10	WS-1,N	
				1	10	GND	
40	3/4	VSD-1	JUNCTION BOX (SPAN LIMIT SWITCHES)	8	14	FC-1,2,NC-1,2,NO-1,2,FO-1,2	
41	3/4	JUNCTION BOX	LIMIT SWITCH FC/NC	4	14	FC-1,FC-2,NC-1,NC-2	
42	3/4	JUNCTION BOX	LIMIT SWITCH NO/FO	4	14	NO-1,NO-2,FO-1,FO-2	
43	3/4	SPANLOCK STARTER	DISCONNECT SWITCH (HYD. PWR. UNIT)	2	10	EP-2,4	
				1	12	GND	
44	3/4	SPANLOCK HYDRAULIC POWER UNIT (DIRECTIONAL VALVE)	JUNCTION BOX (LIMIT SWITCHES)	3	14	–	
45	3/4	JUNCTION BOX	LIMIT SWITCHES SPANLOCK 'A'	8	14	SLAP-1,2,3,4,SLAD-1,2,3,4	(1)
46	3/4	JUNCTION BOX	LIMIT SWITCHES SPANLOCK 'B'	8	14	SLBP-1,2,3,4,SLBD-1,2,3,4	(1)
47	1	NAV. LTS. POWER SUPPLY	JUNCTION BOX (NAVIGATION LIGHTS)	3	12	NAV-2,PE,N	
				8	12	CONTROLS	
				1	12	GND	
48	3/4	JUNCTION BOX (FLEX CABLE)	CLEARANCE LIGHTS	2	12	NAV-2,N	
				2	12	CONTROLS	
				1	12	GND	
49	3/4	JUNCTION BOX	CLEARANCE LIGHT (NORTH)	2	12	NAV-2,N	
				2	12	CONTROLS	
				1	12	GND	
50	3/4	JUNCTION BOX	CLEARANCE LIGHT (SOUTH)	2	12	NAV-2,N	
				2	12	CONTROLS	
				1	12	GND	
51	3/4	JUNCTION BOX	JUNCTION BOX (FENDER LIGHTS & CLEARANCE GUAGE LIGHT)	3	12	NAV-2,PE,N	
				4	12	CONTROLS	
				1	12	GND	
52	3/4	FENDER LIGHT	CLEARANCE GUAGE LIGHT	3	12	NAV-2,PE,N	
				1	12	GND	
53	1	JUNCTION BOX	TRAFFIC SIGNAL (NOCA)	2	12	TS-2,N	
				2	12	CONTROLS	
				1	12	GND	
54	1	JUNCTION BOX	WARNING LIGHT (NOC)	2	10	WS-2,N	
				1	12	GND	
55	1	JUNCTION BOX	JUNCTION BOX TRAFFIC SIGNAL (NOCB)	2	12	TS-2,N	
				2	12	CONTROLS	
				1	12	GND	
56	1	JUNCTION BOX	JUNCTION BOX (NEAR TRAFFIC SIGNALS)	3	10	TS-2,WS-2,N	
				4	12	CONTROLS	
				1	12	GND	
57	1 1/4	CONTROL CABINET #1	JUNCTION BOX	3	10	TS-2,WS-2,N	
				4	12	CONTROLS	
				1	12	GND	
58	1	MOTION CONTROLLER	JUNCTION BOX (BRAKE CONTROLS)	8	14	CONTROLS	
				(2)4	18 SH	CONTROLS	
59	3/4	JUNCTION BOX	MACHINE BRAKE SOLENOID	5	14	CONTROLS	
				4	18 SH	CONTROLS	
60	3/4	JUNCTION BOX	MOTOR BRAKE SOLENOID	3	14	CONTROLS	
				4	18 SH	CONTROLS	
61	3/4	CONTROL CONSOLE	ELECTRIC HORN	2	12	POWER	
				1	12	GND	
62	1	NAV. LTS. POWER SUPPLY	SCTC-1	3	10	NAV-1,PE,N	
				8	12	CONTROLS	
				1	12	GND	
63	3/4	JUNCTION BOX	CLEARANCE GUAGE LIGHT	3	10	PE,N	
				2	12	CONTROLS	
				1	12	GND	
63	3/4	JUNCTION BOX	CLEARANCE GUAGE LIGHT	3	10	PE,N	
				2	12	CONTROLS	
				1	12	GND	
64	3/4	JUNCTION BOX	TRAFFIC SIGNAL (NOCB)	2	12	TS-2,N	
				2	12	CONTROLS	
				1	12	GND	
65	3/4	LIGHT SWITCH	CONTROL CABINET #1	2	12	MP-12,SW LEG	
				1	12	GND	

DRAWING NOTES:

(1) QUANTITIES SHOWN ARE MINIMUM. PROVIDE REQUIRED QUANTITIES AND SIZES OF CONDUCTORS BASED ON SUBMITTED CONTROL DIAGRAMS.

(2) INTERNAL CONSOLE/CABINET WIRING.

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2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

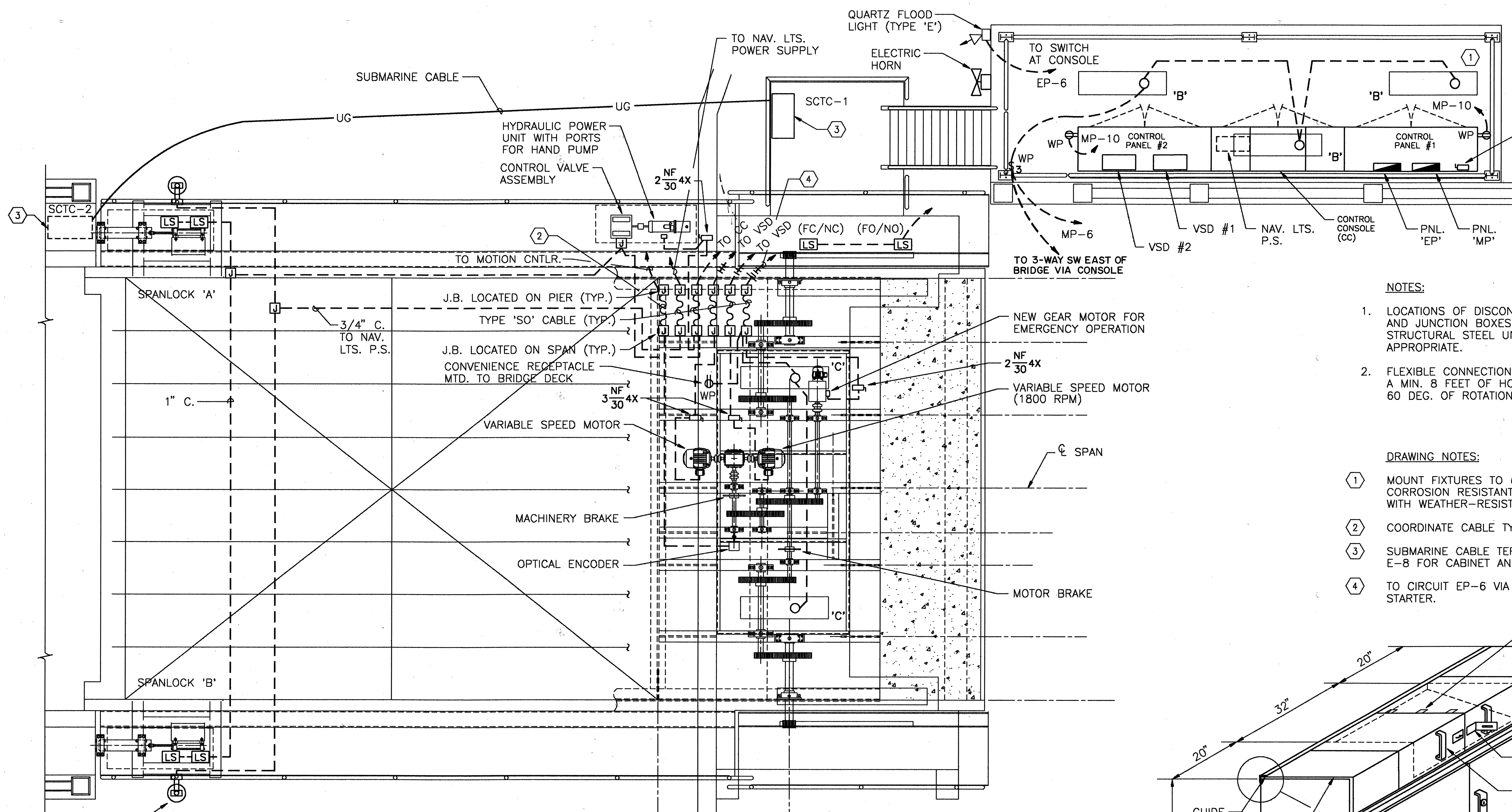
PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

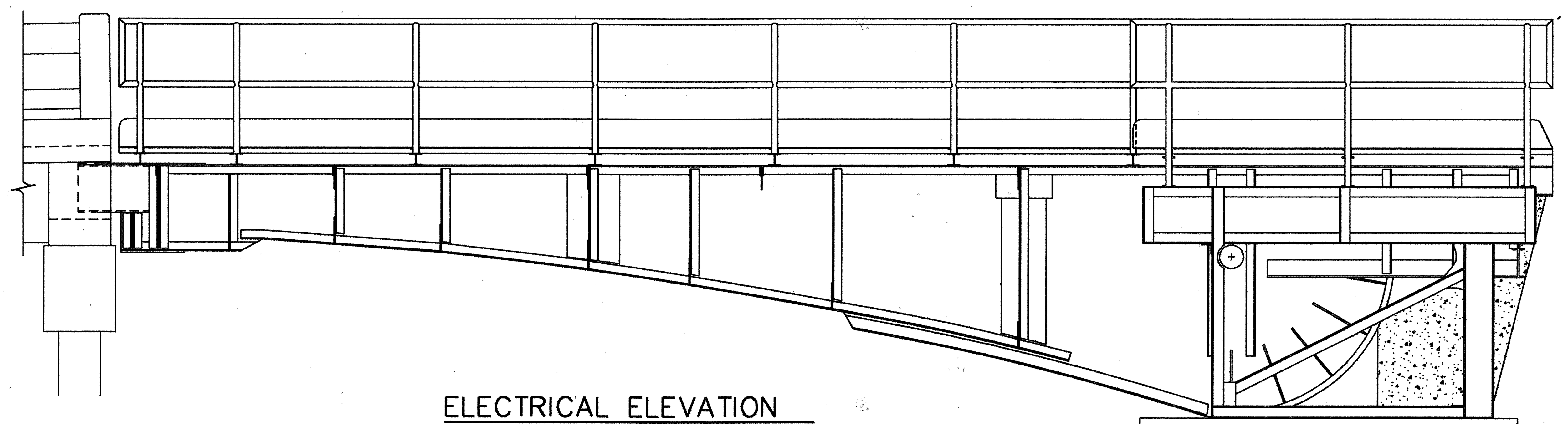
SHEET TITLE: CONDUIT AND CABLE SCHEDULE

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-4



ELECTRICAL PLAN
SCALE: 3/8" = 1'-0"



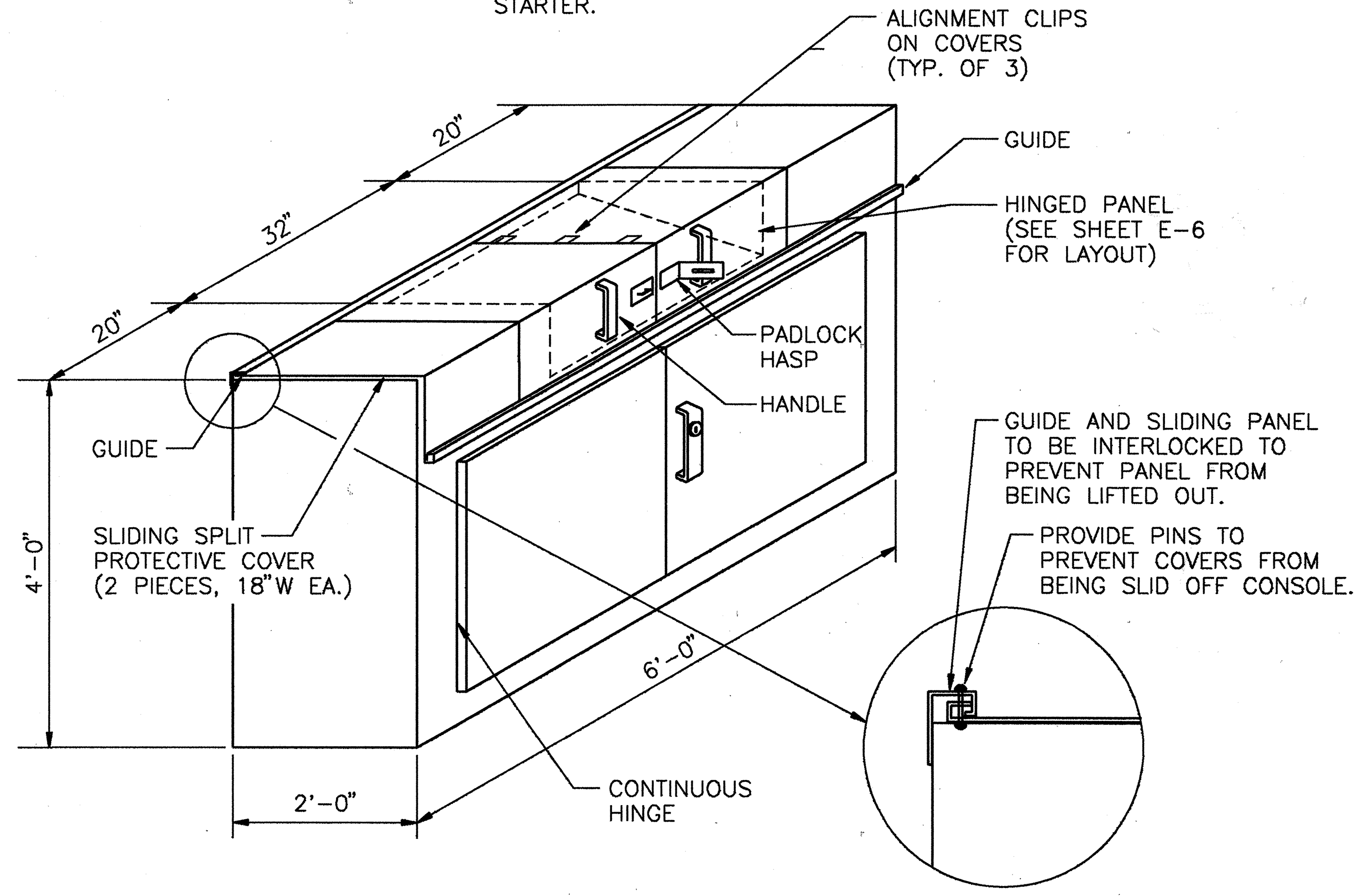
ELECTRICAL ELEVATION
SCALE: 3/8" = 1'-0"

NOTES:

1. LOCATIONS OF DISCONNECTS, CONDUIT, LIGHT FIXTURES AND JUNCTION BOXES ARE DIAGRAMATIC; MOUNT TO SPAN STRUCTURAL STEEL UNDERDECK OR ON PIER AS APPROPRIATE.
2. FLEXIBLE CONNECTIONS AT TRUNNIONS SHALL ALLOW FOR A MIN. 8 FEET OF HORIZONTAL MOVEMENT AS WELL AS 60 DEG. OF ROTATION.

DRAWING NOTES:

1. MOUNT FIXTURES TO (WIDE RIB) GALVANIZED ROOF WITH CORROSION RESISTANT HARDWARE. SEAL ALL PENETRATIONS WITH WEATHER-RESISTANT, UV-STABLE SEALANT.
2. COORDINATE CABLE TYPE WITH ENCODER SUPPLIER.
3. SUBMARINE CABLE TERMINAL CABINET. REFER TO SHEET E-8 FOR CABINET AND CABLE SUPPORT.
4. TO CIRCUIT EP-6 VIA CONTROL CONSOLE AND EP-10 VIA STARTER.



NOTE:
PROTECTIVE COVER DESIGN IS DIAGRAMATIC. CONTRACTOR MAY PROVIDE SUITABLE, COMPARABLE ARRANGEMENT FOR APPROVAL.

CONTROL CONSOLE DETAIL
N.T.S.

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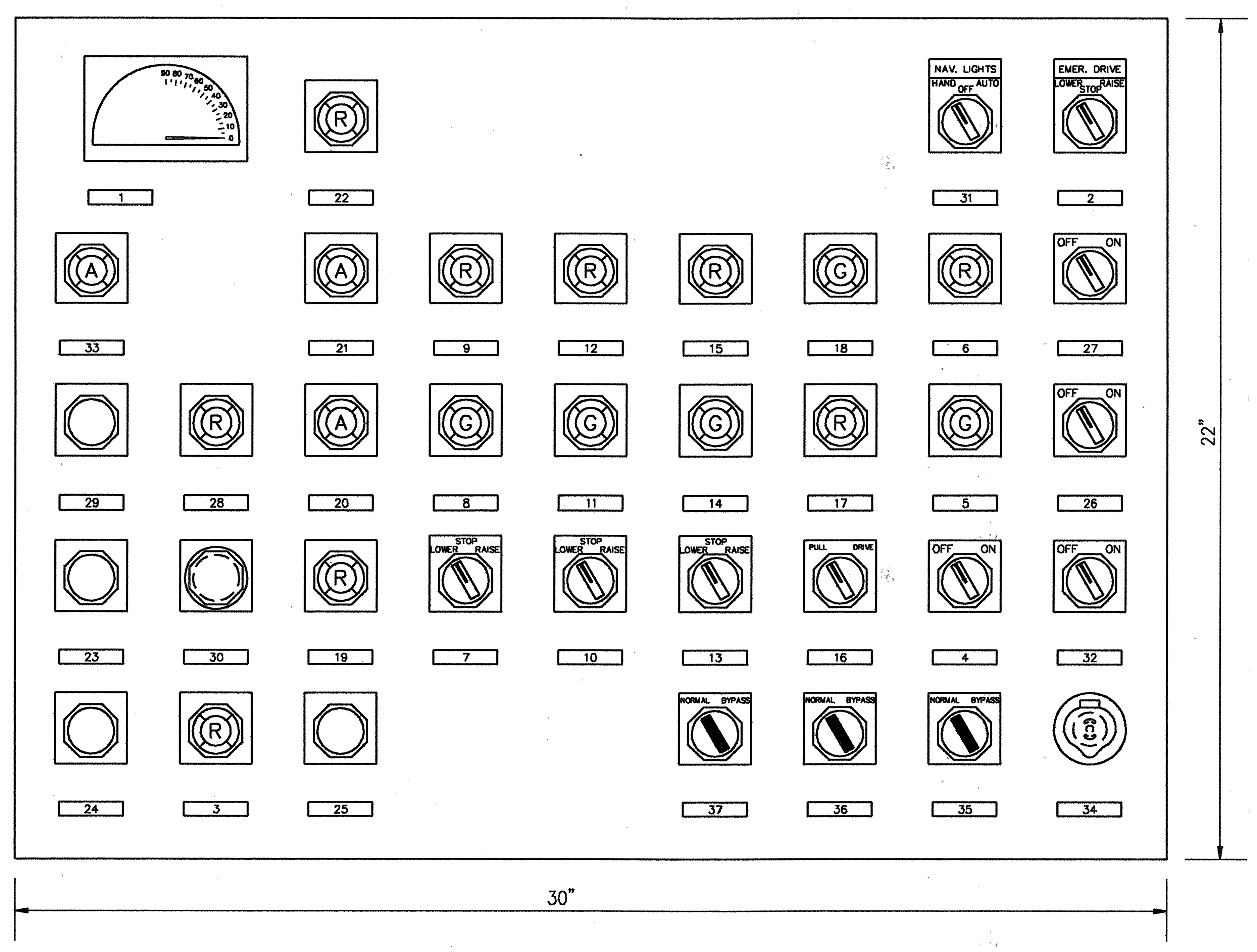
SHEET TITLE: SPAN ELECTRICAL PLAN

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET: E-5



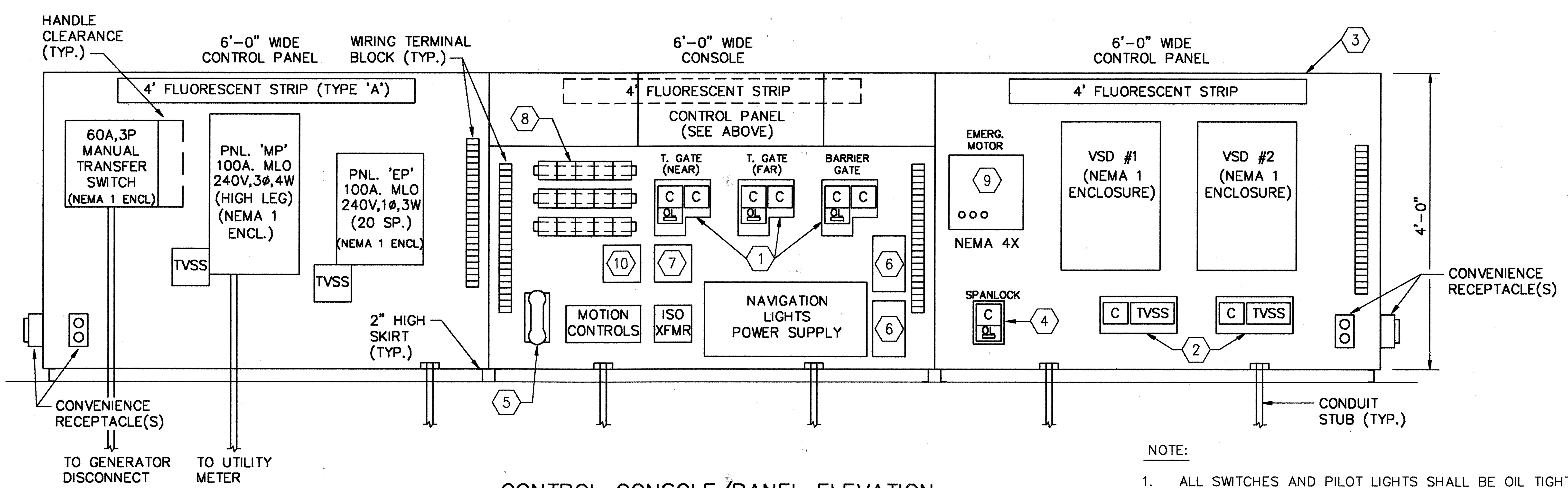
CONTROL PANEL NAMEPLATE

SCALE: 3/8"=1"

DRAWING NOTES:

1. SIZE 1 REVERSING STARTER IN OPEN FRAME, HORIZONTAL MOUNT. SQUARE 'D' #8736 OR APPROVED EQUAL.
2. SIZE 2 CONTACTOR IN OPEN FRAME, HORIZONTAL MOUNT. SQUARE 'D' #8736 OR APPROVED EQUAL, WITH TRANSIENT VOLTAGE SURGE SUPPRESSOR ON LOAD SIDE OF CONTACTOR.
3. STAINLESS STEEL CABINET, WELDED CONSTRUCTION, GASKETED DOUBLE DOORS. CONTINUOUS HINGE PINS AND LOCKING LATCH HANDLES.
4. SIZE ø FULL VOLTAGE STARTER IN OPEN FRAME, VERTICAL MOUNT. SQUARE 'D' #8536 OR APPROVED EQUAL.
5. PORTABLE TELEPHONE HANDSET, STORAGE CRADLE MOUNTED ON INSIDE OF DOOR. PROVIDE WEATHERPROOF TELEPHONE RECEPTACLE ON CONSOLE (HUBBELL PH6596 OR EQUAL) WITH TELEPHONE CABLE ASSEMBLY (HUBBELL PH6599 OR EQUAL). PROVIDE MATCHING PLUG AND CABLE ON HANDSET.
6. LOW VOLTAGE TVSS DEVICE, 10-PAIR UNIT EQUAL TO APT TE/DA20B-XX. SUITABLE FOR 24V DC SIGNALS.
7. POWER SUPPLY FOR MOTION CONTROLLER.
8. RAIL MOUNTED CONTROL RELAYS.
9. SIZE 1 STARTER FOR EMERGENCY DRIVE MOTOR. RELOCATED FROM SOUTH SIDE OF BRIDGE (SEE SITE PLAN).
10. 24 VOLT, 400W POWER SUPPLY FOR EMERGENCY DRIVE CLUTCH.

CONTROL PANEL NAME PLATE SCHEDULE		
NO.	FIRST LINE	SECOND LINE
1	LEAF POSITION	
2	EMERGENCY DRIVE	MOTOR
3	DRIVE FAILURE	
4	TRAFFIC	SIGNALS
5	TRAFFIC LIGHTS	OFF (GREEN)
6	TRAFFIC LIGHTS	ON (RED)
7	WEST TRAFFIC	GATE CONTROL
8	WEST TRAFFIC	GATE OPEN
9	WEST TRAFFIC	GATE CLOSED
10	EAST TRAFFIC	GATE CONTROL
11	EAST TRAFFIC	GATE OPEN
12	EAST TRAFFIC	GATE CLOSED
13	BARRIER	GATE CONTROL
14	BARRIER	GATE OPEN
15	BARRIER	GATE CLOSED
16	NOSE LOCK	CONTROL
17	NOSE LOCK	LOCK PULLED
18	NOSE LOCK	LOCK DRIVEN
19	BRIDGE SPAN	FULLY CLOSED
20	BRIDGE SPAN	NEARLY CLOSED
21	BRIDGE SPAN	NEARLY OPEN
22	BRIDGE SPAN	FULLY OPEN
23	BRIDGE SPAN	RAISE
24	BRIDGE SPAN	LOWER
25	WARNING HORN	PUSHBUTTON
26	BRIDGE LIGHT	
27	DESK LIGHT	
28	BRAKE FAILURE	
29	NORMAL STOP	(MOTOR BRAKE)
30	EMERGENCY STOP	(MACHINE BRAKE)
31	NAVIGATION LIGHTS	
32	MACHINE AREA	LIGHT
33	LEAF OVERSPEED	
34	TELEPHONE RECEPTACLE	
35	SPAN LOCK	BYPASS
36	SPAN LIMIT	SWITCH BYPASS
37	GATE LIMIT	SWITCH BYPASS



CONTROL CONSOLE/PANEL ELEVATION

SCALE: 1"=1'-0"

NOTE:

1. ALL SWITCHES AND PILOT LIGHTS SHALL BE OIL TIGHT, CORROSION-RESISTANT.
2. PROVIDE SWITCH INSIDE EACH CABINET AND CONTROL CONSOLE FOR THE FLUORESCENT LIGHT.

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Approved by	G.M. MOSCINSKI	

G.M. Moscinski

DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: CONTROL PANEL DETAILS & NOTES

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-6

SUMMARY OF QUANTITIES		
ITEM	UNIT	QUANTITY
ELECTRICAL SYSTEM	L.S.	1
TYPE 'A' LIGHT FIXTURE	EA.	3
TYPE 'B' LIGHT FIXTURE	EA.	2
TYPE 'C' LIGHT FIXTURE	EA.	1
TYPE 'D' LIGHT FIXTURE	EA.	1
TOGGLE LIGHT SWITCH	EA.	1
GENERATOR RECEPTACLE, WP	EA.	1
METER SOCKET	EA.	1
DISCONNECT SWITCHES		
3P-100-100-4X	EA.	1
2P-NF-30-4X	EA.	3
3P-NF-30-4X	EA.	2
STARTER SIZE 0	EA.	1
STARTER SIZE 1	EA.	4
CONTACTOR SIZE 2	EA.	2
PULLBOX (12" SQ.)	EA.	8
LIGHTNING ARRESTOR (TVSS)	EA.	5
PANEL 'MP' (240/120V, 3Ø)	EA.	1
PANEL 'EP' (240/120V, 1Ø)	EA.	1
JUNCTION BOX (4" SQ.)	EA.	46
W.P. ELECTRIC HORN 95dB @ 10'	EA.	1
DEMOLITION	L.S.	1
CONTROL CABINET	EA.	2
CONTROL CONSOLE	EA.	1
LIMIT SWITCH	EA.	4
GROUNDING ELECTRODE (COPPERWELD)	L.F.	30
GROUNDING ELECTRODE (STAINLESS STEEL)	L.F.	20
(CONDUCTOR) #14 CU THHN/MTW	L.S.	1
(CONDUCTOR) #12 CU THWN	L.S.	1
(CONDUCTOR) #10 CU THWN	L.S.	1
(CONDUCTOR) #6 CU THWN	L.S.	1
(CONDUCTOR) #4/0 (BARE)	L.S.	1
(CONDUIT) 1" PVC SCH. 80	L.S.	1
(CONDUIT) 3/4" FIBERGLASS REINFORCED EPOXY	L.S.	1
(CONDUIT) 1" FIBERGLASS REINFORCED EPOXY	L.S.	1
(CONDUIT) 1 1/2" FIBERGLASS REINF. EPOXY	L.S.	1
(CONDUIT) 2" FIBERGLASS REINFORCED EPOXY	L.S.	1
(CONDUIT) 1" RIGID GALVANIZED STEEL	L.S.	1
SUBMARINE CABLE	L.F.	90

SCHEDULE – PANEL 'MP'

LOAD SERVED DESCRIPTION	CND. SIZE	WIRE SIZE	CT BKR AMPS	CT BKR P	CT #	AØ KVA	BØ KVA	CØ KVA	CT #	CT BKR P	CT BKR AMPS	WIRE SIZE	CND. SIZE	LOAD SERVED DESCRIPTION
MAIN DRIVE #1		#10	50	3	1	3.00								
		#10			3	6.2	3.00		2	2	60	#6		PANEL 'EP'
		#10			5		5.5	3.00	4			#6		(MAIN XFER. SW.)
MAIN DRIVE #2		#10	50	3	7	3.00		0.5	6	1	20	#12		LIGHTING
		#10			9	0.5	3.00		8	1	20			SPARE
		#10			11		1.0	3.00	10	1	20	#12		CONV. RECEPTACLES
SPARE			20	1	13	0.5		0.5	12	1	20	#10		AREA LIGHT
SPARE			20	1	15	–	0.5		14	3	30	#10		TVSS
SPARE			20	1	17		–	0.5	16					
SPARE			20	1	19	0.5		–	18					
SPACE					21	0.5	–		20	1	20			SPARE
SPACE					23		0.5	–	22	1	20			SPARE
SPACE					25	–		–	24					SPACE
SPACE					27	–	–		26					SPACE
SPACE					29		–	–	28					SPACE
								–	30					SPACE

PANEL TYPE: 3Ø 4 WIRE 120/240 VOLTS — 14.2 13.5 7.5 — DEMAND FACTOR: NONE
MANUFACTURER: SQUARE 'D' — 35.2/.42 = 84A/Ø — TOTAL DEMAND AMPS:
CATALOG NO.: QO LOAD CENTER — TOTAL CONNECTED AMPS — TOTAL DEMAND KVA:
MAIN: LOCATION: TOP LUGS: 100 AMP
ENCLOSURE: NEMA 1 MOUNTING: SURFACE
PANEL SHORT CIRCUIT INTERRUPTING CAPACITY: 10,000 AMPS SYMMETRICAL (MINIMUM)
MODIFICATIONS:

REFER TO RISER DIAGRAM (SHEET E-3) AND CONDUIT SCHEDULE (SHEET E-4) FOR ADDITIONAL CONDUIT AND CABLE INFO.

SCHEDULE – PANEL 'EP'

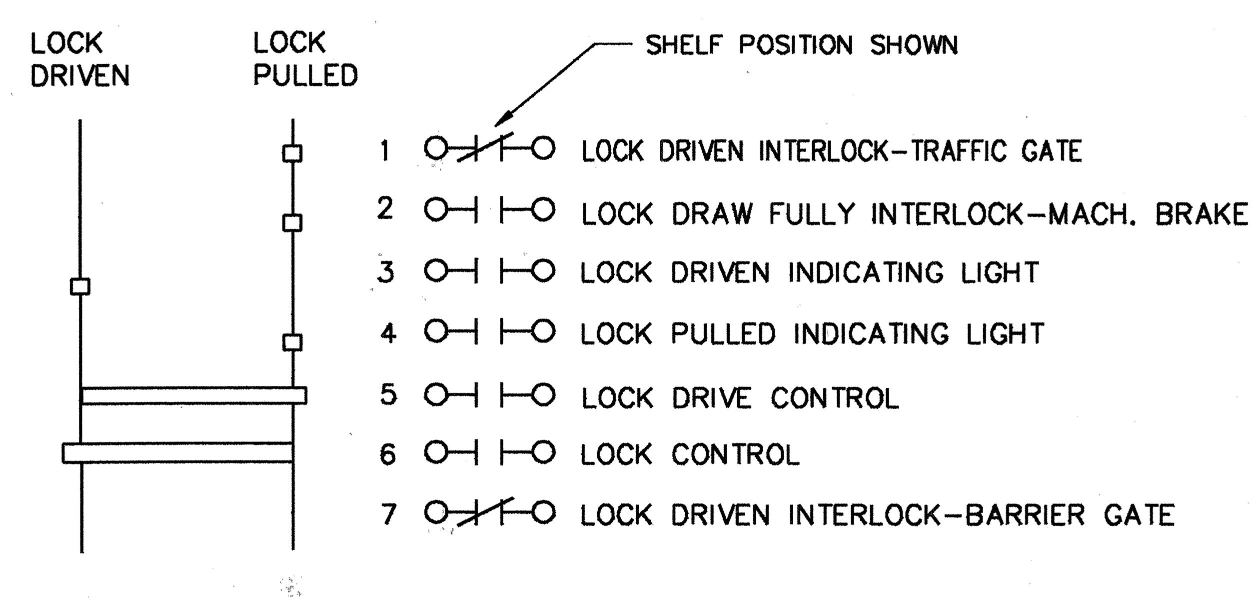
LOAD SERVED DESCRIPTION	CND. SIZE	WIRE SIZE	CT BKR AMPS	CT BKR P	CT #	AØ	BØ	CT #	CT BKR P	CT BKR AMPS	WIRE SIZE	CND. SIZE	LOAD SERVED DESCRIPTION
TRAFFIC GATE (NEAR)		#10	20	2	1	.75							
		#10			3	.75	.75	2	2	20	#10		SPANLOCK HYD. POWER UNIT
TRAFFIC GATE (FAR)		#10	20	2	5	.75	.75	4			#10		
		#10			7	.75	1.0	6	1	20	#12		CONV. RECEPT. & LIGHTING
BARRIER GATE		#10	20	2	9	0.5	0.5	8	1	20			SPARE
		#10			11	0.5	0.5	10	2	20	#10		EMERGENCY DRIVE MOTOR
NAV. LIGHTS P.S.		#12	20	1	13	1.0	0.5	12			#10		
TRAFFIC/WARNING SIGNALS		#10	20	1	15	.7	0.5	14	1	20	#12		ISOLATION XFMR.
SPARE			20	1	17	0.5	0.5	16	2	30	#10		TVSS
SPACE					19	–	0.5	18					
							–	20					

PANEL TYPE: 1Ø 3 WIRE 120/240 VOLTS — 6.2 5.5 — DEMAND FACTOR:
MANUFACTURER: SQUARE 'D' — 11.7/.24 = 49A/Ø — TOTAL DEMAND AMPS:
CATALOG NO.: QO LOAD CENTER — TOTAL CONNECTED AMPS — TOTAL DEMAND KVA:
MAIN: MLO LOCATION: – LUGS: 100 AMP
ENCLOSURE: NEMA 1 MOUNTING: SURFACE
PANEL SHORT CIRCUIT INTERRUPTING CAPACITY:10,000 AMPS SYMMETRICAL (MINIMUM)
MODIFICATIONS:

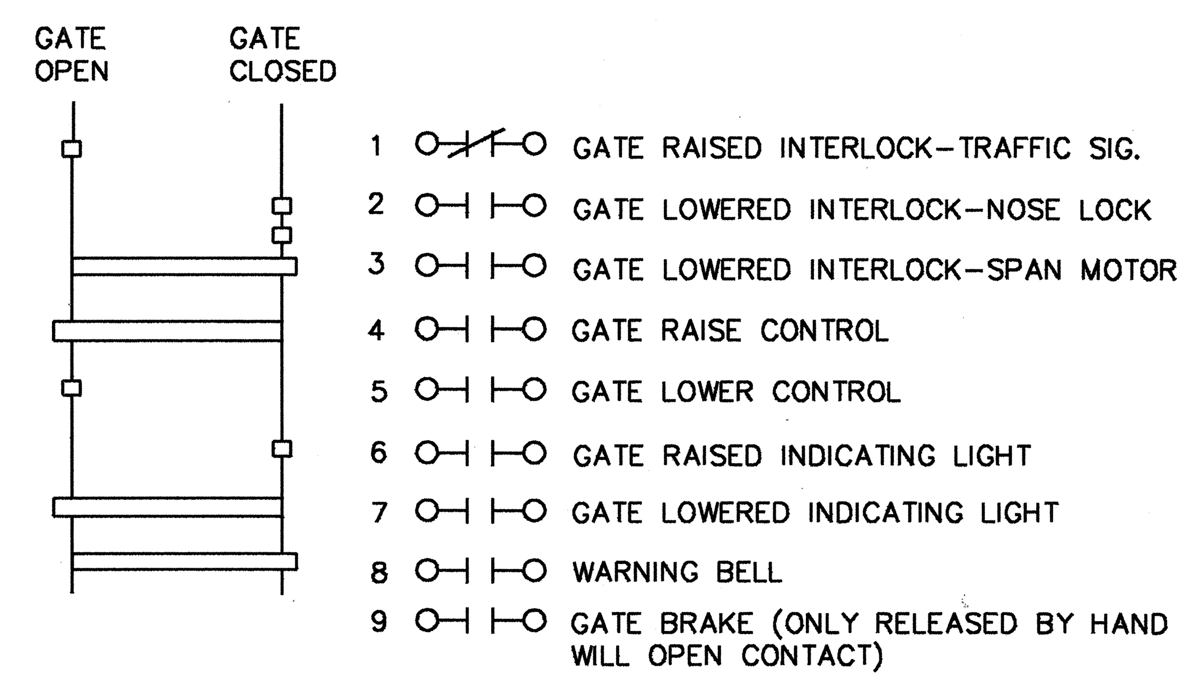
FIXTURE SCHEDULE

MARK	MANUFACTURER	CATALOG NO.	VOLTAGE	LAMPS PER FIXTURE NO.	WATTS	TYPE	COLOR	MOUNTING REMARKS
A	COLUMBIA	K148-120-PAF	120	1	40	F40T12/RS	W.W.	SURFACE
B	COLUMBIA	LUN-240-WL-120-SSLTP	120	2	40	F40T12/RS	W.W.	SURFACE, WP
C	PARAMOUNT	71438-MD-120	120	2	40	F40T12/RS	W.W.	SURFACE, WP *
D	G.E.	M400A2 'POWRDOOR', MEDIUM SEMI-CUTOFF TYPE II DISTRIB.	120	1	400	LU400		25' TAPERED ALUM. POLE W/6' ARM
E	G.E.	QHF-300	120	1	300	Q300T3		SURFACE, CAST BOX

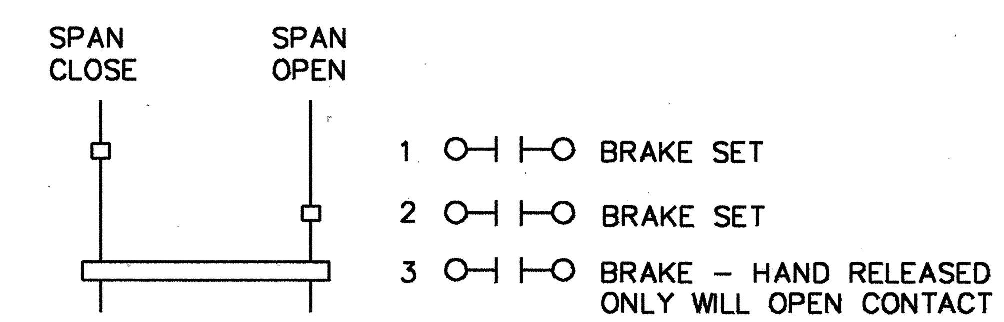
* BRASS LAMP SOCKETS AND VIBRATION RESISTANT LAMP SUPPORTS.



NOSE LOCK LIMIT SWITCH DEVELOPMENT



TRAFFIC GATE LIMIT SWITCH DEVELOPMENT



SERVICE BRAKE LIMIT SWITCH DEVELOPMENT

NOTE:
QUANTITIES ARE APPROXIMATE. CONTRACTOR SHALL PROVIDE TOTAL QUANTITIES NEEDED TO COMPLETE PROJECT.

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Approved by	G.M. MOSCINSKI	

Gene M. Moscinski

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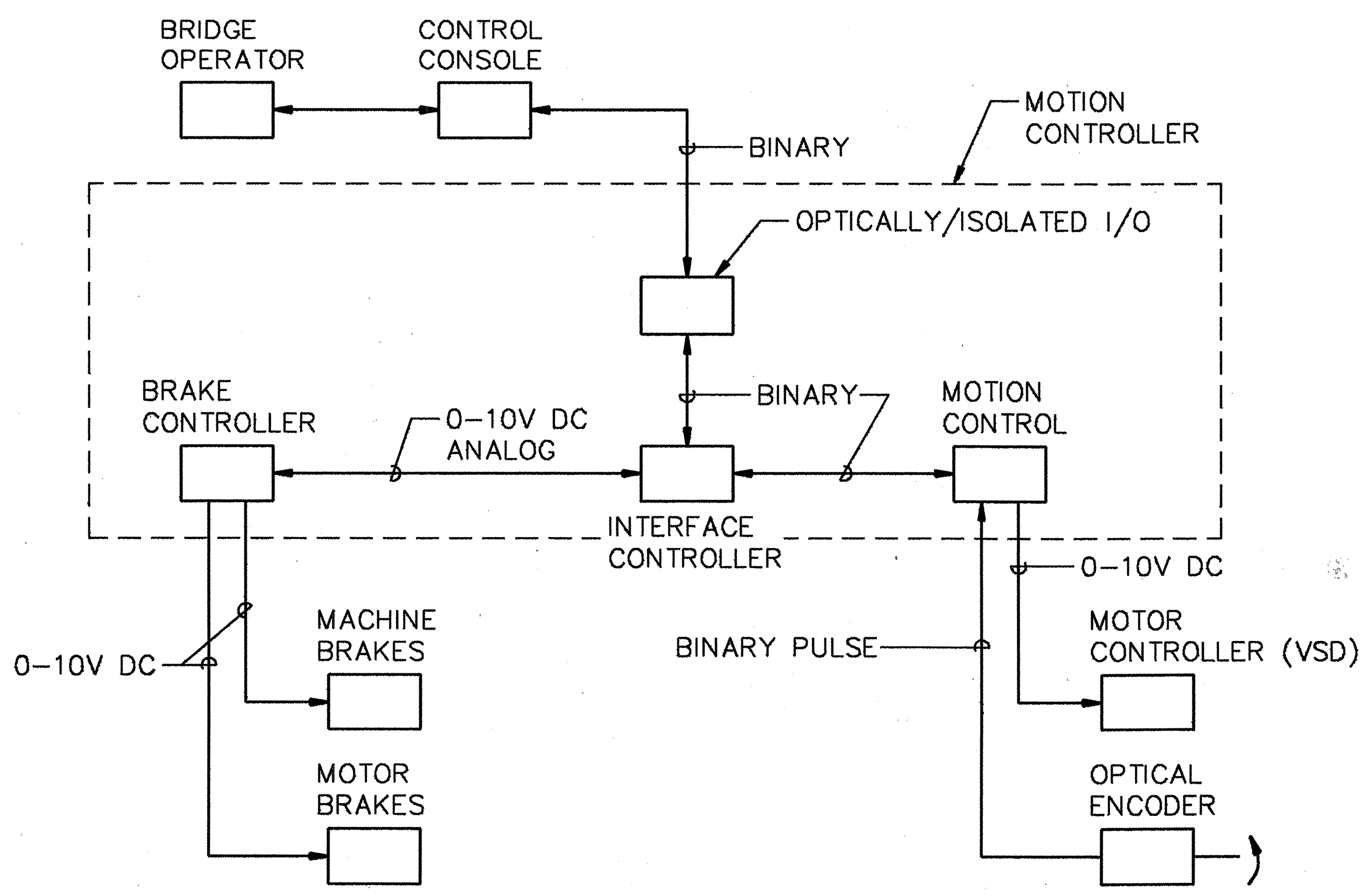
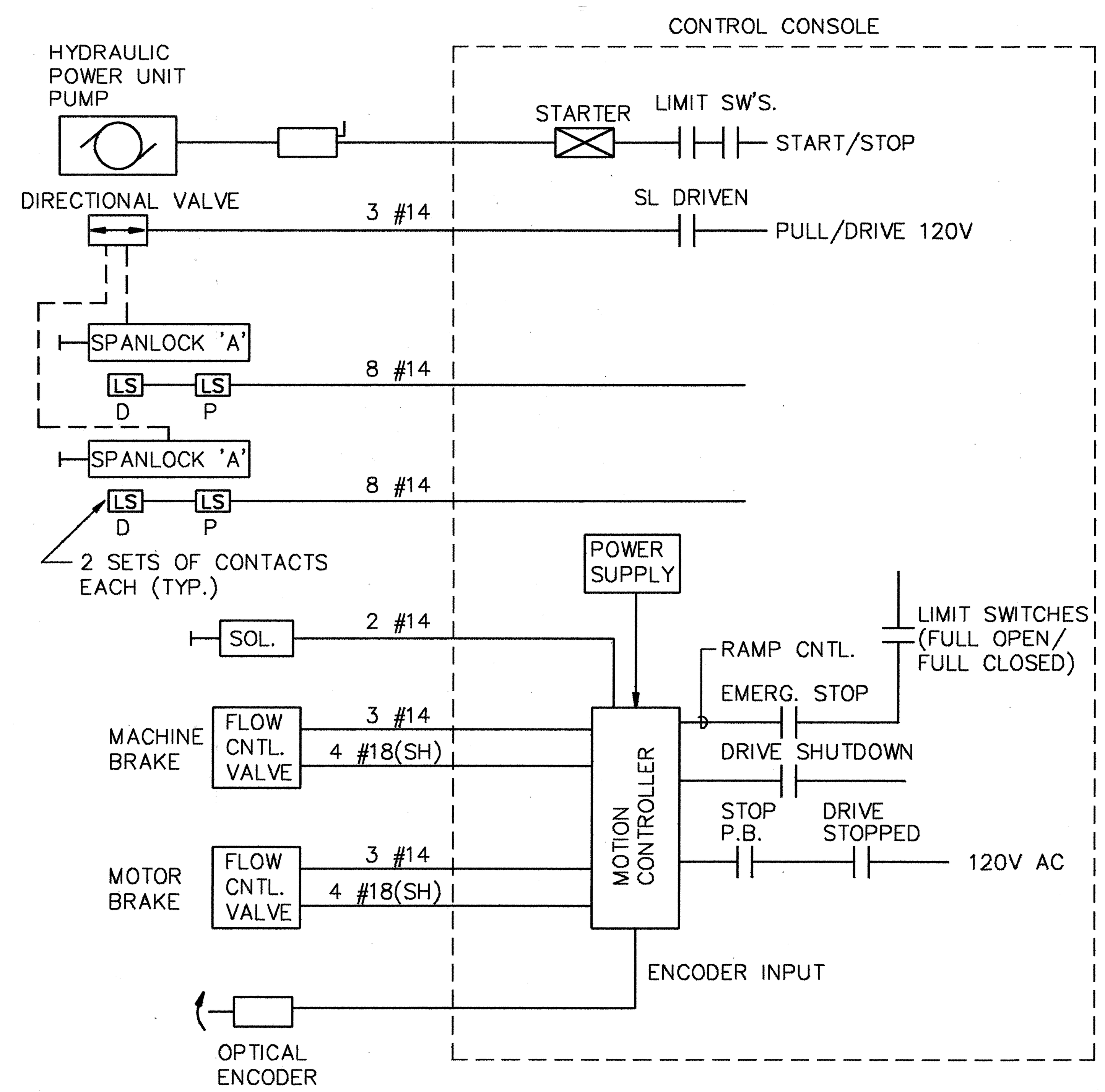
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA
PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

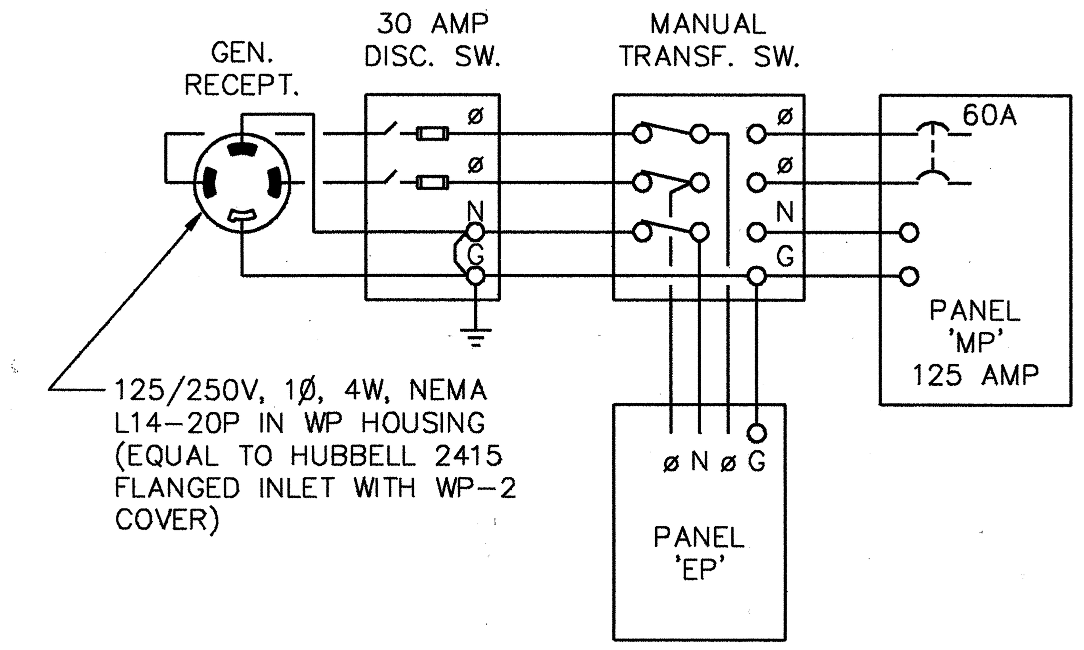
SHEET TITLE: SCHEDULES
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET E-7



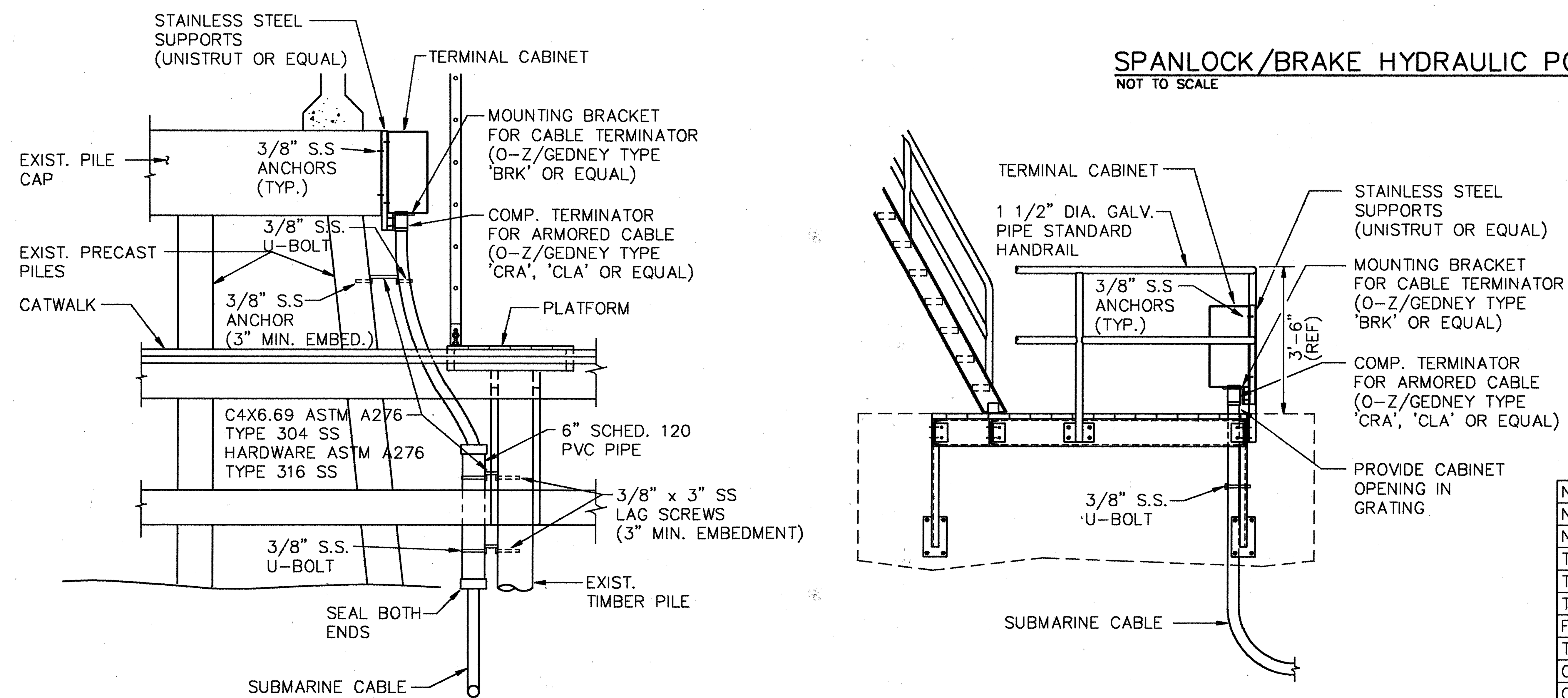
ADAPTIVE MOTION CONTROL WITH ENCODER FEEDBACK
NOT TO SCALE



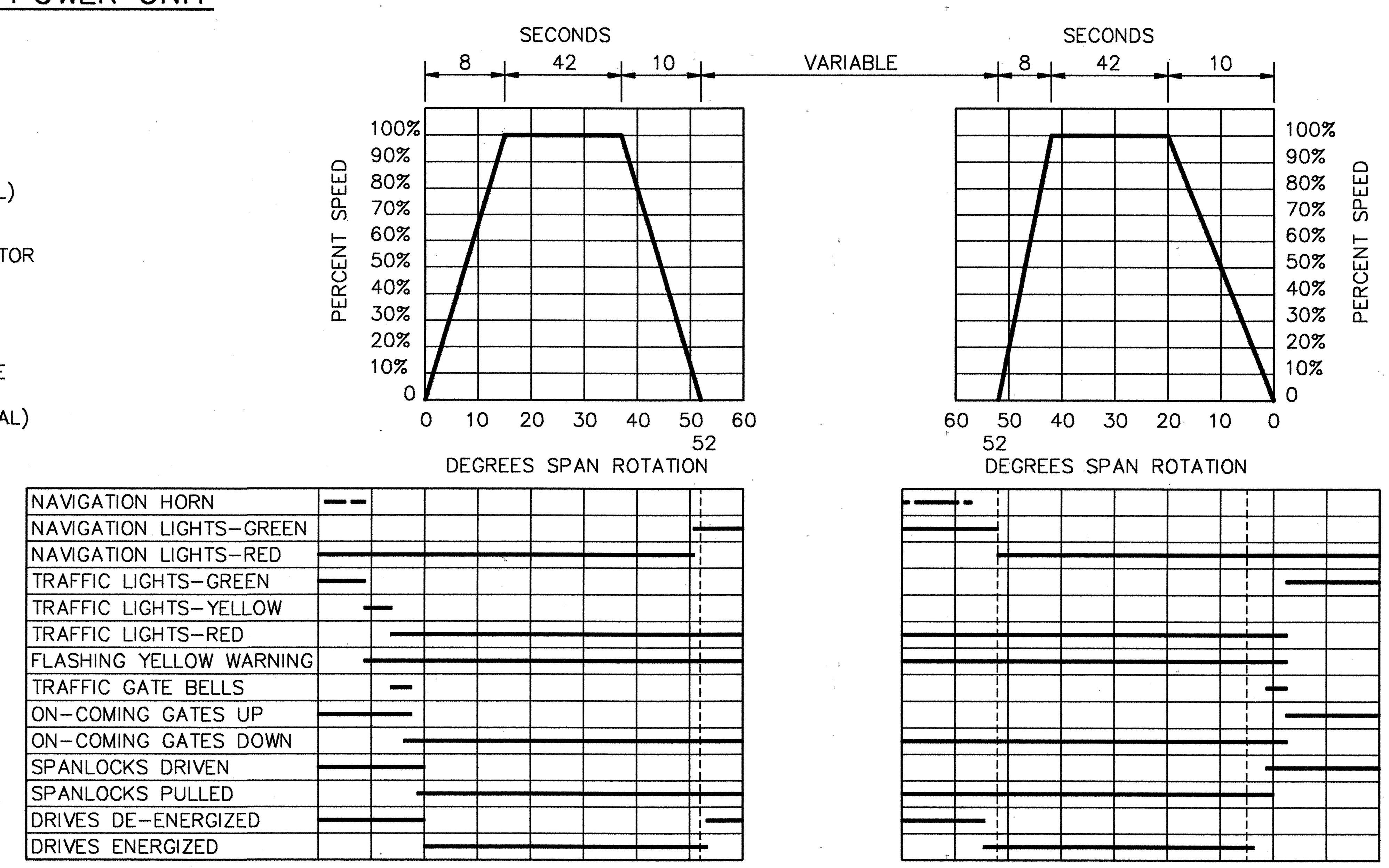
SPANLOCK/BRAKE HYDRAULIC POWER UNIT
NOT TO SCALE



EMERGENCY POWER SUPPLY WIRING
NOT TO SCALE



SCTC MOUNTING DETAIL
TYPICAL SUBMARINE CABLE SUPPORT



SEQUENCE TIME DIAGRAM
NOT TO SCALE

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Approved by	G.M. MOSCINSKI	

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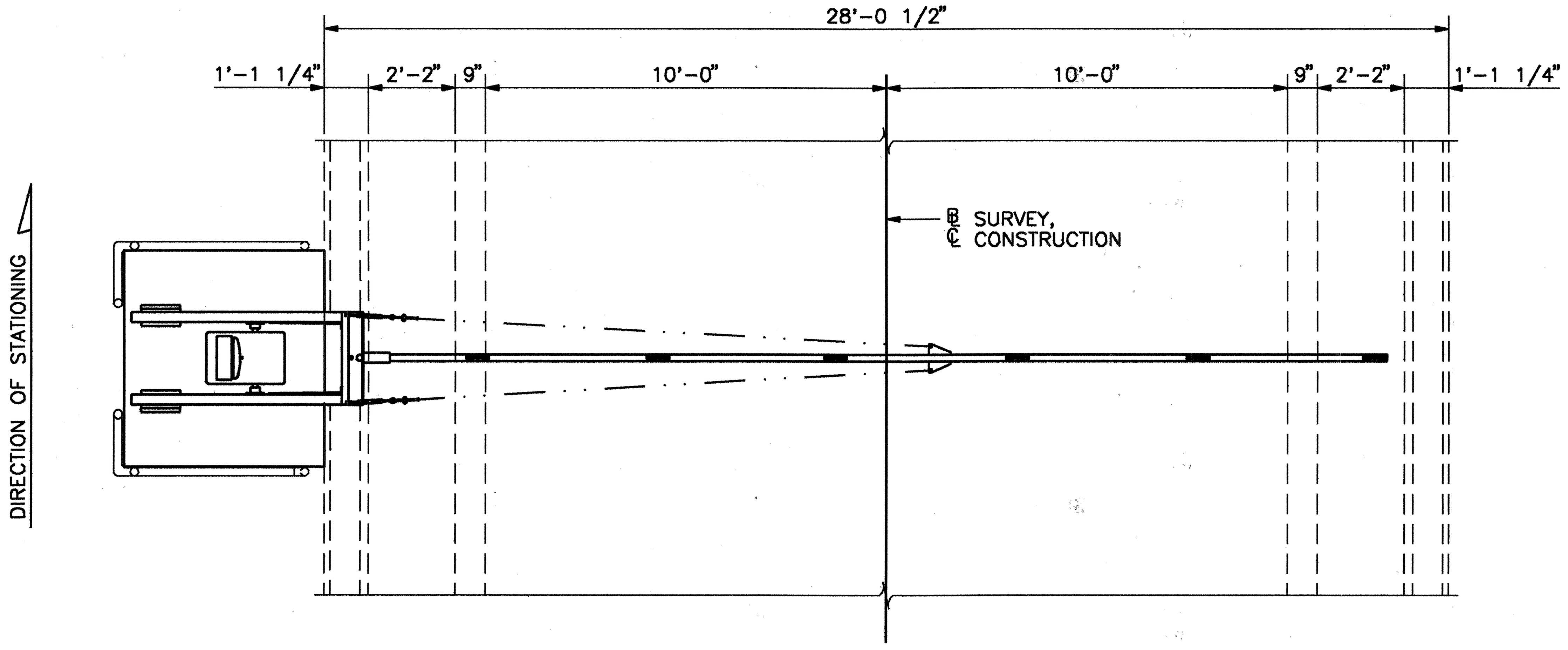
DEPARTMENT OF
PUBLIC WORKS

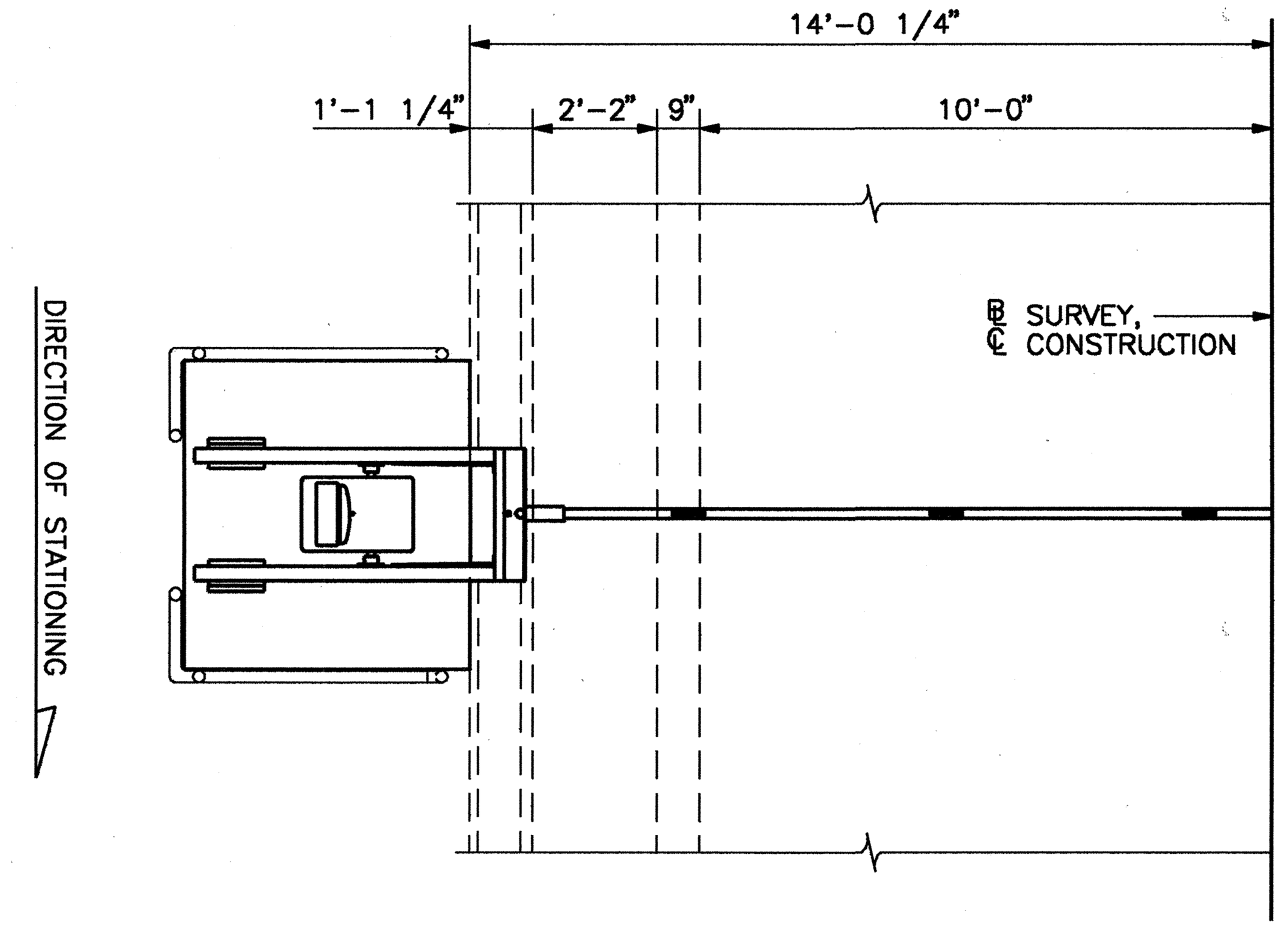
SHEET TITLE: ELECTRICAL DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-8



PLAN



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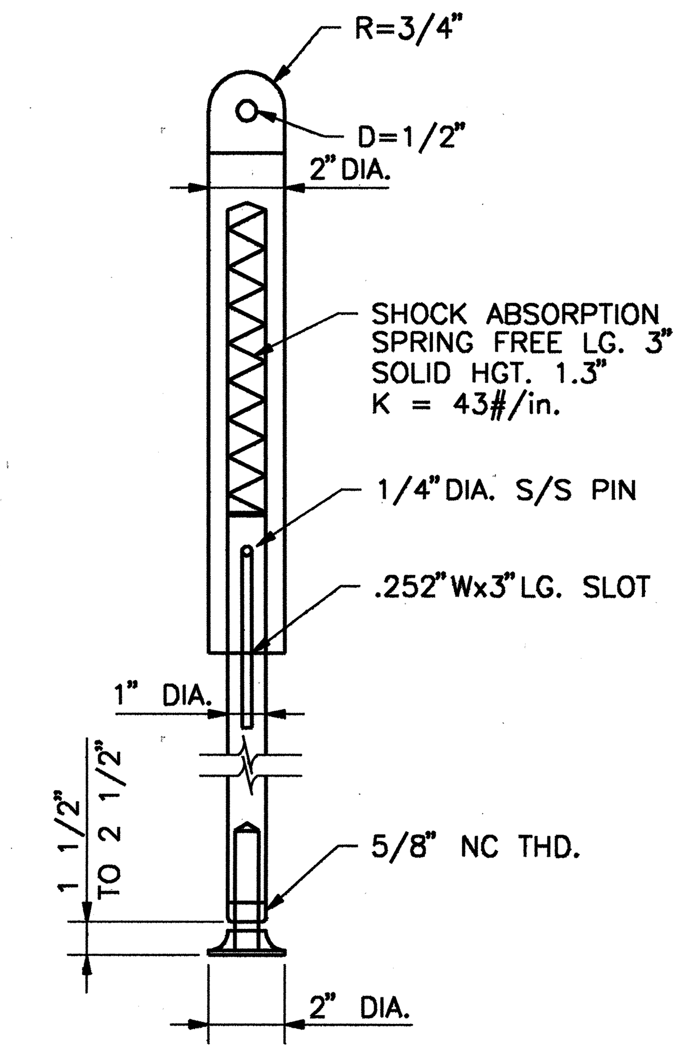
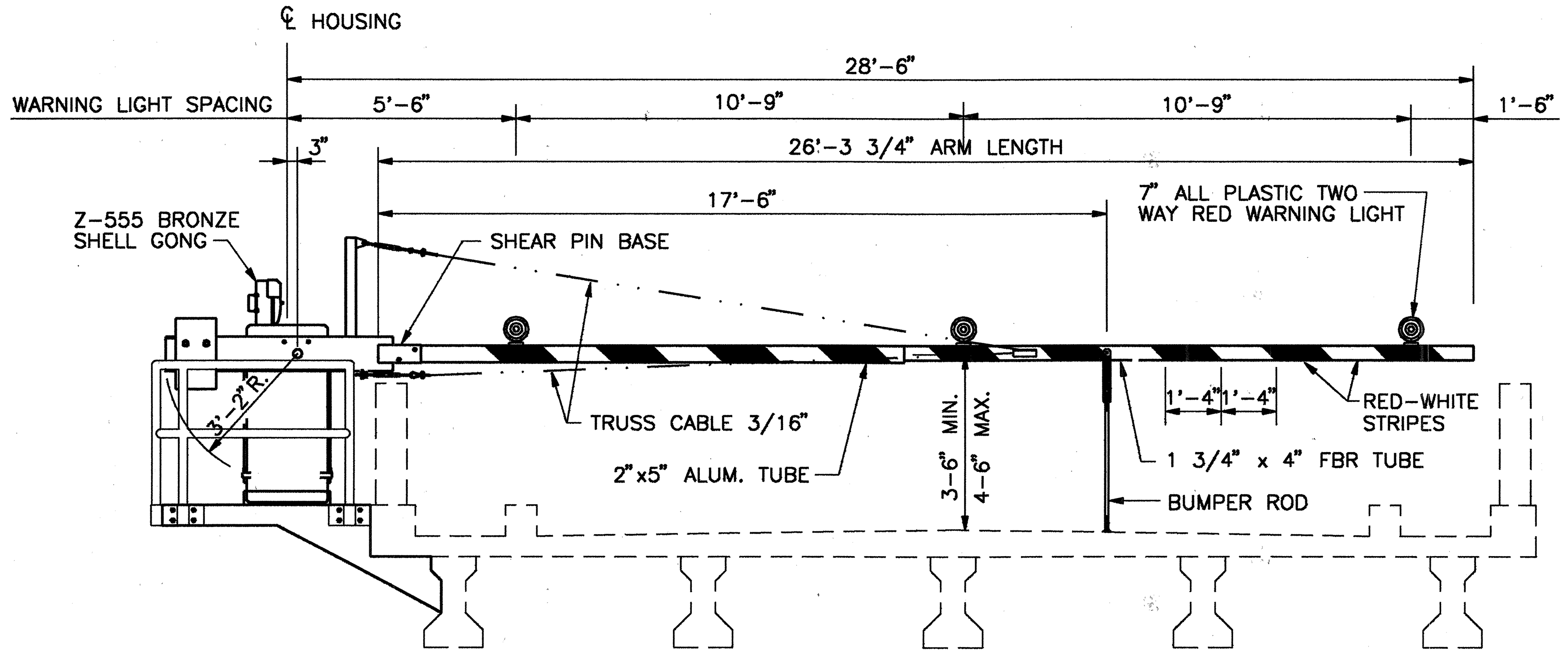
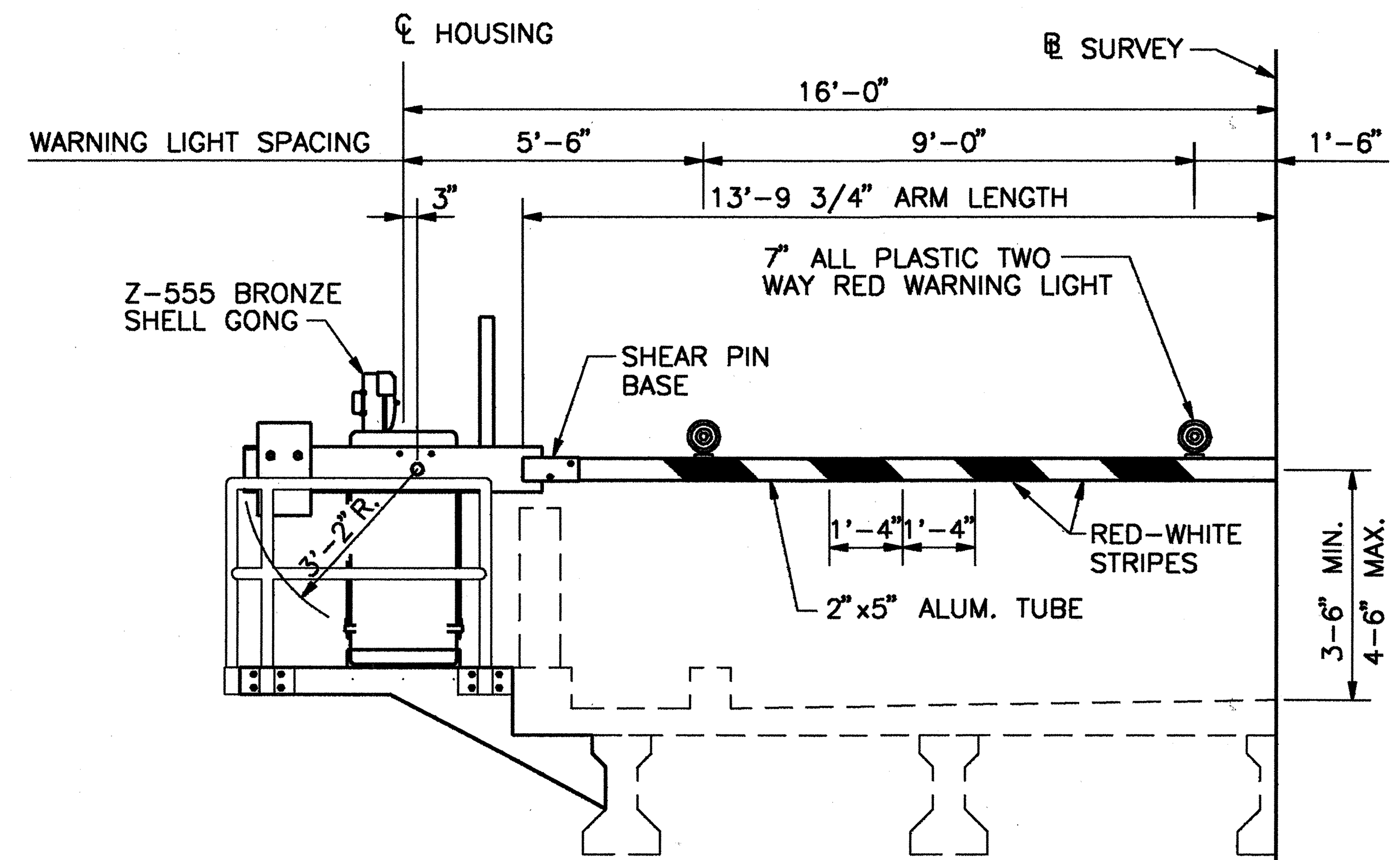


BUMPER ROD DETAIL
N.T.S.



ELEVATION



ELEVATION

NOTES:
1. GATE ARM, STANDARD ALUMINUM POLE, ALLOY 6063-T6 WITH CAST 6061-T6 BASE, ARM, ARM BRACKETS AND ALL ALUMINUM PARTS SHALL BE CLEANED AND PRIMED ONE COAT ON ZINC CHROMATE PRIMER. FINAL FINISH SHALL BE BY GENERAL CONTRACTOR AFTER ERECTION, TEST AND FINAL INSPECTION.
2. GATE ARM CONNECTIONS AT SIDEWALK SHALL BE STRUCTURAL STEEL ASTM A588, HOT DIPPED GALVANIZED, FASTENERS SHALL BE ASTM A325 UNLESS OTHERWISE NOTED.
3. STAINLESS STEEL FASTENERS SHALL BE ASTM A240, TYPE 316 AND ASTM A320 GRADE B8, STRAIN HARDENED.
4. TURN BUCKLES AND WIRE ROPE HARDWARE SHALL BE STEEL HOT DIP GALVANIZED.
5. GUY CABLE SHALL BE PREFORMED 7x19 STAINLESS STEEL 18-8, .312 DIA. MINIMUM BREAKING STRENGTH 9,000 LBS. FITTINGS SHALL BE STAINLESS STEEL.
6. ENERGY ABSORPTION CABLES SHALL BE 3/8" DIA. 7x19 ANNEALED AUSTENITIC STAINLESS STEEL WIRE ROPE WITH STAINLESS STEEL MALE THREADED ROD ENDS.
7. GATE HOUSING, SIDE ARM TUBES, CABLE ANCHORAGE AND ALL EXPOSED STEEL PARTS EXCEPT FASTNERS SHALL BE HOT DIPPED GALVANIZED. STEEL FASTENERS SHALL BE CAD PLATED
8. JACK BOLTS SHALL BE HI-TEN STEEL UNF .750-16 THD. WITH CASE HARDENED TIP, CAD PLATED.
9. ARM REST BUMPER SHALL BE ALUMINUM, 6061-T6 WITH STAINLESS STEEL PIVOT PIN.
10. WIRING BETWEEN THE GATE ARM AND HOUSING SHALL BE WATERTIGHT, FLEXIBLE AND BE ENCLOSED WITH INTERLOCKED ARMOR OF GALVANIZED STEEL. ALL WIRING ON THE GATE ARM SHALL BE IN RIGID METAL CONDUIT.
11. GONG SHALL BE 12" BRONZE SHELL.
12. CONTRACTOR SHALL PROVIDE THE FOLLOWING SPARE PARTS: 1 COMPLETE GATE ARM INCLUDING LIGHTS, TRUSS AND BUMPER ROD.

NOTE:
1. FOR PEDESTAL DETAILS, SEE DWG. NO. S-9

R:\94085\CADD\ELEC
C:\WORK\S8869 05/22/95 08:14:18 ALC PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	KTL	5-95
Checked by	TJF	5-95
Designed by	TJF	5-95
Checked by	GMM	5-95
Approved by	T.J. FARRELL	

DSA GROUP INC.

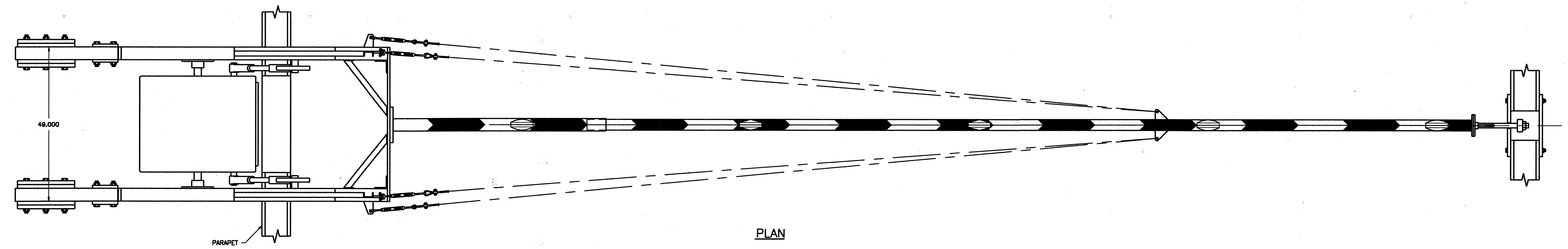
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

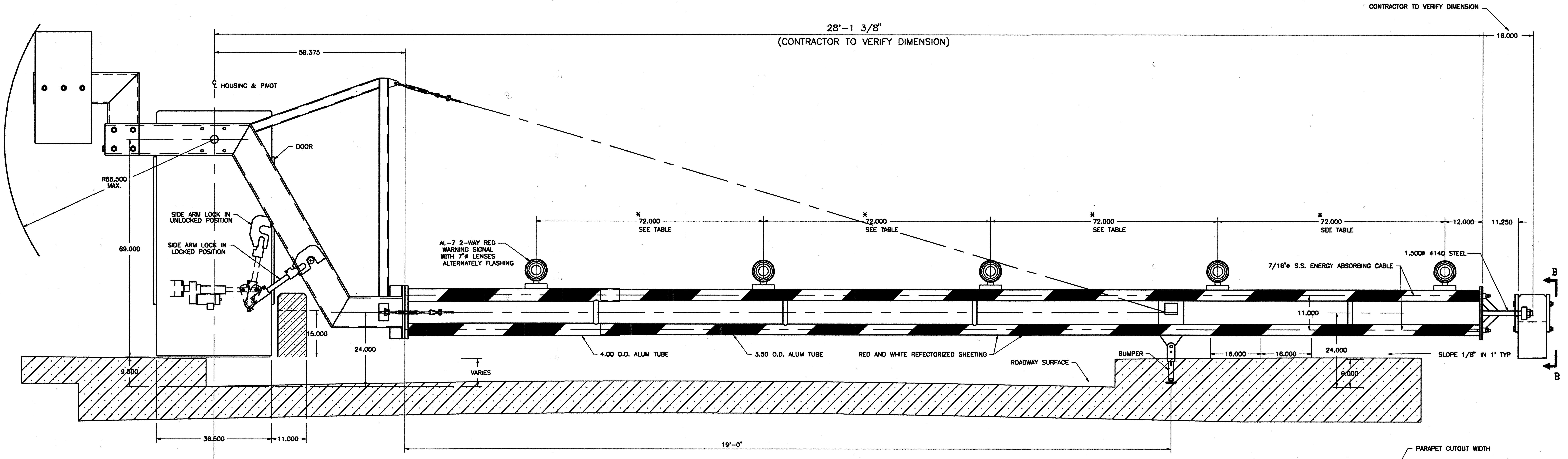
SHEET TITLE: TRAFFIC GATE DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET E-9



PLAN



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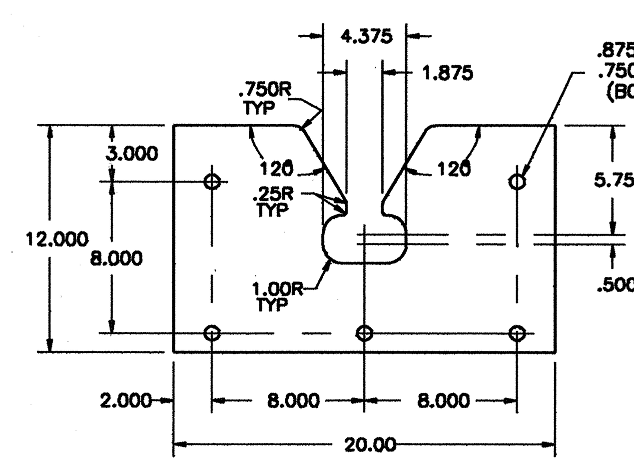
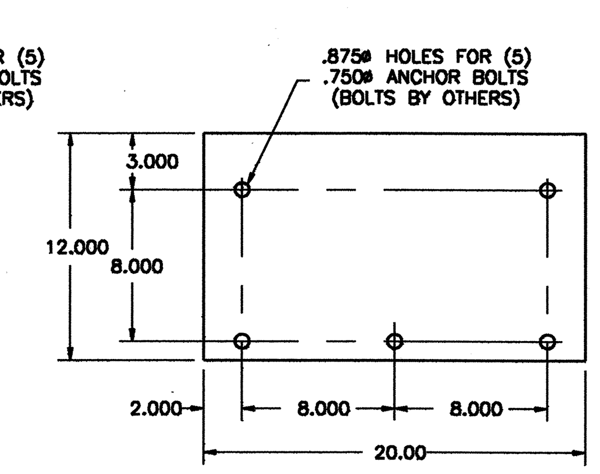
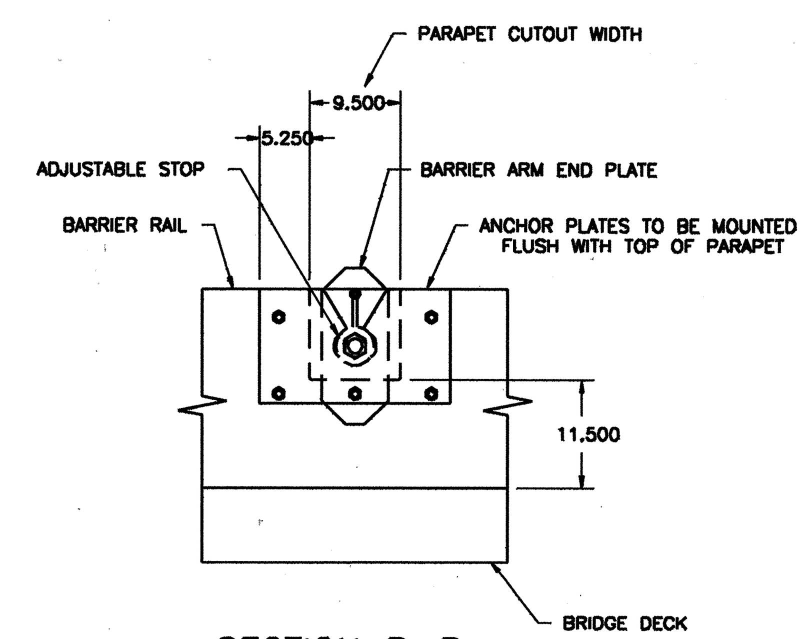


END LOCK ANCHOR PLATE
1.000 THICK PLATE



END LOCK BACKUP PLATE
1.000 THICK PLATE



SECTION B-B
(END VIEW OF END LOCK)

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	KTL	1-95
Checked by	TJF	1-95
Designed by	TJF	5-95
Checked by	GMM	5-95
Approved by	Timothy J. Farrell	

Gene M. Mosmuler

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

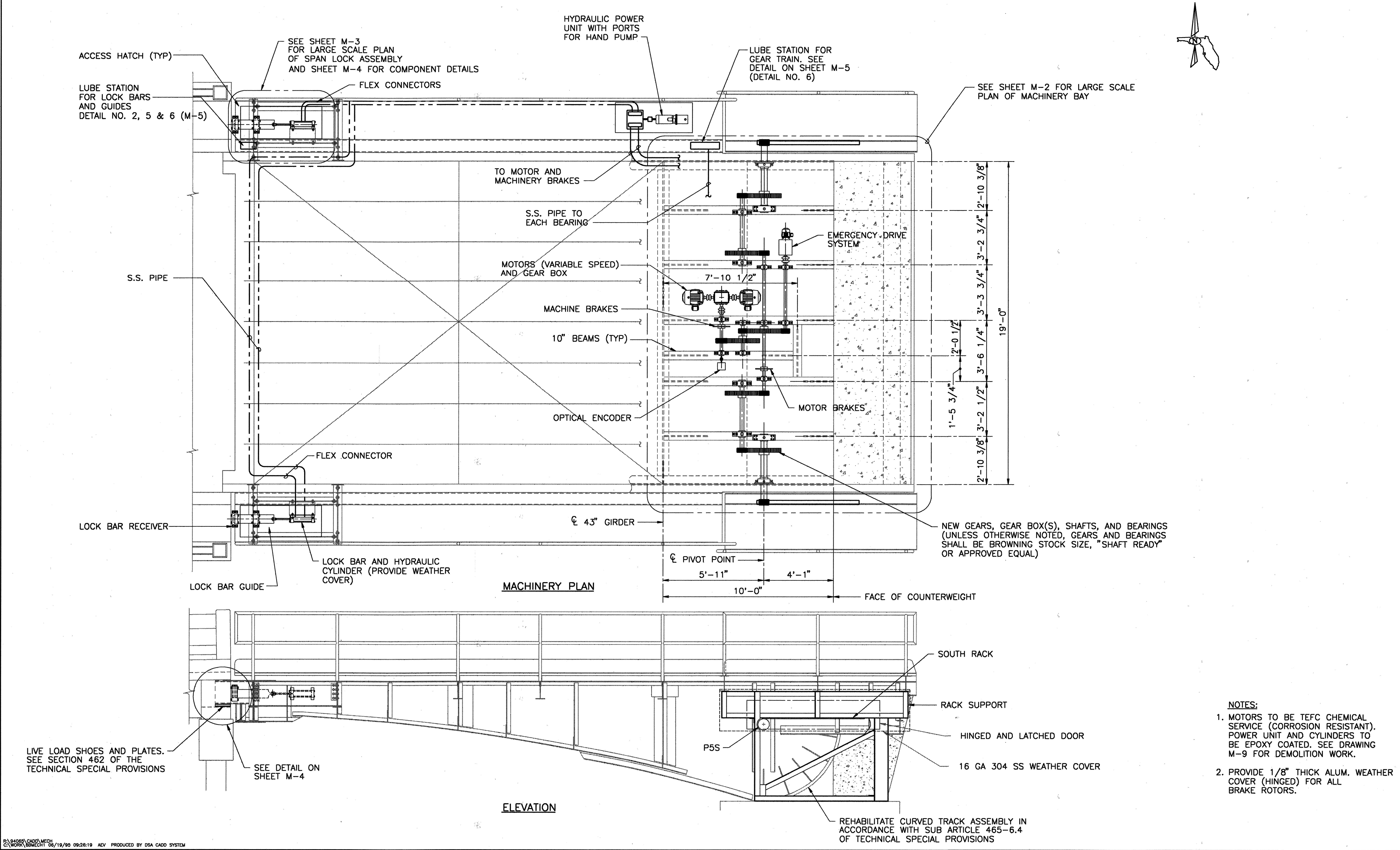
PINELLAS COUNTY FLORIDA

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE:
BARRIER GATE DETAILS

PROJECT NAME:
BECKETT BRIDGE REPAIRS

SHEET
E-10



NOTES:

1. MOTORS TO BE TEFC CHEMICAL SERVICE (CORROSION RESISTANT). POWER UNIT AND CYLINDERS TO BE EPOXY COATED. SEE DRAWING M-9 FOR DEMOLITION WORK.
2. PROVIDE 1/8" THICK ALUM. WEATHER COVER (HINGED) FOR ALL BRAKE ROTORS.

R:\94065\CADD\MECH C:\WORK\BEMECH1 06/19/95 09:26:19 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

RM Couret

DSA GROUP INC.

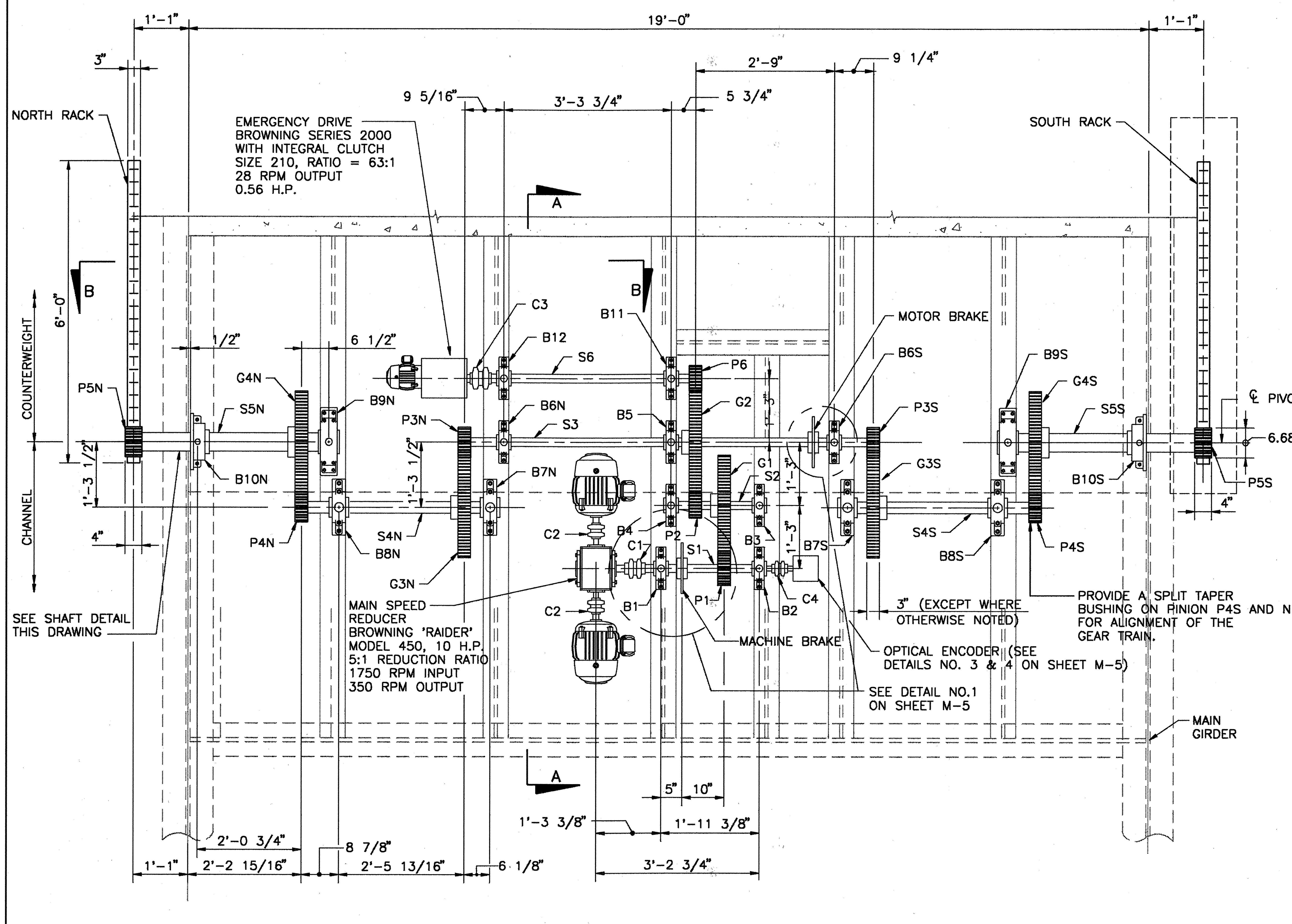
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: MACHINERY PLAN

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET M-1



PLAN OF MACHINERY BAY

NOTES:
1. DIMENSIONS SHOWN ARE FOR GENERAL REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. SEE SHEET M-6 FOR SECTIONS A-A AND B-B.

TABLE OF GEARS										
ID NUMBER	QUANTITY	NUMBER OF TEETH	DP	WIDTH	TORQUE (# INCH)	RPM (OLD)	RPM (NEW)	BORE	PART NUMBER	KEY SEAT
P1	1	18	3	3"	228	417	350	1.875"	NSS318	1/2" x 1/4"
G1	1	72	3	3"	NA	143.7	87.5	1.875"	NCS372	1/2" x 1/4"
P2	1	18	3	3"	455	143.7	87.5	1.875"	NSS318A	1/2" x 1/4"
G2	1	72	3	3"	NA	26.0	21.9	2.0"	NCS372	1/2" x 1/4"
P3 N&S	2	21	3	3"	1,822	26.0	21.9	2.0"	NSS321A	1/2" x 1/4"
G3 N&S	2	72	3	3"	NA	7.69	6.4	2.75"	NSC372	5/8" x 5/16"
P4 N&S	2	24	3	3"	6,250	7.69	6.4	2.75"	NSS324A	5/8" x 5/16"
G4 N&S	2	72	3	3"	NA	2.27	2.13	3.25"	NSC372	1" x 1/2"
P5 N&S *	2	14	2	4"	18,750	2.27	2.13	3.1875"	NA	1" x 1/2"
P6	1	16	3	3"	1,305	N/A	28	2.0"	NSS316A	1/2" x 1/4"
RACK N&S *	2	N/A	2	3"	18,750	NA	NA	NA	NA	NA

NOTE:
1. ALL NEW AND EXISTING GEARS ARE 14.5° PA. EXCEPT P5 N&S AND RACK N&S WHICH ARE 20° PA.
2. ALL GEAR PART NUMBERS ARE BROWNING.
3. * = SHOP MACHINED

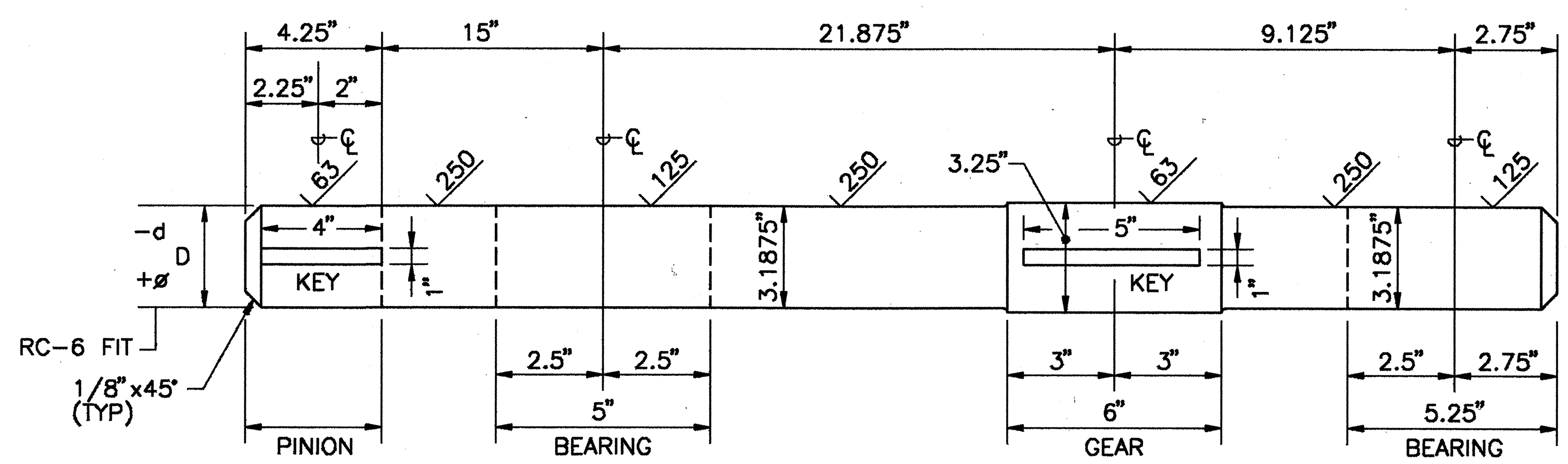
TABLE OF BEARINGS				
ID NUMBER	QUANTITY	RPM	BORE(D)	PART NUMBER
B1	1	350	1.875"	PB970, TYPE SR
B2	1	350	1.875"	PB970, TYPE SR
B3	1	87.5	1.875"	PB970, TYPE SR
B4	1	87.5	1.875"	PB970, TYPE SR
B5	1	21.9	1.875"	PB970, TYPE SR
B6 N&S	2	21.9	2"	PB970, TYPE SR
B7 N&S	2	6.4	2.75"	PB970, TYPE SR
B8 N&S	2	6.4	2.75"	PB970, TYPE SR
B9 N&S	2	2.13	3.1875"	PB970, TYPE SR
B10 N&S	2	2.13	3.1875"	SFC1000NE x 3 3/16"
B11	1	28	2"	PB970, TYPE SR
B12	1	28	2"	PB970, TYPE SR

NOTE:
1. RC 6 FIT $(D {+d \atop -\emptyset})$

TABLE OF COUPLINGS						
ID NUMBER	QUANTITY	KEY	TORQUE RATING (# INCH)	RPM	BORE	PART NO.
C1	1	REFER TO REDUCER	5,500	350	1.625"	1060T
C2	2	REFER TO REDUCER	3,500	1750	1.375"	1050T
C3	1	REFER TO GEAR MOTOR	1,200	28	1.5"	1030T
C4	1	NONE	–	–	.375"	CS-08*

* INDICATES BROWNING MANUFACTURER. ALL OTHER COUPLINGS ARE FALK.

TABLE OF SHAFTS							
ID NUMBER	QUANTITY	LENGTH	DIA.(D)	KEY SEAT 1	KEY SEAT 2	KEY SEAT 3	NOTES
S1	1	32"	1.875"	1/2"x1/4"x3 1/2"	1/2"x1/4"x4"	1/2"x1/4"x2 1/2"	
S2	1	26"	1.875"	1/2"x1/4"x3 1/2"			
S3	1	103.5"	2"	1/2"x1/4"x3 1/2"	1/2"x1/4"x3 1/2"	1/2"x1/4"x3 1/2"	
S4 N&S	2	53"	2.75"	5/8"x5/16"x5 1/2"			
S5 N&S	2	53"	3.25"	1"x1/2"x5"	1"x1/2"x4"		
S6	1	53"	2"	1/2"x1/4"x3 1/2"	1/2"x1/4"x2"		



SHAFT DETAIL FOR S5 N & S
OTHER SHAFTS SIMILAR

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REVISIONS			REVISIONS			SEAL:
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	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

DSA GROUP INC.

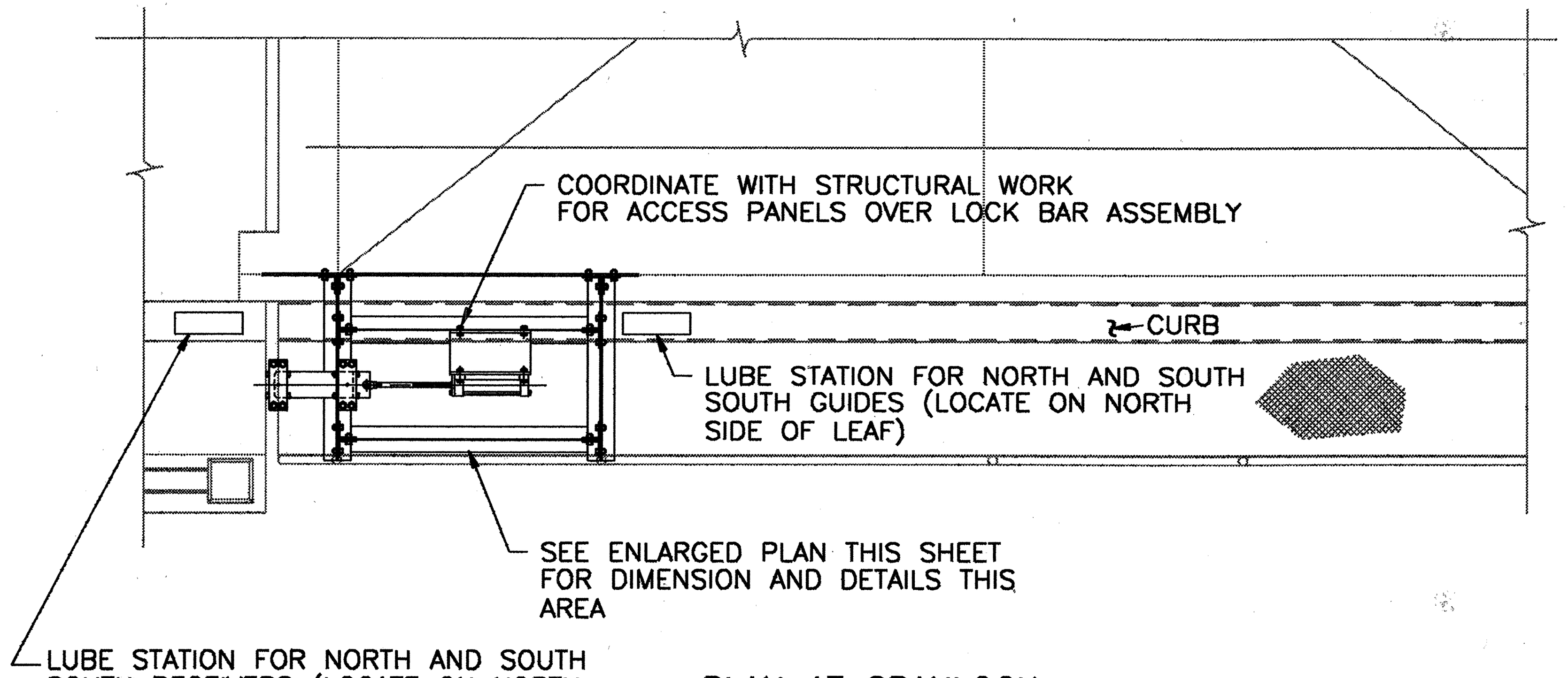
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

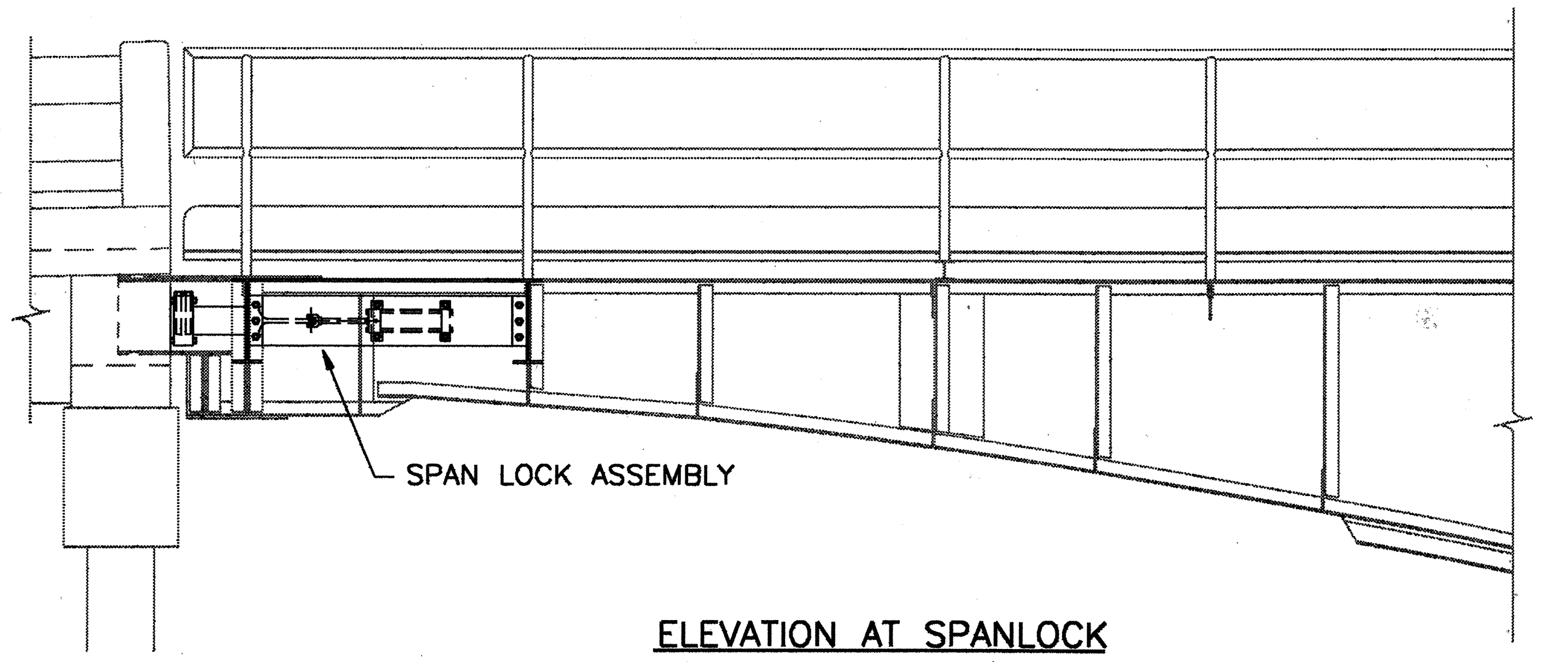
SHEET TITLE: MACHINERY PLAN AND SCHEDULES

PROJECT NAME: BECKETT BRIDGE REPAIRS

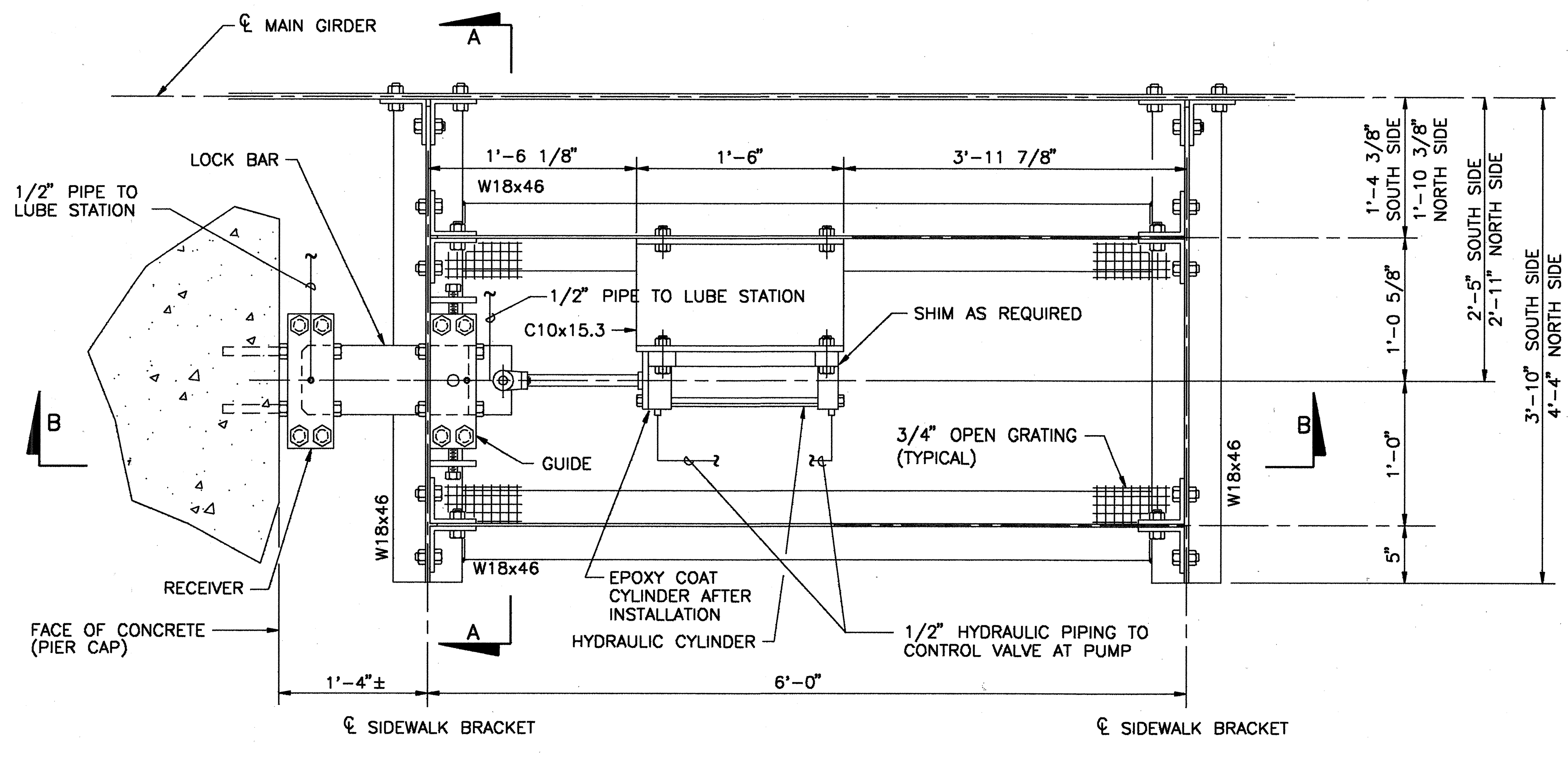
SHEET M-2



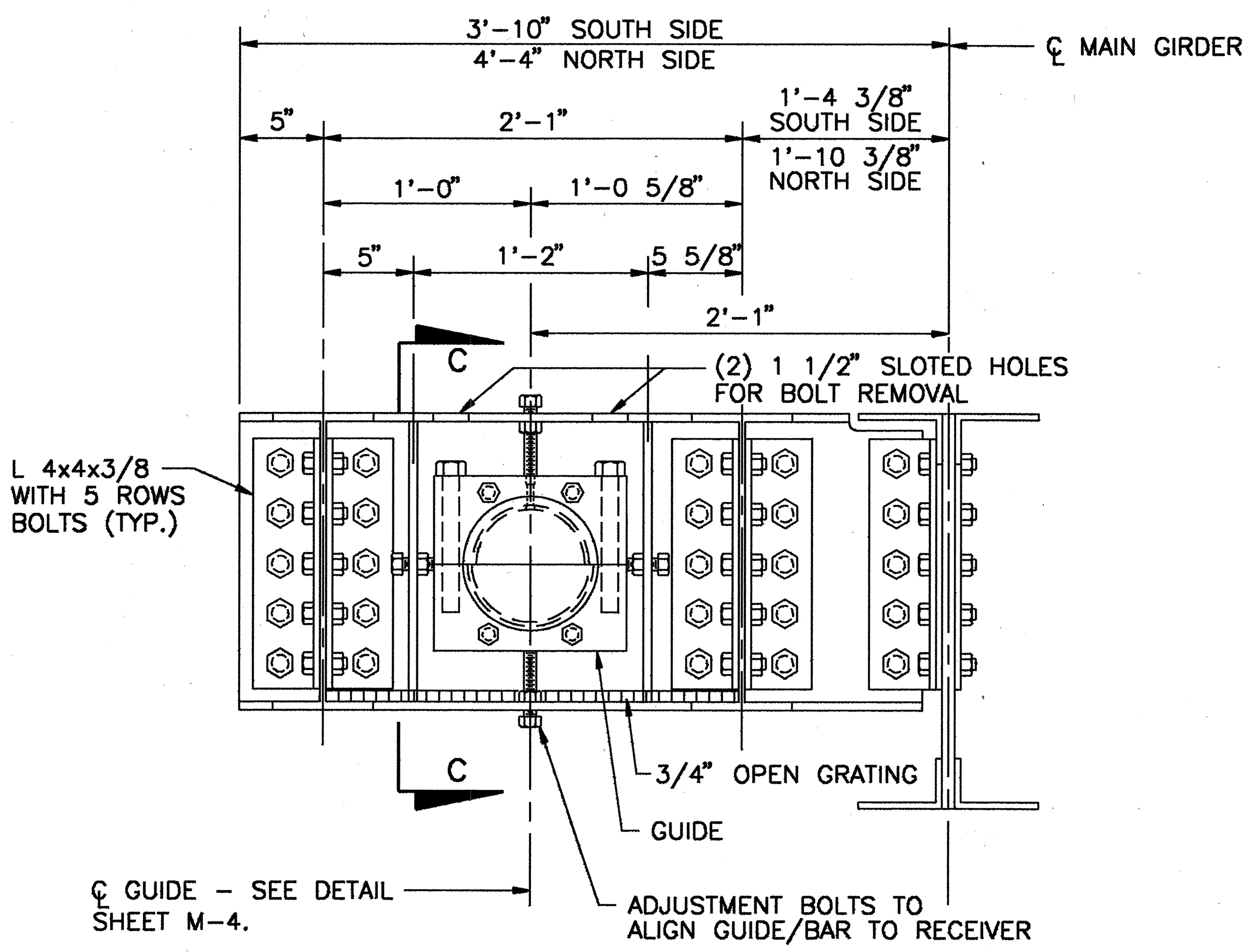
PLAN AT SPANLOCK



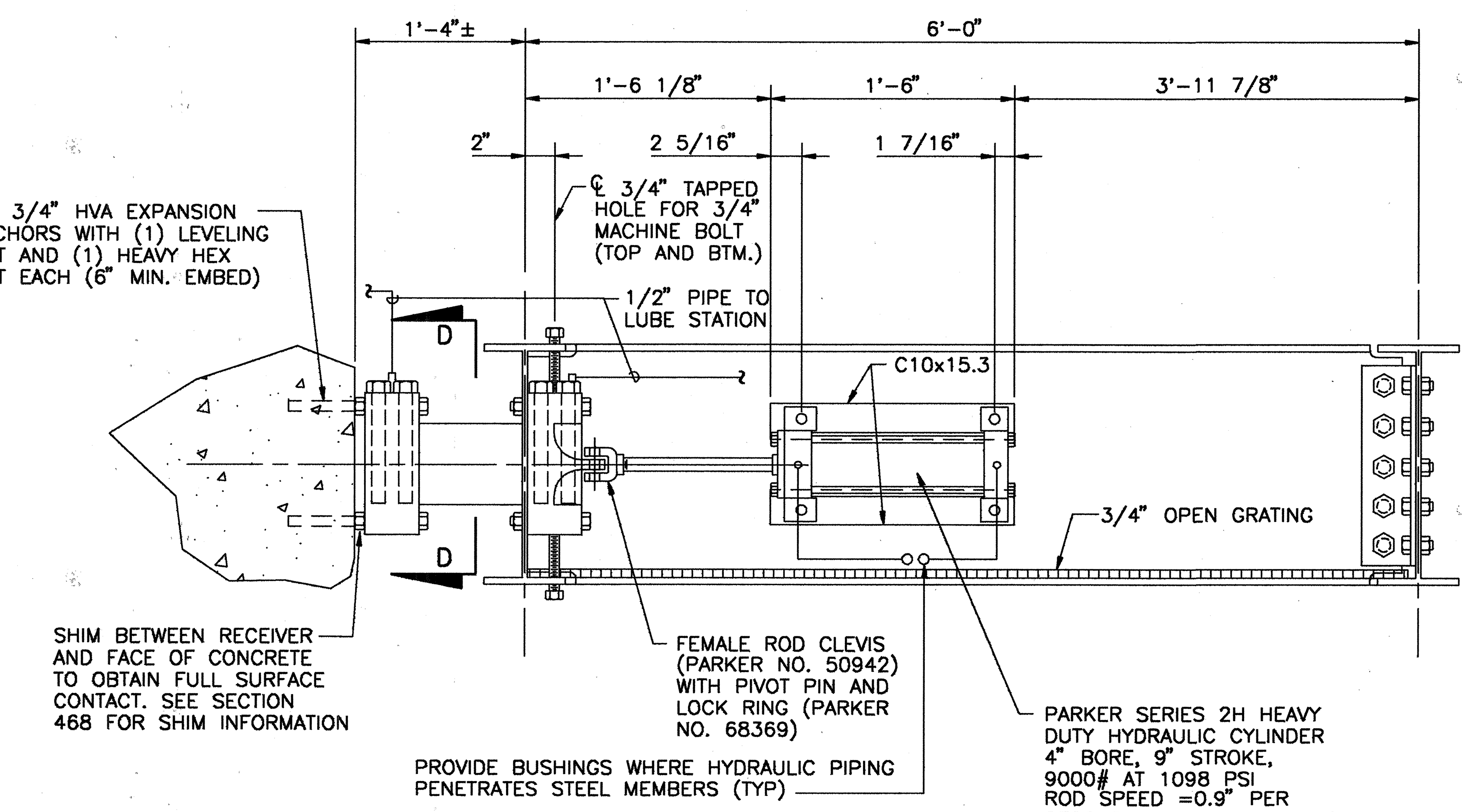
ELEVATION AT SPANLOCK
(NORTH SIDE SIMILAR)



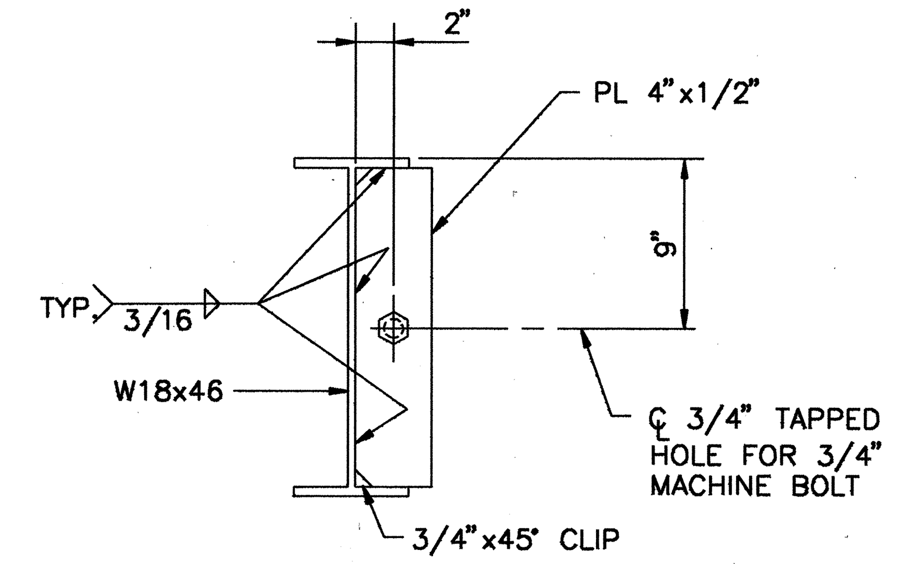
ENLARGED PLAN



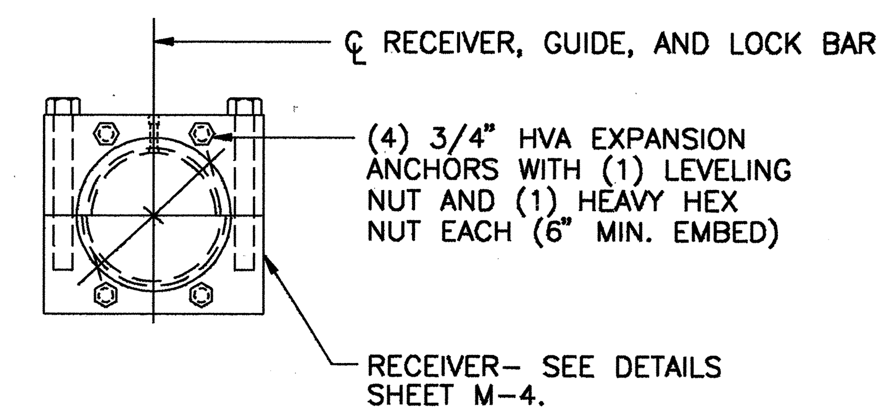
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES:
1. WORK THIS SHEET IN CONJUNCTION WITH SHEET M-4.

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REVISIONS

Date	By	Description

REVISIONS

Date	By	Description

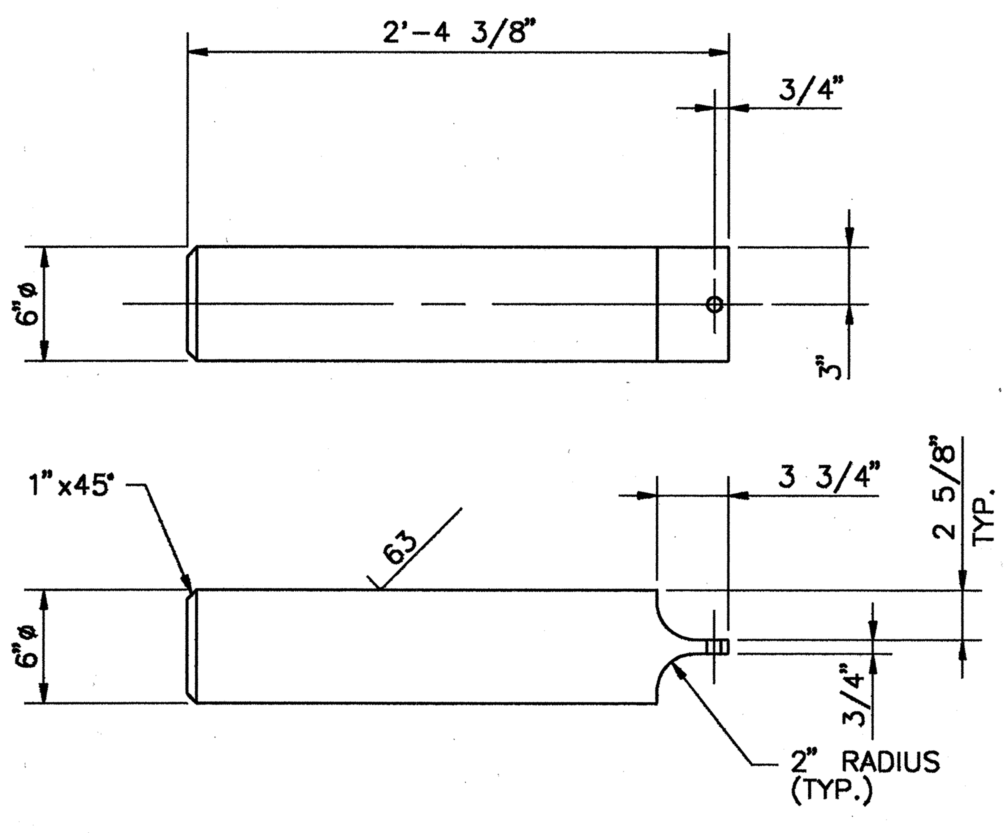
SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

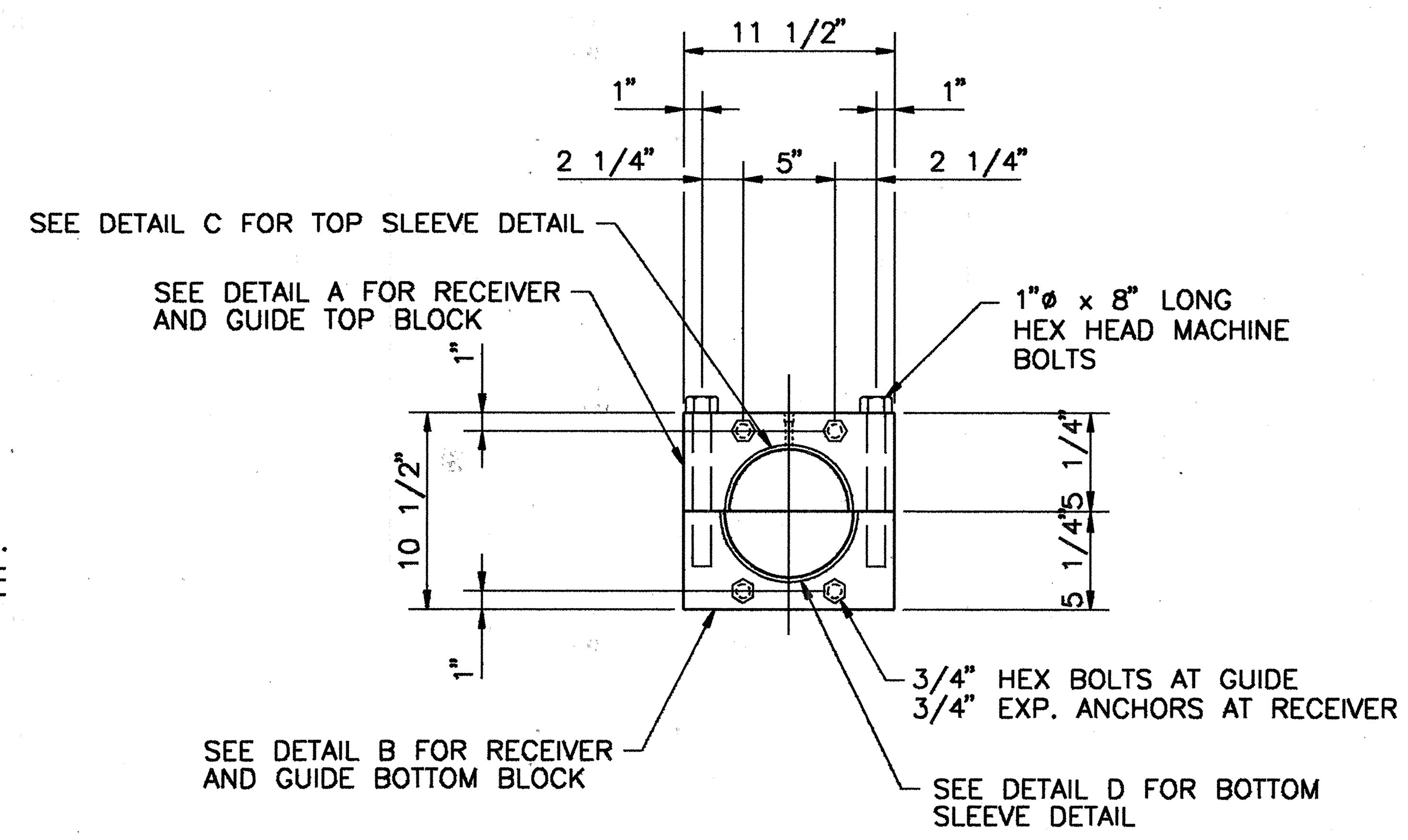
PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

SHEET TITLE: SPAN LOCK DETAILS
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET M-3

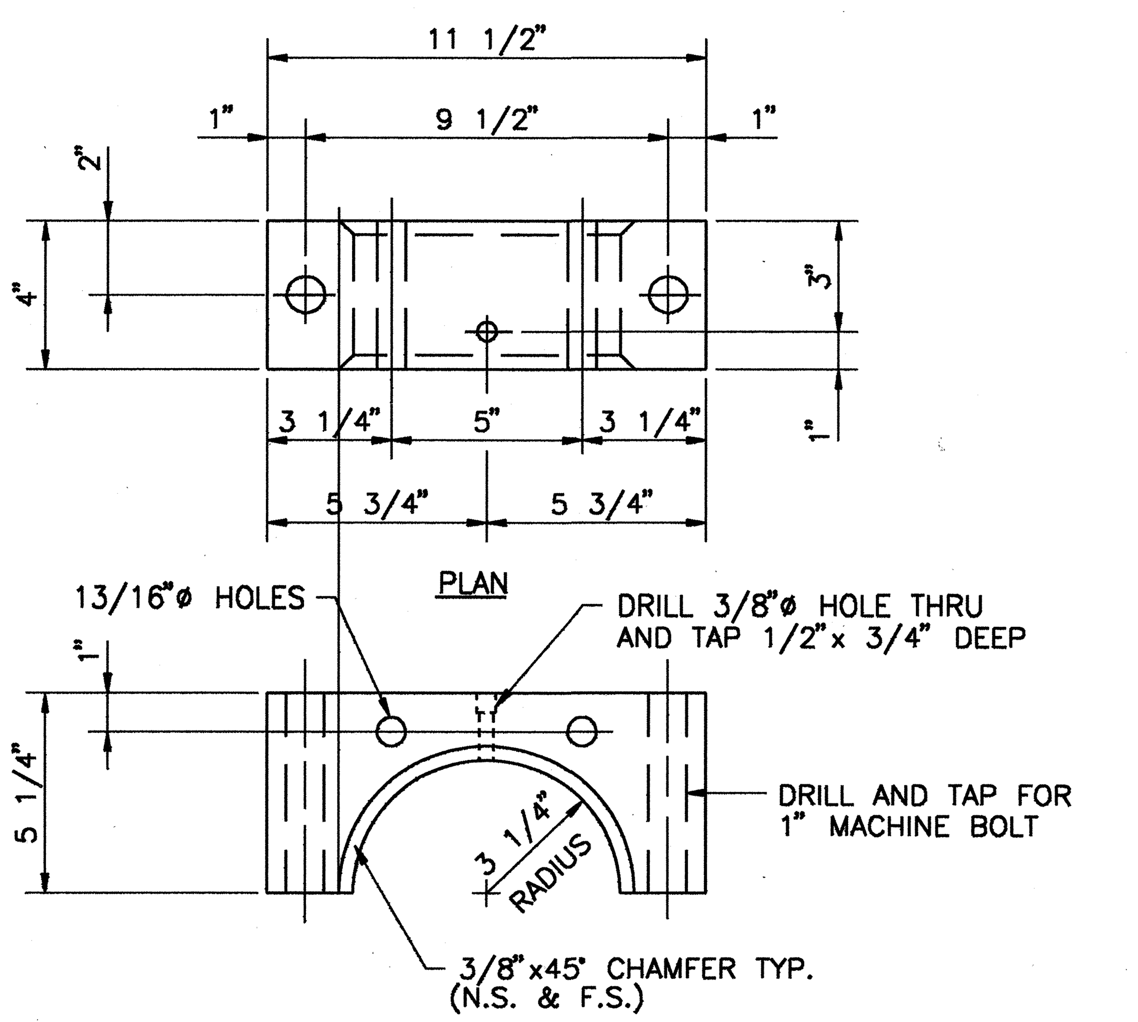


LOCK BAR DETAILS

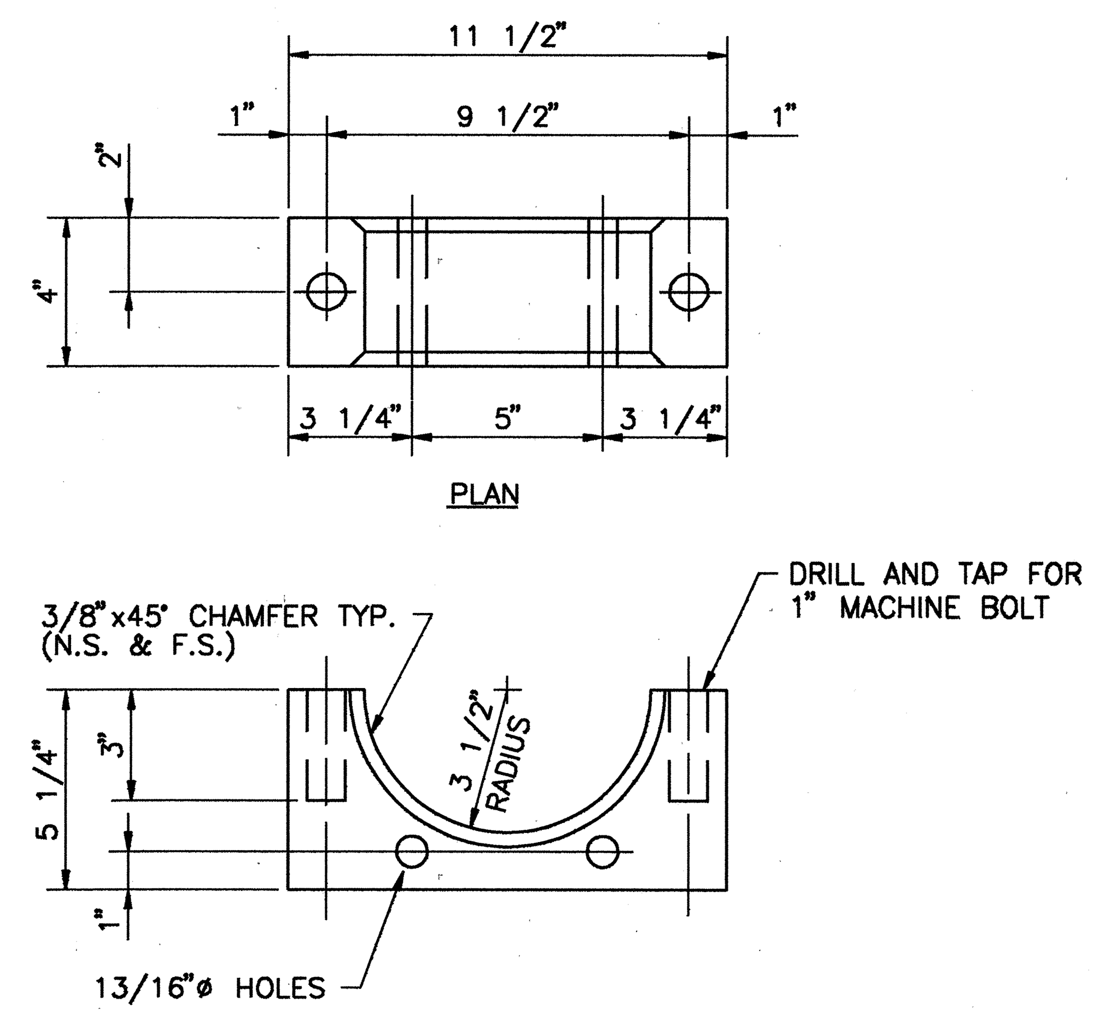
MATERIAL OF CONSTRUCTION TO BE SAE51440 S/S.



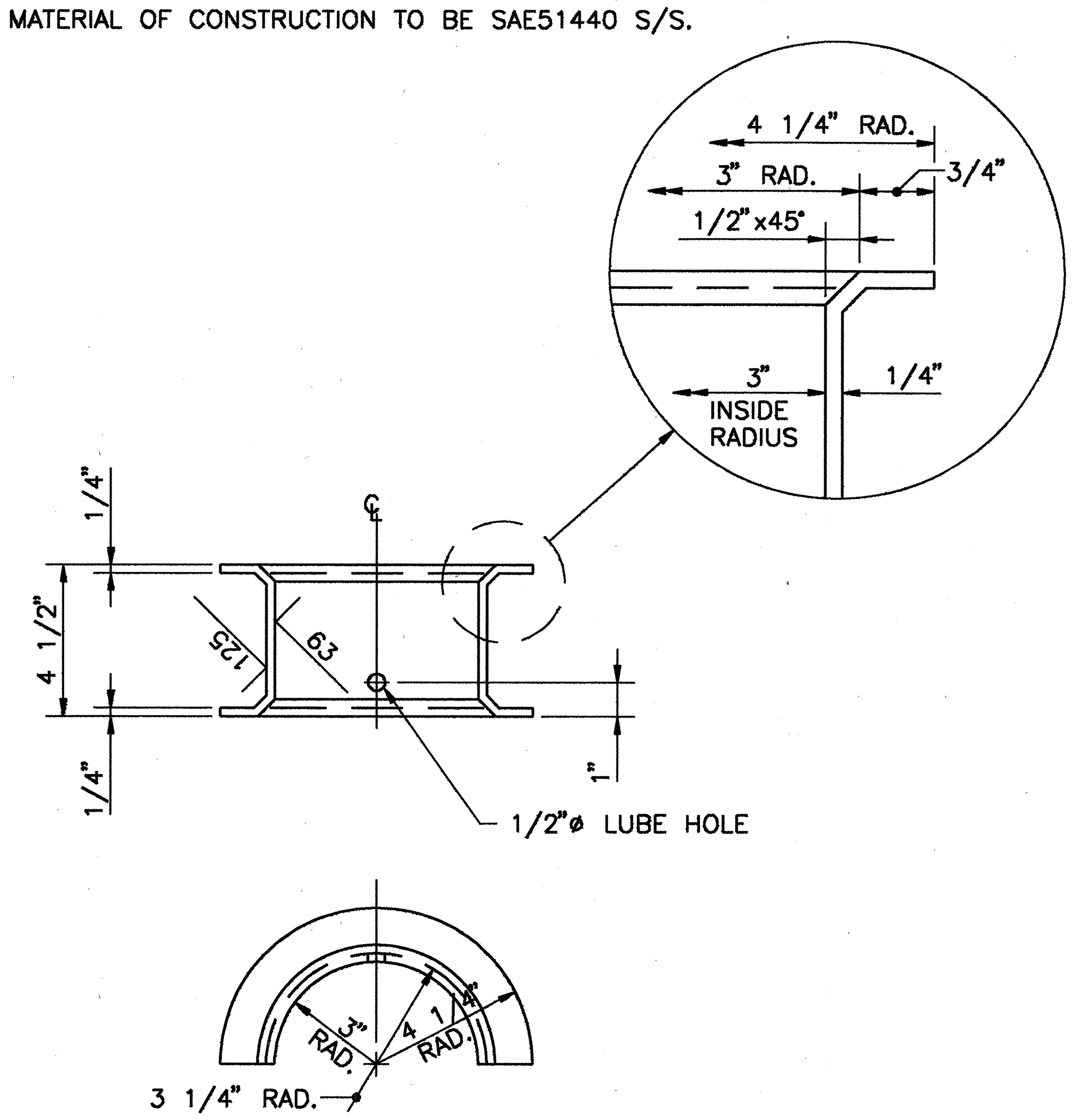
RECEIVER AND GUIDE BLOCK DETAIL



DETAIL A – RECEIVER AND GUIDE TOP

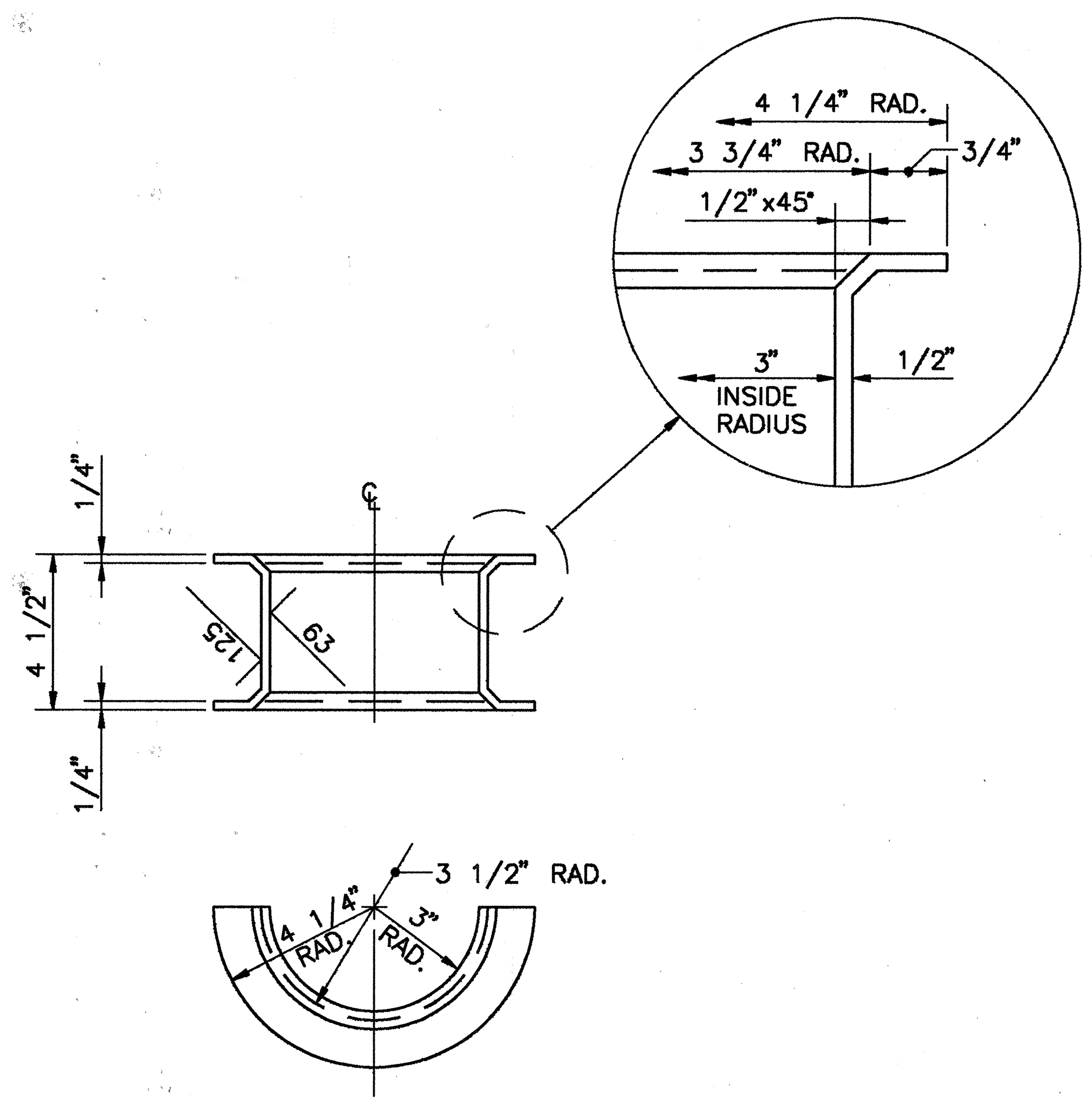


DETAIL B – RECEIVER AND GUIDE BOTTOM



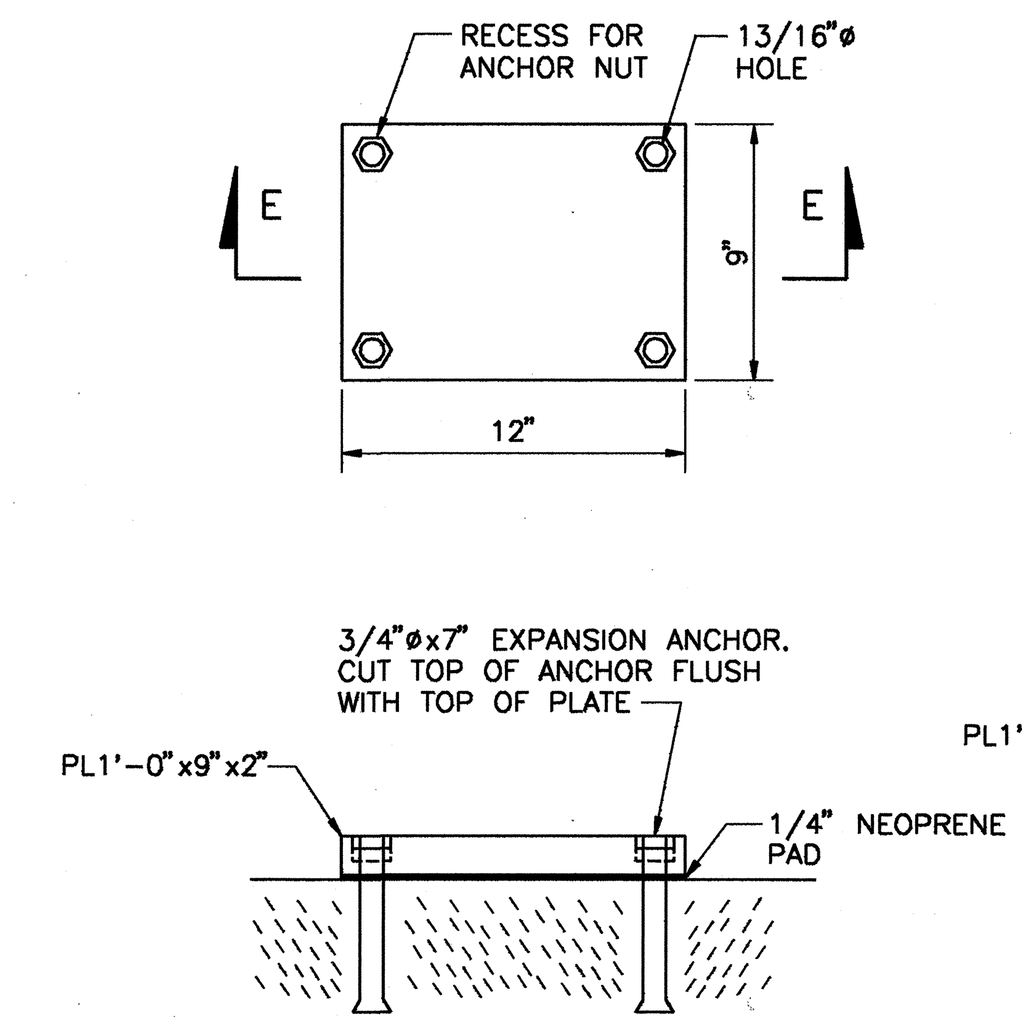
DETAIL C – RECEIVER AND GUIDE SLEEVE TOP

MATERIAL OF CONSTRUCTION TO BE SAE30905 STEEL.
MACHINE TO ACCOMODATE RC6 FIT, INSIDE AND OUTSIDE SURFACES.



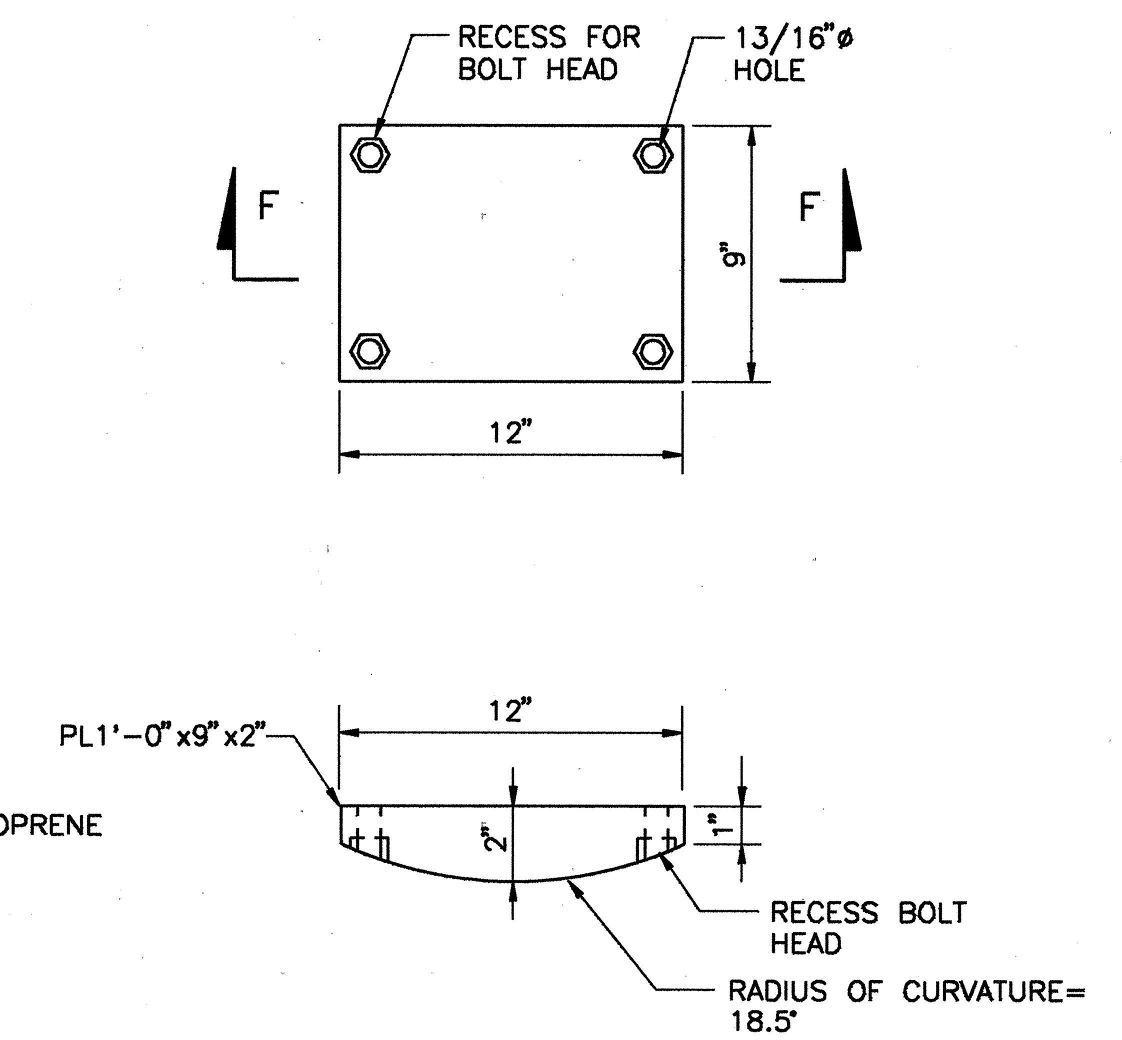
DETAIL D – RECEIVER AND GUIDE SLEEVE BOTTOM

MATERIAL OF CONSTRUCTION TO BE SAE30905 STEEL.
MACHINE TO ACCOMODATE RC6 FIT, INSIDE AND OUTSIDE SURFACES.



SECTION E–E

STRIKE PLATE – TWO REQ'D.



SECTION F–F

LIVE LOAD SHOE – TWO REQ'D.

NOTE:
1. ALL MATERIAL TO BE ASTM A36 U.O.N.
2. ALL BOLTS TO BE A325 U.O.N.
3. PROVIDE RC-6 FIT FOR LOCK BAR, WEAR INSERTS, RECEIVER AND GUIDE.
4. PROVIDE ONE SPARE SET OF TOP AND BOTTOM WEAR INSERTS FOR EACH GUIDE AND RECEIVER. PREPARE FOR STORAGE, TAG WITH BRIDGE NAME, NUMBER AND LOCATION. TURN OVER TO COUNTY AT END OF PROJECT.

R:\94065\CADD\MECH
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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

R.M. Couret

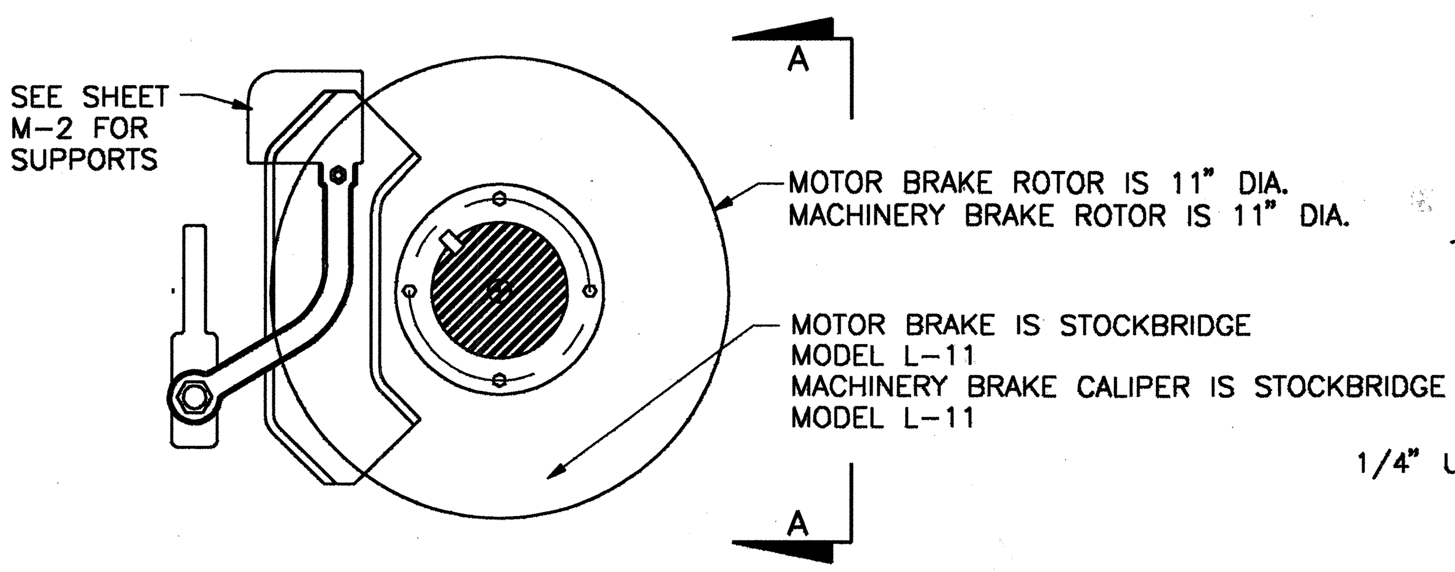
DSA GROUP INC.
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

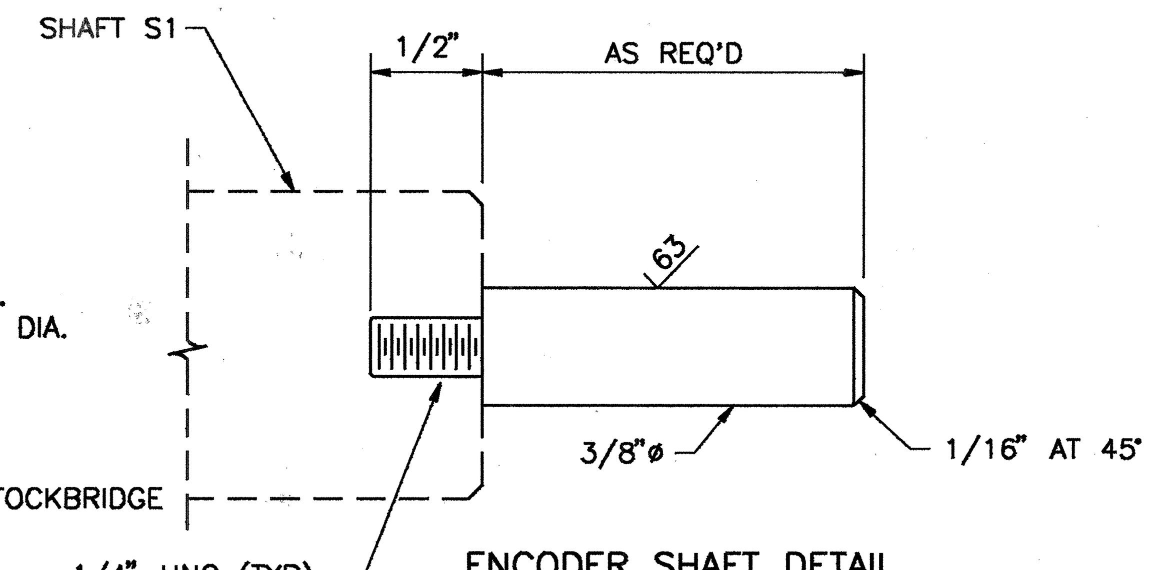
SHEET TITLE: SPAN LOCK DETAILS

PROJECT NAME: BECKETT BRIDGE REPAIRS

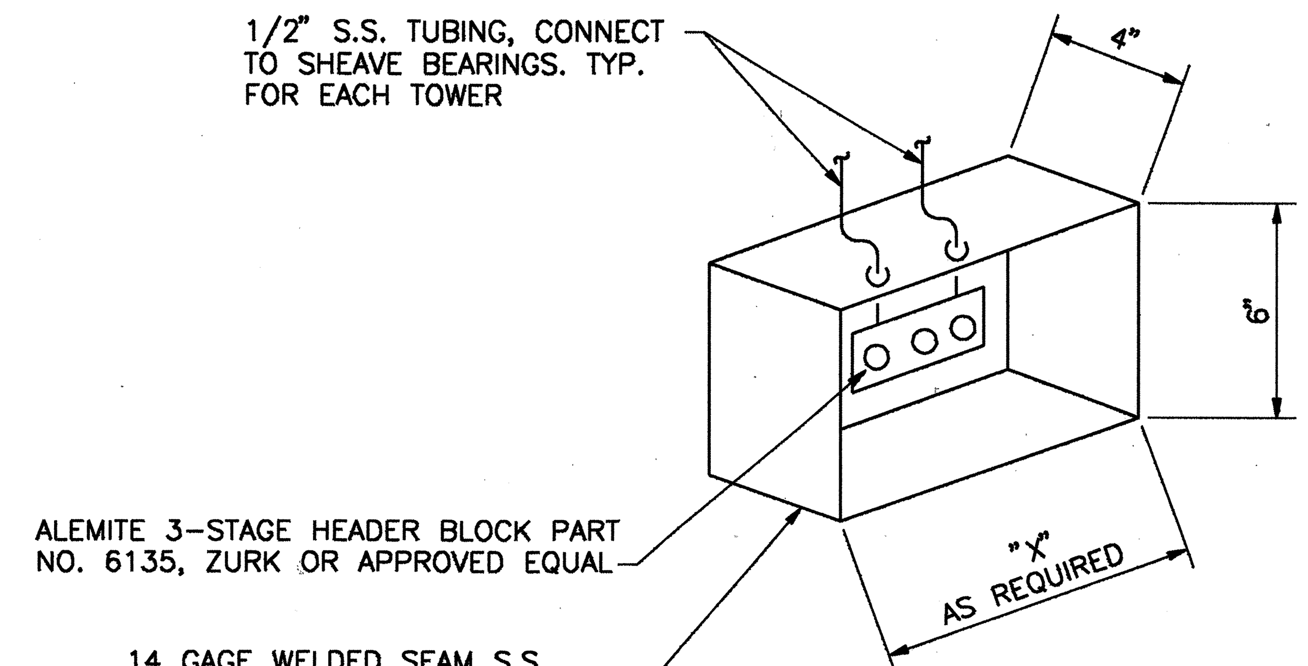
SHEET M-4



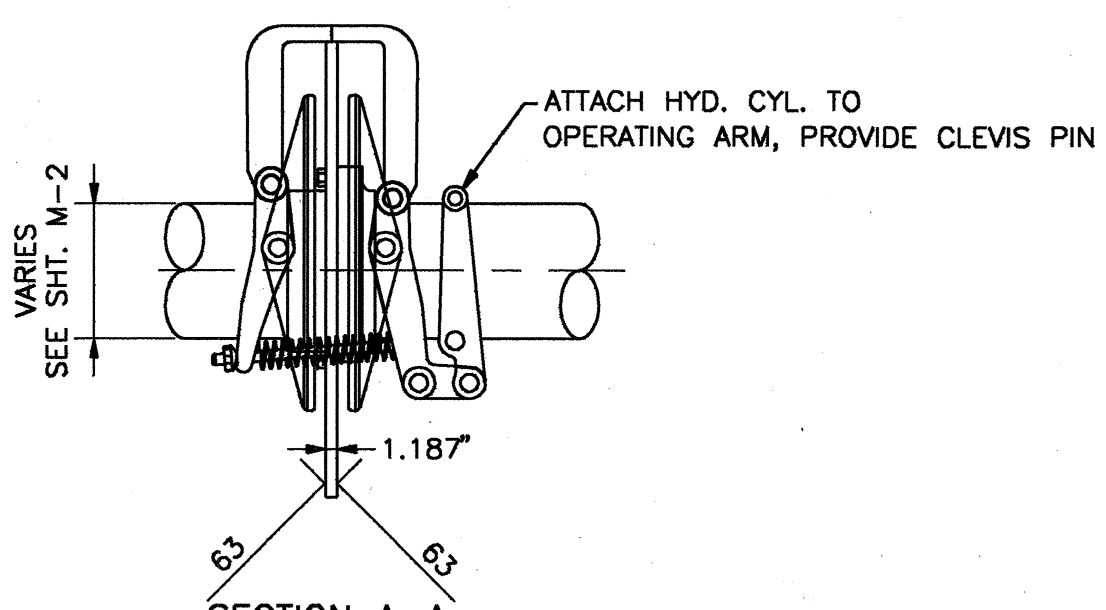
MOTOR AND MACHINERY BRAKE DETAIL
(MACH.=SPRING APPLY, HYDRAULIC RELEASE, 905 PSI RELEASE PRESSURE)
(MOTOR=HYDRAULIC APPLY, 300 PSI HYDRAULIC PRESSURE, SPRING RELEASE)
(DETAIL NO. 1)



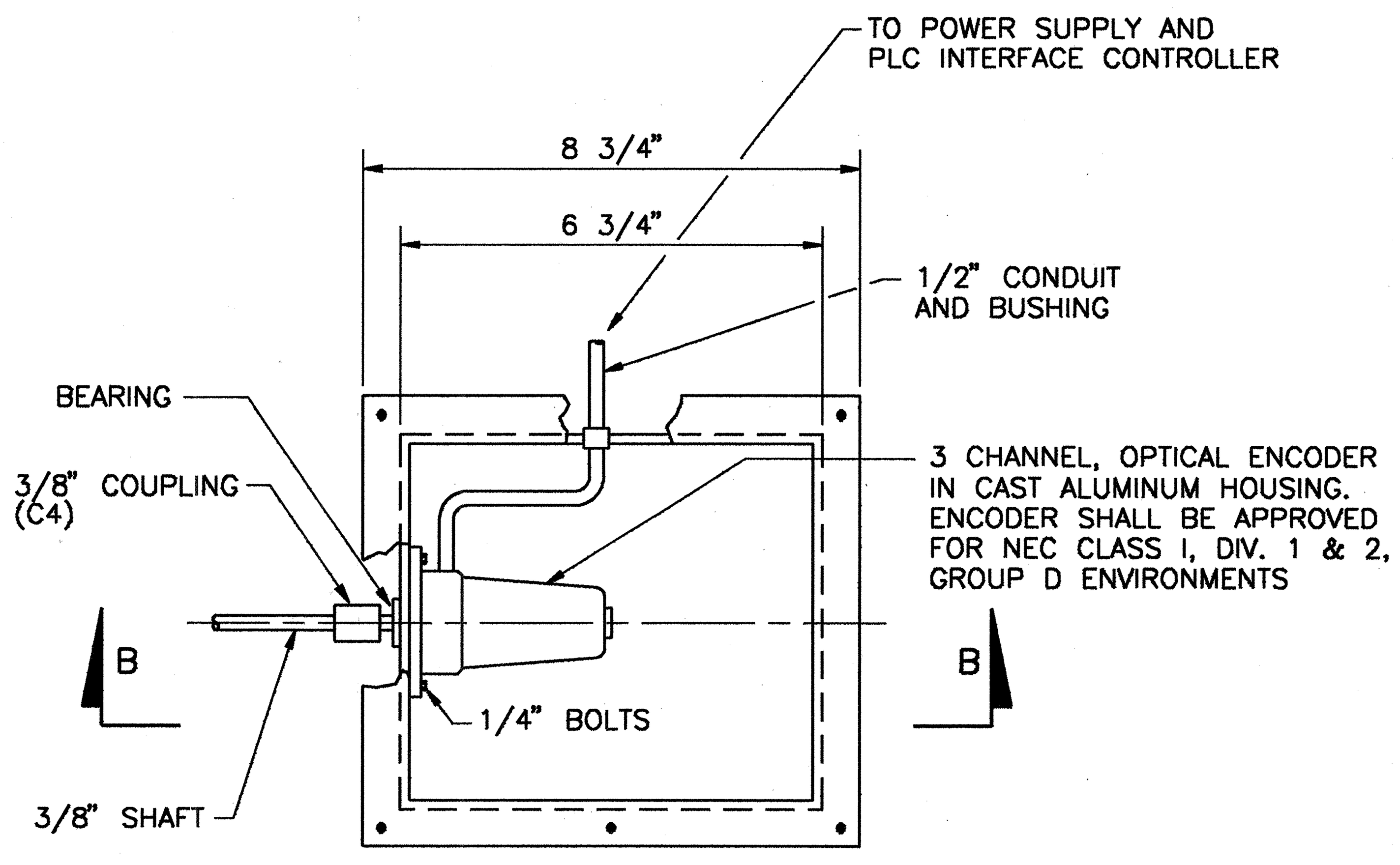
ENCODER SHAFT DETAIL
(DETAIL NO. 3)



LUBRICATION STATION DETAIL
(DETAIL NO. 2)

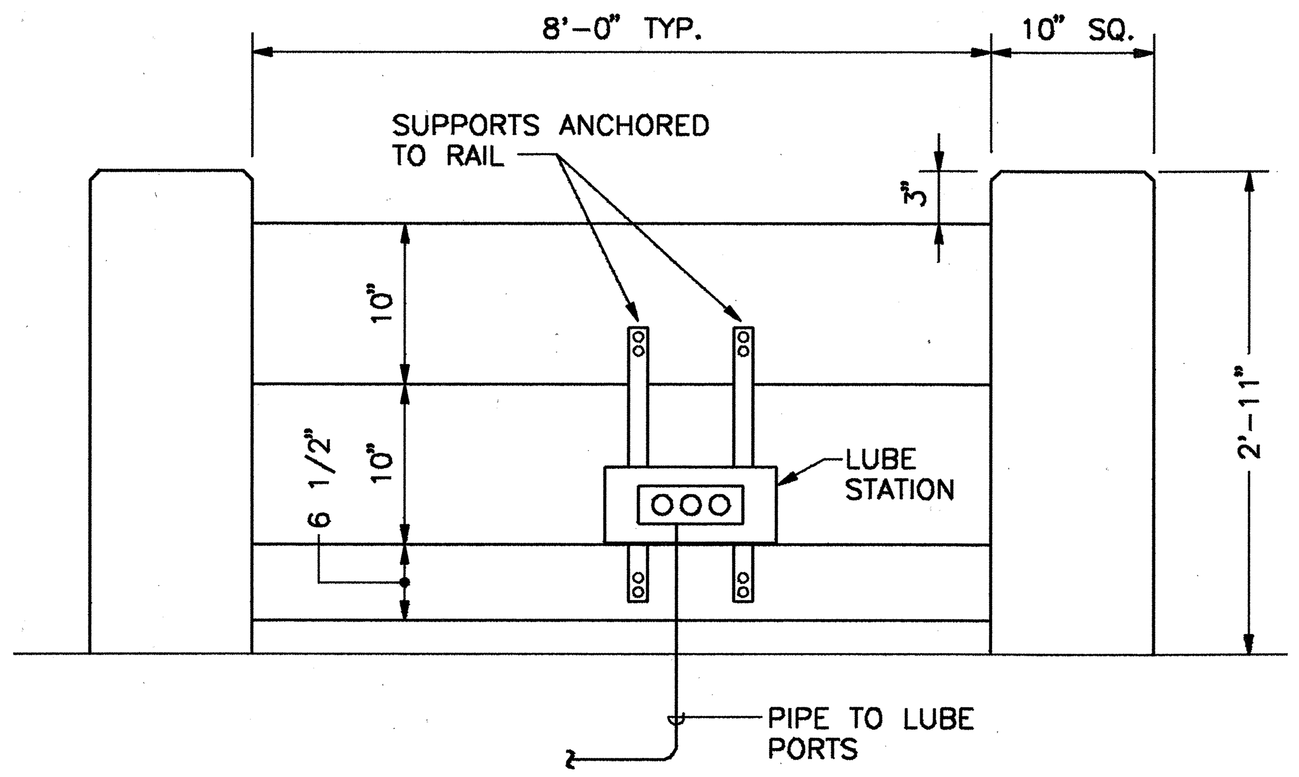


SECTION A-A

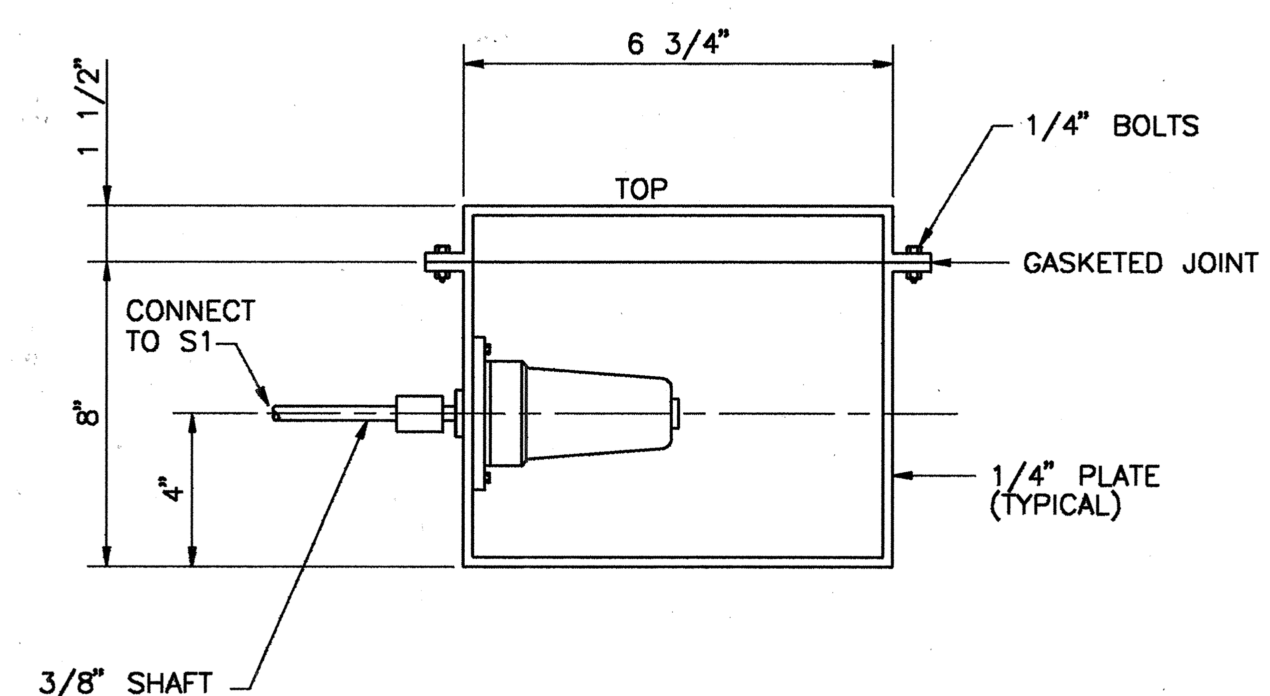


PLAN

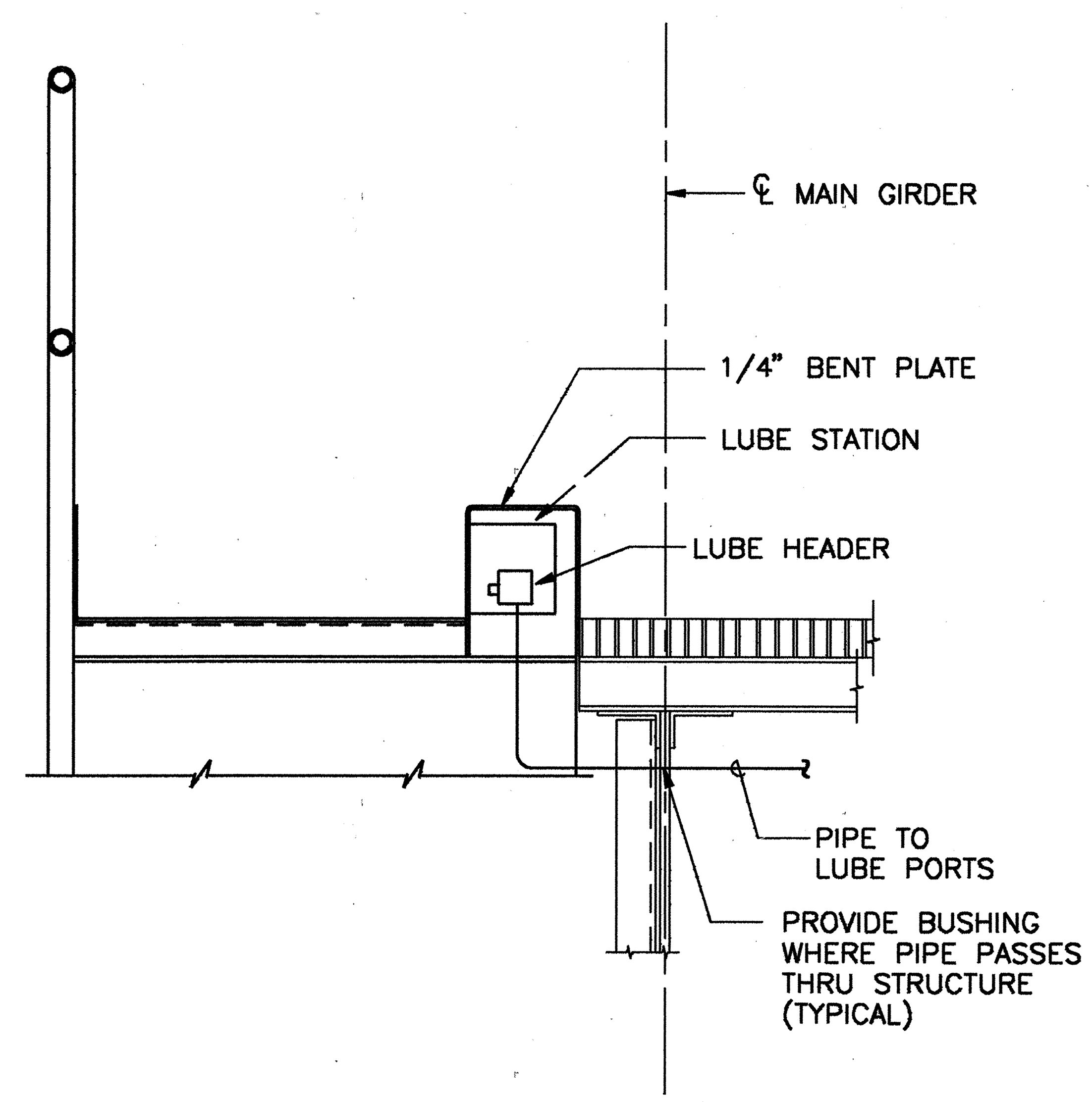
ENCODER GEAR DETAILS
(TYPICAL FOR ONE SHAFT)
(DETAIL NO. 4)



DETAIL OF LUBE STATION MOUNTED ON RAIL
(DETAIL NO. 5)



SECTION B-B



DETAIL OF LUBE STATION MOUNTED IN METAL CURB
(DETAIL NO. 6)

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C:\WORK\BBMECH5 08/02/95 07:53:04 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

R.M. Couret

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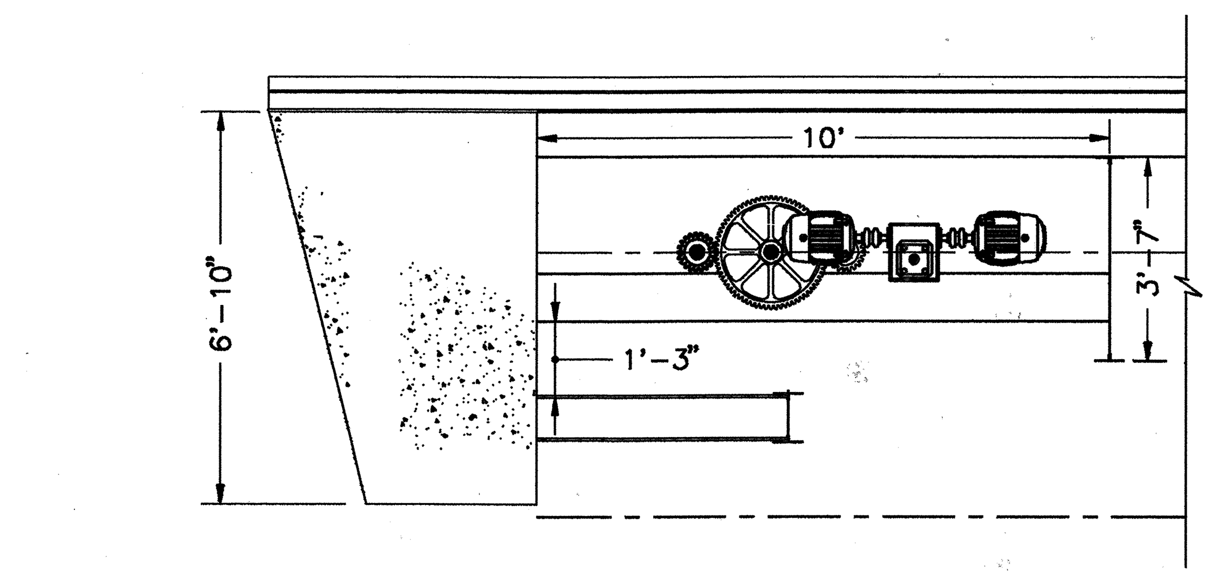
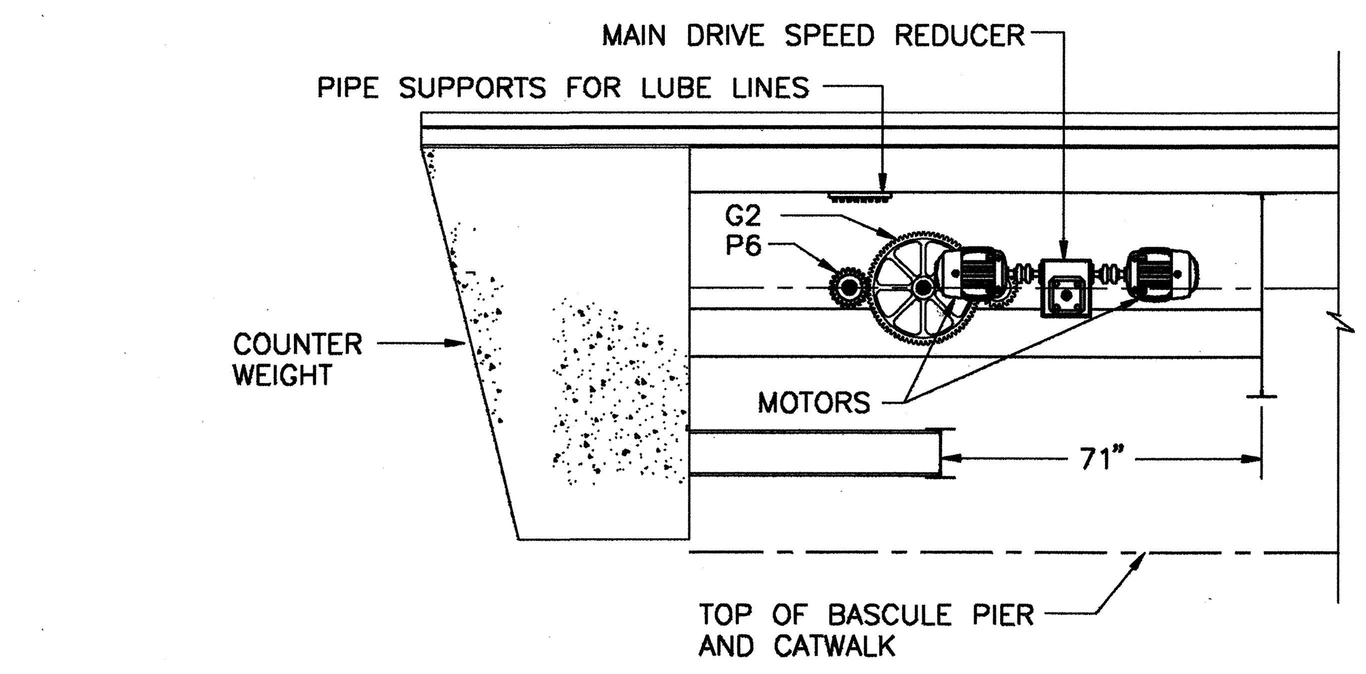
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY DEPARTMENT OF PUBLIC WORKS

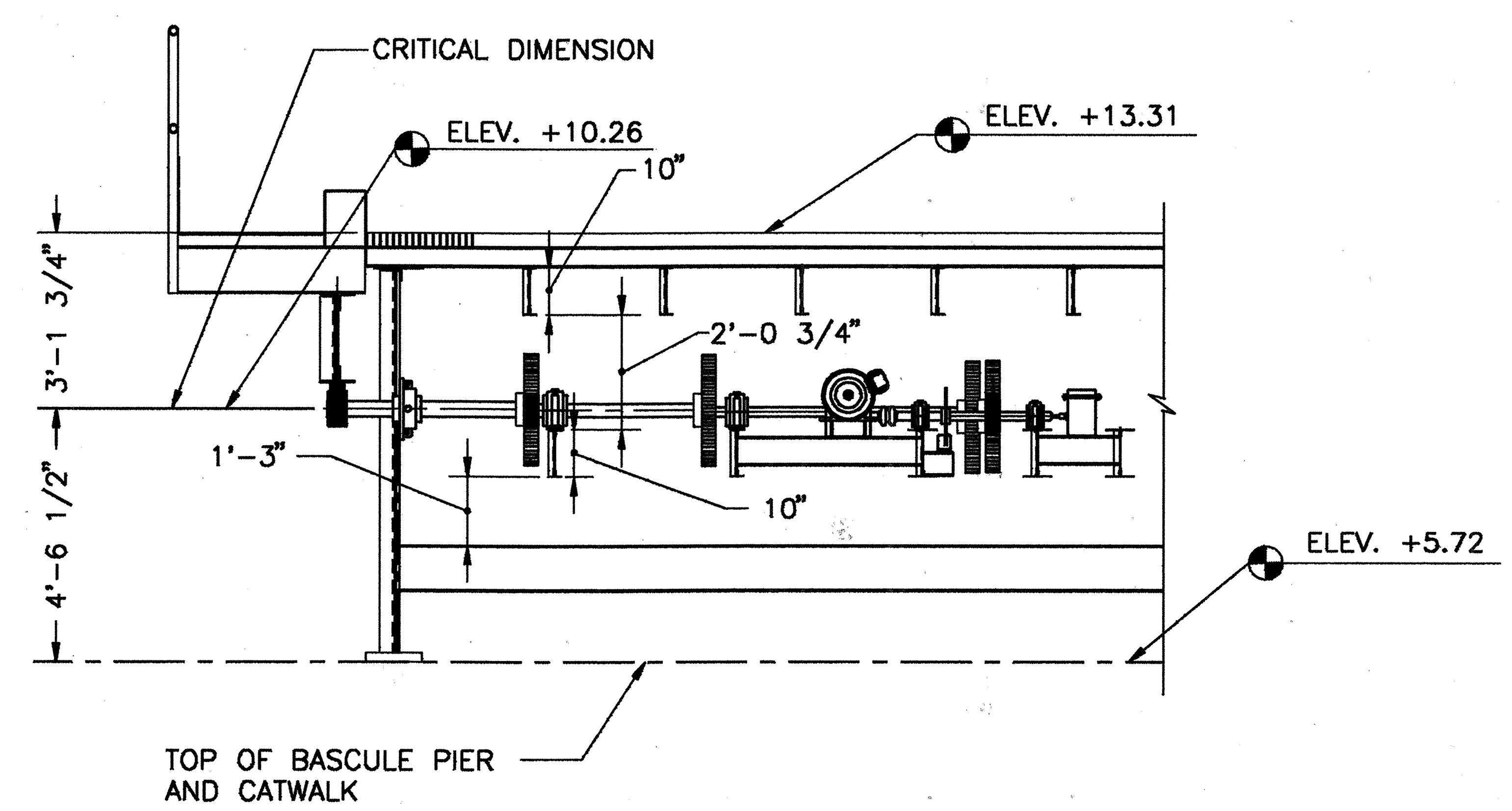
SHEET TITLE: MISCELLANOUS DETAILS
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET M-5



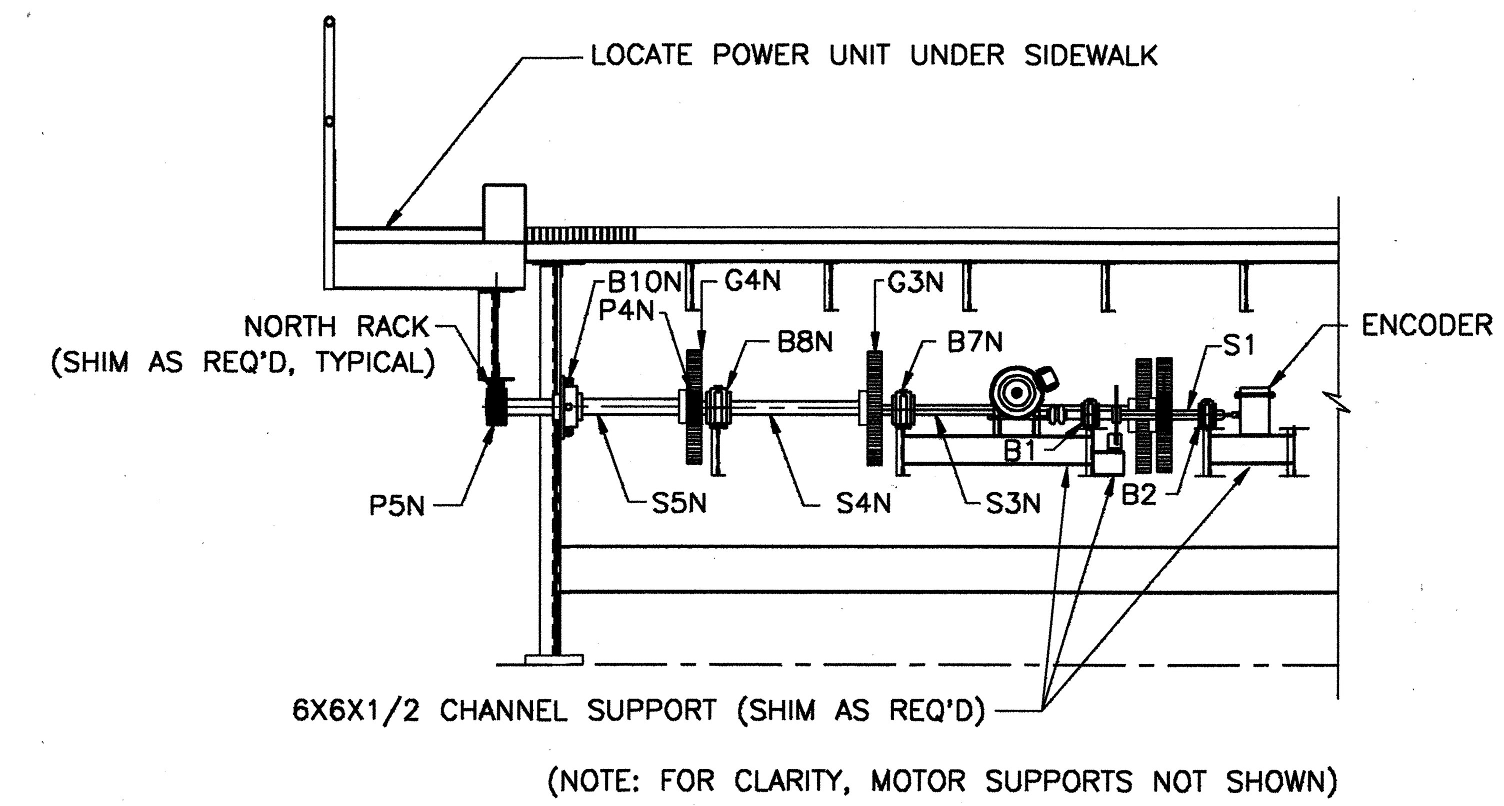
SECTION A–A (DIMENSIONS)
SCALE: 3/8" = 1'-0"



SECTION A–A (PARTS/NOTES)
SCALE: 3/8" = 1'-0"



SECTION B–B (DIMENSIONS)
SCALE: 3/8" = 1'-0"



SECTION B–B (PARTS/NOTES)
SCALE: 3/8" = 1'-0"

NOTE:
REFER TO SHEET M–2 FOR LOCATION OF SECTION CUTS

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C:\WORK\BBMECH6 08/01/95 08:44:30 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS

Date	By	Description

REVISIONS

Date	By	Description

SEAL:

	Names	Dates
Drawn by	AEV	5–95
Checked by	LET	5–95
Designed by	LET	5–95
Checked by	RMC	5–95
Approved by	R.M. COURET	

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TAMPA, FLORIDA 33607

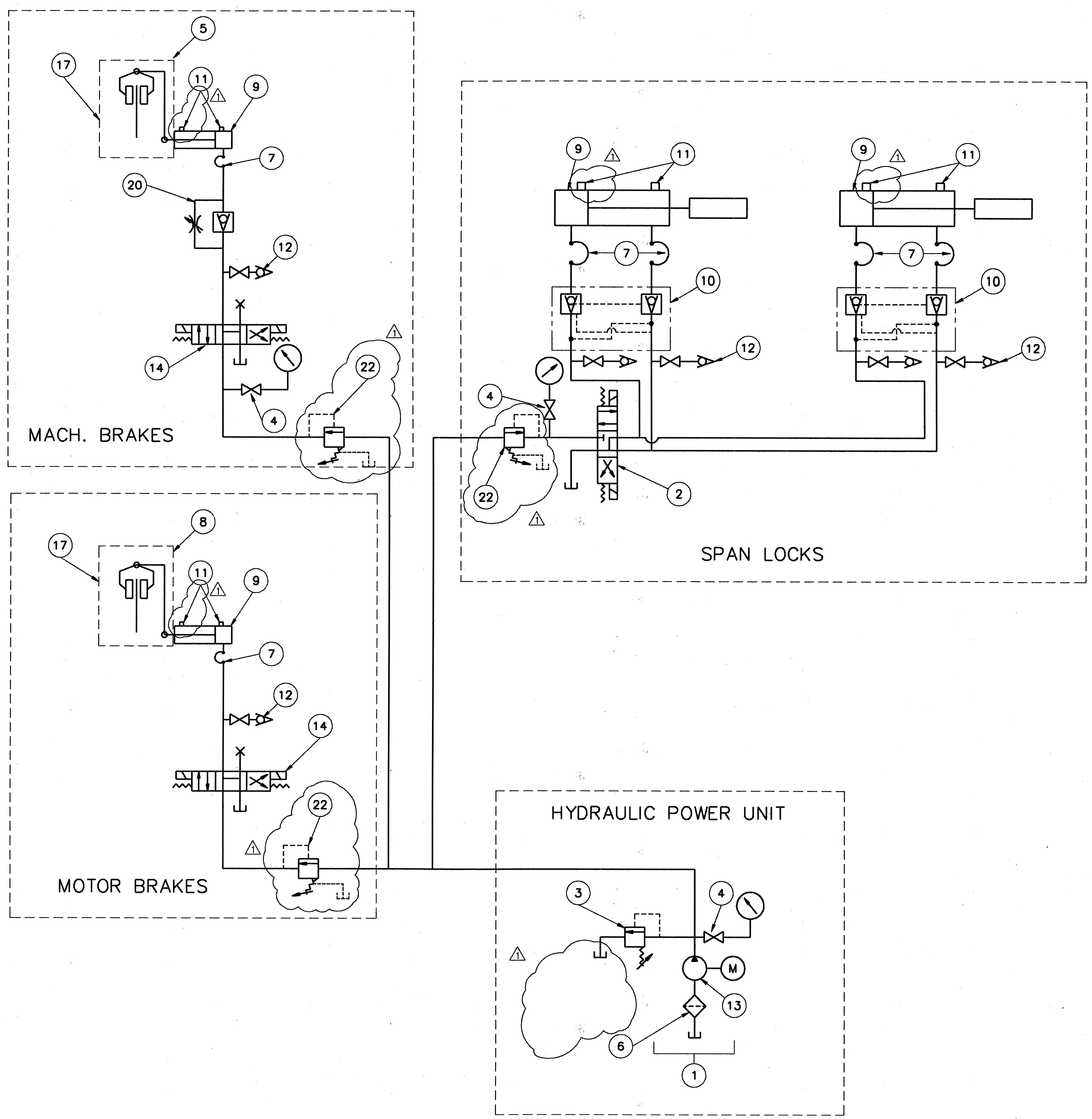
PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: SECTIONS AND ELEVATIONS

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET M–6

R.M. Couret



BRAKES & SPANLOCK HYDRAULIC SYSTEM DIAGRAM

BILL OF MATERIAL

	ITEM NO.	NO. REQ'D.	PART NUMBER	DESCRIPTION	BASE MFGR	ALTERNATE MFGR *
	1	1	JIC 10 A	10 GALLON JIC RESERVOIR W/DRIP STAND	MARCO	
**	2	1	D2FWEC △1	PROPORTIONAL DIRECTIONAL VALVE	PARKER	SUN
**	3	1	D03	3 STATION MANIFOLD W/RELIEF VALVE	PARKER	SUN
**	4	3	PG3000 W/ NVG250B	GAUGE W/ NEEDLE VALVE	HSI	PARKER
	5	1	L-11	MACHINERY BRAKE	STOCKBRIDGE	MICO
**	6	1	40CN110B	RETURN FILTER	PARKER	SUN
	7	12		FLEXIBLE HOSE	PARKER	GOODYEAR
	8	1	L-11	MOTOR BRAKE	STOCKBRIDGE	MICO
	9	4	4CC2HLUS14AC9	4" BORE x 9" STROKE HYDRAULIC CYLINDER	PARKER	SUN
**	10	2	△1	DUAL PILOT OPERATED CHECK VALVE MODULE	PARKER	HSI
+	11	8	AB-3	LIMIT SWITCH	PARKER	HONEYWELL
	12	6		CONNECTION FOR HAND PUMP	PARKER	SUN
	13	1	Q25145A	1 1/2 HP HYDRAULIC POWER UNIT	PARKER	MONARCH
	14	2	D1F-EC	PROPORTIONAL DIRECTIONAL VALVE	PARKER	SUN
	15	2	△1	ROTOR/CALIPER SYMBOL	STOCKBRIDGE	MICO
**	16	1	RCVA	RELIEF VALVE MODULE	PARKER	SUN
***	17	2	9662K34	1.125" X 7.58" RETURN SPRING, K=168	MCMASTER	STOCKBRIDGE
***	18	2	NA	11" DIA. VENTILATED ROTOR	STOCKBRIDGE	HAYES
***	19	2	NA	28 SQ. INCH CALIPER PADS	STOCKBRIDGE	HAYES
	20	1	SHOP △1	COMBINATION CHECK VALVE AND NEEDLE VALVE	PARKER	SUN
	21	3	EW55	DRIVER BOARD FOR DIRECTIONAL VALVES	PARKER	SUN
△1	22	3	PR400S	PRESSURE REDUCING VALVE	PARKER	SUN

* DENOTES "OR APPROVED EQUAL"
** DENOTES ITEM INCLUDED AS PART OF ITEM 13
\+ DENOTES ITEM INCLUDED AS PART OF ITEM 18
* DENOTES ITEM LOCATED IN CONTROL CONSOLE
*** DENOTES ITEM INCLUDED AT PART OF ITEMS 5 AND 8

NOTES:

1. HYDRAULIC POWER UNIT ROTATES WITH LEAF. PROVIDE TOTALLY ENCLOSED UNIT.
2. PROVIDE HAND PUMP FOR MANUAL RELEASE OF BRAKE AND SPAN LOCKS.
3. REPLACE STOCKBRIDGE K 25.5 SPRING WITH ITEM 17

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REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description
1/31/96	RMC	△1 ADDEND. 2-ADDED PRV & DEL. PROP. CNTL. VALVE ADDED SUBSYSTEM TITLES ADDED ITEM 22 CHANGED PART NO'S FOR ITEMS 2,14,20 CHANGED QTY'S FOR ITEMS 9,11,12,14,20			

SEAL: 1/31/96

	Names	Dates
Drawn by	ALC	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

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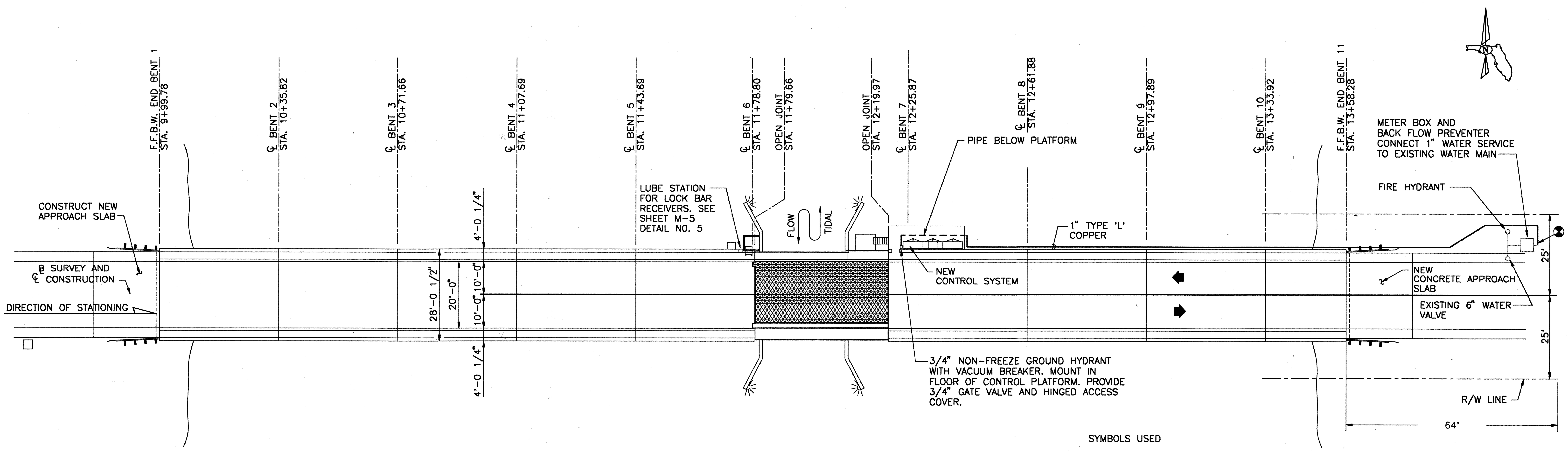
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

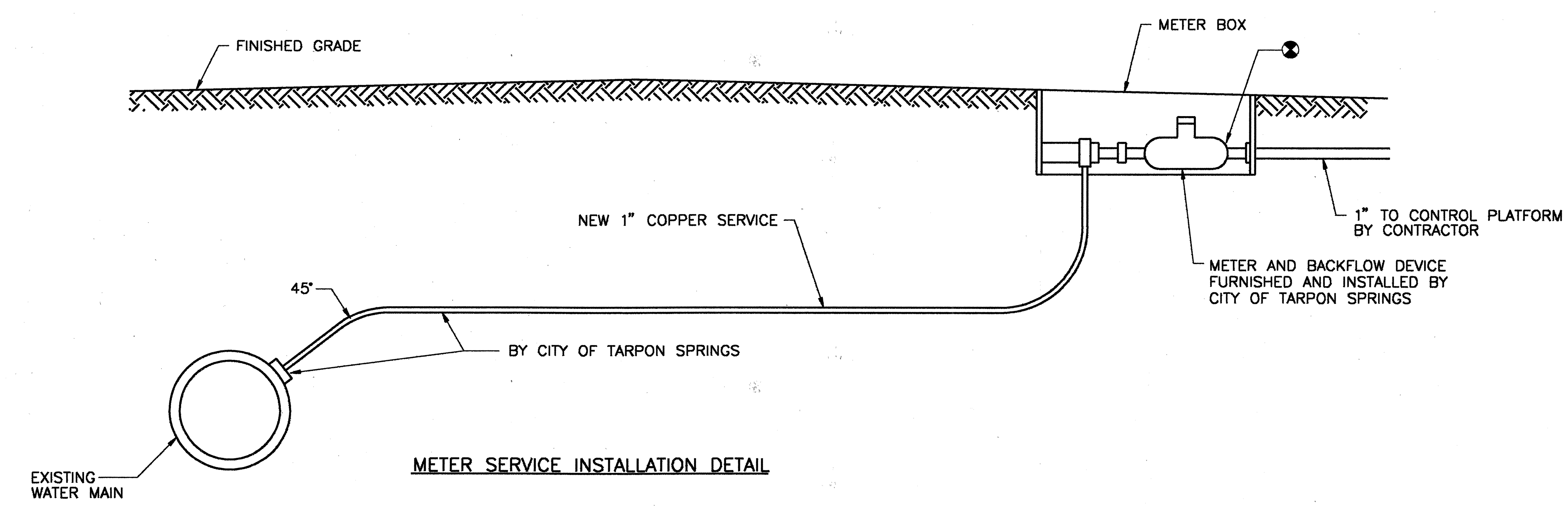
SHEET TITLE: HYDRAULIC SYSTEM SCHEMATIC
PROJECT NAME: BECKETT BRIDGE REPAIRS
SHEET M-7



PLAN

SYMBOLS USED

⊗ = POINT OF CONNECTION



METER SERVICE INSTALLATION DETAIL

NOTES:

1. MAKE CONNECTION IN ACCORDANCE WITH THESE DRAWINGS AND CITY OF TARPON SPRINGS WATER DEPT. STANDARD SPECIFICATIONS. PROVIDE CATHODIC PROTECTION FOR UNDERGROUND TYPE "L" COPPER SERVICE PIPE. COAT EXPOSED AND UNDERGROUND PIPING WITH 50 MIL DRY COATING OF BITUMASTIC.

2. PAYMENT FOR SERVICE CONNECTION AND MATERIALS TO PROVIDE WATER SERVICE AT THE CONTROL PLATFORM SHALL BE INCLUDED IN ITEM NO. 512-1 "TENDER FACILITIES AND EQUIPMENT".

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REVISIONS

Date	By	Description	Date	By	Description

SEAL:

	Names	Dates
Drawn by	CLM	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

R.M. Couret

DSA GROUP INC.

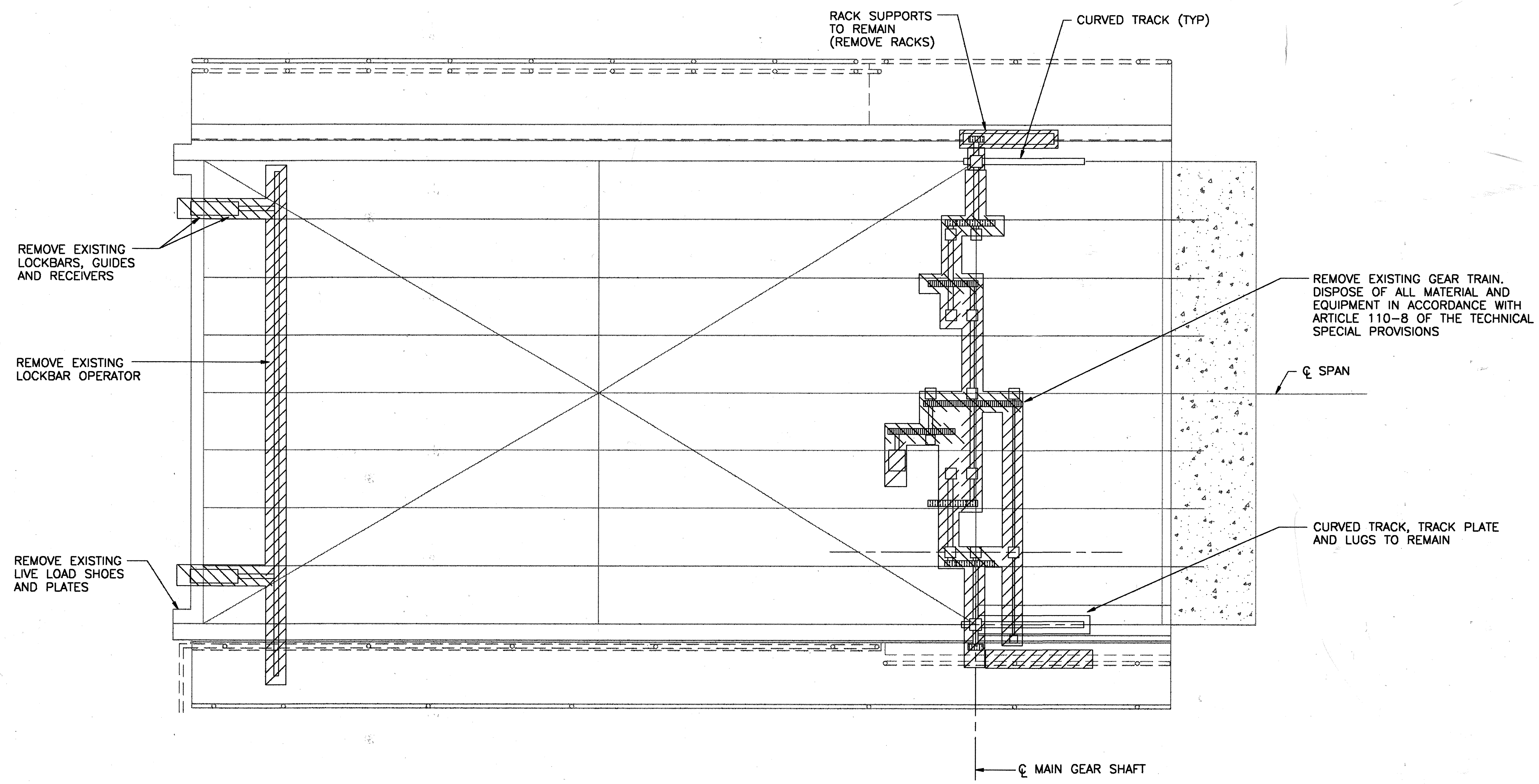
DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: MECHANICAL SITE PLAN

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET M-8



DEMOLITION PLAN

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C:\WORK\BBMECH9 06/19/95 09:45:21 AEV PRODUCED BY DSA CADD SYSTEM

REVISIONS			REVISIONS			SEAL:
Date	By	Description	Date	By	Description	

	Names	Dates
Drawn by	ALC	5-95
Checked by	LET	5-95
Designed by	LET	5-95
Checked by	RMC	5-95
Approved by	R.M. COURET	

RM Couret

DSA GROUP INC.

DSA GROUP, INC.
2005 PAN AM CIRCLE
TAMPA, FLORIDA 33607

PINELLAS COUNTY FLORIDA BOARD OF COUNTY COMMISSIONERS

PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: MACHINERY DEMOLITION

PROJECT NAME: BECKETT BRIDGE REPAIRS

SHEET M-9

4. SCOUR EVALUATION REPORTS

4.1. PHASE 1 SCOUR EVALUATION REPORT (1994)

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT SEVEN
DISTRICTWIDE SCOUR EVALUATIONS
WPA NO.: 7620014
STATE PROJECT NO.: 99007-1828

HAMID B. KASHANI, P.E., PROJECT MANAGER

SCOUR EVALUATION REPORT

BRIDGE NUMBER:	***154000***
OWNER:	***PINELLAS COUNTY***
BRIDGE NAME:	***BECKETT BRIDGE***
LOCATION:	***RIVERSIDE DR. (SPRING BLVD)*** ***0.1 MILE WEST OF CHESAPEAKE DRIVE***
COUNTY:	***PINELLAS***
SCOUR MODE:	***TIDAL*** ***SCOUR SUSCEPTIBLE, HIGH PRIORITY***
RECOMMENDATION:	***PHASE 2 SCOUR ASSESSMENT IS RECOMMENDED.*** ***INITIATE AN INTERIM PLAN OF ACTION.***

THIS REPORT ADDRESSES:

■ **PHASE 1**	☐ **PHASE 2**	☐ **PHASE 3**	☐ **PHASE 4**
QUALITATIVE EVALUATION / ASSESSMENT	**HYDRAULIC / HYDROLOGIC ASSESSMENT**	**STRUCTURAL / GEOTECHNICAL ASSESSMENT**	**PLAN OF ACTION**
DATE: 3-15-94	DATE:________	DATE:________	DATE:________

PREPARED BY: PHM

CHECKED BY: PWH

QA / QC BY: PFL

PITMAN ▼ HARTENSTEIN & ASSOC., INC.
E N G I N E E R S

PROJECT MANAGER:
PATRICK W. HEERDT, P.E.

Patrick W Heerdt 9/26/94 FL34258

SIGNATURE **DATE** **P.E. NUMBER**

1.0 SUMMARY OF FINDINGS

Bridge Number 154000 is identified as a Tidal, Scour Susceptible, High Priority bridge. The bridge, known as the Beckett Bridge, is a 10 span, concrete and steel single leaf bascule structure; constructed in 1924, it was rehabilitated in 1956. Pinellas County Department of Public Works is in the process of obtaining design and repair services for the bridge. The bridge serves as a east/west crossing of Riverside Drive (CR 45), also named Spring Boulevard, over the tidal waters of Tarpon Bayou. Tarpon Bayou is a tributary of the Anclote River north of Riverside Drive and the tidally influenced flows flush through the structure. The bridge has vertical wall abutments at the channel banks and pile supported intermediate bents. The abutment footings are lined with layers of bagged sand cement, the left abutment is further protected by wing walls. The U/S wing wall extends back to concrete sheet piling lining the U/S left channel. The D/S wing wall is connected to rubble riprap and concrete block bulkhead. Soil loss from behind the D/S wing wall was observed. The right abutment is flanked U/S by an elevated, lightly vegetated shoulder and no countermeasures for a distance of approximately 25 feet. The U/S right channel is lined with concrete block bulkhead, which has 8 to 10 inches of exposed footing. Downstream low concrete sheet piling extends approximately 3 feet under the bridge. The bulkhead connects to sheet piling around the perimeter of the Tarpon Springs Yacht Club which juts out into the channel blocking flow through span No. 10. Further D/S the channel banks are vegetated and appear stable. The D/S bulkhead at the right abutment is being undermined. The roadways in this low lying area will overtop during coastal storms, the overbank flow is approximately 4,500 feet left and 2,100 feet right.

Review of past inspection reports identified undermining at the left and right abutments. Soil backfill has been placed, the bridge approaches repaved, and further undermining reduced by the placement of bagged sand cement countermeasures. We have been informed through discussions with County personnel that the bridge foundation has been subject to settlement and may be the motivation for the recent rehabilitation project.

Recommendations: This bridge is categorized as Scour Susceptible, High Priority. A Phase 2 scour assessment is recommended due to the unknown foundation and pile embedment condition, the exposed footings at the left and right abutment, and the known settlement of foundation elements (not directly attributed to scour). Repair undermined areas of bulkhead and sheet piling lining the channel U/S and D/S. Increase the frequency of bridge inspections and following coastal storms or tidal surges. Initiate an Interim Plan of Action which should include the following:

a. Increase the frequency of inspections, and following coastal storm events and tidal surges, and file a report of findings following each visit.

b. Timely installation of temporary scour countermeasures to stabilize a known scour condition.

c. Prepare contingency plans should the bridge require closure, or during severe coastal storms until countermeasures are installed.

d. Prepare a schedule for bridge replacement or installation of permanent countermeasures dependent upon the perceived risk involved.

2.0 BASIS FOR EVALUATION

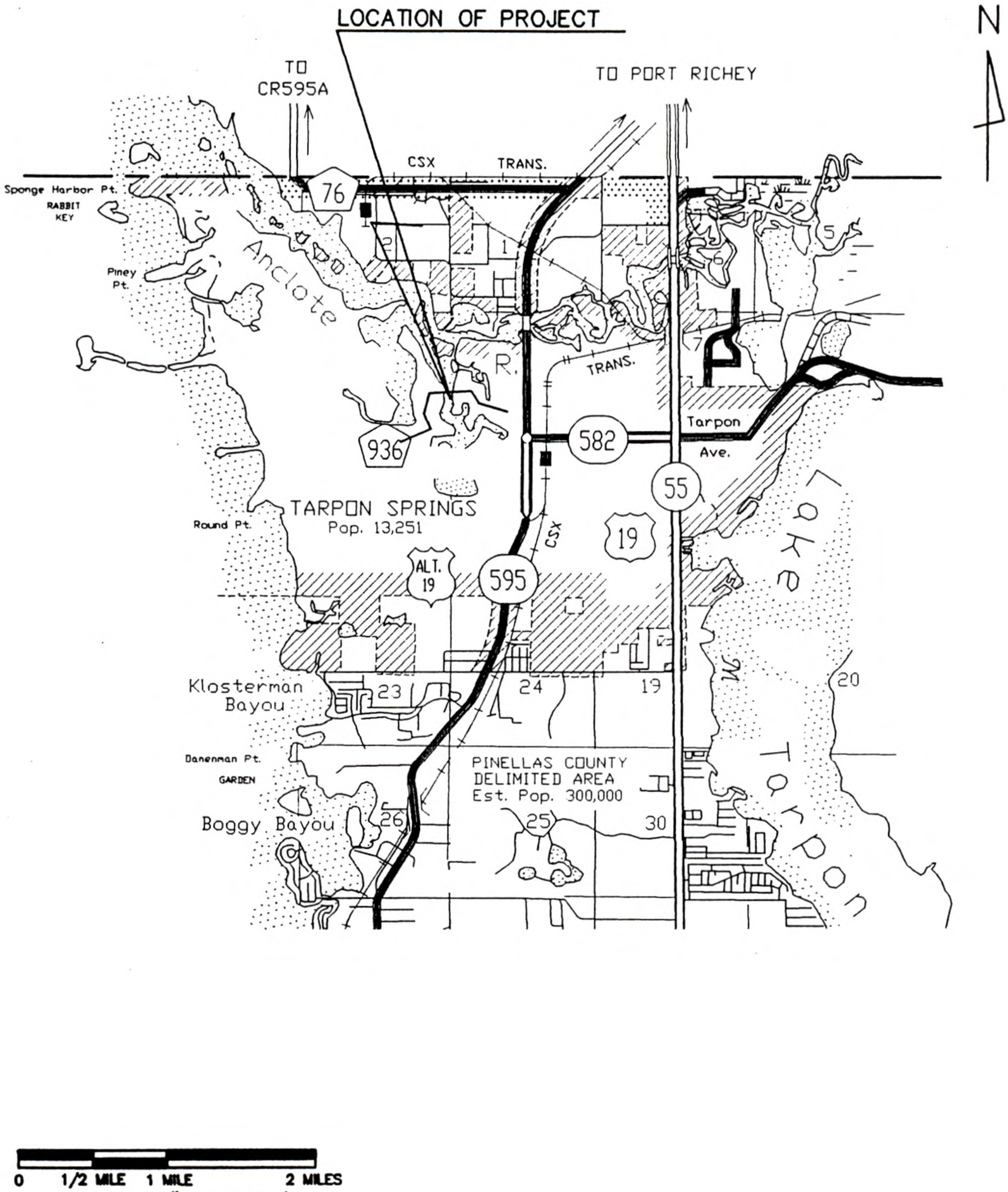
Evaluation of this structure is based upon HEC 20 geomorphic qualitative analyses criteria. The Tarpon Bayou is a manmade channel in a low lying, flood prone, tidally influenced urban area. The surface velocity is 0.3 fps, the bed material is erodible sand and organic muck. The Pinellas County FEMA, Flood Insurance Rate Map classified the area as Zone A12; the bridge will not overtop, however, a large floodplain is located left and right of the structure.

3.0 MATERIALS AND DOCUMENTATION

The following data were utilized in this evaluation:

* Bridge inventory sheets dated 2-07-94
* Previous bridge inspection reports were reviewed at the District 7 Structures Office. Available reports were dated between 11-19-86 and 10-18-93.
* Concrete repair and framing plan dated 1979.
* A field review conducted by the project team on 3-15-94.
* Pinellas County FEMA, Flood Insurance Rate Map.
* Replacement Feasibility Study dated 11/91.
* Pinellas County Master Drainage Plan.

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

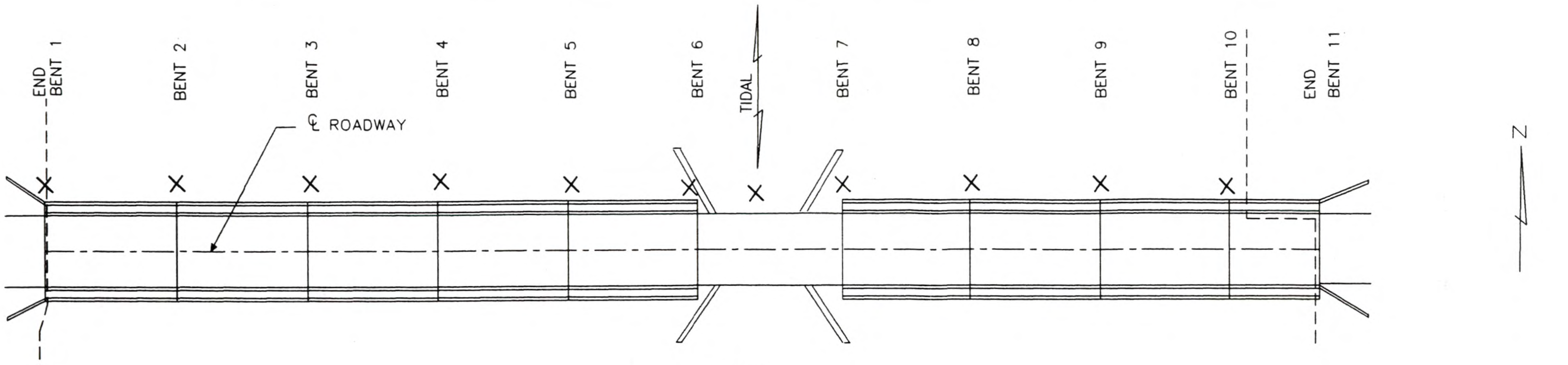


SCALE : 1" = 5280'

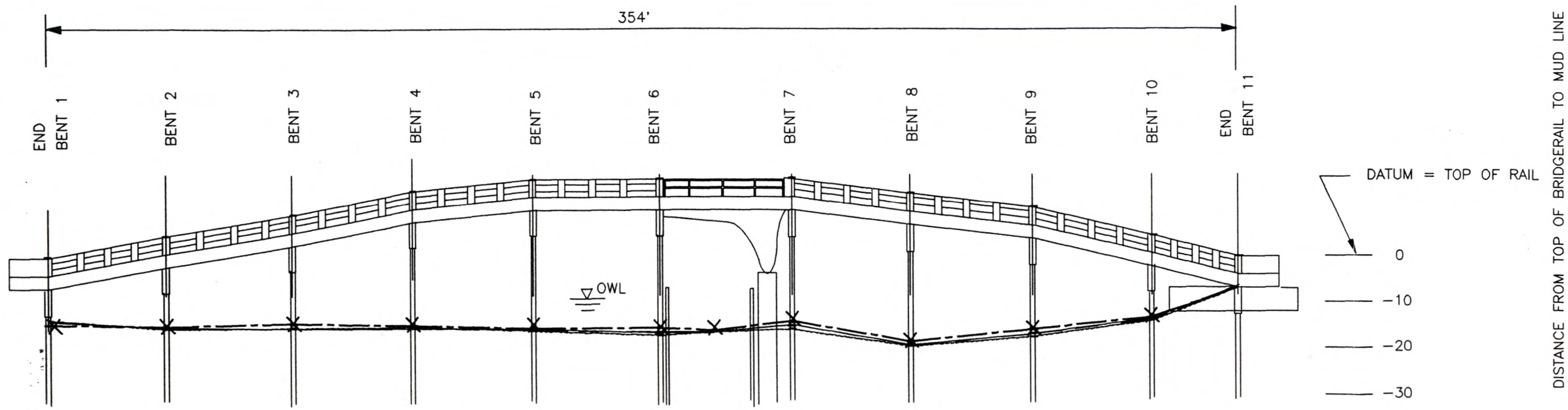
PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. - DISTRICT VII DISTRICT - WIDE BRIDGE SCOUR EVALUATION	LOCATION MAP	
JOB NO. 9304-1A	REVISED	DATE FEB.3,1994	FIGURE 1

LOCHAP.DWG

STATE PROJ. NO. 99007-1828
BRIDGE NO. 154000



PLAN



PROFILE

STRATA DATA

SOIL BORING INFORMATION NOT AVAILABLE.

LEGEND

OWL – OBSERVED WATER LINE

CHANNEL SOUNDING LEGEND

X 1994 SCOUR REPORT (L.SIDE)
1993 INSPECTION REPORT
1991 INSPECTION REPORT
1989 INSPECTION REPORT
1986 INSPECTION REPORT

NOTES:

1. BRIDGE PLAN AND PROFILE IS SCHEMATIC BASED UPON SITE MEASUREMENTS, PHOTOGRAPHS AND INSPECTION REPORTS, AND IS APPROXIMATE.
2. CHANNEL CROSS-SECTION TAKEN FROM LEFT SIDE OF BRIDGE.

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	PLAN & PROFILE	
JOB NO. 9304-1A	REVISED	DATE MAR.15,1994	FIGURE 2

6/6/94

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

Bridge Number: *154000*	County: *PINELLAS*	Route: *RIVERSIDE DR. (SPRING BLVD)*	Over: *BECKETT BRIDGE*

1. SCOUR VULNERABILITY RATING (PER FHWA)

a. Scour Critical	( ) Yes	(X) No	
Scour Susceptible	(X) High	( ) Medium	( ) Low
Low Risk	( ) High	( ) Medium	( ) Low
Foundation	( ) Known	(X) Unknown	

b. Reasons for Rating:

- *Foundation is on piles of unknown embedment.*
- *End bents are on unknown foundation on erodible bed.*
- *History of undermining at both abutments.*
- *Flow velocity of stream does not appear aggressive.*
- *Erosion at abutment shoulders.*
- *Undermining of channel countermeasure at structure.*
- *Span No. 10 blocked by concrete bulkhead.*
- *D/S boat docks fill right side of channel.*
- *Evidence of settlement of bent or bascule.*
- *Significant overbank flow.*

2. FLORIDA DOT SCOUR INDEX NUMBER Initial (11) Secondary ( )

3. RECOMMENDATIONS (See Preceding Narrative)

a. Countermeasures:

(X) Riprap — *Repair undermined areas of embankment bulkhead, vegetate shoulders and slopes, provide countermeasures at D/S left and U/S right shoulders.*

( ) Scour Monitor

(X) Inspection — *Increase frequency of inspections and following coastal storm events and tidal surges.*

(X) Other — *Investigate cause of bridge settlement and provide foundation improvements. Initiate an Interim Plan of Action as described in the preceding Narrative.*

b. Phase 2 Assessment: *IS RECOMMENDED.*

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

4. SITE FIELD REVIEW

a. Evidence of Scour at Structure (Scour Critical Evaluation):

1) Abutment Tilting / Moving in	( ) Yes	(X) No
2) Slopes Washing in / Sloughing	( ) Yes	(X) No
3) Scour Holes Near Abutments / Bents	(X) Yes	( ) No
4) Bed Deposits Downstream	( ) Yes	(X) No
5) Bridge Railing Sagging	(X) Yes	( ) No
6) Debris	( ) Yes	(X) No

7) High-Water Mark (X) Yes ( ) No (*2.0*) ft.

8) Other *Reports of bent foundation sagging 4.5"+/-*

b. Feasibility of Monitoring During High Flow:

1) Rod / Pole / Weight from Deck	(X) Yes	( ) No
2) Fixed Monitoring Device	(X) Yes	( ) No

c. Feasibility of Adding Riprap or Other Scour Countermeasures: (X) Yes ( ) No

5. ABUTMENTS

a. Type: (X) Bridge ( ) Bridge Culvert

( ) Spill-Through (X) Vertical Wall (X) Wing Walls ( ) Sheet Piles

b. Foundation	Dimensions (L,W,D) (ft)	Embedment (ft)	Scour Exposure (ft)
( ) Spread Footing			
( ) Pile Cap			
(X) Piles	*Assumed*		
( ) Drilled Shafts			

Source of Data:
- (X) Field Review
- ( ) As-built Plans
- (X) Inspection Reports
- ( ) Design Plans
- ( ) Pile Driving Records
- ( ) Other

c. Location from Bank	Left (ft)	Right (ft)
( ) Set back		
(X) At bank	0.0	0.0
( ) In channel		

d. Protection:

1) Countermeasures: ( ) Sand-Cement ( ) Rubble ( ) Commercial Block
( ) None ( ) Grouted ( ) Sheet Piles (X) Other: *Bagged sand cement*

2) Condition:	Good	Fair	Poor
Left	( )	(X)	( )
Right	( )	( )	(X)

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

6. PIER

a. Type (Typical or Worst Pier):

( ) Concrete Wall (X) Pile Bent ( ) Column

b. Shape: (X) Square ( ) Rounded ( ) Sharp Nose

c. Width: ( ) feet Length: ( ) feet

d. Foundation: (Worst pier)	Dimensions (L,W,D) (ft)	Embedment (ft)	Scour Exposure (ft)
( ) Spread Footing			
( ) Pile Cap			
(X) Piles	*1.5 FT. SQ.*		
( ) Drilled Shafts			

Source of Data:
- (X) Field Review
- ( ) As-built Plans
- (X) Inspection Reports
- ( ) Design Plans
- ( ) Pile Driving Records
- ( ) Other

e. Protection:

1) Countermeasures: ( ) Sand-Cement ( ) Rubble ( ) Commercial Block (X) None ( ) Grouted ( ) Sheet Piles ( ) Other:

2) Condition: ( ) Good ( ) Fair ( ) Poor

7. CHANNEL LATERAL STABILITY

a. Bends: ( ) None

1) Bridge Location: (X) Upstream of Bend ( ) Downstream of Bend ( ) In Bend

2) Channel Migration ( ) Yes (X) No

3) Countermeasures (X) Yes ( ) No Type: *Bulkhead*

b. Bank Condition:	Upstream	Downstream
1) Eroding	( )	( )
2) Stable	(X)	(X)
3) Vegetated	( )	( )
4) Sheet Piles	( )	(X) *R/S*

5) Countermeasures: (X) Yes ( ) No Type: *Bulkhead*

c. Angle of Attack: Flood Flow (*0°*) Normal Flow (*0°*)

d. Point Bar Under Bridge ( ) Yes (X) No

e. Islands or Bars:

1) Upstream ( ) Yes (X) No

2) Downstream ( ) Yes (X) No

f. Other:

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

8. CHANNEL VERTICAL STABILITY				
a. Exposed Footing:		(X) Yes	( ) No	( ) Unknown
b. Exposed Piles:		( ) Yes	(X) No	( ) Unknown
c. Contraction Scour (Encroachment):				
1) Overbank Flow:	Left	(X) Yes	( ) No	(*4500*) feet
	Right	(X) Yes	( ) No	(*2100*) feet
2) Relief Bridge:		( ) Yes	(X) No	
3) Roadway Overtopping:		(X) Yes	( ) No	
		( ) Unknown	( ) Possible	
4) Bridge Overtopping:		( ) Yes	(X) No	
		( ) Unknown	( ) Possible	
d. Long Term:				
1) Aggradation		( ) Yes	(X) No	( ) Unknown
2) Degradation		( ) Yes	(X) No	( ) Unknown
e. Bed Material:				
(X) Sand				
( ) Gravel				
( ) Cobbles				
(X) Other	*Oyster shell, mud and silt*			

9. GEOMORPHOLOGY				
a. Alluvial Fan		( ) Yes	(X) No	
b. Dam or Reservoir		( ) Yes	(X) No	
c. River Form		( ) Straight	( ) Meandering	
		( ) Braided	(X) Manmade	
d. Instream Mining / Dredging		( ) Yes	(X) No	
e. Headcuts or Nickpoints		( ) Yes	(X) No	
f. Diversions		( ) Yes	(X) No	
g. Channel Straightening		( ) Yes	( ) No	
h. Stream Size:	( ) Small (<100 feet)	(X) Medium (100-500 feet)	( ) Large (>500 feet)	
i. Flow Characteristics:	( ) Intermittent	( ) Perennial	(X) Tidal	
j. Other:				

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

10. OTHER CONSIDERATIONS

a. Sediment Transport (During High Flow):

1) (X) Live Bed Condition ( ) Clear Water Condition ( ) Unknown

2) Armored Bed ( ) Yes (X) No

b. Watershed: ( ) Agricultural ( ) Forested ( ) Swamp (X) Urban

c. Tidal Influence: (X) Yes ( ) No ( ) Unknown ( ) Possible

d. Tidal Features: (X) Bay (X) Estuary ( ) Inlet ( ) Barrier Island

1) Normal Range (Amplitude) (*2.0*) feet ( ) Tide Table (X) Field Observation

2) Observed Surface Velocity (*0.3*) ft/sec

3) Seiching (wind set up) ( ) Yes ( ) No (X) Possible

4) Distance to coast (*.3*) miles-shortest distance (*.3*) miles along thalweg

5) Traffic: ( ) Ship (X) Recreation ( ) Commercial
( ) Barge ( ) Intracoastal Waterway

e. Tributaries:

( ) Upstream ( ) Downstream (X) No Factor

Distance to confluence of next stream or water body: (*0*) miles upstream
(*0*) miles downstream

f. Observed Stream Velocity (*0.3*) ft/sec

g. Manning's n: Channel (*0.25*) Overbank (*0.35*)

11. ADDITIONAL COMMENTS

a. Photographs:
(X) Bridge Number
(X) Upstream Face
(X) Downstream Face
(X) SE Abutment
(X) Upstream Channel
(X) Downstream Channel
(X) NE Abutment

b. Remarks:
Ref: 8.a. Concrete block bulkhead U/S R/S. Ref: 8.c.4. FEMA, FIRM locates bridge in Zone A12, bridge deck is approximately elevation 17.

12. WORK PROGRAM STATUS

a.) Listed on Ten Year Work Program: ( ) Yes ( ) No

b.) WPI No.: ( ) Replacement ( ) Widening ( ) Rehabilitation/Repair

c.) Scheduled Fiscal Year:

d.) Fund Type:

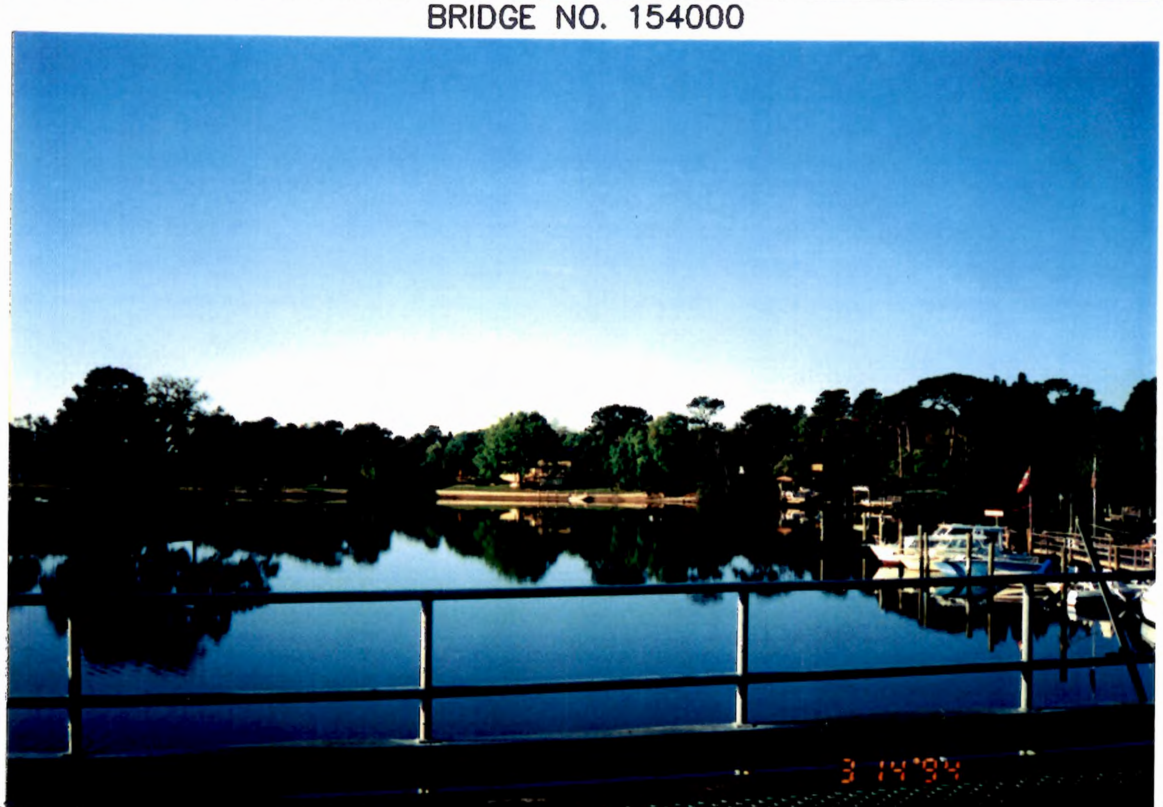
e.) Other: *Pinellas County Dept. of Public Works currently is requesting proposals for design/repair services.*

Field Reviewers: *PHM, JVA/PFL, PWH, PHM, SMB*

Date of Field Review: *3-15-94/4-15-94* Time of Field Review: *8:30AM/3:00PM*

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

BRIDGE NO. 154000



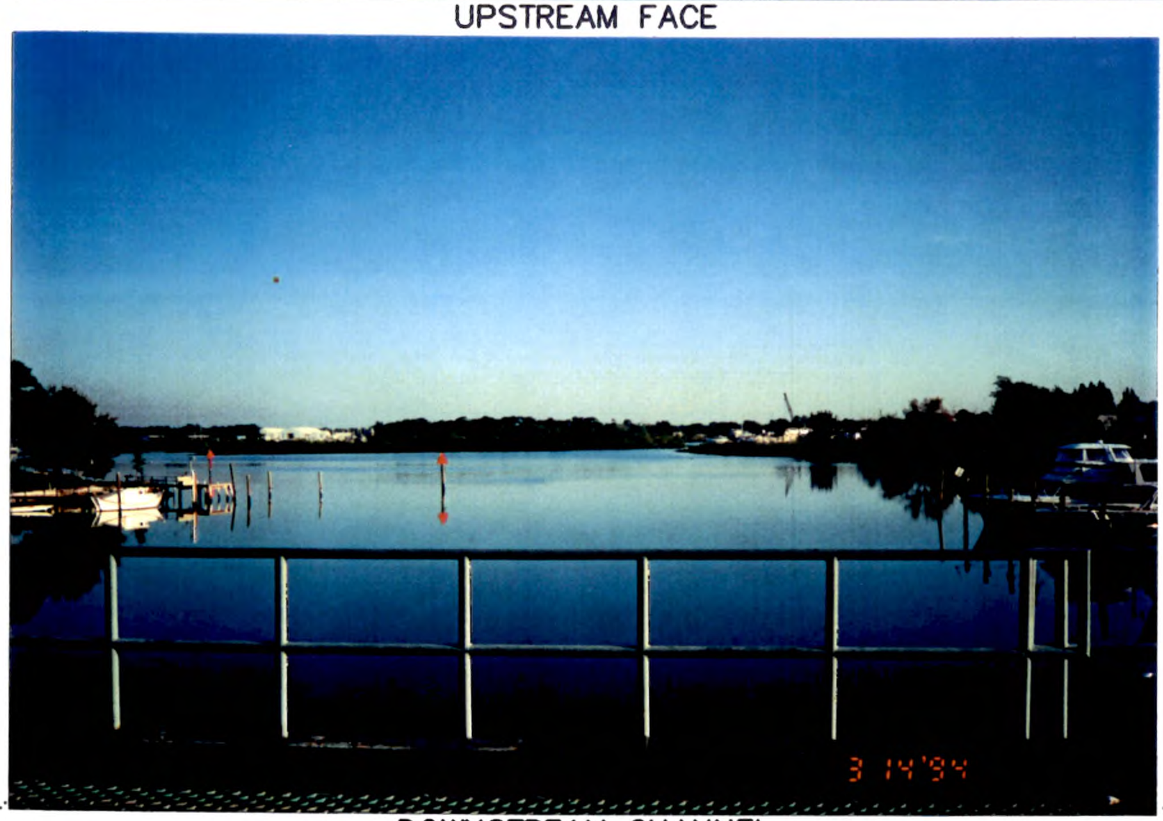
UPSTREAM CHANNEL

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	PHOTO LOG	
JOB NO. 9304-1A	REVISED	DATE 03-14-94	FIGURE 3

photolog.DWG

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

UPSTREAM FACE

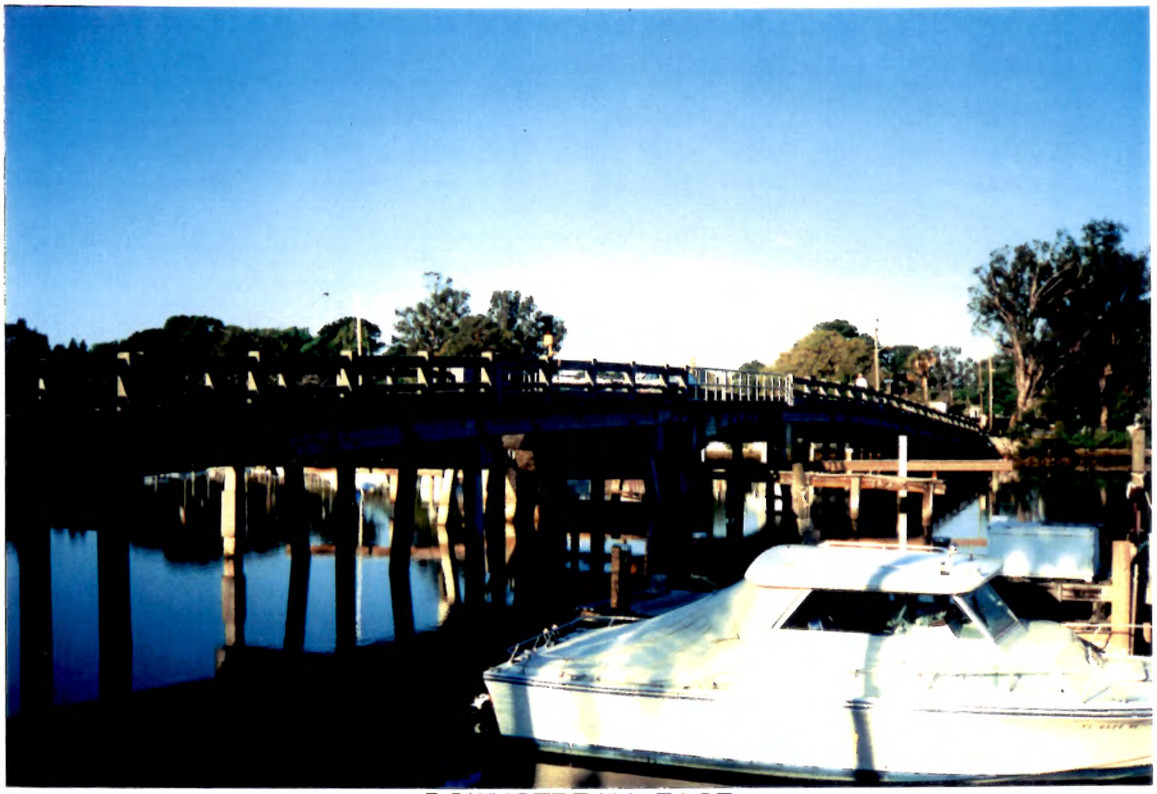


DOWNSTREAM CHANNEL

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	PHOTO LOG	
JOB NO. 9304-1A	REVISED	DATE 03-14-94	FIGURE 4

photolog.DWG

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000



DOWNSTREAM FACE

UPSTREAM RIGHT ABUTMENT

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	PHOTO LOG	
JOB NO.	REVISED	DATE	FIGURE
9304-1A		03-14-94	5

photolog.DWG

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

DOWNSTREAM RIGHT ABUTMENT

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. - DISTRICT VII DISTRICT - WIDE BRIDGE SCOUR EVALUATION	PHOTO LOG	
JOB NO. 9304-1A	REVISED	DATE 03-14-94	FIGURE 6

photolog.DWG

4.2. PHASE 2 SCOUR EVALUATION REPORT (1998)

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT SEVEN
DISTRICTWIDE SCOUR EVALUATIONS
WPI NO.: 7620014
STATE PROJECT NO.: 99007-1828

HAMID B. KASHANI, P.E., PROJECT MANAGER

SCOUR EVALUATION REPORT

BRIDGE NUMBER:	***154000***
OWNER:	***PINELLAS COUNTY***
BRIDGE NAME:	***BECKETT BRIDGE***
LOCATION:	***RIVERSIDE DR. (SPRING BLVD.)*** ***0.1 MILES WEST OF CHESAPEAKE DRIVE***
COUNTY:	***PINELLAS***
SCOUR MODE:	***TIDAL*** ***SCOUR SUSCEPTIBLE, HIGH PRIORITY***
RECOMMENDATION:	***A PHASE 3 SCOUR ASSESSMENT IS REQUIRED.***

( ) Riprap

( ) Scour Monitor

(X) Inspection — *The structure should be inspected at an increased frequency and following severe storm events and tidal surges.*

(X) Other — *Determine pile tip elevations, repair undermined abutments, sheet pile and bulkheads.*

BMIS ITEM I7(113) ____U____
FOUNDATION STATUS: ( ) Known (X) Unknown

THIS REPORT ADDRESSES:

☐ PHASE 1	■ PHASE 2	☐ PHASE 3	☐ PHASE 4
QUALITATIVE EVALUATION / ASSESSMENT	HYDRAULIC / HYDROLOGIC ASSESSMENT	STRUCTURAL / GEOTECHNICAL ASSESSMENT	PLAN OF ACTION
DATE: 3-15-94	DATE: 12-8-97	DATE:________	DATE:________

PREPARED BY: MSB

CHECKED BY: LWZ/STB

REVIEWED BY: ERE

QA / QC BY: PFL

PITMAN ▼ HARTENSTEIN & ASSOC., INC.
ENGINEERS

PROJECT MANAGER:
E. ROB ENGBERG, P.E

1/23/98 FL 48081

SIGNATURE DATE P.E. NUMBER

Bridge #: 154000 County: PINELLAS Route: RIVERSIDE DR. (SPRING BLVD.) Over: TARPON BAYOU

1.0 SUMMARY OF FINDINGS

Bridge 154000 is a 10 span, 354 foot long, single leaf bascule structure that was constructed in 1924, rehabilitated in 1956, as a crossing of Riverside Drive (CR 54) over Tarpon Bayou (See Figure 1). A Phase 1 Report was completed in March 1994 and identified the bridge as a Tidal, Scour Susceptible, High Priority structure. The vertical wall abutments located at the channel banks are protected with bagged sand cement. The Phase 1 Report indicated that the abutment countermeasures were in fair to poor condition. Sheet pile, bulkhead and riprap line the adjacent channel banks. A history of undermining at the abutments, sheet pile and bulkhead has been reported. Erosion behind the wingwalls has also been observed. Beyond the immediate limits of the bridge, the upstream and downstream channel banks were reported as vegetated and appeared to be stable. The structure is supported by piles of unknown elevation and therefore has an Unknown Foundation rating. Bridge plans were not available for review, but relevant hydraulic information was obtained from a recent survey. Soil borings were not available for this structure.

The results of the Phase 2 analysis indicate that scour during a storm surge could lower the channel elevation to a level which may threaten the stability of the structure. The Scour Vulnerability Rating for Bridge 154000 will remain as Scour Susceptible, High Priority with an Unknown Foundation rating.

The worst case computed scour variables are listed below:

Storm Event (yr)	Q[1] (cfs)	V[2] (fps)	Contraction Scour (ft)	Local Scour (ft)	Degradation (ft)	Total Calculated Scour (ft)	Minimum Remaining Embedment (ft)
100	23987 / 20577	5.4	3.6	5.5	0.0	9.1	UNKNOWN
500	34165 / 25743	6.7	6.4	5.7	0.0	12.1	UNKNOWN

[1]Qtotal/Qbridge opening

[2]average velocity through bridge opening

Recommendations:

A Phase 3 Analysis is required to complete the scour analysis at this structure. The Phase 3 requirement is based on the Vulnerability Rating of Scour Susceptible, High Priority and the recommended Item 113 I7 (113) code of U. The analysis should include determination of pile tip elevations. This may eliminate the need for further phased assessment. In the interim the structure should be inspected at an increased frequency and following major storm events and tidal surges. Repair undermined areas of bulkhead and sheet piling lining the channel banks as per the Phase 1 Report. Maintain and repair abutment countermeasures as needed.

2.0 HYDROLOGIC ANALYSIS

The hydrologic analysis is based on the assumption that the peak inland runoff event (riverine flood) and peak coastal event (storm surge) occur independently. The basis for this assumption is the FEMA Flood Insurance Study (FIS) which analyzes runoff and coastal events as independent occurrences.

A tidal prism analysis was conducted to determine the tidal discharge at the bridge location. Incremental prism surface areas were obtained by digitizing the shoreline at 5-, 10-, and 15-ft contours on USGS 7.5 minute quadrangle maps. Prism volumes were computed using the HEC-1 conic method for reservoir volumes. Tidal discharges were determined by computing the change in prism volume with respect to tide elevation over time for the duration of the storm surge hydrograph as described by the following equation.

$$Q(t) = \frac{\Delta V}{\Delta t}$$

where $Q(t)$ = tidal discharge with respect to time
ΔV = change in prism volume with respect to storm tide elevation ($Volume^{t}$ - $Volume^{t+1}$) $Volume^{t}$ represents the prism volume filled at a particular time and $Volume^{t+1}$ is the prism volume at the next time step.
Δt = computational time step

Storm tide elevations for this analysis were obtained from the FIS for Pinellas County (1982). Storm tide elevations of 10.5 ft-NGVD and 13.0 ft-NGVD for the 100- and 500-year events, respectively, were obtained from the FIS. The FEMA Flood Insurance Rate Map for Pinellas County confirmed a base flood elevation of 11 feet NGVD rounded to the nearest foot.

$$S(t) = S_p\,(1 - e^{-(D/t)}) + H_t(t)$$

where
D = R/f = storm duration
R = radius of maximum wind
f = forward speed
t = time
$H_t(t)$ = height of normal daily tide
S_p = the known stage for the selected return period
$S(t)$ = total storm tide elevation

2.0 HYDROLOGIC ANALYSIS cont.

The values of *R* and *f* for the Tarpon Springs area were obtained from data provided in the NOAA Technical Report NWS 15 (1975). The radius of maximum wind and forward speed of the hurricane are dependent on coastal location. The H_t values are the predicted daily tide values with peak surge height, S_p, set at mid-rising tide. The 100- and 500-year values for S_p were adjusted until the peak storm tide elevation, S(t), matched the respective 100-year and 500-year FEMA storm tide elevations.

The peak storm tide discharges using the methodology described above were determined to be 23987 cfs occurring at an elevation of 8.8 ft-NGVD for the 100-year event and 34165 cfs occurring at an elevation of 11.0 ft-NGVD for the 500-year event. Hydrologic data are presented in Attachment A.

3.0 HYDRAULIC ANALYSIS

The hydraulic analysis utilized a steady-state simulation of peak flow conditions using the WSPRO water surface profile program. A model was developed using surveyed data supplemented with USGS mapping. A survey of the bridge cross-section and roadway profile was conducted on July 31, 1997, however the surveyed elevations are relative to a temporary benchmark of unknown elevation. Bridge plans were not available for review, therefore, surveyed water surface elevations were used to reference the assumed elevations to NGVD. The following comparisons were made to estimate the adjustments needed to convert the surveyed elevations to NGVD:

a. Comparison of estimated mean high water (MHW) and mean low water (MLW) elevations computed from vertical clearance data listed in the 1994 inspection report to MHW and MLW values determined from data for the Tarpons Spring gage using TIDE1 and National Ocean Service (NOS) benchmark data.

b. Comparison of the surveyed water surface elevations at specific times to tide elevations determined from data for the Tarpons Spring gage using TIDE1 and NOS benchmark data.

Using these two methods to reference the surveyed elevations to NGVD an adjustment of 990.86 feet was made with a confidence level of +/- 0.5 foot.

Starting water surface elevations were determined from the hydrologic analysis where the tidal discharge was computed by integrating the change in prism volume over time during the storm surge. The water surface elevations corresponding to the peak flow conditions were determined to be 8.8 ft-NGVD and 11.0 ft-NGVD for the 100- and 500-year storm surges respectively.

Approach roadway overtopping is expected when the water surface elevation exceeds the channel bank elevations (approximately elevation 5 ft-NGVD), because the approach roadway is approximately flush with the ground surface in the overbanks. Due to the low road profile, the weir coefficient in the model was reduced to emulate overland flow on the approach roadway rather than weir flow. The WSPRO user defined weir coefficient was adjusted until the discharge flowing over the approach roadway matched the overbank flow in the approach section. Approach roadway flow was computed as 14% and 25% of the total discharge for the 100- and 500-year events respectively. WSPRO model input and output are presented in Attachment B.

4.0 SCOUR ANALYSIS

The scour analysis and related computations were performed using HEC-18 procedures. These calculations were made under the assumption of an infinite depth of erodible material with a homogeneous particle size distribution. The Phase 1 report indicated sand, oyster shell, mud and silt as the predominant forms of sediment underneath the structure. A D_{50} = 0.2 mm = 0.000656 ft, reflecting fine sand, was assumed for the scour calculations.

The Phase 1 Report indicated no long term degradation. Comparison of the 1986 inspection report to the 1994 Phase 1 Scour Report mudlines does not indicate long term degradation. Therefore degradation was estimated as 0.0 ft for this analysis.

Using HEC-18's critical velocity equation the mode of sediment transport in the main channel was quantified as live-bed for the 100- and 500-year events. Critical velocities in the main channel approach section are 1.47 fps and 1.52 fps for the 100- and 500-year storm events, respectively, whereas mean velocities in the approach section main channel are 4.21 fps and 4.40 fps. Contraction scour for the bridge opening was calculated as 3.6 ft and 6.4 ft for 100- and 500-year events respectively. Although the bridge does not contract the channel it would experience pressure flow during an extreme storm surge. The pressure flow condition is the primary cause of contraction scour.

Local pier scour computations were performed using square pile dimensions of 1.5 ft and no angle of attack. Pier scour of the greatest magnitude occurred at the bascule pier which is adjacent to pile Bent 7 with calculated scour depths of 17.2 ft and 19.4 ft for the 100- and 500-year storm events respectively. Pier scour of the greatest magnitude for the typical pile bents occurred at Bent 6 with calculated scour depths of 5.5 ft and 5.7 ft for the 100- and 500-year storm events, respectively.

The Phase 1 analysis indicates the abutments are protected from scour and therefore, local abutment scour depth calculations are not made. Results from the scour analysis are presented in Attachment C and a graphical representation of the computed scour depths is shown in Figure 2.

5.0 MATERIALS AND DOCUMENTATION

The following information was used in this evaluation:

- Federal Emergency and Management Agency

Flood Insurance Study Pinellas County (December 1982)
Flood Insurance Rate Map (FIRM): Pinellas County

- Army Corps of Engineers
  DYNLET1 Application to Federal Highway Administration Projects, Miscellaneous Paper CERC-93-6, August 1993

- U.S. Geological Survey
  Tarpon Springs, FL - 7.5 minute quadrangle, 5 foot contours (Photorevised 1987)
  Elfers, FL - 7.5 minute quadrangle, 5 foot contours (Photorevised 1987)
  Dunedin, FL - 7.5 minute quadrangle, 5 foot contours (Photorevised 1987)

- NOAA
  Ho, F., Schwerdt, R., Goodyear, H., 1975. "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States," NOAA Technical Report NWS 15, Washington, D.C.

- Bridge No. 154000 Phase 1 Scour Evaluation Report
  (3/15/94)

- Bridge Inspection Reports
  (1986 - 1994)

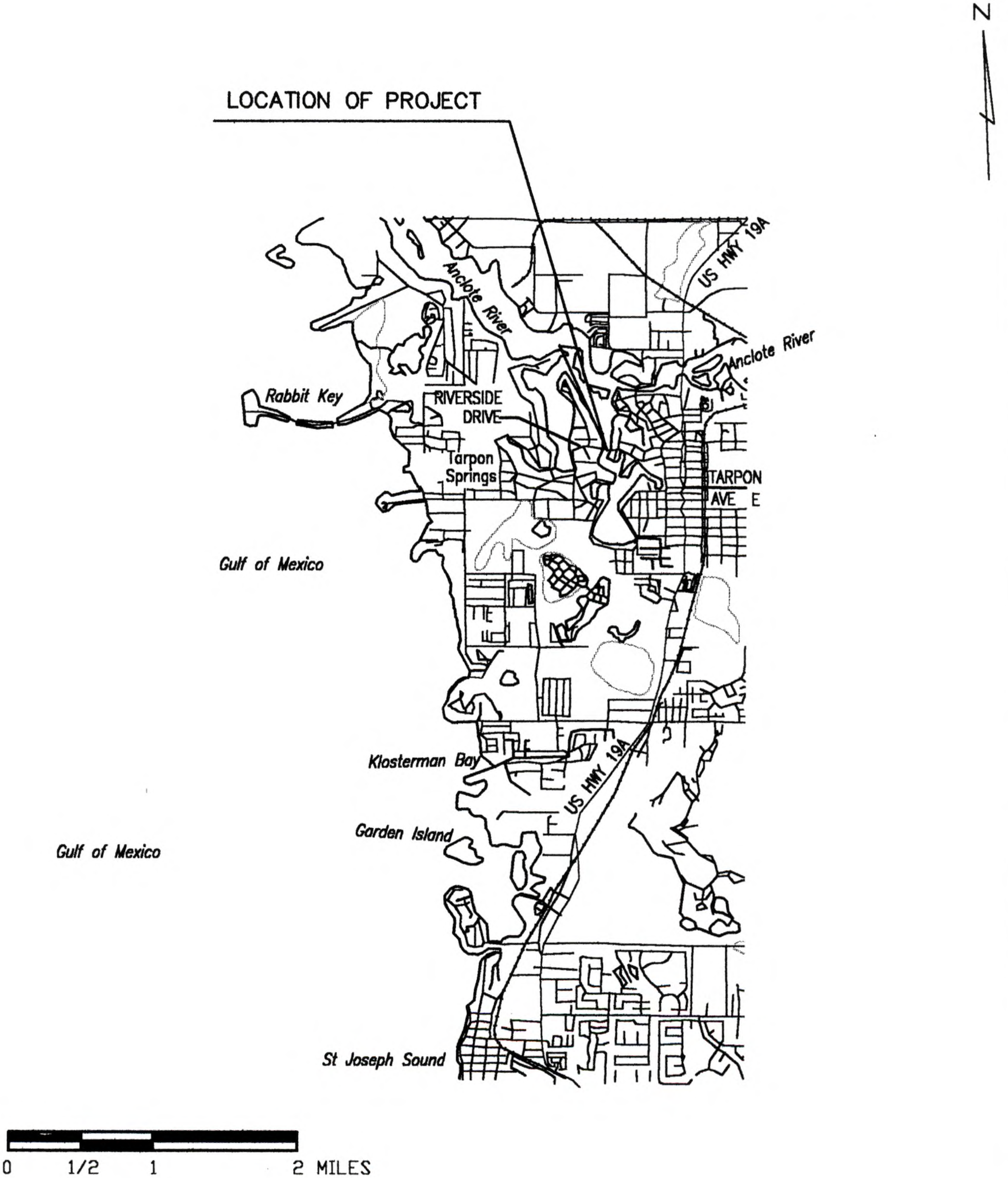
- Federal Highway Administration
  Evaluating Scour Critical Bridges, Hydraulic Engineering Circular No. 18, Publication No. FHWA-IP-90-017, (November 1995)
  User's Manuel for WSPRO - A Computer Model for Surface Water Profile Computations, (September 1990)

- Bridge, Roadway, Upstream and Downstream Channel Survey
  (7/31/97)

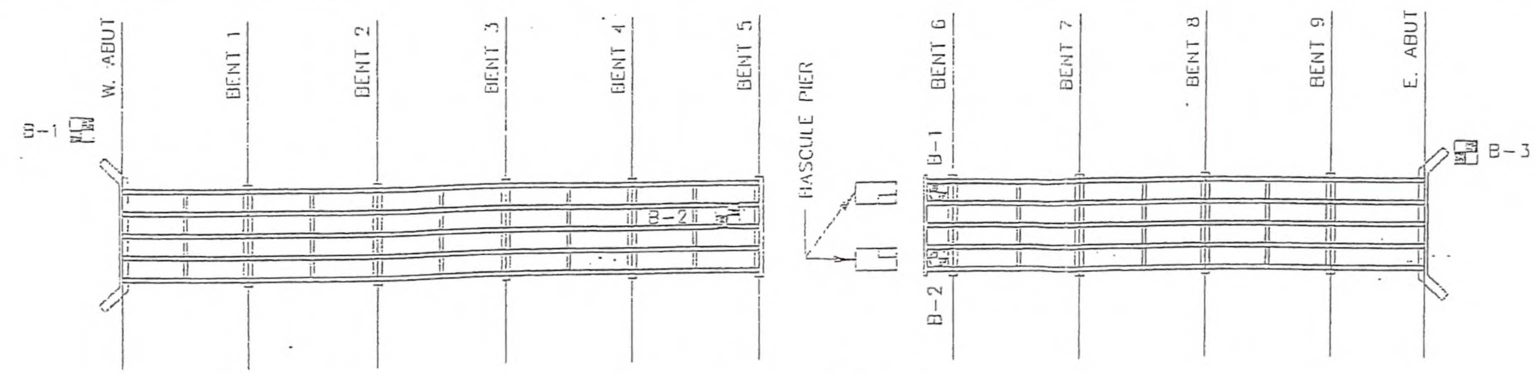
- Attachments

  Attachment A - Hydrologic Analysis
  Attachment B - Hydraulic Analysis
  Attachment C - Scour Calculations

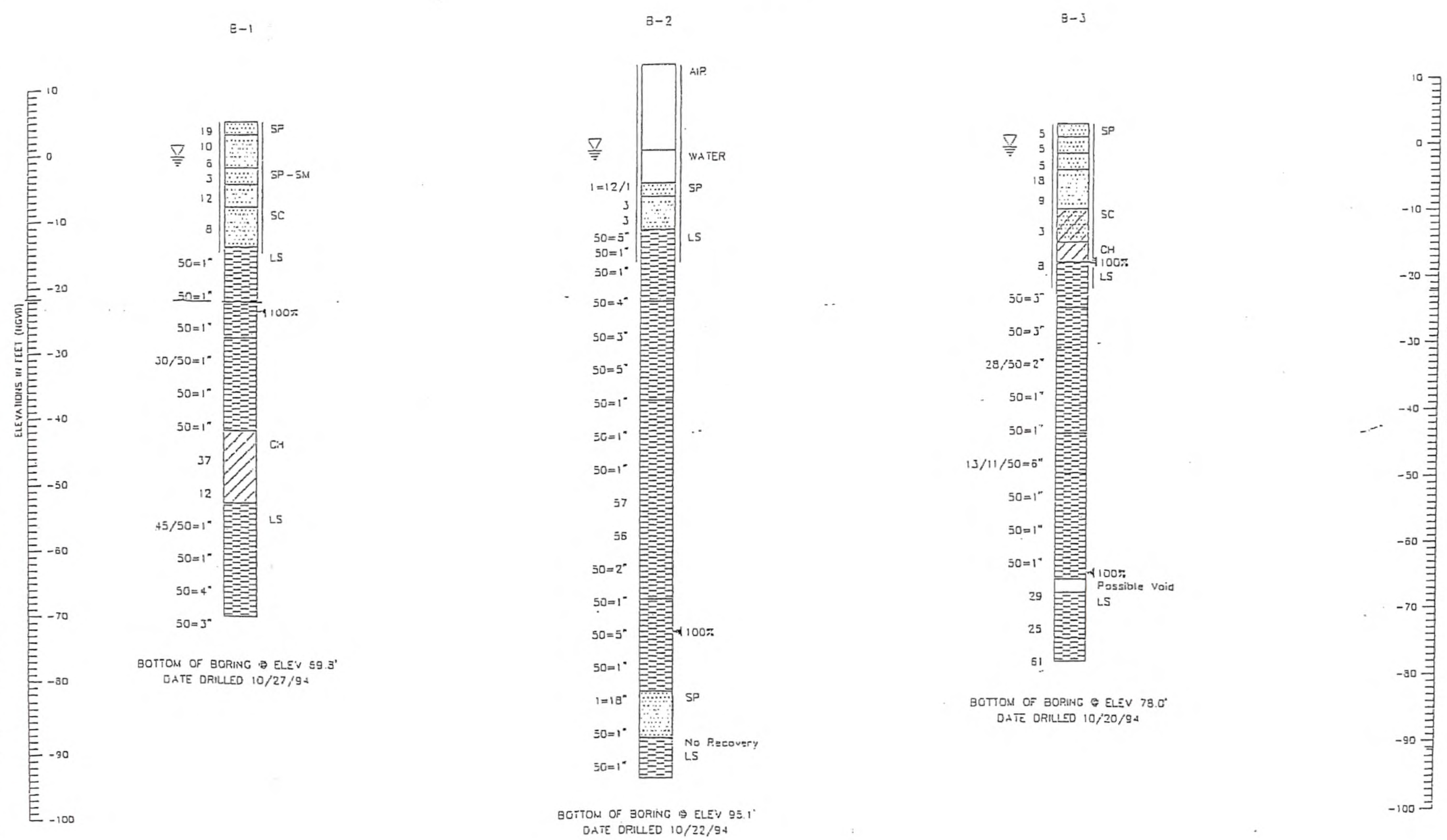
STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000



PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	LOCATION MAP	
JOB NO. 9304-1X	REVISED	DATE OCT. 30, 1997	FIGURE 1



PLAN



LEGEND

= SP SP-SM and SP-SC Sands and slightly clayey sands

= CH inorganic clays of low plasticity

= SC Clayey sands and very sandy clays

= LS Limestone

GENERAL NOTES

DRILL AND PENETRATION TESTING WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. NUMBER TO LEFT OF BORING INDICATES BLOWS OF 1 3/8" I.D., 2" O.D. SPLIT-SPOON FOR 12" OF PENETRATION (UNLESS OTHERWISE NOTED) WITH A 140 LB. HAMMER DROPPED 30 INCHES

THE BORING LOGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITION, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING.

ELEVATIONS SHOWN ARE APPROXIMATED BY WATER LEVEL AND WATER TABLE MEASURED AT TIME AND DATE BORINGS WERE COMPLETED.

REFER TO FINAL REPORT FOR ADDITIONAL BORING INFORMATION

CREW CHIEF: SPOON
DRILLER: PATTERSON
DRILL RIG TYPE: FAILING 250

LEGEND

= Water Table @ end of drilling

= Casing used

= Shelby Tube

100% = Percent Loss of Circulation

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)

Granular Materials–Relative Density	SPT (Blows/Ft)
Very Loose	Less than 4
Loose	4 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	Greater than 50

Silts and Clays–Consistency	SPT (Blows/Ft)
Very Soft	Less than 2
Soft	2 – 4
Firm	5 – 8
Stiff	9 – 15
Very Stiff	16 – 30
Hard	Greater than 30

REVISIONS			REVISIONS		
Date	By	Description	Date	By	Description

SEAL:

	Date
Drawn by	11-94
Checked by	11-94
Designed by	11-94
Checked by	11-94
Approved by	BENNETT

WILLIAMS EARTH SCIENCES, INC.

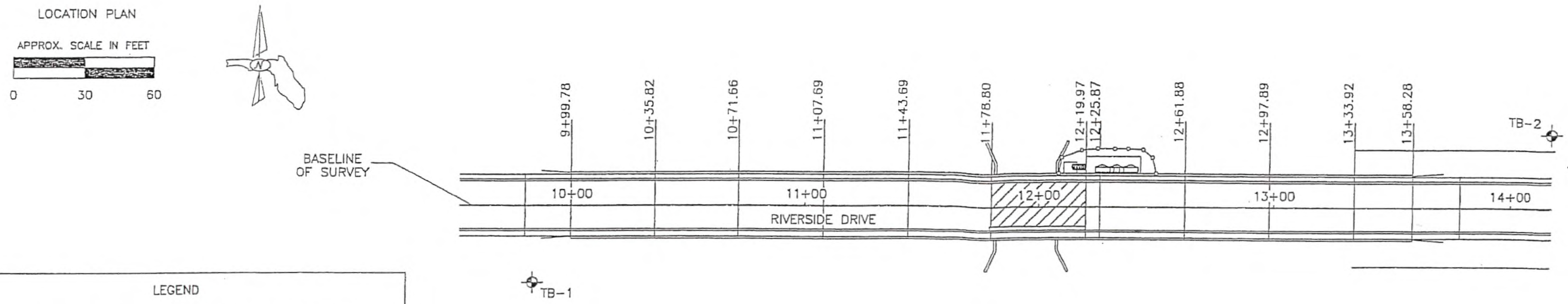
PINELLAS COUNTY
DEPARTMENT OF
PUBLIC WORKS

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: BECKETT BRIDGE REPAIRS

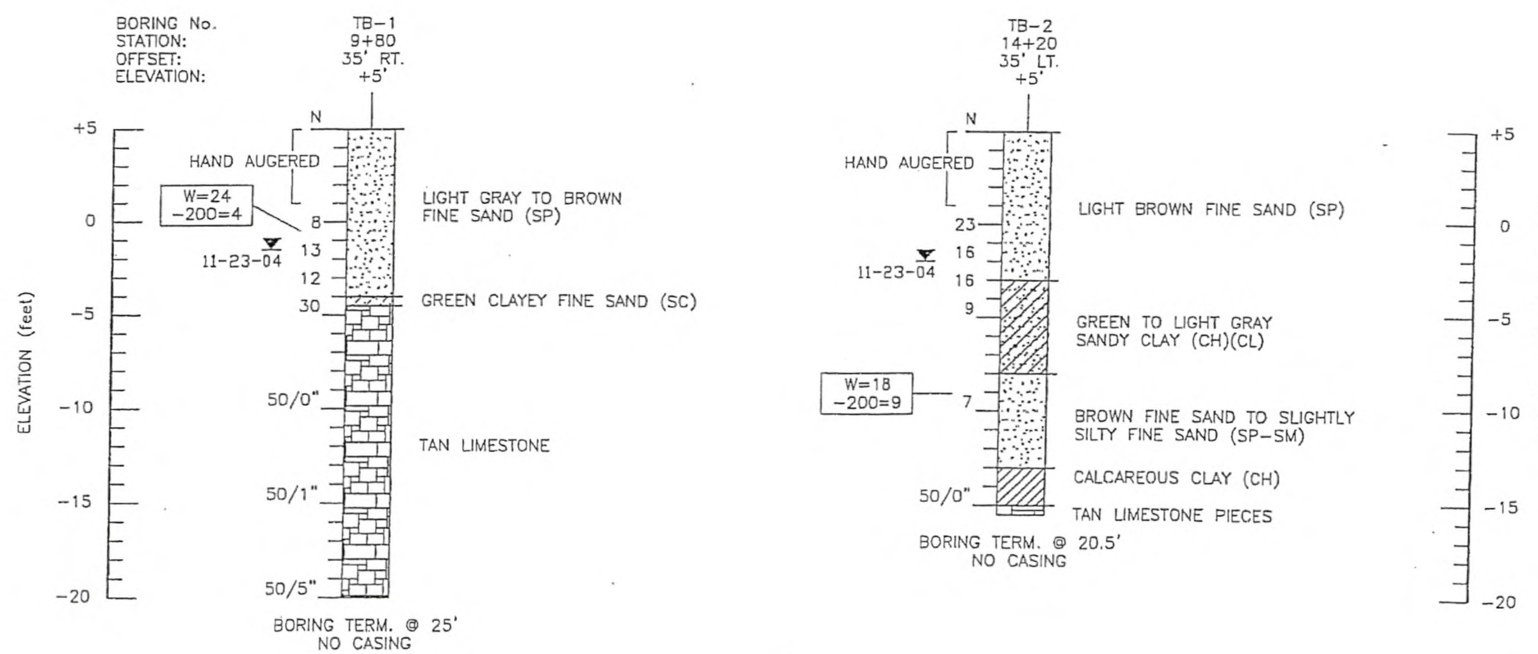
SHEET A-

LOCATION PLAN



LEGEND

⌖	APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
NOTE:	PLAN AS SHOWN IS PRELIMINARY FOR REPRESENTATION OF BORING LOCATION ONLY AND MAY NOT BE INDICATIVE OF FINAL CONTRACT PLANS.



LEGEND

SAND — SANDY CLAY

LIMESTONE — CLAYEY SAND

CLAY

(SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL

11-23-04 ENCOUNTERED GROUNDWATER LEVEL DATE NOTED

W=0 / -200=0 NATURAL MOISTURE CONTENT (%) FINES PASSING No. 200 SIEVE (%)

N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED

50/0" NUMBER OF BLOWS REQUIRED (50) TO ADVANCE SAMPLING SPOON (0) INCHES

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1 3/8 in.
SPOON OUTSIDE DIA.	2 in.
ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD)	
AVG. HAMMER DROP	30 in.
HAMMER WEIGHT	140 lbs.

GRANULAR MATERIALS

RELATIVE DENSITY	SPT (BLOWS/FOOT)
VERY LOOSE	LESS THAN 4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	GREATER THAN 50

SILTS AND CLAYS

CONSISTENCY	SPT (BLOWS/FOOT)
VERY SOFT	LESS THAN 2
SOFT	2-4
FIRM	4-8
STIFF	8-15
VERY STIFF	15-30
HARD	GREATER THAN 30

NOTES:
1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION. FOR FURTHER DETAILS SEE SECTION 120-3.
2) STATIONS AND OFFSETS FOR BORINGS ARE REFERENCED FROM BASELINE OF SURVEY OF RIVERSIDE DRIVE.

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	SLW	2-14-05
Checked by	SF	2-14-05
Designed by		
Checked by		
Approved by	DANIEL C. STANFILL, P.E.	

504 E. TYLER ST.
TAMPA, FLORIDA 33602
(813) 221-0050
CERTIFICATE OF AUTHORIZATION No. 6174
DANIEL C. STANFILL, P.E. No. 42763
NODARSE & ASSOCIATES, INC.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID.
S.R. -	PINELLAS	000000-1-52-01

SHEET TITLE: REPORT OF SPT BORINGS FOR STRUCTURES

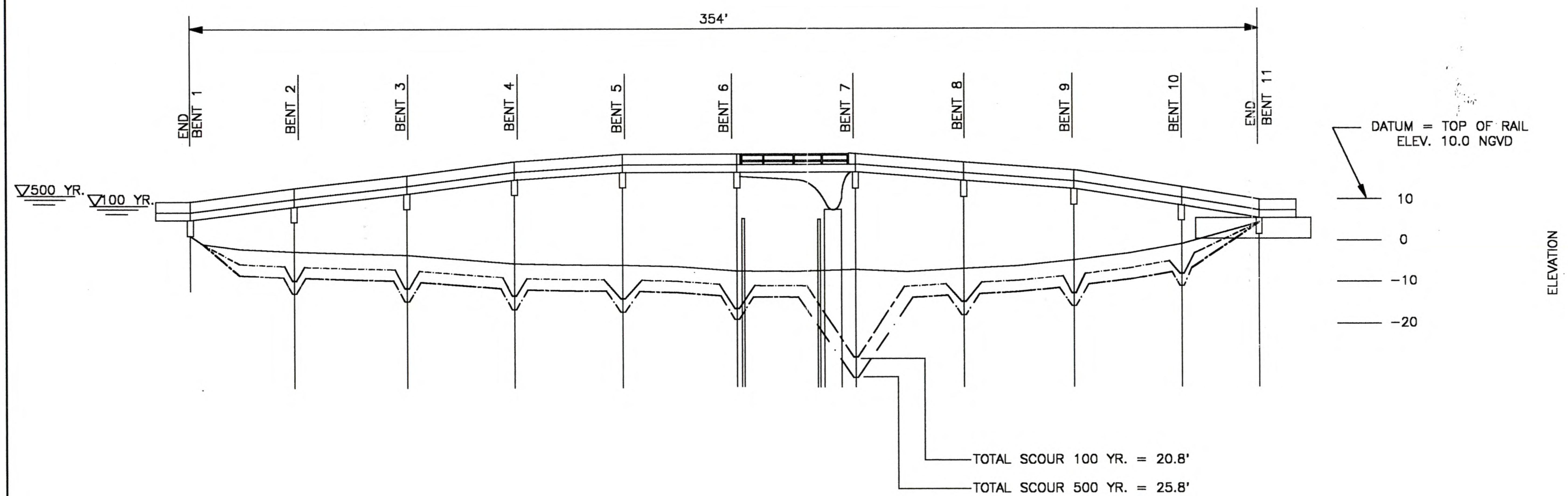
PROJECT NAME: BECKETT BRIDGE - RIVERSIDE DRIVE OVER TARPON BAYOU
BRIDGE No. 154000
PINELLAS COUNTY, FLORIDA

SHEET No. —

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

STRATA DATA

SOIL BORING INFORMATION NOT AVAILABLE.



SCOUR PROFILE

LEGEND

- PIER SCOUR (100 YR)
- PIER SCOUR (500 YR)
- CONTRACTION SCOUR (100 YR)
- CONTRACTION SCOUR (500 YR)
- EXISTING BED FROM SURVEY

NOTES:

1. BRIDGE PLAN AND PROFILE IS SCHEMATIC BASED UPON SITE MEASUREMENTS, PHOTOGRAPHS AND INSPECTION REPORTS, AND IS APPROXIMATE.
2. CHANNEL CROSS-SECTION TAKEN FROM LEFT SIDE OF BRIDGE.
3. DRAWING NOT TO SCALE.

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	SCOUR PROFILE	
JOB NO. 9304-1X	REVISED	DATE OCT. 30, 1997	FIGURE 2

SCC EVALUATION - FIELD / OFFICE REVIE EPORT

Bridge Number: *154000*	County: *PINELLAS*	Route: *RIVERSIDE DR. (SPRING BLVD.)*	Over: *TARPON BAYOU*

1. **SCOUR VULNERABILITY RATING (PER FHWA)**				
a. Scour Critical	( ) Yes	(X) No		
Scour Susceptible	(X) High	( ) Medium	( ) Low	
Low Risk	( ) High	( ) Medium	( ) Low	
Foundation	( ) Known	(X) Unknown		
b. Method of Analysis:	(X) Simple	( ) Complex	(X) Riverine	(X) Tidal

c. Reasons for Phase 2 Rating:

- *Unknown foundation on erodible material.*
- *History of scour at abutments and abutment shoulders.*
- *Significant total scour calculated for 100-year and 500-year events*
- *Evidence of structural settlement (Phase 1 Report)*

2. RECOMMENDATIONS (See Preceding Narrative)

a. Countermeasures:

( ) Riprap

( ) Scour Monitor

(X) Inspection *The structure should be inspected at an increased frequency and following severe storm events and tidal surges.*

(X) Other *Determine pile tip elevations, repair undermined abutments, sheet pile and bulkheads.*

b. Phase 3 Analysis: (X) Required ( ) Not Required at this time

3. SUMMARY OF RESULTS

	100 YEAR FLOOD EVENT				500-YEAR FLOOD EVENT				OVERTOPPING EVENT			
		Worst Case				Worst Case				Worst Case		
	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)
a. Reported Design / Constructed Embedment: 1	*UNK*	*UNK*		*UNK*	*UNK*	*UNK*		*UNK*				
b. Current Remaining Embedment: 2	*UNK*	*UNK*		*UNK*	*UNK*	*UNK*		*UNK*				
c. Maximum Total Scour: 3		*9.1*				*12.1*						
d. Estimated Embedment Remaining After Scour:	***UNK***	***UNK***		***UNK***	***UNK***	***UNK***		***UNK***				

e. Sources for above table:

1.

2.

3. *Section 7 (Page 10 of this Report)*

4. EVALUATION OF METHODS

Method of Analysis:

a. (X) Simple

Do results of analysis provide reasonable prediction of scour depths for this structure? [1) or 2)]

1) (X) Yes — Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert?

(X) Yes **RESULT:** Phase 3 is recommended.

( ) No **RESULT:** No further action is required.

2) ( ) No — **RESULT:** Perform a Detailed Analysis.

b. ( ) Complex

Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert? [1) or 2)]

1) ( ) Yes — **RESULT:** Phase 3 is recommended.

2) ( ) No — **RESULT:** No further action is required.

Notes:

5. FLOOD HISTORY

a. Drainage Area: ( ) Square Miles ( ) Acres Coastal: (X)

b. Debris Potential: ( ) High ( ) Medium (X) Low

c. Scour Mode: ( ) Riverine (X) Tidal

d. Riverine Flow *N/A*

Q_{100} = ( ) cfs	Q_{100} Discharge Computed Using: ( ) Gage Analysis ( ) Regression Analysis: ( ) Rational Method ( ) Other:
$Q_{OVERTOPPING}$ = ( ) cfs	$Q_{OVERTOPPING}$ Discharge Computed Using: ( ) Gage Analysis ( ) Iterative WSPRO runs ( ) Other:
Q_{500} = ( ) cfs	Q_{500} Discharge Computed Using: ( ) Gage Analysis ( ) Regression Analysis: ( ) Rational Method ( ) Other:

e. Tidal Flow

Q_{DAILY} = (900) cfs	Source: ( ) Historic Data (X) HEC 18 Modified Procedure ( ) HEC 18 Procedure ( ) Other:	
Q_{100} = (23987) cfs	Components of Q_{100} Discharge: Inland Flood Flow ( ) cfs Astronomical Tidal Flow ( ) cfs Storm Surge Flow (23987) cfs	Source: ( ) Historic Data ( ) HEC 18 Procedure (X) HEC 18 Modified Procedure ( ) Other:
$Q_{OVERTOPPING}$ = ( ) cfs	Source: ( ) Historic Data ( ) HEC 18 Modified Procedure ( ) HEC 18 Procedure ( ) Other:	
Q_{500} = (34165) cfs	Components of Q_{500} Discharge: Inland Flood Flow ( ) cfs Astronomical Tidal Flow ( ) cfs Storm Surge Flow (34165) cfs	Source: ( ) Historic Data ( ) HEC 18 Procedure (X) HEC 18 Modified Procedure ( ) Other:

f. Notes:

6. CHANNEL STABILITY CONSIDERATIONS

a. Natural Channel Aggradation Expected Over Remaining Life of Structure = (*0.0*) *feet*

b. Natural Channel Degradation Expected Over Remaining Life of Structure = (*0.0*) *feet*

c. Channel Migration Anticipated During Life of Structure — ( ) Yes (X) No — Left: (*0.0*) *feet* Right: (*0.0*) *feet*

d. Armoring Potential ( ) Yes (X) No ( ) Possible

e. Depth to Armoring for Q = ( ) cfs ( ) *feet*

f. Notes:

7. ESTIMATED SCOUR

7. ESTIMATED SCOUR		100-YEAR EVENT	500-YEAR EVENT	OVERTOPPING EVENT
a. Worst Case Flood Event:	Discharge	( ) cfs	( ) cfs	( ) cfs
b. Contraction Scour: (Looking Downstream)	Left Overbank	( ) ft	( ) ft	( ) ft
	Main Channel	(*3.6*) ft	(*6.4*) ft	( ) ft
	Right Overbank	( ) ft	( ) ft	( ) ft
c. Maximum Pier Scour:	Maximum Velocity	(*8.81*) fps	(*9.63*) fps	( ) fps
	Froude Number	(*0.39*)	(*0.42*)	( )
Main Channel Pier No.: (6*)	Main Channel	(*5.5*) ft	(*5.7*) ft	( ) ft
Floodplain Pier No: (N/A)	Floodplain	( ) ft	( ) ft	( ) ft
d. Abutment Scour: (Looking Downstream)	Max Velocity at Abutments	( ) fps	( ) fps	( ) fps
	Left Abutment	(*N/A*) ft	(*N/A*) ft	( ) ft
(X) Abutments Protected	Right Abutment	( ) ft	( ) ft	( ) ft
e. Maximum Total Scour: (Looking Downstream)	**Left Abutment**	**( ) ft**	**( ) ft**	**( ) ft**
	Main Channel Pier	**(9.1) ft**	**(12.1) ft**	**( ) ft**
	Floodplain Pier	**( ) ft**	**( ) ft**	**( ) ft**
6b + 7b + (7c or 7d)	**Right Abutment**	**( ) ft**	**( ) ft**	**( ) ft**

f. Notes: See Page 6 for Summary of Results.

*Total scour for bascule pier near Bent 7 not included here due to uncertainties with computing scour at wide piers.

Total computed scour at Bent 7 = 20.8 100 year
25.8 500 year

ATTACHMENTS
Bridge 154000

A - HYDROLOGY

- 100-YR and 500-YR Storm Surge Hydrographs
- Determination of Radius of Maximum Winds and Forward Speed of Storm Surge

B - HYDRAULICS

- Conveyance Calculations for Bridge and Approach Sections
- NOS Benchmark Information
- Tidal Prism Calculations
- WSPRO Model Input File
- WSPRO Model Output File

C - SCOUR

- Scour Mode Calculations
- 100-YR and 500-YR Contraction Scour
- 100-YR and 500-YR Local Scour
- 100-YR and 500-YR Scour Summaries

Prepared by: MSB

Checked by: LWZ

QA/QC by: PFL

Review by: ERE

Owen Ayres & Associates, Inc.
3665 JFK Parkway, Bldg. 2, Ste 300
Fort Collins, Colorado 80525

[signature]	1/15/98	FL 45889
Signature	Date	PE Number

ATTACHMENT A

HYDROLOGIC ANALYSIS

RCE

Clie	PHA, FDOT Dist 7	Job No.	92092025	Page	1 of 1
Project	Beckett Bridge Phase 2	Date	9-4-97	Date chkd.	9-8-97
Subject	Hydrology	By	MSB	Chkd. By	fwz

Storm Surge Hydrology

Storm tide elevs from:

Pinellas County F.I.S

Aclote River 100 YR = 10.5 Ft

500-YR = 13.0 Ft

Storm Surge Hydrograph Parameters

Radius Max Winds = ~~12~~ 21 fwz n mi

Forward Speed = 10 Kt

- Discharge computed from hydrograph (stage) and Prism Volumes using $Q = \Delta V / \Delta t$

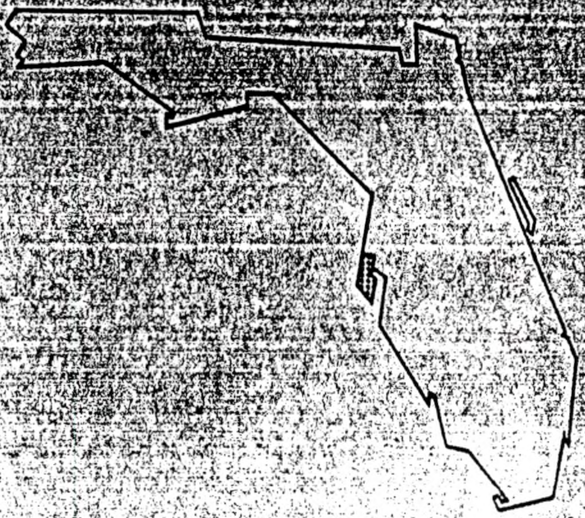
Peak Q observed on rising limb for both 100- and 500-yr events

Q_{100} = 23987 @ 8.8 Ft stage

Q_{500} = 34165 @ 11.0 Ft stage

FLOOD INSURANCE STUDY

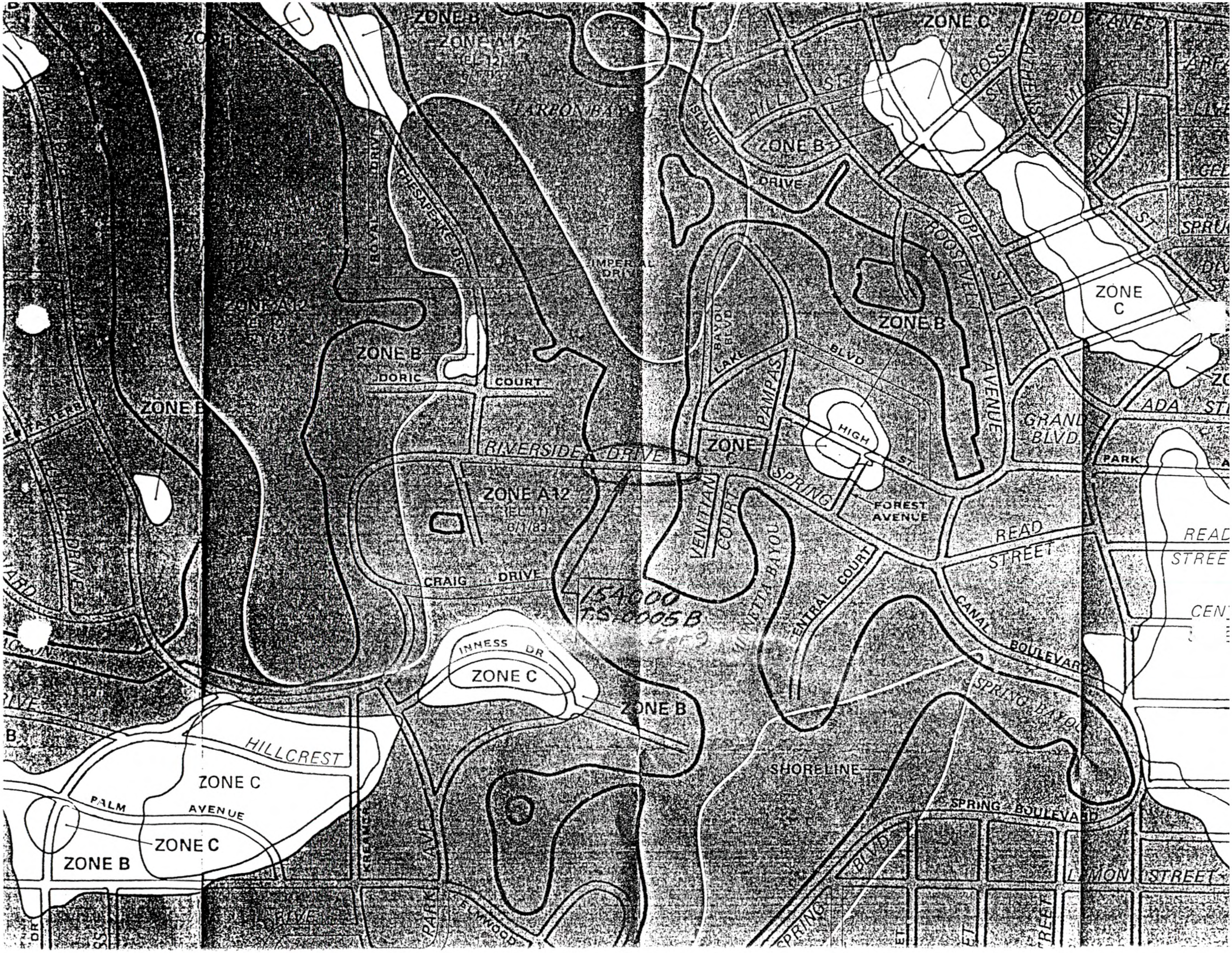
PINELLAS COUNTY, FLORIDA
UNINCORPORATED AREAS



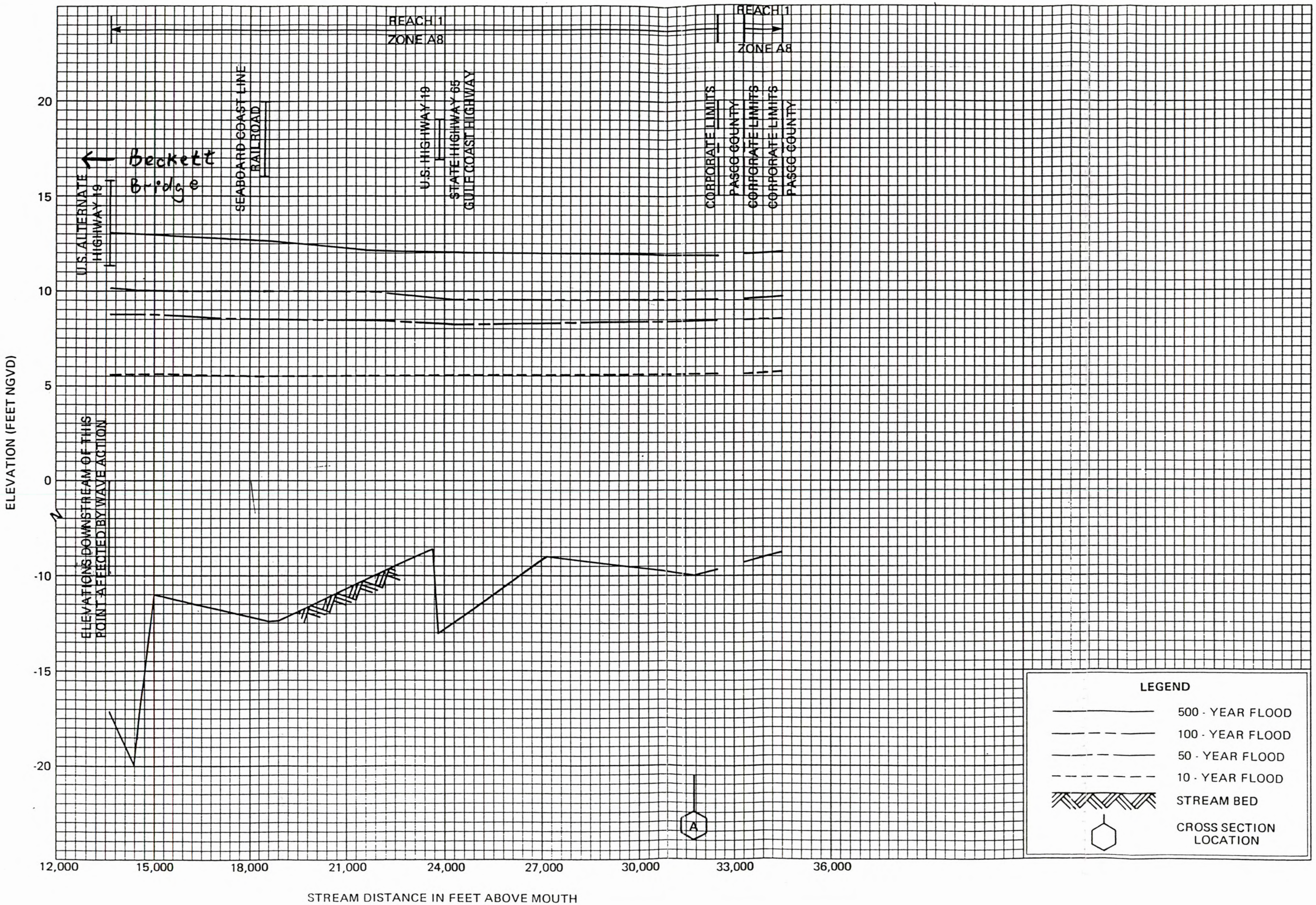
DECEMBER 1, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER-125139



ZONE B
ZONE A 12
ZONE C
ZONE B
DRIVE
ROOSEVELT
AVENUE
ZONE C
IMPERIAL DRIVE
ZONE A 12
ZONE B
DORIC
COURT
ZONE B
RIVERSIDE DRIVE
ZONE
PAMPAS
BLVD
ZONE B
HIGH ST
SPRING
FOREST AVENUE
GRAND BLVD
ADA ST
PARK
ZONE A 12
(EL 11)
6/1/83
CRAIG DRIVE
READ STREET
VENITIAN COURT
CENTRAL COURT
CANAL BOULEVARD
INNESS DR
ZONE C
ZONE B
HILLCREST
ZONE C
PALM AVENUE
ZONE C
ZONE B
SHORELINE
SPRING BOULEVARD
LEMON STREET



FLOOD PROFILES

ANCLOTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

PINELLAS COUNTY, FL
(UNINCORPORATED AREAS)

04P

Table 5B. Flood Insurance Zone Data (Cont'd)

Flooding Source	Stillwater Elevation* 10-Year	100-Year	FHF	Zone	Base Flood Elevation (Feet NGVD)**
Tampa Bay					
Safety Harbor at Lake Tarpon Outfall Canal to Old Tampa Bay South of Alligator Lake	5.5	10.1	045	V9,A9	10
Old Tampa Bay South of Alligator Lake to East of St. Petersburg-Clearwater International Airport	5.3	9.6	045	V9,A9	10
Old Tampa Bay East of St. Petersburg-Clearwater International Airport to South of Gandy Boulevard	5.2	9.6	045	V9,A9	10
Old Tampa Bay From South of Gandy Boulevard to Weedon Island	5.0	9.4	045	V9,A9	9
East of Sunshine Skyway to South of Mullet Key	4.3	8.5	045	V9	9
Anclote River					
Mouth to U.S. Alternative Highway 19	5.5	10.5	060	A12	11-13
U.S. Alternate Highway 19 to Horseshoe Bend	5.6	9.8	040	A8	10
Lake Tarpon	4.2	7.0	030	A6	7
Alligator Lake	7.5	9.9	025	A5	10

*Sample elevations given; variation may occur within the area cited
**Due to map scale limitations, base flood elevations shown on the FIRM may represent average elevations for the zones depicted.

NOAA Technical Report NWS 15

Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States

Francis P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear

WASHINGTON, D.C.
MAY 1975

UNITED STATES
DEPARTMENT OF COMMERCE
Rogers C. B. Morton, Secretary

NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Weather
Service
George P. Cressman, Director

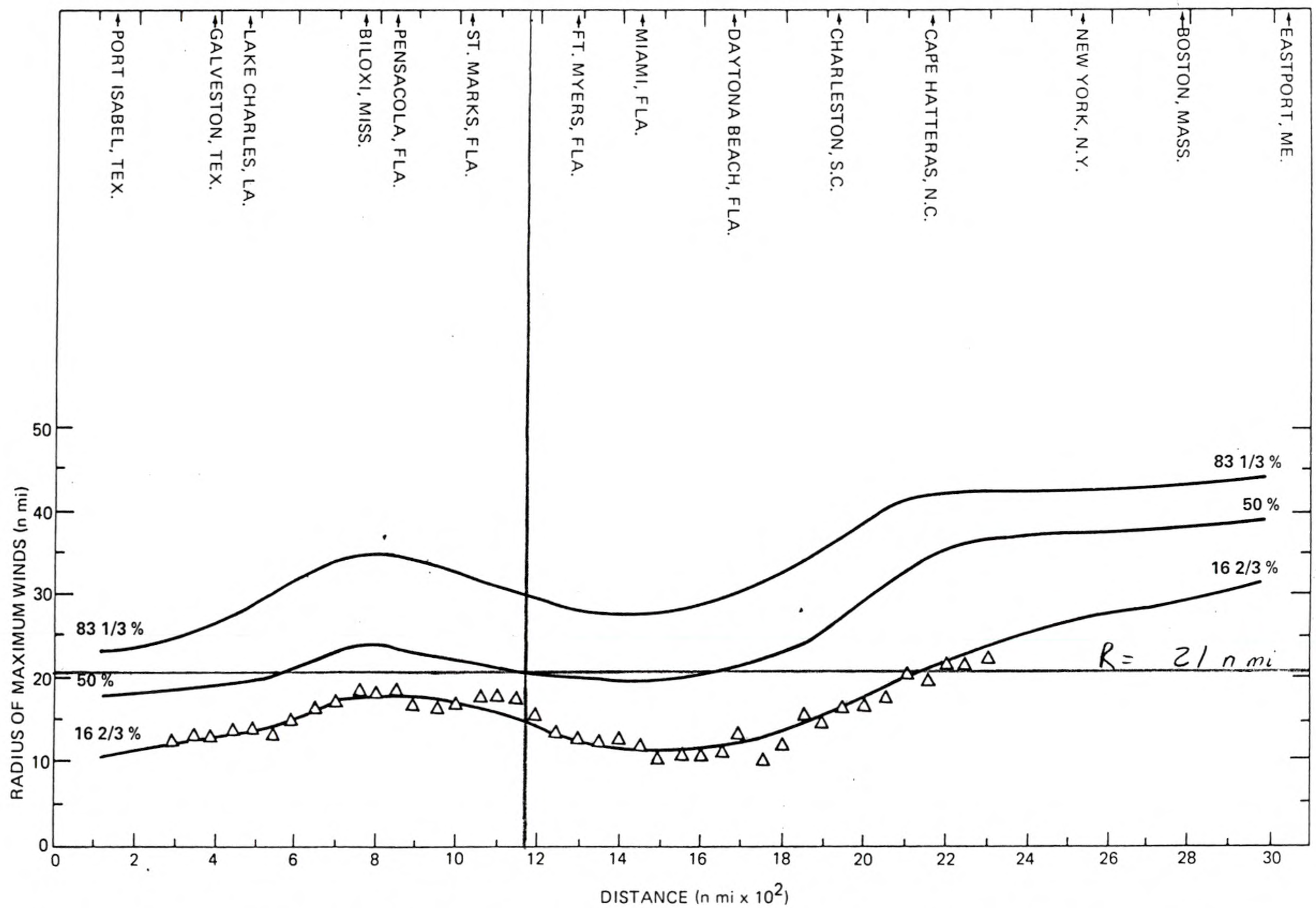


Figure 19.--Probability distribution of radius of maximum winds of hurricanes, gulf and east coasts (1900-73). Numbered lines denote the percent of storms with R equal to or less than the value indicated along the ordinate. Plotted points (▲) are taken from frequency analyses at 50-n.mi. intervals for the 16-2/3 percentile (sec. 4.2).

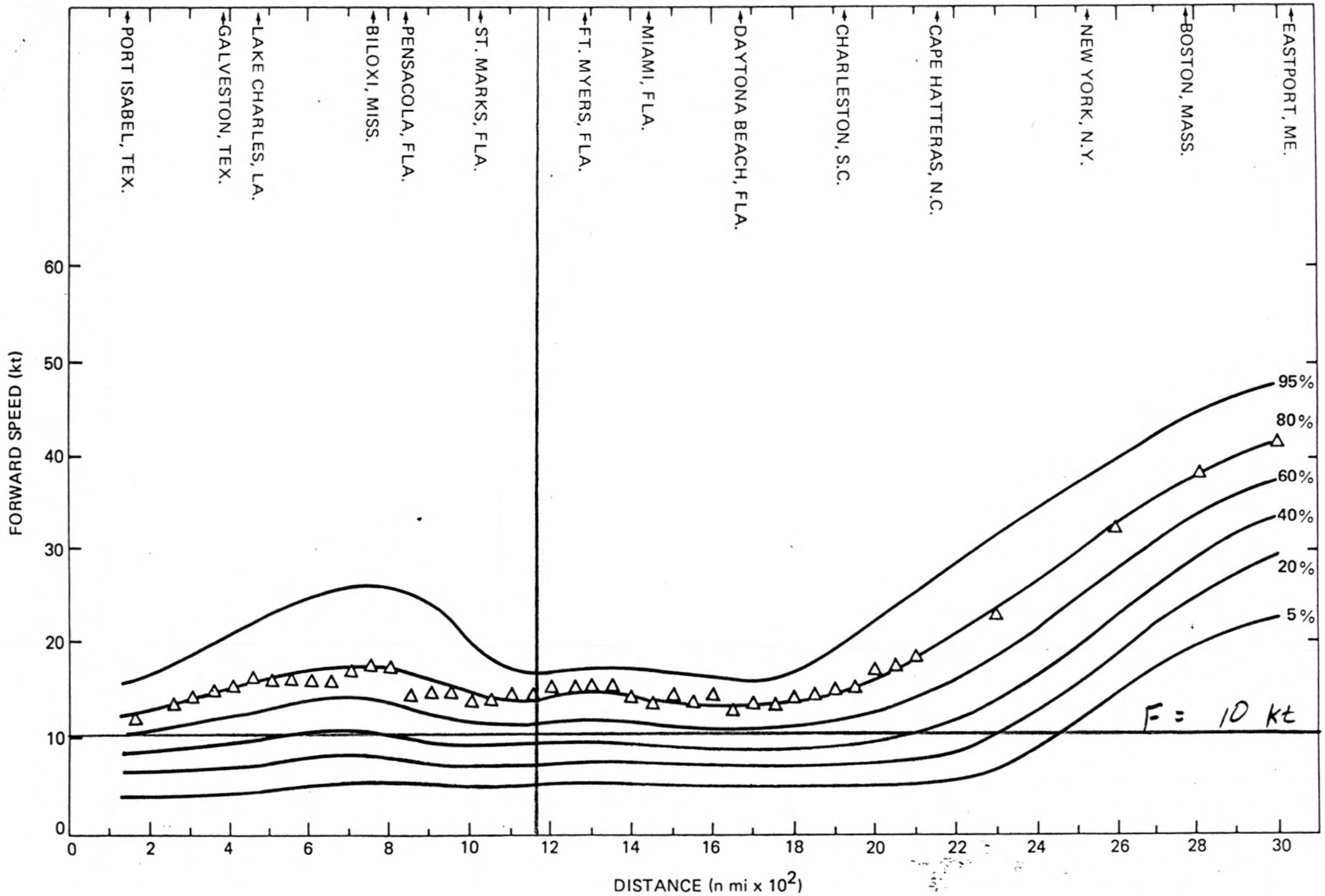
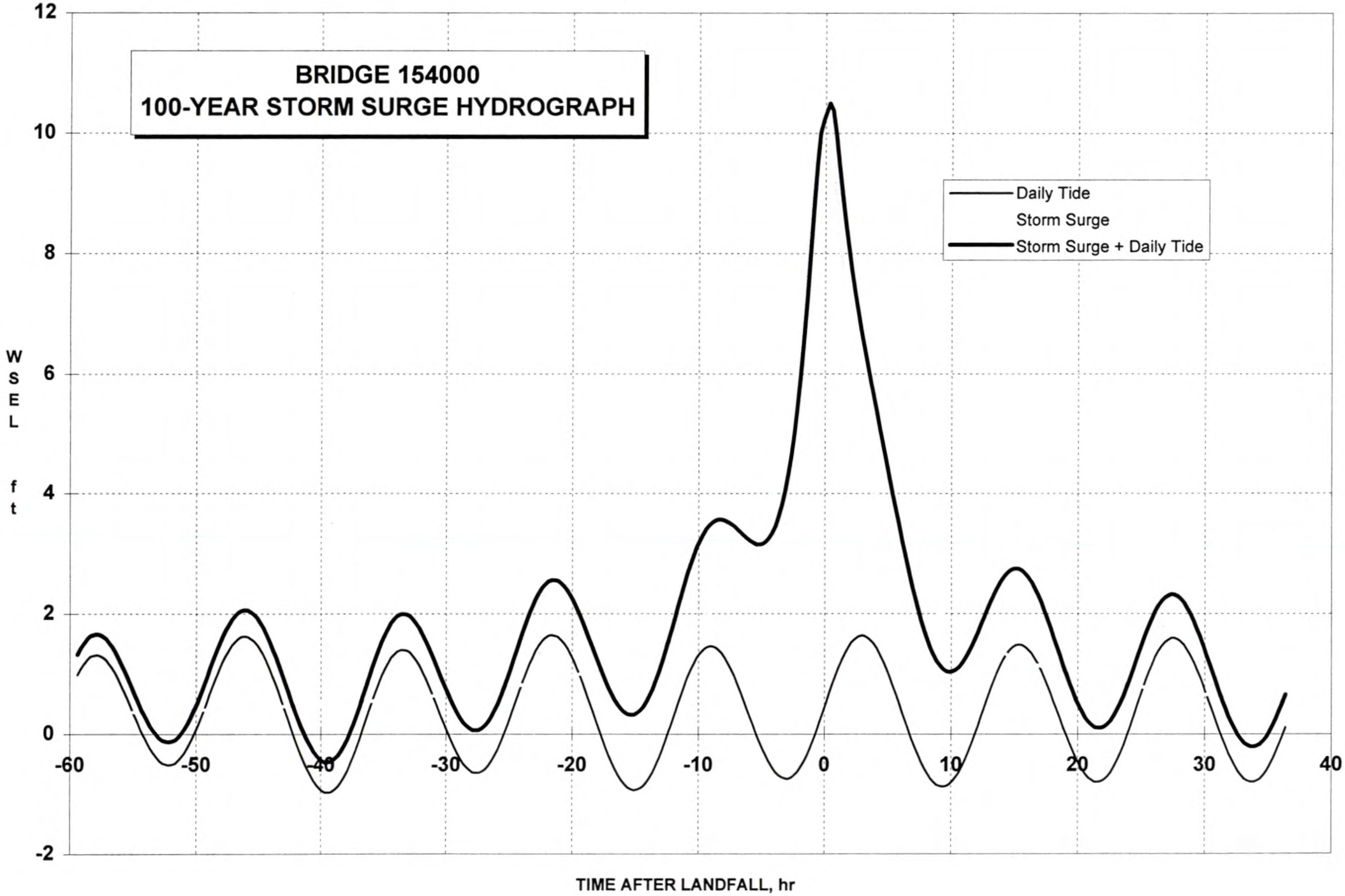
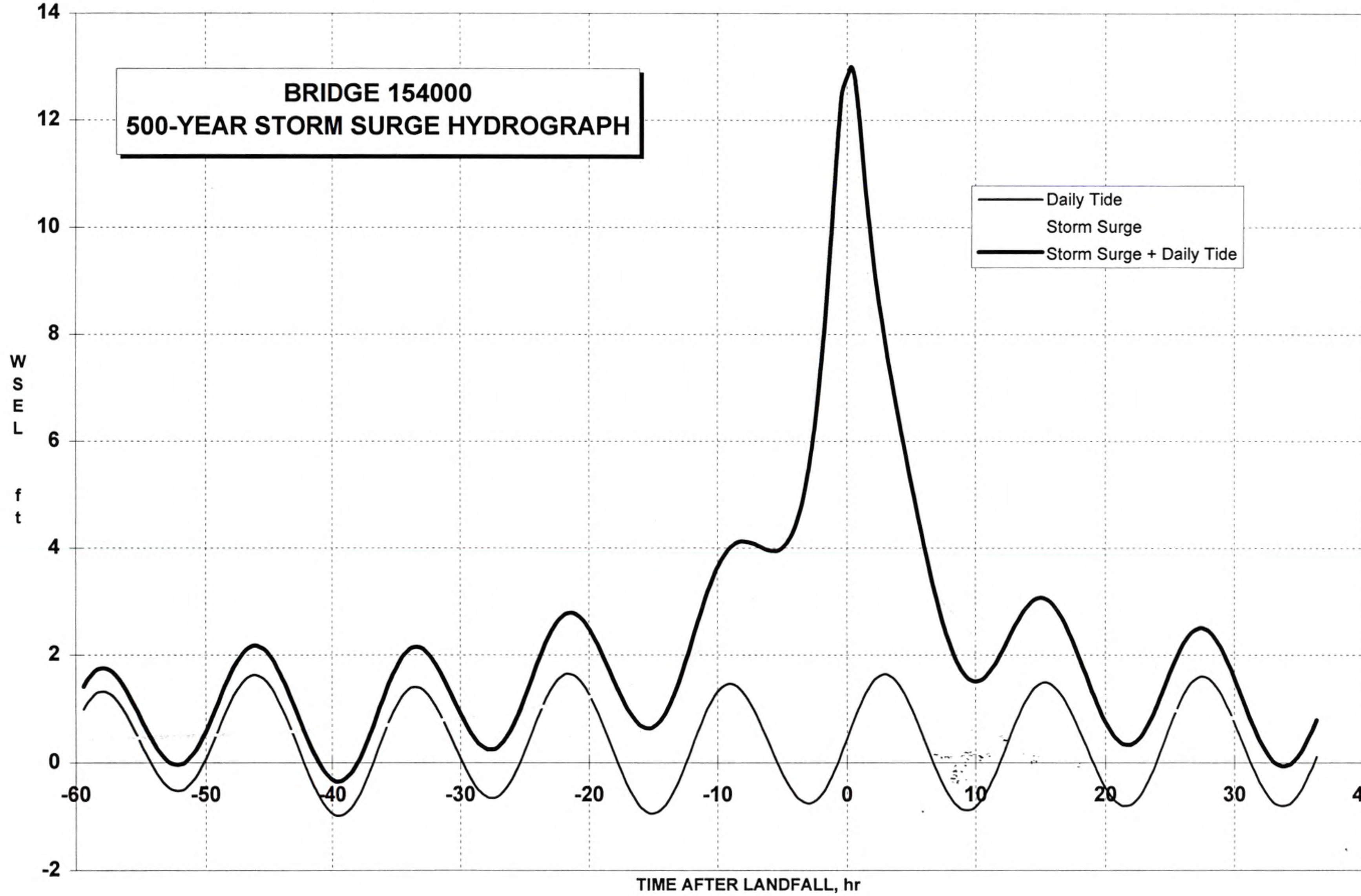
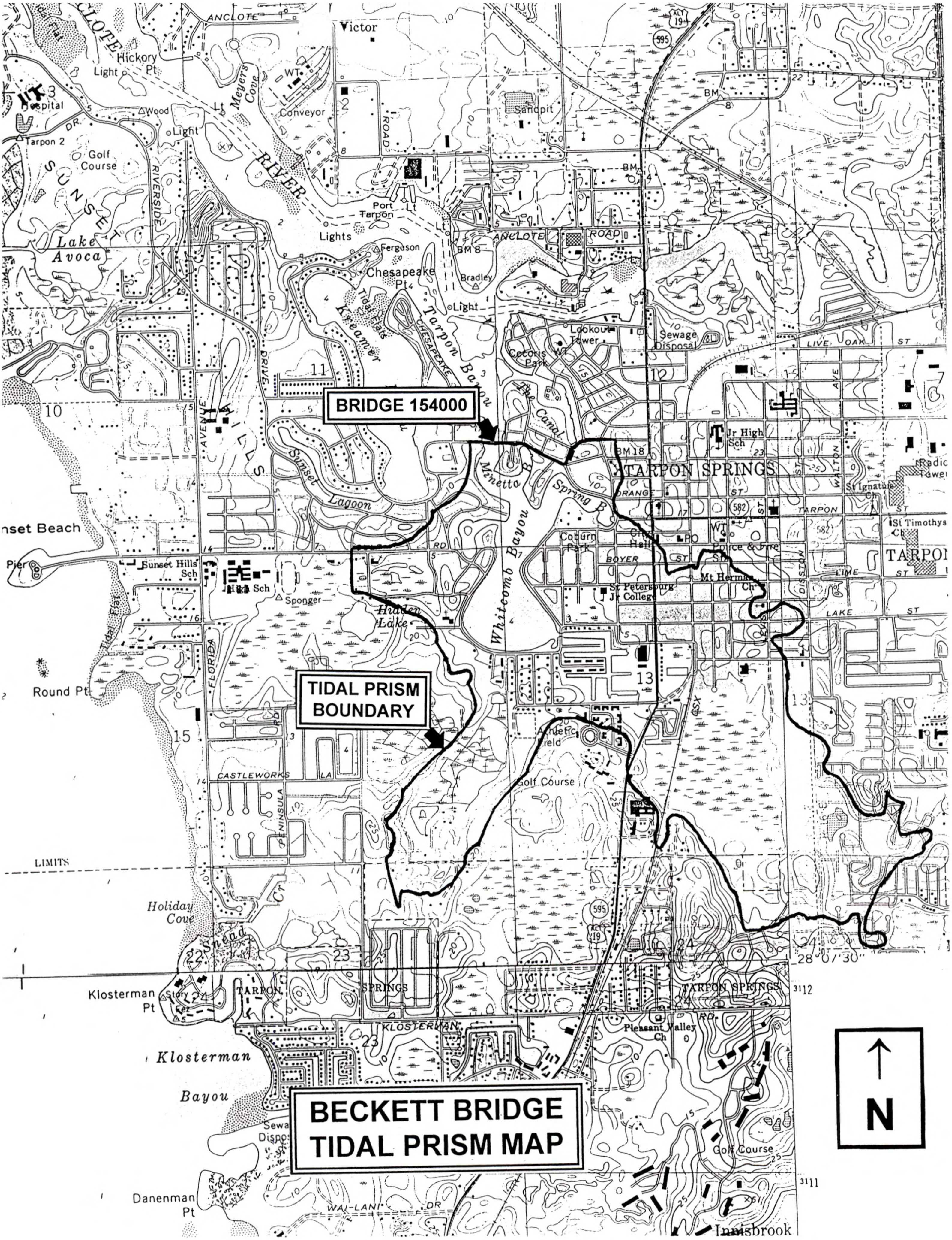


Figure 23.--Probability distribution of forward speed for landfalling hurricanes, 1886-1973. Numbered lines denote the percent of storms with forward speed equal to or less than the value indicated along the ordinate. Plotted points (▲) are taken from frequency analyses at 50-n.mi. intervals for the 80th percentile (par. 5.2.1).


BRIDGE 154000
100-YEAR STORM SURGE HYDROGRAPH
Daily Tide
Storm Surge
Storm Surge + Daily Tide
W S E L ft
12
10
8
6
4
2
0
-2
-60
-50
-40
-30
-20
-10
0
10
20
30
40
TIME AFTER LANDFALL, hr


BRIDGE 154000
500-YEAR STORM SURGE HYDROGRAPH
Daily Tide
Storm Surge
Storm Surge + Daily Tide
W S E L ft
TIME AFTER LANDFALL, hr
14
12
10
8
6
4
2
0
-2
-60
-50
-40
-30
-20
-10
0
10
20
30
40

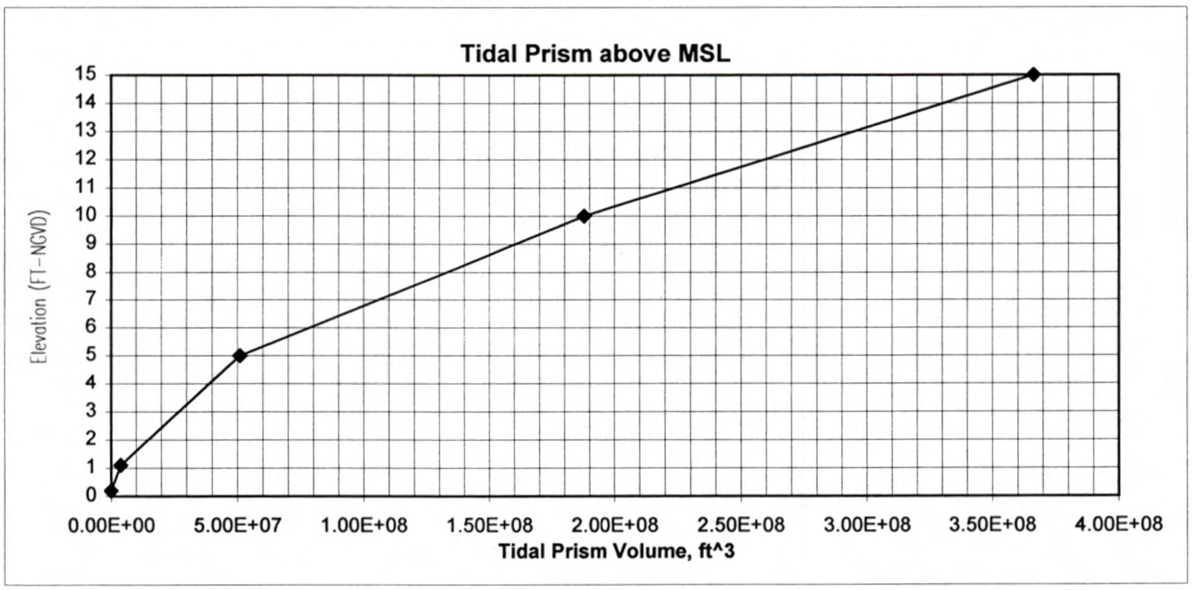

BRIDGE 154000
TIDAL PRISM BOUNDARY
BECKETT BRIDGE TIDAL PRISM MAP
N
ANCLOTE
Victor
Hickory Pt
Light
Hospital
Wood
Tarpon 2
Golf Course
SUNSET
RIVERSIDE
Meyers Cove
Conveyor
ROAD
Sandpit
RIVER
Port Tarpon
Lights
Ferguson
BM 8
ANCLOTE ROAD
Lake Avoca
Chesapeake Pt
Bradley
Kreamer
Tidal Flats
CHESAPEAKE
Tarpon Bayou
Lookout Tower
Sewage Disposal
LIVE OAK ST
Cocoris Park
The Canal
Jr High Sch
Radio Tower
TARPON SPRINGS
Sunset Lagoon
Minetto B
Spring B
ORANGE ST
TARPON ST
St Ignatius Ch
St Timothys Ch
Sunset Beach
Pier
Sunset Hills Sch
High Sch
Sponger
Coburn Park
BOYER ST
PO
City Hall
Mt Hermon Ch
LIME ST
St Petersburg Jr College
DISSTON
WALTON AVE
LAKE ST
Hidden Lake
Whitcomb Bayou
Round Pt
Tidal Flat
FLORIDA
Athletic Field
Golf Course
CASTLEWORKS LA
PENINSULA
LIMITS
Holiday Cove
Snead Cr
TARPON
SPRINGS
TARPON SPRINGS
Klosterman Pt
KLOSTERMAN RD
Pleasant Valley Ch
Klosterman Bayou
Danenman Pt
WAI-LANI DR
Golf Course
Innisbrook
28°07'30"

TIDAL PRISM CALCULATIONS

BECKETT BRIDGE OVER TARPON BAYOU (RIVERSIDE DRIVE/SPRING BLVD.)
BRIDGE # 154000
QUADS: DUNEDIN, ELFERS, TARPON SPRINGS

DELTA VOLUME = (ELEV2-ELEV1)/3*(AREA1+AREA2+SQRT(AREA1*AREA2)

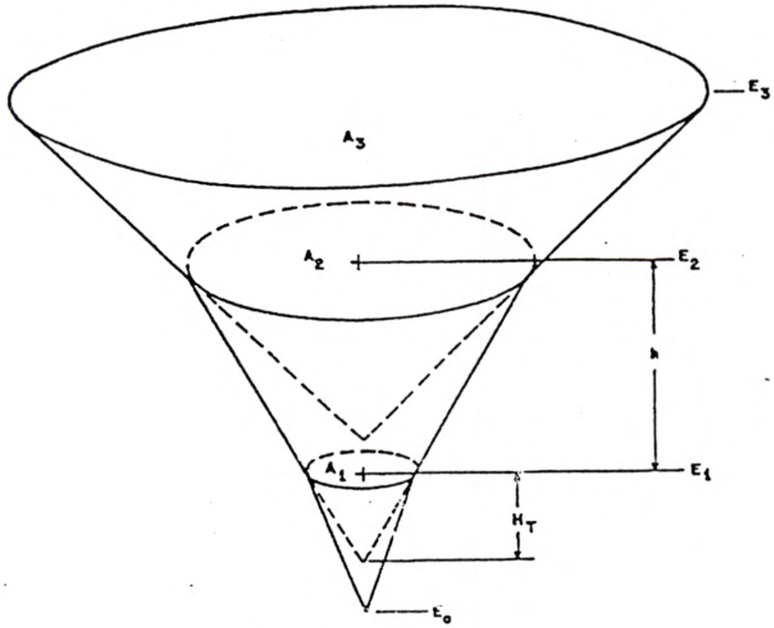
ELEVATION	AREA(ft^2)	AREA(mi^2)	DELTA VOL(ft^3)	PRISM VOL (ft^3)
0.2	4318121.067	0.15	0.00E+00	0
1.1	4318121.067	0.15	3.89E+06	3886308.96
5	22184310.67	0.80	4.72E+07	51063179.24
10	32871245.33	1.18	1.37E+08	187829411.5
15	38640477.33	1.39	1.79E+08	366414470.4



Prepared by Morgan Byars 9/4/97

Ayres Associates

If pumps or dam breaks are not being simulated, an outflow rating curve is computed for 20 elevations which span the range of elevations given for storage data. Storages are computed for those elevations. The routing is then accomplished by the modified Puls method using the derived storage-outflow relation. For level-pool reservoir routing with pumping or dam-break simulation, outflows are computed for the orifice and weir equations for each time interval.



$$\Delta V_{12} = \frac{h}{3}(A_1 + A_2 + \sqrt{A_1 A_2})$$

$$H_T = h/(\sqrt{A_2/A_1} - 1)$$

Where

ΔV_{12} = volume between base areas 1 and 2,

A_i = surface area of base i,

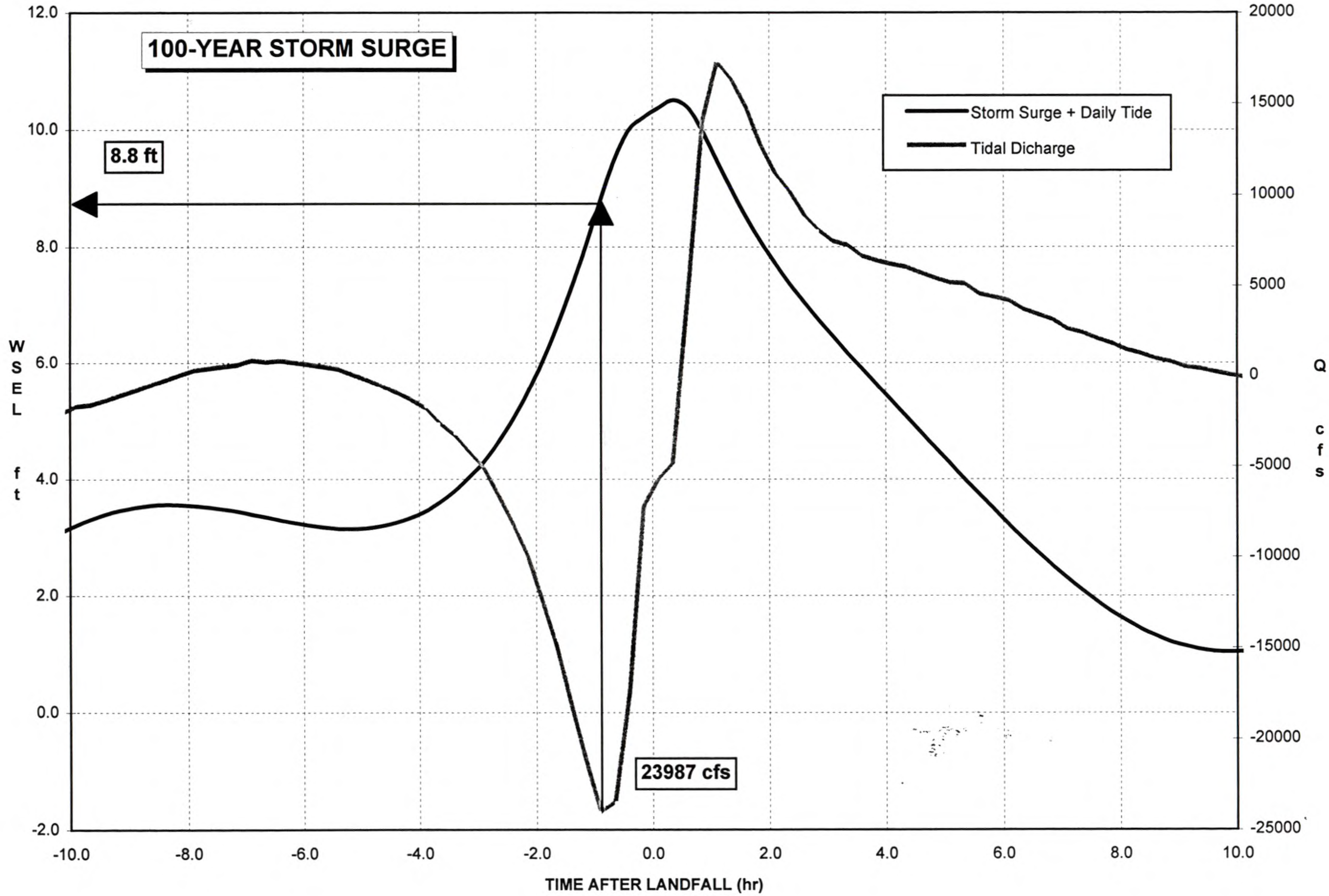
E_i = elevation of base i,

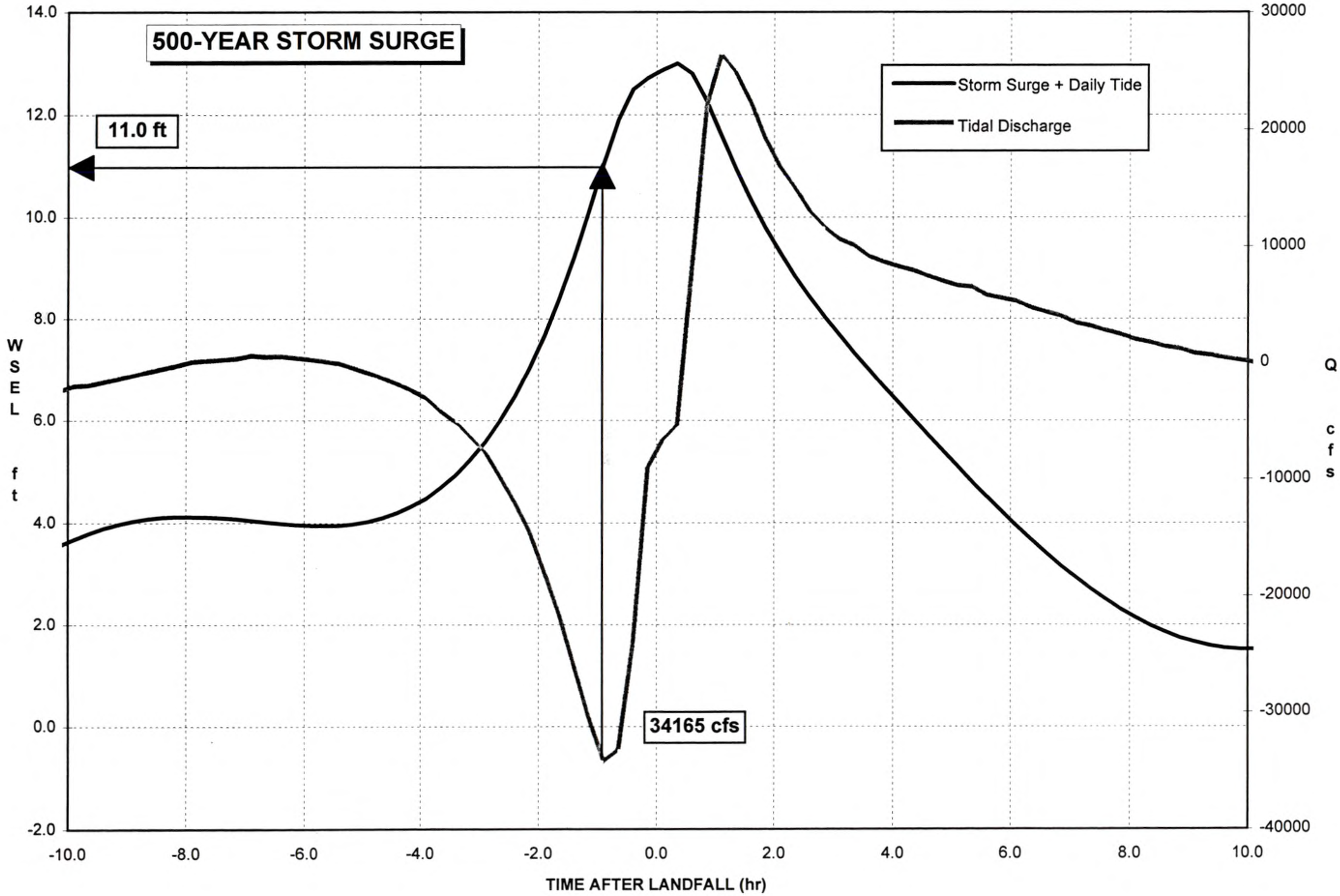
h = vertical distance $(E_2 - E_1)$ between bases A_1 and A_2, and

H_T = height of truncated part of cone.

Figure 3.11 Conic Method for Reservoir Volumes

(3) Trapezoidal and Ogee Spillways. Trapezoidal and ogee spillways (Corps of Engineers, 1965) may be simulated as shown in Figure 3.12. The outflow rating curve is computed for 20 stages which span the range of given storage data. If there is a low-level outlet, the stages are evenly spaced between the low-level outlet and the maximum elevation, with the spillway crest located at the tenth elevation. In the absence of a low-level outlet, the second stage is at the spillway crest.


100-YEAR STORM SURGE
8.8 ft
23987 cfs
Storm Surge + Daily Tide
Tidal Dicharge
WSEL ft
Q cfs
TIME AFTER LANDFALL (hr)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0


500-YEAR STORM SURGE
Storm Surge + Daily Tide
Tidal Discharge
11.0 ft
34165 cfs
WSEL ft
Q cfs
TIME AFTER LANDFALL (hr)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
30000
20000
10000
0
-10000
-20000
-30000
-40000
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0

ATTACHMENT B

HYDRAULIC ANALYSIS

Survey adjustment to NGVD

① Vert Clearance @

MHW = 8.5', MLW = 10.0' } 1.5 ft Range

survey low chord @ Center span =

1003.62 (road) − 3.45 (deck) = 1000.17'

therefore survey { MHW = 1000.17 − 8.5 = 991.67
MLW = 1000.17 − 10 = 990.17

− 1997 tidel data
Tarpon Springs gage
MHW = 2.2
MSL = 1.3 } range = 1.8
MLLW = 0.0
*MLW ≈ 0.4

− NOAA Data
Tarpon Springs gage (1960-1978)

MHW = 2.62
MTL = 1.57 } 2.1 ft range
MLW = 0.52
MLLW = 0.00
*NGVD (1929) = 1.12

therefore use tidel range b/c average range

MHW (NGVD) = 2.2 − 1.12 = 1.08 Ft
MLW (NGVD) = 0.4 − 1.12 = −0.72

survey adjustment =

991.67 − 1.08 = 990.59
990.17 − (−0.72) = 990.89 } 990.74 Ft average

Survey adjustments to NGVD

② surveyed WSEL @

9:30 am 7/31/97 = 992.31

11:00 am 7/31/97 = 992.24

1997 Tidel WSEL @ Tarpon Springs gage

@ 9:30 a.m. 7/31/97 = 2.27 - 1.12 = 1.15

@ 11:00 a.m. 7/31/97 = 2.58 - 1.12 = 1.46

survey adjustment =

$$\left.\begin{array}{l} 992.31 - 1.15 = 991.16 \\ 992.24 - 1.46 = 990.78 \end{array}\right\} \begin{array}{l} 990.97 \text{ Ft} \\ \text{average} \end{array}$$

Use average of ① and ② =

survey adjust = 990.86 Ft

FLORIDA 872 6905

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

TARPON SPRINGS, ANCLOTE RIVER

LATITUDE: 28ø 9.6' N LONGITUDE: 82ø 46.1' W
NOAA CHART: 11412 USGS QUAD: TARPON SPRINGS

To reach the tidal bench marks proceed 0.1 mile (0.2 km) along US Highway 19A from the north end of the bridge over the Anclote River at Tarpon Springs, then 0.6 mile (1.0 km) west along Pinellas County Road 47 and 0.2 mile (0.3 km) west along a dirt road to the Bradley residence. The bench marks are between Anclote Road and the river. The gage and staff were north of the Bradley residence at the wood pier west of the Linger Longer trailer park.

....

BENCH MARK STAMPING: NO 4 1975

MONUMENTATION: Survey Disk
AGENCY/DISK TYPE: NOS Tidal Bench Mark
SETTING CLASSIFICATION: Copper-coated Steel Rod

The bench mark is 76.5 feet (23.3 m) SW of the centerline of Anclote Road, 24 feet (7 m) south of the centerline of the most southern entrance to the Linger Longer trailer park, and 7 feet (2 m) north of the centerline of the road leading to the Bradley residence. The bench mark is crimped to a corner-coated steel rod driven to refusal and encased in a PVC pipe and concrete kickblock.

BENCH MARK STAMPING: NO I

MONUMENTATION: Survey Disk
AGENCY/DISK TYPE: USC&GS Bench Mark
SETTING CLASSIFICATION: Concrete Post

The bench mark is 63 feet (19 m) SE of the SE corner of a two story yellow frame house owned by Mrs. F. Bradley, 6 feet (2 m) west of a utility pole, 3 feet (1 m) south of the SW corner of a garage, and 1 foot (0.3 m) north of a century plant, and set into the top of a concrete post, 0.2 foot (0.1 m) below ground level.

BENCH MARK STAMPING: NO II

MONUMENTATION: Survey Disk
AGENCY/DISK TYPE: USC&GS Bench Mark
SETTING CLASSIFICATION: Concrete Post

The bench mark is 12 feet (4 m) SW of the SW corner of a two story yellow frame dwelling owned by Mrs. F. Bradley, 2 feet (1 m) SW of a 1-inch water pipe projecting 1.5 feet (0.5 m) above ground, 0.2 foot (0.1 m) north of the north edge of an east-west sidewalk and 0.2 foot (0.1 m) east of the east edge of a north-south sidewalk, and set into the top of a concrete post, 0.2 foot (0.1 m) below ground level.

FLORIDA 872 6905

TARPON SPRINGS, ANCLOTE RIVER

BENCH MARK STAMPING: NO III

MONUMENTATION: Survey Disk
AGENCY/DISK TYPE: USC&GS Bench Mark
SETTING CLASSIFICATION: Concrete Post

The bench mark is 250 feet (76 m) south of the south face of a two story yellow frame dwelling owned by Mrs. F. Bradley, 180 feet (55 m) south of Bench Mark No II, 25 feet (8 m) north of the north bank of the Anclote River, 20 feet (6 m) SW of a triangular blazed 1.2 feet (0.4 m) diameter pine tree, 18 feet (5 m) east of a triangular blazed 1.2 foot (0.4 m) diameter pine tree, 1.3 feet (0.4 m) north of a witness post, and set into the top of a concrete post projecting 0.1 foot (0.03 m) above ground level.

FLORIDA 872 6905

TARPON SPRINGS, ANCLOTE RIVER

Tidal datums at TARPON SPRINGS, ANCLOTE RIVER are based on the following:

LENGTH OF SERIES	=	1 MONTH
TIME PERIOD	=	OCTOBER 1975
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	ANCLOTE RIVER (872 6924)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/17/1975)	=	3.91 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.00 FEET
MEAN HIGH WATER (MHW)	=	2.62 FEET
MEAN TIDE LEVEL (MTL)	=	1.57 FEET
*NATIONAL GEODETIC VERTICAL DATUM-1929 (NGVD)	=	1.12 FEET
MEAN LOW WATER (MLW)	=	0.52 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (10/21/1975)	=	-0.58 FEET

*NGVD reference based on elevations published in Quad 280823, 1969, and NOS leveling of 1975.

Bench mark elevation information:

	ELEVATION IN FEET ABOVE:	
BENCH MARK STAMPING	MLLW	MHW
NO 4 1975	7.69	5.07
NO I	10.92	8.30
NO II	8.64	6.02
NO III	7.59	4.97

FLORIDA 872 6905

TARPON SPRINGS, ANCLOTE RIVER

MSL is the local mean sea level and should not be confused with the fixed datums of NGVD (sometimes referred to as Sea Level Datum of 1929) or NAVD 88.

NGVD is a fixed datum adopted as a standard geodetic reference for heights. It was derived from a general adjustment of the first order leveling nets of the U.S. and Canada. Mean sea level was held fixed as observed at 26 stations in the U.S. and Canada. Numerous adjustments have been made since originally established in 1929.

NAVD 88 involved a simultaneous, least squares, minimum-constraint adjustment of Canadian-Mexican-United States leveling observations. Local mean sea level at Father Point/Rimouski, Canada was held fixed as the single constraint.

These fixed datums do not take into account the changing stands of sea level and because they represent a "best" fit over a broad area, their relationship to local mean sea level is not consistent from one location to another.

WSPRO MODEL INPUT FILE

```
*F
T1     BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
T2     FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
T3     PINELLAS COUNTY, FL
*         DELTAY   YTOL     QTOL    FNTEST  IHFNOJ
J1          *        0.0005   0.0005   0.9       *
*
*       SLEN     Q  YMIN XSTW FR#    VEL  WSEL   EGL
J3        10     5    22   28  14     13     3     7
*
*      STRUCTURE NUMBER ---- 156310
*         Q100      Q500
Q         23987     34165
WS        8.8       11.0
*
XS    EXIT  0
GR          -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0   -71.5     4.0
GR             0.0     4.3   28.5     4.4   78.5     4.2  128.5     4.5   178.5     4.8
GR           228.5     5.2  245.5     5.2  246.5     5.4  247.5     2.8   250.0     1.5
GR           253.5    -0.5  266.5    -1.7  285.0    -2.3  302.5    -2.7   321.0    -3.1
GR           339.5    -4.1  357.0    -5.2  375.5    -5.5  393.0    -5.6   411.5    -6.0
GR           428.5    -7.1  444.5    -7.2  475.5    -6.8  493.5    -7.4   511.0    -6.6
GR           529.5    -6.0  547.0    -4.6  564.5    -3.0  583.0    -0.7   584.5    -0.6
GR           585.5     2.7  598.5     4.2  607.0     4.5  608.5     6.1   628.5     6.1
GR           655.5     6.0  678.5     5.6  728.5     5.4  757.5     5.0   768.5     5.1
GR           778.5     4.8  828.5     4.2  857.0     4.2  928.5     3.7  1147.0    10.0
GR          1257.0    15.0 1557.0    15.0 1757.0    10.0 1957.0     5.0  2107.0     5.0
GR          2557.0    10.0 3057.0    15.0
N           0.08   0.025  0.08
SA              250     607
*
XS    FULLV 354
GR          -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0   -71.5     4.0
GR             0.0     4.3   28.5     4.4   78.5     4.2  128.5     4.5   178.5     4.8
GR           228.5     5.2  245.5     5.2  246.5     5.4  247.5     2.8   250.0     1.5
GR           253.5    -0.5  266.5    -1.7  285.0    -2.3  302.5    -2.7   321.0    -3.1
GR           339.5    -4.1  357.0    -5.2  375.5    -5.5  393.0    -5.6   411.5    -6.0
GR           428.5    -7.1  444.5    -7.2  475.5    -6.8  493.5    -7.4   511.0    -6.6
GR           529.5    -6.0  547.0    -4.6  564.5    -3.0  583.0    -0.7   584.5    -0.6
GR           585.5     2.7  598.5     4.2  607.0     4.5  608.5     6.1   628.5     6.1
GR           655.5     6.0  678.5     5.6  728.5     5.4  757.5     5.0   768.5     5.1
GR           778.5     4.8  828.5     4.2  857.0     4.2  928.5     3.7  1147.0    10.0
GR          1257.0    15.0 1557.0    15.0 1757.0    10.0 1957.0     5.0  2107.0     5.0
GR          2557.0    10.0 3057.0    15.0
N           0.08   0.025  0.08
SA              250     607
*
BR    BRDG  354 9.3
GR           250.0     1.5  253.5    -0.5  266.5    -1.7  285.0    -2.3   302.5    -2.7
GR           321.0    -3.1  339.5    -4.1  357.0    -5.2  375.5    -5.5   393.0    -5.6
GR           411.5    -6.0  428.5    -7.1  444.5    -7.2  475.5    -6.8   493.5    -7.4
GR           511.0    -6.6  529.5    -6.0  547.0    -4.6  564.5    -3.0   583.0    -0.7
GR           584.5    -0.6  585.5     2.7  598.5     4.2  607.0     4.5   528.5     7.8
GR           428.5     9.3  328.5     6.4  250.0     1.5
CD          4 28 2 4.5 45
*
PW           -7.06  1.5    -6.76  1.5    -6.76  3       -6.56  3       -6.56   4.5
PW           -5.56  4.5    -5.56  6      -5.16  6       -5.16  7.5     -4.56   7.5
PW           -4.56  9      -3.06  9      -3.06  10.5    -2.26  10.5    -2.26   12
PW           -0.66  12     -0.66  13.5    10    13.5
*
XR    ROAD  368 30 * 0.26
GR          -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0   -71.5     4.0
GR            28.5     4.2  128.5     4.5  228.5     5.6  328.5     9.8   428.5    12.8
GR           528.5    11.3  628.5     6.5  728.5     5.5  828.5     4.6   928.5     3.7
GR          1147.0    10.0 1257.0    15.0 1557.0    15.0 1757.0    10.0  1957.0     5.0
```

```
GR         2107.0     5.0 2557.0    10.0 3057.0    15.0
*
XS    APPCH 736
GR         -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0  -71.5     4.0
GR            0.0     4.3   28.5     4.4   78.5     4.2  128.5     4.5  178.5     4.8
GR          228.5     5.2  245.5     5.2  246.5     5.4  247.5     2.8  250.0     1.5
GR          253.5    -0.5  266.5    -1.7  285.0    -2.3  302.5    -2.7  321.0    -3.1
GR          339.5    -4.1  357.0    -5.2  375.5    -5.5  393.0    -5.6  411.5    -6.0
GR          428.5    -7.1  444.5    -7.2  475.5    -6.8  493.5    -7.4  511.0    -6.6
GR          529.5    -6.0  547.0    -4.6  564.5    -3.0  583.0    -0.7  584.5    -0.6
GR          585.5     2.7  598.5     4.2  607.0     4.5  608.5     6.1  628.5     6.1
GR          655.5     6.0  678.5     5.6  728.5     5.4  757.5     5.0  768.5     5.1
GR          778.5     4.8  828.5     4.2  857.0     4.2  928.5     3.7 1147.0    10.0
GR         1257.0    15.0 1557.0    15.0 1757.0    10.0 1957.0     5.0 2107.0     5.0
GR         2557.0    10.0 3057.0    15.0
N          0.08   0.025  0.08
SA             250     607
*
DP BRDG 250 607 1.5 *  * 1.1 1.0 1.1
*   100-YEAR HYDRAULIC PARAMETERS
*
HP 2 BRDG  8.89,10,8.89,20576.56
HP 2 APPCH 9.323,10,9.323,23987
HP 1 BRDG  8.89,10,8.89
HP 1 APPCH 9.323,10,9.323
*
*   500-YEAR HYDRAULIC PARAMETERS
*
HP 2 BRDG  9.300,10,9.300,25743.13
HP 2 APPCH 12.223,10,12.223,34165
HP 1 BRDG  9.300,10,9.300
HP 1 APPCH 12.223,10,12.223
*
*
EX
ER
```

WSPRO MODEL OUTPUT FILE

```
   ************************  W S P R O  *************************
      Federal Highway Administration  -  U. S. Geological Survey
             Model for Water-Surface Profile Computations.
        Run Date & Time:  9/ 4/97  3:02 pm      Version V011697
         Input File: 154000.WSP      Output File: 154000.lst
   *-------------------------------------------------------------*
*F
 ***                   Input Data In Free Format                    ***

T1      BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
T2      FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
T3      PINELLAS COUNTY, FL
J1         *         0.0005   0.0005   0.9        *

     *---------------------------------------------------------*
              Computational Control (J1) Parameters
          ------------------------------------------------
          Trial WSE Stepping Increment     (DeltaY):  1.00
          Allowable Elevation Tolerance      (yTol):   .00
          Allowable Discharge Tolerance      (qTol):   .00
          Maximum Froude Number Test Value (FNTest):   .90
          Friction-Loss Computation Method (IHFNOJ):   0
     *---------------------------------------------------------*

J3         10    5    22   28  14    13     3    7
+++082 NOTICE:  J3 Record Replaced With UT Record (See Users Manual).
Q          23987    34165

 ***  Processing Flow Data; Placing Information into Sequence  1    ***

WS         8.8      11.0
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*--------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

      *---------------------------------------------------*
      *      Starting To Process Header Record EXIT       *
      *---------------------------------------------------*

XS   EXIT  0
GR         -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0  -71.5     4.0
GR            0.0     4.3   28.5     4.4   78.5     4.2  128.5     4.5  178.5     4.8
GR          228.5     5.2  245.5     5.2  246.5     5.4  247.5     2.8  250.0     1.5
GR          253.5    -0.5  266.5    -1.7  285.0    -2.3  302.5    -2.7  321.0    -3.1
GR          339.5    -4.1  357.0    -5.2  375.5    -5.5  393.0    -5.6  411.5    -6.0
GR          428.5    -7.1  444.5    -7.2  475.5    -6.8  493.5    -7.4  511.0    -6.6
GR          529.5    -6.0  547.0    -4.6  564.5    -3.0  583.0    -0.7  584.5    -0.6
GR          585.5     2.7  598.5     4.2  607.0     4.5  608.5     6.1  628.5     6.1
GR          655.5     6.0  678.5     5.6  728.5     5.4  757.5     5.0  768.5     5.1
GR          778.5     4.8  828.5     4.2  857.0     4.2  928.5     3.7 1147.0    10.0
GR         1257.0    15.0 1557.0    15.0 1757.0    10.0 1957.0     5.0 2107.0     5.0
GR         2557.0    10.0 3057.0    15.0
N          0.08   0.025  0.08
SA             250     607

 ***   Completed Reading Data Associated With Header Record EXIT     ***
 ***  Storing X-Section Data In Temporary File As Record Number  1   ***

 ***              Data Summary For Header Record EXIT                ***
 SRD Location:         0.   Cross-Section Skew:     .0   Error Code   0
 Valley Slope:    .00000    Averaging Conveyance By Geometric Mean.
 Energy Loss Coefficients ->   Expansion:    .50    Contraction:    .00

                    X,Y-coordinates (57 pairs)
     X          Y           X          Y            X          Y
 ---------- ----------  ---------- ----------  ---------- ----------
   -302.000     15.000    -301.000     10.000    -300.000      5.000
   -150.000      5.000     -71.500      4.000        .000      4.300
     28.500      4.400      78.500      4.200     128.500      4.500
    178.500      4.800     228.500      5.200     245.500      5.200
    246.500      5.400     247.500      2.800     250.000      1.500
    253.500      -.500     266.500     -1.700     285.000     -2.300
    302.500     -2.700     321.000     -3.100     339.500     -4.100
    357.000     -5.200     375.500     -5.500     393.000     -5.600
    411.500     -6.000     428.500     -7.100     444.500     -7.200
    475.500     -6.800     493.500     -7.400     511.000     -6.600
    529.500     -6.000     547.000     -4.600     564.500     -3.000
    583.000      -.700     584.500      -.600     585.500      2.700
    598.500      4.200     607.000      4.500     608.500      6.100
    628.500      6.100     655.500      6.000     678.500      5.600
    728.500      5.400     757.500      5.000     768.500      5.100
    778.500      4.800     828.500      4.200     857.000      4.200
    928.500      3.700    1147.000     10.000    1257.000     15.000
   1557.000     15.000    1757.000     10.000    1957.000      5.000
   2107.000      5.000    2557.000     10.000    3057.000     15.000
 ---------- ----------  ---------- ----------  ---------- ----------

                  Minimum and Maximum X,Y-coordinates
  Minimum X-Station:     -302.000  ( associated Y-Elevation:    15.000 )
  Maximum X-Station:     3057.000  ( associated Y-Elevation:    15.000 )
  Minimum Y-Elevation:     -7.400  ( associated X-Station:     493.500 )
  Maximum Y-Elevation:     15.000  ( associated X-Station:    -302.000 )
```

```
  Roughness Data (  3 SubAreas )
            Roughness   Horizontal
 SubArea   Coefficient  Breakpoint
 -------   -----------  ----------
    1         .080         ---
              ---        250.000
    2         .025         ---
              ---        607.000
    3         .080         ---
 -------   -----------  ----------
```

```
*----------------------------------------------------*
*       Finished Processing Header Record EXIT       *
*----------------------------------------------------*
```

```
************************* W S P R O **************************
     Federal Highway Administration  -  U. S. Geological Survey
            Model for Water-Surface Profile Computations.
           Input Units: English  /  Output Units: English
 *-----------------------------------------------------------------*
  BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
           FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL

       *---------------------------------------------------*
       *      Starting To Process Header Record FULLV      *
       *---------------------------------------------------*

XS    FULLV 354
GR         -302.0   15.0 -301.0   10.0 -300.0    5.0 -150.0    5.0  -71.5    4.0
GR            0.0    4.3   28.5    4.4   78.5    4.2  128.5    4.5  178.5    4.8
GR          228.5    5.2  245.5    5.2  246.5    5.4  247.5    2.8  250.0    1.5
GR          253.5   -0.5  266.5   -1.7  285.0   -2.3  302.5   -2.7  321.0   -3.1
GR          339.5   -4.1  357.0   -5.2  375.5   -5.5  393.0   -5.6  411.5   -6.0
GR          428.5   -7.1  444.5   -7.2  475.5   -6.8  493.5   -7.4  511.0   -6.6
GR          529.5   -6.0  547.0   -4.6  564.5   -3.0  583.0   -0.7  584.5   -0.6
GR          585.5    2.7  598.5    4.2  607.0    4.5  608.5    6.1  628.5    6.1
GR          655.5    6.0  678.5    5.6  728.5    5.4  757.5    5.0  768.5    5.1
GR          778.5    4.8  828.5    4.2  857.0    4.2  928.5    3.7 1147.0   10.0
GR         1257.0   15.0 1557.0   15.0 1757.0   10.0 1957.0    5.0 2107.0    5.0
GR         2557.0   10.0 3057.0   15.0
N          0.08   0.025  0.08
SA             250    607

 ***   Completed Reading Data Associated With Header Record FULLV   ***
 ***  Storing X-Section Data In Temporary File As Record Number  2  ***

 ***               Data Summary For Header Record FULLV             ***
 SRD Location:       354.   Cross-Section Skew:     .0   Error Code   0
 Valley Slope:     .00000   Averaging Conveyance By Geometric Mean.
 Energy Loss Coefficients ->   Expansion:    .50   Contraction:    .00

                      X,Y-coordinates (57 pairs)
      X          Y             X          Y             X          Y
 ----------  ----------   ----------  ----------   ----------  ----------
   -302.000      15.000     -301.000      10.000     -300.000       5.000
   -150.000       5.000      -71.500       4.000         .000       4.300
     28.500       4.400       78.500       4.200      128.500       4.500
    178.500       4.800      228.500       5.200      245.500       5.200
    246.500       5.400      247.500       2.800      250.000       1.500
    253.500       -.500      266.500      -1.700      285.000      -2.300
    302.500      -2.700      321.000      -3.100      339.500      -4.100
    357.000      -5.200      375.500      -5.500      393.000      -5.600
    411.500      -6.000      428.500      -7.100      444.500      -7.200
    475.500      -6.800      493.500      -7.400      511.000      -6.600
    529.500      -6.000      547.000      -4.600      564.500      -3.000
    583.000       -.700      584.500       -.600      585.500       2.700
    598.500       4.200      607.000       4.500      608.500       6.100
    628.500       6.100      655.500       6.000      678.500       5.600
    728.500       5.400      757.500       5.000      768.500       5.100
    778.500       4.800      828.500       4.200      857.000       4.200
    928.500       3.700     1147.000      10.000     1257.000      15.000
   1557.000      15.000     1757.000      10.000     1957.000       5.000
   2107.000       5.000     2557.000      10.000     3057.000      15.000
 ----------  ----------   ----------  ----------   ----------  ----------

                  Minimum and Maximum X,Y-coordinates
  Minimum X-Station:     -302.000  ( associated Y-Elevation:    15.000 )
  Maximum X-Station:     3057.000  ( associated Y-Elevation:    15.000 )
  Minimum Y-Elevation:     -7.400  ( associated X-Station:     493.500 )
  Maximum Y-Elevation:     15.000  ( associated X-Station:    -302.000 )
```

```
  Roughness Data (  3 SubAreas )
          Roughness   Horizontal
SubArea  Coefficient  Breakpoint
-------  -----------  ----------
   1         .080        ---
             ---        250.000
   2         .025        ---
             ---        607.000
   3         .080        ---
-------  -----------  ----------

*----------------------------------------------------*
*      Finished Processing Header Record FULLV      *
*----------------------------------------------------*
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL

      *---------------------------------------------------*
      *       Starting To Process Header Record BRDG      *
      *---------------------------------------------------*

 BR   BRDG  354 9.3
 GR         250.0    1.5  253.5   -0.5  266.5   -1.7  285.0   -2.3  302.5   -2.7
 GR         321.0   -3.1  339.5   -4.1  357.0   -5.2  375.5   -5.5  393.0   -5.6
 GR         411.5   -6.0  428.5   -7.1  444.5   -7.2  475.5   -6.8  493.5   -7.4
 GR         511.0   -6.6  529.5   -6.0  547.0   -4.6  564.5   -3.0  583.0   -0.7
 GR         584.5   -0.6  585.5    2.7  598.5    4.2  607.0    4.5  528.5    7.8
 GR         428.5    9.3  328.5    6.4  250.0    1.5
 CD         4 28 2 4.5 45
 PW         -7.06  1.5    -6.76  1.5    -6.76  3      -6.56  3      -6.56  4.5
 PW         -5.56  4.5    -5.56  6      -5.16  6      -5.16  7.5    -4.56  7.5
 PW         -4.56  9      -3.06  9      -3.06  10.5   -2.26  10.5   -2.26  12
 PW         -0.66  12     -0.66  13.5   10     13.5
+++075 NOTICE:  PW Record Replaced With PD Record (See Users Manual).

  ***   Completed Reading Data Associated With Header Record BRDG    ***
  ***   No Roughness Data Input, Propagating From Previous Section   ***
  ***   Storing Bridge Data In Temporary File As Record Number  3    ***

  ***              Data Summary For Bridge Record BRDG               ***
  SRD Location:       354.   Cross-Section Skew:    .0   Error Code   0
  Valley Slope:  *******    Averaging Conveyance By Geometric Mean.
  Energy Loss Coefficients ->   Expansion:    .50   Contraction:    .00
```

X,Y-coordinates (28 pairs)

X	Y	X	Y	X	Y
250.000	1.500	253.500	-.500	266.500	-1.700
285.000	-2.300	302.500	-2.700	321.000	-3.100
339.500	-4.100	357.000	-5.200	375.500	-5.500
393.000	-5.600	411.500	-6.000	428.500	-7.100
444.500	-7.200	475.500	-6.800	493.500	-7.400
511.000	-6.600	529.500	-6.000	547.000	-4.600
564.500	-3.000	583.000	-.700	584.500	-.600
585.500	2.700	598.500	4.200	607.000	4.500
528.500	7.800	428.500	9.300	328.500	6.400
250.000	1.500				

```
              Minimum and Maximum X,Y-coordinates
 Minimum X-Station:     250.000  ( associated Y-Elevation:    1.500 )
 Maximum X-Station:     607.000  ( associated Y-Elevation:    4.500 )
 Minimum Y-Elevation:    -7.400  ( associated X-Station:    493.500 )
 Maximum Y-Elevation:     9.300  ( associated X-Station:    428.500 )
```

Roughness Data (3 SubAreas)

SubArea	Roughness Coefficient	Horizontal Breakpoint
1	.080	---
	---	250.000
2	.025	---
	---	607.000
3	.080	---

Discharge coefficient parameters

BRType	BRWdth	EMBSS	EMBElv	WWAngl	UserCD
4	28.000	2.00	4.500	45.000	**********

Pressure flow elevations

AVBCEL	PFElev
*********	9.300

Abutment Parameters

ABSLPL	ABSLPR	XTOELT	YTOELT	XTOERT	YTOERT
*******	*******	*********	*********	*********	*********

Pier/Pile Data (16 Group(s))
Code Indicates Bridge Uses Piles

Group	Elevation	Gross Width	Number
1	-6.760	3.000	1
2	-6.560	3.000	1
3	-6.560	4.500	1
4	-5.560	4.500	1
5	-5.560	6.000	1
6	-5.160	6.000	1
7	-5.160	7.500	1
8	-4.560	7.500	1
9	-4.560	9.000	1
10	-3.060	9.000	1
11	-3.060	10.500	1
12	-2.260	10.500	1
13	-2.260	12.000	1
14	-.660	12.000	1
15	-.660	13.500	1
16	10.000	13.500	1

```
*----------------------------------------------*
*     Finished Processing Header Record BRDG    *
*----------------------------------------------*
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
          Input Units: English  /  Output Units: English
*------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

      *----------------------------------------------------*
      *       Starting To Process Header Record ROAD       *
      *----------------------------------------------------*

XR   ROAD  368 30 * 0.26
GR         -302.0    15.0 -301.0    10.0 -300.0    5.0 -150.0    5.0  -71.5    4.0
GR           28.5     4.2  128.5     4.5  228.5    5.6  328.5    9.8  428.5   12.8
GR          528.5    11.3  628.5     6.5  728.5    5.5  828.5    4.6  928.5    3.7
GR         1147.0    10.0 1257.0    15.0 1557.0   15.0 1757.0   10.0 1957.0    5.0
GR         2107.0     5.0 2557.0    10.0 3057.0   15.0

 ***  Completed Reading Data Associated With Header Record ROAD    ***
  ***  Storing Roadway Data In Temporary File As Record Number  4    ***

 ***            Data Summary For Roadway Record ROAD              ***
 SRD Location:       368.   Cross-Section Skew:    .0  Error Code   0
 Roadway Width:   30.000   User-Specified Weir Coefficient:    .260
 Input Code Indicates Roadway Surface Consists of a Paved Material.

                    X,Y-coordinates (23 pairs)
      X          Y            X          Y            X          Y
 ----------  ----------   ----------  ----------   ----------  ----------
   -302.000      15.000     -301.000      10.000     -300.000       5.000
   -150.000       5.000      -71.500       4.000       28.500       4.200
    128.500       4.500      228.500       5.600      328.500       9.800
    428.500      12.800      528.500      11.300      628.500       6.500
    728.500       5.500      828.500       4.600      928.500       3.700
   1147.000      10.000     1257.000      15.000     1557.000      15.000
   1757.000      10.000     1957.000       5.000     2107.000       5.000
   2557.000      10.000     3057.000      15.000
 ----------  ----------   ----------  ----------   ----------  ----------

                 Minimum and Maximum X,Y-coordinates
  Minimum X-Station:     -302.000  ( associated Y-Elevation:   15.000 )
  Maximum X-Station:     3057.000  ( associated Y-Elevation:   15.000 )
  Minimum Y-Elevation:      3.700  ( associated X-Station:    928.500 )
  Maximum Y-Elevation:     15.000  ( associated X-Station:   -302.000 )

Bridge datum projection:  XREFLT = *******

      *----------------------------------------------------*
      *       Finished Processing Header Record ROAD       *
      *----------------------------------------------------*
```

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*--------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL

       *---------------------------------------------------*
       *      Starting To Process Header Record APPCH      *
       *---------------------------------------------------*

XS    APPCH 736
GR          -302.0    15.0 -301.0    10.0 -300.0     5.0 -150.0     5.0  -71.5     4.0
GR             0.0     4.3   28.5     4.4   78.5     4.2  128.5     4.5  178.5     4.8
GR           228.5     5.2  245.5     5.2  246.5     5.4  247.5     2.8  250.0     1.5
GR           253.5    -0.5  266.5    -1.7  285.0    -2.3  302.5    -2.7  321.0    -3.1
GR           339.5    -4.1  357.0    -5.2  375.5    -5.5  393.0    -5.6  411.5    -6.0
GR           428.5    -7.1  444.5    -7.2  475.5    -6.8  493.5    -7.4  511.0    -6.6
GR           529.5    -6.0  547.0    -4.6  564.5    -3.0  583.0    -0.7  584.5    -0.6
GR           585.5     2.7  598.5     4.2  607.0     4.5  608.5     6.1  628.5     6.1
GR           655.5     6.0  678.5     5.6  728.5     5.4  757.5     5.0  768.5     5.1
GR           778.5     4.8  828.5     4.2  857.0     4.2  928.5     3.7 1147.0    10.0
GR          1257.0    15.0 1557.0    15.0 1757.0    10.0 1957.0     5.0 2107.0     5.0
GR          2557.0    10.0 3057.0    15.0
N           0.08   0.025  0.08
SA             250     607

 ***   Completed Reading Data Associated With Header Record APPCH    ***
 ***  Storing X-Section Data In Temporary File As Record Number  5   ***

 ***               Data Summary For Header Record APPCH              ***
 SRD Location:       736.   Cross-Section Skew:     .0   Error Code  0
 Valley Slope:   .00000   Averaging Conveyance By Geometric Mean.
 Energy Loss Coefficients ->   Expansion:    .50   Contraction:   .00

                      X,Y-coordinates (57 pairs)
     X          Y            X          Y            X          Y
---------- ----------   ---------- ----------   ---------- ----------
  -302.000     15.000     -301.000     10.000     -300.000      5.000
  -150.000      5.000      -71.500      4.000         .000      4.300
    28.500      4.400       78.500      4.200      128.500      4.500
   178.500      4.800      228.500      5.200      245.500      5.200
   246.500      5.400      247.500      2.800      250.000      1.500
   253.500      -.500      266.500     -1.700      285.000     -2.300
   302.500     -2.700      321.000     -3.100      339.500     -4.100
   357.000     -5.200      375.500     -5.500      393.000     -5.600
   411.500     -6.000      428.500     -7.100      444.500     -7.200
   475.500     -6.800      493.500     -7.400      511.000     -6.600
   529.500     -6.000      547.000     -4.600      564.500     -3.000
   583.000      -.700      584.500      -.600      585.500      2.700
   598.500      4.200      607.000      4.500      608.500      6.100
   628.500      6.100      655.500      6.000      678.500      5.600
   728.500      5.400      757.500      5.000      768.500      5.100
   778.500      4.800      828.500      4.200      857.000      4.200
   928.500      3.700     1147.000     10.000     1257.000     15.000
  1557.000     15.000     1757.000     10.000     1957.000      5.000
  2107.000      5.000     2557.000     10.000     3057.000     15.000
---------- ----------   ---------- ----------   ---------- ----------

                 Minimum and Maximum X,Y-coordinates
  Minimum X-Station:     -302.000  ( associated Y-Elevation:    15.000 )
  Maximum X-Station:     3057.000  ( associated Y-Elevation:    15.000 )
  Minimum Y-Elevation:     -7.400  ( associated X-Station:     493.500 )
  Maximum Y-Elevation:     15.000  ( associated X-Station:    -302.000 )
```

```
  Roughness Data (  3 SubAreas )
           Roughness   Horizontal
SubArea   Coefficient  Breakpoint
-------   -----------  ----------
   1         .080         ---
              ---       250.000
   2         .025         ---
              ---       607.000
   3         .080         ---
-------   -----------  ----------
```

```
Bridge datum projection(s):  XREFLT  XREFRT  FDSTLT  FDSTRT
                             ******* ******* ******* *******
```

```
*---------------------------------------------------*
*      Finished Processing Header Record APPCH      *
*---------------------------------------------------*
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                          PINELLAS COUNTY, FL
 DC  0 BRDG 250 607 250 607 0.69 1.5 7.0  3.0 0.000656
+++005 WARNING: Ignoring Unrecognized Record "PC".
 HP  2 BRDG  8.89,10,8.89,20576.56
 HP  2 APPCH 9.323,10,9.323,23987
 HP  1 BRDG  8.89,10,8.89
 HP  1 APPCH 9.323,10,9.323
 HP  2 BRDG  9.300,10,9.300,25743.13
 HP  2 APPCH 12.223,10,12.223,34165
 HP  1 BRDG  9.300,10,9.300
 HP  1 APPCH 12.223,10,12.223
 EX

     *====================================================*
     *     Summary of Boundary Condition Information      *
     *====================================================*

        Reach      Water Surface   Friction
 #    Discharge      Elevation      Slope        Flow Regime
--    ---------    -------------   --------   --------------------
 1     23987.00        8.800        ******       Sub-Critical
 2     34165.00       11.000        ******       Sub-Critical
--    ---------    -------------   --------   --------------------

     *====================================================*
     *        Beginning  2 Profile Calculation(s)         *
     *====================================================*
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*------------------------------------------------------------*
  BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

                     WSEL    VHD       Q          AREA      SRDL      LEW
                     EGEL    HF        V           K        FLEN      REW
                     CRWS    HO       FR #         SF       ALPHA     ERR
                  --------- ------ ---------- ---------- --------- ---------
Section: EXIT         8.800   .272  23987.000  10164.590 *********  -300.760
Header Type: XS       9.072 ******      2.360 1754422.00 *********  2449.000
SRD:       .000        .630 ******       .331     ******     3.138    ******

Section: FULLV        8.871   .266  23987.000  10310.040   354.000  -300.774
Header Type: FV       9.137   .065      2.327 1775554.00   354.000  2455.367
SRD:    354.000        .630   .000       .326      .0002     3.166      .000

      <<< The Preceding Data Reflect The "Unconstricted" Profile >>>

Section: APPCH        8.945   .261  23987.000  10463.860   382.000  -300.789
Header Type: AS       9.206   .069      2.292 1797950.00   382.000  2462.061
SRD:    736.000        .630   .000       .322      .0002     3.194      .000

      <<< The Preceding Data Reflect The "Unconstricted" Profile >>>

       <<< The Following Data Reflect The "Constricted" Profile >>>
         <<< Beginning Bridge/Culvert Hydraulic Computations >>>

===215 FLOW CLASS 1 SOLUTION INDICATES POSSIBLE ROAD OVERFLOW.
       WS1, WS2, WS3, RGMIN:      9.41         .00        8.76       3.70

===260 ATTEMPTING FLOW CLASS 4 SOLUTION.


                     WSEL    VHD       Q          AREA      SRDL      LEW
                     EGEL    HF        V           K        FLEN      REW
                     CRWS    HO       FR #         SF       ALPHA     ERR
                  --------- ------ ---------- ---------- --------- ---------
Section: BRDG         8.890   .506  20576.560   3840.197   354.000   250.000
Header Type: BR       9.396   .135      5.358  778447.00   354.000   607.000
SRD:    354.000        .224   .189       .400     ******     1.134      .000

Specific Bridge Information   C     P/A   PFELEV    BLEN     XLAB     XRAB
Bridge Type 4   Flow Type 4 ------ ----- -------- -------- -------- --------
Pier/Pile Code  1            .9392  .047    9.300 ******** ******** ********
------------------------- ------ ----- -------- -------- -------- --------

                     WSEL    VHD       Q          AREA      FLEN      LEW
                     EGEL    HF        V          ERR       SRD       REW
                  --------- ------ ---------- ---------- --------- ---------
Section: ROAD         8.536   .235   3410.444   4994.204   354.000  -300.707
Header Type: XR       9.503   .056       .683       .000   368.000  2425.222

       Hydraulic Characteristics of Left and Right Roadway Sections

                                  Left Weir            Right Weir
       Weir Flow          (Q)      1491.85              1918.60
       Weir Length     (WLEN)      599.107             1119.784
       Weir LEW         (LEW)     -300.707              586.088
       Weir REW         (REW)      298.400             2425.222
       Maximum Depth   (DMAX)        4.536                4.836
       Average Depth   (DAVG)        3.608                2.529
       Maximum Velocity (VMAX)        .816                 .735
```

```
Average Velocity (VAVG)          .690                 .677
Average Head     (HAVG)         4.575                3.497
Weir Coefficient (CAVG)          .254                 .262

                    WSEL      VHD        Q          AREA       SRDL       LEW
                    EGEL      HF         V          K          FLEN       REW
                    CRWS      HO         FR #       SF         ALPHA      ERR
                 --------- ------ ---------- ---------- --------- ---------
Section: APPCH      9.323   .235  23987.000  11259.570   354.000  -300.865
Header Type: AS     9.559   .141      2.130 1914584.00   402.842  2496.079
SRD:     736.000     .630   .022       .299      .0002     3.335      .000

      Approach Section APPCH Flow Contraction Information
    M( G )   M( K )     KQ       XLKQ      XRKQ     OTEL
   -------- -------- --------- -------- -------- --------
      .871     .153 1621250.0  254.936  611.936 ********
   -------- -------- --------- -------- -------- --------

          <<< End of Bridge Hydraulics Computations >>>
```

```
************************* W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL
```

=== User Defined Table 1 of 1 ===

	SRDL	Q	YMAX	XSTW	FR #	VEL	WSEL
1 EXIT	*********	23987.000	15.000	2050.141	.331	2.360	8.800
2 FULLV	354.000	23987.000	15.000	2061.806	.326	2.327	8.871
3 APPCH	382.000	23987.000	15.000	2074.070	.322	2.292	8.945
4 BRDG	354.000	20576.560	15.000	606.105	.400	5.358	8.890
5 ROAD	368.000	3410.444	15.000	2061.806	.326	.683	8.536
6 APPCH	354.000	23987.000	15.000	2136.391	.299	2.130	9.323

	EGL
1 EXIT	9.072
2 FULLV	9.137
3 APPCH	9.206
4 BRDG	9.396
5 ROAD	9.503
6 APPCH	9.559

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

                     WSEL     VHD       Q         AREA       SRDL       LEW
                     EGEL      HF       V           K        FLEN       REW
                     CRWS      HO     FR #          SF       ALPHA      ERR
                   --------- ------ ---------- ---------- --------- ---------
Section: EXIT        11.000   .309  34165.000  15072.570 ********* -301.200
Header Type: XS      11.309 ******      2.267 2490007.00 ********* 2657.000
SRD:        .000      2.083 ******       .314     ******     3.863   ******

Section: FULLV       11.072   .303  34165.000  15245.860   354.000 -301.214
Header Type: FV      11.375   .066      2.241 2516754.00   354.000 2664.172
SRD:     354.000      2.083   .000       .310      .0002     3.883     .000

       <<< The Preceding Data Reflect The "Unconstricted" Profile >>>

Section: APPCH       11.147   .298  34165.000  15428.470   382.000 -301.229
Header Type: AS      11.445   .070      2.214 2544993.00   382.000 2671.694
SRD:     736.000      2.083   .000       .306      .0002     3.903     .000

       <<< The Preceding Data Reflect The "Unconstricted" Profile >>>

        <<< The Following Data Reflect The "Constricted" Profile >>>
          <<< Beginning Bridge/Culvert Hydraulic Computations >>>

===255 ATTEMPTING FLOW CLASS 3 OR 6 SOLUTION.
       WS3N, PFelv:       11.07        9.30


                     WSEL     VHD       Q         AREA       SRDL       LEW
                     EGEL      HF       V           K        FLEN       REW
                     CRWS      HO     FR #          SF       ALPHA      ERR
                   --------- ------ ---------- ---------- --------- ---------
Section: BRDG         9.300   .770  25743.130   3658.665   354.000   250.000
Header Type: BR      10.070 ******      7.036  756358.80 *********   607.000
SRD:     354.000      1.046 ******       .517     ******     1.000    ******

Specific Bridge Information   C      P/A    PFELEV    BLEN     XLAB     XRAB
Bridge Type 4   Flow Type 6 ------ ----- -------- -------- -------- --------
Pier/Pile Code  1            .8000  .049    9.300 ******** ******** ********
--------------------------- ------ ----- -------- -------- -------- --------

                     WSEL     VHD       Q         AREA       FLEN       LEW
                     EGEL      HF       V          ERR       SRD        REW
                   --------- ------ ---------- ---------- --------- ---------
Section: ROAD        10.955   .230   8432.877   9769.749   354.000 -301.191
Header Type: XR      12.405   .047       .863       .000   368.000 2652.453

       Hydraulic Characteristics of Left and Right Roadway Sections

                                 Left Weir            Right Weir
       Weir Flow          (Q)     3246.91               5185.96
       Weir Length     (WLEN)     668.175              1565.936
       Weir LEW         (LEW)    -301.191               535.697
       Weir REW         (REW)     366.984              2652.453
       Maximum Depth   (DMAX)       6.955                 7.255
       Average Depth   (DAVG)       5.519                 3.884
       Maximum Velocity (VMAX)      1.046                  .931
       Average Velocity (VAVG)       .881                  .853
       Average Head    (HAVG)       6.970                 5.335
```

```
        Weir Coefficient (CAVG)          .264                .269

                          WSEL    VHD       Q           AREA        SRDL      LEW
                          EGEL    HF        V           K           FLEN      REW
                          CRWS    HO       FR #         SF          ALPHA     ERR
                        --------- ------ ---------- ---------- --------- ---------
Section: APPCH            12.223   .230  34165.000  18140.470   354.000  -301.445
Header Type: AS           12.452   .179      1.883 2970295.00   427.374  2779.258
SRD:      736.000          2.083   .022       .257      .0002     4.164      .000

            Approach Section APPCH Flow Contraction Information
           M( G )   M( K )     KQ       XLKQ     XRKQ     OTEL
          -------- -------- --------- -------- -------- --------
          ******** ******** ********* ******** ******** ********
          -------- -------- --------- -------- -------- --------

               <<< End of Bridge Hydraulics Computations >>>
```

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-----------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
         FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                       PINELLAS COUNTY, FL
```

=== User Defined Table 1 of 1 ===

	SRDL	Q	YMAX	XSTW	FR #	VEL	WSEL
1 EXIT	*********	34165.000	15.000	2410.200	.314	2.267	11.000
2 FULLV	354.000	34165.000	15.000	2421.833	.310	2.241	11.072
3 APPCH	382.000	34165.000	15.000	2434.033	.306	2.214	11.147
4 BRDG	354.000	25743.130	15.000	635.500	.517	7.036	9.300
5 ROAD	368.000	8432.877	15.000	2421.833	.310	.863	10.955
6 APPCH	354.000	34165.000	15.000	2608.503	.257	1.883	12.223

	EGL
1 EXIT	11.309
2 FULLV	11.375
3 APPCH	11.445
4 BRDG	10.070
5 ROAD	12.405
6 APPCH	12.452

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                       PINELLAS COUNTY, FL

  ***    Beginning Velocity Distribution For Header Record BRDG       ***
         SRD Location:    354.000       Header Record Number  3

      Water Surface Elevation:       8.890             Element # 1
      Flow:   20576.560   Velocity:  5.36  Hydraulic Depth:  10.757
      Cross-Section Area:   3840.20         Conveyance:   778439.90
         Bank Stations ->  Left:    250.000   Right:    607.000

X STA.       250.0   2  298.8      320.6   3  340.0   4  357.3      372.3
  A( I )           231.0      176.0      193.9      201.5      192.0
  V( I )            4.45       5.84       5.31       5.11       5.36
  D( I )            4.73       8.08      10.00      11.66      12.78

X STA.       372.3      386.3   5  399.2      411.6      421.1   6  428.5
  A( I )           188.2      178.3      179.2      144.8      116.8
  V( I )            5.47       5.77       5.74       7.11       8.81
  D( I )           13.39      13.89      14.50      15.19      15.75

X STA.       428.5      439.1      448.5      459.0      471.4   7  484.6
  A( I )           170.5      150.8      167.4      194.6      203.3
  V( I )            6.04       6.82       6.14       5.29       5.06
  D( I )           16.02      16.07      15.96      15.68      15.47

X STA.       484.6      497.5   8  512.2      528.6   9  547.7  10  607.0
  A( I )           202.2      221.3      233.6      242.5      356.0
  V( I )            5.09       4.65       4.41       4.24       2.89
  D( I )           15.63      15.04      14.22      12.70       6.01

      Water Surface Elevation:       9.300             Element # 2
      Flow:   20576.560   Velocity:  5.35  Hydraulic Depth:  10.774
      Cross-Section Area:   3846.23         Conveyance:   756358.80
         Bank Stations ->  Left:    250.000   Right:    607.000

X STA.       250.0      297.4      319.4      338.2      355.8      370.3
  A( I )           221.1      175.6      184.8      203.0      183.9
  V( I )            4.65       5.86       5.57       5.07       5.60
  D( I )            4.66       7.97       9.86      11.51      12.70

X STA.       370.3      383.9      396.8      408.7      420.1      428.5
  A( I )           181.5      177.6      170.6      172.8      133.7
  V( I )            5.67       5.79       6.03       5.95       7.69
  D( I )           13.31      13.79      14.36      15.10      16.01

X STA.       428.5      440.9      451.8      463.1      475.2      487.7
  A( I )           202.2      176.8      180.8      187.4      193.5
  V( I )            5.09       5.82       5.69       5.49       5.32
  D( I )           16.35      16.20      15.90      15.57      15.50

X STA.       487.7      500.3      514.4      530.3      549.1      607.0
  A( I )           196.7      209.8      224.6      235.8      340.1
  V( I )            5.23       4.90       4.58       4.36       3.03
  D( I )           15.59      14.89      14.12      12.51       5.88
```

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL

 ***    Beginning Velocity Distribution For Header Record APPCH     ***
        SRD Location:     736.000       Header Record Number  5

     Water Surface Elevation:      9.323              Element # 1
     Flow:   23987.000   Velocity:  2.13  Hydraulic Depth:   4.026
     Cross-Section Area:  11259.37          Conveyance:  1914553.00
        Bank Stations ->  Left:    -300.865   Right:    2496.070

X STA.      -300.9       89.5      270.4      297.9      323.4      345.4
  A( I )          1847.5      949.7      317.6      311.2      289.6
  V( I )             .65       1.26       3.78       3.85       4.14
  D( I )            4.73       5.25      11.57      12.20      13.15

X STA.       345.4      364.7      383.1      401.0      418.2      433.9
  A( I )           277.4      271.4      266.8      264.3      254.3
  V( I )            4.32       4.42       4.50       4.54       4.72
  D( I )           14.33      14.78      14.95      15.34      16.21

X STA.       433.9      449.4      465.0      480.7      496.3      512.7
  A( I )           256.5      254.5      254.9      258.3      264.6
  V( I )            4.68       4.71       4.70       4.64       4.53
  D( I )           16.49      16.36      16.20      16.54      16.22

X STA.       512.7      529.9      549.8      576.6      885.0     2496.1
  A( I )           269.0      288.8      330.5     1383.0     2649.6
  V( I )            4.46       4.15       3.63        .87        .45
  D( I )           15.59      14.49      12.35       4.48       1.64

     Water Surface Elevation:     15.000              Element # 2
     Flow:   23987.000   Velocity:   .92  Hydraulic Depth:   7.744
     Cross-Section Area:  26010.97          Conveyance:  4189009.00
        Bank Stations ->  Left:    -302.000   Right:    3057.000

X STA.      -302.0      -57.0      154.6      272.5      302.1      331.0
  A( I )          2493.3     2260.2     1324.7      512.8      523.1
  V( I )             .48        .53        .91       2.34       2.29
  D( I )           10.18      10.68      11.24      17.33      18.06

X STA.       331.0      356.3      379.8      402.6      424.3      444.7
  A( I )           490.2      478.1      470.3      459.9      450.5
  V( I )            2.45       2.51       2.55       2.61       2.66
  D( I )           19.38      20.37      20.62      21.20      22.11

X STA.       444.7      465.4      486.0      507.0      528.6      553.2
  A( I )           456.3      453.3      463.6      462.7      493.6
  V( I )            2.63       2.65       2.59       2.59       2.43
  D( I )           22.06      21.92      22.16      21.39      20.08

X STA.       553.2      587.1      813.0     1301.8     2159.0     3057.0
  A( I )           578.6     2194.9     3319.7     4005.1     4119.9
  V( I )            2.07        .55        .36        .30        .29
  D( I )           17.05       9.72       6.79       4.67       4.59
```

```
************************  W S P R O  **************************
     Federal Highway Administration  -  U. S. Geological Survey
            Model for Water-Surface Profile Computations.
           Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
  BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
           FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

 ***     Compute Cross-Section Properties For Header Record BRDG     ***
          SRD Location:    354.000       Header Record Number  3
```

Water Surface Elevation	S A #	Cross Section Conveyance	Cross Section Area(s)	Top Width	Wetted Pmtr	Bank Station Left	Bank Station Right	Hydrlic Depth	Critical Flow
	2	778439.90	3840.	~~606.1~~	609.77			~~6.336~~	54850.59
8.890		778439.90	3840.	~~606.1~~	609.77	250.0	607.0	~~6.336~~	54850.59
Velocity Head Correction Factor (alpha): 1.000									
	2	756358.80	3846.	635.5	639.17			6.052	53693.56
9.300		756358.80	3846.	635.5	639.17	250.0	607.0	6.052	53693.56
Velocity Head Correction Factor (alpha): 1.000									

y   Tw
10.76   357

```
************************* W S P R O ***************************
     Federal Highway Administration  -  U. S. Geological Survey
            Model for Water-Surface Profile Computations.
           Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
   BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
           FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL
```

*** Compute Cross-Section Properties For Header Record APPCH ***
SRD Location: 736.000 Header Record Number 5

Water Surface Elevation	SA #	Cross Section Conveyance	Cross Section Area(s)	Top Width	Wetted Pmtr	Bank Station Left	Bank Station Right	Hydrlic Depth	Critical Flow	Q
	1	133876.10	2587.	550.9	556.54			4.697	31819.95	1677.3
	2	1629309.00	4848.	357.0	360.56			13.579	101370.70	20413.2
	3	151367.80	3824.	1228.5	1229.38			3.113	38286.24	1896.5
9.323		1914553.00	11259.	2136.4	2146.49	-300.9	2496.1	5.270	80313.07	
		Velocity Head Correction Factor (alpha): 3.335								
	1	498495.60	5718.	552.0	562.33			10.358	104426.40	
	2	2916283.00	6875.	357.0	360.56			19.256	171181.00	
	3	774230.30	13419.	2450.0	2451.09			5.477	178199.20	
15.000		4189009.00	26011.	3359.0	3373.99	-302.0	3057.0	7.744	185757.50	
		Velocity Head Correction Factor (alpha): 4.889								

$$S = (Q/K)^2 = (20413.2/1629309)^2 = 0.00016$$

************************* W S P R O ***************************
Federal Highway Administration - U. S. Geological Survey
Model for Water-Surface Profile Computations.
Input Units: English / Output Units: English

BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
PINELLAS COUNTY, FL

*** Beginning Velocity Distribution For Header Record BRDG ***
SRD Location: 354.000 Header Record Number 3

Water Surface Elevation: 9.300 Element # 1
Flow: 25743.130 Velocity: 6.69 Hydraulic Depth: 10.774
Cross-Section Area: 3846.23 Conveyance: 756358.80
Bank Stations -> Left: 250.000 Right: 607.000

X STA.	250.0	2 297.4	319.4	3 338.2	355.8	4 370.3
A(I)		221.1	175.6	184.8	203.0	183.9
V(I)		5.82	7.33	6.96	6.34	7.00
D(I)		4.66	7.97	9.86	11.51	12.70

X STA.	370.3	383.9	5 396.8	408.7	420.1	6 428.5
A(I)		181.5	177.6	170.6	172.8	133.7
V(I)		7.09	7.25	7.54	7.45	9.63
D(I)		13.31	13.79	14.36	15.10	16.01

X STA.	428.5	440.9	451.8	463.1	475.2	7 487.7
A(I)		202.2	176.8	180.8	187.4	193.5
V(I)		6.37	7.28	7.12	6.87	6.65
D(I)		16.35	16.20	15.90	15.57	15.50

X STA.	487.7	500.3	8 514.4	530.3	9 549.1	10 607.0
A(I)		196.7	209.8	224.6	235.8	340.1
V(I)		6.54	6.14	5.73	5.46	3.78
D(I)		15.59	14.89	14.12	12.51	5.88

```
************************ W S P R O *************************
  Federal Highway Administration  -  U. S. Geological Survey
        Model for Water-Surface Profile Computations.
        Input Units: English  /  Output Units: English
*-----------------------------------------------------------*
  BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
         FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                      PINELLAS COUNTY, FL

 ***   Beginning Velocity Distribution For Header Record APPCH    ***
       SRD Location:    736.000       Header Record Number  5

    Water Surface Elevation:     12.223             Element # 1
    Flow:   34165.000   Velocity:  1.88  Hydraulic Depth:   5.889
    Cross-Section Area:  18141.55        Conveyance:  2970468.00
       Bank Stations ->  Left:   -301.445   Right:   2779.300

X STA.       -301.4      -23.6      247.7      282.9      311.0      337.1
  A( I )          2083.8     2078.5      470.1      416.1      405.6
  V( I )             .82        .82       3.63       4.11       4.21
  D( I )            7.50       7.66      13.36      14.79      15.55

X STA.        337.1      359.5      380.7      401.3      421.3      439.4
  A( I )           377.6      374.3      368.1      365.1      349.2
  V( I )            4.52       4.56       4.64       4.68       4.89
  D( I )           16.87      17.63      17.84      18.32      19.25

X STA.        439.4      457.7      476.5      494.6      513.4      533.6
  A( I )           353.2      360.1      350.4      359.5      372.3
  V( I )            4.84       4.74       4.88       4.75       4.59
  D( I )           19.36      19.13      19.35      19.15      18.40

X STA.        533.6      557.0      593.8      888.6     1993.2     2779.3
  A( I )           396.8      482.4     2116.1     2868.4     3194.1
  V( I )            4.31       3.54        .81        .60        .53
  D( I )           16.93      13.11       7.18       2.60       4.06

    Water Surface Elevation:     15.000             Element # 2
    Flow:   34165.000   Velocity:  1.31  Hydraulic Depth:   7.744
    Cross-Section Area:  26010.97        Conveyance:  4189009.00
       Bank Stations ->  Left:   -302.000   Right:   3057.000

X STA.       -302.0      -57.0      154.6      272.5      302.1      331.0
  A( I )          2493.3     2260.2     1324.7      512.8      523.1
  V( I )             .69        .76       1.29       3.33       3.27
  D( I )           10.18      10.68      11.24      17.33      18.06

X STA.        331.0      356.3      379.8      402.6      424.3      444.7
  A( I )           490.2      478.1      470.3      459.9      450.5
  V( I )            3.48       3.57       3.63       3.71       3.79
  D( I )           19.38      20.37      20.62      21.20      22.11

X STA.        444.7      465.4      486.0      507.0      528.6      553.2
  A( I )           456.3      453.3      463.6      462.7      493.6
  V( I )            3.74       3.77       3.68       3.69       3.46
  D( I )           22.06      21.92      22.16      21.39      20.08

X STA.        553.2      587.1      813.0     1301.8     2159.0     3057.0
  A( I )           578.6     2194.9     3319.7     4005.1     4119.9
  V( I )            2.95        .78        .51        .43        .41
  D( I )           17.05       9.72       6.79       4.67       4.59
```

```
   *************************  W S P R O  **************************
      Federal Highway Administration  -  U. S. Geological Survey
             Model for Water-Surface Profile Computations.
             Input Units: English  /  Output Units: English
   *-------------------------------------------------------------*
    BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
             FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                           PINELLAS COUNTY, FL

  ***     Compute Cross-Section Properties For Header Record BRDG     ***
           SRD Location:     354.000       Header Record Number  3

Water      S  Cross       Cross                     Bank Station
Surface    A  Section     Section  Top    Wetted   ------------  Hydrlic  Critical
Elevation  #  Conveyance  Area(s)  Width   Pmtr     Left  Right   Depth     Flow
---------  -- ----------  -------  ------ -------  ------ ------  -------  ---------
            2  756358.80    3846.  635.5  639.17                   6.052  53693.56
    9.300      756358.80    3846.  635.5  639.17   250.0  607.0    6.052  53693.56
           Velocity Head Correction Factor (alpha): 1.000
---------  -- ----------  -------  ------ -------  ------ ------  -------  ---------
```

Tw 357

Y 10.77

```
************************* W S P R O ***************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*-------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                         PINELLAS COUNTY, FL

  ***    Compute Cross-Section Properties For Header Record APPCH    ***
          SRD Location:     736.000       Header Record Number  5

Water     S  Cross       Cross                   Bank Station
Surface   A  Section     Section  Top    Wetted  ------------  Hydrlic  Critical
Elevation #  Conveyance  Area(s)  Width  Pmtr     Left  Right  Depth     Flow
--------- -- ---------- ------- ------ ------- ------ ------ ------- ---------
          1  297407.80    4186.  551.4  559.50               7.591  65438.87
          2 2249604.00    5883.  357.0  360.56              16.479 135520.30
          3  423455.90    8073. 1700.1 1701.11               4.748  99819.57
   12.223    2970468.00  18142. 2608.6 2621.17 -301.4 2779.3   6.955 133044.10
          Velocity Head Correction Factor (alpha): 4.164

          1  498495.60    5718.  552.0  562.33              10.358 104426.40
          2 2916283.00    6875.  357.0  360.56              19.256 171181.00
          3  774230.30   13419. 2450.0 2451.09               5.477 178199.20
   15.000    4189009.00  26011. 3359.0 3373.99 -302.0 3057.0   7.744 185757.50
          Velocity Head Correction Factor (alpha): 4.889
--------- -- ---------- ------- ------ ------- ------ ------ ------- ---------
```

Q
3420.7
25873.9
4870.4

$$S = (Q/K)^2 = (25873.9/2249604)^2 = 0.00013$$

```
************************ W S P R O **************************
   Federal Highway Administration  -  U. S. Geological Survey
          Model for Water-Surface Profile Computations.
         Input Units: English  /  Output Units: English
*------------------------------------------------------------*
 BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TARPON BAYOU
          FILE 154000.WSP / MSB / AYRES ASSOCIATES / 9/97
                        PINELLAS COUNTY, FL

    ***  Pier Scour Calculations for Header Record BRDG   ***

                 Constants and Input Variables

                     Pier Width:   1.500
         *-------------------------------------------*
           Pier Shape Factor             (K1):   1.10
           Flow Angle of Attack Factor   (K2):   1.00
           Bed Condition Factor          (K3):   1.10
           Bed Material Factor           (K4):   1.00
           Velocity Multiplier           (VM):   1.00
           Depth Multiplier              (YM):   1.00
         *-------------------------------------------*

    Scour   ---- Localized Hydraulic Properties ----    -- X-Stations --
 #  Depth     Flow       WSE    Depth  Velocity Froude #  Left      Right
-- ------ ---------- -------- ------ -------- -------- --------- ---------
 1  5.575  20576.560    8.911 16.311   8.912      .389   250.000   607.000
 2  5.782  25743.130    9.322 16.722   9.626      .415   250.000   607.000
-- ------ ---------- -------- ------ -------- -------- --------- ---------

ER

 ****************** Normal end of WSPRO execution. *****************
 ***************  Elapsed Time:   0 Minutes  1 Seconds  **************
```

ATTACHMENT C

SCOUR CALCULATIONS

CONTRACTION SCOUR COMPUTATIONS
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

The following computations are made using Laursen's Equation (Equation 15 in HEC-18):

$$V_c = 10.95 * Y_1^{1/6} * D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

APPROACH SECTION MAIN CHANNEL AREA (ft^2), A_1	=	4848
APPROACH SECTION MAIN CHANNEL WIDTH (ft), W_1	=	357
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	=	13.6
MEDIAN GRAIN SIZE (ft), D_{50}	=	0.000656
BED TRANSPORT CRITICAL VELOCITY (fps), V_c	=	1.47
DISCHARGE IN APPROACH CHANNEL (cfs), Q_1	=	20413
MEAN VELOCITY IN APPROACH CHANNEL (fps), V_m	=	4.21
MAIN CHANNEL SCOUR MODE	=	**LIVE-BED**

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

APPROACH SECTION MAIN CHANNEL AREA (ft^2), A_1	=	5883
APPROACH SECTION MAIN CHANNEL WIDTH (ft), W_1	=	357
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	=	16.5
MEDIAN GRAIN SIZE (ft), D_{50}	=	0.000656
BED TRANSPORT CRITICAL VELOCITY (fps), V_c	=	1.52
DISCHARGE IN APPROACH CHANNEL (cfs), Q_1	=	25874
MEAN VELOCITY IN APPROACH CHANNEL (fps), V_m	=	4.40
MAIN CHANNEL SCOUR MODE	=	**LIVE-BED**

Calc. By:	MSB	Date:	9/4/97
Check By:	Jul	Date:	9/8/97

100-YEAR
CONTRACTION SCOUR COMPUTATIONS
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

The following computations are made using the HEC-18 equation for
Live Bed Contraction Scour:

$$Y_s = Y_2 - Y_o$$

$$Y_2 = ((Q_2/Q_1)^{6/7}((W_1/W_2)^{\wedge k1}))^* Y_1$$

100-YEAR DISCHARGE
MAIN BRIDGE
LIVE-BED CONTRACTION SCOUR COMPUTATIONS

ENERGY SLOPE	=	0.00016
w FALL VELOCITY(m/s)	=	0.027
AVERAGE APPROACH SECTION CHANNEL DEPTH (FT), Y_1	=	13.6
V* SHEAR VELOCITY IN APPROACH SECTION(m/s)	=	0.08
V*/w	=	2.99
k_1 SEE PAGE 30 IN HEC-18	=	0.69
DISCHARGE IN APPROACH SECTION CHANNEL (CFS), Q_1	=	20413
DISCHARGE IN CONTRACTED SECTION (CFS), Q_2	=	20577
WIDTH OF APPROACH SECTION CHANNEL(FT), W_1	=	357
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (FT), (W_2-W_{piers})	=	333
COMPUTED WATER DEPTH OF CONTRACTED SECTION (FT), Y_2	=	14.4
AVERAGE CHANNEL DEPTH AT CONTRACTED SECTION (FT), Y_o	=	10.8
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION (FT), Y_s	=	**3.6**

Calc. By:	MSB	Date:	1/19/98
Check By:	[signature]	Date:	1-19-98

500-YEAR
CONTRACTION SCOUR COMPUTATIONS
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

The following computations are made using the HEC-18 equation for
Live Bed Contraction Scour:

$Y_s = Y_2 - Y_o$

$Y_2 = ((Q_2/Q_1)^{6/7}((W_1/W_2)^{\wedge k1}))*Y_1$

500-YEAR DISCHARGE
MAIN BRIDGE
LIVE-BED CONTRACTION SCOUR COMPUTATIONS

ENERGY SLOPE	=	0.00013
w FALL VELOCITY(m/s)	=	0.027
AVERAGE APPROACH SECTION CHANNEL DEPTH (FT), Y_1	=	16.5
V* SHEAR VELOCITY IN APPROACH SECTION(m/s)	=	0.08
V*/w	=	2.96
k_1 SEE PAGE 30 IN HEC-18	=	0.69
DISCHARGE IN APPROACH SECTION CHANNEL (CFS), Q_1	=	25874
DISCHARGE IN CONTRACTED SECTION (CFS), Q_2	=	25743.13
WIDTH OF APPROACH SECTION CHANNEL(FT), W_1	=	357
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (FT), (W_2-W_{piers})	=	333
COMPUTED WATER DEPTH OF CONTRACTED SECTION (FT), Y_2	=	17.2
AVERAGE CHANNEL DEPTH AT CONTRACTED SECTION (FT), Y_o	=	10.8
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION (FT), Y_s	=	**6.4**

Calc. By:	MSB	Date:	9/5/97
Check By:	Lws	Date:	9/8/97

100-YEAR
LOCAL PIER SCOUR COMPUTATIONS
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

The following calculations are made using Equation 22 in HEC-18 for Pier Scour:

$Y_s=(2*K_1*K_2*K_3*(Y_1/a)^{0.35}*Fr^{0.43})*a$

SCOUR ANALYSIS FOR Q_{100} - CASE 1 (WITHOUT DEBRIS)

HYDRAULIC VARIABLES USED IN CSU EQUATION

PIER/BENT NUMBER	BENT 2	BENT 3	BENT 4	BENT 5	BENT 6	BENT 7	BENT 8	BENT 9	BENT 10
PIER STATION (ft)	285	321	357	393	428.5	475.5	511	547	583
VELOCITY (fps), V_1	4.45	5.31	5.11	5.77	8.81	5.06	4.65	4.24	2.89
CHANNEL DEPTH (ft), Y_1	4.73	10.00	11.66	13.89	15.75	15.47	15.04	12.70	6.01
ATTACK ANGLE (degrees)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INDIVIDUAL PILE WIDTH (ft)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
PIER WIDTH (ft), a	1.50	1.50	1.50	1.50	1.50	12.50	1.50	1.50	1.50
PIER LENGTH (ft), L	1.50	1.50	1.50	1.50	1.50	12.50	1.50	1.50	1.50
SHAPE COEFFICIENT, K_1	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
ANGLE COEFFICIENT, K_2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BED COND. COEFFICIENT, K_3	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
FROUDE NUMBER, Fr	0.36	0.30	0.26	0.27	0.39	0.23	0.21	0.21	0.21
LOCAL SCOUR DEPTH (ft), Y_s	3.5	4.2	4.2	4.5	5.5	17.2	4.2	3.9	3.0

Calc. By:	MSB	Date:	9/5/97
Check By:	[illegible]	Date:	9/8/97

500-YEAR
LOCAL PIER SCOUR COMPUTATIONS
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

The following calculations are made using Equation 22 in HEC-18 for Pier Scour:

$Y_s = (2 * K_1 * K_2 * K_3 * (Y_1/a)^{0.35} * Fr^{0.43}) * a$

SCOUR ANALYSIS FOR Q_{100} - CASE 1 (WITHOUT DEBRIS)

HYDRAULIC VARIABLES USED IN CSU EQUATION

PIER/BENT NUMBER	BENT 2	BENT 3	BENT 4	BENT 5	BENT 6	BENT 7	BENT 8	BENT 9	BENT 10
PIER STATION (ft)	285	321	357	393	428.5	475.5	511.	547	583
VELOCITY (fps), V_1	5.82	6.96	7.00	7.25	9.63	6.65	6.14	5.46	3.78
CHANNEL DEPTH (ft), Y_1	4.66	9.86	12.70	13.79	16.01	15.50	14.89	12.51	5.88
ATTACK ANGLE (degrees)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INDIVIDUAL PILE WIDTH (ft)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
PIER WIDTH (ft), a	1.50	1.50	1.50	1.50	1.50	12.50	1.50	1.50	1.50
PIER LENGTH (ft), L	1.50	1.50	1.50	1.50	1.50	12.50	1.50	1.50	1.50
SHAPE COEFFICIENT, K_1	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
ANGLE COEFFICIENT, K_2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BED COND. COEFFICIENT, K_3	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
FROUDE NUMBER, Fr	0.48	0.39	0.35	0.34	0.42	0.30	0.28	0.27	0.27
LOCAL SCOUR DEPTH (ft), Y_s	3.9	4.7	4.9	5.0	5.7	19.4	4.7	4.4	3.4

Calc. By:	MSB	Date:	9/5/97
Check By:	Jne	Date:	9/8/97

100-YEAR SCOUR SUMMARY
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

Pier/Bent	Groundline Elevation (ft)	Maximum Pile Tip Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Degradation (ft)	Total Scour (ft)	Scour Elevation (ft)	Minumum Remaining Pile Embedment (ft)
1	1.5	UNKNOWN	--	--	0.0	--	1.5	UNKNOWN
2	-2.6	UNKNOWN	3.6	3.5	0.0	7.1	-9.7	UNKNOWN
3	-3.1	UNKNOWN	3.6	4.2	0.0	7.8	-10.9	UNKNOWN
4	-5.2	UNKNOWN	3.6	4.2	0.0	7.8	-13.0	UNKNOWN
5	-5.6	UNKNOWN	3.6	4.5	0.0	8.1	-13.7	UNKNOWN
6	-7.1	UNKNOWN	3.6	5.5	0.0	9.1	-16.2	UNKNOWN
7	-6.8	UNKNOWN	3.6	17.2	0.0	20.8	-27.6	UNKNOWN
8	-6.6	UNKNOWN	3.6	4.2	0.0	7.8	-14.4	UNKNOWN
9	-4.6	UNKNOWN	3.6	3.9	0.0	7.5	-12.1	UNKNOWN
10	-0.7	UNKNOWN	3.6	3.0	0.0	6.6	-7.3	UNKNOWN
11	4.5	UNKNOWN	--	--	0.0	--	4.5	UNKNOWN

Calc. By:	MSB	9/5/97
Check By:	FWZ	9/3/97

500-YEAR SCOUR SUMMARY
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

Pier/Bent	Groundline Elevation (ft)	Maximum Pile Tip Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Degradation (ft)	Total Scour (ft)	Scour Elevation (ft)	Minumum Remaining Pile Embedment (ft)
1	1.5	UNKNOWN	--	--	0.0	--	1.5	UNKNOWN
2	-2.6	UNKNOWN	6.4	3.9	0.0	10.3	-12.9	UNKNOWN
3	-3.1	UNKNOWN	6.4	4.7	0.0	11.1	-14.2	UNKNOWN
4	-5.2	UNKNOWN	6.4	4.9	0.0	11.3	-16.5	UNKNOWN
5	-5.6	UNKNOWN	6.4	5.0	0.0	11.4	-17.0	UNKNOWN
6	-7.1	UNKNOWN	6.4	5.7	0.0	12.1	-19.2	UNKNOWN
7	-6.8	UNKNOWN	6.4	19.4	0.0	25.8	-32.6	UNKNOWN
8	-6.6	UNKNOWN	6.4	4.7	0.0	11.1	-17.7	UNKNOWN
9	-4.6	UNKNOWN	6.4	4.4	0.0	10.8	-15.4	UNKNOWN
10	-0.7	UNKNOWN	6.4	3.4	0.0	9.8	-10.5	UNKNOWN
11	4.5	UNKNOWN	--	--	0.0	--	4.5	UNKNOWN

Calc. By:	MSB	9/5/97
Check By:	Jwr	9/3/97

4.3. PHASE 3 SCOUR EVALUATION REPORT (2006)

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT SEVEN
DISTRICTWIDE SCOUR EVALUATIONS
FPN NO. 400782-1-72-02
WPI NO. 7620014
STATE PROJECT NO. 99007-1828
JAMES JACOBSEN, P.E., PROJECT MANAGER

SCOUR EVALUATION REPORT

The Unknown Foundation studies Scope Says that any unknown foundation bridge that was not evaluated from the UF studies will become a scour critical bridge. Item 113 is a 3.

BRIDGE NUMBER:	***154000***
OWNER:	***PINELLAS COUNTY***
BRIDGE NAME:	***BECKETT BRIDGE***
LOCATION:	***RIVERSIDE DRIVE (SPRING BLVD.)*** ***0.1 MILE WEST OF CHESAPEAKE DRIVE***
COUNTY:	***PINELLAS***
SCOUR MODE:	***TIDAL***
	STABLE
RECOMMENDATION:	***A PHASE 4 SCOUR ASSESSMENT IS NOT REQUIRED BUT IS RECOMMENDED DUE TO BRIDGE BEING FUNCTIONALLY OBSOLETE & POSTED WITH A LOAD RATING.***

( ) Countermeasures

A Phase 4 Scour Assessment is not on file and does not appear to have been performed.

( ) Scour Monitor

(X) Inspection — The structure should be inspected at an increased frequency & following severe storm events & tidal surges.

(X) Other: — Determine pile tip elevations. Prepare a schedule for bridge replacement (may not apply if posted load rating limits are exceeded.)

RECOMMENDED ITEM 113 CODE: ~~5~~ 3

FOUNDATION STATUS: ( ) Known (X) Unknown

☐ **PHASE 1**	☐ **PHASE 2**	■ **PHASE 3**	☐ **PHASE 4**
QUALITATIVE EVALUATION / ASSESSMENT	HYDRAULIC / HYDROLOGIC ASSESSMENT	STRUCTURAL / GEOTECHNICAL ASSESSMENT	PLAN OF ACTION
DATE: 6-14-94	DATE: 3-16-00	DATE: 11-25-06	DATE:

PREPARED BY:	RCR
CHECKED BY:	SWJ
REVIEWED BY:	SWJ
QA/QC BY:	TJM

PITMAN ▼ HARTENSTEIN & ASSOC., INC.
ENGINEERS
(813) 988-1882 6989 E. Fowler Ave., Tampa, FL 33617
EB# 4464

PROJECT MANAGER:
THOMAS J. MONTGOMERY, P.E.

SIGNATURE — FL 35008 P.E. NUMBER

11/25/06

The assumptions in this study do not reflect the presence of the relict sinkhole. Scour can occur at the piles located within the limits of the sinkhole and thus the assumptions used in the stability analysis are not accurate. The loads used in the foundation stability analysis are based on the reduced load posting limit.

1.0 Summary of Findings

Bridge Number 154000 is a 10 span, 354' long, single leaf bascule structure that was constructed in 1924, rehabilitated in 1956, and repaired in 1995 as a crossing of Riverside Drive (CR 54) over Tarpon Bayou. It consists of a cast-in-place concrete deck on precast, prestressed concrete I-girders supported by cast-in-place concrete pile bent substructures. During the repairs made in 1995 a crutch bent consisting of 2 steel piles and a steel cap was added at Bent 7. The Phase 2 scour report identified Bent 7 as the critical bent.

A Phase 3 structural/geotechnical analysis has been performed using FB-PIER program to determine whether the bridge is "Scour Critical" or not at the critical bent based on a 100 yr. storm event. As a result of the Phase 3 analysis, the vulnerability rating has been determined to be "Stable for the calculated scour conditions with scour within the limits of the piles" because the bridge foundations exhibit very small deflections (1.5" or less) during the 100 yr. storm event. Note that this rating may not apply when the vehicular loading exceeds the posted load rating limits of 12 tons for a single unit truck with two axles (the bridge is classified "Functionally Obsolete" in the Load Rating report).

Since the pile driving records, the original 1924 design plans, and the 1956 rehab plans for Bridge Number 154000 are not available, the pile tip elevations for the concrete piles at the bents are **unknown**. Only the 1995 repair plans are available and they show very little information about the existing bridge. Therefore, the assumption has been made that the concrete piles are embedded at least 1 foot into the rock layer. As per the 2/10/05 geotechnical report by Nodarse & Associates, the top of the rock layer is at elevation -20.0 ft. and is also considered the top of the non-scourable material. At Bent 7 the pile tips are assumed to be at elevation -21.0 ft.

The geotechnical report shows that the top layer of soil consists of "very loose to medium dense fine sand, slightly silty fine sand, and clayey fine sand" to approximate elevation -13.0 ft. This top layer is followed by "firm clay" and "very hard limestone" down to elevations ranging from -13 ft. to -22 ft. (the termination points of the borings). Based on the information provided by Nodarse and Associates, the approximate top of the non-scourable material is at elevation -20.0 ft. at Bent 7. Therefore, the predicted 100 yr. scour elevation of -27.60 ft. at Bent 7 (see Phase 3 Scour Analysis in Attachment C) may not be reached.

The Phase 2 Scour Report listed Bent 7 as the critical bent. The Phase 3 Scour Analysis in Attachment C of this report was not able to confirm this conclusion since the original 1924 design plans and pile driving records were not available. Also, the 7/27/04 Inspection Report did not include any bridge soundings to verify the location of the existing ground line. Therefore, Bent 7 was analyzed using the Florida Pier program for this Phase 3 Scour Report based on the recommendation made in the Phase 2 report. Using the pile tip elevation stated above means that the piles only have 1.0 foot of embedment into the hard limestone layer during the 100 yr. scour conditions but the structure does not become unstable providing that the vehicular loading does not exceed the posted load rating limits. When the scour reaches the top of the non-scourable material the lateral deflections at the tops of the piles are about 1.5" max. Note that the demand-to-capacity ratios of the pile bent structure are impossible to estimate because the dimensions and reinforcing details of the existing bridge are not shown in the 1995 repair plans and the original 1924 design plans are not available. Therefore, the flexural stresses in the bent under scour conditions are unknown.

In summary, the Phase 3 Scour Analysis reveals that the predicted 100 yr. scour elevation of -27.60 ft. for Bent 7 may not be achieved due to the presence of non-scourable material at elevation -20.0. The structure remains "Stable for the calculated scour conditions with scour within the limits of the piles" because the bridge foundations exhibit very small deflections (1.5" or less) during the 100 yr. storm event. Note that this scour rating may not apply when the vehicular loading exceeds the posted load rating limits of 12 tons for a single unit truck with two axles (the bridge is classified as "Functionally Obsolete" in the Load Rating report).

The following is a summary of data assembled for Bent 7:

Bent 7 (Elevations shown are NGVD)

Storm Event (yr.)	Avg. Flow Velocity (fps)	Water Elevation (ft)	**Assumed Avg. Pile Tip Elev. (ft)	Predicted Scour Elev. (ft)	*Top of non scourable material (ft)	***Assumed Avg. Remaining Embedment (ft)	Critical Scour Elev. (ft)****
100	5.4	+8.8	-21.0	-27.60	-20.0	1.0	N/A

*Based on Nodarse's geotechnical report (Attached).
**Pile tip elevations are unknown since the original 1924 design plans, the 1956 rehab plans, and the pile driving records for the concrete piles are not available. Only the 1995 repair plans are available and they show very little information about the existing bridge. The assumption is made that the piles are embedded at least 1 foot into the rock layer.
*** Note that this embedment is assumed since the actual pile tip elevations are unknown. The avg. ground elev. at Bent 7 is -6.8 ft. NGVD.
**** The bridge is "Stable" under 100 year scour conditions providing that the load rating postings are not exceeded.

2.0 Bridge History and Specifications

- The bridge was originally constructed in 1924, rehabilitated in 1956, and repaired in 1995.
- Original design specs are not shown. Original design plans are N/A but are most likely "The Florida Department of Transportation Standard Specifications for Road and Bridge Construction" & "AASHTO Standard Specifications for Highway Bridges".
- The design load is not shown in the original design plans that are available but the 1995 repair plans state that it is an H-20 truck. Note that the bridge is load rated, classified as "Functionally Obsolete", and posted for reduced allowable axle loads.
- The design load for the 14" square concrete piles is **unknown** as are the reinforcing details of the piles because the original 1924 design plans are not available.

3.0 Recommendations

A Phase 4 scour assessment is not required due to the Scour Vulnerability Rating of "Stable" with the recommended Item 113 coding of 5, where the structure is stable for the calculated scour conditions and the scour is within the limits of the piles. However, this scour rating may not apply if the vehicular loading exceeds the posted load rating limits of 12 tons for a single unit truck with two axles (the bridge is classified as "Functionally Obsolete" in the Load Rating report). The bridge could become unstable under heavier loads so a Phase 4 scour assessment is recommended but only if the original 1924 design plans can be obtained.

Interim Plan of Action:

Stability analysis does not consider longitudinal braking forces.

3.0 Recommendations (continued)

a. Find the original 1924 design plans as well as the 1956 rehab plans.

b. The structure should be inspected on an increased frequency not exceeding a 12 month interval and following severe storm events. Conduct underwater inspections for foundations that may not be visually inspected from the surface.

c. Prepare a schedule for bridge replacement.

4.0 Basis For Evaluation

The superstructure for this bridge consists of a cast-in-place concrete deck on precast, prestressed concrete I-girders supported by cast-in-place concrete pile bent substructures using 14" square concrete piles. The piles are assumed to be prestressed. During the repairs made in 1995 a crutch bent consisting of 2 steel piles and a steel cap was added at Bent 7.

Nodarse and Associates, Inc. performed two Standard Penetration Test (SPT) borings for this project on the north side of the east abutment and on the south side of the west abutment. These borings were performed to a depths ranging from -15.5 to -20 ft. NGVD. The geotechnical report prepared by Nodarse shows that the top layer of soil consists of "very loose to medium dense fine sand, slightly silty fine sand, and clayey fine sand" to approximate elevation -13.0 ft. This top layer is followed by "firm clay" and "very hard limestone" down to elevations ranging from -13 feet to -22 ft. (the termination points of the borings). As described in Section 1.0 of this report, the location of the nonscourable material at Bent 7 (the critical bent) is at elevation -20.0 ft. Therefore, the predicted 100 year scour elevation of -27.60 ft. at Bent 7 (see Phase 3 Scour Analysis in Attachment C) may not be reached.

Evaluation of this structure was based upon AASHTO Load Factor Group I loads with ß=1.0 and gamma=1.0. The critical scour elevation will be based on three criteria. The first criterion is based on axial capacity where the critical scour elevation is defined as the soil elevation at which the structure becomes unstable or exhibits excessive deflections due to the axial loads only. The second criterion is based on lateral capacity where the critical scour elevation is defined as the soil elevation at which the structure becomes unstable or exhibits excessive deflections due to the axial and lateral loads combined. The third criterion is based on buckling where the critical scour elevation is manually calculated from the maximum unsupported length of pile that can resist the maximum axial load on the pile.

The total axial load on a pile was found by calculating the total dead load on the bent and dividing that load equally among all piles in the bent and adding the maximum live load calculated for the pile. The maximum live load was calculated from the larger of the H-20 truck load and the standard H-20 lane load (both loads were reduced to compensate for the posted load rating of 12 tons for a single unit truck with 2 axles). The total calculated axial load is 17.54 tons per pile at Bent 7. The design load of the piles is unknown since the original 1924 design plans are not available.

Lateral loads were also calculated based on AASHTO Load Factor Group I which includes centrifugal force and stream pressure. The total lateral load from the stream flow was found to be 0.203 kips per pile applied at the tops of the piles.

The critical bent for this structure was analyzed using the FB-Pier program (multi-pier version) developed by the Bridge Software Institute at the University of Florida in Gainesville. FB-Pier is a nonlinear finite element analysis program designed for analyzing bridge pier structures. FB-Pier allows for geometric (P-Δ and P-y) as well as material nonlinearity. A model is composed of nonlinear pier columns and cap supported on a linear pile cap and nonlinear piles/shafts with nonlinear soil. This analysis program couples nonlinear structural finite element analysis with nonlinear static soil models for axial, lateral and torsional soil behavior to provide a robust system of analysis for coupled bridge pier structures and foundation systems. FB-Pier performs the generation of the finite element model internally given the geometric definition of the structure and foundation system as input graphically by the designer. This allows the engineer to work directly with the design parameters and lessens the bookkeeping necessary to create and interpret a model. The preceding description of the FB-Pier program and its capabilities was taken from BSI's web site.

The axial and lateral capacity analyses were performed using the FB-PIER program by modeling Bent 7 as a pile bent using the pile tip elevations assumed as described in Section 1.0 of this report. The loads were applied as described above and the ground line was then iteratively reduced to see if a new Critical Scour Elevation would be reached. When the soil was reduced to the top of the non-scourable rock layer the structure remained stable and the lateral deflections at the tops of the piles were about 1.5" max. However, the loads applied were reduced to account for the load-rated status of the structure and if full HS20-44 live loads were applied the structure may become unstable at a critical scour elevation higher than -20.0 feet NGVD.

For Bent 7, a pile was also considered as a reinforced concrete column subjected to dead+live+impact loads. The critical buckling length was manually calculated using the Euler formula for buckling and using a method obtained from the ASCE Journal for calculating the equivalent length of a pile in soil to the point of fixity (where pile is assumed to be fixed at the bottom and fixed at the top but free to translate). Therefore, the pile was considered to be semi-fixed and a "k" value of 1.0 was used to determine the effective unbraced length. The critical scour elevation based on buckling criteria has been determined to be -17.8 ft., which is only 2.2 ft. above the predicted scour elevation of -20.0 ft. so it is assumed that the presence of the crutch bent will keep buckling from controlling. Therefore, a new critical scour elevation will not be established before the scour reaches the top of the non-scourable material at elevation -20.0.

Therefore, the bridge is classified as "Stable" since during a 100 year storm event the scour is within the limits of the piles and the structure does not become unstable as determined by the FB-PIER program.

5.0 MATERIALS AND DOCUMENTATION

The following data was used in this evaluation:

- Phase 2 Scour Evaluation Report dated 12-08-97.
- 1995 Bridge Repair Design Plans.
- "Standard Specifications for Highway Bridges", American Association of State Highway and Transportation Officials, 17th Edition, 2002, with Interims through 2003.
- Phase 3 Geotechnical Evaluation report and soil borings by Nodarse and Associates, Inc., dated 02-10-05.
- Bridge Inspection Report dated 07-27-04.

SC(EVALUATION - FIELD / OFFICE REVIE REPORT

Bridge No.: *154000*	County: *PINELLAS*	Route: *RIVERSIDE DRIVE (SPRING BLVD.)*	Over: *TARPON BAYOU*

1. SCOUR VULNERABILITY RATING (PER FHWA)

A.	Scour Critical	( ) Yes	(X) No	(May not apply if posted load rating limits are exceeded.)
	Scour Susceptible	( ) High	( ) Medium	( ) Low
	Low Risk	( ) High	( ) Medium	( ) Low
B.	Foundation	( ) Known	(X) Unknown	(Pile Tips Unknown).
C.	Method of Analysis:	( ) Simplified	(X) Complex	

D. Reasons for Phase 3 Rating:(in addition to Phase 1 and Phase 2 responses)

- Pile tip elevations are unknown due to lack of pile driving records.
- Original structure (1924) and rehab (1956) have no plans available so structural dimensions & reinforcing details are unknown.
- Structure has a history of settlement problems.
- Structure has been classified as "Functionally Obsolete" & posted with a reduced load capacity as a result of load rating report.
- Structure may become unstable if posted load rating limits are exceeded during a 100-year scour event.

2. RECOMMENDATIONS (See Preceding Narrative)

Phase 4 assessment is NOT required but recommended. (See Section D above).

A. Recommended Course of Action:

( ) Countermeasures

( ) Scour Monitor

(X) Inspection — *The structure should be inspected at an increased frequency & following severe storm events & tidal surges.*

(X) Other — *Determine pile tip elevations. Prepare a schedule for bridge replacement (may not apply if posted load rating limits are exceeded.)*

B. Phase 4 Analysis: ( ) Recommended (X) Not Recommended at this time

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

3. SUMMARY OF RESULTS

A. Scourability of Bed Material

1.) Type of Bed Material

(X) Sand	( ) Sandy Loam
(X) Clay	( ) Sandy Clay Loam
( ) Muck	( ) Clayey Fine Sand
( ) Shell	( ) Marl
( ) Coated with Organic Matter	(X) Limestone
( ) Other	

2.) Material Scourable to Predicted Depth ( ) Yes (X) No

3.) Notes: *Top of non-scourable material at EL. -20.0 feet NGVD.*

B. Load Capacity Bent No. (7)

1.) Axial Load Capacity Analysis

a. AASHTO Group 1 Axial Load (Per Pile) (17.5) tons (156) kN

b. Ultimate Axial Capacity (N/A) tons (N/A) kN

c. Method of Analysis: FB-PIER

d. Notes: *only applied a reduced LL due to posted load rating.*

2.) Lateral Load Capacity Analysis

a. AASHTO Group 1 Lateral Load (0.1) tons (0.90) kN

b. Pile Head Deflection (Fixed round) (N/A) inches (N/A) mm

c. Method of Analysis: FB-PIER

d. Notes:

C. Critical Buckling Length (Does not control due to presence of crutch bent)

1.) Type of Foundation

a. (X) Pile Bent ( ) Column ( ) Concrete Wall ( ) Spread Footing

b. Size: *14" SQ. CONCRETE PILES (ASSUMED PRESTRESSED)*

2.) Critical Buckling Length: (N/A) feet (N/A) meters

3.) Unbraced Length at 100-yr. Scour Depth (N/A) feet (N/A) meters

4.) Notes: *BUCKLING DOES NOT CONTROL DUE TO PRESENCE OF CRUTCH BENT*

D. Critical Scour Depth (Not confirmed by soundings)

1.) Existing Channel Bed Elevation *ASSUMED AVERAGE* (-6.80) Ft NGVD

2.) Predicted 100-Year Scour Elevation (-27.60) Ft NGVD

3.) Predicted 500-Year Scour Elevation (-32.6) Ft NGVD

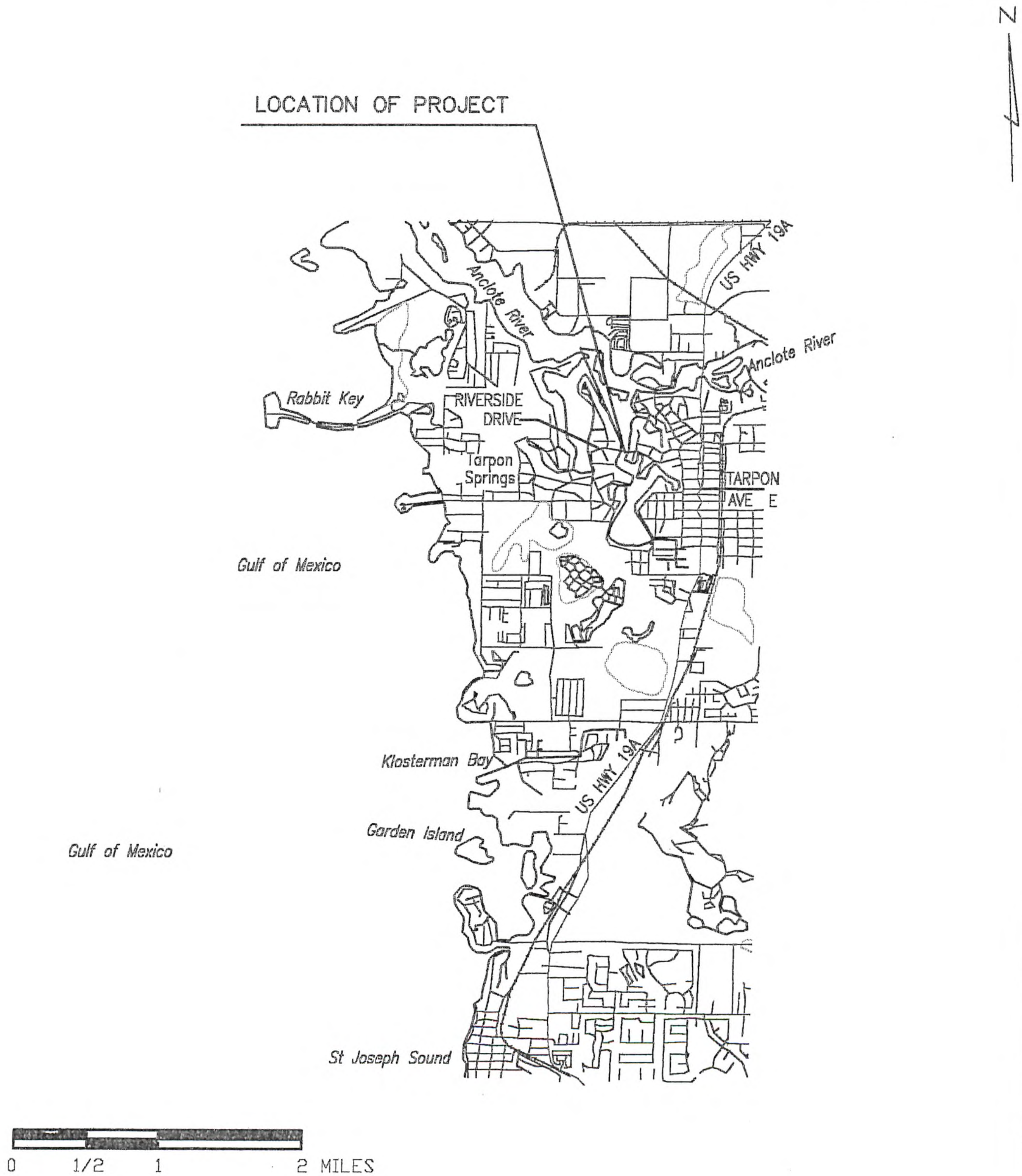
4.) Critical Scour Depth Elevation (N/A) Ft NGVD

5.) Notes: Non-scourable material is at EL. -20.0 feet NGVD.

Not accurate within limits of relict sinkhole.

Lateral loads do not consider longitudinal braking forces.

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000



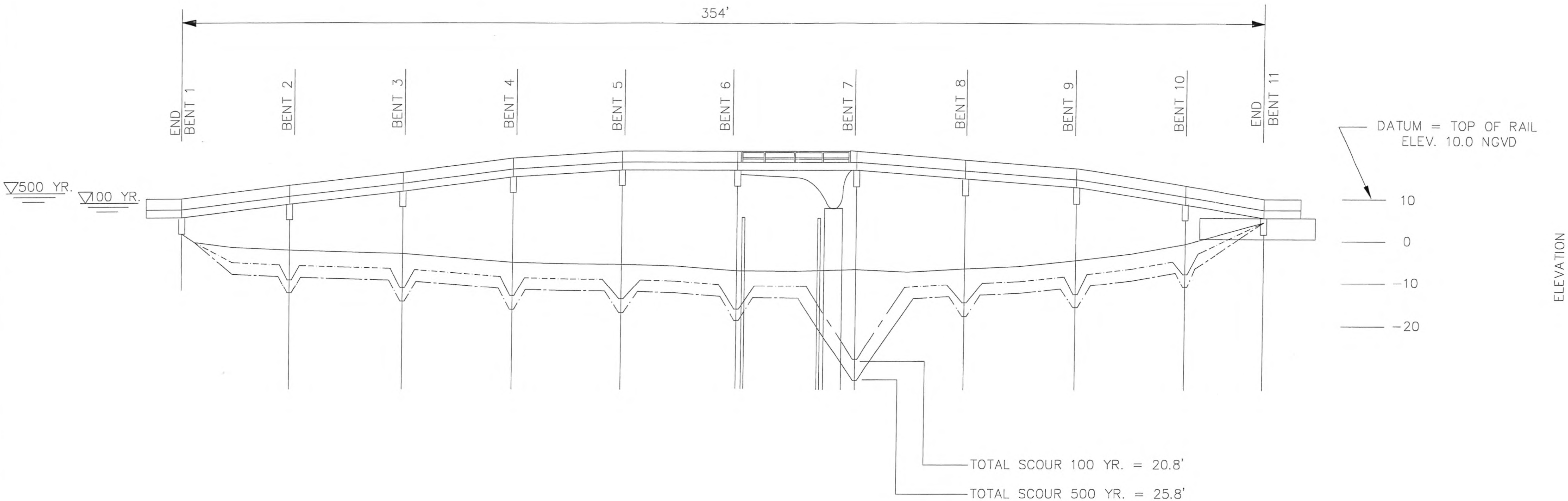
PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. – DISTRICT VII DISTRICT – WIDE BRIDGE SCOUR EVALUATION	LOCATION MAP	
JOB NO. 9304-1X	REVISED	DATE OCT. 30, 1997	FIGURE 1

STATE PROJ. NO.
99007-1828
BRIDGE NO. 154000

STRATA DATA

SOIL BORING INFORMATION NOT AVAILABLE.

N



SCOUR PROFILE

TOP OF NON-SCOURABLE MATERIAL AT EL. -20.2'

ASSUMED AVERAGE GROUND EL. -6.80'

LEGEND

PIER SCOUR (100 YR)
PIER SCOUR (500 YR)
CONTRACTION SCOUR (100 YR)
CONTRACTION SCOUR (500 YR)
EXISTING BED FROM SURVEY

NOTES:

1. BRIDGE PLAN AND PROFILE IS SCHEMATIC BASED UPON SITE MEASUREMENTS, PHOTOGRAPHS AND INSPECTION REPORTS, AND IS APPROXIMATE.
2. CHANNEL CROSS-SECTION TAKEN FROM LEFT SIDE OF BRIDGE.
3. DRAWING NOT TO SCALE.

PITMAN • HARTENSTEIN & ASSOC., INC. ENGINEERS	F.D.O.T. - DISTRICT VII DISTRICT - WIDE BRIDGE SCOUR EVALUATION	SCOUR PROFILE	
JOB NO. 9304-153	REVISED	DATE MAR. 30, 2006	FIGURE 2

ATTACHMENTS
Bridge No.: 154000

A - STRUCTURAL CALCULATIONS
- Load Rating Data from 9/01/2004 Inspection Report
- Pile Load Calculations
- Florida Pier Run

B - GEOTECHNICAL REPORT

- Geotechnical Report by Nodarse & Associates, Inc.

C - SCOUR SUMMARY

- Phase 3 Scour Analysis for 100 year storm
- Bridge #154000, Existing Elevations & Dimensions
- Phase 2 Scour Summary for 100 year storm
- Phase 2 Scour Summary for 500 year storm

ATTACHMENT A

STRUCTURAL CALCULATIONS

(Bridge No. 154000)

Nov. 25, 2006

Prepared by: RCR

Checked by: SWJ

QA/QC by: TJM

Pitman-Hartenstein & Assoc., Inc., Engineers
7820 Arlington Expwy, Suite 640
Jacksonville, Florida 32211

Rodrigo C. Rodriguez, P.E.	Nov. 25, 2006	FL 48874
Engineer of Record	Date	P.E. Number

Bridge was originally designed for H20 loading.

From the 7-27-04 Inspection Report

Structure ID: 154000

Structure Identification

Admin Area Pinellas County
District (2) D7 - Tampa
County (3) (15)Pinellas
Place Code (4) Tarpon Springs
Location (9) 0.4 MI W/O GRAND BLVD
Border Br St/Reg (98) Not Applicable (P) Share 0 %
Border Struct No (99)
FIPS State/Region (1) 12 Florida Region 4-Atlanta
NBIS Bridge Len (112) Meets NBI Length
Parallel Structure (101) No || bridge exists
Temp. Structure (103) Not Applicable (P)
Maint. Resp. (21) County Hwy Agency
Owner (22) County Hwy Agency
Historic Signif. (37) 3 Possibly eligible for

Geometrics

Spans in Main Unit (45) 1
Approach Spans (46) 9
Length of Max Span (48) 40 ft
Structure Length (49) 358.9 ft
Deck Area 10050 sqft
Structure Flared (35) 0 No flare

Age and Service

Year Built (27) 1924
Year Reconstructed (106) 1996
Type of Service On (42a) 5 Highway-pedestrian
Under (42b) 5 Waterway
Fracture Critical Details 1 or 2 Stl-girder systms

Structure Type and Material

Curb/Sidewalk (50): Left 2.9 ft Right 2.9 ft
Bridge Median (33): 0 No median
Main Span Material (43A): 3 Steel
Appr Span Material (44A): 5 Prestressed Concrete
Main Span Design (43B): 16 Movable-Bascule
Appr Span Design (44B): 02 Stringer/Girder

Deck Type and Material

Deck Width (52): 28 ft
Skew (34): 0 deg
Deck Type (107): 1 Concrete-Cast-in-Place
Surface (108): 0 None
Membrane: 0 None
Deck Protection: None

3 Appraisal

Structure Appraisal

Open/Posted/Closed (41) P Posted for load
Deck Geometry (68) 2 Intolerable - Replace
Underclearances (69) N Not applicable (NBI)
Approach Alignment (72) 8-No Speed Red thru Curv
Bridge Railings (36a) 0 Substandard
Transitions (36b) 0 Substandard
Approach Guardrail (36c) 0 Substandard
Approach Guardrail ends (36d) 0 Substandard
Scour Critical (113) U Unknown Scour

Navigation Data

Navigation Control (38) Permit Required
Nav Vertical Clr (39) 5.9 ft
Nav Horizontal Clr (40) 24.9 ft
Min Vert Lift Clr (116) 0 ft
Pier Protection (111) 4 In-Place, Re-Evaluate

NBI Condition Rating

Sufficiency Rating 44.9
Structural Eval (67) 3 Intolerable - Correct
Deficiency Functionally Obsolete

Minimum Vertical Clearance

Over Structure (53) 99.99 ft
Under (reference) (54a) N Feature not hwy or RR
Under (54b) 0 ft

Minimum Lateral Underclearance

Reference (55a) N Feature not hwy or RR
Right Side (55b) 0 ft
Left Side (56) 0 ft

Load Rating

Design Load (31) 0 Other or Unknown
Rating Date 1/12/1987 Initials TAL
Posting (70) 0 >39.9% below

Operating Type (63) 2 AS Allowable Stress
Operating rating (64) 24.3 tons Alternate -1
Inventory Type (65) 2 AS Allowable Stress
Inventory Rating (66) 17.5 tons Alternate -1
Alt Meth -1

Structure ID: 154000

6 Schedule

Current Inspection

Inspection Date: 07/27/2004
Inspector: KN738BM-P - Bruce Miller
Bridge Group: BD520
Primary Type: Special - Movable
Review Required: ☑

Next Inspection Date **Scheduled**

NBI: 7/31/2005
Element: 07/31/2005
Fracture Critical: 07/31/2005
Underwater: 07/31/2005
Other/Special: 07/31/2005

Inspection Types Performed NBI ☐ Element ☑ Fracture Critical ☑ Underwater ☐ Other Special ☑

Inspection Intervals	Required (92)	Frequency (92)	Last Date (93)
Fracture Critical	☑	12 mos	07/27/2004
Underwater	☑	24 mos	07/11/2003
Other Special	☑	12 mos	07/27/2004
NBI		24 mos (91)	07/31/2003 (90)

Inspection Resources

Crew Hours 48
Flagger Hours 0
Helper Hours 0
Snooper Hours 0
Special Crew Hours 6
Special Equip Hours 0

5 Custom

General Bridge Information

Parallel Bridge Seq
Channel Depth 6.9 ft
Radio Frequency -1
Phone Number (727) 464-8900
Exception Date
Exception Type Unknown
Accepted By Maint 01/01/1924

H-20, 40k GVW
8k 32k
14'

C-3, 56k GVW
12k 22k 22k
10' 20'

Bridge Rail 1 Concrete post & beam
Bridge Rail 2 Other
Electrical Devices Combination values 1-7
Culvert Type Not applicable
Maintenance Yard 0
FIHS ON / OFF No Routes on FIHS
Previous Structure

Bridge Load Rating Information

HS20 Govr. Span Length 13.5 ft
L-Rating Origination Field Measurements
Load Rating Date 01/12/1987
Method Calculation AASHTO formula
Load Dist. Factor 1
Impact Factor 30
Design Method Unknown
Design Measure English
Recommend SU Posting 12 tons 24k GVW
Recommend C Posting 20 tons 40k GVW
Recommend T Posting 99 tons
Gov FB Span ft
Gov FB Spacing ft
FB HS20 Rating 24.3 tons

Single Unit Truck 2 Axles 12 tons 24k GVW
Single Unit Truck 3 Axles 19 tons
Single Unit Truck 4 Axles 18
Combination Unit Truck 3 Axles 20 tons
Combination Unit Truck 4 Axles 21
Combination Unit Truck 5 Axles 23 tons
Truck Trailer 5 Axles 0 tons
Posting Weight 99 tons
Actual SU Posting 12 tons
Actual C Posting 20 tons
Actual T Posting 99 tons
FB SU4 Rating 18.9 tons
FB Present Y

Bridge Scour and Storm Information

Pile Driving Record Unknown
Foundation Type No foundation details
Mode of Flow Tidal
Rating Scour Eval Scour Susceptible - High
Highest Scour Eval Phase II completed

Scour Recommended I Perform Phase III
Scour Recommended II Perform countermeasures
Scour Recommended III No recommendation
Scour Elevation -27.999
Action Elevation -27.999
Storm Frequency 100

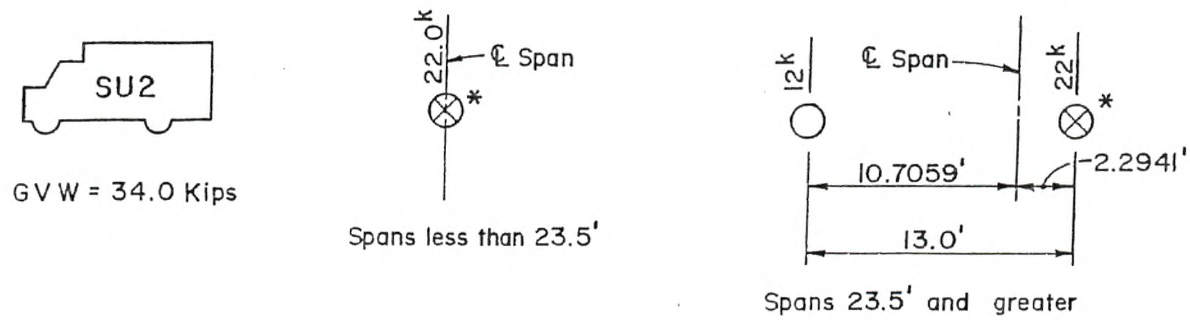
1 Condition

NBI Rating

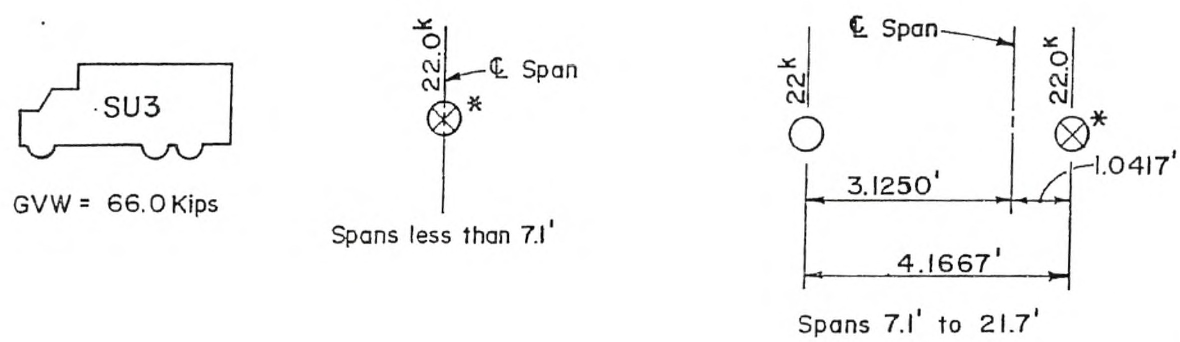
Channel (61) 7 Minor Damage
Deck (58) 7 Good
Superstructure (59) 6 Satisfactory
Substructure (60) 6 Satisfactory

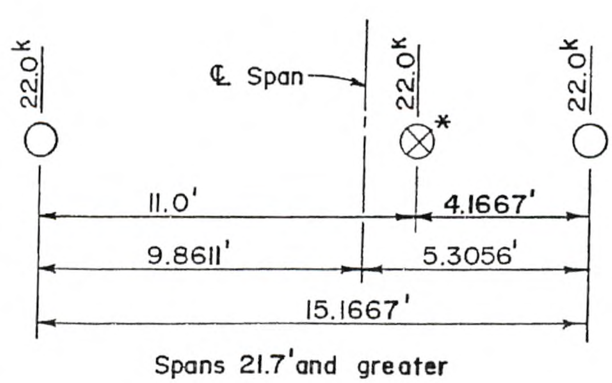
Culvert (62) N N/A (NBI)
Waterway (71) 8 Equal Desirable
Unrepaired Spalls -1 sq.ft.
Review Required ☑

SINGLE UNIT - 2 AXLE (SU 2)



SINGLE UNIT - 3 AXLE (SU 3)

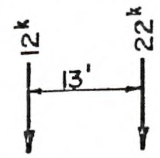




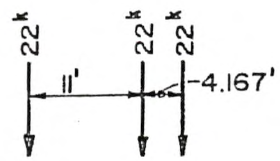
*Denotes the axle under which maximum bending moment occurs.

MAXIMUM FLORIDA LEGAL LOAD CASES AND AASHTO DESIGN LOAD CASES AND THEIR PLACEMENTS ON VARIOUS SIMPLE SPANS TO YIELD MAXIMUM MOMENT

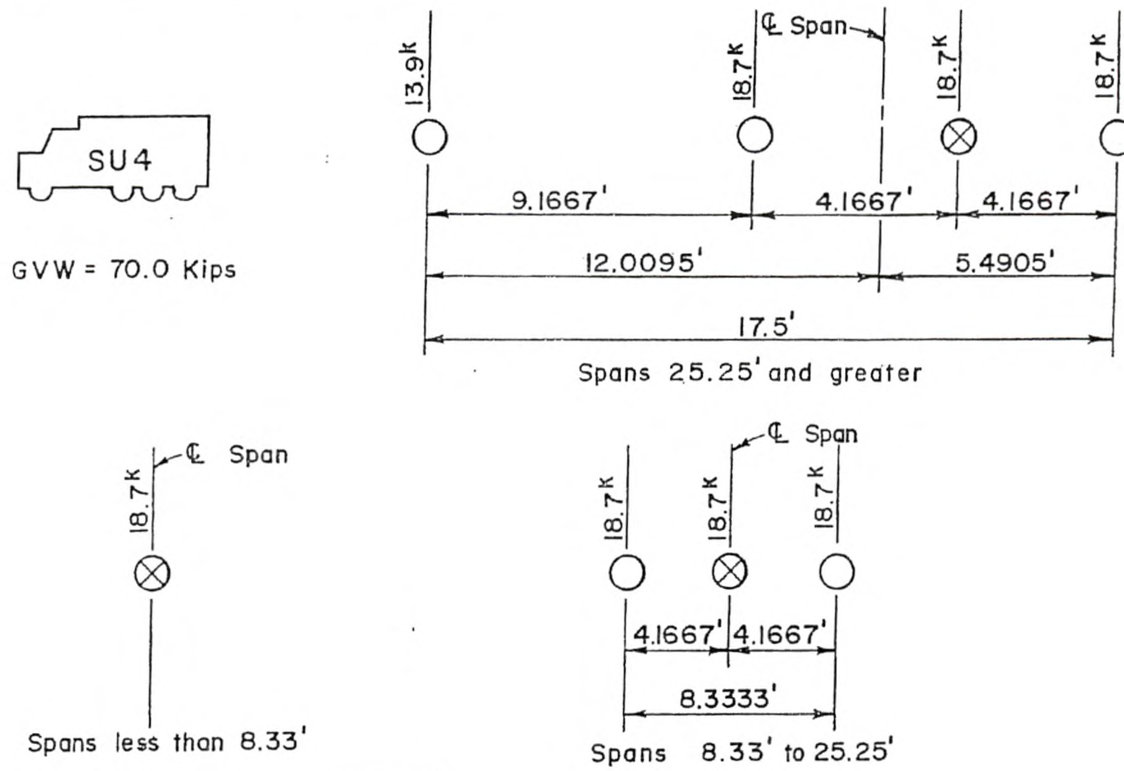
SU2 LOAD CASE:



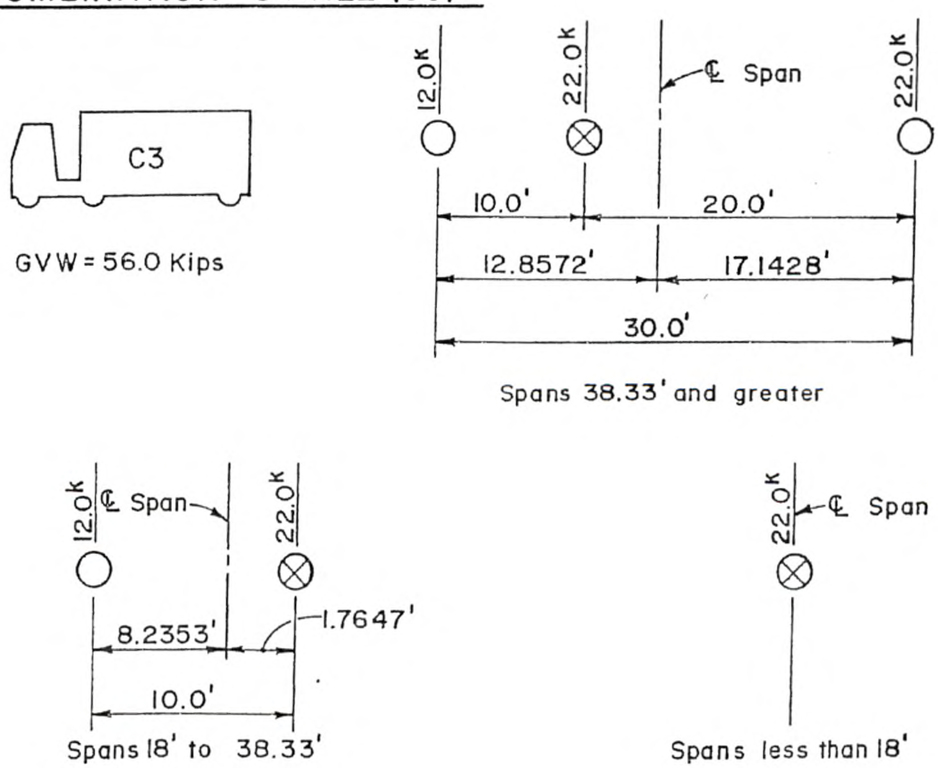
SU3 LOAD CASE:



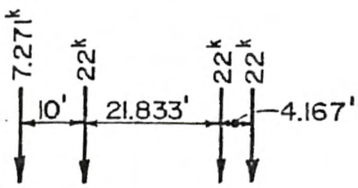
SINGLE UNIT - 4 AXLE (SU4)



COMBINATION - 3 AXLE (C3)

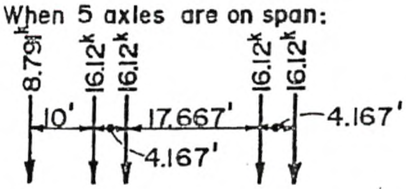


C4 LOAD CASE:



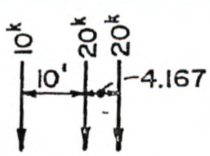
C5 LOAD CASE:

When 5 axles are on span:



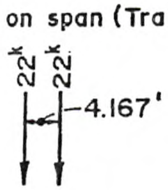
GVW = 73.271 Kips

When 3 axles are on span(Tractor axles only on span):



GVW = 80.0 Kips

When 2 axles are on span (Trailer axles only on span):



GVW = 80.0 Kips

Phase 3 Scour Analysis

Bent 7

Units Definition: $kip \equiv 1000 \cdot lbf$ $ksi \equiv \frac{kip}{in^2}$ $kcf \equiv \frac{kip}{ft^3}$ $ksf \equiv \frac{kip}{ft^2}$ $klf \equiv \frac{kip}{ft}$ $fps \equiv \frac{ft}{sec}$ $lane \equiv 1$ $beam \equiv 1$ $pile \equiv 1$ $°F \equiv 1$

$ton \equiv 2000 \cdot lbf$

" * " Assumed dimension or elevation since original 1924 design plans, 1956 rehab plans, & pile driving records for concrete piles not available.

Span Length Ahead: $L_{span\_a} := \mathbf{0.00} \cdot ft$

Span Length Back: $L_{span\_b} := \mathbf{41.9167} \cdot ft$

Average Span length: $L_{span} := \frac{L_{span\_a} + L_{span\_b}}{2}$

Number of Lanes: $N_{lane} := \mathbf{2} \cdot lane$

Reduction for Lanes: $R_l := \mathbf{1.0}$

*Avg. Pile Tip Elevation: $Tip := \mathbf{-21.0} \cdot ft$

Water Elevation: (100 yr. Storm) $WE := \mathbf{8.8} \cdot ft$ (Phase II Report)

*Area of Beam: $A_b := \mathbf{276} \cdot in^2$

*Height of Beam: $H_b := \mathbf{2.5833} \cdot ft$

*Slab Width: $W_{slab} := \mathbf{28} \cdot ft + \mathbf{0.5} \cdot in$

*Width of End Diaphragms: $W_{enddia} := \mathbf{8} \cdot in$

*Width of Interior Diaphragms: $W_{intdia} := \mathbf{0} \cdot in$

*Average Gound Elevation $Grnd_{elev} := \mathbf{-6.80} \cdot ft$

*Slab Thickness: $T_{slab} := \mathbf{7.0} \cdot in$

Concrete Weight: $w_c := \mathbf{.150} \cdot kcf$

Weight of Water: $w_w := \mathbf{.0624} \cdot kcf$

Pile Width: $W_{pile} := \mathbf{14} \cdot in$

Avg. Skew Angle: $\theta_{skew} := \mathbf{0.0} \cdot deg$

Number of Piles: $N_{pile} := \mathbf{7} \cdot pile$ <<=Includes crutch bent piles from rehab.

*Width of Bent Cap: $W_{bentcap} := \mathbf{2.0} \cdot ft$

*Depth of Pier Cap: $D_{cap} := \mathbf{2.0} \cdot ft$

*Elevation of Bottom of Bent Cap: $Elev_{cap} := \mathbf{8.184} \cdot ft$

Beam Spacing: $S_b := \mathbf{6} \cdot ft + \mathbf{0.0} \cdot in$

Number of Beams: $N_b := \mathbf{5} \cdot beam$

*Width of top flange: $w_{tf} := \mathbf{1.0} \cdot ft$

*Width of Bot. flange: $w_{bf} := \mathbf{1.333} \cdot ft$

*Depth of Bottom flange: $D_{bf} := \mathbf{6} \cdot in$

Axial Pile Loads

Dead Load - Superstructure:

Number of Beams in Span: $K := N_b$ (10 Maximum) (AASHTO Load Factor Group I - $\gamma = 1.0$, $\beta = 1.0$)

Parapet Posts: (Ea. Side) $p_{posts} := w_c \cdot 8 \cdot (\mathbf{0.875} \cdot ft \cdot \mathbf{2.9167} \cdot ft \cdot \mathbf{1.1667} \cdot ft)$ $p_{posts} = 3.573\,kip$

Parapet Handrail Length: (Ea. Side) $P_{handrail} := w_c \cdot \mathbf{0.75} \cdot ft \cdot \mathbf{0.5} \cdot ft \cdot 2 \cdot (L_{span} - \mathbf{8} \cdot \mathbf{1.1667} \cdot ft)$ $P_{handrail} = 1.308\,kip$

Curb: (2 Curbs Ea. Side) $P_{curb} := \mathbf{1.25} \cdot ft \cdot \mathbf{9.0} \cdot in \cdot w_c \cdot L_{span} \cdot \mathbf{2}$ $P_{curb} = 5.895\,kip$

Total Dead Load of Parapet+ Post+Curb: $W := p_{posts} + P_{handrail} + P_{curb}$ $W = 10.775\,kip$

(Barrier Railing Distribution SDG 2000 EQ 10-1,10-2,10-3)

$$C_1 := 1.53 \cdot \sqrt{\left(\frac{S_b}{m}\right)^3 \cdot (3 \cdot K - 8) + \frac{(10 - K)^2 + 39}{1.4}} \qquad C_1 = 55.726$$

$$C_2 := 2.2 - 1.1 \cdot \left(\frac{L_{span}}{10 \cdot m}\right) + 0.3 \cdot \left(\frac{L_{span}}{10 \cdot m}\right)^2 - 0.028 \cdot \left(\frac{L_{span}}{10 \cdot m}\right)^3 \qquad C_2 = 1.612$$

Phase 3 Scour Analysis

Handrail+ Post Load on Exterior Girder: $W_{ext} := \frac{W \cdot C_1 \cdot C_2}{100}$ $\quad W_{ext} = 9.682 \frac{kip}{beam}$

Handrail+ Post Load on Interior Girder: $W_{int} := \frac{(W - W_{ext}) \cdot \mathbf{2}}{K - \mathbf{2}}$ $\quad W_{int} = 0.729 \frac{kip}{beam}$

Slab: $w_{int\_slab} := w_c \cdot T_{slab} \cdot L_{span} \cdot S_b$ $\quad$ Interior Beam $\quad w_{int\_slab} = 11.003 \frac{kip}{beam}$

$w_{ext\_slab} := w_c \cdot T_{slab} \cdot L_{span} \cdot \left(\frac{S_b}{2} + \mathbf{2.02} \cdot ft\right)$ $\quad$ Exterior Beam $\quad w_{ext\_slab} = 9.206 \frac{kip}{beam}$

Beams: (Typical) $w_{beam} := w_c \cdot A_b \cdot L_{span}$ $\quad w_{beam} = 6.026 \frac{kip}{beam}$

End Diaphragms:

$$P_{end\_dia} := w_c \cdot \left[\left(H_b \cdot \frac{S_b}{\cos(\theta_{skew})} \cdot W_{enddia}\right) - A_b \cdot W_{enddia} - \left[D_{bf} \cdot W_{enddia}\left(\frac{S_b - w_{bf}}{\cos(\theta_{skew})}\right)\right]\right] \cdot \mathbf{2} \qquad P_{end\_dia} = 2.25 \frac{kip}{beam}$$

Int. Diaphragms:

$$p_{int\_dia} := w_c \cdot \left[\left(H_b \cdot \frac{S_b}{\cos(\theta_{skew})} \cdot W_{intdia}\right) - A_b \cdot W_{intdia} - (H_b - \mathbf{2.5833} \cdot ft) \cdot W_{intdia}\left(\frac{S_b - w_{bf}}{\cos(\theta_{skew})}\right)\right] \cdot \mathbf{1}$$

$$p_{int\_dia} = 0 \frac{kip}{beam}$$

Interior Beam Diaphragm Load: $P_{intb\_dia} := P_{end\_dia} + p_{int\_dia}$ $\quad P_{intb\_dia} = 2.25 \frac{kip}{beam}$

Exterior Beam Diaphragm Load: $P_{extb\_dia} := \frac{P_{end\_dia}}{2} + \frac{p_{int\_dia}}{2}$ $\quad P_{extb\_dia} = 1.125 \frac{kip}{beam}$

Cross slope $\qquad$ 1/2" buildup

Buildup: $P_{bup} := \left[\left[\left(3 \cdot \mathbf{0.1875} \cdot \frac{in}{ft} \cdot w_{tf}^{\,2}\right) + 2 \cdot w_{tf} \cdot \frac{\mathbf{1}}{\mathbf{2}} \cdot in\right] \cdot \frac{L_{span}}{6}\right] \cdot w_c$ $\quad P_{bup} = 0.068 \frac{kip}{beam}$

Total Superstructure Dead Load per beam:

Interior Beam $P_{dl\_intbeam} := W_{int} + w_{int\_slab} + w_{beam} + P_{bup} + P_{intb\_dia}$ $\quad P_{dl\_intbeam} = 20.076 \frac{kip}{beam}$

Exterior Beam $P_{dl\_extbeam} := W_{ext} + w_{ext\_slab} + w_{beam} + P_{bup} + P_{extb\_dia}$ $\quad P_{dl\_extbeam} = 26.107 \frac{kip}{beam}$

Phase 3 Scour Analysis

Dead Load - Substructure:

Cap:

(average top-of-cap elevation fom plans)

$$p_{cap} := w_c \cdot \left[\left[\left(\frac{\mathbf{10.184} \cdot ft + \mathbf{10.184} \cdot ft}{2} \right) - Elev_{cap} \right] \cdot W_{bentcap} \cdot \mathbf{41.0} \cdot ft - W_{pile}{}^2 \cdot \mathbf{1.0} ft \cdot N_{pile} \right]$$

$$p_{cap} = 23.171\ kip$$

(pile below water line) (pile above water line)

Piles: $$p_{pile} := \left(N_{pile} \cdot W_{pile}{}^2\right) \cdot \left[(w_c - w_w) \cdot (WE - Tip) + w_c \cdot \left(Elev_{cap} + \mathbf{1.0} \cdot ft - WE\right)\right]$$

$$p_{pile} = 25.421\ kip$$

Substructure Dead Load at Pier:

$$P_{dl\_sub} := p_{cap} + p_{pile}$$

$$P_{dl\_sub} = 48.592\ kip$$

Total Dead Load Per Pile: (checking purposes only)

$$P_{dl\_pile} := \frac{\left(P_{dl\_extbeam}\right) \cdot 2 + P_{dl\_intbeam}\left(N_b - 2\right) + P_{dl\_sub}}{N_{pile}}$$

$$P_{dl\_pile} = 23.005 \frac{kip}{pile}$$

Live Load H-20 Truck (Bridge is Load Rated - Posted as 12 tons Max. for Single Unit Truck w/2 axles, reduce loads):

Maximum End Reaction for 1 Simple Span:

$$P_{ll\_truck} := \left[8 \cdot kip \cdot \left[\frac{\left(L_{span\_b}\right) - 14 \cdot ft}{L_{span\_b}} \right] + 32 \cdot kip \right] \cdot \left(24 \cdot \frac{kip}{40 \cdot kip} \right)$$

$$P_{ll\_truck} = 22.4\ kip$$

LANE LOAD (use HS20 but reduce the load for the posted load capacity of the bridge as above):

Maximum End Reaction for 1 Simple Span:

$$P_{ll\_lane} := \left[0.640 \cdot klf \cdot \left(L_{span}\right) + 26.0 \cdot kip\right] \cdot \left(24 \cdot \frac{kip}{40 \cdot kip} \right)$$

$$P_{ll\_lane} = 23.65\ kip$$

Controlling Live Load:

$$P_{ll\_ftg} := if\left(P_{ll\_truck} > P_{ll\_lane}, P_{ll\_truck}, P_{ll\_lane}\right)$$

$$P_{ll\_ftg} = 23.65\ kip$$

Wheel Load:

$$P_{wheel} := \frac{P_{ll\_ftg}}{2}$$

$$P_{wheel} = 11.82\ kip$$

Impact Factor:

$$I := \frac{50}{\frac{L_{span}}{ft} + 125}$$

$$I := if(I > 0.3, 0.3, I) \qquad I = 0.3$$

Very conservative since analyzing under severe storm conditions

Sidewalk Live Load:

Use 85 psf sidewalk LL at each side of bridge and divide equally among all beams.

$$P_{sdwlk} := \frac{\mathbf{2.167} \cdot ft \cdot L_{span} \cdot 0.085 \cdot ksf \cdot \mathbf{2}}{N_b}$$

$$P_{sdwlk} = 1.544 \frac{kip}{beam}$$

[redacted]

Phase 3 Scour Analysis

Divide Load from 2 Trucks evenly among all Beams: $P_{LI\_BM} := \frac{P_{wheel} \cdot (1 + I) \cdot \mathbf{5}}{N_b} \cdot R_l$ $P_{LI\_BM} = 15.371 \frac{kip}{beam}$

Superstructure Dead+Live: For use in Florida Pier run - program calculates substructure self weight automatically. Apply superstructure loads as concentrated loads.

Ext. Beam: $P_{sup\_ext\_D\_LI} := P_{dl\_extbeam} + P_{LI\_BM} + P_{sdwlk}$ $P_{sup\_ext\_D\_LI} = 43.0 \frac{kip}{beam}$

Int. Beam: $P_{sup\_int\_D\_LI} := P_{dl\_intbeam} + P_{LI\_BM} + P_{sdwlk}$ $P_{sup\_int\_D\_LI} = 37.0 \frac{kip}{beam}$

Check total load per pile:

$$P_{total\_pile} := \frac{2 \cdot P_{sup\_ext\_D\_LI} + (N_b - 2) \cdot P_{sup\_int\_D\_LI} + P_{dl\_sub}}{N_{pile}}$$

$P_{total\_pile} = 35.087 \frac{kip}{pile}$ $P_{total\_pile} = 17.544 \frac{ton}{pile}$ Very low & < 20 tons ∴ ok

The original 1924 design plans are not available so the design vehicle, the pile design loads, and the pile tip elevations are unknown. The 1995 repair plans state that the bridge was originally designed for AASHTO H-20 loading but that can't be confirmed without the original 1924 plans. Also, the 07-27-04 inspection report shows that the bridge is load rated and posted with a maximum allowable load of 12 tons for a single unit truck with 2 axles versus a design load of 20 tons for an H-20 truck. Existing pile capacity is probably very low since excessive bridge settlement was reported in a 1994 inspection report and a crutch bent was added as a rehab repair in 1995. Note that since the beam details were not included in the available plans an AASHTO Type I girder was assumed so the girder self weight may be slightly underestimated.

Lateral Pile Loads

Centrifugal Force (AASHTO Sect. 3.10)

Design Speed: $S := \mathbf{45}\ mph$ (Assumed design speed since not shown in available design plans.)

Radius of Curve: $R := \mathbf{1000000} \cdot ft$ Bridge is not on a curve so use a very, very large radius.

C3 Permit Truck Weight: $W_t := \mathbf{56.0} \cdot kip$

Centrifugal Force Factor: $C := \frac{6.68 \cdot S^2 \cdot ft}{R \cdot 100}$ $C = 1.353 \times 10^{-4}$ (Applied as a percentage of the live load.)

Live Load Reaction: $R_t := W_t \cdot N_{lane} \cdot R_l$ $R_t = 112\,kip$

Centrifugal Force per Beam: $F_{t\_cf} := \frac{R_t \cdot C}{N_b}$ $F_{t\_cf} = 3.03 \times 10^{-3} \frac{kip}{beam}$ Ignore this force as lateral load at each beam since it is so low.

As per AASHTO, apply this force 6 feet above the deck at centerline of roadway to find overturning moment from centrifugal forces. Apply a force couple using vertical reactions at exterior girders (1 upwards and 1 downwards).

Vertical forces at exterior girders:

$F_{v\_cf} := \frac{N_b \cdot F_{t\_cf} \cdot 6 \cdot ft}{N_b \cdot S_b}$ $F_{v\_cf} = 3.03 \times 10^{-3}\,kip$

Normally would apply as one upward load at one exterior girder and one downward load at the other exterior girder but will ignore for this bridge since force is negligible.

??? - Should apply braking forces instead.

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Jacksonville, FL 32211

Foundation stability should be evaluated at the 500-year event rather than the 100-year event

Stream Flow Force (AASHTO 3.18.1) (100-Yr Storm Scour Event)

Average Water Velocity: $V := 5.4 \cdot fps$

Water Elevation: $WE = 8.8\ ft$

Scour Elevation: $SE := -20.0 \cdot ft$ (Top of non-scourable material at this elevation as per the geotechnical report.)

Exposed Pile Height: $Exp_{pileH} := Elev_{cap} - SE$ $\quad Exp_{pileH} = 28.184\ ft$

Constant: $K := 1.4 \cdot lbf \cdot \frac{sec^2}{ft^4}$

Max. Stream Flow Press.: (Drift Factor 1.0) $P_{max} := 1.0 \cdot 2 \cdot K \cdot V^2$ $\quad P_{max} = 0.082\, ksf$

Top of Bent Cap Elevation: $EL_{bent\_top} := Elev_{cap} + D_{cap}$ $\quad EL_{bent\_top} = 10.184\ ft$

Stream Flow Force from Superstructure: $F_{t\_sup} := if(WE > EL_{bent\_top}, \text{"Add Superstructure Force"}, 0 \cdot kip)$ $\quad F_{t\_sup} = 0\, kip$

Stream Flow Force on Piles (Add 50% to the Force to Account for the S.F.F acting on the other Piles at the Same Time):

$$F_{t\_pile} := \begin{cases} \dfrac{\left(\dfrac{P_{max} \cdot Exp_{pileH}}{WE - SE}\right) \cdot Exp_{pileH} \cdot W_{pile} \cdot 1.5}{2 \cdot N_{pile}} & \text{if } WE > Elev_{cap} \\ \dfrac{P_{max} \cdot Exp_{pileH} \cdot W_{pile} \cdot 1.5}{2 \cdot N_{pile}} & \text{otherwise} \end{cases}$$

$$F_{t\_pile} = 0.281 \frac{kip}{pile}$$

Stream Flow Force on Cap:

$$F_{t\_cap} := \begin{cases} \dfrac{\left[\left(\dfrac{P_{max} \cdot Exp_{pileH}}{WE - SE}\right) + P_{max}\right] \cdot 0.5 \cdot W_{bentcap} \cdot (WE - Elev_{cap})}{N_{pile}} & \text{if } Elev_{cap} + D_{cap} > WE > Elev_{cap} \\ \dfrac{\left[\left(\dfrac{P_{max} \cdot Exp_{pileH}}{WE - SE}\right) + \dfrac{P_{max} \cdot (EL_{bent\_top} - SE)}{WE - SE}\right] \cdot 0.5 \cdot W_{bentcap} \cdot D_{cap}}{N_{pile}} & \text{if } WE \ge Elev_{cap} + D_{cap} \\ 0 \cdot kip & \text{otherwise} \end{cases}$$

$$F_{t\_cap} = 0.014 \frac{kip}{pile}$$

Phase 3 Scour Analysis

Stream Flow Force from the piles and cap at the bottom of pile cap:

Assume 2/3 of pile load is picked up at top of pile and 1/3 at pile tip.
Assume full cap load is picked up at top of pile.

$$F_{t\_sf} := 0.67 \cdot F_{t\_pile} + F_{t\_cap} + F_{t\_sup} \qquad F_{t\_sf} = 0.203 \frac{kip}{pile}$$

Find Critical Scour Elevation for Pile Buckling

Calculate Equivalent Length of pile in soil to point of fixity. (Method obtained from ASCE Journal, dated Dec 1976. Authored by Peter Kocsis)
Calculate critical pile length for widening piles.

Moment of Inertia of Pile (14" Square):

$$I_{column} := \frac{W_{pile} \cdot W_{pile}^{3}}{12} \qquad I_{column} = 3201\ in^{4}$$

Horizontal Subgrade Reaction Constant: (From Table 1)

$$N := 4 \cdot \frac{ton}{ft^{3}}$$ (Loose Sandy Soil)

(use 0.9 factor for Fla. limerock as per FDOT SDG)

Modulus of Elasticity of 14" Prestressed Concrete Pile :

$$E_{c\_column} := 0.9 \cdot 57000 \cdot \sqrt{4500} \cdot psi \qquad E_{c\_column} = 3441\ ksi$$

Depth to Point of Fixity:

$$L_u := \left(\frac{102.9 \cdot E_{c\_column} \cdot I_{column}}{N} \right)^{\frac{1}{5}} \qquad L_u = 15.798\ ft$$

Distance from Ground to the point of Loading:

(Assume point of loading is at top of pile.)

$$a_c := Elev_{cap} - Grnd_{elev} \qquad a_c = 14.984\ ft$$

Effective Length of Column:

$$L_{e\_1} := L_u \cdot \left[0.4 + 1.353 \cdot \frac{a_c}{L_u} + 1.875 \cdot \left(\frac{a_c}{L_u} \right)^{2} + \left(\frac{a_c}{L_u} \right)^{3} \right]^{\frac{1}{3}} \qquad L_{e\_1} = 25.536\ ft$$

$$L_{e\_1} := 26 \cdot ft$$

USE 26 ft

Impact:

$$impact := \frac{50 \cdot ft}{L_{span} + 125 \cdot ft} + 1$$

$$impact := if(impact > 1.3, 1.3, impact) \qquad impact = 1.3$$

Phase 3 Scour Analysis

(2 Lanes loaded.)

Critical Pile Load: $P_{cr} := \frac{P_{dl\_pile}}{7} + \frac{P_{ll\_ftg} \cdot \mathbf{2.0} \cdot lane \cdot impact \cdot R_l}{7}$ $\quad P_{cr} = 12.07\,kip$

Effective Length Factor: $k := \mathbf{1.0}$

Guess value for L: $L := 20 \cdot ft$

Euler Buckling Formula: Given $P_{cr} = \frac{\pi^2 \cdot E_{c\_column} \cdot I_{column}}{(k \cdot L)^2}$ $\quad L_{unb} := Find(L) \quad L_{unb} = 250.1\ ft$

Factor of Safety: $FS := \mathbf{2.0}$

Critical Buckling Length: $L_{unb} := \frac{L_{unb}}{FS}$ $\quad L_{unb} = 125.1\ ft$

Effective Length of column: $L_{e\_2} := L_{unb} + L_u$ $\quad L_{e\_2} = 140.857\ ft$

$L_e := \min(L_{e\_2}, L_{e\_1})$ $\quad L_e = 26\ ft$

Elevation of Bottom of Pile Cap: $Elev_{cap} = 8.184\ ft$

Critical Scour Elevation for Pile Buckling: $Elev_{crit\_scour} := Elev_{cap} - (L_e)$ $\quad Elev_{crit\_scour} = -17.8\ ft$

Predicted Average 100 Year Scour Elevation: $Elev_{100yr\_scour} := -20.0 \cdot ft$

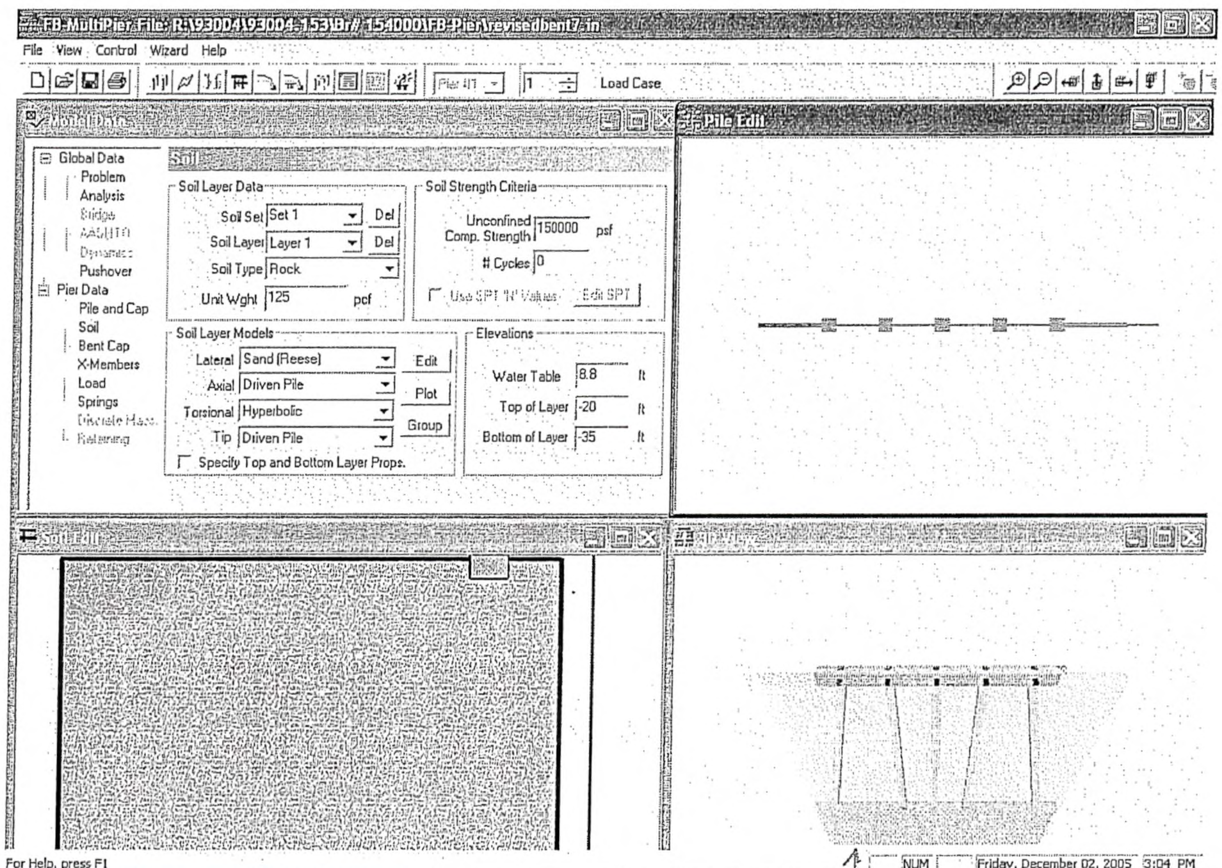
Predicted scour elevation is -27.87 but non-scourable material is at elevation -20.0.

As seen above, the critical scour elevation for pile buckling is above the predicted 100 year scour elevation. Therefore, pile buckling criteria will control if the Florida Pier runs show a stable structure for scour elevations below -17.8 feet..

Only 2.2 ft above EL. -20.0 ft, Assume that the presence of the crutch bent provides enough stability to keep this from controlling.

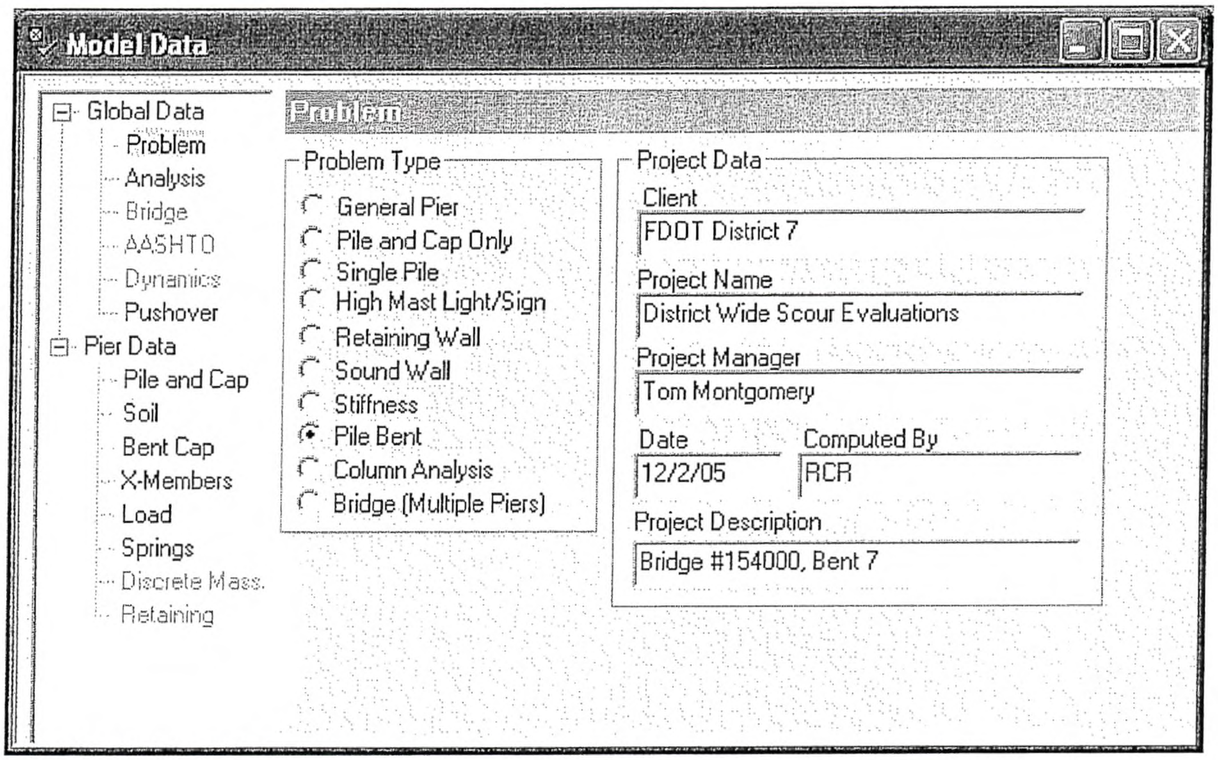
The two crutch bent piles are non-redundant and not likely to have adequate axial resistance to support the full loads on their own if the concrete piles are ineffective.

Bent 7

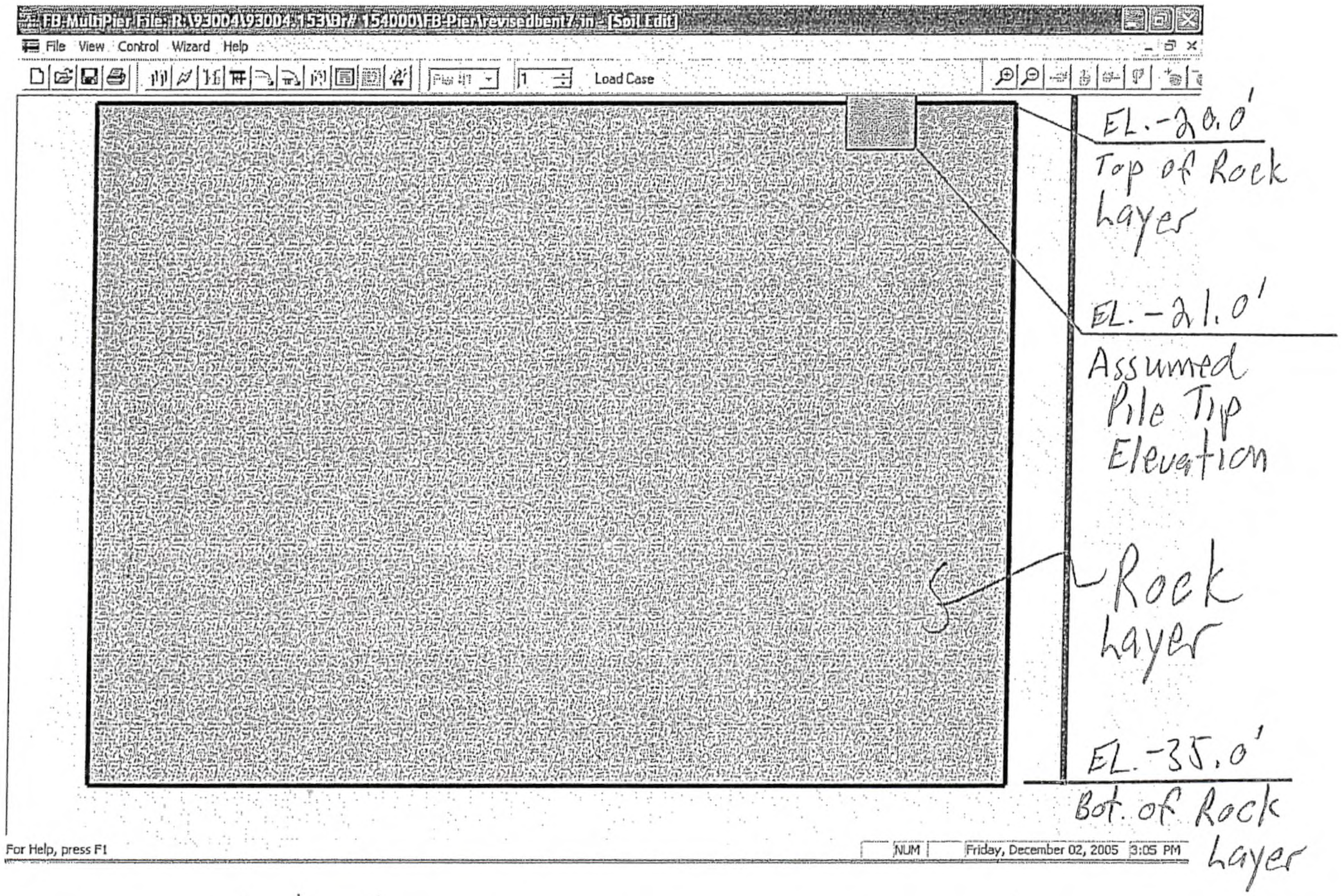


Conservatively ignored the crutch bent + only analyzed the original concrete cap with its 5 - 14" sq. concrete piles. Piles are assumed to be prestressed.

File


Model Data
Global Data
Problem
Analysis
Bridge
AASHTO
Dynamics
Pushover
Pier Data
Pile and Cap
Soil
Bent Cap
X-Members
Load
Springs
Discrete Mass.
Retaining
Problem
Problem Type
General Pier
Pile and Cap Only
Single Pile
High Mast Light/Sign
Retaining Wall
Sound Wall
Stiffness
Pile Bent
Column Analysis
Bridge (Multiple Piers)
Project Data
Client
FDOT District 7
Project Name
District Wide Scour Evaluations
Project Manager
Tom Montgomery
Date
12/2/05
Computed By
RCR
Project Description
Bridge #154000, Bent 7

Soil Model (after scour)



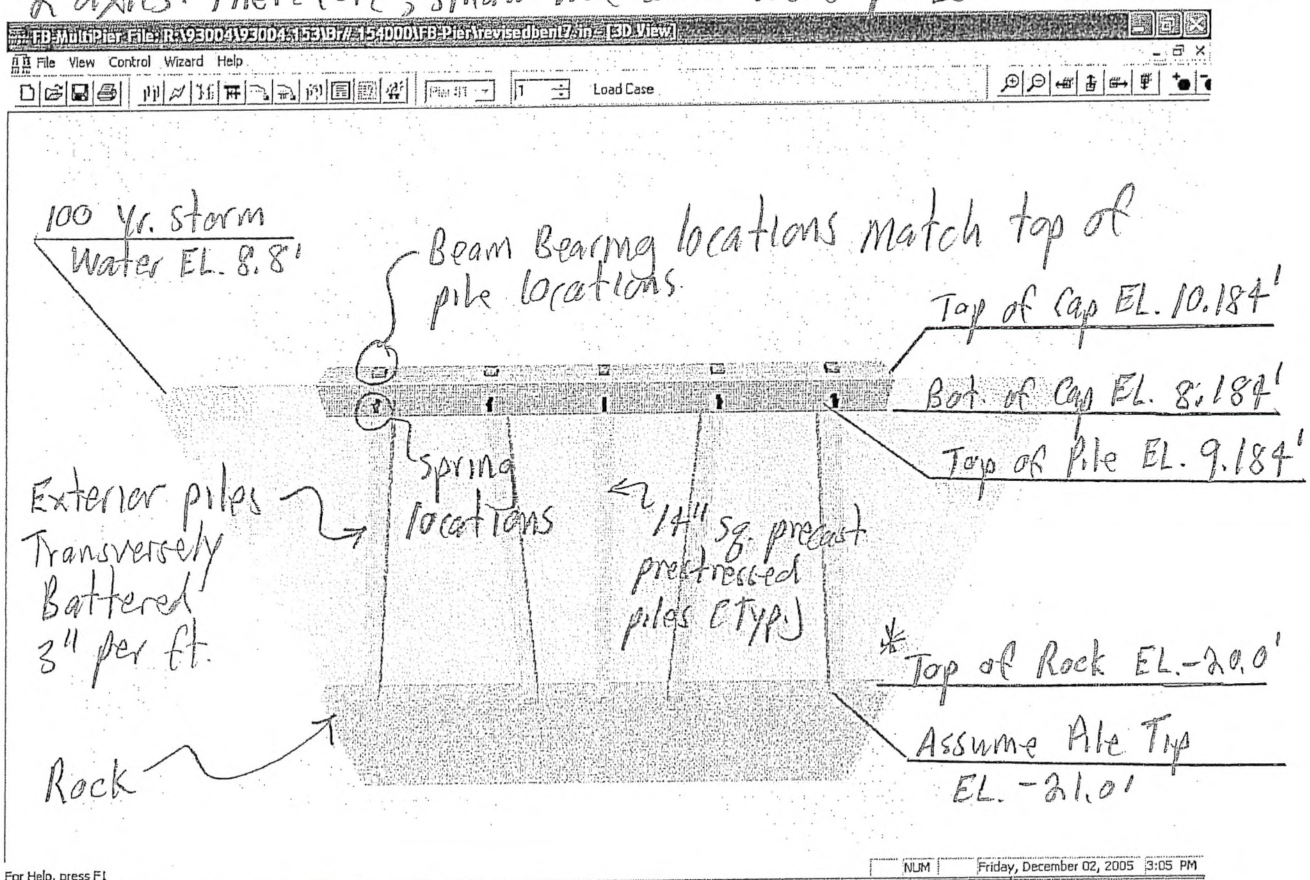
Predicted 100 yr. scour EL. = -27.6'

Top of Non-scourable material EL. = -20.0'

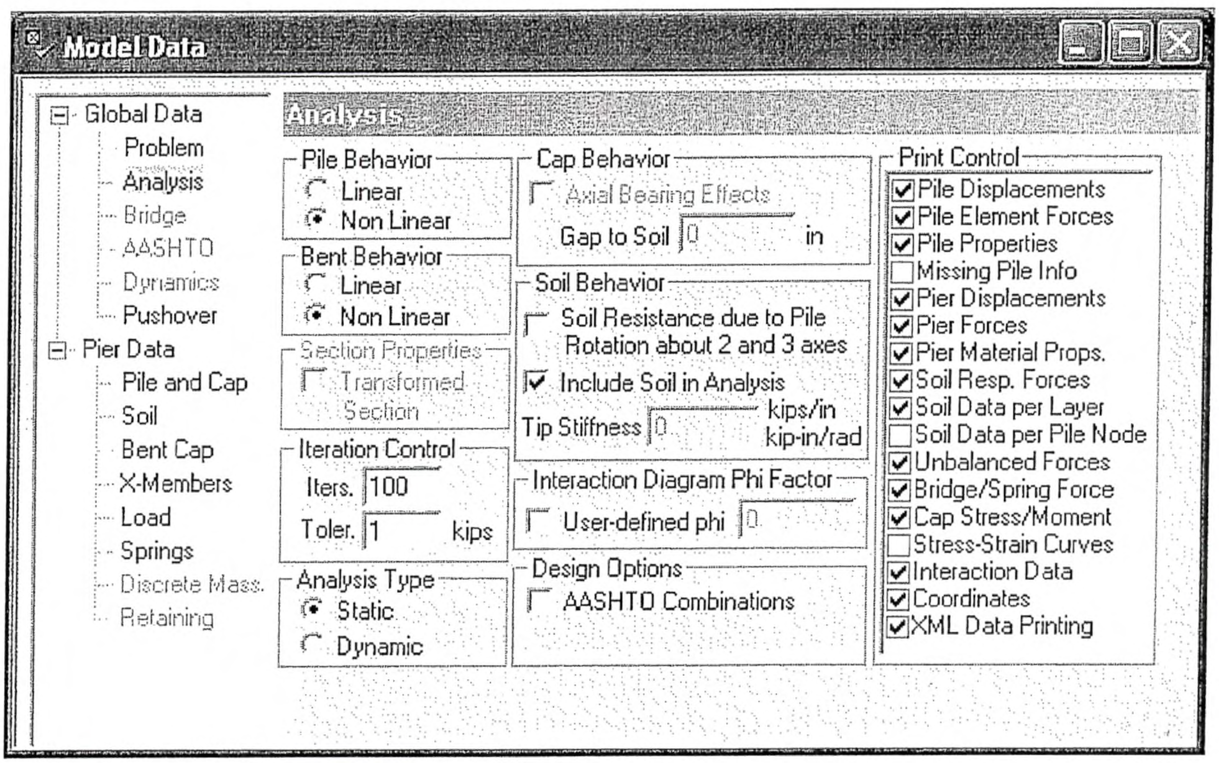
Actual Pile tip elevations are unknown since pile driving data is not available.

Assumptions (Original 1924 design plans not available)

- Conservatively ignored the crutch bent + analyzed the original concrete cap with its 5-14" sq. concrete piles
- The Bridge is functionally obsolete + is load rated with a posting showing 12 tons max. for a single unit truck with 2 axles. Therefore, small live loads were placed on the model.

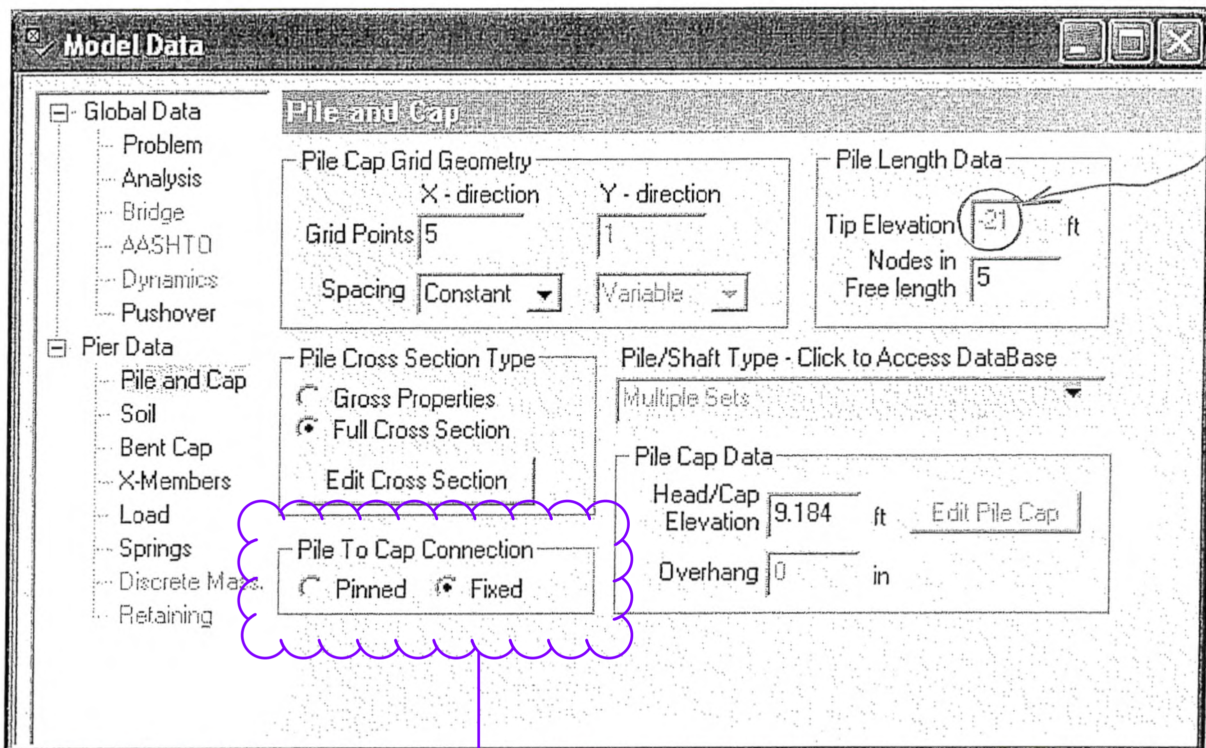


* Scour was able to reach the top-of-rock elevation of -20.0' + the structure remained stable with only about 1.5" of deflection. Therefore, the bridge is probably safe assuming that the live loads don't exceed the posted loads from the load rating. However, the bridge is functionally obsolete with severe settlement at the end bents + the pile tip elevations are not known.


Model Data
Global Data
Problem
Analysis
Bridge
AASHTO
Dynamics
Pushover
Pier Data
Pile and Cap
Soil
Bent Cap
X-Members
Load
Springs
Discrete Mass.
Retaining
Analysis
Pile Behavior
Linear
Non Linear
Bent Behavior
Linear
Non Linear
Section Properties
Transformed Section
Iteration Control
Iters. 100
Toler. 1 kips
Analysis Type
Static
Dynamic
Cap Behavior
Axial Bearing Effects
Gap to Soil 0 in
Soil Behavior
Soil Resistance due to Pile Rotation about 2 and 3 axes
Include Soil in Analysis
Tip Stiffness 0 kips/in kip-in/rad
Interaction Diagram Phi Factor
User-defined phi 0
Design Options
AASHTO Combinations
Print Control
Pile Displacements
Pile Element Forces
Pile Properties
Missing Pile Info
Pier Displacements
Pier Forces
Pier Material Props.
Soil Resp. Forces
Soil Data per Layer
Soil Data per Pile Node
Unbalanced Forces
Bridge/Spring Force
Cap Stress/Moment
Stress-Strain Curves
Interaction Data
Coordinates
XML Data Printing

Original 1924 pile driving records not available so the

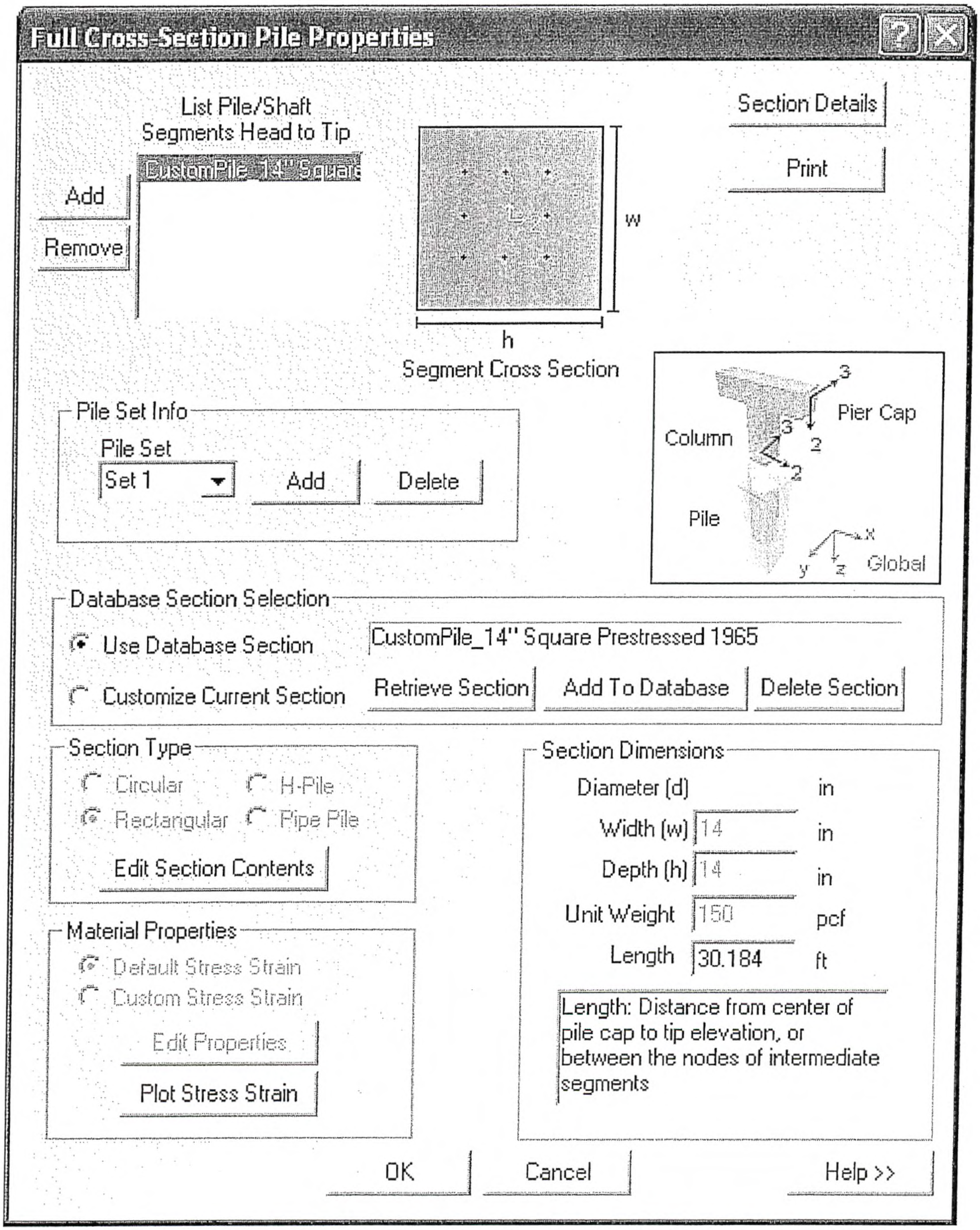
Pile tips assumed to be at -21.0' since that would give the piles 1' of embedment into rock.

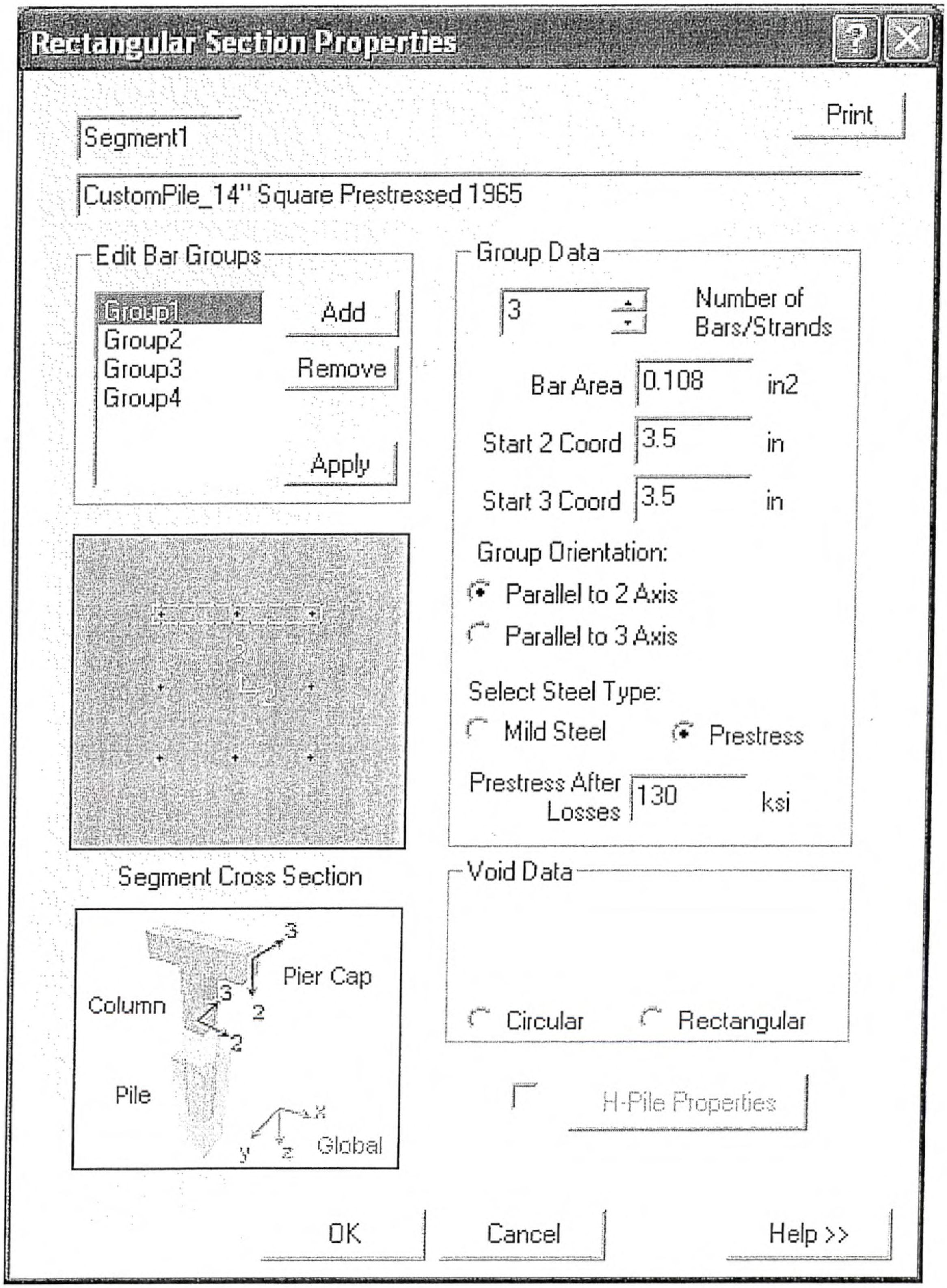


A fixed condition of the pile into the cap is unconservative and inconsistent with standard design practice in which the pile is embedded a short amount (i.e., approximately 1-foot into the cap). A pinned connection should have been used. Due to the underestimation of the pile fixity depth into the soil, use of fixed instead of pinned connection into the cap, and failure to use larger longitudinal braking forces for the lateral loads, the deflections are significantly underestimated.

Piles

Assumed data since original design plans not available

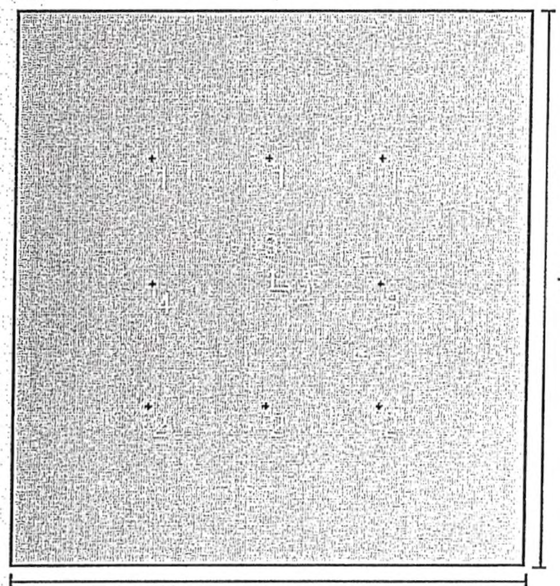



Rectangular Section Properties
Print
Segment1
CustomPile_14" Square Prestressed 1965
Edit Bar Groups
Group1
Group2
Group3
Group4
Add
Remove
Apply
Group Data
3
Number of Bars/Strands
Bar Area
0.108
in2
Start 2 Coord
3.5
in
Start 3 Coord
3.5
in
Group Orientation:
Parallel to 2 Axis
Parallel to 3 Axis
Select Steel Type:
Mild Steel
Prestress
Prestress After Losses
130
ksi
Segment Cross Section
Void Data
Circular
Rectangular
Pier Cap
Column
Pile
Global
H-Pile Properties
OK
Cancel
Help >>

Assumed Pile Cross-Section since original design plans not available.

Piles

Detailed Cross Section



Print

Section List: Segment 1

Pile Set: Pile Set 1

☑ Show Bar Group Numbers

Bar Group Properties

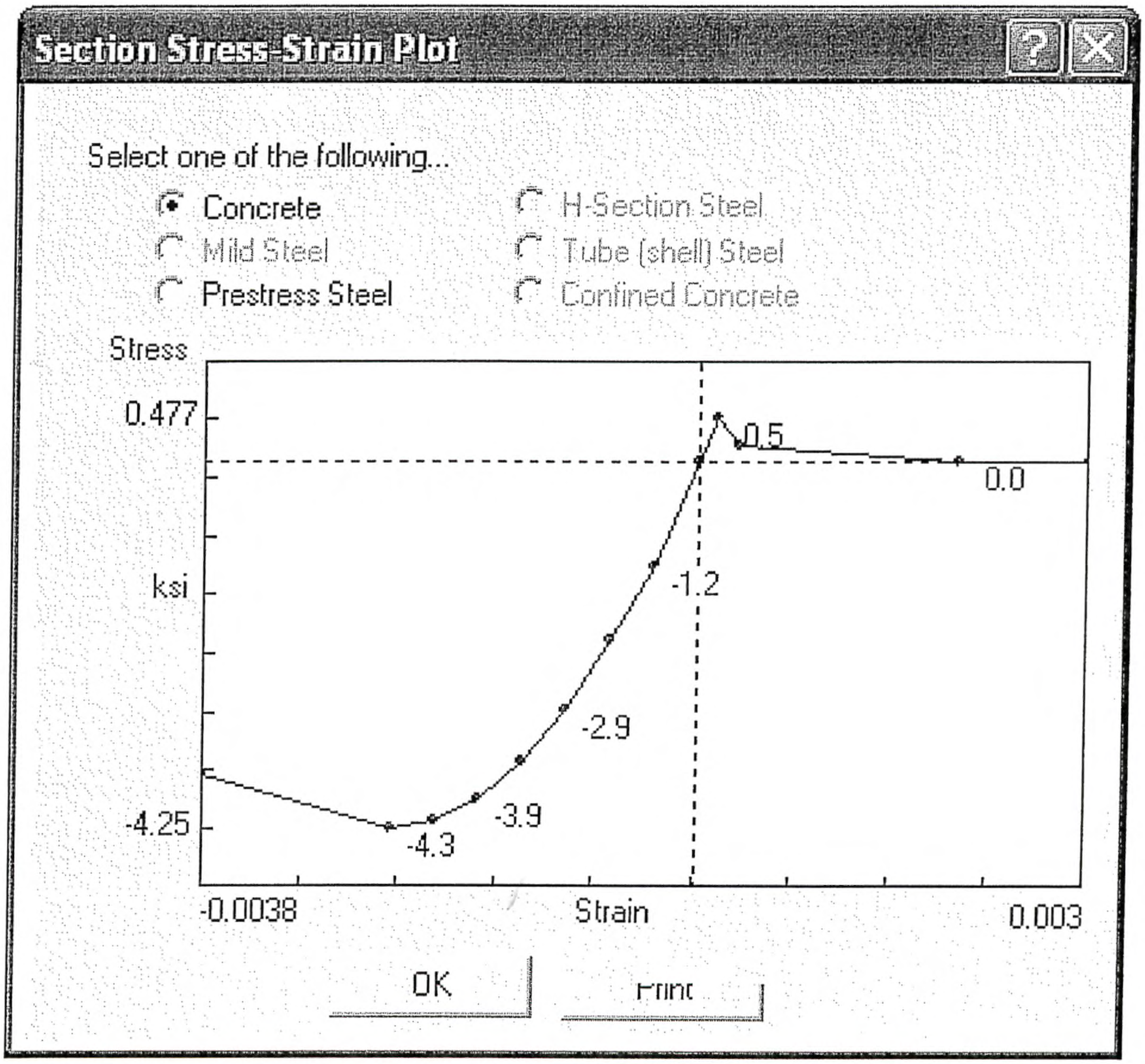
Group	# Bars	Area (in^2)	Diameter (in.)	Spacing (in.)	Coord-2 (in.)	Coord-3 (in.)	Orientation	Prestress (ksi)
1	3	0.108000	N/A	N/A	3.500	3.500	Horizontal	130.00
2	3	0.108000	N/A	N/A	3.500	-3.500	Horizontal	130.00
3	1	0.108000	N/A	N/A	3.500	0.000	Vertical	130.00
4	1	0.108000	N/A	N/A	-3.500	0.000	Vertical	130.00

Material Properties

Concrete		Mild Steel		Prestress Steel		H-Pile Steel		Shell Steel	
f'c (ksi)	Ec (ksi)	fy (ksi)	Es (ksi)	fps (ksi)	Eps (ksi)	fhp (ksi)	Ehp (ksi)	fsh (ksi)	Esh (ksi)
5.0	3627.0	0.0	0.0	270.0	28500.0	0.0	0.0	0.0	0.0

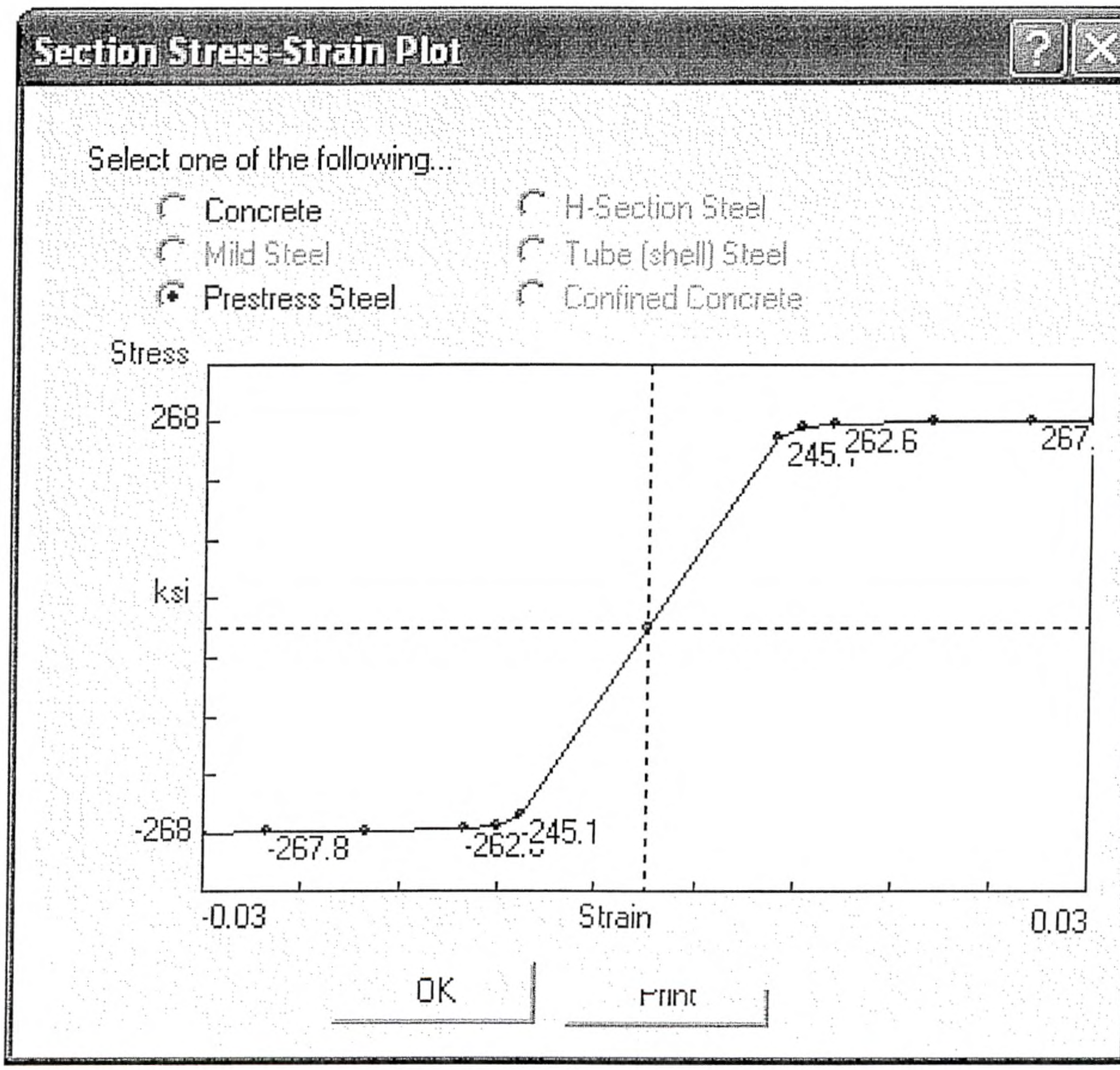
OK Cancel

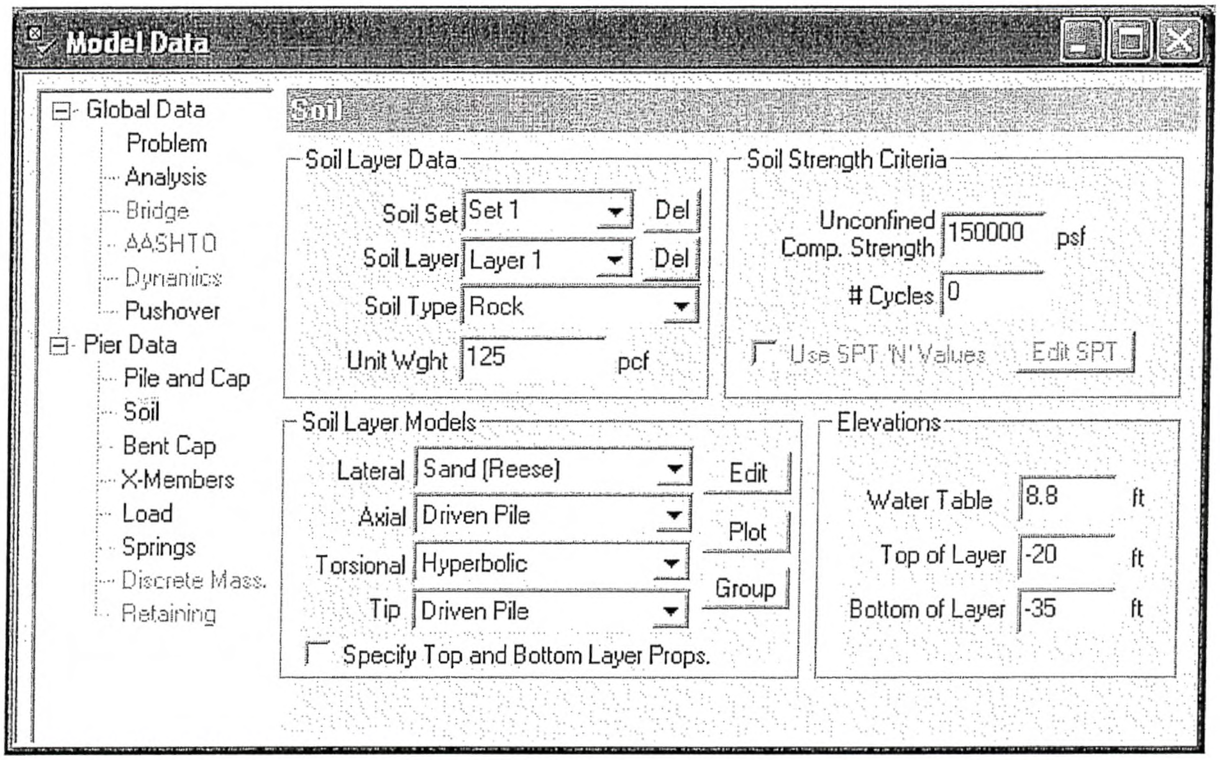
Piles



Section Stress-Strain Plot
Select one of the following...
Concrete
H-Section Steel
Mild Steel
Tube (shell) Steel
Prestress Steel
Confined Concrete
Stress
0.477
ksi
-4.25
0.5
0.0
-1.2
-2.9
-3.9
-4.3
-0.0038
Strain
0.003
OK
Print

Piles


Section Stress-Strain Plot
Select one of the following...
Concrete
Mild Steel
Prestress Steel
H-Section Steel
Tube (shell) Steel
Confined Concrete
Stress
268
ksi
-268
245.1
262.6
267.
-267.8
-262.5
-245.1
-0.03
Strain
0.03
OK
Print


Model Data
Global Data
Problem
Analysis
Bridge
AASHTO
Dynamics
Pushover
Pier Data
Pile and Cap
Soil
Bent Cap
X-Members
Load
Springs
Discrete Mass.
Retaining
Soil
Soil Layer Data
Soil Set
Set 1
Del
Soil Layer
Layer 1
Del
Soil Type
Rock
Unit Wght
125
pcf
Soil Strength Criteria
Unconfined Comp. Strength
150000
psf
Cycles
0
Use SPT 'N' Values
Edit SPT
Soil Layer Models
Lateral
Sand (Reese)
Edit
Axial
Driven Pile
Plot
Torsional
Hyperbolic
Group
Tip
Driven Pile
Specify Top and Bottom Layer Props.
Elevations
Water Table
8.8
ft
Top of Layer
-20
ft
Bottom of Layer
-35
ft

Additional Soil Properties

Print

Lateral Model

Sand (Reese)

38	Internal Friction Angle	degrees
125	Total Unit Weight	pcf
150	Subgrade Modulus	lb/in3

OK Cancel

Additional Soil Properties

Print

Axial Model

Driven Pile

125	Total Unit Weight	pcf
35	Shear Modulus	ksi
0.3	Poisson's ratio	
2000	Vertical Failure Shear Stress	psf

OK Cancel

Additional Soil Properties

Print

Torsional Model

Hyperbolic

38	Internal Friction Angle	Degrees
125	Total Unit Weight	pcf
35	Shear Modulus	ksi
2000	Torsional Shear Stress	psf

OK | Cancel

Additional Soil Properties

Print

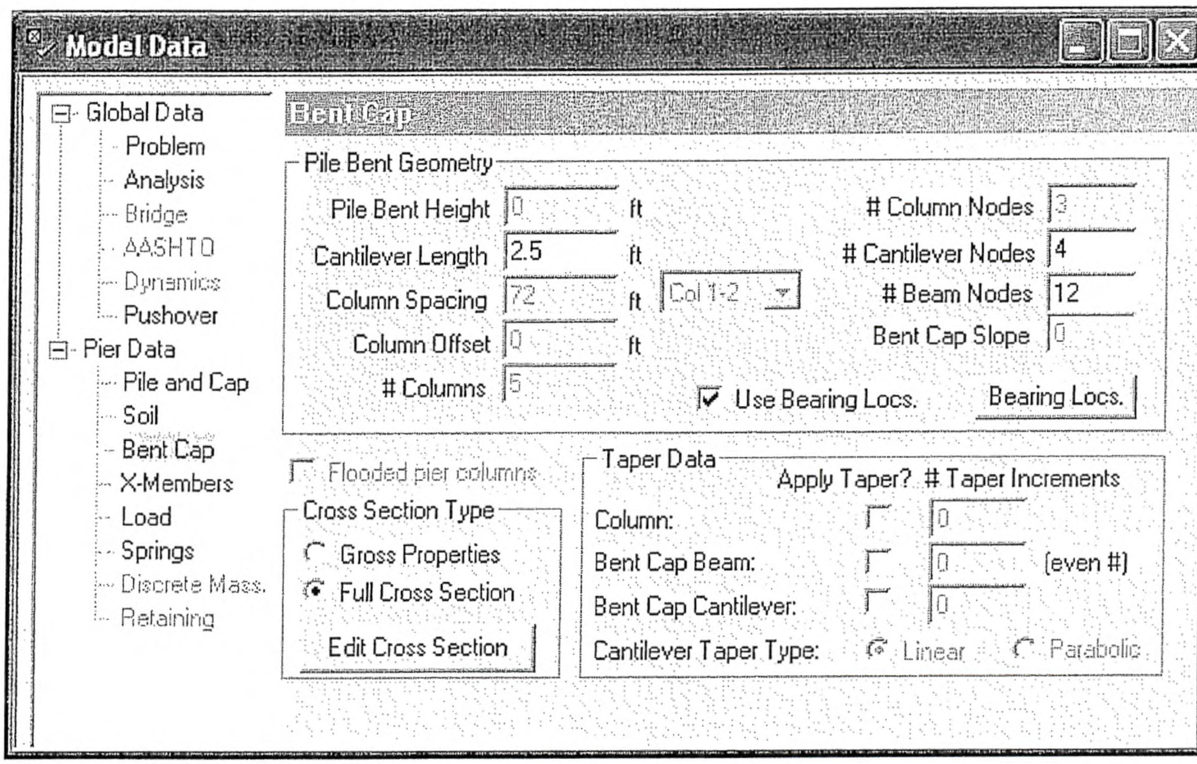
Tip Model

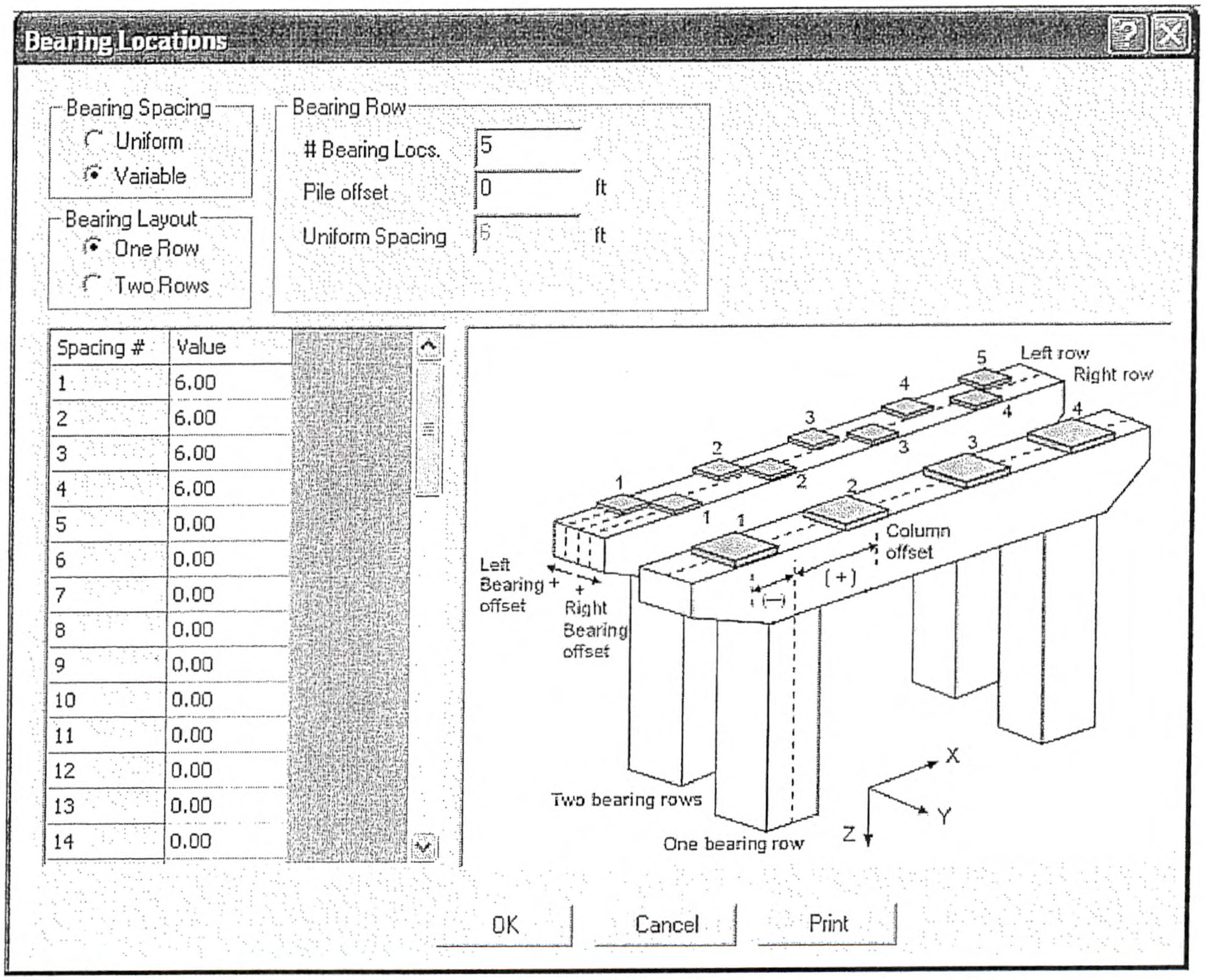
Driven Pile

35	Shear Modulus	ksi
0.3	Poisson's ratio	
500	Axial Bearing Failure	kips

Note: The tip spring force is calculated based on the tip elevation and the soil properties. The soil properties are constant along the depth of the soil layer for this tip spring calculation.

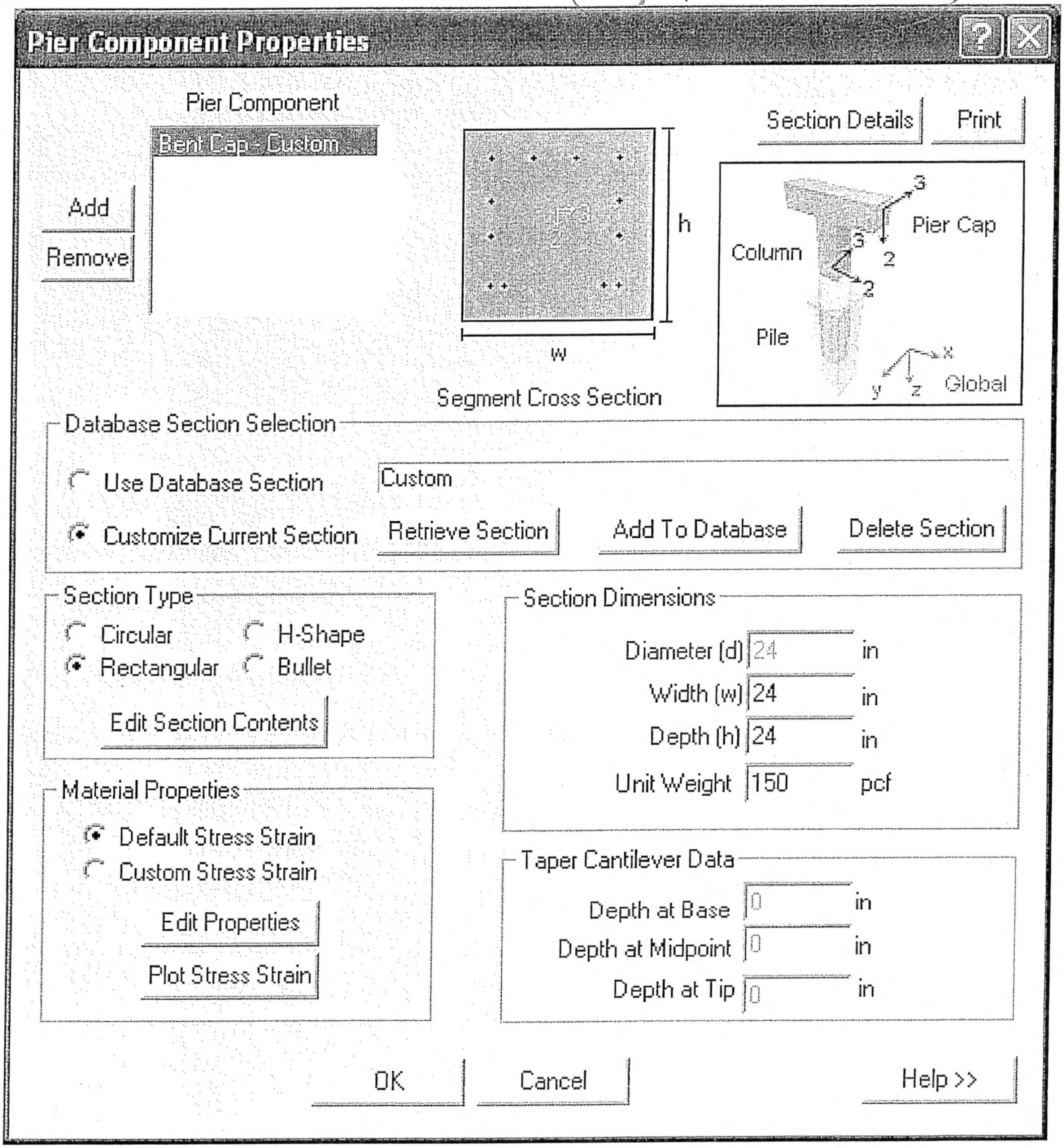
OK Cancel


Model Data
Global Data
Problem
Analysis
Bridge
AASHTO
Dynamics
Pushover
Pier Data
Pile and Cap
Soil
Bent Cap
X-Members
Load
Springs
Discrete Mass.
Retaining
Bent Cap
Pile Bent Geometry
Pile Bent Height 0 ft
Cantilever Length 2.5 ft
Column Spacing 72 ft Col 1-2
Column Offset 0 ft
Columns 5
Column Nodes 3
Cantilever Nodes 4
Beam Nodes 12
Bent Cap Slope 0
Use Bearing Locs.
Bearing Locs.
Flooded pier columns
Cross Section Type
Gross Properties
Full Cross Section
Edit Cross Section
Taper Data
Apply Taper? # Taper Increments
Column: 0
Bent Cap Beam: 0 (even #)
Bent Cap Cantilever: 0
Cantilever Taper Type: Linear Parabolic


Bearing Locations
Bearing Spacing
Uniform
Variable
Bearing Layout
One Row
Two Rows
Bearing Row
Bearing Locs. 5
Pile offset 0 ft
Uniform Spacing 6 ft
Spacing # Value
1 6.00
2 6.00
3 6.00
4 6.00
5 0.00
6 0.00
7 0.00
8 0.00
9 0.00
10 0.00
11 0.00
12 0.00
13 0.00
14 0.00
Left row
Right row
Column offset
Left Bearing offset
Right Bearing offset
Two bearing rows
One bearing row
X
Y
Z
OK
Cancel
Print

Bent Cap

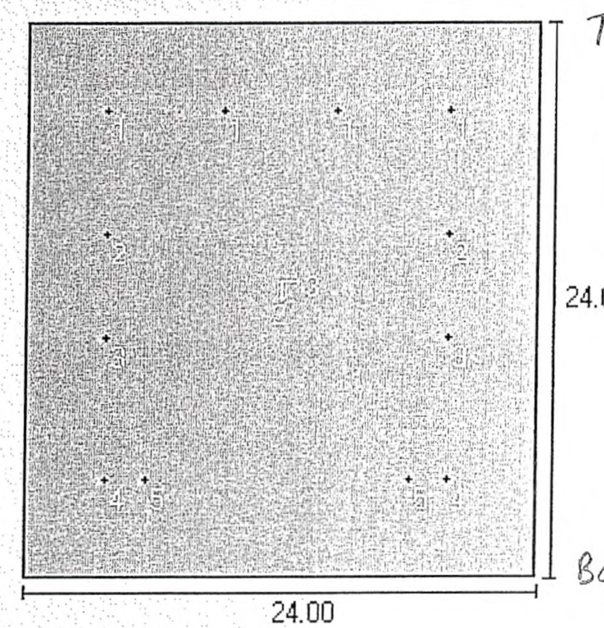
Assumed reinforcing & cap dimensions since original design plans Not available.



Bent Cap

Assumed reinforcing + cap dimensions since original design plans not available.

Detailed Cross Section



Top of Cap

Bot. of Cap

Print

Section List

Bent Cap

☑ Show Bar Group Numbers

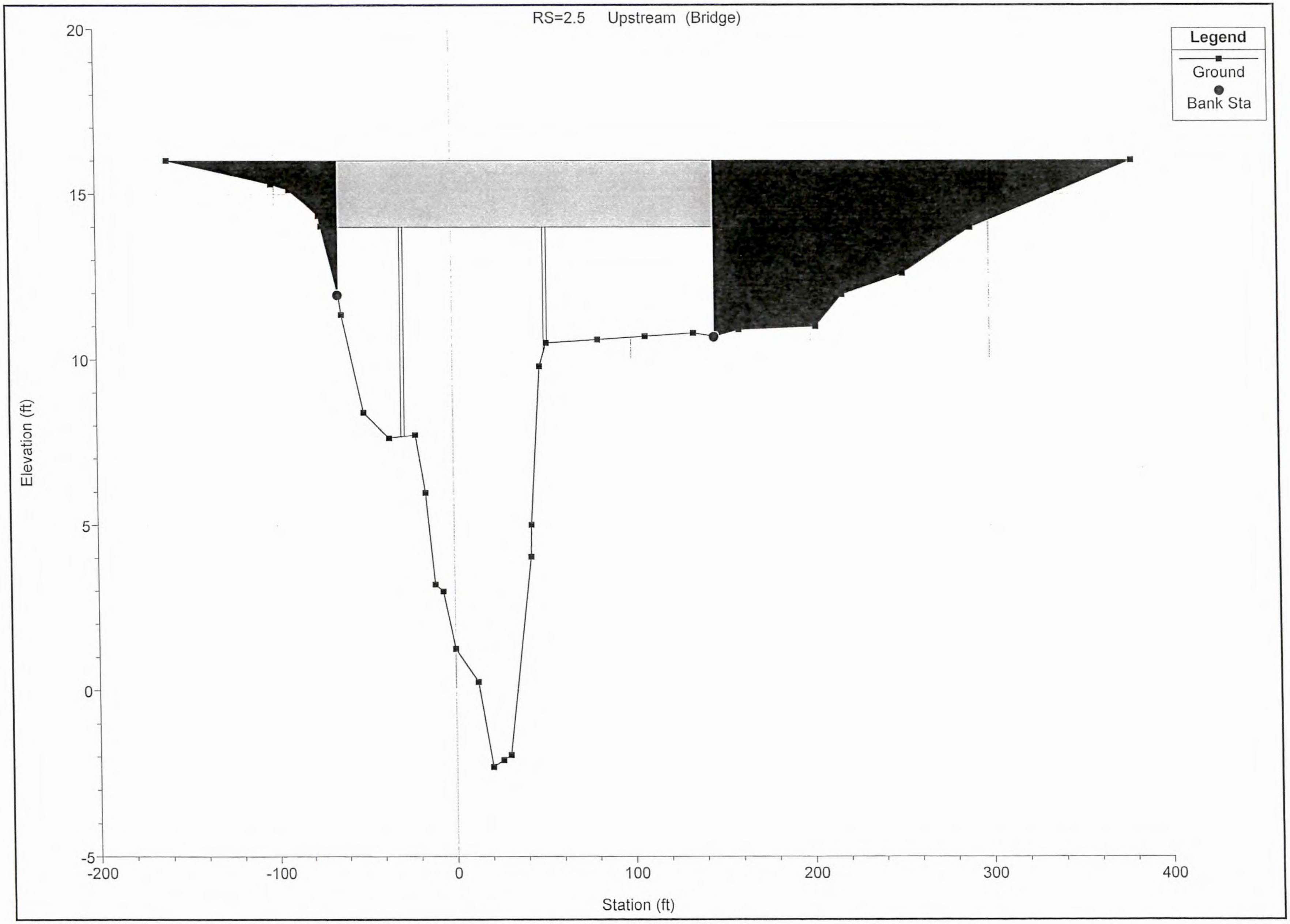
Bar Group Properties

Group	# Bars	Area (in^2)	Diameter (in.)	Spacing (in.)	Coord-2 (in.)	Coord-3 (in.)	Orientation	Prestress (ksi)
1	4	1.000000	N/A	N/A	-8.875	-8.875	Vertical	0.00
2	2	0.440000	N/A	N/A	-3.000	-8.875	Vertical	0.00
3	2	0.440000	N/A	N/A	2.125	-8.875	Vertical	0.00
4	2	1.000000	N/A	N/A	8.875	-8.875	Vertical	0.00
5	2	1.000000	N/A	N/A	8.875	-6.875	Vertical	0.00

Material Properties

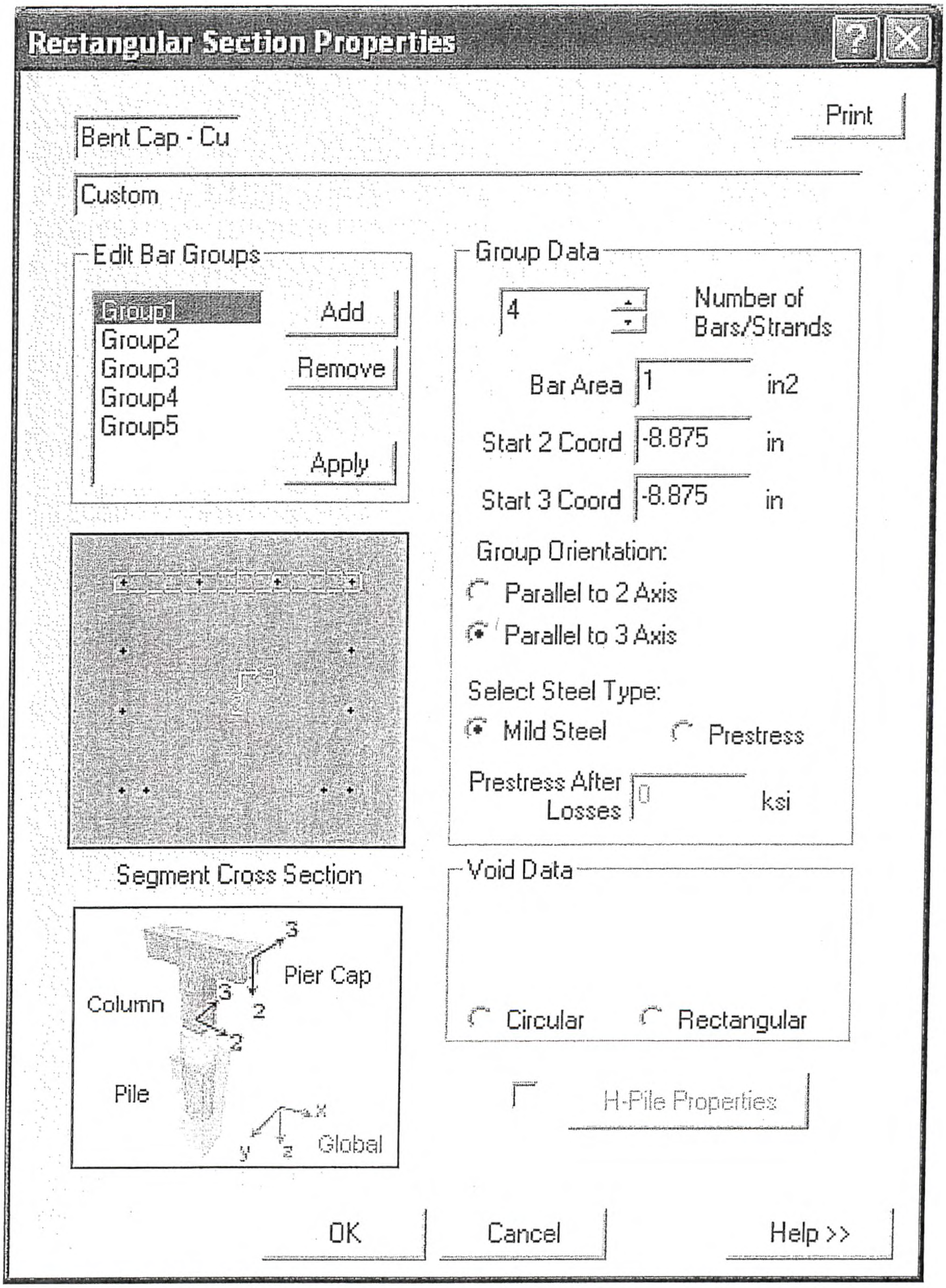
Concrete		Mild Steel		Prestress Steel		H-Pile Steel		Shell Steel	
f'c (ksi)	Ec (ksi)	fy (ksi)	Es (ksi)	fps (ksi)	Eps (ksi)	fhp (ksi)	Ehp (ksi)	fsh (ksi)	Esh (ksi)
3.0	2810.0	40.0	29000.0	0.0	0.0	0.0	0.0	0.0	0.0

OK Cancel

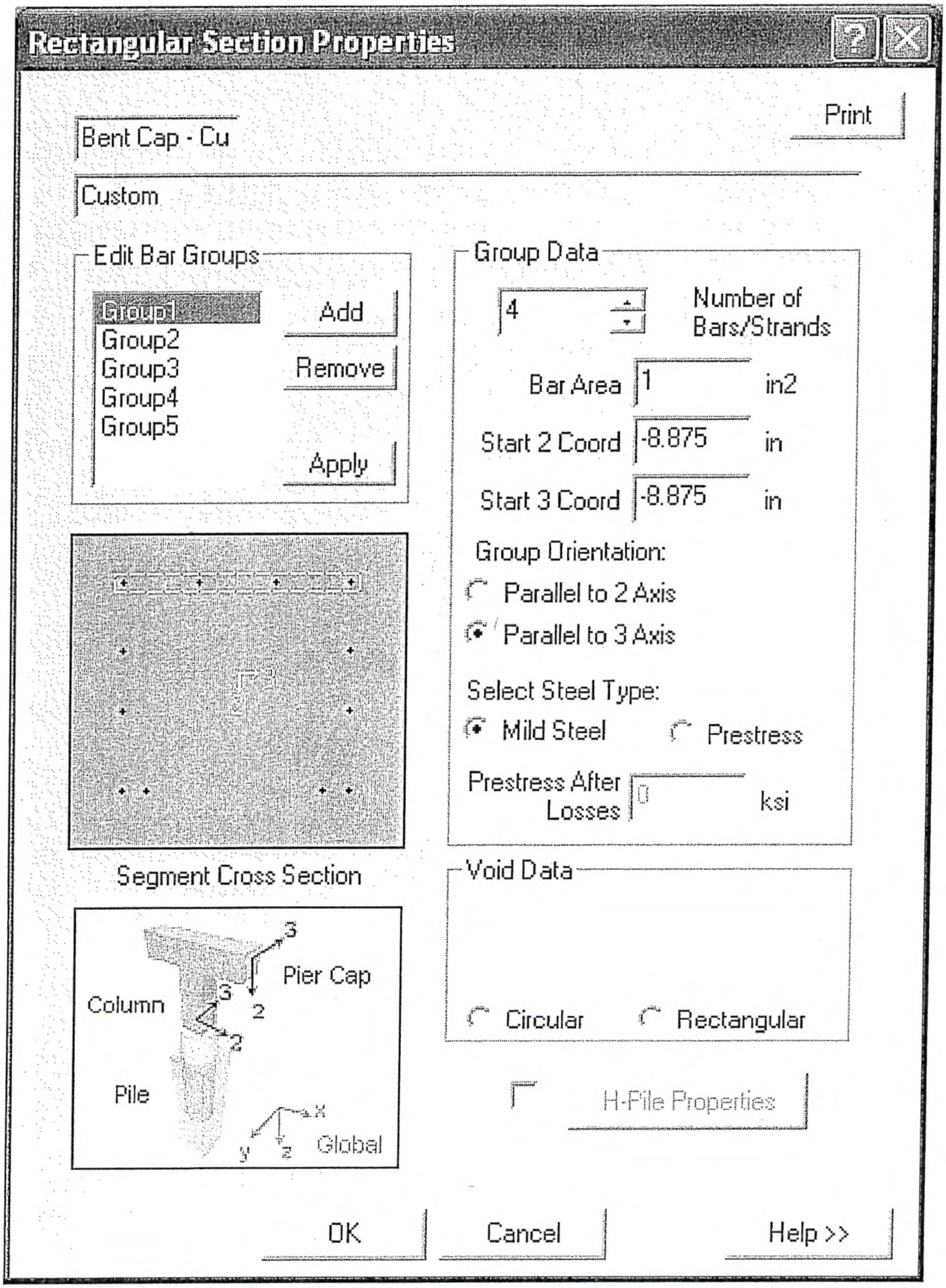


RS=2.5 Upstream (Bridge)
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
20
15
10
5
0
-5
-200
-100
0
100
200
300
400

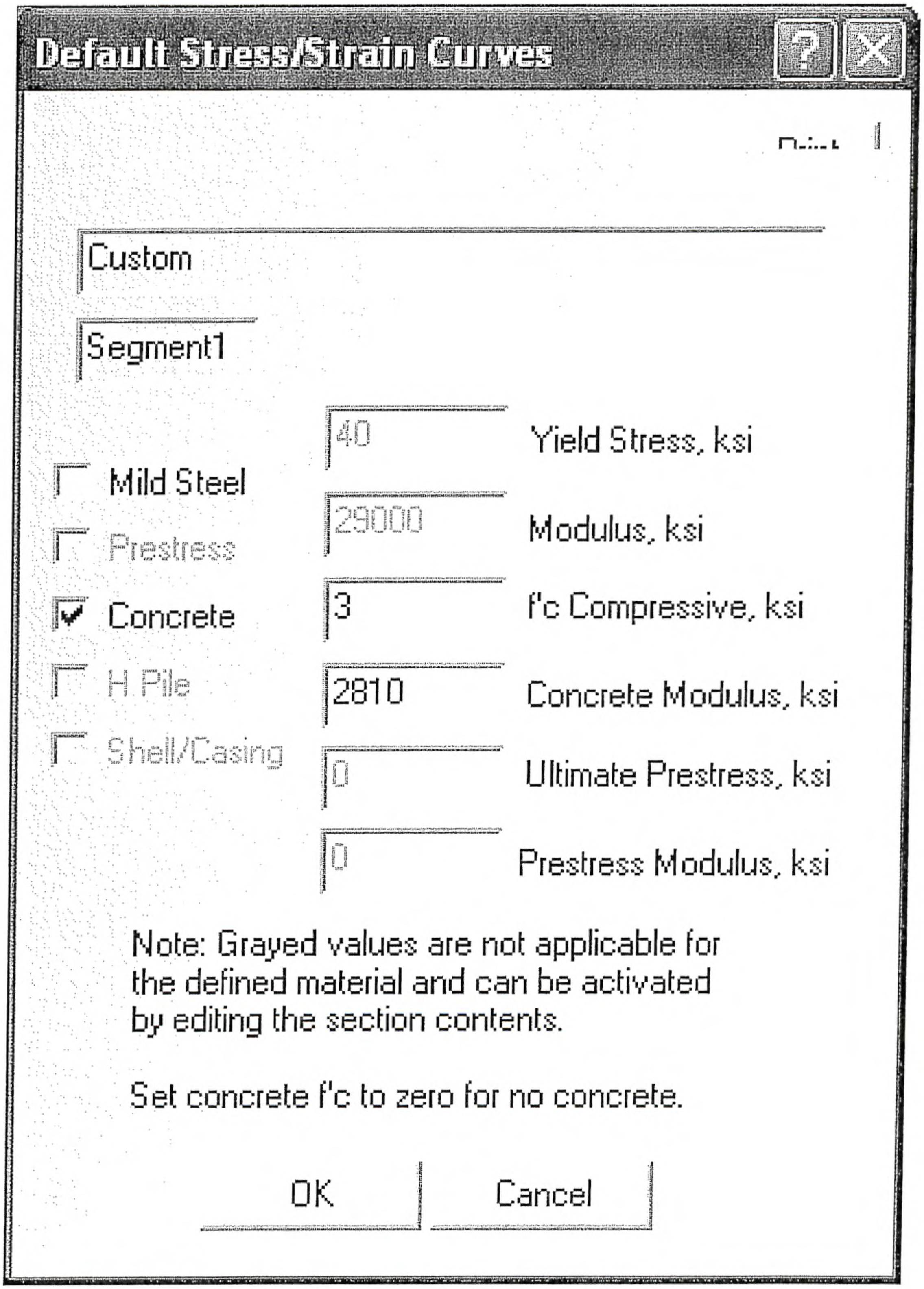
Bent Cap


Rectangular Section Properties
Print
Bent Cap - Cu
Custom
Edit Bar Groups
Group1
Group2
Group3
Group4
Group5
Add
Remove
Apply
Group Data
4
Number of Bars/Strands
Bar Area
1
in2
Start 2 Coord
-8.875
in
Start 3 Coord
-8.875
in
Group Orientation:
Parallel to 2 Axis
Parallel to 3 Axis
Select Steel Type:
Mild Steel
Prestress
Prestress After Losses
0
ksi
Segment Cross Section
Void Data
Circular
Rectangular
H-Pile Properties
Pier Cap
Column
Pile
Global
OK
Cancel
Help >>

Bent Cap


Rectangular Section Properties
Print
Bent Cap - Cu
Custom
Edit Bar Groups
Group1
Group2
Group3
Group4
Group5
Add
Remove
Apply
Group Data
4
Number of Bars/Strands
Bar Area
1
in2
Start 2 Coord
-8.875
in
Start 3 Coord
-8.875
in
Group Orientation:
Parallel to 2 Axis
Parallel to 3 Axis
Select Steel Type:
Mild Steel
Prestress
Prestress After Losses
0
ksi
Segment Cross Section
Void Data
Circular
Rectangular
Pier Cap
Column
Pile
Global
H-Pile Properties
OK
Cancel
Help >>

Bent Cap


Default Stress/Strain Curves
Custom
Segment1
40
Yield Stress, ksi
Mild Steel
29000
Modulus, ksi
Prestress
Concrete
3
f'c Compressive, ksi
H Pile
2810
Concrete Modulus, ksi
Shell/Casing
0
Ultimate Prestress, ksi
0
Prestress Modulus, ksi
Note: Grayed values are not applicable for
the defined material and can be activated
by editing the section contents.
Set concrete f'c to zero for no concrete.
OK
Cancel

Bent Cap

Default Stress/Strain Curves

Custom

Segment1

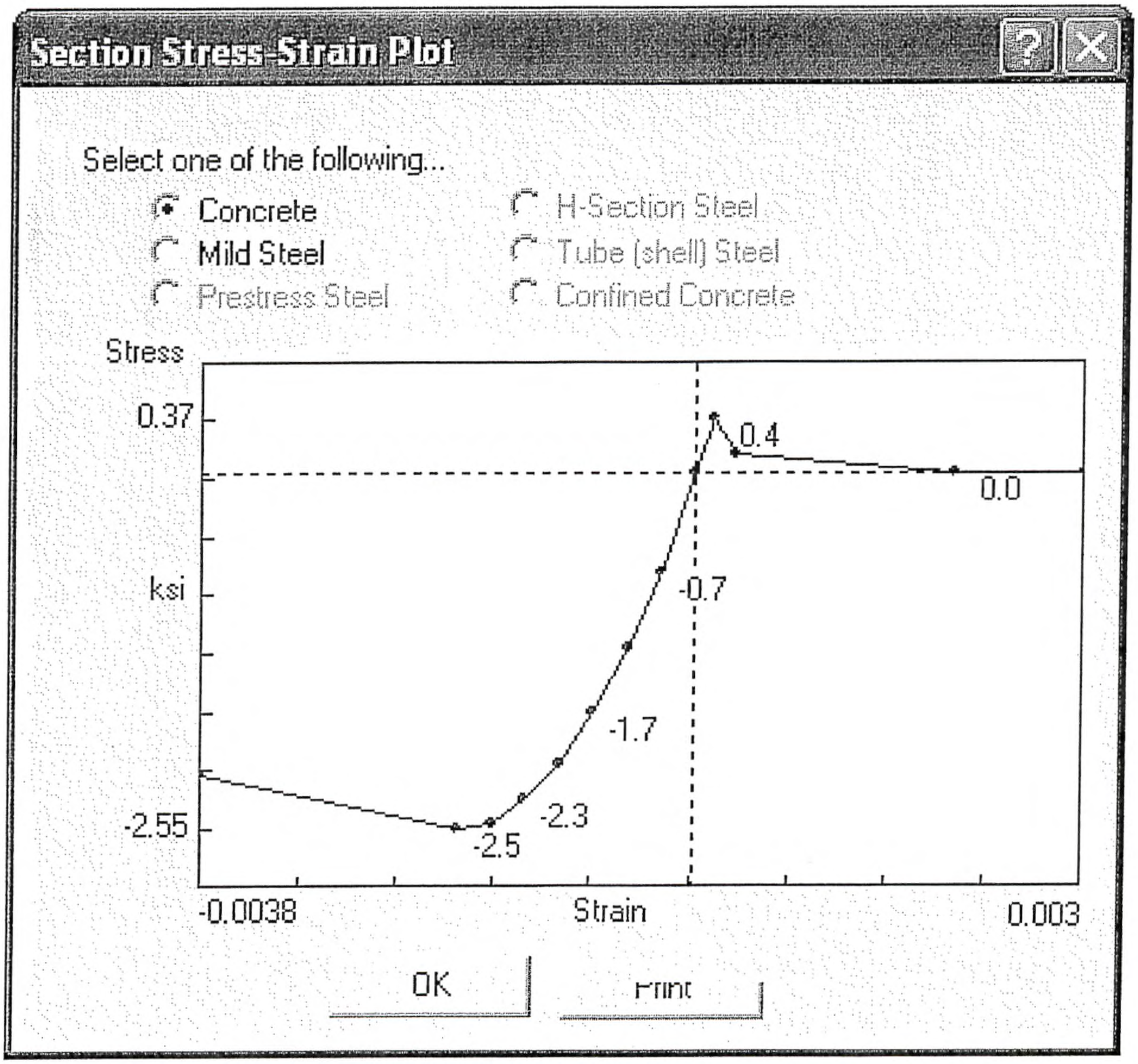
☑ Mild Steel	40	Yield Stress, ksi
☐ Prestress	29000	Modulus, ksi
☐ Concrete	3	f'c Compressive, ksi
☐ H Pile	2810	Concrete Modulus, ksi
☐ Shell/Casing	0	Ultimate Prestress, ksi
	0	Prestress Modulus, ksi

Note: Grayed values are not applicable for the defined material and can be activated by editing the section contents.

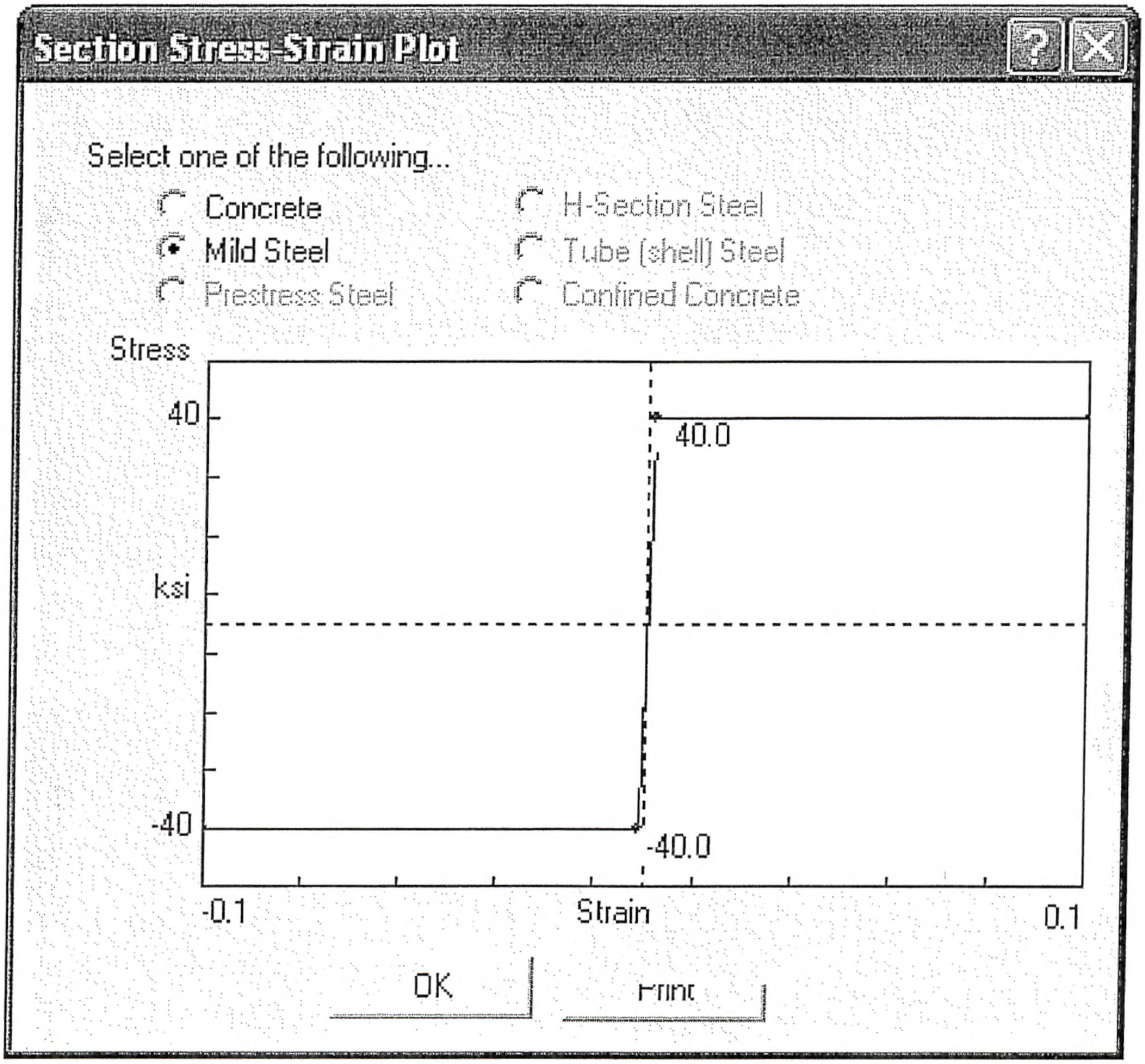
Set concrete f'c to zero for no concrete.

OK | Cancel

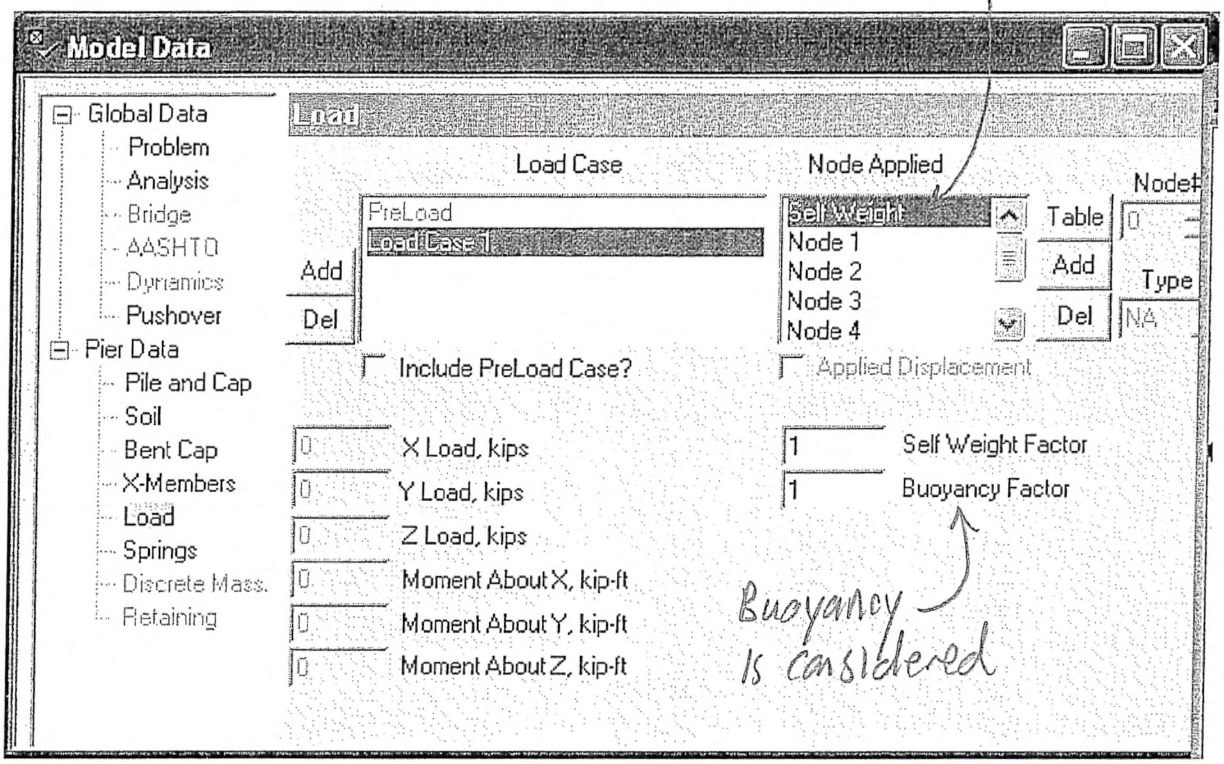
Bent Cap


Section Stress-Strain Plot
Select one of the following...
Concrete
Mild Steel
Prestress Steel
H-Section Steel
Tube (shell) Steel
Confined Concrete
Stress
0.37
ksi
-2.55
0.4
0.0
-0.7
-1.7
-2.3
-2.5
-0.0038
Strain
0.003
OK
Print

Bent Cap


Section Stress-Strain Plot
Select one of the following...
Concrete
Mild Steel
Prestress Steel
H-Section Steel
Tube (shell) Steel
Confined Concrete
Stress
40
ksi
-40
40.0
-40.0
-0.1
Strain
0.1
OK
Print

Self Wt. is for substructure only

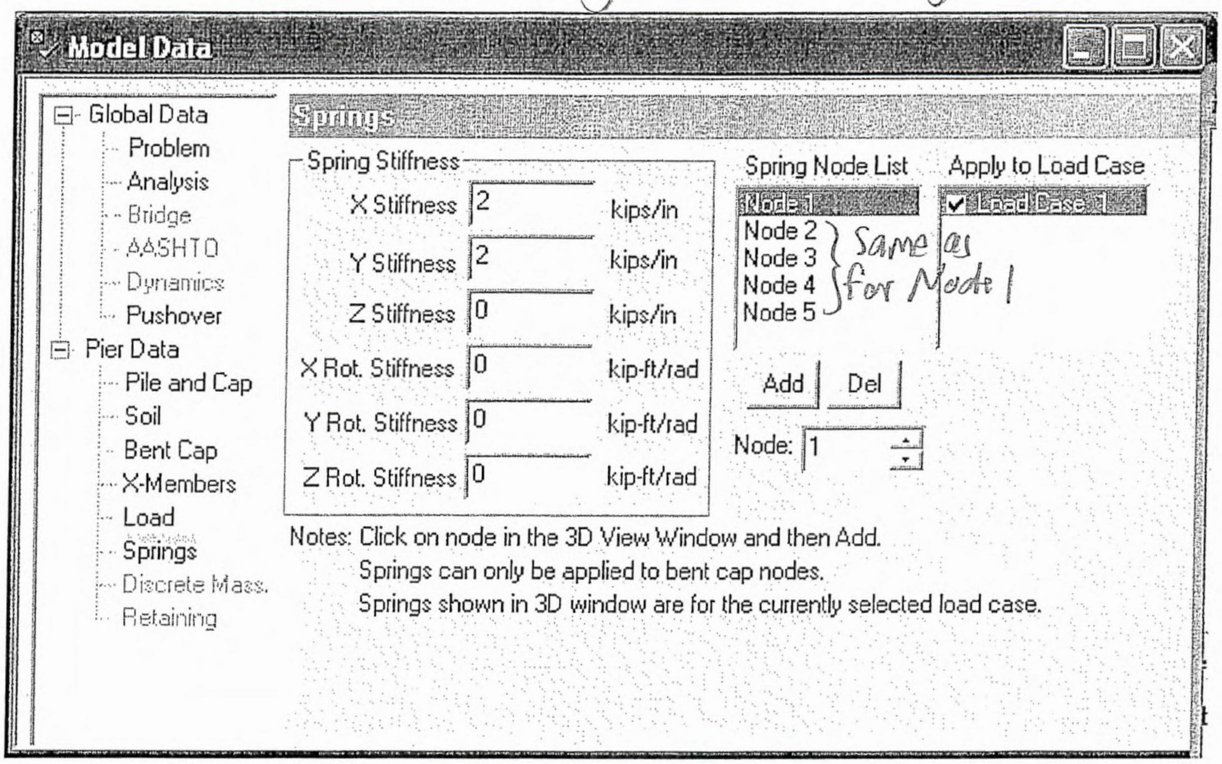


Load Case	Node	Force X	Force Y	Force Z	Moment X	Moment Y	Moment Z	Disp?
0	1	0.00	0.00	0.00	0.00	0.00	0.00	N/A
1	1	0.20	0.00	43.00	0.00	0.00	0.00	
1	2	0.20	0.00	37.00	0.00	0.00	0.00	
1	3	0.20	0.00	37.00	0.00	0.00	0.00	
1	4	0.20	0.00	37.00	0.00	0.00	0.00	
1	5	0.20	0.00	43.00	0.00	0.00	0.00	

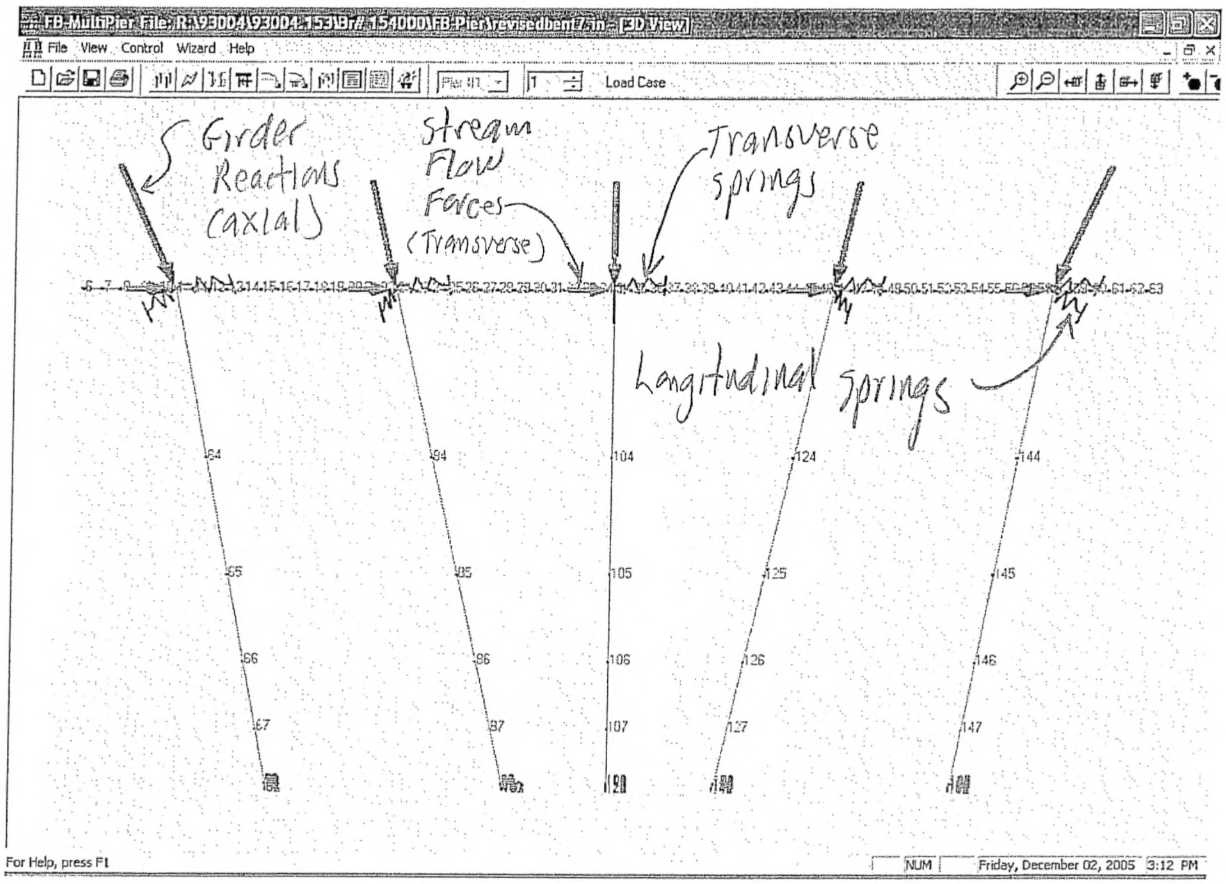
stream Flow Force

Beam reactions from Superstructure DL + LL.

- Springs represent the additional longitudinal + transverse stiffness provided by the superstructure through bearing on the bent cap. Helps resist cap displacements due to friction force along beam bearing locations.



Cap loads & spring locations shown.



```
!-------------------------------------------------------------!
!                                                             !
!        The University of Florida, Florida Department        !
!        of Transportation, Drs. Marc Hoit, Mike McVay        !
!        Cliff Hays Mark Williams and Petros Christou         !
!         disclaim any warranty, expressed or implied,        !
!          including but not limited to, any implied          !
!         warranty of fitness for a particular purpose        !
!            or accuracy of the FB-Pier software              !
!     The  developers shall not be liable for any damages     !
!          incurred through the use of FB-MultiPier           !
!                                                             !
!                                                             !
!             :::: F B - M U L T I P I E R ::::               !
!                 FB-MultiPier Version 4.06                   !
!                                                             !
!         Written by Marc Hoit, Mike McVay, Cliff Hays        !
!              Mark Williams, Petros Christou                 !
!                                                             !
!      Civil & Coastal Engineering, University of Florida     !
!      Supported by Florida Department of Transportation      !
!           and the Federal Highway Administration            !
!                                                             !
!            The program calculates the Response              !
!           of the Bridge Pier Pile Soil Structures           !
!                                                             !
!            The Analysis includes PreLoad, Static,           !
!         Dynamic (Response Spectrum or Time History)         !
!                        or Push Over                         !
!                                                             !
!          The Program Handles NonLinear Soil Behavior,       !
!  Linear Pile Cap and Linear and NonLinear Piles and Piers   !
!                                                             !
!                                                             !
!       Contact: Bridge Software Institute for Support        !
!               HTTP://BSI-WEB.CE.UFL.EDU                     !
!                                                             !
!-------------------------------------------------------------!
```

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Input File Data File : revisedbent7.in
Analysis Date        :12- 2-2005
License ID Number    : DEMO VERSION
```

Bent 7 - Axial + lateral loads at Top of Rock EL. -20.0'

```
********************
*   PROJECT DATA   *
********************

Project Client      : FDOT District 7
Project Name        : District Wide Scour Evaluations
Project Manager     : Tom Montgomery
Computed by         : RCR
Project Description : Bridge #154000, Bent 7


***************************************
*   SELECTIVE PRINT OUTPUT CONTROL    *
***************************************
                                          Print On
Pile and Bent Cap Coordinates              YES
Bent Cap Material Properties               YES
Pile Displacements                         YES
Out of Balance Forces                      YES
```

```
 Soil Response Forces                            YES
 Pile Element Forces                             YES
 Pile Cap Stress / Moment Output                 YES
 Bridge Simulation Spring Force Output           YES
 Interaction Diagram Data for Pile and Bent      YES
 Missing Pile ID Numbers                          NO
 Material Stress Strain Curve Data                NO


 *************
 *   UNITS   *
 *************

 Analysis Units Specified are: English Mixed (Kips & Ft some lbs & in)


 ***************************
 *   CONTROL INFORMATION   *
 ***************************

 Number of Piers                 (NUMPIERS) =    1
 Maximum Number of Iterations      (MAXITN) =  100
 Tolerance                          (TOLER) =    1.0000000     Kips

 Soil Behavior Option               (IFLEX) =    1
    IFLEX = 0 -> PY Multipliers are Input
    IFLEX = 1 -> PY Multipliers Defaulted to 1.0
    IFLEX = 2 -> No SOIL (Must use tip springs)

 Soil resistance due to Pile Rotation About 2 and 3 Axis (NSODF) =    4
    NSDOF = 4 -> NO Resistance Accounted
    NSDOF = 6 -> Resistance Accounted

 Linear Pile TIP Spring Option      (ITIP) =    0
    ITIP = 0 -> NO spring
    ITIP = 1 -> Axial only
    ITIP = 2 -> All DOF

 Linear Pile TIP Spring Stiffness (TSTIF) =          0.00 kips/in


 *********************
 *   SOIL BEHAVIOR   *
 *********************

 PY Multipliers will all be set to 1.0 (IFLEX = 1)
 Axial Efficiency for all piles  (AXEFF)  =  0.000


 ***************************************************
 *   LOAD FACTORS FOR SELF WEIGHT AND BUOYANCY    *
 ***************************************************

 LOAD CASE     SELF WEIGHT    BUOYANCY
     #            FACTOR        FACTOR
     1             1.00          1.00


 ***************************
 *   GENERAL INFORMATION   *
 ***************************

 Static / Cyclic Load (KCYC)       =     0
    KCYC = 0 -> Static Load
    KCKC > 0 -> Cyclic Load (# Cycles)
```

```
 Fixity of Pile Cap (KFIX)          =    1
    KFIX = 0 -> Pinned Head
    KFIX = 1 -> Fixed head

 Bearing of Cap on Soil             =  NO
```

```
*****************************
*   GRID DATA INFORMATION   *
*****************************
```

NOTE: X-Grid : Distance between axes along the X-Axis
      Y-Grid : Distance between axes along the Y-Axis

Number of Grid Points in X-Direction (NPX) = 5
Number of Grid Points in X-Direction (NPY) = 1

Grid Spacing in the X Direction : (inches)

72.00	72.00	72.00	72.00

Grid Spacing in the Y Direction : (inches)

No Y-Grid Spacing : One Pile

```
************************
*   ANALYSIS OPTIONS   *
************************
```

Type of Stiffness = Secant Stiffness
Type of Structure = Full
Type of Analysis = Static Analysis

```
****************************************
*   INPUT SOIL DATA - GIVEN BY LAYER   *
****************************************
```

NOTE : The following data is used to define Springs
for each Soil Layer to determine the Soil
Behavior during the analysis

LAYERED P-Y CURVES

SET	LAYER	MODEL	PHI (DEG)	RK lbs/in^3	GAMMA pcf
1	1	2	0.3800E+02	0.1500E+03	0.1250E+03
			0.3800E+02	0.1500E+03	0.1250E+03

LAYERED T-Z CURVES

SET	LAYER	MODEL	SHEAR M. ksi	POIS.R.	TAU MAX psf	ELEVATION ft	Elev. Piez. ft
1	1	1	35.00	0.3000	2000.	-20.00	8.800
			35.00	0.3000	2000.	-35.00	8.800

LAYERED T-Theta CURVES

SET	LAYER	MODEL	SHEAR M. ksi	TAU MAX psf
1	1	1	0.3500E+02	0.2000E+04

0.3500E+02 0.2000E+04

PILE TIP SOIL PARAMETERS

SOIL SET # 1

Shear Modulus at Tip = 35.00 ksi
Poisson"s Ratio at Pile Tip = 0.3000
Vertical Bearing Failure Load at Tip = 500.0000 Kips

```
**************************************
*   PILE SEGMENT INFORMATION DATA    *
**************************************
```

NOTE: The Piles Sets consist of Pile Segments based on the User Input. The program groups all segments from all the different Pile Sets and assigns a reference number to each

The reference number for each segment together with the User Input Pile Set/Segment number is shown below. The Input section properties for each section/segment is also provided below.

The user is advised to double check these numbers

Number of segments found in all Piles (NPSEG) = 2

```
----------------------------------------------
! -> SECTION DATA FOR SECTION/SEGMENT :   1  !
----------------------------------------------
```

Input Pile Set Number = 1
Input Pile Set Segment = 1

Section Pile Length (L) = 30.184000 ft

Nonlinear Section/Segment Material Properties

Material Option (MATOPT) = 1
(Please Refer to the Users Guide for Details)

- Concrete Stress Strain Properties

Concrete Strength (FPC) = 0.5000E+01 ksi
Modulus of Elasticity (EC) = 0.3627E+04 ksi

Number of Gauss Integration Points for Concrete = 9

- Steel Stress Strain Properties

Prestressing Ultimate Stress = 0.270E+03 ksi
Modulus of Elasticity = 0.2850E+05 ksi

- Miscellaneous Properties

Section/Segment Width = 14.0000 in
Section/Segment Depth = 14.0000 in
Void Diameter = 0.0000 in
Weight Density = 150.0000 pcf

- Shape of Section : USER SPECIFIED (ISTNOPT) = 2

- Total Area of Steel Reinforcement = 0.86 in^2
  Position of Steel Reinforcement in the Section (NS) = 8 Strands

22	33	AS	PRESTRESS
in	in	in^2	ksi
3.500	3.500	0.108	130.000
-3.500	3.500	0.108	130.000
0.000	3.500	0.108	130.000
3.500	-3.500	0.108	130.000
-3.500	-3.500	0.108	130.000
0.000	-3.500	0.108	130.000
3.500	0.000	0.108	130.000
-3.500	0.000	0.108	130.000

! -> SECTION DATA FOR SECTION/SEGMENT : 2 !

Input Pile Set Number = 2
Input Pile Set Segment = 1

Section Pile Length (L) = 30.184000 ft

Nonlinear Section/Segment Material Properties

Material Option (MATOPT) = 1
(Please Refer to the Users Guide for Details)

- Steel Stress Strain Properties

  H-Pile Yield Stress (FY) = 60.00 ksi
  Modulus of Elasticity (ES) = 0.2900E+05 ksi

- Shape of Section : USER DEFINED H-PILE
  Units are in in
  Orientation : OR = 2 Web along 2 axis
  OR = 3 Web along 3 axis

Depth	Width	Web Width	Flange Width	Orientation
13.6	14.6	0.505	0.505	3

- Battered Pile Specification

PILE	X-BAT	Y-BAT
1	-0.25	0.00
5	0.25	0.00

****
* INPUT SOIL DATA PER NODE ALONG THE PILE *
****

PLOT OF THE PY CURVE FOR EVERY NODE OF THE PILE IN THE SOIL

Pile # 1

- USER SOIL INPUT DATA FOR PY CURVES

NOTE : The Py curves to be used in the analysis are
based on the data below provided by the user
For more information refer to the Users Guide

NODE	PHI	K	GAMMA	CU	E50	E100	qu
	(DEG)	Lbs/in^3	lb/ft^3	psf	ft/ft	ft/ft	ksi
6	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
11	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
13	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
14	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
16	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
17	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
21	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Pile # 2

- USER SOIL INPUT DATA FOR PY CURVES

NOTE : The Py curves to be used in the analysis are
based on the data below provided by the user
For more information refer to the Users Guide

NODE	PHI	K	GAMMA	CU	E50	E100	qu
	(DEG)	Lbs/in^3	lb/ft^3	psf	ft/ft	ft/ft	ksi
6	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

11	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
13	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
14	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
16	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
17	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
21	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Pile # 3

- USER SOIL INPUT DATA FOR PY CURVES

NOTE : The Py curves to be used in the analysis are
based on the data below provided by the user
For more information refer to the Users Guide

NODE	PHI	K	GAMMA	CU	E50	E100	qu
	(DEG)	Lbs/in^3	lb/ft^3	psf	ft/ft	ft/ft	ksi
6	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
11	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
13	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
14	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
16	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
17	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

```
  20     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  21     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
```

Pile #   4

- USER SOIL INPUT DATA FOR PY CURVES

  NOTE : The Py curves to be used in the analysis are
         based on the data below provided by the user
         For more information refer to the Users Guide

```
 NODE       PHI          K           GAMMA         CU          E50         E100
qu
           (DEG)      Lbs/in^3     lb/ft^3        psf         ft/ft       ft/ft
ksi
   6     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
   7     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
   8     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
   9     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  10     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  11     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  12     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  13     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  14     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  15     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  16     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  17     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  18     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  19     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  20     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  21     0.3800E+02  0.1500E+03  0.1250E+03  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
```

Pile #   5

- USER SOIL INPUT DATA FOR PY CURVES

  NOTE : The Py curves to be used in the analysis are
         based on the data below provided by the user
         For more information refer to the Users Guide

```
 NODE       PHI          K           GAMMA         CU          E50         E100
qu
```

	(DEG)	Lbs/in^3	lb/ft^3	psf	ft/ft	ft/ft	ksi
6	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
11	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
13	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
14	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
16	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
17	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
18	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
19	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
21	0.3800E+02	0.1500E+03	0.1250E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

PLOT OF THE TZ CURVE FOR EVERY NODE OF THE PILE IN THE SOIL

Pile #   1

- USER SOIL INPUT DATA FOR TZ CURVES

NOTE : The TZ curves to be used in the analysis are
       based on the data below provided by the user
       For more information refer to the Users Guide

NODE	Gi ksi	POISSONS R.	TAU MAX psf
6	0.3500E+02	0.3000E+00	0.2000E+04
7	0.3500E+02	0.3000E+00	0.2000E+04
8	0.3500E+02	0.3000E+00	0.2000E+04
9	0.3500E+02	0.3000E+00	0.2000E+04
10	0.3500E+02	0.3000E+00	0.2000E+04
11	0.3500E+02	0.3000E+00	0.2000E+04
12	0.3500E+02	0.3000E+00	0.2000E+04
13	0.3500E+02	0.3000E+00	0.2000E+04
14	0.3500E+02	0.3000E+00	0.2000E+04
15	0.3500E+02	0.3000E+00	0.2000E+04
16	0.3500E+02	0.3000E+00	0.2000E+04
17	0.3500E+02	0.3000E+00	0.2000E+04
18	0.3500E+02	0.3000E+00	0.2000E+04
19	0.3500E+02	0.3000E+00	0.2000E+04

20	0.3500E+02	0.3000E+00	0.2000E+04
21	0.3500E+02	0.3000E+00	0.2000E+04

Pile # 2

- USER SOIL INPUT DATA FOR TZ CURVES

NOTE : The TZ curves to be used in the analysis are
based on the data below provided by the user
For more information refer to the Users Guide

NODE	Gi ksi	POISSONS R.	TAU MAX psf
6	0.3500E+02	0.3000E+00	0.2000E+04
7	0.3500E+02	0.3000E+00	0.2000E+04
8	0.3500E+02	0.3000E+00	0.2000E+04
9	0.3500E+02	0.3000E+00	0.2000E+04
10	0.3500E+02	0.3000E+00	0.2000E+04
11	0.3500E+02	0.3000E+00	0.2000E+04
12	0.3500E+02	0.3000E+00	0.2000E+04
13	0.3500E+02	0.3000E+00	0.2000E+04
14	0.3500E+02	0.3000E+00	0.2000E+04
15	0.3500E+02	0.3000E+00	0.2000E+04
16	0.3500E+02	0.3000E+00	0.2000E+04
17	0.3500E+02	0.3000E+00	0.2000E+04
18	0.3500E+02	0.3000E+00	0.2000E+04
19	0.3500E+02	0.3000E+00	0.2000E+04
20	0.3500E+02	0.3000E+00	0.2000E+04
21	0.3500E+02	0.3000E+00	0.2000E+04

Pile # 3

- USER SOIL INPUT DATA FOR TZ CURVES

NOTE : The TZ curves to be used in the analysis are
based on the data below provided by the user
For more information refer to the Users Guide

NODE	Gi ksi	POISSONS R.	TAU MAX psf
6	0.3500E+02	0.3000E+00	0.2000E+04
7	0.3500E+02	0.3000E+00	0.2000E+04
8	0.3500E+02	0.3000E+00	0.2000E+04
9	0.3500E+02	0.3000E+00	0.2000E+04
10	0.3500E+02	0.3000E+00	0.2000E+04
11	0.3500E+02	0.3000E+00	0.2000E+04
12	0.3500E+02	0.3000E+00	0.2000E+04
13	0.3500E+02	0.3000E+00	0.2000E+04
14	0.3500E+02	0.3000E+00	0.2000E+04
15	0.3500E+02	0.3000E+00	0.2000E+04
16	0.3500E+02	0.3000E+00	0.2000E+04
17	0.3500E+02	0.3000E+00	0.2000E+04
18	0.3500E+02	0.3000E+00	0.2000E+04
19	0.3500E+02	0.3000E+00	0.2000E+04
20	0.3500E+02	0.3000E+00	0.2000E+04
21	0.3500E+02	0.3000E+00	0.2000E+04

Pile # 4

- USER SOIL INPUT DATA FOR TZ CURVES

NOTE : The TZ curves to be used in the analysis are based on the data below provided by the user For more information refer to the Users Guide

NODE	Gi ksi	POISSONS R.	TAU MAX psf
6	0.3500E+02	0.3000E+00	0.2000E+04
7	0.3500E+02	0.3000E+00	0.2000E+04
8	0.3500E+02	0.3000E+00	0.2000E+04
9	0.3500E+02	0.3000E+00	0.2000E+04
10	0.3500E+02	0.3000E+00	0.2000E+04
11	0.3500E+02	0.3000E+00	0.2000E+04
12	0.3500E+02	0.3000E+00	0.2000E+04
13	0.3500E+02	0.3000E+00	0.2000E+04
14	0.3500E+02	0.3000E+00	0.2000E+04
15	0.3500E+02	0.3000E+00	0.2000E+04
16	0.3500E+02	0.3000E+00	0.2000E+04
17	0.3500E+02	0.3000E+00	0.2000E+04
18	0.3500E+02	0.3000E+00	0.2000E+04
19	0.3500E+02	0.3000E+00	0.2000E+04
20	0.3500E+02	0.3000E+00	0.2000E+04
21	0.3500E+02	0.3000E+00	0.2000E+04

Pile # 5

- USER SOIL INPUT DATA FOR TZ CURVES

NOTE : The TZ curves to be used in the analysis are based on the data below provided by the user For more information refer to the Users Guide

NODE	Gi ksi	POISSONS R.	TAU MAX psf
6	0.3500E+02	0.3000E+00	0.2000E+04
7	0.3500E+02	0.3000E+00	0.2000E+04
8	0.3500E+02	0.3000E+00	0.2000E+04
9	0.3500E+02	0.3000E+00	0.2000E+04
10	0.3500E+02	0.3000E+00	0.2000E+04
11	0.3500E+02	0.3000E+00	0.2000E+04
12	0.3500E+02	0.3000E+00	0.2000E+04
13	0.3500E+02	0.3000E+00	0.2000E+04
14	0.3500E+02	0.3000E+00	0.2000E+04
15	0.3500E+02	0.3000E+00	0.2000E+04
16	0.3500E+02	0.3000E+00	0.2000E+04
17	0.3500E+02	0.3000E+00	0.2000E+04
18	0.3500E+02	0.3000E+00	0.2000E+04
19	0.3500E+02	0.3000E+00	0.2000E+04
20	0.3500E+02	0.3000E+00	0.2000E+04
21	0.3500E+02	0.3000E+00	0.2000E+04

PLOT OF THE T-Theta CURVE FOR EVERY NODE OF THE PILE IN THE SOIL

Pile # 1

- USER SOIL INPUT DATA FOR T-Theta CURVES

NOTE : The T-Theta curves to be used in the analysis are based on the data below provided by the user. For more information refer to the Users Guide

NODE	Gi ksi	TAU MAX psf
6	0.3500E+02	0.2000E+04
7	0.3500E+02	0.2000E+04
8	0.3500E+02	0.2000E+04
9	0.3500E+02	0.2000E+04
10	0.3500E+02	0.2000E+04
11	0.3500E+02	0.2000E+04
12	0.3500E+02	0.2000E+04
13	0.3500E+02	0.2000E+04
14	0.3500E+02	0.2000E+04
15	0.3500E+02	0.2000E+04
16	0.3500E+02	0.2000E+04
17	0.3500E+02	0.2000E+04
18	0.3500E+02	0.2000E+04
19	0.3500E+02	0.2000E+04
20	0.3500E+02	0.2000E+04
21	0.3500E+02	0.2000E+04

Pile # 2

- USER SOIL INPUT DATA FOR T-Theta CURVES

NOTE : The T-Theta curves to be used in the analysis are based on the data below provided by the user. For more information refer to the Users Guide

NODE	Gi ksi	TAU MAX psf
6	0.3500E+02	0.2000E+04
7	0.3500E+02	0.2000E+04
8	0.3500E+02	0.2000E+04
9	0.3500E+02	0.2000E+04
10	0.3500E+02	0.2000E+04
11	0.3500E+02	0.2000E+04
12	0.3500E+02	0.2000E+04
13	0.3500E+02	0.2000E+04
14	0.3500E+02	0.2000E+04
15	0.3500E+02	0.2000E+04
16	0.3500E+02	0.2000E+04
17	0.3500E+02	0.2000E+04
18	0.3500E+02	0.2000E+04
19	0.3500E+02	0.2000E+04
20	0.3500E+02	0.2000E+04
21	0.3500E+02	0.2000E+04

Pile # 3

- USER SOIL INPUT DATA FOR T-Theta CURVES

NOTE : The T-Theta curves to be used in the analysis are based on the data below provided by the

user. For more information refer to the
Users Guide

NODE	Gi ksi	TAU MAX psf
6	0.3500E+02	0.2000E+04
7	0.3500E+02	0.2000E+04
8	0.3500E+02	0.2000E+04
9	0.3500E+02	0.2000E+04
10	0.3500E+02	0.2000E+04
11	0.3500E+02	0.2000E+04
12	0.3500E+02	0.2000E+04
13	0.3500E+02	0.2000E+04
14	0.3500E+02	0.2000E+04
15	0.3500E+02	0.2000E+04
16	0.3500E+02	0.2000E+04
17	0.3500E+02	0.2000E+04
18	0.3500E+02	0.2000E+04
19	0.3500E+02	0.2000E+04
20	0.3500E+02	0.2000E+04
21	0.3500E+02	0.2000E+04

Pile # 4

- USER SOIL INPUT DATA FOR T-Theta CURVES

NOTE : The T-Theta curves to be used in the analysis
are based on the data below provided by the
user. For more information refer to the
Users Guide

NODE	Gi ksi	TAU MAX psf
6	0.3500E+02	0.2000E+04
7	0.3500E+02	0.2000E+04
8	0.3500E+02	0.2000E+04
9	0.3500E+02	0.2000E+04
10	0.3500E+02	0.2000E+04
11	0.3500E+02	0.2000E+04
12	0.3500E+02	0.2000E+04
13	0.3500E+02	0.2000E+04
14	0.3500E+02	0.2000E+04
15	0.3500E+02	0.2000E+04
16	0.3500E+02	0.2000E+04
17	0.3500E+02	0.2000E+04
18	0.3500E+02	0.2000E+04
19	0.3500E+02	0.2000E+04
20	0.3500E+02	0.2000E+04
21	0.3500E+02	0.2000E+04

Pile # 5

- USER SOIL INPUT DATA FOR T-Theta CURVES

NOTE : The T-Theta curves to be used in the analysis
are based on the data below provided by the
user. For more information refer to the
Users Guide

NODE	Gi	TAU MAX

	ksi	psf
6	0.3500E+02	0.2000E+04
7	0.3500E+02	0.2000E+04
8	0.3500E+02	0.2000E+04
9	0.3500E+02	0.2000E+04
10	0.3500E+02	0.2000E+04
11	0.3500E+02	0.2000E+04
12	0.3500E+02	0.2000E+04
13	0.3500E+02	0.2000E+04
14	0.3500E+02	0.2000E+04
15	0.3500E+02	0.2000E+04
16	0.3500E+02	0.2000E+04
17	0.3500E+02	0.2000E+04
18	0.3500E+02	0.2000E+04
19	0.3500E+02	0.2000E+04
20	0.3500E+02	0.2000E+04
21	0.3500E+02	0.2000E+04

```
**********************************
*   PILE SET DATA DESCRIPTION    *
**********************************
```

NOTE : The piles are organised in pile sets. Each pile set is composed of pile segments that are input by the User. A pile set is attached to each pile in order to describe its composition

List of Piles Sets and Piles

Pile Set	Piles (that are assigned the Pile Set)
1	1, 2, 3, 4, 5
2	

Total Length for Each Pile Set

Pile Set	Length
1	362.21
2	362.21

```
**************************************
*   INPUT FOR STRUCTURAL ANALYSIS    *
**************************************
```

```
Number of Joints                   =  63
Number of Different Element Types  =   3
Number of Load Conditions          =   1
```

```
*******************************************
*   GENERAL PILE BENT INFORMATION DATA    *
*******************************************
```

```
Structure Type                            = PILE BENT STRUCTURE
Number of Piles                           =          5
Number of Elements per Span               =         13
Length of Bent Cap Cantilevers            =      2.500 (ft)
Number of Elements per Cantilever         =          5
Number of Bearing Locations Specified     =          5
Offset from the Left Pile to Left-Most
Bearing Location                          =      0.000 (ft)
Spacing Between Bearing Locations (ft)
```

1 and	2	=	6.00
2 and	3	=	6.00
3 and	4	=	6.00
4 and	5	=	6.00

```
*****************************
*   PILE SPATIAL GEOMETRY   *
*****************************
```

PILE #	X	Y
1	0.000	0.000
2	72.000	0.000
3	144.000	0.000
4	216.000	0.000
5	288.000	0.000

```
*************************
*   NODAL INFORMATION   *
*************************
```

NOTE : This section provides the Nodal Information for each element. The information is provided for each Element separately

NODE NUMBER	BOUNDARY CONDITION CODES X	Y	Z	Rx	Ry	Rz	NODAL COORDINATES (units are: in) X	Y	Z

- Nodal Coordinates for Pile # 1
  Z - Coordinate of Soil Surface = -20.000 (ft)

NODE NUMBER	X	Y	Z	Rx	Ry	Rz	X	Y	Z
1	R	R	R	R	R	R	0.00000	0.00000	-110.21
64	R	R	R	R	R	R	-17.510	0.00000	-40.166
65	R	R	R	R	R	R	-35.021	0.00000	29.875
66	R	R	R	R	R	R	-52.531	0.00000	99.917
67	R	R	R	R	R	R	-70.042	0.00000	169.96
68	R	R	R	R	R	R	-87.552	0.00000	240.00
69	R	R	R	R	R	R	-87.572	0.00000	240.08
70	R	R	R	R	R	R	-87.592	0.00000	240.16
71	R	R	R	R	R	R	-87.611	0.00000	240.24
72	R	R	R	R	R	R	-87.631	0.00000	240.32
73	R	R	R	R	R	R	-87.651	0.00000	240.40
74	R	R	R	R	R	R	-87.671	0.00000	240.47
75	R	R	R	R	R	R	-87.690	0.00000	240.55
76	R	R	R	R	R	R	-87.710	0.00000	240.63
77	R	R	R	R	R	R	-87.730	0.00000	240.71
78	R	R	R	R	R	R	-87.750	0.00000	240.79
79	R	R	R	R	R	R	-87.769	0.00000	240.87
80	R	R	R	R	R	R	-87.789	0.00000	240.95
81	R	R	R	R	R	R	-87.809	0.00000	241.03
82	R	R	R	R	R	R	-87.829	0.00000	241.11
83	R	R	R	R	R	R	-87.848	0.00000	241.19

- Nodal Coordinates for Pile # 2
  Z - Coordinate of Soil Surface = -20.000 (ft)

NODE NUMBER	X	Y	Z	Rx	Ry	Rz	X	Y	Z
2	R	R	R	R	R	R	72.000	0.00000	-110.21
84	R	R	R	R	R	R	72.000	0.00000	-40.166
85	R	R	R	R	R	R	72.000	0.00000	29.875
86	R	R	R	R	R	R	72.000	0.00000	99.917
87	R	R	R	R	R	R	72.000	0.00000	169.96
88	R	R	R	R	R	R	72.000	0.00000	240.00
89	R	R	R	R	R	R	72.000	0.00000	240.80
90	R	R	R	R	R	R	72.000	0.00000	241.60

91	R	R	R	R	R	R	72.000	0.00000	242.40
92	R	R	R	R	R	R	72.000	0.00000	243.20
93	R	R	R	R	R	R	72.000	0.00000	244.00
94	R	R	R	R	R	R	72.000	0.00000	244.80
95	R	R	R	R	R	R	72.000	0.00000	245.60
96	R	R	R	R	R	R	72.000	0.00000	246.40
97	R	R	R	R	R	R	72.000	0.00000	247.20
98	R	R	R	R	R	R	72.000	0.00000	248.00
99	R	R	R	R	R	R	72.000	0.00000	248.80
100	R	R	R	R	R	R	72.000	0.00000	249.60
101	R	R	R	R	R	R	72.000	0.00000	250.40
102	R	R	R	R	R	R	72.000	0.00000	251.20
103	R	R	R	R	R	R	72.000	0.00000	252.00

- Nodal Coordinates for Pile # 3
  Z - Coordinate of Soil Surface = -20.000 (ft)

3	R	R	R	R	R	R	144.00	0.00000	-110.21
104	R	R	R	R	R	R	144.00	0.00000	-40.166
105	R	R	R	R	R	R	144.00	0.00000	29.875
106	R	R	R	R	R	R	144.00	0.00000	99.917
107	R	R	R	R	R	R	144.00	0.00000	169.96
108	R	R	R	R	R	R	144.00	0.00000	240.00
109	R	R	R	R	R	R	144.00	0.00000	240.80
110	R	R	R	R	R	R	144.00	0.00000	241.60
111	R	R	R	R	R	R	144.00	0.00000	242.40
112	R	R	R	R	R	R	144.00	0.00000	243.20
113	R	R	R	R	R	R	144.00	0.00000	244.00
114	R	R	R	R	R	R	144.00	0.00000	244.80
115	R	R	R	R	R	R	144.00	0.00000	245.60
116	R	R	R	R	R	R	144.00	0.00000	246.40
117	R	R	R	R	R	R	144.00	0.00000	247.20
118	R	R	R	R	R	R	144.00	0.00000	248.00
119	R	R	R	R	R	R	144.00	0.00000	248.80
120	R	R	R	R	R	R	144.00	0.00000	249.60
121	R	R	R	R	R	R	144.00	0.00000	250.40
122	R	R	R	R	R	R	144.00	0.00000	251.20
123	R	R	R	R	R	R	144.00	0.00000	252.00

- Nodal Coordinates for Pile # 4
  Z - Coordinate of Soil Surface = -20.000 (ft)

4	R	R	R	R	R	R	216.00	0.00000	-110.21
124	R	R	R	R	R	R	216.00	0.00000	-40.166
125	R	R	R	R	R	R	216.00	0.00000	29.875
126	R	R	R	R	R	R	216.00	0.00000	99.917
127	R	R	R	R	R	R	216.00	0.00000	169.96
128	R	R	R	R	R	R	216.00	0.00000	240.00
129	R	R	R	R	R	R	216.00	0.00000	240.80
130	R	R	R	R	R	R	216.00	0.00000	241.60
131	R	R	R	R	R	R	216.00	0.00000	242.40
132	R	R	R	R	R	R	216.00	0.00000	243.20
133	R	R	R	R	R	R	216.00	0.00000	244.00
134	R	R	R	R	R	R	216.00	0.00000	244.80
135	R	R	R	R	R	R	216.00	0.00000	245.60
136	R	R	R	R	R	R	216.00	0.00000	246.40
137	R	R	R	R	R	R	216.00	0.00000	247.20
138	R	R	R	R	R	R	216.00	0.00000	248.00
139	R	R	R	R	R	R	216.00	0.00000	248.80
140	R	R	R	R	R	R	216.00	0.00000	249.60
141	R	R	R	R	R	R	216.00	0.00000	250.40
142	R	R	R	R	R	R	216.00	0.00000	251.20
143	R	R	R	R	R	R	216.00	0.00000	252.00

- Nodal Coordinates for Pile # 5
  Z - Coordinate of Soil Surface = -20.000 (ft)

5	R	R	R	R	R	R	288.00	0.00000	-110.21
144	R	R	R	R	R	R	305.51	0.00000	-40.166
145	R	R	R	R	R	R	323.02	0.00000	29.875
146	R	R	R	R	R	R	340.53	0.00000	99.917
147	R	R	R	R	R	R	358.04	0.00000	169.96
148	R	R	R	R	R	R	375.55	0.00000	240.00
149	R	R	R	R	R	R	375.57	0.00000	240.08
150	R	R	R	R	R	R	375.59	0.00000	240.16
151	R	R	R	R	R	R	375.61	0.00000	240.24
152	R	R	R	R	R	R	375.63	0.00000	240.32
153	R	R	R	R	R	R	375.65	0.00000	240.40
154	R	R	R	R	R	R	375.67	0.00000	240.47
155	R	R	R	R	R	R	375.69	0.00000	240.55
156	R	R	R	R	R	R	375.71	0.00000	240.63
157	R	R	R	R	R	R	375.73	0.00000	240.71
158	R	R	R	R	R	R	375.75	0.00000	240.79
159	R	R	R	R	R	R	375.77	0.00000	240.87
160	R	R	R	R	R	R	375.79	0.00000	240.95
161	R	R	R	R	R	R	375.81	0.00000	241.03
162	R	R	R	R	R	R	375.83	0.00000	241.11
163	R	R	R	R	R	R	375.85	0.00000	241.19

- Pier Coordinates

6	R	R	R	R	R	R	-30.000	0.00000	-110.21
7	R	R	R	R	R	R	-24.000	0.00000	-110.21
8	R	R	R	R	R	R	-18.000	0.00000	-110.21
9	R	R	R	R	R	R	-12.000	0.00000	-110.21
10	R	R	R	R	R	R	-6.0000	0.00000	-110.21
11	R	R	R	R	R	R	5.5385	0.00000	-110.21
12	R	R	R	R	R	R	11.077	0.00000	-110.21
13	R	R	R	R	R	R	16.615	0.00000	-110.21
14	R	R	R	R	R	R	22.154	0.00000	-110.21
15	R	R	R	R	R	R	27.692	0.00000	-110.21
16	R	R	R	R	R	R	33.231	0.00000	-110.21
17	R	R	R	R	R	R	38.769	0.00000	-110.21
18	R	R	R	R	R	R	44.308	0.00000	-110.21
19	R	R	R	R	R	R	49.846	0.00000	-110.21
20	R	R	R	R	R	R	55.385	0.00000	-110.21
21	R	R	R	R	R	R	60.923	0.00000	-110.21
22	R	R	R	R	R	R	66.462	0.00000	-110.21
23	R	R	R	R	R	R	77.538	0.00000	-110.21
24	R	R	R	R	R	R	83.077	0.00000	-110.21
25	R	R	R	R	R	R	88.615	0.00000	-110.21
26	R	R	R	R	R	R	94.154	0.00000	-110.21
27	R	R	R	R	R	R	99.692	0.00000	-110.21
28	R	R	R	R	R	R	105.23	0.00000	-110.21
29	R	R	R	R	R	R	110.77	0.00000	-110.21
30	R	R	R	R	R	R	116.31	0.00000	-110.21
31	R	R	R	R	R	R	121.85	0.00000	-110.21
32	R	R	R	R	R	R	127.38	0.00000	-110.21
33	R	R	R	R	R	R	132.92	0.00000	-110.21
34	R	R	R	R	R	R	138.46	0.00000	-110.21
35	R	R	R	R	R	R	149.54	0.00000	-110.21
36	R	R	R	R	R	R	155.08	0.00000	-110.21
37	R	R	R	R	R	R	160.62	0.00000	-110.21
38	R	R	R	R	R	R	166.15	0.00000	-110.21
39	R	R	R	R	R	R	171.69	0.00000	-110.21
40	R	R	R	R	R	R	177.23	0.00000	-110.21
41	R	R	R	R	R	R	182.77	0.00000	-110.21
42	R	R	R	R	R	R	188.31	0.00000	-110.21
43	R	R	R	R	R	R	193.85	0.00000	-110.21
44	R	R	R	R	R	R	199.38	0.00000	-110.21
45	R	R	R	R	R	R	204.92	0.00000	-110.21
46	R	R	R	R	R	R	210.46	0.00000	-110.21

47	R	R	R	R	R	R	221.54	0.00000	-110.21
48	R	R	R	R	R	R	227.08	0.00000	-110.21
49	R	R	R	R	R	R	232.62	0.00000	-110.21
50	R	R	R	R	R	R	238.15	0.00000	-110.21
51	R	R	R	R	R	R	243.69	0.00000	-110.21
52	R	R	R	R	R	R	249.23	0.00000	-110.21
53	R	R	R	R	R	R	254.77	0.00000	-110.21
54	R	R	R	R	R	R	260.31	0.00000	-110.21
55	R	R	R	R	R	R	265.85	0.00000	-110.21
56	R	R	R	R	R	R	271.38	0.00000	-110.21
57	R	R	R	R	R	R	276.92	0.00000	-110.21
58	R	R	R	R	R	R	282.46	0.00000	-110.21
59	R	R	R	R	R	R	294.00	0.00000	-110.21
60	R	R	R	R	R	R	300.00	0.00000	-110.21
61	R	R	R	R	R	R	306.00	0.00000	-110.21
62	R	R	R	R	R	R	312.00	0.00000	-110.21
63	R	R	R	R	R	R	318.00	0.00000	-110.21

```
**************************************************
*   MATERIAL PROPERTIES FOR BENT CAP ELEMENTS   *
**************************************************

---------------------------------------
! -> PROPERTIES FOR BENT CAP (BEAMS) !
---------------------------------------

-> SECTION DATA FOR SECTION/SEGMENT :   3

Nonlinear Section/Segment Material Properties
_____________________________________________

Material Option (MATOPT) =   1
(Please Refer to the Users Guide for Details)

- Concrete Stress Strain Properties

  Concrete Strength     (FPC) = 0.3000E+01 ksi
  Modulus of Elasticity (EC)  = 0.2810E+04 ksi

  Number of Gauss Integration Points for Concrete =  9

- Steel Stress Strain Properties

  Mild Steel Yield Stress  (FY) =  0.400E+02 ksi
  Modulus of Elasticity    (ES) = 0.2900E+05 ksi


- Miscellaneous Properties
  Section/Segment Width  =    24.0000 in
  Section/Segment Depth  =    24.0000 in
  Void Diameter          =     0.0000 in
  Weight Density         =   150.0000 pcf

- Shape of Section : USER SPECIFIED (ISTNOPT) =   2

- Total Area of Steel Reinforcement  =   9.76 in^2
  Position of Steel Reinforcement in the Section (NS) =  12 Bars
```

22 in	33 in	AS in^2	PRESTRESS ksi
-8.875	-8.875	1.000	0.000
-8.875	8.875	1.000	0.000
-8.875	2.958	1.000	0.000
-8.875	-2.958	1.000	0.000
-3.000	-8.875	0.440	0.000
-3.000	8.875	0.440	0.000

2.125	-8.875	0.440	0.000
2.125	8.875	0.440	0.000
8.875	-8.875	1.000	0.000
8.875	8.875	1.000	0.000
8.875	-6.875	1.000	0.000
8.875	6.875	1.000	0.000

-> SECTION DATA FOR SECTION/SEGMENT :   4

Nonlinear Section/Segment Material Properties

Material Option (MATOPT) =   1
(Please Refer to the Users Guide for Details)

- Concrete Stress Strain Properties

  Concrete Strength   (FPC) = 0.3000E+01 ksi
  Modulus of Elasticity (EC) = 0.2810E+04 ksi

  Number of Gauss Integration Points for Concrete = 9

- Steel Stress Strain Properties

  Mild Steel Yield Stress (FY) = 0.400E+02 ksi
  Modulus of Elasticity   (ES) = 0.2900E+05 ksi

- Miscellaneous Properties
  Section/Segment Width =   24.0000 in
  Section/Segment Depth =   24.0000 in
  Void Diameter   =   0.0000 in
  Weight Density   = 150.0000 pcf

- Shape of Section : USER SPECIFIED (ISTNOPT) =   2

- Total Area of Steel Reinforcement =   9.76 in^2
  Position of Steel Reinforcement in the Section (NS) = 12 Bars

22 in	33 in	AS in^2	PRESTRESS ksi
-8.875	-8.875	1.000	0.000
-8.875	8.875	1.000	0.000
-8.875	2.958	1.000	0.000
-8.875	-2.958	1.000	0.000
-3.000	-8.875	0.440	0.000
-3.000	8.875	0.440	0.000
2.125	-8.875	0.440	0.000
2.125	8.875	0.440	0.000
8.875	-8.875	1.000	0.000
8.875	8.875	1.000	0.000
8.875	-6.875	1.000	0.000
8.875	6.875	1.000	0.000

****
*   BENT CAP MEMBER CONNECTIVITY   *
****

ELEMENT NUMBER	NODES I	NODES J	MATERIAL NUMBER
1	6	7	3
2	7	8	3
3	8	9	3
4	9	10	3

5	10	1	3
6	1	11	3
7	11	12	3
8	12	13	3
9	13	14	3
10	14	15	3
11	15	16	3
12	16	17	4
13	17	18	3
14	18	19	3
15	19	20	3
16	20	21	3
17	21	22	3
18	22	2	3
19	2	23	3
20	23	24	3
21	24	25	3
22	25	26	3
23	26	27	3
24	27	28	3
25	28	29	4
26	29	30	3
27	30	31	3
28	31	32	3
29	32	33	3
30	33	34	3
31	34	3	3
32	3	35	3
33	35	36	3
34	36	37	3
35	37	38	3
36	38	39	3
37	39	40	3
38	40	41	4
39	41	42	3
40	42	43	3
41	43	44	3
42	44	45	3
43	45	46	3
44	46	4	3
45	4	47	3
46	47	48	3
47	48	49	3
48	49	50	3
49	50	51	3
50	51	52	3
51	52	53	4
52	53	54	3
53	54	55	3
54	55	56	3
55	56	57	3
56	57	58	3
57	58	5	3
58	5	59	3
59	59	60	3
60	60	61	3
61	61	62	3
62	62	63	3

****
*   SPRING STIFFNESS   *
****

NODE	X	Y	Z	RX	RY	RZ
1	0.2000E+01	0.2000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2	0.2000E+01	0.2000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3	0.2000E+01	0.2000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4	0.2000E+01	0.2000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5	0.2000E+01	0.2000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

```
**************************
*   GENERAL LOAD DATA    *
**************************
```

The table below shows the Applied Loads for every Load Case. The values in the table represent the magnitute of the Loads in the specified units

- Applied Load

NODE	LOAD	X (Kips)	Y (Kips)	Z (Kips)	MXX (Kip-ft)	MYY (Kip-ft)	MZZ (Kip-ft)
1	1	0.20	0.00	43.00	0.00	0.00	0.00
2	1	0.20	0.00	37.00	0.00	0.00	0.00
3	1	0.20	0.00	37.00	0.00	0.00	0.00
4	1	0.20	0.00	37.00	0.00	0.00	0.00
5	1	0.20	0.00	43.00	0.00	0.00	0.00

```
************************
*                      *
*   ANALYSIS RESULTS   *
*                      *
************************
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************************************
*  RESULTS FOR LOAD CASE #       1 *
************************************
```

Summary of Abs Maximum Out-Of-Balance Forces

FZZ =	0.851	Kips
FXX =	0.516	Kips
FYY =	0.438	Kips
MXX =	5.495	Kip-in
MYY =	0.000	Kip-in
MZZ =	0.000	Kip-in

Summary of Displacements at Pile Heads

Node	X (in)	Y (in)	Z (in)
1	0.0799	0.0000	0.3689
2	0.0822	0.0000	0.1165
3	0.0894	0.0000	0.0298
4	0.0968	0.0000	0.1175
5	0.0990	0.0000	0.3718

Small displacements
∴ OK

Final Displacements

Load Case # 1

Node	X (in)	Y (in)	Z (in)	Rx (rad)	Ry (rad)	Rz (rad)

Pile Number 1

1	0.0799	0.0000	0.3689	0.0000	0.0037	0.0000
64	0.1888	0.0001	0.3957	0.0000	-0.0004	0.0000
65	0.0431	0.0001	0.3583	0.0000	-0.0036	0.0000
66	-0.2965	0.0001	0.2726	0.0000	-0.0060	0.0000
67	-0.7700	0.0002	0.1534	0.0000	-0.0074	0.0000
68	-1.3131	0.0003	0.0168	0.0000	-0.0079	0.0000
69	-1.3137	0.0003	0.0166	0.0000	-0.0079	0.0000
70	-1.3144	0.0003	0.0164	0.0000	-0.0079	0.0000
71	-1.3150	0.0003	0.0163	0.0000	-0.0079	0.0000
72	-1.3156	0.0003	0.0161	0.0000	-0.0079	0.0000
73	-1.3163	0.0003	0.0160	0.0000	-0.0079	0.0000
74	-1.3169	0.0003	0.0158	0.0000	-0.0079	0.0000
75	-1.3175	0.0003	0.0156	0.0000	-0.0079	0.0000
76	-1.3181	0.0003	0.0155	0.0000	-0.0079	0.0000
77	-1.3188	0.0003	0.0153	0.0000	-0.0079	0.0000
78	-1.3194	0.0003	0.0152	0.0000	-0.0079	0.0000
79	-1.3200	0.0003	0.0150	0.0000	-0.0079	0.0000
80	-1.3207	0.0003	0.0149	0.0000	-0.0079	0.0000
81	-1.3213	0.0003	0.0147	0.0000	-0.0079	0.0000
82	-1.3219	0.0003	0.0145	0.0000	-0.0079	0.0000
83	-1.3225	0.0003	0.0144	0.0000	-0.0079	0.0000

Pile Number 2

2	0.0822	0.0000	0.1165	0.0000	0.0026	0.0000
84	0.2182	0.0000	0.1077	0.0000	0.0013	0.0000
85	0.2660	0.0000	0.0987	0.0000	0.0001	0.0000
86	0.2449	0.0000	0.0898	0.0000	-0.0007	0.0000
87	0.1765	0.0000	0.0809	0.0000	-0.0012	0.0000
88	0.0830	0.0000	0.0718	0.0000	-0.0014	0.0000
89	0.0819	0.0000	0.0717	0.0000	-0.0014	0.0000
90	0.0808	0.0000	0.0716	0.0000	-0.0014	0.0000
91	0.0796	0.0000	0.0715	0.0000	-0.0014	0.0000
92	0.0785	0.0000	0.0714	0.0000	-0.0014	0.0000
93	0.0774	0.0000	0.0713	0.0000	-0.0014	0.0000
94	0.0762	0.0000	0.0712	0.0000	-0.0014	0.0000
95	0.0751	0.0000	0.0711	0.0000	-0.0014	0.0000
96	0.0740	0.0000	0.0710	0.0000	-0.0014	0.0000
97	0.0728	0.0000	0.0709	0.0000	-0.0014	0.0000
98	0.0717	0.0000	0.0708	0.0000	-0.0014	0.0000
99	0.0706	0.0000	0.0708	0.0000	-0.0014	0.0000
100	0.0694	0.0000	0.0707	0.0000	-0.0014	0.0000
101	0.0683	0.0000	0.0706	0.0000	-0.0014	0.0000
102	0.0672	0.0000	0.0705	0.0000	-0.0014	0.0000
103	0.0660	0.0000	0.0704	0.0000	-0.0014	0.0000

small displ. ∴ OK

Pile Number 3

3	0.0894	0.0000	0.0298	0.0000	0.0000	0.0000
104	0.0845	0.0000	0.0273	0.0000	-0.0001	0.0000
105	0.0721	0.0000	0.0246	0.0000	-0.0002	0.0000
106	0.0539	0.0000	0.0219	0.0000	-0.0003	0.0000
107	0.0319	0.0000	0.0190	0.0000	-0.0003	0.0000
108	0.0078	0.0000	0.0161	0.0000	-0.0004	0.0000
109	0.0075	0.0000	0.0160	0.0000	-0.0004	0.0000
110	0.0072	0.0000	0.0160	0.0000	-0.0004	0.0000
111	0.0070	0.0000	0.0160	0.0000	-0.0004	0.0000
112	0.0067	0.0000	0.0159	0.0000	-0.0004	0.0000
113	0.0064	0.0000	0.0159	0.0000	-0.0004	0.0000
114	0.0061	0.0000	0.0159	0.0000	-0.0004	0.0000
115	0.0058	0.0000	0.0158	0.0000	-0.0004	0.0000
116	0.0056	0.0000	0.0158	0.0000	-0.0004	0.0000
117	0.0053	0.0000	0.0158	0.0000	-0.0004	0.0000
118	0.0050	0.0000	0.0158	0.0000	-0.0004	0.0000
119	0.0047	0.0000	0.0157	0.0000	-0.0004	0.0000
120	0.0044	0.0000	0.0157	0.0000	-0.0004	0.0000
121	0.0041	0.0000	0.0157	0.0000	-0.0004	0.0000
122	0.0039	0.0000	0.0156	0.0000	-0.0004	0.0000

123	0.0036	0.0000	0.0156	0.0000	-0.0004	0.0000

Pile Number 4

4	0.0968	0.0000	0.1175	0.0000	-0.0027	0.0000
124	-0.0491	0.0000	0.1086	0.0000	-0.0015	0.0000
125	-0.1209	0.0000	0.0997	0.0000	-0.0006	0.0000
126	-0.1348	0.0000	0.0908	0.0000	0.0001	0.0000
127	-0.1090	0.0000	0.0817	0.0000	0.0006	0.0000
128	-0.0618	0.0000	0.0727	0.0000	0.0007	0.0000
129	-0.0612	0.0000	0.0726	0.0000	0.0007	0.0000
130	-0.0606	0.0000	0.0724	0.0000	0.0007	0.0000
131	-0.0600	0.0000	0.0723	0.0000	0.0007	0.0000
132	-0.0594	0.0000	0.0722	0.0000	0.0007	0.0000
133	-0.0589	0.0000	0.0721	0.0000	0.0007	0.0000
134	-0.0583	0.0000	0.0720	0.0000	0.0007	0.0000
135	-0.0577	0.0000	0.0719	0.0000	0.0007	0.0000
136	-0.0571	0.0000	0.0718	0.0000	0.0007	0.0000
137	-0.0565	0.0000	0.0717	0.0000	0.0007	0.0000
138	-0.0559	0.0000	0.0716	0.0000	0.0007	0.0000
139	-0.0553	0.0000	0.0715	0.0000	0.0007	0.0000
140	-0.0547	0.0000	0.0715	0.0000	0.0007	0.0000
141	-0.0541	0.0000	0.0714	0.0000	0.0007	0.0000
142	-0.0535	0.0000	0.0713	0.0000	0.0007	0.0000
143	-0.0529	0.0000	0.0712	0.0000	0.0007	0.0000

Pile Number 5

5	0.0990	0.0000	0.3718	0.0000	-0.0037	0.0000
144	-0.0105	-0.0001	0.3987	0.0000	0.0004	0.0000
145	0.1361	-0.0001	0.3612	0.0000	0.0036	0.0000
146	0.4775	-0.0002	0.2750	0.0000	0.0060	0.0000
147	0.9532	-0.0002	0.1552	0.0000	0.0075	0.0000
148	1.4987	-0.0003	0.0180	0.0000	0.0080	0.0000
149	1.4994	-0.0003	0.0178	0.0000	0.0080	0.0000
150	1.5000	-0.0003	0.0176	0.0000	0.0080	0.0000
151	1.5006	-0.0003	0.0175	0.0000	0.0080	0.0000
152	1.5012	-0.0003	0.0173	0.0000	0.0080	0.0000
153	1.5019	-0.0003	0.0172	0.0000	0.0080	0.0000
154	1.5025	-0.0003	0.0170	0.0000	0.0080	0.0000
155	1.5031	-0.0003	0.0168	0.0000	0.0080	0.0000
156	1.5038	-0.0003	0.0167	0.0000	0.0080	0.0000
157	1.5044	-0.0003	0.0165	0.0000	0.0080	0.0000
158	1.5050	-0.0003	0.0164	0.0000	0.0080	0.0000
159	1.5057	-0.0003	0.0162	0.0000	0.0080	0.0000
160	1.5063	-0.0003	0.0161	0.0000	0.0080	0.0000
161	1.5069	-0.0003	0.0159	0.0000	0.0080	0.0000
162	1.5076	-0.0003	0.0157	0.0000	0.0080	0.0000
163	1.5082	-0.0003	0.0156	0.0000	0.0080	0.0000

Bent Cap Nodes

6	0.0799	0.0000	0.4797	0.0000	0.0037	0.0000
7	0.0799	0.0000	0.4575	0.0000	0.0037	0.0000
8	0.0799	0.0000	0.4354	0.0000	0.0037	0.0000
9	0.0799	0.0000	0.4132	0.0000	0.0037	0.0000
10	0.0799	0.0000	0.3911	0.0000	0.0037	0.0000
11	0.0799	0.0000	0.3484	0.0000	0.0037	0.0000
12	0.0799	0.0000	0.3277	0.0000	0.0037	0.0000
13	0.0799	0.0000	0.3070	0.0000	0.0037	0.0000
14	0.0799	0.0000	0.2863	0.0000	0.0037	0.0000
15	0.0799	0.0000	0.2657	0.0000	0.0037	0.0000
16	0.0799	0.0000	0.2453	0.0000	0.0037	0.0000
17	0.0799	0.0000	0.2251	0.0000	0.0036	0.0000
18	0.0799	0.0000	0.2052	0.0000	0.0036	0.0000
19	0.0799	0.0000	0.1858	0.0000	0.0035	0.0000
20	0.0801	0.0000	0.1669	0.0000	0.0033	0.0000
21	0.0805	0.0000	0.1489	0.0000	0.0032	0.0000
22	0.0812	0.0000	0.1320	0.0000	0.0029	0.0000

Small displ ∴ ok
Z

23	0.0830	0.0000	0.1026	0.0000	0.0024	0.0000
24	0.0837	0.0000	0.0900	0.0000	0.0021	0.0000
25	0.0844	0.0000	0.0788	0.0000	0.0019	0.0000
26	0.0851	0.0000	0.0689	0.0000	0.0017	0.0000
27	0.0857	0.0000	0.0602	0.0000	0.0015	0.0000
28	0.0863	0.0000	0.0527	0.0000	0.0013	0.0000
29	0.0868	0.0000	0.0463	0.0000	0.0010	0.0000
30	0.0874	0.0000	0.0410	0.0000	0.0009	0.0000
31	0.0878	0.0000	0.0368	0.0000	0.0007	0.0000
32	0.0883	0.0000	0.0336	0.0000	0.0005	0.0000
33	0.0887	0.0000	0.0314	0.0000	0.0003	0.0000
34	0.0891	0.0000	0.0302	0.0000	0.0001	0.0000
35	0.0897	0.0000	0.0303	0.0000	-0.0002	0.0000
36	0.0901	0.0000	0.0316	0.0000	-0.0003	0.0000
37	0.0905	0.0000	0.0339	0.0000	-0.0005	0.0000
38	0.0910	0.0000	0.0371	0.0000	-0.0007	0.0000
39	0.0914	0.0000	0.0414	0.0000	-0.0009	0.0000
40	0.0920	0.0000	0.0467	0.0000	-0.0011	0.0000
41	0.0925	0.0000	0.0531	0.0000	-0.0013	0.0000
42	0.0931	0.0000	0.0606	0.0000	-0.0015	0.0000
43	0.0938	0.0000	0.0694	0.0000	-0.0017	0.0000
44	0.0944	0.0000	0.0794	0.0000	-0.0019	0.0000
45	0.0952	0.0000	0.0907	0.0000	-0.0022	0.0000
46	0.0959	0.0000	0.1034	0.0000	-0.0024	0.0000
47	0.0977	0.0000	0.1331	0.0000	-0.0030	0.0000
48	0.0984	0.0000	0.1501	0.0000	-0.0032	0.0000
49	0.0988	0.0000	0.1683	0.0000	-0.0034	0.0000
50	0.0990	0.0000	0.1874	0.0000	-0.0035	0.0000
51	0.0990	0.0000	0.2070	0.0000	-0.0036	0.0000
52	0.0990	0.0000	0.2270	0.0000	-0.0036	0.0000
53	0.0990	0.0000	0.2473	0.0000	-0.0037	0.0000
54	0.0990	0.0000	0.2679	0.0000	-0.0037	0.0000
55	0.0990	0.0000	0.2886	0.0000	-0.0038	0.0000
56	0.0990	0.0000	0.3095	0.0000	-0.0038	0.0000
57	0.0990	0.0000	0.3303	0.0000	-0.0038	0.0000
58	0.0990	0.0000	0.3511	0.0000	-0.0037	0.0000
59	0.0990	0.0000	0.3941	0.0000	-0.0037	0.0000
60	0.0990	0.0000	0.4164	0.0000	-0.0037	0.0000
61	0.0990	0.0000	0.4387	0.0000	-0.0037	0.0000
62	0.0990	0.0000	0.4610	0.0000	-0.0037	0.0000
63	0.0990	0.0000	0.4833	0.0000	-0.0037	0.0000

Small displ. ∴ OK

Out of Balance Forces

Pile Node#	FXX (Kips)	FYY (Kips)	FZZ (Kips)	MXX (Kip-in)	MYY (Kip-in)	MZZ (Kip-in)
Pile Number 1						
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
67	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
68	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
69	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
70	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
71	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
72	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
73	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
74	0.0000	-0.0006	-0.0001	-0.0008	0.0000	0.0000
75	0.0000	-0.0236	0.0529	-0.6288	0.0000	0.0000
76	0.0000	-0.0223	-0.0090	-0.0187	0.0000	0.0000
77	0.0000	0.1012	-0.8511	5.4948	-0.0001	0.0000
78	0.0000	0.0018	0.4950	-2.6226	-0.0001	0.0000

79	0.0000	-0.0172	-0.6375	0.5799	0.0000	0.0000
80	0.0000	0.0008	0.1471	-0.4079	0.0000	0.0000
81	0.0001	-0.0268	0.3223	-0.4819	-0.0005	0.0000
82	-0.0001	0.0287	-0.0092	-0.0410	-0.0001	0.0000
83	0.0000	0.0000	-0.0070	0.0536	0.0000	0.0000

Pile Number 2

2	0.0000	0.0001	-0.0072	0.0535	0.0000	0.0000
84	0.0000	0.0001	-0.0068	0.0491	0.0000	0.0000
85	0.0000	-0.0118	-0.0097	0.0616	0.0000	0.0000
86	0.0000	0.0089	-0.0386	0.2323	0.0000	0.0000
87	0.0000	-0.0025	-0.0868	0.5192	0.0000	0.0000
88	-0.0001	-0.4382	-0.4414	1.5460	0.0000	0.0000
89	0.0001	0.4351	0.1596	-2.1728	0.0004	0.0000
90	0.0000	0.0097	0.3918	-2.4826	0.0000	0.0000
91	0.0000	0.0071	-0.2996	1.9333	0.0000	0.0000
92	0.0000	0.0170	0.2548	-1.6236	0.0000	0.0000
93	0.0000	-0.0240	0.2072	-1.1722	0.0000	0.0000
94	0.0000	-0.0020	0.0717	-0.4279	0.0000	0.0000
95	0.0000	0.0155	0.0367	-0.2135	0.0000	0.0000
96	0.0000	-0.0181	0.0104	-0.0605	0.0000	0.0000
97	0.0000	0.0000	0.0076	-0.0532	0.0000	0.0000
98	0.0000	0.0000	0.0078	-0.0559	0.0000	0.0000
99	0.0000	0.0000	0.0077	-0.0566	0.0000	0.0000
100	0.0000	0.0000	0.0021	-0.0188	0.0000	0.0000
101	0.0000	-0.0007	-0.1613	0.0386	0.0000	0.0000
102	0.0000	0.0027	-0.2072	0.5365	0.0000	0.0000
103	0.0000	-0.0168	0.6378	-0.5981	0.0000	0.0000

Pile Number 3

3	0.0000	0.0450	-0.4663	2.5980	-0.0001	0.0000
104	0.0000	0.0527	0.8138	-5.1803	-0.0001	0.0000
105	0.0000	-0.0199	0.0145	-0.0504	0.0000	0.0000
106	0.0000	-0.0179	-0.0534	0.6369	0.0000	0.0000
107	0.0000	-0.0038	0.0005	0.0053	0.0000	0.0000
108	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
109	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
113	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
115	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
116	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
119	0.0396	0.0000	0.1472	0.0000	1.2240	0.0000
120	0.4087	0.0000	-0.0531	0.0000	-1.0201	0.0001
121	-0.2424	0.0000	-0.0062	0.0000	1.5515	0.0000
122	-0.5155	0.0000	-0.0618	0.0000	1.3390	0.0000
123	-0.0385	0.0000	0.1375	0.0000	-1.1933	0.0000

Pile Number 4

4	0.0385	0.0000	-0.1367	0.0000	0.9320	0.0000
124	-0.0002	0.0000	0.0001	0.0000	-0.0018	0.0000
125	0.0002	0.0000	-0.0009	0.0000	-0.0053	0.0000
126	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
127	-0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
128	0.0003	0.0000	-0.0001	0.0000	0.0000	0.0000
129	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
130	-0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
131	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
132	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
133	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
134	0.0002	0.0000	0.0001	0.0000	0.0000	0.0000
135	-0.0001	0.0000	0.0000	0.0000	0.0000	0.0000

136	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
137	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
138	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
139	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
140	-0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
141	-0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
142	0.0001	0.0000	-0.0065	0.0000	0.0000	0.0000
143	-0.0001	0.0000	0.0014	0.0000	0.0022	0.0000

Pile Number 5

5	-0.0014	0.0000	0.0082	0.0000	-0.0150	0.0000
144	0.0001	0.0000	0.0115	0.0000	-0.0356	0.0000
145	0.0013	0.0000	0.0038	0.0000	-0.0234	0.0000
146	0.0000	0.0000	-0.0001	0.0000	0.0000	0.0000
147	0.0002	0.0000	-0.0002	0.0000	0.0000	0.0000
148	0.0004	0.0000	-0.0002	0.0000	0.0000	0.0000
149	0.0006	0.0000	-0.0002	0.0000	0.0000	0.0000
150	0.0008	0.0000	-0.0002	0.0000	0.0000	0.0000
151	0.0010	0.0000	-0.0002	0.0000	0.0000	0.0000
152	0.0012	0.0000	-0.0002	0.0000	0.0000	0.0000
153	0.0015	0.0000	-0.0002	0.0000	0.0000	0.0000
154	0.0017	0.0000	-0.0002	0.0000	0.0000	0.0000
155	0.0020	0.0000	-0.0002	0.0000	0.0000	0.0000
156	0.0023	0.0000	-0.0002	0.0000	0.0000	0.0000
157	0.0026	0.0000	-0.0002	0.0000	0.0000	0.0000
158	0.0029	0.0000	-0.0002	0.0000	0.0000	0.0000
159	0.0032	0.0000	-0.0002	0.0000	0.0000	0.0000
160	0.0035	0.0000	-0.0002	0.0000	0.0000	0.0000
161	0.0020	0.0000	-0.0107	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
163	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

```
**********************************
*   MAXIMUM STRAINS IN PILES     *
**********************************

Concrete Strains for Section #     1
Maximum =  0.2539E-03
Minimum = -0.5812E-03

WARNING : The Concrete in this section has cracked

Steel Strains for Section #     1
Steel type =     2 (For Description see Users Manual)
Maximum =  0.4771E-02
Minimum =  0.4340E-02

Concrete Strains for Section #     2
Maximum = -0.1000E+03
Minimum =  0.1000E+03

Steel Strains for Section #     2
Steel type =     3 (For Description see Users Manual)
Maximum = -0.1000E+03
Minimum =  0.0000E+00


SUM OF TOTAL SOIL SPRING LOADS
______________________________

CHECK: Total Load Carried by the Soil
       (Sum of NF+FF Soil Spring Resistances)
       X Direction       =          0.1230  Kips
       Y Direction       =          0.0000  Kips
```

Did not get this message when ran a 7 pile model that took the crutch bent into account. Due to Fla. Pier limitations the crutch bent was considered by adding 2 steel piles to the cap shown in this model. The 7 pile cap was much more stable than this 5 pile cap but the 5 pile model was conservatively chosen for final analysis.

∴ say OK

Z Direction = 25.3032 Kips
Sum of Tip Forces = 621.1103 Kips

Near Field Soil Resistance (Kips & Kip-in)

NOTE: The Force shown in the last pile node includes the force from the bearing spring. The force in the bearing spring is also printed separately at the end of the section

	X	Y	Z	MZ
Pile Number 1				
1	0.000	0.000	0.000	0.000
64	0.000	0.000	0.000	0.000
65	0.000	0.000	0.000	0.000
66	0.000	0.000	0.000	0.000
67	0.000	0.000	0.000	0.000
68	0.000	0.000	0.031	0.000
69	0.000	0.000	0.063	0.000
70	0.000	0.000	0.063	0.000
71	0.000	0.000	0.063	0.000
72	0.000	0.000	0.063	0.000
73	0.000	0.000	0.063	0.000
74	-0.001	0.000	0.063	0.000
75	-0.001	0.000	0.063	0.000
76	-0.001	0.000	0.063	0.000
77	-0.001	0.000	0.063	0.000
78	-0.001	0.000	0.063	0.000
79	-0.001	0.000	0.063	0.000
80	-0.001	0.000	0.063	0.000
81	-0.001	0.000	0.063	0.000
82	-0.001	0.000	0.063	0.000
83	-0.001	0.000	206.150	0.000

Pile Tip Spring Force = 206.118

	X	Y	Z	MZ
Pile Number 2				
2	0.000	0.000	0.000	0.000
84	0.000	0.000	0.000	0.000
85	0.000	0.000	0.000	0.000
86	0.000	0.000	0.000	0.000
87	0.000	0.000	0.000	0.000
88	0.000	0.000	0.291	0.000
89	0.005	0.000	0.583	0.000
90	0.011	0.000	0.582	0.000
91	0.016	0.000	0.582	0.000
92	0.022	0.000	0.582	0.000
93	0.028	0.000	0.582	0.000
94	0.034	0.000	0.582	0.000
95	0.040	0.000	0.582	0.000
96	0.046	0.000	0.582	0.000
97	0.052	0.000	0.582	0.000
98	0.059	0.000	0.582	0.000
99	0.065	0.000	0.582	0.000
100	0.072	0.000	0.582	0.000
101	0.078	0.000	0.582	0.000
102	0.085	0.000	0.582	0.000
103	0.046	0.000	86.289	0.000

Pile Tip Spring Force = 85.999

	X	Y	Z	MZ
Pile Number 3				
3	0.000	0.000	0.000	0.000

104	0.000	0.000	0.000	0.000
105	0.000	0.000	0.000	0.000
106	0.000	0.000	0.000	0.000
107	0.000	0.000	0.000	0.000
108	0.000	0.000	0.200	0.000
109	0.001	0.000	0.399	0.000
110	0.001	0.000	0.399	0.000
111	0.002	0.000	0.399	0.000
112	0.003	0.000	0.398	0.000
113	0.003	0.000	0.398	0.000
114	0.004	0.000	0.397	0.000
115	0.004	0.000	0.397	0.000
116	0.004	0.000	0.397	0.000
117	0.005	0.000	0.396	0.000
118	0.005	0.000	0.396	0.000
119	0.005	0.000	0.395	0.000
120	0.005	0.000	0.395	0.000
121	0.005	0.000	0.395	0.000
122	0.005	0.000	0.394	0.000
123	0.003	0.000	25.306	0.000

Pile Tip Spring Force = 25.109

Pile Number 4

4	0.000	0.000	0.000	0.000
124	0.000	0.000	0.000	0.000
125	0.000	0.000	0.000	0.000
126	0.000	0.000	0.000	0.000
127	0.000	0.000	0.000	0.000
128	0.000	0.000	0.292	0.000
129	-0.005	0.000	0.583	0.000
130	-0.010	0.000	0.583	0.000
131	-0.015	0.000	0.583	0.000
132	-0.020	0.000	0.583	0.000
133	-0.026	0.000	0.583	0.000
134	-0.031	0.000	0.583	0.000
135	-0.037	0.000	0.583	0.000
136	-0.043	0.000	0.583	0.000
137	-0.049	0.000	0.583	0.000
138	-0.054	0.000	0.582	0.000
139	-0.058	0.000	0.582	0.000
140	-0.063	0.000	0.582	0.000
141	-0.068	0.000	0.582	0.000
142	-0.072	0.000	0.582	0.000
143	-0.038	0.000	86.974	0.000

Pile Tip Spring Force = 86.683

Pile Number 5

5	0.000	0.000	0.000	0.000
144	0.000	0.000	0.000	0.000
145	0.000	0.000	0.000	0.000
146	0.000	0.000	0.000	0.000
147	0.000	0.000	0.000	0.000
148	0.000	0.000	0.031	0.000
149	0.000	0.000	0.063	0.000
150	0.000	0.000	0.063	0.000
151	0.000	0.000	0.063	0.000
152	0.000	0.000	0.063	0.000
153	0.000	0.000	0.063	0.000
154	0.001	0.000	0.063	0.000
155	0.001	0.000	0.063	0.000
156	0.001	0.000	0.063	0.000
157	0.001	0.000	0.063	0.000
158	0.001	0.000	0.063	0.000
159	0.001	0.000	0.063	0.000

160	0.001	0.000	0.063	0.000
161	0.001	0.000	0.063	0.000
162	0.001	0.000	0.063	0.000
163	0.001	0.000	217.233	0.000

Pile Tip Spring Force = 217.201

Summary of Pile Forces for Load CASE 1

1. Max Axial Force (Kips)

Pile #	Max AF
1	-0.91672E+01
2	-0.94615E+02
3	-0.30930E+02
4	-0.95310E+02
5	-0.91910E+01

2. Max Pile Shear Force in 2 Direction (Kips)

Pile #	Max Shear
1	0.22822E+01
2	0.64325E+00
3	0.53838E-01
4	-0.59099E+00
5	-0.22886E+01

3. Max Pile Shear Force in 3 Direction (Kips)

Pile #	Max Shear
1	0.10931E-03
2	-0.11918E-04
3	0.52274E-05
4	0.22099E-04
5	-0.12388E-03

4. Max Bending Moment About 2 Axis (Kip-ft)

Pile #	Pile Node	At Depth Below Cap	Max Moment
1	1	0.00000E+00	0.3291E-02
2	2	0.00000E+00	-0.4792E-03
3	3	0.00000E+00	0.1548E-03
4	4	0.00000E+00	0.7758E-03
5	5	0.00000E+00	-0.3749E-02

5. Max Bending Moment About 3 Axis (Kip-ft)

Pile #	Pile Node	At Depth Below Cap	Max Moment

1	1	0.00000E+00	-52.67
2	2	0.00000E+00	-19.37
3	3	0.00000E+00	-1.814
4	4	0.00000E+00	16.51
5	5	0.00000E+00	52.88

Ignore demand-to-capacity ratios since all the reinforcing has been assumed due to lack of original plans.

- Analytical Force Results for the Bent Cap

ELEM NO.	NODE NO.	LOAD CASE	FAX (Kips)	F22 (Kips)	F33 (Kips)	M22 (Kip-ft)	M33 (Kip-ft)	TORQUE (Kip-ft)
! -> Pile Number 1 !								
63	1	1	-4.3	1.0	0.0	0.0	-52.7	0.0
	64	1	5.5	-1.3	0.0	0.0	45.7	0.0
The Demand/Capacity Ratio =				0.6140				
64	64	1	-5.3	1.3	0.0	0.0	-45.8	0.0
	65	1	6.5	-1.6	0.0	0.0	36.8	0.0
The Demand/Capacity Ratio =				0.5322				
65	65	1	-6.5	1.6	0.0	0.0	-36.8	0.0
	66	1	7.7	-1.9	0.0	0.0	26.0	0.0
The Demand/Capacity Ratio =				0.4267				
66	66	1	-7.7	1.9	0.0	0.0	-26.1	0.0
	67	1	8.5	-2.1	0.0	0.0	13.7	0.0
The Demand/Capacity Ratio =				0.2988				
67	67	1	-8.5	2.1	0.0	0.0	-13.7	0.0
	68	1	9.2	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.1624				
68	68	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	69	1	9.2	-2.3	0.0	0.0	0.2	0.0
The Demand/Capacity Ratio =				0.0186				
69	69	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	70	1	9.2	-2.3	0.0	0.0	0.2	0.0
The Demand/Capacity Ratio =				0.0185				
70	70	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	71	1	9.2	-2.3	0.0	0.0	0.2	0.0
The Demand/Capacity Ratio =				0.0184				
71	71	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	72	1	9.2	-2.3	0.0	0.0	0.2	0.0
The Demand/Capacity Ratio =				0.0183				
72	72	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	73	1	9.2	-2.3	0.0	0.0	0.2	0.0
The Demand/Capacity Ratio =				0.0182				
73	73	1	-9.2	2.3	0.0	0.0	-0.2	0.0
	74	1	9.2	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0181				
74	74	1	-9.2	2.3	0.0	0.0	-0.1	0.0
	75	1	9.2	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0181				
75	75	1	-9.1	2.3	0.0	0.0	-0.1	0.0
	76	1	9.1	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0180				
76	76	1	-9.1	2.3	0.0	0.0	-0.1	0.0
	77	1	9.1	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0179				
77	77	1	-9.1	2.3	0.0	0.0	-0.1	0.0
	78	1	9.1	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0207				
78	78	1	-9.1	2.3	0.0	0.0	-0.1	0.0
	79	1	9.1	-2.3	0.0	0.0	0.1	0.0
The Demand/Capacity Ratio =				0.0207				
79	79	1	-9.1	2.3	0.0	0.0	-0.1	0.0
	80	1	9.1	-2.3	0.0	0.0	0.0	0.0

```
 The Demand/Capacity Ratio =   0.0206
   80   80     1        -9.1        2.3        0.0       0.0       0.0       0.0
        81     1         9.1       -2.3        0.0       0.0       0.0       0.0
 The Demand/Capacity Ratio =   0.0206
   81   81     1        -9.1        2.3        0.0       0.0       0.0       0.0
        82     1         9.1       -2.3        0.0       0.0       0.0       0.0
 The Demand/Capacity Ratio =   0.0206
   82   82     1        -9.1        2.3        0.0       0.0       0.0       0.0
        83     1         9.1       -2.3        0.0       0.0       0.0       0.0
 The Demand/Capacity Ratio =   0.0206

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 ! -> Pile Number   2 !
 ----------------------
   83    2     1       -89.6        0.6        0.0       0.0     -19.4       0.0
        84     1        90.8       -0.6        0.0       0.0      16.6       0.0
 The Demand/Capacity Ratio =   0.2844
   84   84     1       -90.8        0.6        0.0       0.0     -16.6       0.0
        85     1        92.0       -0.6        0.0       0.0      13.2       0.0
 The Demand/Capacity Ratio =   0.2681
   85   85     1       -92.0        0.6        0.0       0.0     -13.2       0.0
        86     1        93.2       -0.6        0.0       0.0       9.3       0.0
 The Demand/Capacity Ratio =   0.2500
   86   86     1       -93.2        0.6        0.0       0.0      -9.3       0.0
        87     1        93.9       -0.6        0.0       0.0       5.1       0.0
 The Demand/Capacity Ratio =   0.2292
   87   87     1       -93.9        0.6        0.0       0.0      -5.1       0.0
        88     1        94.6       -0.6        0.0       0.0       0.6       0.0
 The Demand/Capacity Ratio =   0.2066
   88   88     1       -94.3        0.6        0.0       0.0      -0.6       0.0
        89     1        94.3       -0.6        0.0       0.0       0.5       0.0
 The Demand/Capacity Ratio =   0.1809
   89   89     1       -93.7        0.6        0.0       0.0      -0.5       0.0
        90     1        93.8       -0.6        0.0       0.0       0.5       0.0
 The Demand/Capacity Ratio =   0.1796
   90   90     1       -93.2        0.6        0.0       0.0      -0.5       0.0
        91     1        93.2       -0.6        0.0       0.0       0.4       0.0
 The Demand/Capacity Ratio =   0.1782
   91   91     1       -92.6        0.6        0.0       0.0      -0.4       0.0
        92     1        92.6       -0.6        0.0       0.0       0.4       0.0
 The Demand/Capacity Ratio =   0.1768
   92   92     1       -92.0        0.6        0.0       0.0      -0.4       0.0
        93     1        92.0       -0.6        0.0       0.0       0.3       0.0
 The Demand/Capacity Ratio =   0.1755
   93   93     1       -91.5        0.6        0.0       0.0      -0.3       0.0
        94     1        91.5       -0.6        0.0       0.0       0.3       0.0
 The Demand/Capacity Ratio =   0.1741
   94   94     1       -90.9        0.5        0.0       0.0      -0.3       0.0
        95     1        90.9       -0.5        0.0       0.0       0.2       0.0
 The Demand/Capacity Ratio =   0.1728
   95   95     1       -90.3        0.5        0.0       0.0      -0.2       0.0
        96     1        90.3       -0.5        0.0       0.0       0.2       0.0
 The Demand/Capacity Ratio =   0.1714
   96   96     1       -89.7        0.4        0.0       0.0      -0.2       0.0
        97     1        89.7       -0.4        0.0       0.0       0.1       0.0
 The Demand/Capacity Ratio =   0.1701
   97   97     1       -89.2        0.4        0.0       0.0      -0.1       0.0
        98     1        89.2       -0.4        0.0       0.0       0.1       0.0
 The Demand/Capacity Ratio =   0.1688
   98   98     1       -88.6        0.3        0.0       0.0      -0.1       0.0
        99     1        88.6       -0.3        0.0       0.0       0.1       0.0
 The Demand/Capacity Ratio =   0.2001
   99   99     1       -88.0        0.3        0.0       0.0      -0.1       0.0
       100     1        88.0       -0.3        0.0       0.0       0.0       0.0
 The Demand/Capacity Ratio =   0.1988
  100  100     1       -87.4        0.2        0.0       0.0       0.0       0.0
```

```
        101     1        87.4      -0.2      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.1975
  101   101     1       -86.9       0.1      0.0      0.0      0.0      0.0
        102     1        86.9      -0.1      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.1962
  102   102     1       -86.3       0.0      0.0      0.0      0.0      0.0
        103     1        86.3       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.1949

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 ! -> Pile Number   3 !
 ----------------------
  103     3     1       -25.9       0.1      0.0      0.0     -1.8      0.0
        104     1        27.1      -0.1      0.0      0.0      1.5      0.0
 The Demand/Capacity Ratio =    0.0612
  104   104     1       -27.1       0.1      0.0      0.0     -1.5      0.0
        105     1        28.3      -0.1      0.0      0.0      1.1      0.0
 The Demand/Capacity Ratio =    0.0617
  105   105     1       -28.3       0.1      0.0      0.0     -1.1      0.0
        106     1        29.5      -0.1      0.0      0.0      0.8      0.0
 The Demand/Capacity Ratio =    0.0620
  106   106     1       -29.5       0.1      0.0      0.0     -0.8      0.0
        107     1        30.2      -0.1      0.0      0.0      0.4      0.0
 The Demand/Capacity Ratio =    0.0614
  107   107     1       -30.2       0.1      0.0      0.0     -0.4      0.0
        108     1        30.9      -0.1      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0699
  108   108     1       -30.7       0.1      0.0      0.0      0.0      0.0
        109     1        30.7      -0.1      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0694
  109   109     1       -30.3       0.1      0.0      0.0      0.0      0.0
        110     1        30.3      -0.1      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0686
  110   110     1       -29.9       0.1      0.0      0.0      0.0      0.0
        111     1        30.0      -0.1      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0677
  111   111     1       -29.6       0.0      0.0      0.0      0.0      0.0
        112     1        29.6       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0668
  112   112     1       -29.2       0.0      0.0      0.0      0.0      0.0
        113     1        29.2       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0659
  113   113     1       -28.8       0.0      0.0      0.0      0.0      0.0
        114     1        28.8       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0650
  114   114     1       -28.4       0.0      0.0      0.0      0.0      0.0
        115     1        28.4       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0641
  115   115     1       -28.0       0.0      0.0      0.0      0.0      0.0
        116     1        28.0       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0633
  116   116     1       -27.6       0.0      0.0      0.0      0.0      0.0
        117     1        27.6       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0624
  117   117     1       -27.2       0.0      0.0      0.0      0.0      0.0
        118     1        27.2       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0615
  118   118     1       -26.8       0.0      0.0      0.0      0.0      0.0
        119     1        26.8       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0606
  119   119     1       -26.5       0.0      0.0      0.0      0.0      0.0
        120     1        26.5       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0598
  120   120     1       -26.1       0.0      0.0      0.0      0.0      0.0
        121     1        26.1       0.0      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =    0.0589
```

```
 121  121      1          -25.7        0.0        0.0        0.0        0.0        0.0
      122      1           25.7        0.0        0.0        0.0        0.0        0.0
 The Demand/Capacity Ratio =    0.0580
 122  122      1          -25.3        0.0        0.0        0.0        0.0        0.0
      123      1           25.3        0.0        0.0        0.0        0.0        0.0
 The Demand/Capacity Ratio =    0.0572

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 ! -> Pile Number   4 !
 ----------------------
 123    4      1          -90.3       -0.6        0.0        0.0       16.5        0.0
      124      1           91.5        0.6        0.0        0.0      -14.2        0.0
 The Demand/Capacity Ratio =    0.2665
 124  124      1          -91.5       -0.6        0.0        0.0       14.2        0.0
      125      1           92.7        0.6        0.0        0.0      -11.3        0.0
 The Demand/Capacity Ratio =    0.2545
 125  125      1          -92.7       -0.6        0.0        0.0       11.3        0.0
      126      1           93.9        0.6        0.0        0.0       -7.9        0.0
 The Demand/Capacity Ratio =    0.2400
 126  126      1          -93.9       -0.6        0.0        0.0        7.9        0.0
      127      1           94.6        0.6        0.0        0.0       -4.3        0.0
 The Demand/Capacity Ratio =    0.2227
 127  127      1          -94.6       -0.6        0.0        0.0        4.3        0.0
      128      1           95.3        0.6        0.0        0.0       -0.5        0.0
 The Demand/Capacity Ratio =    0.2036
 128  128      1          -95.0       -0.6        0.0        0.0        0.5        0.0
      129      1           95.0        0.6        0.0        0.0       -0.4        0.0
 The Demand/Capacity Ratio =    0.1817
 129  129      1          -94.4       -0.6        0.0        0.0        0.4        0.0
      130      1           94.5        0.6        0.0        0.0       -0.4        0.0
 The Demand/Capacity Ratio =    0.1803
 130  130      1          -93.9       -0.6        0.0        0.0        0.4        0.0
      131      1           93.9        0.6        0.0        0.0       -0.3        0.0
 The Demand/Capacity Ratio =    0.1790
 131  131      1          -93.3       -0.6        0.0        0.0        0.3        0.0
      132      1           93.3        0.6        0.0        0.0       -0.3        0.0
 The Demand/Capacity Ratio =    0.1777
 132  132      1          -92.7       -0.5        0.0        0.0        0.3        0.0
      133      1           92.7        0.5        0.0        0.0       -0.2        0.0
 The Demand/Capacity Ratio =    0.1764
 133  133      1          -92.1       -0.5        0.0        0.0        0.2        0.0
      134      1           92.2        0.5        0.0        0.0       -0.2        0.0
 The Demand/Capacity Ratio =    0.1751
 134  134      1          -91.6       -0.5        0.0        0.0        0.2        0.0
      135      1           91.6        0.5        0.0        0.0       -0.2        0.0
 The Demand/Capacity Ratio =    0.1738
 135  135      1          -91.0       -0.4        0.0        0.0        0.2        0.0
      136      1           91.0        0.4        0.0        0.0       -0.1        0.0
 The Demand/Capacity Ratio =    0.1725
 136  136      1          -90.4       -0.4        0.0        0.0        0.1        0.0
      137      1           90.4        0.4        0.0        0.0       -0.1        0.0
 The Demand/Capacity Ratio =    0.1712
 137  137      1          -89.8       -0.4        0.0        0.0        0.1        0.0
      138      1           89.9        0.4        0.0        0.0       -0.1        0.0
 The Demand/Capacity Ratio =    0.2030
 138  138      1          -89.3       -0.3        0.0        0.0        0.1        0.0
      139      1           89.3        0.3        0.0        0.0       -0.1        0.0
 The Demand/Capacity Ratio =    0.2017
 139  139      1          -88.7       -0.2        0.0        0.0        0.1        0.0
      140      1           88.7        0.2        0.0        0.0        0.0        0.0
 The Demand/Capacity Ratio =    0.2004
 140  140      1          -88.1       -0.2        0.0        0.0        0.0        0.0
      141      1           88.1        0.2        0.0        0.0        0.0        0.0
 The Demand/Capacity Ratio =    0.1991
 141  141      1          -87.5       -0.1        0.0        0.0        0.0        0.0
      142      1           87.6        0.1        0.0        0.0        0.0        0.0
```

The Demand/Capacity Ratio = 0.1978

142	142	1	-87.0	0.0	0.0	0.0	0.0	0.0
	143	1	87.0	0.0	0.0	0.0	0.0	0.0

The Demand/Capacity Ratio = 0.1965

! -> Pile Number 5 !

143	5	1	-4.3	-1.0	0.0	0.0	52.9	0.0
	144	1	5.5	1.3	0.0	0.0	-45.8	0.0

The Demand/Capacity Ratio = 0.6164

144	144	1	-5.4	-1.3	0.0	0.0	45.9	0.0
	145	1	6.6	1.6	0.0	0.0	-37.0	0.0

The Demand/Capacity Ratio = 0.5342

145	145	1	-6.6	-1.6	0.0	0.0	37.0	0.0
	146	1	7.7	1.9	0.0	0.0	-26.1	0.0

The Demand/Capacity Ratio = 0.4282

146	146	1	-7.7	-1.9	0.0	0.0	26.2	0.0
	147	1	8.5	2.1	0.0	0.0	-13.7	0.0

The Demand/Capacity Ratio = 0.2998

147	147	1	-8.5	-2.1	0.0	0.0	13.7	0.0
	148	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.1629

148	148	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	149	1	9.2	2.3	0.0	0.0	-0.2	0.0

The Demand/Capacity Ratio = 0.0187

149	149	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	150	1	9.2	2.3	0.0	0.0	-0.2	0.0

The Demand/Capacity Ratio = 0.0186

150	150	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	151	1	9.2	2.3	0.0	0.0	-0.2	0.0

The Demand/Capacity Ratio = 0.0185

151	151	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	152	1	9.2	2.3	0.0	0.0	-0.2	0.0

The Demand/Capacity Ratio = 0.0184

152	152	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	153	1	9.2	2.3	0.0	0.0	-0.2	0.0

The Demand/Capacity Ratio = 0.0183

153	153	1	-9.2	-2.3	0.0	0.0	0.2	0.0
	154	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0182

154	154	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	155	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0181

155	155	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	156	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0180

156	156	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	157	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0179

157	157	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	158	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0207

158	158	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	159	1	9.2	2.3	0.0	0.0	-0.1	0.0

The Demand/Capacity Ratio = 0.0207

159	159	1	-9.2	-2.3	0.0	0.0	0.1	0.0
	160	1	9.2	2.3	0.0	0.0	0.0	0.0

The Demand/Capacity Ratio = 0.0207

160	160	1	-9.2	-2.3	0.0	0.0	0.0	0.0
	161	1	9.2	2.3	0.0	0.0	0.0	0.0

The Demand/Capacity Ratio = 0.0207

161	161	1	-9.2	-2.3	0.0	0.0	0.0	0.0
	162	1	9.2	2.3	0.0	0.0	0.0	0.0

The Demand/Capacity Ratio = 0.0207

162	162	1	-9.2	-2.3	0.0	0.0	0.0	0.0

```
  163    1      9.2      2.3      0.0      0.0      0.0      0.0
 The Demand/Capacity Ratio =   0.0207
```

```
 *********************************
 *   MAXIMUM STRAINS FOR BENT   *
 *********************************
```

NOTE : For the numbering of the Bent element Materials please
refer to the Part in the OUTPUT file where the
SECTION/SEGMENT input properties are specified

```
 - Material for SECTION/SEGMENT #     3

 Concrete Section #     4
 Maximum Strain =  0.7797E-03
 Minimum Strain = -0.4385E-03

 Steel Reinforcement Type     1
 Maximum Strain =  0.6359E-03
 Minimum Strain = -0.2947E-03

 - Material for SECTION/SEGMENT #     4

 Concrete Section #     5
 Maximum Strain =  0.5303E-03
 Minimum Strain = -0.3284E-03

 Steel Reinforcement Type     1
 Maximum Strain =  0.4290E-03
 Minimum Strain = -0.2271E-03
```

```
 ******************************************
 *   ANALYTICAL FORCE RESULTS FOR BENT   *
 ******************************************

 ELEM NODE   LOAD       FAX       F22     F33       M22      M33       TORQUE
  NO.  NO.   CASE     (Kips)    (Kips)  (Kips)   (Kip-ft)(Kip-ft)    (Kip-ft)

 - Cantilever Bent Cap Segments
   1    6     1         0.0       0.0     0.0       0.0      0.0        0.0
        7               0.0      -0.3     0.0       0.0      0.1
 Demand/Capacity Ratio =  0.0000
 Maximum Midspan Moment =       0.000 At Distance     0.00 From Node      6
   2    7     1         0.0       0.3     0.0       0.0     -0.1        0.0
        8               0.0      -0.6     0.0       0.0      0.3
 Demand/Capacity Ratio =  0.0000
   3    8     1         0.0       0.6     0.0       0.0     -0.3        0.0
        9               0.0      -0.9     0.0       0.0      0.7
 Demand/Capacity Ratio =  0.0024
   4    9     1         0.0       0.9     0.0       0.0     -0.7        0.0
       10               0.0      -1.2     0.0       0.0      1.2
 Demand/Capacity Ratio =  0.0043
   5   10     1         0.0       1.2     0.0       0.0     -1.2        0.0
        1               0.0      -1.5     0.0       0.0      1.9
 Demand/Capacity Ratio =  0.0066

 - Bent Cap Segments
   6    1     1         0.1      40.2     0.0       0.0     51.2        0.0
       11              -0.1     -40.5     0.0       0.0    -32.6
 Demand/Capacity Ratio =  0.1844
   7   11     1         0.1      40.5     0.0       0.0     32.6        0.0
       12              -0.1     -40.8     0.0       0.0    -13.8
 Demand/Capacity Ratio =  0.1173
   8   12     1         0.1      40.8     0.0       0.0     13.8        0.0
```

```
          13              -0.1    -41.1       0.0        0.0       5.1
 Demand/Capacity Ratio =   0.0497
    9     13      1        0.1     41.1       0.0        0.0      -5.1       0.0
          14              -0.1    -41.3       0.0        0.0      24.1
 Demand/Capacity Ratio =   0.0853
   10     14      1        0.1     41.3       0.0        0.0     -24.1       0.0
          15              -0.1    -41.6       0.0        0.0      43.2
 Demand/Capacity Ratio =   0.1532
   11     15      1        0.1     41.6       0.0        0.0     -43.2       0.0
          16              -0.1    -41.9       0.0        0.0      62.5
 Demand/Capacity Ratio =   0.2215

 - Center Bent Cap Segment
   12     16      1        0.1     41.9       0.0        0.0     -62.5       0.0
          17              -0.1    -42.2       0.0        0.0      81.9
 Demand/Capacity Ratio =   0.2902

 - Bent Cap Segments
   13     17      1        0.1     42.2       0.0        0.0     -81.9       0.0
          18              -0.1    -42.4       0.0        0.0     101.4
 Demand/Capacity Ratio =   0.3594
   14     18      1        0.0     42.4       0.0        0.0    -101.5       0.0
          19               0.0    -42.7       0.0        0.0     121.1
 Demand/Capacity Ratio =   0.4293
   15     19      1        0.0     42.7       0.0        0.0    -121.1       0.0
          20               0.0    -43.0       0.0        0.0     140.9
 Demand/Capacity Ratio =   0.4993
   16     20      1        0.8     43.0       0.0        0.0    -140.5       0.0
          21              -0.8    -43.3       0.0        0.0     160.4
 Demand/Capacity Ratio =   0.5673
   17     21      1        0.4     43.3       0.0        0.0    -160.6       0.0
          22              -0.4    -43.6       0.0        0.0     180.6
 Demand/Capacity Ratio =   0.6398
   18     22      1        1.0     43.6       0.0        0.0    -180.6       0.0
           2              -1.0    -43.9       0.0        0.0     200.8
 Demand/Capacity Ratio =   0.7103
   19      2      1       -0.1     -8.8       0.0        0.0    -181.5       0.0
          23               0.1      8.5       0.0        0.0     177.5
 Demand/Capacity Ratio =   0.6435
   20     23      1       -0.3     -8.5       0.0        0.0    -177.6       0.0
          24               0.3      8.2       0.0        0.0     173.7
 Demand/Capacity Ratio =   0.6298
   21     24      1       -0.5     -8.2       0.0        0.0    -173.7       0.0
          25               0.5      7.9       0.0        0.0     170.0
 Demand/Capacity Ratio =   0.6165
   22     25      1       -0.5     -7.9       0.0        0.0    -170.0       0.0
          26               0.5      7.7       0.0        0.0     166.4
 Demand/Capacity Ratio =   0.6033
   23     26      1       -0.5     -7.7       0.0        0.0    -166.4       0.0
          27               0.5      7.4       0.0        0.0     162.9
 Demand/Capacity Ratio =   0.5905
   24     27      1       -0.5     -7.4       0.0        0.0    -162.9       0.0
          28               0.5      7.1       0.0        0.0     159.6
 Demand/Capacity Ratio =   0.5781

 - Center Bent Cap Segment
   25     28      1       -0.5     -7.1       0.0        0.0    -159.6       0.0
          29               0.5      6.8       0.0        0.0     156.3
 Demand/Capacity Ratio =   0.5663

 - Bent Cap Segments
   26     29      1       -0.5     -6.9       0.0        0.0    -156.3       0.0
          30               0.5      6.6       0.0        0.0     153.2
 Demand/Capacity Ratio =   0.5548
   27     30      1       -0.4     -6.6       0.0        0.0    -153.2       0.0
          31               0.4      6.3       0.0        0.0     150.2
```

```
 Demand/Capacity Ratio =   0.5437
  28   31    1        -0.3      -6.3      0.0      0.0    -150.2      0.0
       32              0.3       6.0      0.0      0.0     147.4
 Demand/Capacity Ratio =   0.5329
  29   32    1        -0.1      -6.0      0.0      0.0    -147.3      0.0
       33              0.1       5.8      0.0      0.0     144.6
 Demand/Capacity Ratio =   0.5221
  30   33    1         0.1      -5.7      0.0      0.0    -144.4      0.0
       34             -0.1       5.5      0.0      0.0     141.8
 Demand/Capacity Ratio =   0.5117
  31   34    1        -0.2      -5.5      0.0      0.0    -142.0      0.0
        3              0.2       5.2      0.0      0.0     139.5
 Demand/Capacity Ratio =   0.5035
  32    3    1        -0.5       5.9      0.0      0.0    -137.9      0.0
       35              0.5      -6.2      0.0      0.0     140.6
 Demand/Capacity Ratio =   0.4993
  33   35    1        -0.1       6.2      0.0      0.0    -140.4      0.0
       36              0.1      -6.5      0.0      0.0     143.4
 Demand/Capacity Ratio =   0.5081
  34   36    1         0.1       6.9      0.0      0.0    -143.2      0.0
       37             -0.1      -7.2      0.0      0.0     146.4
 Demand/Capacity Ratio =   0.5188
  35   37    1        -0.4       6.7      0.0      0.0    -146.5      0.0
       38              0.4      -7.0      0.0      0.0     149.7
 Demand/Capacity Ratio =   0.5311
  36   38    1        -0.4       7.0      0.0      0.0    -149.8      0.0
       39              0.4      -7.3      0.0      0.0     153.1
 Demand/Capacity Ratio =   0.5431
  37   39    1        -0.5       7.3      0.0      0.0    -153.1      0.0
       40              0.5      -7.6      0.0      0.0     156.5
 Demand/Capacity Ratio =   0.5555

 - Center Bent Cap Segment
  38   40    1        -0.5       7.6      0.0      0.0    -156.5      0.0
       41              0.5      -7.8      0.0      0.0     160.1
 Demand/Capacity Ratio =   0.5681

 - Bent Cap Segments
  39   41    1        -0.5       7.8      0.0      0.0    -160.1      0.0
       42              0.5      -8.1      0.0      0.0     163.7
 Demand/Capacity Ratio =   0.5811
  40   42    1        -0.5       8.1      0.0      0.0    -163.7      0.0
       43              0.5      -8.4      0.0      0.0     167.6
 Demand/Capacity Ratio =   0.5947
  41   43    1        -0.5       8.4      0.0      0.0    -167.6      0.0
       44              0.5      -8.7      0.0      0.0     171.5
 Demand/Capacity Ratio =   0.6086
  42   44    1        -0.5       8.7      0.0      0.0    -171.5      0.0
       45              0.5      -9.0      0.0      0.0     175.6
 Demand/Capacity Ratio =   0.6231
  43   45    1        -0.2       8.9      0.0      0.0    -175.5      0.0
       46              0.2      -9.2      0.0      0.0     179.7
 Demand/Capacity Ratio =   0.6372
  44   46    1         0.0       9.2      0.0      0.0    -179.7      0.0
        4              0.0      -9.5      0.0      0.0     184.0
 Demand/Capacity Ratio =   0.6522
  45    4    1         1.0     -43.8      0.0      0.0    -200.4      0.0
       47             -1.0      43.6      0.0      0.0     180.3
 Demand/Capacity Ratio =   0.7091
  46   47    1         0.3     -43.6      0.0      0.0    -180.3      0.0
       48             -0.3      43.3      0.0      0.0     160.2
 Demand/Capacity Ratio =   0.6386
  47   48    1         0.8     -43.3      0.0      0.0    -160.0      0.0
       49             -0.8      43.0      0.0      0.0     140.1
 Demand/Capacity Ratio =   0.5661
  48   49    1         0.0     -42.9      0.0      0.0    -140.6      0.0
```

```
          50            0.0      42.6       0.0       0.0     120.8
 Demand/Capacity Ratio =  0.4982
   49     50      1     0.0     -42.7       0.0       0.0    -120.8       0.0
          51            0.0      42.4       0.0       0.0     101.2
 Demand/Capacity Ratio =  0.4282
   50     51      1     0.0     -42.4       0.0       0.0    -101.1       0.0
          52            0.0      42.1       0.0       0.0      81.6
 Demand/Capacity Ratio =  0.3584

 - Center Bent Cap Segment
   51     52      1     0.0     -42.1       0.0       0.0     -81.6       0.0
          53            0.0      41.9       0.0       0.0      62.2
 Demand/Capacity Ratio =  0.2892

 - Bent Cap Segments
   52     53      1     0.0     -41.9       0.0       0.0     -62.2       0.0
          54            0.0      41.6       0.0       0.0      43.0
 Demand/Capacity Ratio =  0.2205
   53     54      1     0.0     -41.6       0.0       0.0     -43.0       0.0
          55            0.0      41.3       0.0       0.0      23.8
 Demand/Capacity Ratio =  0.1523
   54     55      1     0.0     -41.3       0.0       0.0     -23.8       0.0
          56            0.0      41.0       0.0       0.0       4.8
 Demand/Capacity Ratio =  0.0845
   55     56      1     0.0     -41.0       0.0       0.0      -4.8       0.0
          57            0.0      40.8       0.0       0.0     -14.0
 Demand/Capacity Ratio =  0.0506
   56     57      1     0.0     -40.8       0.0       0.0      14.0       0.0
          58            0.0      40.5       0.0       0.0     -32.8
 Demand/Capacity Ratio =  0.1181
   57     58      1     0.0     -40.5       0.0       0.0      32.8       0.0
           5            0.0      40.2       0.0       0.0     -51.4
 Demand/Capacity Ratio =  0.1852

 - Cantilever Bent Cap Segments
   58      5      1     0.0      -1.5       0.0       0.0      -1.9       0.0
          59            0.0       1.2       0.0       0.0       1.2
 Demand/Capacity Ratio =  0.0066
   59     59      1     0.0      -1.2       0.0       0.0      -1.2       0.0
          60            0.0       0.9       0.0       0.0       0.7
 Demand/Capacity Ratio =  0.0043
   60     60      1     0.0      -0.9       0.0       0.0      -0.7       0.0
          61            0.0       0.6       0.0       0.0       0.3
 Demand/Capacity Ratio =  0.0024
   61     61      1     0.0      -0.6       0.0       0.0      -0.3       0.0
          62            0.0       0.3       0.0       0.0       0.1
 Demand/Capacity Ratio =  0.0000
   62     62      1     0.0      -0.3       0.0       0.0      -0.1       0.0
          63            0.0       0.0       0.0       0.0       0.0
 Demand/Capacity Ratio =  0.0000

------------- SPRING MEMBER FORCES--------------

Forces are in units of Kips, Moments are in units of Kip-ft
NODE LOAD      X          Y          Z          RX         RY         RZ
   1    1    0.160      0.000      0.000      0.000      0.000      0.000
   2    1    0.164      0.000      0.000      0.000      0.000      0.000
   3    1    0.179      0.000      0.000      0.000      0.000      0.000
   4    1    0.194      0.000      0.000      0.000      0.000      0.000
   5    1    0.198      0.000      0.000      0.000      0.000      0.000


Dashpot Forces
______________

Pile Node#    FXX         FYY         FZZ         MXX         MYY         MZZ
```

Kip-sec/in Kip-sec/in Kip-sec/in Kip-sec/rad Kip-sec/rad Kip-sec/rad

```
*************************************
*   UNIAXIAL INTERACTION DIAGRAM    *
*************************************
```

NOTE : 1. The tables below show the values on the Interaction Diagrams for each section which correspond to the section capacity
2. The numbering of the SECTIONS/SEGMENTS is shown previously in the output file

```
---------------------------------------
! -> Pile Cross Section Number =    1 !
---------------------------------------
```

Diagram Data

```
Maximum Tension Force                         =  0.2100E+03 (Kips)
Local 2 Axis Shift for Plastic Centroid       =  0.0000E+00 (in)
Local 3 Axis Shift for Plastic Centroid       = -0.9029E-17 (in)
```

Recommended Phi Values

```
Concrete, Rectangular members              Phi =  0.70
Concrete, Circular members with Ties       Phi =  0.70
Concrete, Circular members with Spirals    Phi =  0.75
```

Phi Factors Used

```
Phi Factor for Concrete Control               =   0.7000
Phi Factor for Steel in Compression           =   0.9000
Phi Factor for Steel in Tension               =   0.9500
Phi Factor for Steel in Bending               =   1.0000
Transition Phi Factor according to AASHTO
```

Units for Axial Force : Kips, Units for Moment : Kip-ft

Axial	Moment(+3)	Moment(-2)	Moment(-3)	Moment(+2)
0.2100E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.1799E+03	0.1549E+02	0.1549E+02	0.1549E+02	0.1549E+02
0.1648E+03	0.2298E+02	0.2298E+02	0.2298E+02	0.2298E+02
0.1448E+03	0.3258E+02	0.3258E+02	0.3258E+02	0.3258E+02
0.1271E+03	0.4097E+02	0.4097E+02	0.4097E+02	0.4097E+02
0.1086E+03	0.4741E+02	0.4741E+02	0.4741E+02	0.4741E+02
0.9001E+02	0.5388E+02	0.5388E+02	0.5388E+02	0.5388E+02
0.7208E+02	0.6018E+02	0.6018E+02	0.6018E+02	0.6018E+02
0.5428E+02	0.6642E+02	0.6642E+02	0.6642E+02	0.6642E+02
0.3626E+02	0.7271E+02	0.7271E+02	0.7271E+02	0.7271E+02
0.1761E+02	0.7920E+02	0.7920E+02	0.7920E+02	0.7920E+02
-0.4075E+00	0.8528E+02	0.8528E+02	0.8528E+02	0.8528E+02
-0.1853E+02	0.8635E+02	0.8635E+02	0.8635E+02	0.8635E+02
-0.3517E+02	0.8797E+02	0.8797E+02	0.8797E+02	0.8797E+02
-0.5128E+02	0.8819E+02	0.8819E+02	0.8819E+02	0.8819E+02
-0.6078E+02	0.8075E+02	0.8075E+02	0.8075E+02	0.8075E+02
-0.7582E+02	0.8378E+02	0.8378E+02	0.8378E+02	0.8378E+02
-0.9033E+02	0.8672E+02	0.8672E+02	0.8672E+02	0.8672E+02
-0.1053E+03	0.7840E+02	0.7840E+02	0.7840E+02	0.7840E+02
-0.1358E+03	0.8084E+02	0.8084E+02	0.8084E+02	0.8084E+02
-0.1652E+03	0.8186E+02	0.8186E+02	0.8186E+02	0.8186E+02
-0.1969E+03	0.8288E+02	0.8288E+02	0.8288E+02	0.8288E+02

-0.2255E+03	0.8137E+02	0.8137E+02	0.8137E+02	0.8137E+02
-0.2562E+03	0.7856E+02	0.7856E+02	0.7856E+02	0.7856E+02
-0.2856E+03	0.7509E+02	0.7509E+02	0.7509E+02	0.7509E+02
-0.3169E+03	0.6866E+02	0.6866E+02	0.6866E+02	0.6866E+02
-0.3466E+03	0.6113E+02	0.6113E+02	0.6113E+02	0.6113E+02
-0.3771E+03	0.5163E+02	0.5163E+02	0.5163E+02	0.5163E+02
-0.4123E+03	0.3987E+02	0.3987E+02	0.3987E+02	0.3987E+02
-0.4427E+03	0.2963E+02	0.2963E+02	0.2963E+02	0.2963E+02

! -> Pile Cross Section Number = 2 !

WARNING : THIS IS A STEEL SECTION
The interaction diagram for steel sections is based
upon developing yield strain(stress/Youngs Modulus)
in the outer fibers of the section
Steel Code requirements must be met for complete' design

Diagram Data

Maximum Tension Force = 0.1202E+04 (Kips)
Local 2 Axis Shift for Plastic Centroid = 0.0000E+00 (in)
Local 3 Axis Shift for Plastic Centroid = 0.0000E+00 (in)

Recommended Phi Values

Concrete, Rectangular members Phi = 0.70
Concrete, Circular members with Ties Phi = 0.70
Concrete, Circular members with Spirals Phi = 0.75

Phi Factors Used

Phi Factor for Concrete Control = 0.7000
Phi Factor for Steel in Compression = 0.9000
Phi Factor for Steel in Tension = 0.9500
Phi Factor for Steel in Bending = 1.0000
Transition Phi Factor according to AASHTO

Units for Axial Force : Kips, Units for Moment : Kip-ft

Axial	Moment(+3)	Moment(-2)	Moment(-3)	Moment(+2)
0.1202E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.8817E+03	0.1659E+03	0.1887E+03	0.1659E+03	0.1887E+03
0.8016E+03	0.1952E+03	0.2350E+03	0.1952E+03	0.2350E+03
0.7214E+03	0.2195E+03	0.2810E+03	0.2195E+03	0.2810E+03
0.6413E+03	0.2390E+03	0.3266E+03	0.2390E+03	0.3266E+03
0.5611E+03	0.2536E+03	0.3719E+03	0.2536E+03	0.3719E+03
0.4809E+03	0.2631E+03	0.4169E+03	0.2631E+03	0.4169E+03
0.4008E+03	0.2680E+03	0.4615E+03	0.2680E+03	0.4615E+03
0.3206E+03	0.2697E+03	0.5051E+03	0.2697E+03	0.5051E+03
0.2405E+03	0.2709E+03	0.5388E+03	0.2709E+03	0.5388E+03
0.1603E+03	0.2719E+03	0.5633E+03	0.2719E+03	0.5633E+03
0.8016E+02	0.2724E+03	0.5779E+03	0.2724E+03	0.5779E+03
0.1350E-12	0.2726E+03	0.5828E+03	0.2726E+03	0.5828E+03
-0.7594E+02	0.2724E+03	0.5779E+03	0.2724E+03	0.5779E+03
-0.1519E+03	0.2719E+03	0.5633E+03	0.2719E+03	0.5633E+03
-0.2278E+03	0.2709E+03	0.5388E+03	0.2709E+03	0.5388E+03
-0.3038E+03	0.2697E+03	0.5051E+03	0.2697E+03	0.5051E+03
-0.3797E+03	0.2680E+03	0.4615E+03	0.2680E+03	0.4615E+03
-0.4556E+03	0.2631E+03	0.4169E+03	0.2631E+03	0.4169E+03

-0.5316E+03	0.2536E+03	0.3719E+03	0.2536E+03	0.3719E+03
-0.6075E+03	0.2390E+03	0.3266E+03	0.2390E+03	0.3266E+03
-0.6834E+03	0.2195E+03	0.2810E+03	0.2195E+03	0.2810E+03
-0.7594E+03	0.1952E+03	0.2350E+03	0.1952E+03	0.2350E+03
-0.8353E+03	0.1659E+03	0.1887E+03	0.1659E+03	0.1887E+03

```
---------------------------------------
! -> Bent Cross Section Number =    1 !
---------------------------------------
```

NOTE : For the numbering of the Bent element Materials please refer to the Part in the OUTPUT file where the SECTION/SEGMENT input properties are specified

Diagram Data

```
Maximum Tension Force                    =  0.3514E+03 (Kips)
Local 2 Axis Shift for Plastic Centroid  = -0.1572E-01 (in)
Local 3 Axis Shift for Plastic Centroid  =  0.0000E+00 (in)
```

Recommended Phi Values

```
Concrete, Rectangular members            Phi =  0.70
Concrete, Circular members with Ties     Phi =  0.70
Concrete, Circular members with Spirals  Phi =  0.75
```

Phi Factors Used

```
Phi Factor for Concrete Control          =   0.7000
Phi Factor for Steel in Compression      =   0.9000
Phi Factor for Steel in Tension          =   0.9500
Phi Factor for Steel in Bending          =   1.0000
Transition Phi Factor according to AASHTO
```

Units for Axial Force : Kips, Units for Moment : Kip-ft

Axial	Moment(+3)	Moment(-2)	Moment(-3)	Moment(+2)
0.3514E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.3005E+03	0.4957E+02	0.4923E+02	0.4890E+02	0.4923E+02
0.2708E+03	0.7395E+02	0.7342E+02	0.7289E+02	0.7342E+02
0.2419E+03	0.9828E+02	0.9756E+02	0.9684E+02	0.9756E+02
0.2105E+03	0.1247E+03	0.1238E+03	0.1228E+03	0.1238E+03
0.1831E+03	0.1485E+03	0.1464E+03	0.1462E+03	0.1464E+03
0.1517E+03	0.1706E+03	0.1691E+03	0.1680E+03	0.1691E+03
0.1214E+03	0.1929E+03	0.1911E+03	0.1899E+03	0.1911E+03
0.9022E+02	0.2163E+03	0.2137E+03	0.2128E+03	0.2137E+03
0.6070E+02	0.2376E+03	0.2352E+03	0.2338E+03	0.2352E+03
0.3054E+02	0.2597E+03	0.2575E+03	0.2555E+03	0.2575E+03
0.5638E+00	0.2820E+03	0.2794E+03	0.2773E+03	0.2794E+03
-0.8296E+02	0.3118E+03	0.3004E+03	0.3074E+03	0.3004E+03
-0.1445E+03	0.3166E+03	0.3053E+03	0.3126E+03	0.3053E+03
-0.2170E+03	0.3484E+03	0.3339E+03	0.3443E+03	0.3339E+03
-0.2885E+03	0.3712E+03	0.3571E+03	0.3668E+03	0.3571E+03
-0.3572E+03	0.3864E+03	0.3751E+03	0.3853E+03	0.3751E+03
-0.4324E+03	0.3865E+03	0.3752E+03	0.3853E+03	0.3752E+03
-0.5034E+03	0.4026E+03	0.3866E+03	0.4030E+03	0.3866E+03
-0.5536E+03	0.3830E+03	0.3721E+03	0.3851E+03	0.3721E+03
-0.5911E+03	0.3709E+03	0.3611E+03	0.3731E+03	0.3611E+03
-0.6381E+03	0.3551E+03	0.3463E+03	0.3572E+03	0.3463E+03
-0.6813E+03	0.3378E+03	0.3311E+03	0.3410E+03	0.3311E+03
-0.7258E+03	0.3225E+03	0.3149E+03	0.3265E+03	0.3149E+03
-0.7766E+03	0.3010E+03	0.2944E+03	0.3048E+03	0.2944E+03

-0.8141E+03	0.2861E+03	0.2765E+03	0.2862E+03	0.2765E+03
-0.8548E+03	0.2655E+03	0.2566E+03	0.2656E+03	0.2566E+03
-0.9015E+03	0.2403E+03	0.2322E+03	0.2405E+03	0.2322E+03
-0.9461E+03	0.2125E+03	0.2049E+03	0.2126E+03	0.2049E+03
-0.9916E+03	0.1830E+03	0.1760E+03	0.1831E+03	0.1760E+03

! -> Bent Cross Section Number = 2 !

NOTE : For the numbering of the Bent element Materials please
refer to the Part in the OUTPUT file where the
SECTION/SEGMENT input properties are specified

Diagram Data

Maximum Tension Force = 0.3514E+03 (Kips)
Local 2 Axis Shift for Plastic Centroid = -0.1572E-01 (in)
Local 3 Axis Shift for Plastic Centroid = 0.0000E+00 (in)

Recommended Phi Values

Concrete, Rectangular members Phi = 0.70
Concrete, Circular members with Ties Phi = 0.70
Concrete, Circular members with Spirals Phi = 0.75

Phi Factors Used

Phi Factor for Concrete Control = 0.7000
Phi Factor for Steel in Compression = 0.9000
Phi Factor for Steel in Tension = 0.9500
Phi Factor for Steel in Bending = 1.0000
Transition Phi Factor according to AASHTO

Units for Axial Force : Kips, Units for Moment : Kip-ft

Axial	Moment(+3)	Moment(-2)	Moment(-3)	Moment(+2)
0.3514E+03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.3005E+03	0.4957E+02	0.4923E+02	0.4890E+02	0.4923E+02
0.2708E+03	0.7395E+02	0.7342E+02	0.7289E+02	0.7342E+02
0.2419E+03	0.9828E+02	0.9756E+02	0.9684E+02	0.9756E+02
0.2105E+03	0.1247E+03	0.1238E+03	0.1228E+03	0.1238E+03
0.1831E+03	0.1485E+03	0.1464E+03	0.1462E+03	0.1464E+03
0.1517E+03	0.1706E+03	0.1691E+03	0.1680E+03	0.1691E+03
0.1214E+03	0.1929E+03	0.1911E+03	0.1899E+03	0.1911E+03
0.9022E+02	0.2163E+03	0.2137E+03	0.2128E+03	0.2137E+03
0.6070E+02	0.2376E+03	0.2352E+03	0.2338E+03	0.2352E+03
0.3054E+02	0.2597E+03	0.2575E+03	0.2555E+03	0.2575E+03
0.5638E+00	0.2820E+03	0.2794E+03	0.2773E+03	0.2794E+03
-0.8296E+02	0.3118E+03	0.3004E+03	0.3074E+03	0.3004E+03
-0.1445E+03	0.3166E+03	0.3053E+03	0.3126E+03	0.3053E+03
-0.2170E+03	0.3484E+03	0.3339E+03	0.3443E+03	0.3339E+03
-0.2885E+03	0.3712E+03	0.3571E+03	0.3668E+03	0.3571E+03
-0.3572E+03	0.3864E+03	0.3751E+03	0.3853E+03	0.3751E+03
-0.4324E+03	0.3865E+03	0.3752E+03	0.3853E+03	0.3752E+03
-0.5034E+03	0.4026E+03	0.3866E+03	0.4030E+03	0.3866E+03
-0.5536E+03	0.3830E+03	0.3721E+03	0.3851E+03	0.3721E+03
-0.5911E+03	0.3709E+03	0.3611E+03	0.3731E+03	0.3611E+03
-0.6381E+03	0.3551E+03	0.3463E+03	0.3572E+03	0.3463E+03
-0.6813E+03	0.3378E+03	0.3311E+03	0.3410E+03	0.3311E+03
-0.7258E+03	0.3225E+03	0.3149E+03	0.3265E+03	0.3149E+03
-0.7766E+03	0.3010E+03	0.2944E+03	0.3048E+03	0.2944E+03

-0.8141E+03	0.2861E+03	0.2765E+03	0.2862E+03	0.2765E+03
-0.8548E+03	0.2655E+03	0.2566E+03	0.2656E+03	0.2566E+03
-0.9015E+03	0.2403E+03	0.2322E+03	0.2405E+03	0.2322E+03
-0.9461E+03	0.2125E+03	0.2049E+03	0.2126E+03	0.2049E+03
-0.9916E+03	0.1830E+03	0.1760E+03	0.1831E+03	0.1760E+03

```
***********************************************
*     FINAL MAXIMUMS FOR ALL LOAD CASES       *
*                PIER # 1                     *
***********************************************
```

Maximum Pile Forces

	Value	Load	Comb.	Pile
Max Shear in 2 Direction	-0.2289E+01 Kip	1	0	5
Max Shear in 3 Direction	-0.1239E-03 Kip	1	0	5
Max Moment about 2 Axis	-0.3749E-02 Kip-ft	1	0	5
Max Moment About 3 Axis	0.5288E+02 Kip-ft	1	0	5
Max Axial Force	-0.9531E+02 Kip	1	0	4
Max Torsional Force	-0.5356E-03 Kip-ft	1	0	5
Max Demand/Capacity Ratio	0.6164E+00	1	0	5

Maximum Soil Forces

Max Axial Soil Force	0.5831E+00 Kip	1	0	4
Max Lateral Force in X dir	0.8471E-01 Kip	1	0	2
Max Lateral Force in Y dir	-0.4029E-05 Kip	1	0	5
Max Torsional Soil Force	-0.3956E-03 Kip-ft	1	0	4

Maximum Pile Head Displacements

Max Axial Displacement	0.3718E+00 in	1	0	5
Max Displacement in X	0.9903E-01 in	1	0	5
Max Displacement in Y	-0.3367E-04 in	1	0	5

Maximum Pier Cap Forces

Max Axial Force	0.9987E+00 Kip	1	0
Max Shear in 2 Direction	0.4387E+02 Kip	1	0
Max Shear in 3 Direction	0.1045E-03 Kip	1	0
Max Torque	0.1005E-16 Kip-ft	1	0
Max Moment about 2 Axis	0.7288E-03 Kip-ft	1	0
Max Moment about 3 Axis	0.2008E+03 Kip-ft	1	0

ATTACHMENT B

GEOTECHNICAL REPORT

NODARSE

& ASSOCIATES, INC.

Phase III Geotechnical Evaluation
Beckett Bridge Over Tarpon Bayou
Bridge No. 154000
rida Department of Transportation, District 7
District-Wide Scour Foundation Evaluation
Pinellas County, Florida

BUILD ON OUR EXPERIENCE

Geotechnical, Environmental Consulting & Materials Engineering

NODARSE
& ASSOCIATES, INC.
Geotechnical, Environmental Consulting & Materials Engineering

February 10, 2005
Project No. T96-G-110-40

Mr. Thomas Montgomery, P.E.
Pitman, Hartenstein & Associates, Inc.
5620 East Fowler Avenue, Suite F
Tampa, Florida 33617

Phase III Geotechnical Evaluation
Beckett Bridge Over Tarpon Bayou
Bridge No. 154000
Florida Department of Transportation, District 7
District-Wide Scour Foundation Evaluation
Pinellas County, Florida

Dear Mr. Montgomery:

Nodarse & Associates, Inc. (N&A) is pleased to present our geotechnical analysis of the Phase III scour evaluation for the above referenced project. This evaluation was authorized by you in the Subconsultant Agreement dated October 13, 2003. The purposes of this study were to review a previous field exploration and perform a limited field exploration for the bridge crossing, and provide FB-Pier parameters for your scour foundation analysis. This report presents our understanding of the project, the results from our field exploration and FB-Pier parameters.

LITERATURE REVIEW

Presented below is data obtained from the Phase I and II evaluations and information provided by Pitman-Hartenstein and Associates, Inc. Bridge No. 154000 is a 10 span, 354-foot long, single leaf bascule bridge constructed in 1924, and rehabilitated in 1956. The elevations were obtained from the scour evaluation report and are based on the assumptions made in the report.

- Bridge No. 154000.
- Bridge Location: Riverside Drive (Spring Boulevard) over Tarpon Bayou.
- Critical Pier Location: Bent 7.
- Foundation Types: 14-inch square concrete piles.

504 EAST TYLER STREET • TAMPA, FL 33602 • 813.221.0050 • FAX: 813.221.0051 • E-MAIL: nodarse@nodarse.com
JACKSONVILLE • ORMOND BEACH • MIAMI • TAMPA • WEST PALM BEACH • WINTER PARK

- Groundline Elevations: 1.5 to -7.1 feet.
- Maximum Pile Tip Elevations: Unknown.
- Scour Elevations: 4.5 to -27.6 feet.
- Remaining Pile Embedment: Unknown.

Review of bridge repair plans dated 1995 indicates that new steel foundations type HP 14x73 were later constructed for Crutch Bent - Bent 6, Bascule Pier, and Crutch Bent - Bent 7.

SUBSURFACE EXPLORATION

We performed two (2) Standard Penetration Test (SPT) borings for this project on the north side of the east bridge abutment, and on the south side of the west bridge abutment. The approximate boring locations relative to the existing bridge are shown in the **Appendix**. The SPT borings were performed to elevations ranging from -15.5 to -20 feet NGVD. The soil profiles are included in the **Appendix.**

At each boring location, a hand auger was used to sample subsurface soils to a depth of 4 feet to avoid any damage to existing utilities. Standard Penetration Tests were then performed continuously to a depth of 10 feet and at 5-foot depth intervals thereafter to the termination depth of the borings. Each sample was removed from the sampler in the field and was examined, packaged and sealed for transportation to our laboratory for further examination and visual classification. Groundwater levels were measured in the boreholes at the time of our field exploration.

Three (3) Standard Penetration Test (SPT) borings were previously performed for this project in 1994 for FDOT. These borings were performed to approximate elevations ranging from -70 to -95 feet NGVD. The boring logs and boring location plan are included in the **Appendix**.

GENERAL SUBSURFACE CONDITIONS

Subsurface conditions encountered in the borings are shown in the **Appendix**. Adjacent to the soil strata in the SPT borings are the Standard Penetration Resistance ("N" values). The N-values have been empirically correlated with various soil properties and are considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive materials.

Borings TB-1 and TB-2 initially encountered loose to medium dense fine sand (SP) to approximate elevation -4 feet. The Standard Penetration Resistance (N values) ranged from 8 to 23 blows per foot. Boring TB-2 then encountered a strata sequence of stiff to very stiff sandy clay (CL/CH), loose slightly silty fine sand (SP-SM) and very hard calcareous clay (CH) to approximate elevation -20

No mention of presence of relict sinkhole, which appears to have been first identified in 2009, after this report. The PSI borings from 1993 provided some indication of an anomaly.

encountered in both borings to their respective termination depths. N values ranged from 30 blows per foot to practical refusal.

Subsurface conditions encountered in the previous borings (B-1, B-2 and B-3) are also attached in the **Appendix**. The borings generally encountered very loose to medium dense fine sand (SP), slightly silty fine sand (SP-SM) and clayey fine sand (SC) to approximate elevation -13 feet. The Standard Penetration Resistance (N values) ranged from 1 to 19 blows per foot. Boring B-3 then encountered strata of firm clay (CH). The borings then encountered very hard limestone at elevations ranging from -13 to -22 feet. N values ranged from 25 blows per foot to 50 blows for 1 inch of penetration.

LABORATORY TESTING

Laboratory testing consisting of full grain size analysis was performed on selected samples obtained in the borings near depths corresponding to the channel bottom. The purpose of the testing was to evaluate the D_{50} particle sizes of the granular soils to assist the hydraulics engineer in scour analysis. The D_{50} particle sizes are summarized as follows:

Boring Sample	Approximate Sample Elevation (feet)	D_{50} Particle Size (mm)
TB-1-4	-1.0	0.19
TB-2-6	-8.0	0.16
	AVG D_{50}	0.175

All laboratory testing was performed in accordance with appropriate Florida methods. Individual grain size curves are included in the **Appendix.**

SCOURABILITY OF BED MATERIAL

Based upon the our subsurface exploration and previous soil borings and our understanding of the FDOT non-scourable material guidelines (dated November 6, 1995), the granular sandy and clayey soils encountered in the upper part of the borings and extending to approximate elevation -15 to -22 feet are scourable. The elevations that the scourable materials extend to per bridge bent are as follows:

Bridge Bent Number	Approximate Elevation of Scourable Material (feet, NGVD)
1	-15
2	-15
3	-15
4	-15
5	-15
6	-15
7	-20
8	-20
9	-20
10	-22
11	-22

This is based on the assumption that the limestone formation meets all the FDOT guideline requirements. The N values of the limestone achieve the non-scourable guidelines.

FB-PIER PARAMETERS

N&A has provided generalized soil parameters to assist in foundation analysis using the computer program FB-Pier. The parameters provided are general in nature and are to be used for the Phase III scour evaluation only. The FB-Pier Parameters are located in the **Appendix.**

CLOSURE

N&A appreciates the opportunity to be of service to you on this project. If you should have any questions concerning the contents of this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NODARSE & ASSOCIATES, INC.

Sonia Florence, E.I.
Geotechnical Engineer

Daniel C. Stanfill 2/18/04

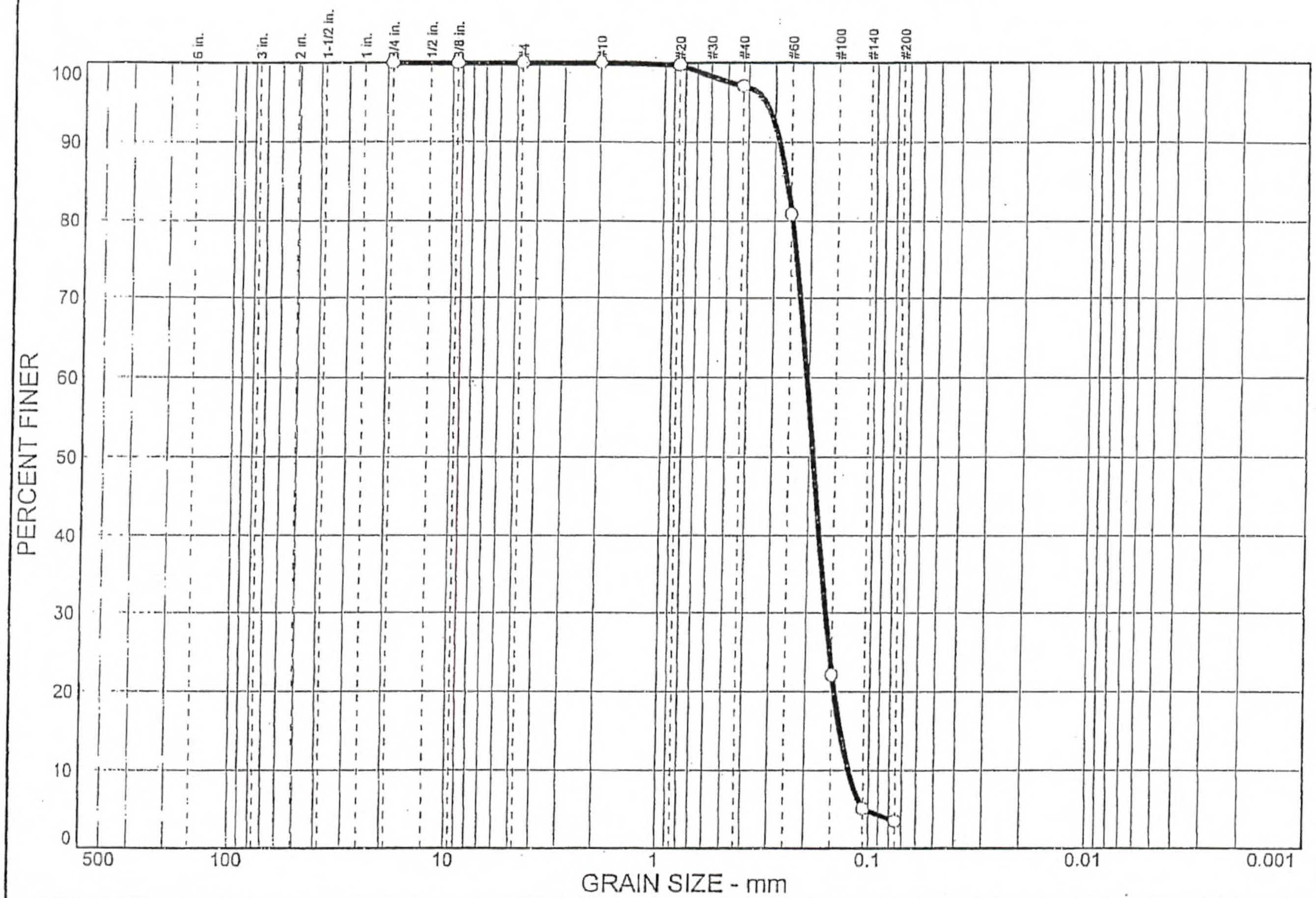
Daniel C. Stanfill, P.E.
Senior Geotechnical Engineer
FL. Registration No. 42763

Distribution: 2 - Addressee

G:\F D O T\T96-G-110 D7 Scour\TaskOrder53\T96-G-110-40 Beckett\geoeval.wpd

APPENDIX

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	96.5	3.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	97.1		
#60	80.9		
#100	22.1		
#140	5.1		
#200	3.5		

* (no specification provided)

Soil Description

Moisture Content - 24.2%

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.263 D_{60}= 0.207 D_{50}= 0.191
D_{30}= 0.162 D_{15}= 0.137 D_{10}= 0.125
C_u= 1.65 C_c= 1.02

Classification

USCS= AASHTO=

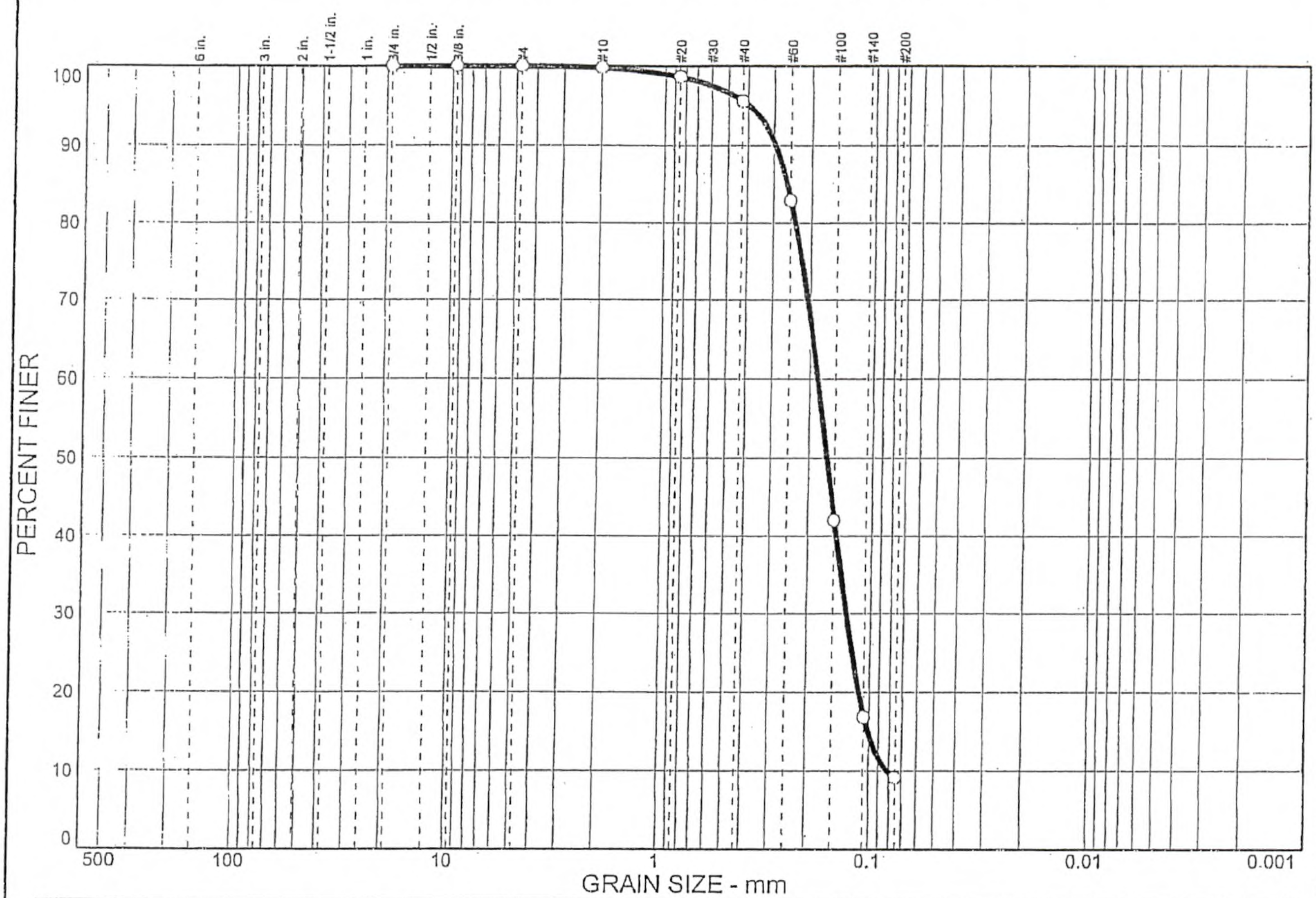
Remarks

Sample No.: TT-6 Source of Sample: Date:
Location: TB-1 S-4 Elev./Depth: 6.0'

NODARSE & ASSOCIATES, INC.

Client:
Project: Beckett Bridge
Project No: T96-G-110 Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	90.9	9.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	99.8		
#20	98.7		
#40	95.6		
#60	82.9		
#100	42.0		
#140	16.8		
#200	9.1		

* (no specification provided)

Soil Description

Moisture Content = 18.1%

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.260 D_{60}= 0.183 D_{50}= 0.164
D_{30}= 0.130 D_{15}= 0.102 D_{10}= 0.0815
C_u= 2.25 C_c= 1.13

Classification

USCS= AASHTO=

Remarks

Sample No.: 500 Source of Sample: Date:
Location: TB-2 S-6 Elev./Depth: 13.0'

NODARSE & ASSOCIATES, INC.

Client:
Project: Beckett Bridge
Project No: T96-G-110 Plate

FB-PIER PARAMETERS

FLPIER - GEOTECHNICAL PARAMETERS

PROJECT: Beckett Bridge Over Tarpon Bayou **DATE:** 02/10/05
BRIDGE NO: 154000 **BORING NO:** B-2 **BENT NO:** 7

Soil Property	LAYER 1	LAYER 2	LAYER 3
Soil Type (Cohesionless, Cohesive, Rock)	Cohesionless	Cohesive	Rock
Unit Weight (pcf)	105	115	125
Elev. @ top of Layer (ft)	-6.8	-15.0	-20.0
Elev. @ bottom of Layer (ft)	-15.0	-20.0	-78.0
Water Table Elevation (100-yr) (ft)	0	0	0

LATERAL PROPERTIES OF SOIL:

	LAYER 1		LAYER 2		LAYER 3	
Lateral Soil Layer Model - 1 ,2, 3, 4, 5, 6	2		4		2	
	Top	Bottom	Top	Bottom	Top	Bottom
Internal Fiction Angle (deg.)	28	28	--	--	38	38
Subgrade Modulus $_{1,2,5}$ (pci)	30	30	125	125	150	150
Total Unit Weight $_{1,2,3,4,5,6}$ (pcf)	105	105	115	115	125	125
Undrained Shear Strength $_{3,4,5,6}$ (psf)	--	--	1,800	1,800	--	--
Avg Undrained Shear $_{5,6}$ (psf)	--	--	--	--	--	--
Major Strain @ 50 $_{3,4,5,6}$	--	--	0.005	0.005	--	--
Major Strain @ 100 $_{5}$	--	--	--	--	--	--

Soil Types (for lateral P-Y curve): 1 - Sand (O'Neill); 2 - Sand (Reese); 3 - Clay (O'Neill); 4 - Clay (Soft < Water Table); 5 - Clay (Stiff < Water); 6 - Clay (Stiff > Water)

AXIAL PROPERTIES OF SOIL:

Unconfined Compressive (psf) (Rock Only)	--	--	--	--	150,000	150,000
Internal Fiction Angle (deg.)	28	28	--	--	38	38
Total Unit Weight (pcf)	105	105	115	115	125	125
Shear Modulus (ksi)	2	2	35	35	35	35
Poissons Ratio	0.35	0.35	0.3	0.3	0.3	0.3
Vertical Failure Shear (psf)	200	200	750	750	2,000	2,000

TORSIONAL PROPERTIES OF SOIL:

Internal Fiction Angle (deg.)	28	28	--	--	38	38
Total Unit Weight (pcf)	105	105	115	115	125	125
Shear Modulus (ksi)	2	2	35	35	35	35
Torsional Shear Stress (psf)	200	200	750	750	2,000	2,000

PROPERTIES OF SOIL AT TIP:

Shear Modulus (ksi)	2	35	35
Poissons Ratio	0.35	0.3	0.3
Axial Bearing Failure (kips)	50	280	500

FIGURES

ATTACHMENT C

SCOUR SUMMARY

Pitman - Hartenstein & Assoc., Inc.
7820 Arlington Expwy., Suite 640
Jacksonville, Florida 32211

Job No.: 93004.153
Date: 5-Dec-05
By: RCR
Checked:
Sheet No.:

Bridge No.: 154000

Phase 3 Scour Analysis
100 yr-Storm Event

Units shown are in feet.

Bent No. Pile No.	Bridge Soundings	Top of Rail Elevation	Ground Elevation	Pile Tip Elevation	Total Scour	Predicted Scour Elevation	Top of Non Scourable Material Elev.	Remaining Pile Embed.
Bent 7								
1	23.65	16.85	-6.80	Unknown	20.8	-27.60	-20.0	Unknown
2	23.65	16.85	-6.80	Unknown	20.8	-27.60	-20.0	Unknown
2	23.65	16.85	-6.80	Unknown	20.8	-27.60	-20.0	Unknown
3	23.65	16.85	-6.80	Unknown	20.8	-27.60	-20.0	Unknown
4	23.65	16.85	-6.80	Unknown	20.8	-27.60	-20.0	Unknown
	Averages		-6.80	Unknown		-27.60		Unknown

Notes:

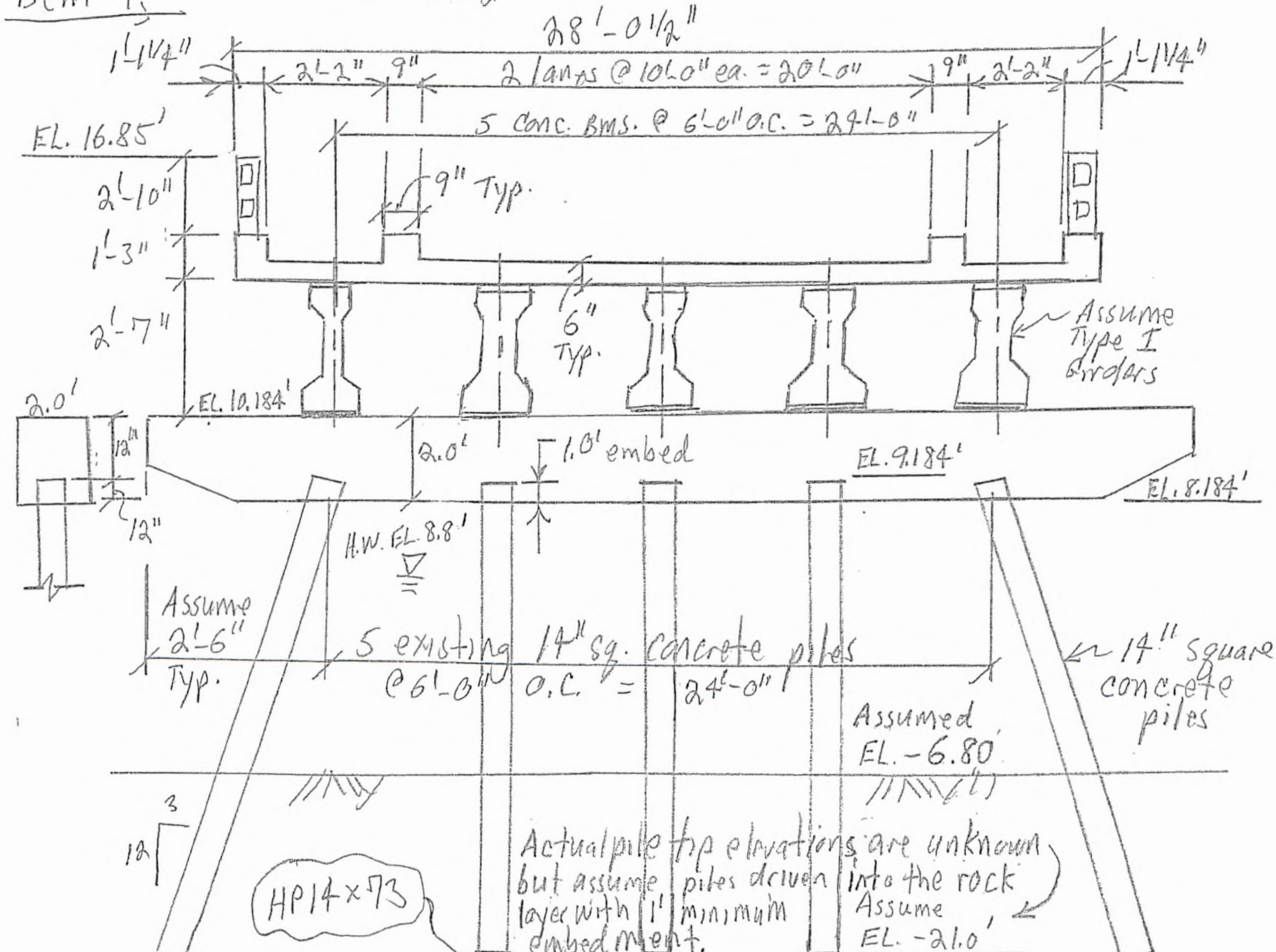
1. The Bridge Sounding depths are based on an assumed ground elevation of -6.80 feet as shown in the Phase 2 report since the 07-27-04 Inspection Report did not include any bridge soundings.
2. Top of Rail elevations calculated based on dimensions shown on "Br. # 154000, Existing Elevations & Dimensions" sheet.
3. Pile tip elevations are **unknown** since the original 1924 design plans, the 1956 rehab plans, and the pile driving records for the concrete piles are not available. Only the 1995 repair plans are available and they show very little information about the existing bridge.
4. Total scour obtained from Phase 2 scour report.
5. Top of non-scourable material elevation obtained from geotechnical report by Nodarse & Associates, 2-10-2005.
6. Ground Elevation = Top of Rail Elevation - Bridge Sounding depth.
7. Predicted Scour Elevation = Ground Elevation - Total Scour
8. Remaining Pile Embedment is **unknown** since pile tip elevations are unknown.

PITMAN ♥ HARTENSTEIN & ASSOC., INC. ENGINEERS	☑ JAX ☐ TAMPA ☐ FT. MYERS	MADE BY: RCR	DATE: 10-05	JOB NO.: 93004.153
		CHECKED BY:	DATE:	SHEET NO.: 1

CALCULATIONS FOR: Bridge #154000, Existing Elevations + Dimensions

Original 1924 design plans, 1956 rehab plans, and pile driving records for concrete piles not available. Only the 1995 repair plans are available + they do not show many dimensions or elevations for the existing bridge. Dimensions will be scaled from the 1995 repair plans, but reinforcing details are unknown when req'd.

Bent 7



Due to limitations in the Fla. Pier program crutch bent will be considered by adding 2 extra steel H-piles @ 6' spa. to the bent shown above. Overall bent width = 2(2.5)+(6)(6') = 41.0'

100-YEAR SCOUR SUMMARY
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

Pier/Bent	Groundline Elevation (ft)	Maximum Pile Tip Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Degradation (ft)	Total Scour (ft)	Scour Elevation (ft)	Minumum Remaining Pile Embedment (ft)
1	1.5	UNKNOWN	--	--	0.0	--	1.5	UNKNOWN
2	-2.6	UNKNOWN	3.6	3.5	0.0	7.1	-9.7	UNKNOWN
3	-3.1	UNKNOWN	3.6	4.2	0.0	7.8	-10.9	UNKNOWN
4	-5.2	UNKNOWN	3.6	4.2	0.0	7.8	-13.0	UNKNOWN
5	-5.6	UNKNOWN	3.6	4.5	0.0	8.1	-13.7	UNKNOWN
6	-7.1	UNKNOWN	3.6	5.5	0.0	9.1	-16.2	UNKNOWN
7	-6.8	UNKNOWN	3.6	17.2	0.0	20.8	-27.6	UNKNOWN
8	-6.6	UNKNOWN	3.6	4.2	0.0	7.8	-14.4	UNKNOWN
9	-4.6	UNKNOWN	3.6	3.9	0.0	7.5	-12.1	UNKNOWN
10	-0.7	UNKNOWN	3.6	3.0	0.0	6.6	-7.3	UNKNOWN
11	4.5	UNKNOWN	--	--	0.0	--	4.5	UNKNOWN

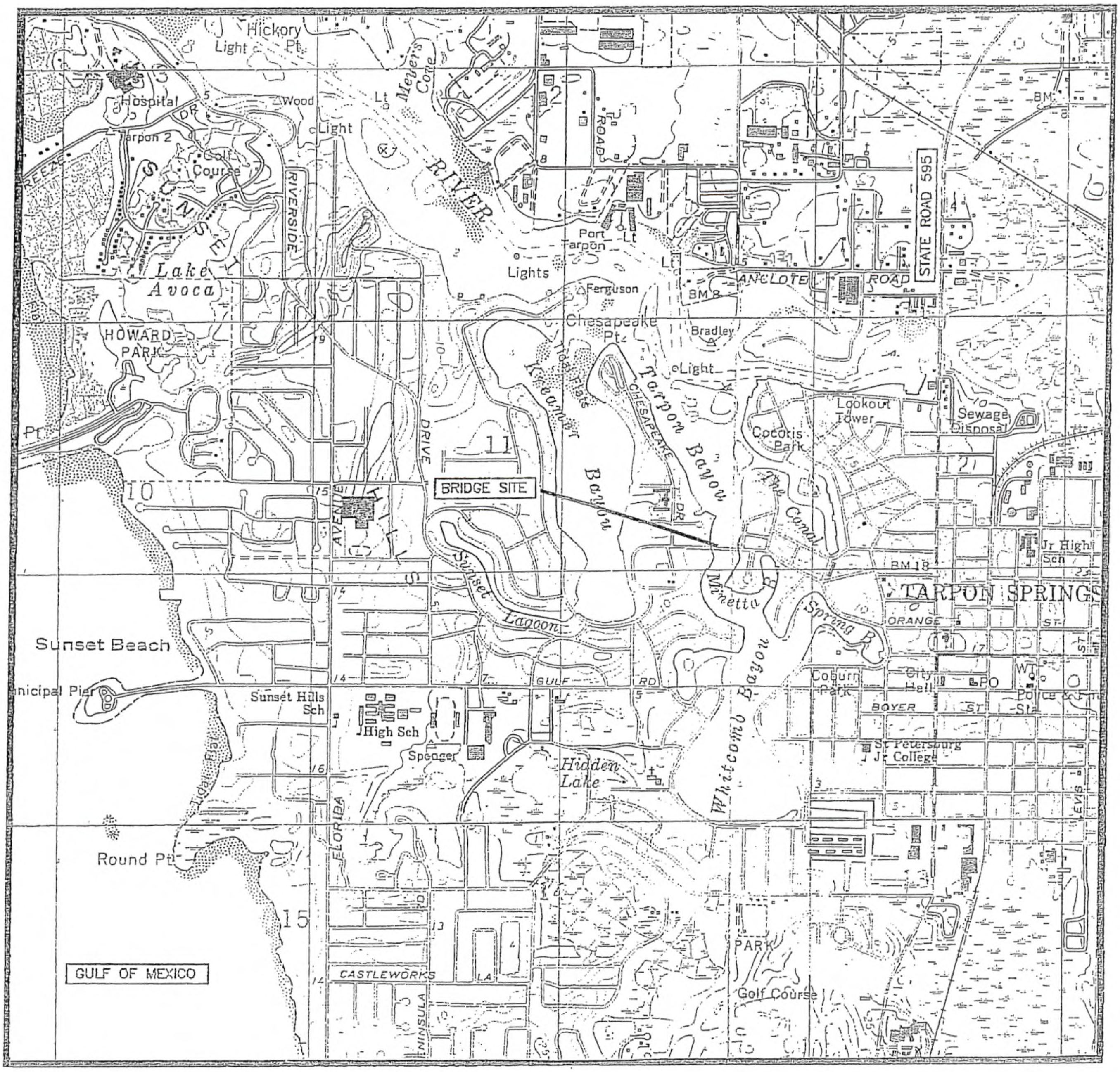
Calc. By:	MSB	9/5/97
Check By:	FWZ	9/8/97

500-YEAR SCOUR SUMMARY
FOR
BECKETT BRIDGE - RIVERSIDE DRIVE (SPRING BLVD.) OVER TRAPON BAYOU
STRUCTURE NO. 154000

PINELLAS COUNTY, FLORIDA
SPETEMBER 1997

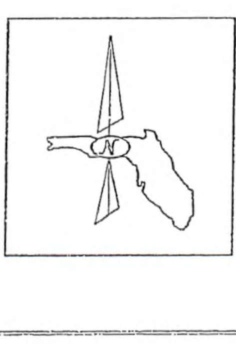
Pier/Bent	Groundline Elevation (ft)	Maximum Pile Tip Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Degradation (ft)	Total Scour (ft)	Scour Elevation (ft)	Minumum Remaining Pile Embedment (ft)
1	1.5	UNKNOWN	--	--	0.0	--	1.5	UNKNOWN
2	-2.6	UNKNOWN	6.4	3.9	0.0	10.3	-12.9	UNKNOWN
3	-3.1	UNKNOWN	6.4	4.7	0.0	11.1	-14.2	UNKNOWN
4	-5.2	UNKNOWN	6.4	4.9	0.0	11.3	-16.5	UNKNOWN
5	-5.6	UNKNOWN	6.4	5.0	0.0	11.4	-17.0	UNKNOWN
6	-7.1	UNKNOWN	6.4	5.7	0.0	12.1	-19.2	UNKNOWN
7	-6.8	UNKNOWN	6.4	19.4	0.0	25.8	-32.6	UNKNOWN
8	-6.6	UNKNOWN	6.4	4.7	0.0	11.1	-17.7	UNKNOWN
9	-4.6	UNKNOWN	6.4	4.4	0.0	10.8	-15.4	UNKNOWN
10	-0.7	UNKNOWN	6.4	3.4	0.0	9.8	-10.5	UNKNOWN
11	4.5	UNKNOWN	--	--	0.0	--	4.5	UNKNOWN

Calc. By:	MSB	9/5/97
Check By:	Fwr	9/3/91



REFERENCE: U.S.G.S. "TARPON SPRINGS, FLORIDA" QUADRANGLE MAP — ISSUED: 1995

SECTIONS: 11, 12
TOWNSHIP: 27 SOUTH
RANGE: 15 EAST
SCALE: 1" = 2000'



U.S.G.S. VICINITY MAP

BECKETT BRIDGE – RIVERSIDE DRIVE OVER TARPON BAYOU

BRIDGE No. 154000

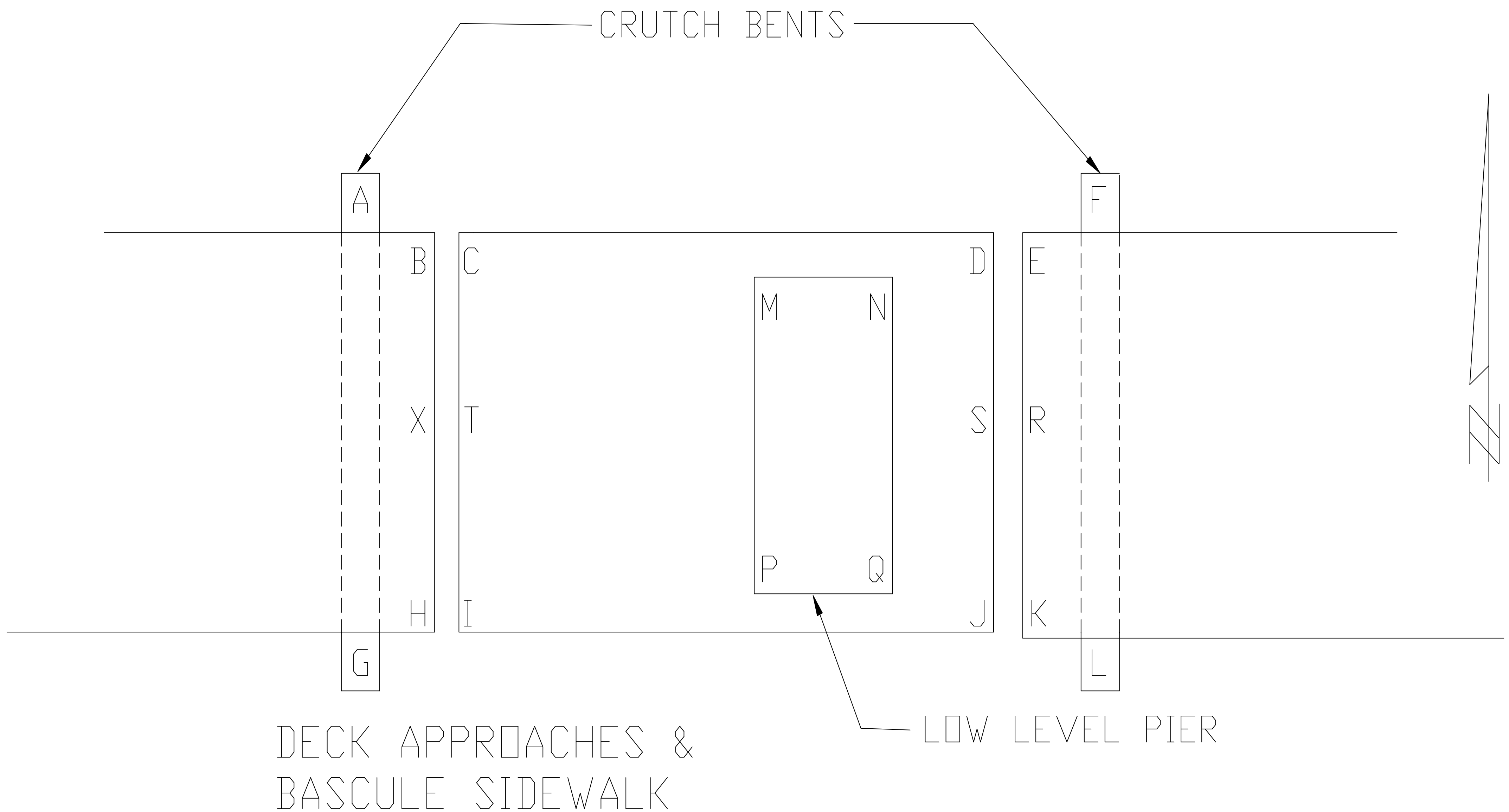
PINELLAS COUNTY, FLORIDA

DRAWN: SLW	NODARSE & ASSOCIATES, INC.	
CHKD: SF		
SCALE: NOTED		
DATE: 12-1-04	PROJ. NO: T96-G-110-40	FIGURE: 1

5. SETTLEMENT EVALUATION REPORT

Beckett Bridge Deck and Approach Check Elevations 1997 to 2018

Date: Crutch Bents	5/2/1997	6/16/1997	7/31/1997	1/26/1998	5/29/1998	1/15/2009	1/9/2012	11/2/2016	5/16/2018	COMMENTS
Diff. L	-0.01	0.00	0.00	-0.01	0.00		-0.01	-0.01	-0.01	
A	10.56	10.55	10.55	10.56	10.56		10.54	10.53	10.54	
Mid	10.56	10.55	10.56	10.56	10.56		10.53	10.53	10.53	Rest pier crutch bent elevations remained consistent within +/- 0.01 feet (+/- 1/8") from **May 1997** thru **May 1998**, were lower by 0.02 feet (1/4") between **May 1998** and **January 2012**, and remained consistent within +/- 0.01 feet (+/- 1/8") between **January 2012** and **May 2018**.
G	10.55	10.55	10.56	10.55	10.56		10.52	10.52	10.52	
Diff. R	0.00	0.00	-0.01	0.00	0.00		0.01	0.00	0.01	
Diff. L	-0.09	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.06	-0.07	
B	13.49	13.49	13.49	13.50	13.51	13.47	13.47	13.47	13.48	
X	13.40	13.44	13.44	13.44	13.45	13.40	13.40	13.41	13.41	East flanking span deck elevations remained consistent within +/- 0.01 feet (+/- 1/8") from **May 1997** thru **May 1998**, were lower by 0.02 feet (1/4") between **May 1998** and **January 2009**, and remained consistent within +/- 0.01 feet (+/- 1/8") between **January 2009** and **May 2018**.
H	13.31	13.31	13.31	13.33	13.33	13.28	13.27	13.35	13.29	
Diff. R	0.09	0.13	0.13	0.11	0.12	0.12	0.13	0.06	0.12	
Diff. L	-0.05	-0.04	-0.05	-0.05	-0.05	-0.06	-0.05	-0.04	-0.07	
C	13.49	13.50	13.50	13.50	13.51	13.49	13.47	13.47	13.49	
T	13.44	13.46	13.45	13.45	13.46	13.43	13.42	13.43	13.42	West end bascule span deck elevations remained consistent within +/- 0.01 feet (+/- 1/8") from **May 1997** thru **May 1998**, were lower by 0.02 feet (1/4") between **May 1998** and **January 2009**, and remained consistent within +/- 0.01 feet (+/- 1/8") to **May 2018**.
I	13.38	13.38	13.36	13.36	13.38	13.35	13.33	13.34	13.29	
Diff. R	0.05	0.08	0.09	0.09	0.08	0.08	0.09	0.09	0.13	
Diff. L	0.00	0.00	0.00	-0.01	0.00					
M	5.72	5.70	5.69	5.70	5.69					
Mid	5.72	5.70	5.69	5.69	5.69					West end bascule pier elevations, were lower by by 0.02 feet (1/4") between **May 1997** and **June 1997**, and remained consistent within +/- 0.01 feet (+/- 1/8") between **June 1997** and **May 1998**. No survey was performed after **May 1998**.
P	5.72	5.70	5.69	5.68	5.68					
Diff. R	0.00	0.00	0.00	0.01	0.01					
Diff. L	-0.02	0.02	0.03	0.02	0.01					
N	5.63	5.70	5.70	5.71	5.71					East end bascule pier elevations, was higher by 0.08 feet (1") at north side and at was higher by 0.17 feet (2") at south side, between **May 1997** and **June 1997**, and remained consistent within +/- 0.015 feet (+/- 3/16") between **June 1997** and **May 1998**. No survey was performed after **May 1998**. (NOTE: The significant increase in elevation rather than a decrease may be explained by rehabilitation construction around this time with installation of "helper piles"/crutch bent. However, it could also be a result of questionable survey.)
Mid	5.61	5.73	5.73	5.73	5.72					
Q	5.58	5.75	5.76	5.75	5.73					
Diff. R	0.05	-0.05	-0.06	-0.04	-0.02					
Diff. L	0.03	0.00	-0.01	0.01	0.00	-0.01	0.00	-0.02	-0.02	
D	13.31	13.31	13.31	13.33	13.33	13.24	13.28	13.28	13.27	
S	13.34	13.31	13.30	13.34	13.33	13.23	13.28	13.26	13.25	East end bascule span deck elevations remained consistent within +/- 0.01 feet (+/- 1/8") between **May 1997** and **May 1998**, were lower by 0.04 feet (1/2") to 0.05 feet (5/8") between **May 1998** and **January 2009**, and remained consistent within +/- 0.01 feet (+/- 1/8") between **January 2009** and **May 2018**.
J	13.37	13.37	13.37	13.40	13.40	13.31	13.35	13.36	13.33	
Diff. R	-0.03	-0.06	-0.07	-0.06	-0.07	-0.08	-0.07	-0.10	-0.08	
Diff. L	0.04	0.01	0.01	0.01	0.00	0.00	0.01	0.00	-0.01	
E	13.32	13.32	13.31	13.32	13.33	13.27	13.26	13.27	13.27	
R	13.36	13.33	13.32	13.33	13.33	13.27	13.27	13.27	13.26	West flanking span deck elevations remained consistent within +/- 0.01 feet (+/- 1/8") to +/- 0.015 feet (+/- 3/16") between **May 1997** and **May 1998**, were lower by 0.02 feet (1/4") between **May 1998** and **January 2009**,and remained consistent within +/- 0.01 feet (+/- 1/8") to **May 2018**.
K	13.39	13.38	13.38	13.39	13.40	13.35	13.34	13.34	13.34	
Diff. R	-0.04	-0.05	-0.06	-0.06	-0.07	-0.08	-0.07	-0.07	-0.08	
Diff. L	0.01	0.00	0.00	-0.01	-0.01		-0.13	-0.02	-0.29	Rest pier crutch bent elevations remained consistent within +/- 0.01 feet (+/- 1/8") between **May 1997** and **May 1998**, changed between **May 1998** and **January 2012** with inconsistent values at the north end, higher by 0.19 feet (2-1/4") in **January 2012**, lower by 0.23 feet (2-3/4") in **November 2016**, and higher by 0.54 feet (6-1/2") in **May 2018**, and consistent values at the south end, lower by 0.05 feet (5/8") that remained consistent within +/- 0.01 feet (+/- 1/8") to **May 2018**. (NOTE: It is unlikley that these extreme variations in north end survey elevations are a result of settlement and are more likely an indication of questionable survey.)
F	10.01	10.02	10.02	10.03	10.03		10.21	9.98	10.52	
Mid	10.02	10.02	10.02	10.02	10.02		10.09	9.97	10.23	
L	10.02	10.01	10.01	10.01	10.01		9.96	9.95	9.94	
Diff. R	0.00	0.01	0.01	0.01	0.01		0.13	0.02	0.29	



CRUTCH BENTS
A
B
C
D
E
F
M
N
X
T
S
R
P
Q
H
I
J
K
G
L
LOW LEVEL PIER
DECK APPROACHES &
BASCULE SIDEWALK

6. PRELIMINARY RISK ANALYSIS FOR RE-CLASSIFYING UNKNOWN FOUNDATIONS

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT SEVEN STRUCTURES MAINTENANCE OFFICE
FPN: 427359-3-72-01

Kimley-Horn and Associates, Inc.

PRELIMINARY RISK ANALYSIS
for
RECLASSIFYING UNKNOWN FOUNDATION BRIDGES

Performed By:	AMB	Date:	10/27/2010
Checked By:	JML	Date:	10/28/2010

BRIDGE NUMBER: 154000
COUNTY: PINELLAS
LOCATION: 0.4 MI W/O GRAND BLVD
FACILITY CARRIED: N SPRING BLVD
FEATURE INTERSECTED: MINETTA BRANCH

The following steps are based on Procedural Manual: Reclassify Unknown Foundation Bridges, FHWA & FDOT, November 2009

STEP 4.1: ANNUAL AND LIFETIME RISKS PROCEDURE

Task 1: Calculate Cost of Failure:

Cost of Failure = Bridge Replacement Cost + Detour Cost + Loss of Life Cost

Bridge Replacement Cost =	$7,331,154
Detour Cost =	$1,596,079
Loss of Life Cost =	$2,900,000
TOTAL =	$11,827,233

Actual bridge replacement cost is significantly higher by a factor of two. Say $15,000,000.

$19,500,000

Task 2: Determine if Bridge is Tidally Influenced:

Scour Mode =	T	Tidal
Overtopping Frequency =	O	Occasional
Annual Probability of Failure (PA) =		0.00017

Actual probability of failure is higher than typical bridges due to presence of relict sinkhole and continued foundation settlement. Also, bridge is classified as a urban collector with a minimum performance level of 0.0005.

Task 3: Determine Risk Adjustment Factors:

K1 Adjustment Factor =	1
K2 Adjustment Factor =	0.8

Task 4: Calculate Annual and Lifetime Risks of Failure:

Annual Risk of Failure (R_A) =	$2,011
Lifetime Risk of Failure (R_L) =	$24,099

$9,750

$117,000 based on 12-year life and should be higher considering the known foundation issues

STEP 4.2: DETERMINE BRIDGE PRIORITY

Is Bridge a High Priority? N — Go to Step 4.3

STEP 4.3: DETERMINE BRIDGE PERFORMANCE LEVEL

Does Bridge Meet Minimum Performance Level (MPL)? Y — Go to Step 4.4

STEP 4.4: DETERMINE IF BRIDGE LIFETIME RISK OF FAILURE (R_L) < $15,000

Is Bridge Lifetime Risk of Failure (R_L) < $15,000 ? N — Go to Step 4.5

STEP 4.5: DETERMINE IF BRIDGE LIFETIME RISK OF FAILURE (R_L) > $100,000

Is Bridge Lifetime Risk of Failure (R_L) > $100,000 ? Y N — Go to Step 5.1 for Stage 2

RESULT OF PRELIMINARY RISK ASSESSMENT:

Proceed to Stage 2, Step 5.1

ANTHONY M. BEVILACQUA LICENSE No 59262 * STATE OF FLORIDA PROFESSIONAL ENGINEER

10-28-10

Responsible Engineer: Anthony M. Bevilacqua
Florida PE #: 59262
Date: 28-Oct-10
Address: Kimley-Horn and Associates, Inc.
4431 Embarcadero Drive
West Palm Beach, Florida 33407
561.845.0665
Certificate of Authorization # 696

7. GEOTECHNICAL REPORTS

7.1. WILLIAMS EARTH SCIENCES GEOTECHNICAL REPORT (2009)

TABLE OF CONTENTS

1.0 PROJECT INFORMATION

1.1 Introduction

As requested by Mr. Timothy Farrell, P.E. of DSA Group, Inc., in his request for services dated October 3, 1994, Williams Earth Sciences, Inc. has analyzed crutch bent foundations for Beckett Bridge Repairs. The project is located in Township 27 South, Range 15 East, Sections 11 and 12, on the Anclote River in Pinellas County, Florida. Figure 1, shown in Appendix A, illustrates the location of the project.

The Beckett Bridge is a two-lane bascule bridge 20 feet across and 358 feet long with two 2 foot wide sidewalks on each side. The approach span foundations structures are constructed of 14 inch square prestressed concrete piles. Plans provided to us by DSA Group show that the existing bridge consists of four spans on the east approach and five spans on the west approach. The bascule is approximately 40 feet long and rests on a concrete pier.

1.2 Information Provided

Williams Earth Sciences, Inc. has reviewed the Subsurface Exploration Report provided to DSA Group by Professional Services Industries, Inc., (PSI) dated January 7, 1994. Also reviewed was the Preliminary Investigation Report by David Volkert and Associates, Inc., dated February 2, 1994. A Bridge Inspection Report prepared by Kisinger, Campo and Associates Corp. was also made available. These items were sent to us in a Letter of Transmittal dated November 4, 1994, from DSA Group, Inc. along with a plan and elevation sheet of the bridge. The Letter of Transmittal requested Williams Earth Sciences, Inc. to perform capacity analyses on HP 14 x 73 and HP 14 x 89 steel piles. The letter also requested Williams Earth Sciences, Inc. to provide estimated settlements of the existing 14-inch square prestressed concrete piles. The settlement analysis however will be submitted in a separate report.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Our field exploration consisted of performing three Standard Penetration Test (SPT) borings. Two borings were performed near the abutments on the east and west approaches to the existing bridge and one boring was performed on the westbound lane of the bridge deck adjacent to the west side of the bascule. The test boring locations are shown on Figure 2 in Appendix A. In addition, a Report of Core Borings has been included. The test location of the SPT borings performed by PSI are also shown on Figure 2 and the Report of Core Borings.

A lane closure and Maintenance of Traffic (MOT) was necessary for the borings performed on the bridge. The bridge deck was cored with a 6-inch barrel for drilling purposes and the hole was patched using Quickrete after completion of the test boring.

While on site, the drill crew retrieved both a soil and water sample for corrosion testing at the laboratory. The water sample was taken from the middle of the Anclote River and the soil sample was taken 1 foot below the ground surface adjacent to Boring B-3.

2.2 Laboratory Testing

Grain size determination and natural moisture content tests were performed on selected samples to assist in soil classification and to provide a general indication of the engineering properties of the soils. The grain size test was performed in general accordance with ASTM D-442.

Corrosion testing was performed on one soil and one water sample to determine the environmental classification. The environmental classifications have been summarized in Table 1 and the results are reported in Appendix B.

Table 1: Summary of Environmental Classification for Soil and Water Samples

Sample ID	Sample Date	Sample Location	Sample Type	Sample Depth	pH	Chlorides ppm	Sulfates ppm	Resistivity ohm-cm
S-1	10/20/94	EAST West approach, north side	Soil	1.0	8.8	300	<2	1440
W-1	10/20/94	Middle of channel	Water	1.0	7.9	14,000	7,920	41

3.0 SUBSURFACE CONDITIONS

3.1 Subsurface Conditions

3.1.1 Abutment Borings

The major subsurface conditions encountered in our exploration are outlined below. A more detailed description of the subsurface soils is provided in the form of individual boring logs in Appendix B. Subsurface conditions may vary across the site and between boring locations.

Borings B-1 and B-3 were performed on land on the east and west sides of the bridge respectively. The soils types and strata depths encountered on these borings were fairly similar. Generally, very loose to medium dense fine sands were found from ground surface to approximately 13 feet below ground surface. The sands were slightly shelly and silty from 8 to 13 feet below the ground surface in Boring B-1. From 13 to approximately 19 feet, the soils encountered were very loose to loose, clayey to very clayey fine sands. Boring B-3 encountered firm green clay with limestone fragments from 18 to 21 feet below ground surface.

In Borings B-1 and B-3, limestone with blow counts ranging from 50=5 inches to 50=1 inch was encountered to termination depths of 75.3 feet and 81.5 feet respectively. However, at Boring B-1 a hard sandy clay with limestone pebbles was encountered from 47 to 58 feet below ground surface. At Boring B-3, the strata from 47 to 53 feet contained interpocketed silty limestone and green sandy clay. There was also a possible void at 69 to 71 feet at this boring location as evidenced by a 2 foot drop in the drill rod.

3.1.2 Bridge Borings

Boring B-2 was performed through the bridge over the Anclote River. The water depth was measured to be approximately 5 feet deep to the top of the mudline. The mudline was measured to be approximately 18 feet below the top of the bridge deck where drilling commenced. From 18 (mudline) to 25 feet below the top of the bridge deck, very loose fine sand was encountered. From 25 to 95 feet limestone was found with blow counts ranging from 50=5 inches to 50=1 inch. The strata from 68 to 75 feet, however, had blows on the order of 55 blows per foot. At 95 feet below the top of the bridge deck a very loose shelly fine sand was encountered. Below this stratum the blows increased to 50=1 inch. However, there was no recovery of the samples. The boring was terminated at 108 feet.

An existing pile settlement report is not in the project files.

3.2 Groundwater and Surface Water

The groundwater depths at the time of drilling for Borings B-1 and B-3 were measured to be 5.5 and 3.5 feet below ground surface. The groundwater depth for Boring B-2 was found to be 5 feet to the mudline.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General

The evaluations that follow were performed under the assumption that steel piles HP 14 x 73 or HP 14 x 89 are to be used as crutch bents. Therefore, driven square prestressed piles, drilled shafts, steel pipe piles and shallow foundations have not been evaluated in this report.

As previously stated, the settlement predictions on the existing 14-inch square prestressed concrete piles will be provided in a separate report. Our analysis for future settlement assumes that construction of a new bridge will not influence the piles on the existing bridge. That is, the existing bridge will be demolished prior to constructing the replacement bridge. If this is not the case, a vibration and settlement monitoring program should be implemented to ensure the safety of motorists during the foundation installation. In addition, vibration monitoring might be necessary during the installation of crutch bent piles.

4.2 Analysis of Steel HP Piles

The computer program "SPT94" was used to analyze HP 14 x 73 and HP 14 x 89 steel piles as crutch bents for the existing bridge. Both steel sections were analyzed at each of the three test borings performed by Williams Earth Sciences, Inc. and as a result, six capacity curves were generated. The curves are shown in Appendix C along with the output created by the computer program. The section properties used as input for the computer runs are as follows:

	HP 14 x 73	HP 14 x 89
Unit Weight	490 pcf	490 pcf
Width	14.0"	14.0"
Depth	13.61"	13.83"
Area	21.4 sq. in.	26.1 sq. in.

For computer analysis purposes the elevations of the borings were assumed to be +5.5 feet for Boring B-1 and +3.5 feet for Boring B-3. Similarly, for Boring B-2 the mudline elevation was assumed to be at -5.0 feet. The elevations assumed were based on water levels at the time of drilling. The elevations shown on the capacity curves should be taken only as estimates.

As previously stated, the required design capacity of the steel piles has not been provided as of this writing, therefore, we can not make recommendations for pile lengths at this time. In addition, when selecting pile lengths and the corresponding allowable capacities from the curves, it should be recognized that the relatively hard limestone can cause buckling of the steel members during driving operations. Therefore, we recommend that a test pile program be considered using the Pile Driving Analyzer (PDA). The PDA offers driving resistance values during driving operations and can detect damage of the member. In addition, the data collected from the PDA can be used to determine driving criteria for production piles. The number of test piles will be determined based on number of crutch piles necessary to support the structure. Also, to minimize damage to the H-pile during installation, we recommend using commercially available H-pile tips with teeth. This device will improve driving alignment, reduce skidding on sloping rock and helps penetrate hard layers of soil and obstruction.

5.0 LIMITATIONS

Evaluations and recommendations presented in this report were prepared for the exclusive use of DSA Group, Inc., their clients, and consultants for the specific application to the Beckett Bridge Repairs Project. These evaluations and recommendations were prepared using generally accepted standards of geotechnical engineering practices. No other warranty is expressed or implied. Also, these evaluations and recommendations are based on design information provided and discussed earlier.

If the structural conditions vary from those stated or should the structure location be changed, the geotechnical engineer should be notified for review of the foundation recommendations.

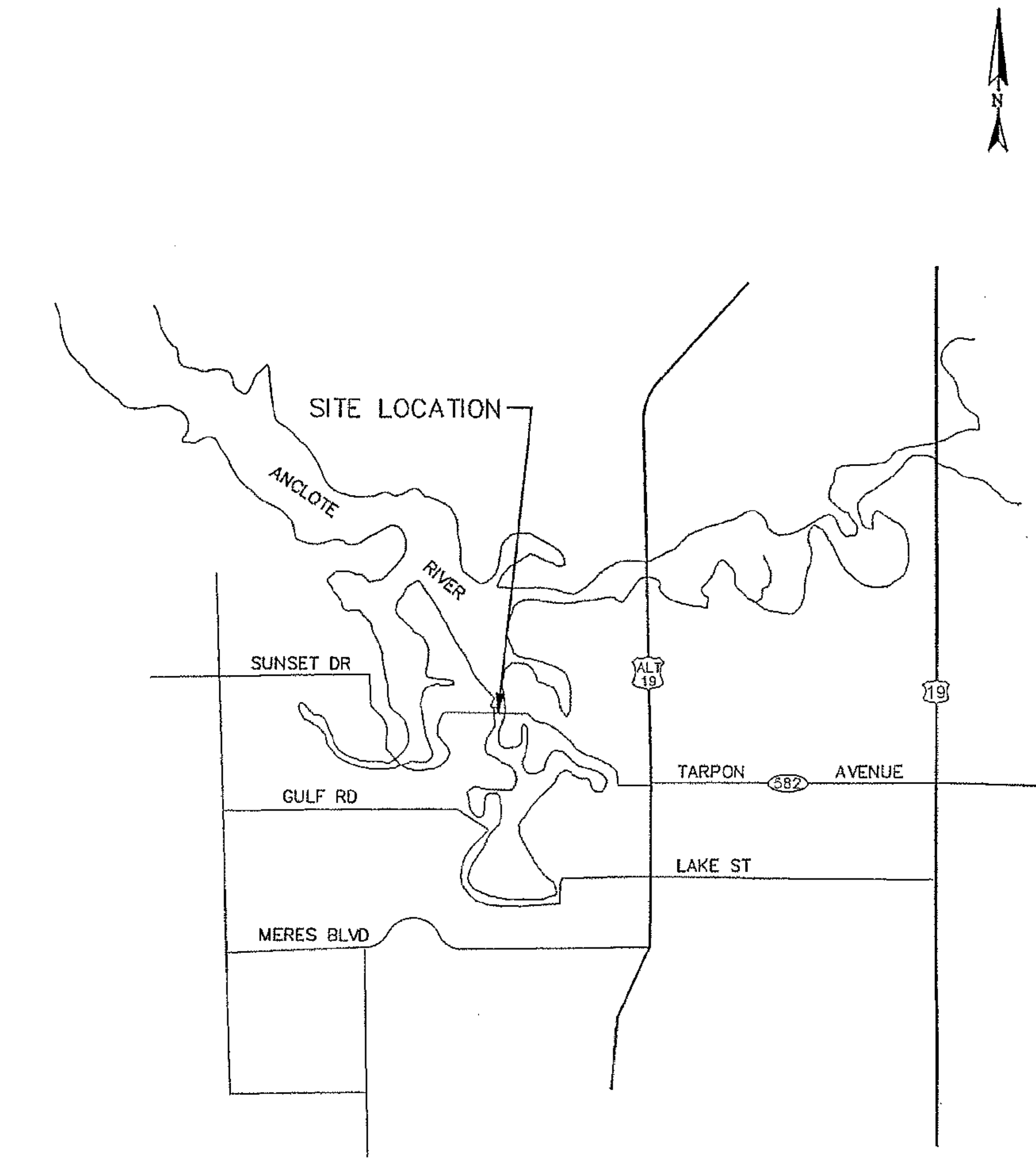
Furthermore, upon discovery of any site or subsurface condition during construction which appears to deviate from the data obtained during this geotechnical exploration as documented herein, please contact us immediately so that we may visit the site, observe the differing conditions, and thus evaluate this new information with regards to our evaluation and recommendations contained herein.

The recommendations presented previously represent design and construction techniques which we feel are both applicable and feasible for the planned construction. It is our recommendation that Williams Earth Sciences, Inc. be provided the opportunity to review the final foundation plans construction specification to evaluate whether the recommendations have been properly interpreted and implemented.

Involvement of the geotechnical engineer during construction is vitally important to ensure the project is constructed in accordance with the geotechnical report. In addition, if varying subsurface conditions are encountered, resolutions can be obtained quickly. Therefore, we recommend that Williams Earth Sciences, Inc. provide inspection services for the foundation elements of this project.

APPENDIX A

Figure 1 - Site Location Map
Figure 2 - Boring Location Map
Report of Core Borings
Soil Test Borings



WILLIAMS EARTH SCIENCES, INC.

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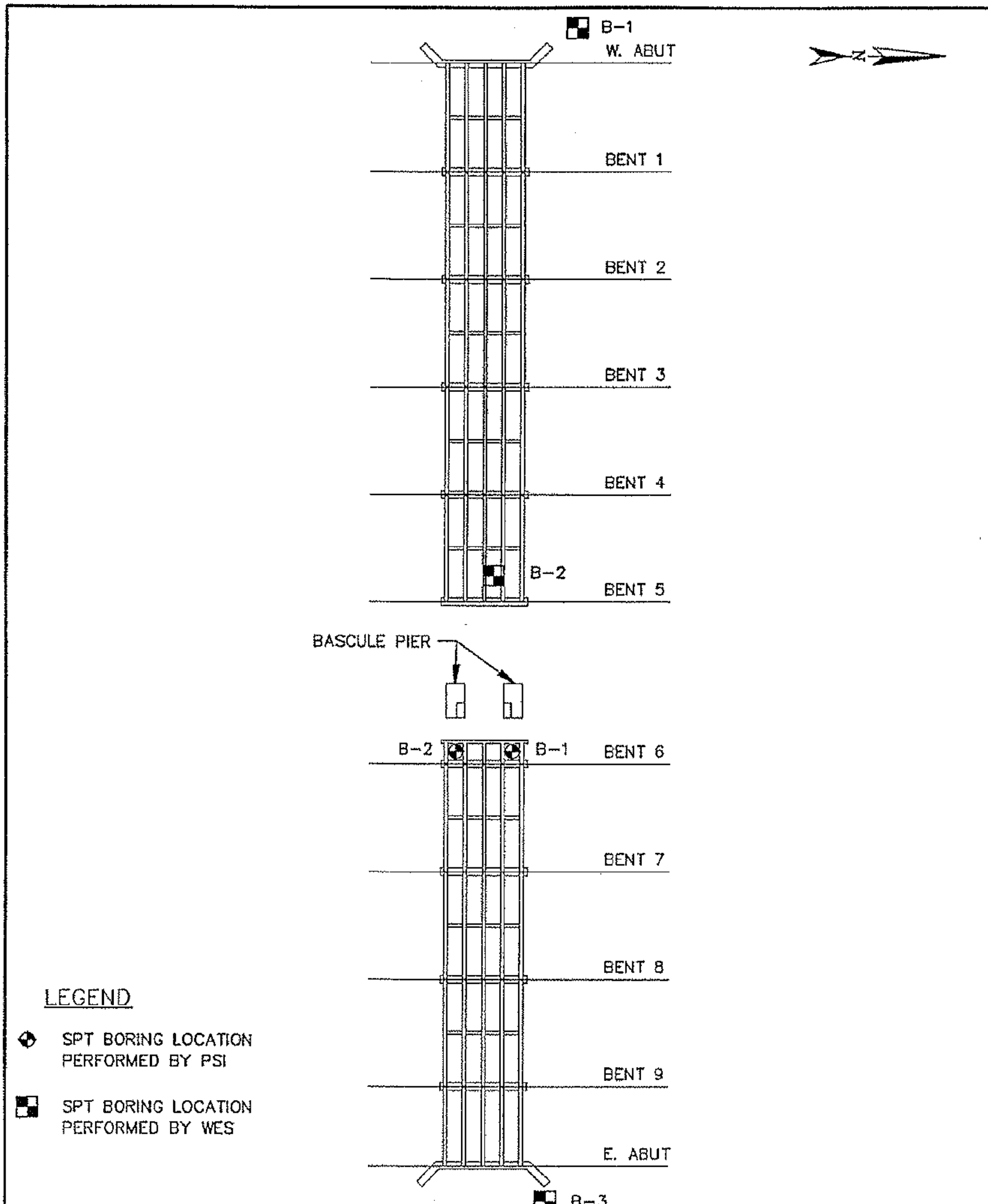
Panama City: (904) 747-9419 FAX: (904) 763-2454

BECKETT BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

SITE LOCATION MAP

Drawn By: TEJ	Date: 9/11/94	Scale: N.T.S.
Checked By: LDS	Report No. C394348	Figure No. 1

site



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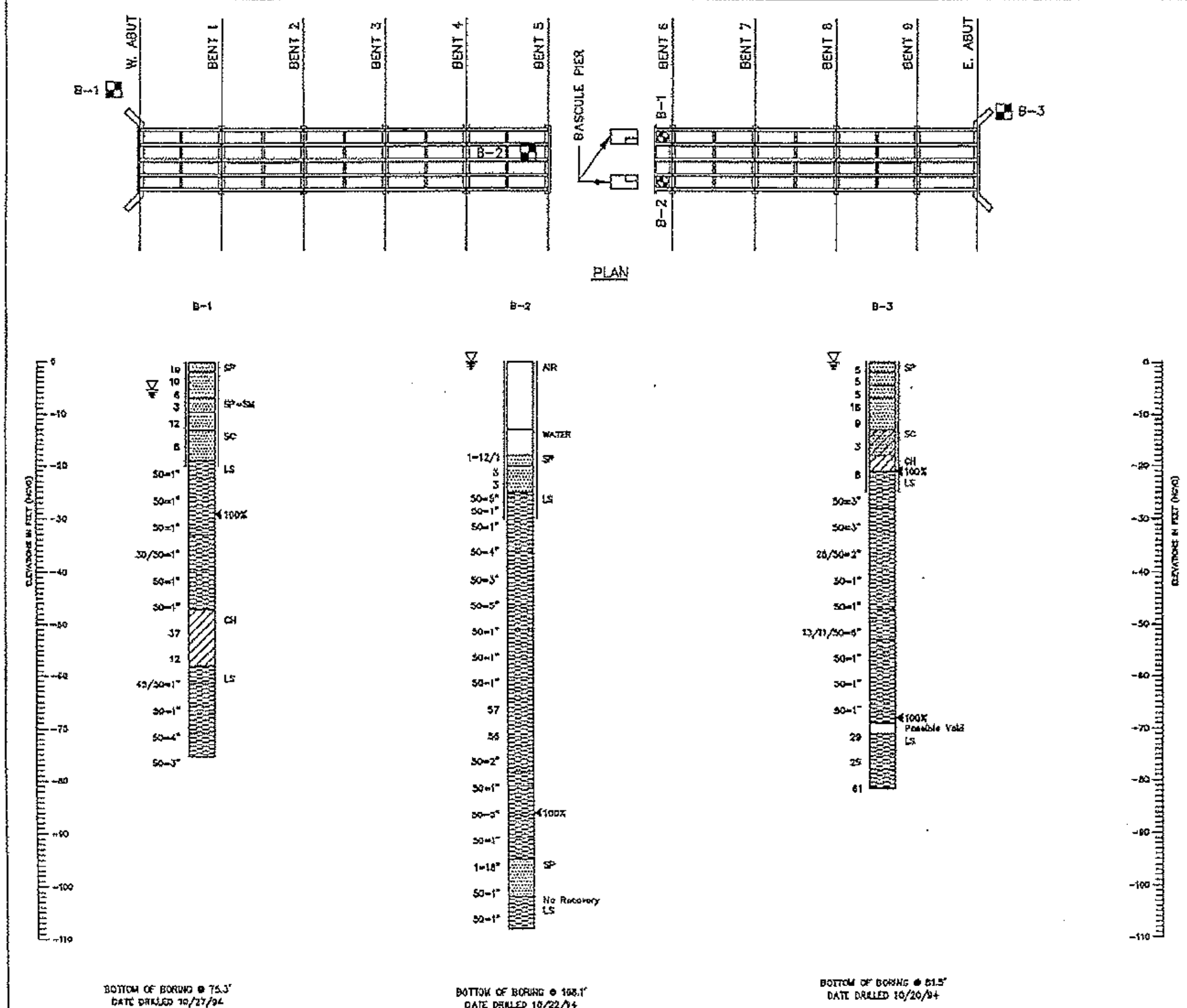
BECKETT BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

BORING LOCATION MAP

Drawn By: TEJ	Date: 9/11/94	Scale: N.T.S.
Checked By: LDS	Report No. C394348	Figure No. 2

bore



LEGEND

- SP, SP-SM and SP-SC, Sands and slightly clayey sands
- CH, Inorganic clays of low plasticity
- SC, Clayey sands and very sandy clays
- LS, Limestone

GENERAL NOTES

DRILL AND PENETRATION TESTING WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. NUMBER TO LEFT OF BORING INDICATES BLOWS OF 1 3/8" I.D., 2" O.D. SPLIT-SPOON FOR 12" OF PENETRATION (UNLESS OTHERWISE NOTED) WITH A 140 LB. HAMMER DROPPED 30 INCHES.

THE BORING LOGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITION, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING.

REFER TO FINAL REPORT FOR ADDITIONAL BORING INFORMATION.

CREW CHIEF: SPOON
DRILLER: PATTERSON
DRILL RIG TYPE: FAILING 250

LEGEND

- = Water Table @ end of drilling
- = Casing used
- = Shelby Tube
- 100% = Percent Loss of Circulation

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)

Granular Materials-Relative Density	SPT (Blows/Ft.)
Very Loose	Less than 4
Loose	4 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	Greater than 50

Silts and Clays-Consistency	SPT (Blows/Ft.)
Very Soft	Less than 2
Soft	2 – 4
Firm	5 – 8
Stiff	9 – 15
Very Stiff	16 – 30
Hard	Greater than 30

ENGINEER OF RECORD:
WILLIAMS EARTH SCIENCES, INC.
10500 ENDEAVOUR WAY
LARGO, FLORIDA 34647

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE

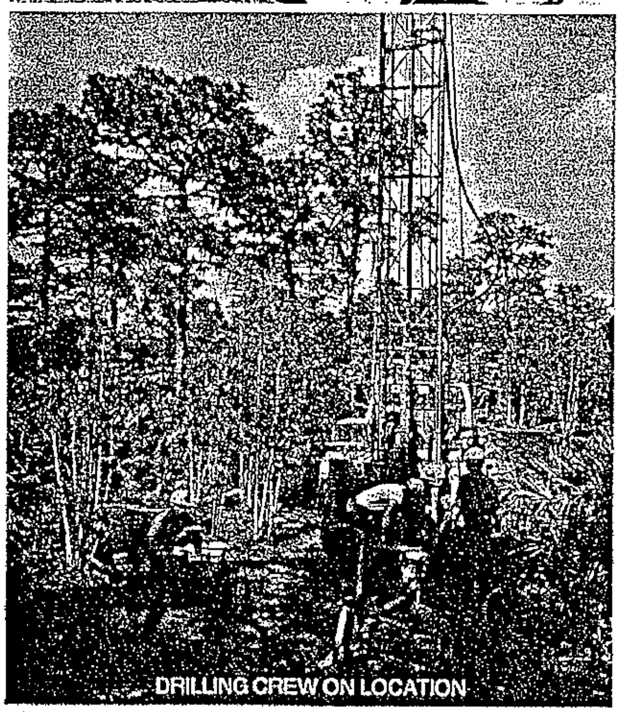
ROAD NO. SR936 | COUNTY PINELLAS | PROJECT NO.

STATE: FLA

SHEET TITLE: REPORT OF CORE BORINGS

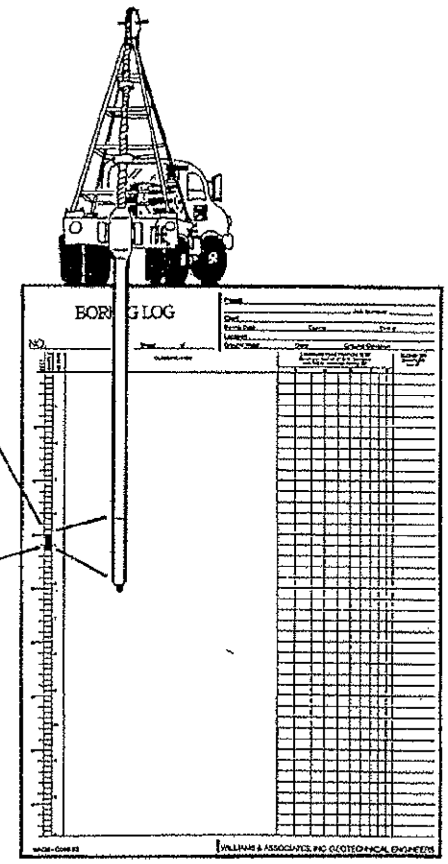
PROJECT NAME: BECKETT BRIDGE REPLACEMENT

SPLIT B EL SAMP



DRILLING CREW ON LOCATION

SSIFICATION



STANDARD PENETRATION TESTING

Watching a soil test boring drill crew is a prime example of man and machine working together to explore our environment. The testing process begins with the mixing of a slurry called "drill mud". A mixture of powdered clay and water is used to flush cuttings from the borehole. The mud also stabilizes the hole walls.

For each project, there are drilling and sampling criteria. Most test borings for engineering purposes utilize an industry standard described in ASTM D1586. This procedure requires a sample be obtained using a driven tube-shaped sampler. The sampler is constructed in such a way that the barrel portion splits to allow visual examination of the soil sample. To drive the sampler, a 140-pound hammer is placed on top of the drill rods. The hammer is raised mechanically using a rope (catline) and wench (cathead), then dropped a standard 30 inches. This operation continues until either 100 blows occur or the sampler is driven 18 inches, whichever occurs first. The number of blows required to advance the sampler each 6-inch increment is recorded. The total number of blows for the last 12 inches of penetration is termed the blow count (N-value).

After the sampler is dislodged and brought to the ground surface, the soil retained in the split barrel is immediately examined and classified. A representative portion of the sample is sealed in a glass jar and labeled. All samples are returned to the laboratory where they are reviewed. Selected samples are chosen for laboratory testing. Samples are stored for a minimum of 60 days.

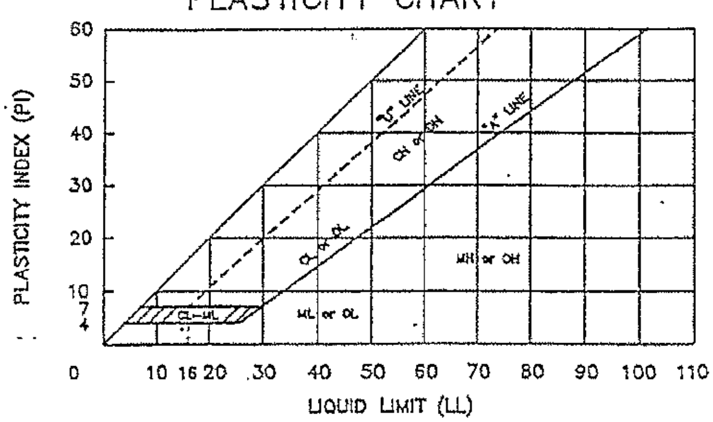
WILLIAMS
EARTH SCIENCES, Inc.

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on NO. 200 sieve *	GRAVELS 50% or more of coarse friction retained on NO. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse friction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes NO. 200 sieve *	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75-mm) sieve.

PLASTICITY CHART



WILLIAMS
EARTH SCIENCES, INC.

CLASS

TEST BORING LOG

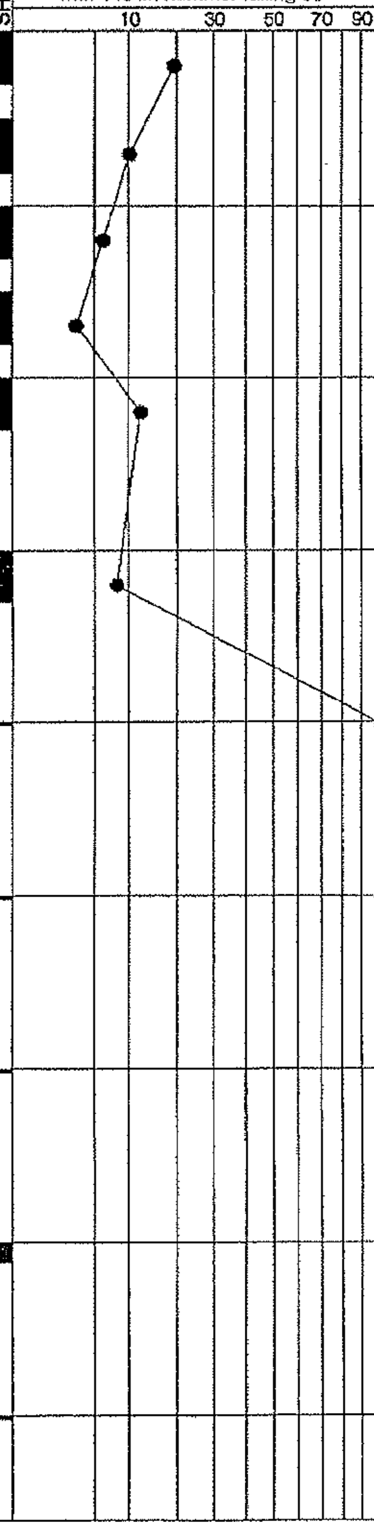
WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT
Boring Location: SEE FIELD EXPLORATION PLAN
Ground Elevation: N/A
Groundwater Depth ▽: 5.5'
Length of Casing Set: 20'

Boring No. B-1
Sheet 1 of 2
Job No. C394348
Boring Completed 10/27/94
Driller J. SPOON
Engineer L. SPEARS

DEPTH FEET	CLASSIFICATION	BLOWS ON SAMPLER PER 6"
	MEDIUM DENSE light brown slightly shelly fine SAND (SP)	5/7/12
	LOOSE brown fine SAND (SP)	5/5/5
5		2/2/4
	VERY LOOSE dark brown slightly shelly slightly silty fine SAND (SP-SM)	4/2/1
10	MEDIUM DENSE brown slightly silty fine SAND (SP-SM)	2/5/7
	LOOSE green very clayey fine SAND (SC)	
15		3/4/4
	Light brown sandy LIMESTONE	
20		50=1"
25		50=1"
	100% Loss of Circulation @ 29.0'	
30		50=1"
	White fossiliferous silty LIMESTONE	
35		30/50=1"
40		50=1"

STANDARD PENETRATION TEST
Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30"



TEST BORING LOG

WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT

Boring No. B-1
Sheet 2 of 2
Job No. C394348

DEPTH FEET	LITHOLOGY	CLASSIFICATION	SAMPLE	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30" (10, 30, 50, 70, 90)	BLOWS ON SAMPLER PER 6"
		White fossiliferous silty LIMESTONE			
45					50=1"
		HARD TO STIFF green sandy CLAY with limestone pebbles (CH)			
50					8/18/19
55					3/5/7
		Cream-colored silty LIMESTONE with pockets of green sandy clay			
60					45/50=1"
65					50=1"
70					50=4"
75					50=3"
		Boring Terminated @ 75.3 feet			
80					
85					

TEST BORING LOG

WILLIAMS
EARTH SCIENCES, INC.

Project	BECKETT BRIDGE REPLACEMENT
Boring Location	SEE FIELD EXPLORATION PLAN
Ground Elevation	N/A
Water Depth	5.0'
Length of Casing Set	30'
Boring No.	B-2
Sheet	1 of 3
Job No.	C394348
Boring Completed	10/22/94
Driller	J. SPOON
Engineer	L. SPEARS

DEPTH FEET	CLASSIFICATION	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30" (10 30 50 70 90)	BLOWS ON SAMPLER PER 6"
0–13			
13–18	Water		
18–20	VERY LOOSE brown fine SAND (SP)		1=12"/1
20–25	VERY LOOSE brown slightly shelly fine SAND (SP)		1/1/2
			1/2/1
25–36	Gray shelly sandy LIMESTONE		50=5"
			50=1"
			50=1"
36–	Cream-colored clayey LIMESTONE		50=4"

TEST BORING LOG

WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT

Boring No. B-2
Sheet 2 of 3
Job No. C394348

DEPTH FEET	LITH-OLOGY	CLASSIFICATION	SAMPLE	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30" (10 30 50 70 90)	BLOWS ON SAMPLER PER 6"
		Cream-colored clayey LIMESTONE			50=3"
45					
					50=5"
50					
		Cream-colored silty LIMESTONE			
					50=1"
55					
					50=1"
60					
					50=1"
65					
					27/27/30
70					
					22/25/31
75					
					50=2"
80					
		Light gray fossiliferous silty LIMESTONE			
					50=1"
85					

TEST BORING LOG

WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT

Boring No. B-2
Sheet 3 of 3
Job No. C394348

DEPTH FEET	LITHOLOGY	CLASSIFICATION	SAMPLE	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30" (10, 30, 50, 70, 90)	BLOWS ON SAMPLER PER 6"
		100% Loss of Circulation @ 86.0' Light gray fossiliferous silty LIMESTONE			50=5"
90					
					50=1"
95		VERY LOOSE light brown shelly fine SAND (SP)			
					1=18"
100					
		No Recovery, Blow counts Indicate Limestone			50=1"
105					
					50=1"
		Boring Terminated @ 108.1 feet			
110					
115					
120					
125					

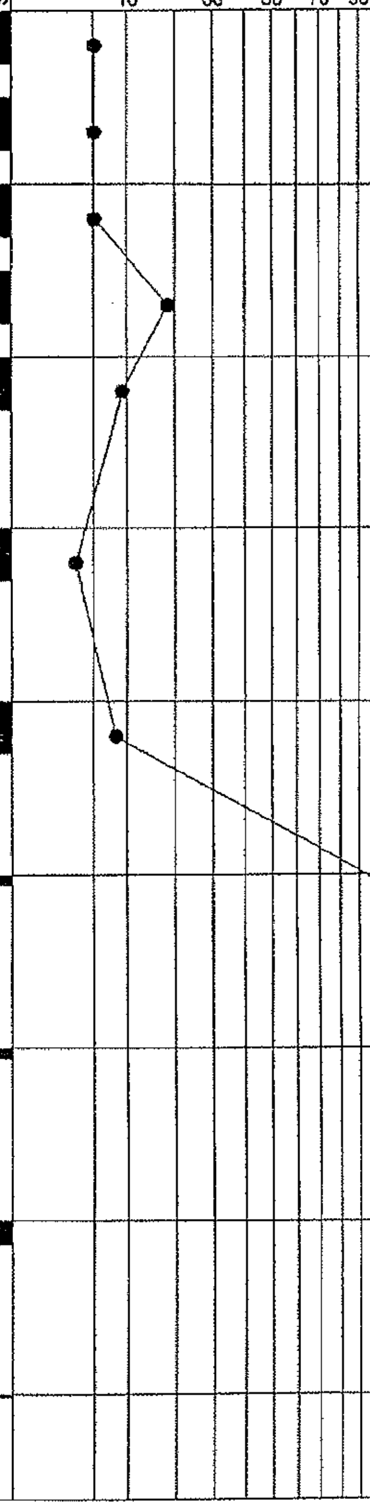
TEST BORING LOG

WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT
Boring Location: 21' N OF CL
Ground Elevation: N/A
Groundwater Depth ⊻: 3.5'
Length of Casing Set: 25'

Boring No. B-3
Sheet 1 of 2
Job No. C394348
Boring Completed: 10/20/94
Driller: J. SPOON
Engineer: L. SPEARS

STANDARD PENETRATION TEST
Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30"



DEPTH FEET	CLASSIFICATION	BLOWS ON SAMPLER PER 6"
0–2	LOOSE dark brown fine SAND with asphalt fragments (SP)	6/3/2
2–4.5	LOOSE light brown fine SAND (SP)	3/2/3
4.5–7	LOOSE light gray fine SAND (SP)	3/2/3
7–13	MEDIUM DENSE TO LOOSE reddish brown fine SAND (SP)	6/6/12
		3/3/6
13–18	VERY LOOSE greenish gray clayey fine SAND (SC)	3/1/2
18–21	FIRM green CLAY with limestone fragments (CH)	
21–28	100% Loss of Circulation @ 21.0' Cream-colored silty LIMESTONE with seams of green partly indurated clay	2/5/3
		50=3"
28–	Cream-colored silty LIMESTONE	50=3"
		28/50=2"
		50=1"

TEST BORING LOG

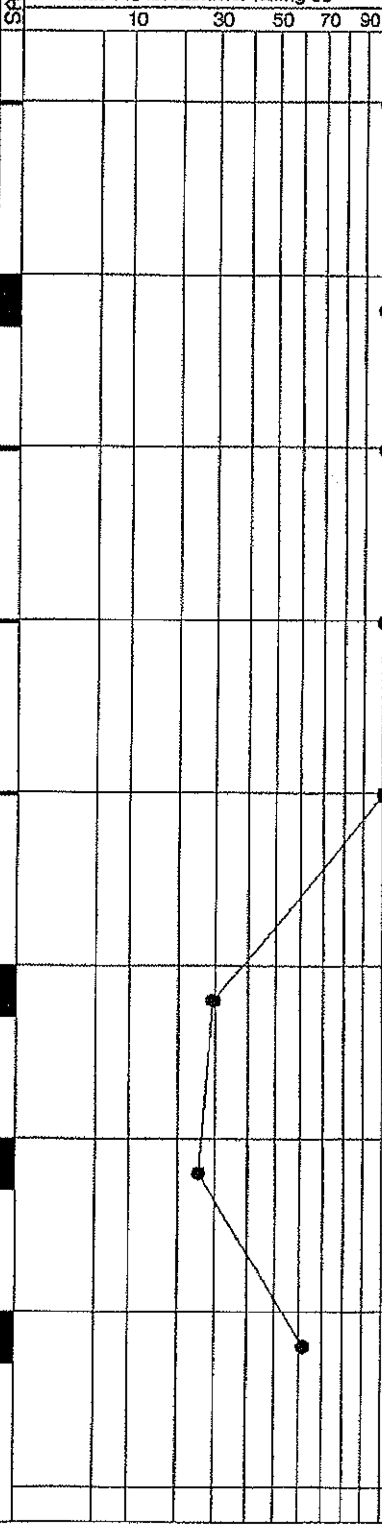
WILLIAMS
EARTH SCIENCES, INC.

Project: BECKETT BRIDGE REPLACEMENT

Boring No. B-3
Sheet 2 of 2
Job No. C394348

DEPTH FEET	CLASSIFICATION	BLOWS ON SAMPLER PER 6"
	Cream-colored silty LIMESTONE	
45		50=1"
	Interpocketed cream-colored silty LIMESTONE and green sandy CLAY	
50		13/11/50=6"
	Cream-colored silty LIMESTONE	
55		50=1"
60		50=1"
65		50=1"
	100% loss of Circulation @ 68.0'	
	Possible Void	
70		
	White silty LIMESTONE	3/5/24
75		34/17/8
	Cream-colored silty LIMESTONE	
80		37/30/31
	Boring Terminated @ 81.5 feet	
85		

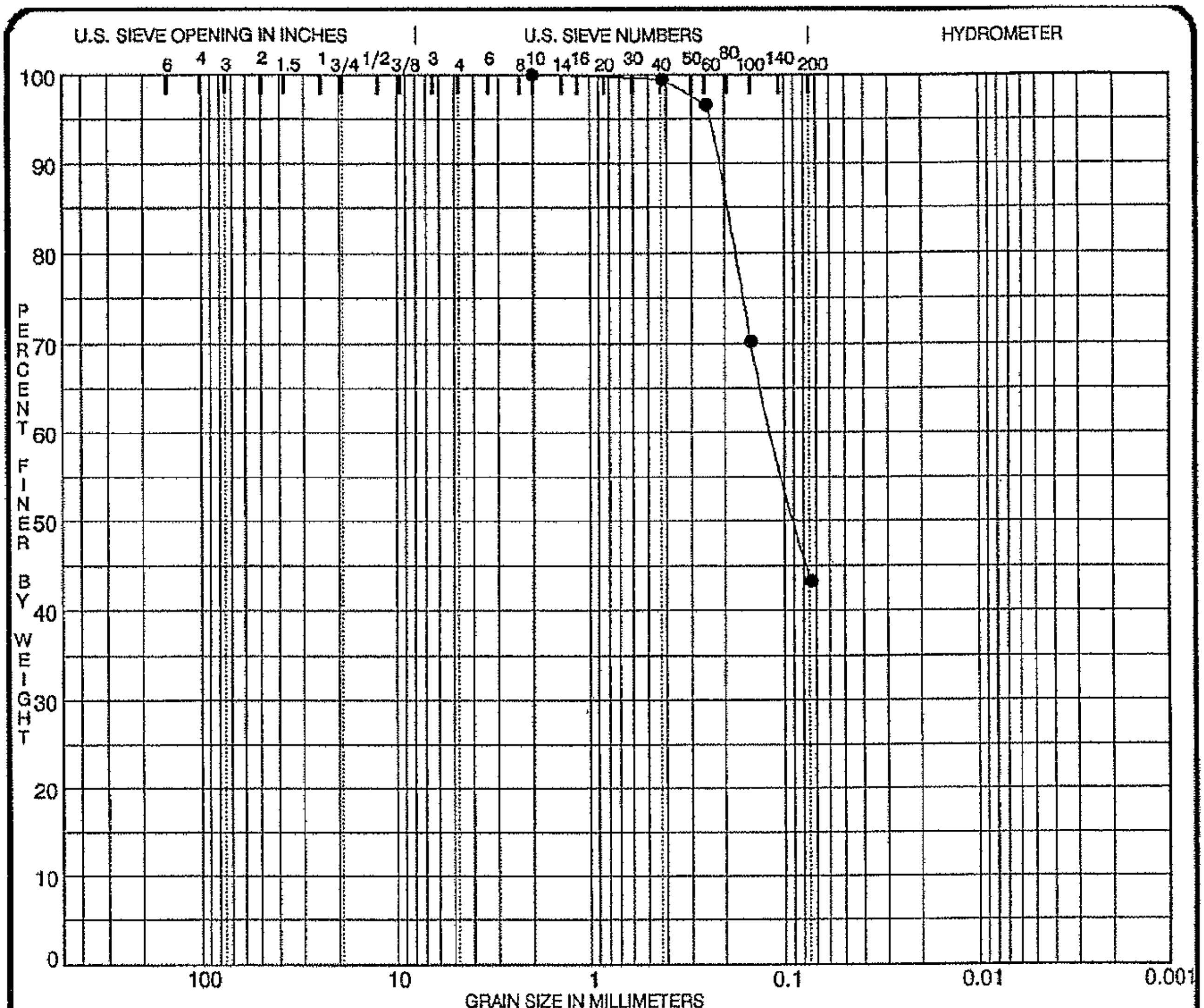
STANDARD PENETRATION TEST
Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30"



APPENDIX B

Gradation Curves

Corrosion Test Results



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

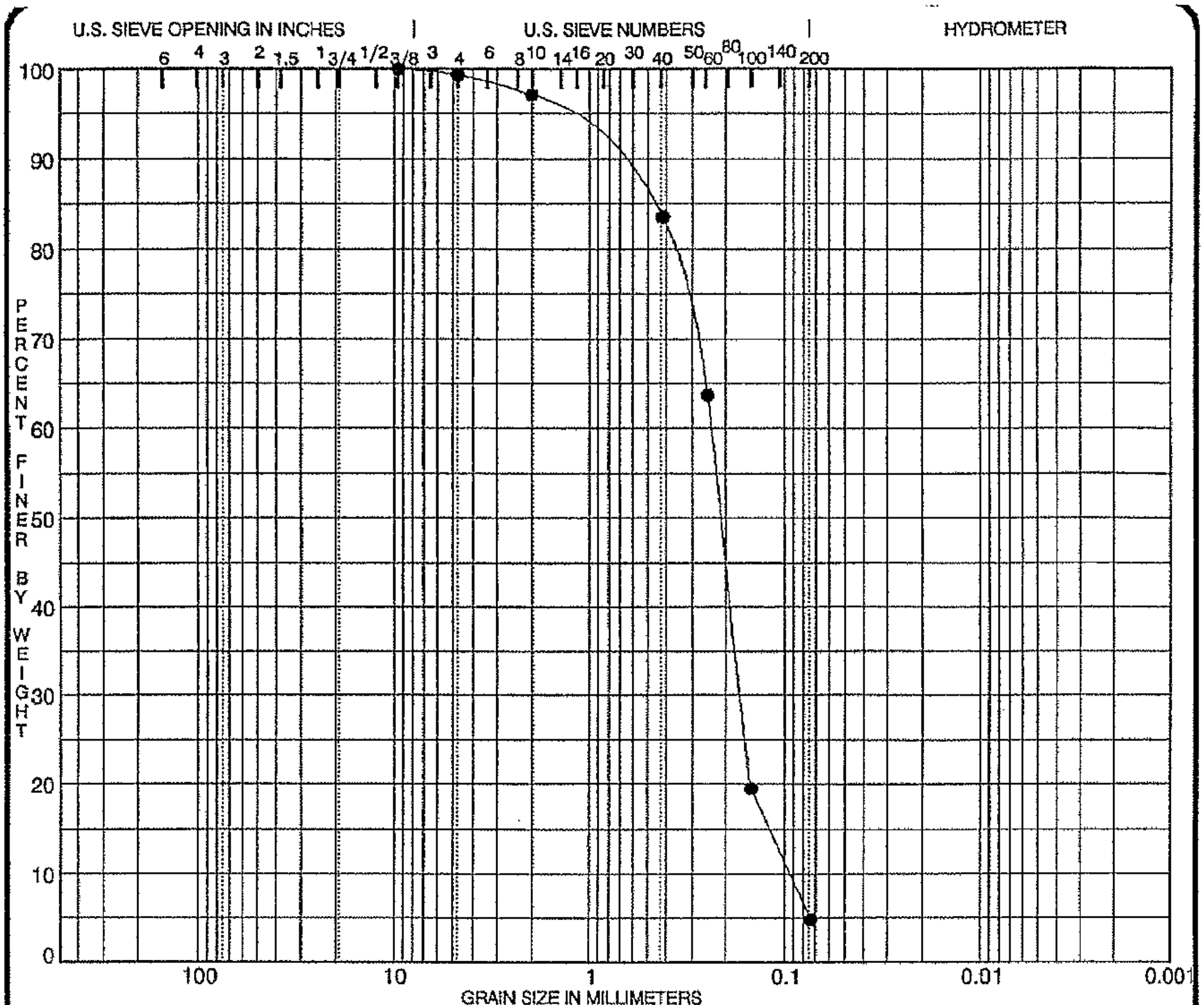
	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	B-1	GREEN VERY CLAYEY FINE SAND	29					
	S-6	(SC)						
	15.0' - 16.5'							

Organics	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
	2.00	0.088			0	56	44	

PROJECT BECKETT BRIDGE REPLACEMENT JOB NO. C394348

GRADATION CURVES

Williams Earth Sciences, Inc.
Largo, Florida



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

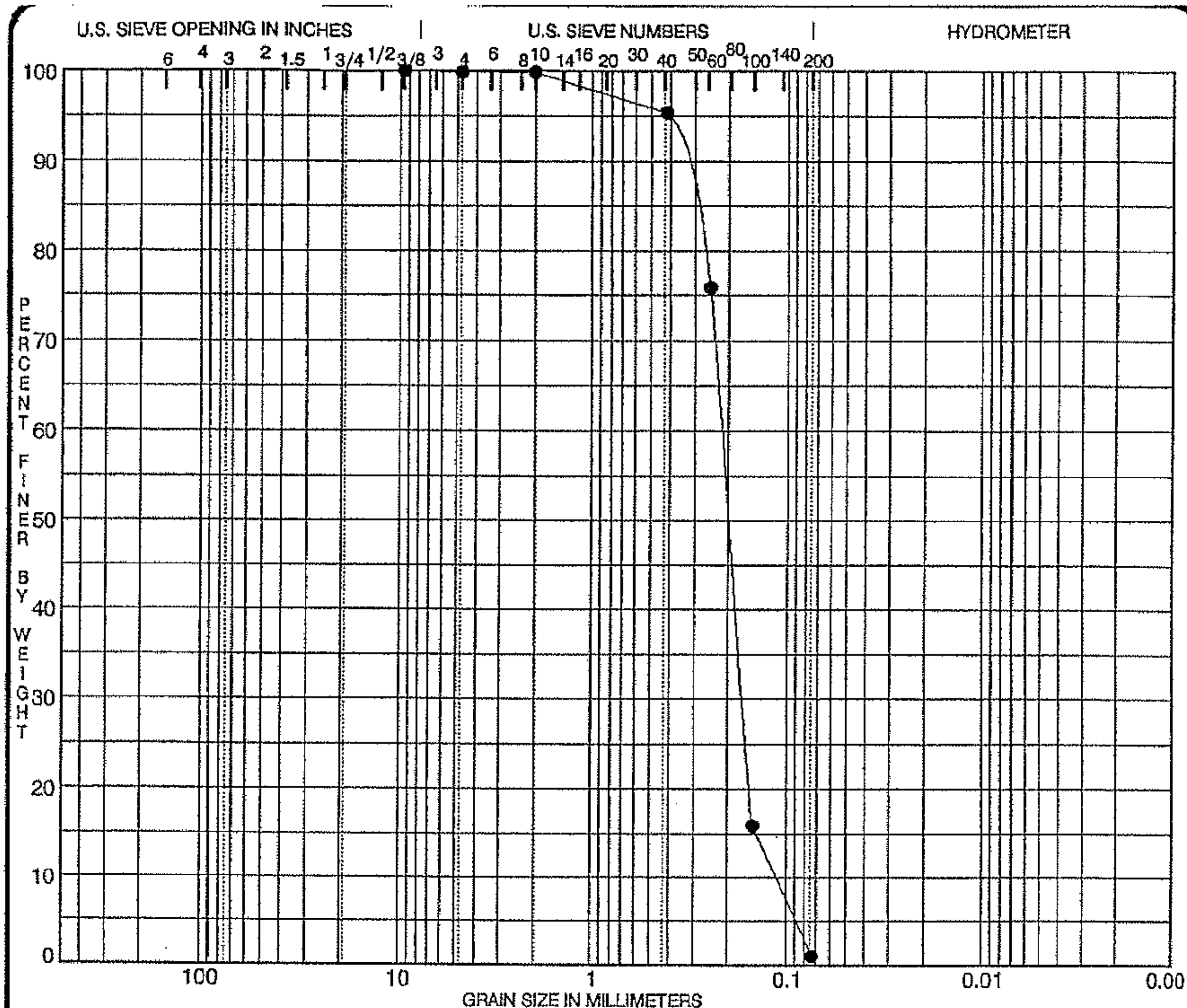
	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-2**	**LIGHT BROWN SHELLY FINE SAND**	**24**					
	S-19	**(SP)**						
	98.0' - 99.5'							

Organics	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
	9.51	**0.213**	**0.169**	**0.095**	**1**	**94**	**5**	

PROJECT **BECKETT BRIDGE REPLACEMENT** JOB NO. C394348

GRADATION CURVES

Williams Earth Sciences, Inc.
Largo, Florida



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	B-3	REDDISH BROWN FINE SAND	23					
	S-4	(SP)						
	7.5' - 9.0'							

Organics	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
	9.51	0.200	0.168	0.113	0	98	1	

PROJECT BECKETT BRIDGE REPLACEMENT JOB NO. C394348

GRADATION CURVES

Williams Earth Sciences, Inc.
Largo, Florida

WILLIAMS
EARTH SCIENCES, Inc.

Corporate Office:
10600 Endeavour Way, Largo, Florida 34647
(813) 541-3444 FAX (813) 541-1510

CORROSION TEST RESULTS

Job Name: Beckett Bridge Repairs

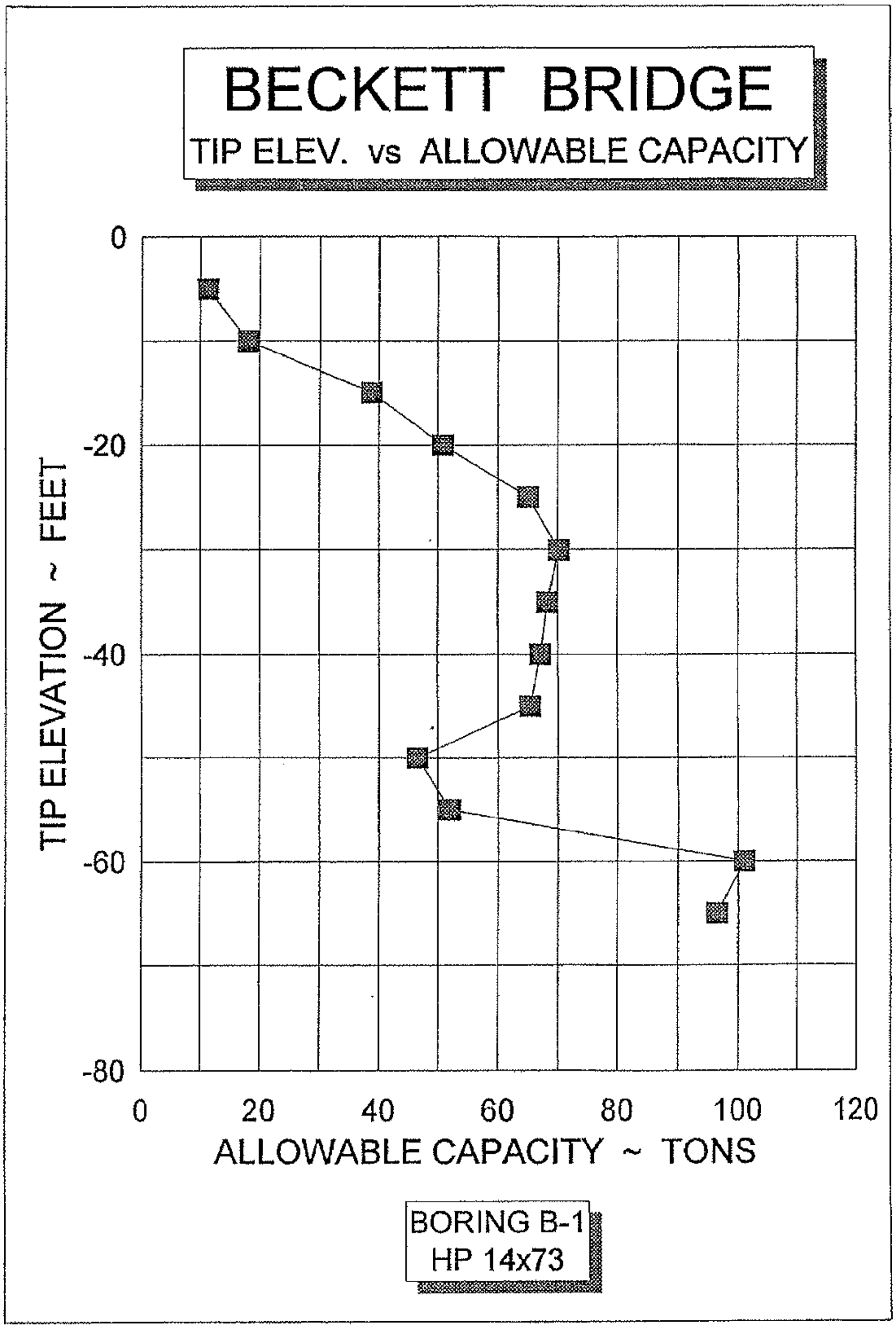
Job №: C394348

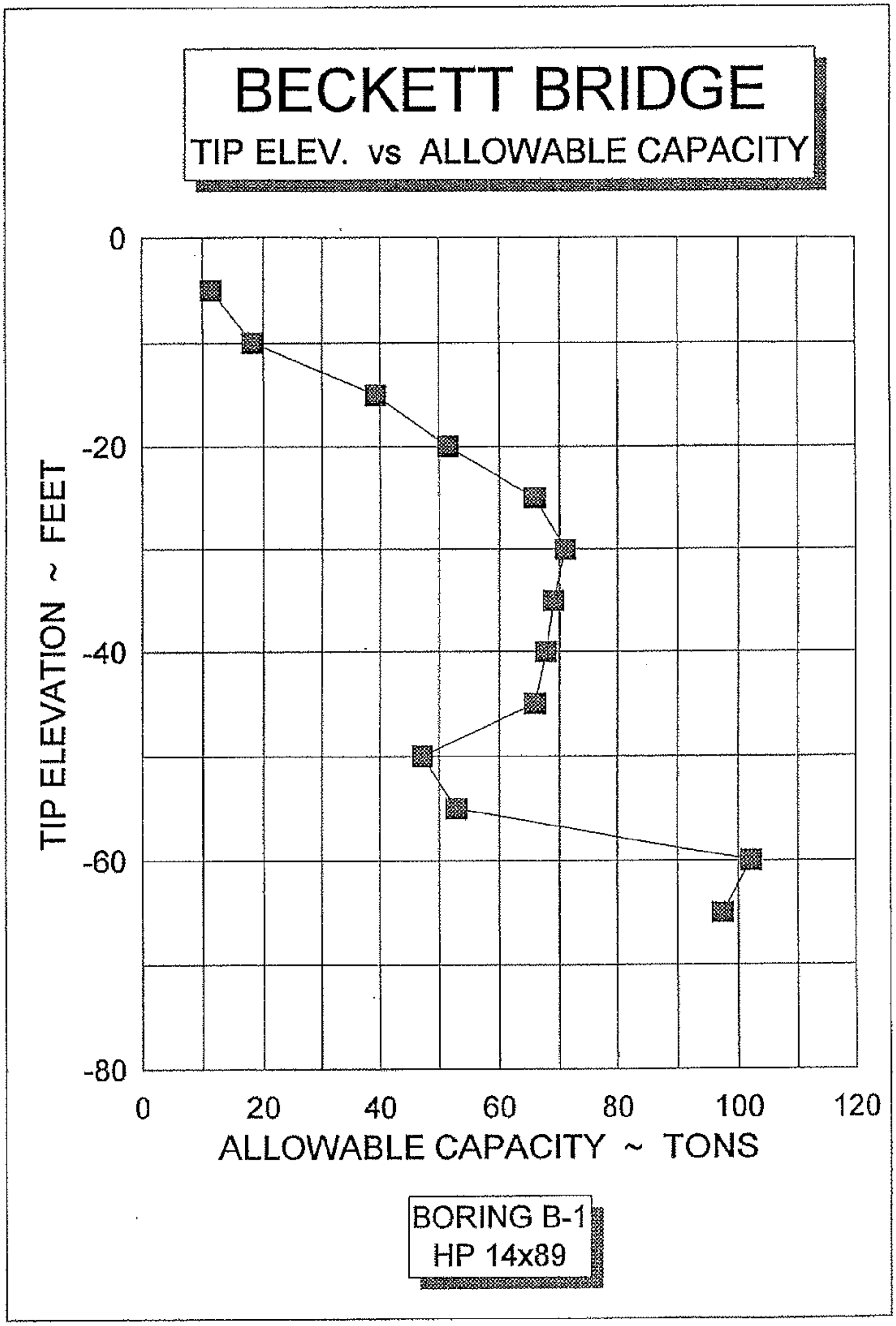
Tested by: M. Fowler

Sample ID	Sample Date	Sample Location	Sample Type	Sample Depth	pH	Chlorides ppm	Sulfates ppm	Resistivity ohm-cm
S-1	10/20/94	West approach, north side	Soil	1.0	8.8	300	<2	1440
W-1	10/20/94	Middle of channel	Water	1.0	7.9	14,000	7,920	41

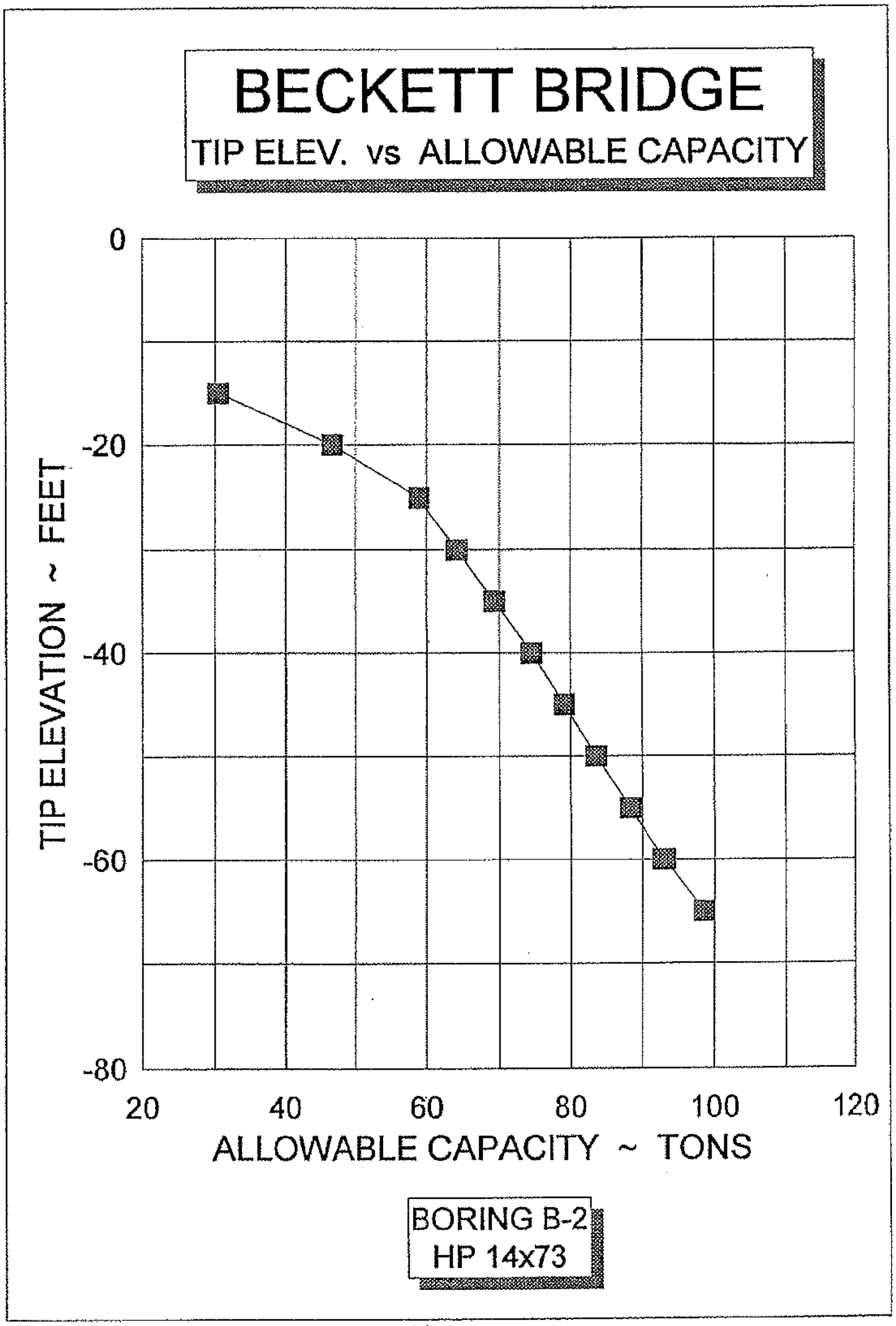
APPENDIX C

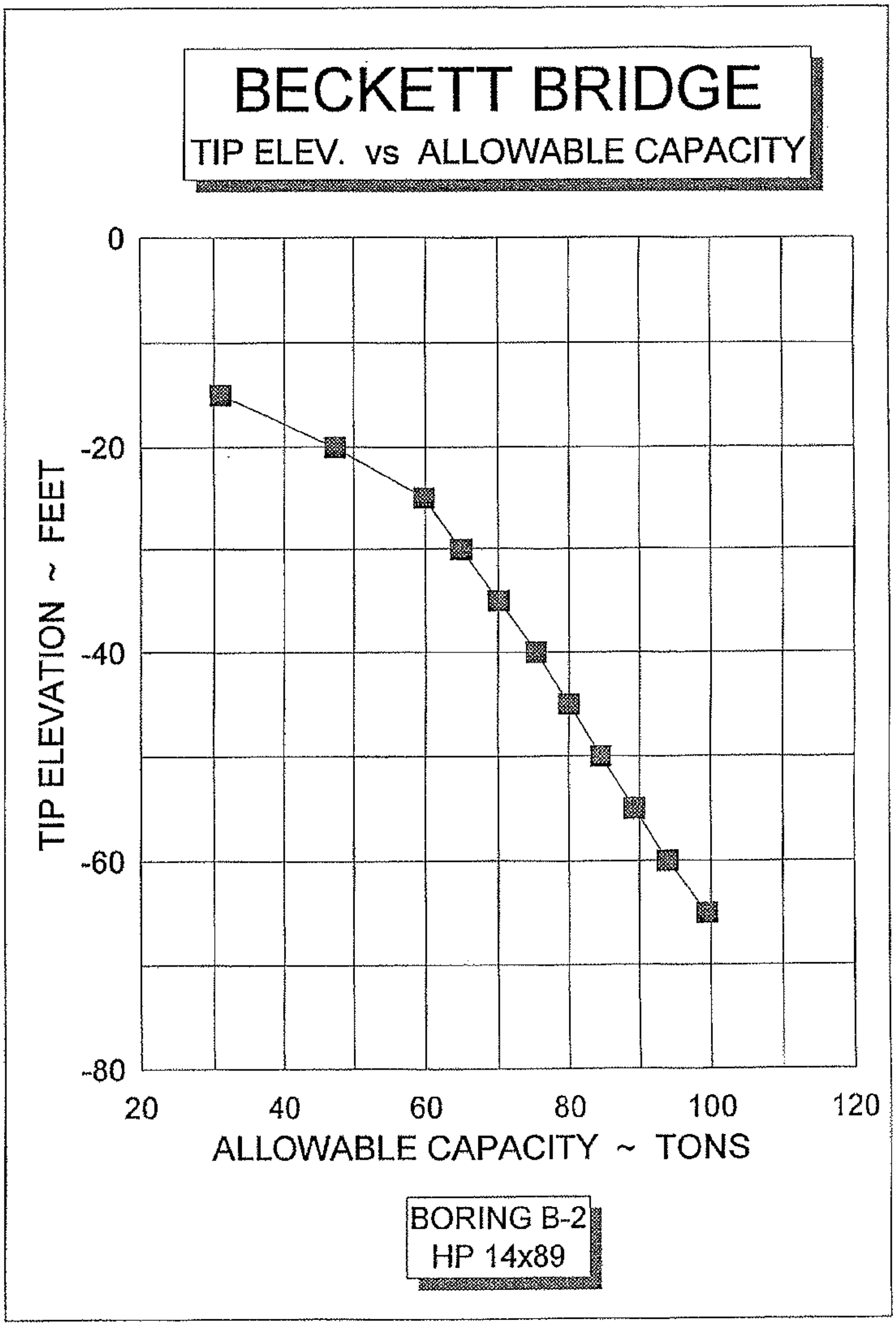
Pile Capacity Curves
"SPT94" Computer Output

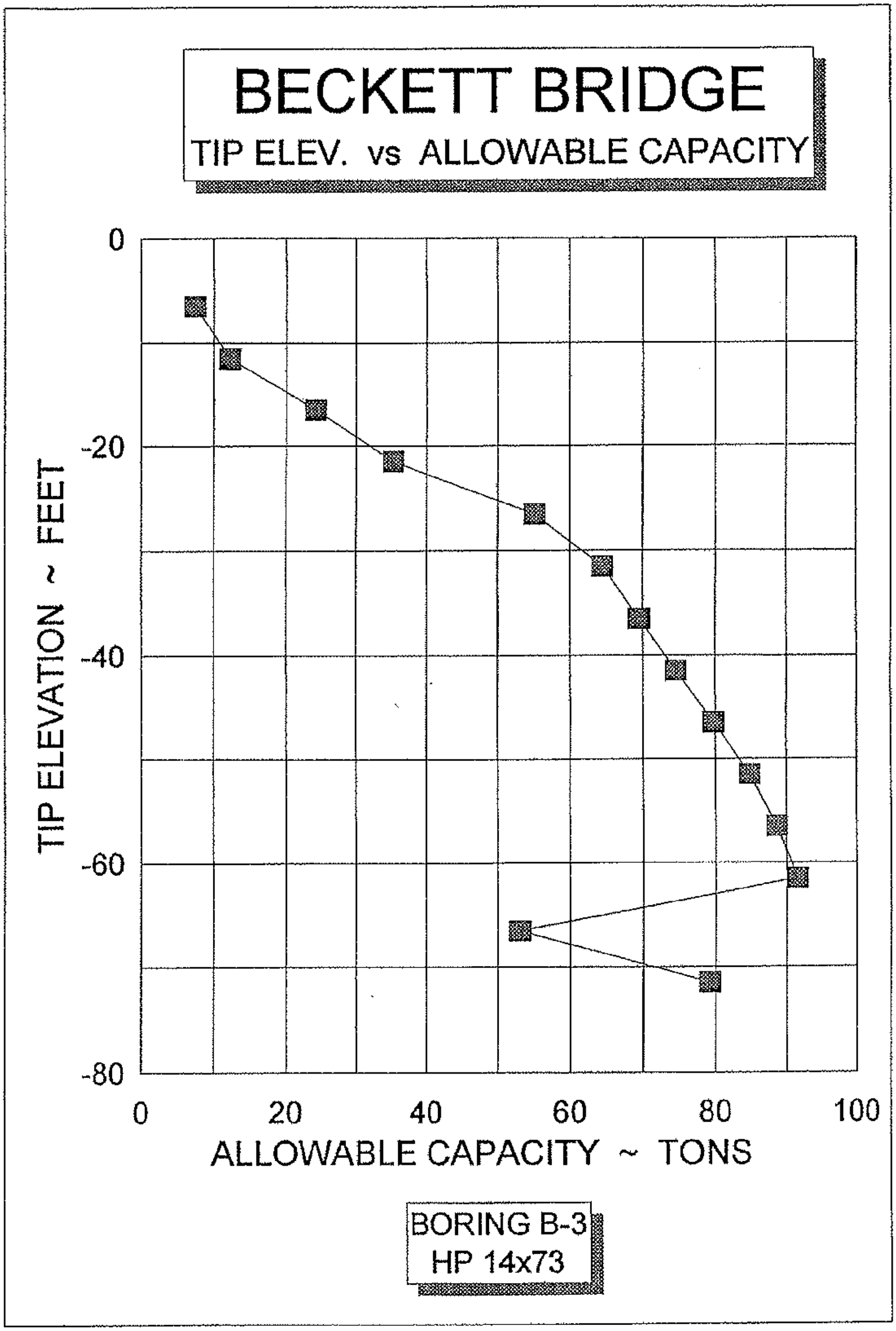

BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
TIP ELEVATION ~ FEET
0
-20
-40
-60
-80
0
20
40
60
80
100
120
ALLOWABLE CAPACITY ~ TONS
BORING B-1
HP 14x73



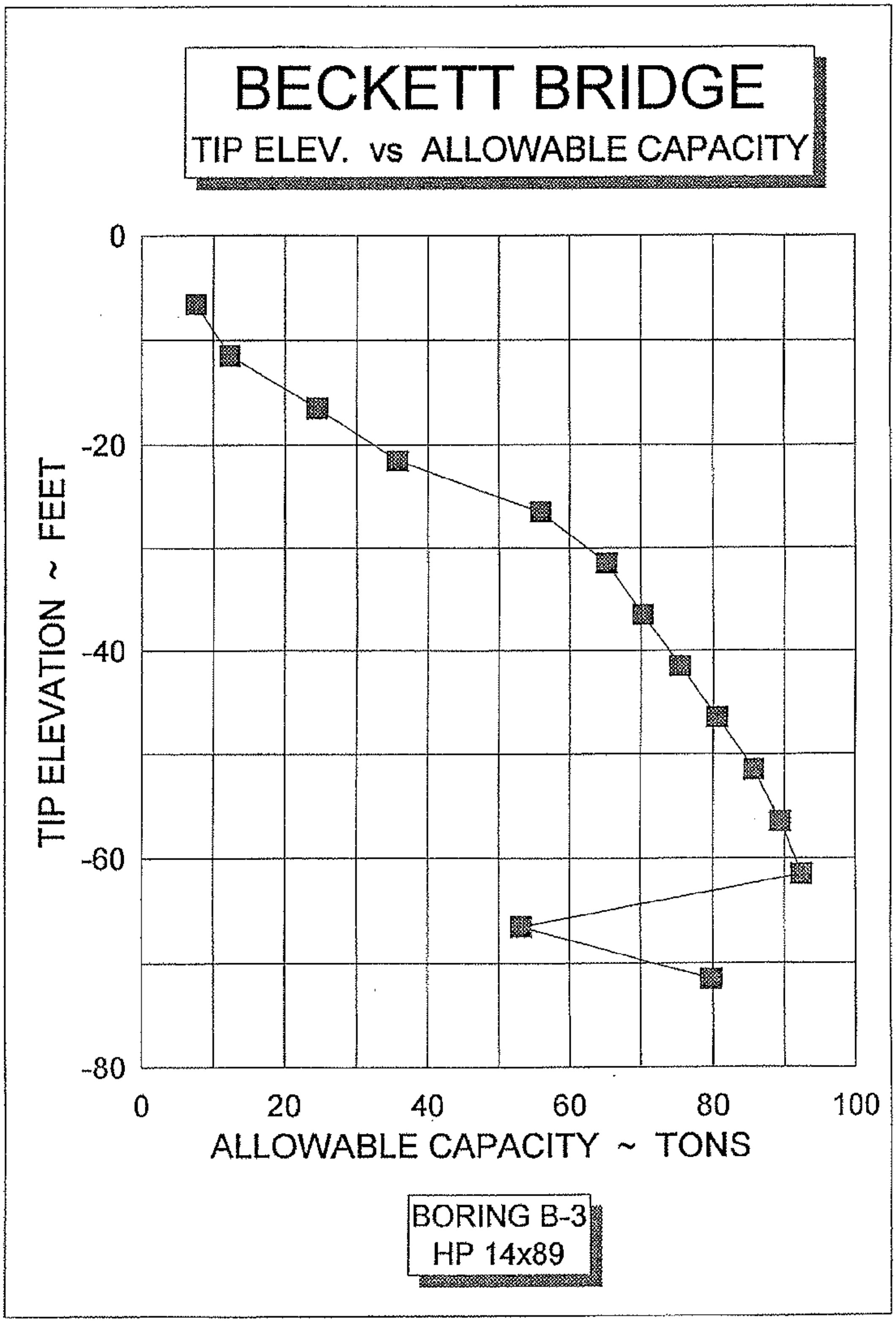
BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
0
-20
-40
-60
-80
TIP ELEVATION ~ FEET
0
20
40
60
80
100
120
ALLOWABLE CAPACITY ~ TONS
BORING B-1
HP 14x89


BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
0
-20
-40
-60
-80
20
40
60
80
100
120
TIP ELEVATION ~ FEET
ALLOWABLE CAPACITY ~ TONS
BORING B-2
HP 14x73


BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
TIP ELEVATION ~ FEET
0
-20
-40
-60
-80
20
40
60
80
100
120
ALLOWABLE CAPACITY ~ TONS
BORING B-2
HP 14x89



BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
TIP ELEVATION ~ FEET
0
-20
-40
-60
-80
0
20
40
60
80
100
ALLOWABLE CAPACITY ~ TONS
BORING B-3
HP 14x73


BECKETT BRIDGE
TIP ELEV. vs ALLOWABLE CAPACITY
TIP ELEVATION ~ FEET
0
-20
-40
-60
-80
0
20
40
60
80
100
ALLOWABLE CAPACITY ~ TONS
BORING B-3
HP 14x89

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B173.DAT
RUN DATE	11/09/94
RUN TIME	18:15:06
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-1 HP 14x73
DRILLING DATE	10/27/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	5.00 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

·oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-1 HP 14x73

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	3.5	19.0	3
2	4.0	1.0	10.0	3
3	6.5	-1.5	3.0	3
4	9.0	-4.0	6.0	3
5	11.5	-6.5	12.0	3
6	16.5	-11.5	8.0	2
7	20.0	-15.0	99.0	4
8	25.0	-20.0	99.0	4
9	30.0	-25.0	99.0	4
10	35.0	-30.0	99.0	4
11	40.0	-35.0	99.0	4
12	45.0	-40.0	99.0	4
13	51.5	-46.5	37.0	2
14	56.5	-51.5	12.0	2
15	60.5	-55.5	99.0	4
16	65.0	-60.0	99.0	4
17	70.0	-65.0	99.0	4
18	75.0	-70.0	99.0	4
19	85.0	-80.0	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING.
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

Project No: C394348 BECKETT BRIDGE REPAIRS
Boring No: B-1 HP 14x73

C. PILE INFORMATION

TEST PILE SECTION	ISECT =	4 {steel H-pile}
WIDTH OF FLANGE	WIDTH =	14.00 INCHES
DEPTH OF SECTION	DEPTH =	13.61 INCHES
TRUE X-SECTIONAL AREA	TAREA =	21.4INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-5.0	.36	4.04	18.82	22.50	11.25	41.33
15.0	-10.0	.55	9.14	27.68	36.28	18.14	63.96
20.0	-15.0	.73	17.33	60.81	77.41	38.71	138.22
25.0	-20.0	.91	26.02	76.60	101.71	50.85	178.30
30.0	-25.0	1.09	35.84	95.27	130.02	65.01	225.29
35.0	-30.0	1.27	46.34	95.27	140.33	70.17	235.60
40.0	-35.0	1.46	56.83	81.15	136.52	68.26	217.67
45.0	-40.0	1.64	69.96	65.95	134.27	67.13	200.21
50.0	-45.0	1.82	77.20	55.38	130.76	65.38	186.14
55.0	-50.0	2.00	90.20	4.75	92.95	46.47	102.44
60.0	-55.0	2.18	99.02	7.08	103.91	51.96	118.08
65.0	-60.0	2.37	109.37	95.27	202.28	101.14	297.55
70.0	-65.0	2.55	119.87	75.82	193.14	96.57	268.95

*** ERROR *** PILE TIP EXCEEDS BORING LOG FOR LENGTH = 75.00 FT

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.
2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.
3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

```
4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,
                        FOR TIP IN SOIL TYPE 3 OR 4,
                 = ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
                        FOR TIP IN SOIL TYPE 1 OR 2.

5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE
   NEGATIVE.

PROBLEM COMPLETED                          ANALYSIS NO.  1
```

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B189.DAT
RUN DATE	11/09/94
RUN TIME	18:16:16
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-1 HP 14x89
DRILLING DATE	10/27/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	5.00 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

·oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-1 HP 14x89

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	3.5	19.0	3
2	4.0	1.0	10.0	3
3	6.5	-1.5	3.0	3
4	9.0	-4.0	6.0	3
5	11.5	-6.5	12.0	3
6	16.5	-11.5	8.0	2
7	20.0	-15.0	99.0	4
8	25.0	-20.0	99.0	4
9	30.0	-25.0	99.0	4
10	35.0	-30.0	99.0	4
11	40.0	-35.0	99.0	4
12	45.0	-40.0	99.0	4
13	51.5	-46.5	37.0	2
14	56.5	-51.5	12.0	2
15	60.5	-55.5	99.0	4
16	65.0	-60.0	99.0	4
17	70.0	-65.0	99.0	4
18	75.0	-70.0	99.0	4
19	85.0	-80.0	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

-oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-1 HP 14x89

C. PILE INFORMATION

TEST PILE SECTION	ISECT =	4 {steel H-pile}
WIDTH OF FLANGE	WIDTH =	14.00 INCHES
DEPTH OF SECTION	DEPTH =	13.83 INCHES
TRUE X-SECTIONAL AREA	TAREA =	26.1INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-5.0	.44	4.07	19.13	22.76	11.38	41.89
15.0	-10.0	.67	9.21	28.13	36.68	18.34	64.80
20.0	-15.0	.89	17.46	61.80	78.37	39.19	140.17
25.0	-20.0	1.11	26.23	77.83	102.95	51.48	180.78
30.0	-25.0	1.33	36.13	96.81	131.61	65.80	228.42
35.0	-30.0	1.55	46.71	96.81	141.96	70.98	238.77
40.0	-35.0	1.78	57.28	82.46	137.97	68.98	220.43
45.0	-40.0	2.00	70.52	67.01	135.53	67.77	202.54
50.0	-45.0	2.22	77.81	56.27	131.87	65.93	188.14
55.0	-50.0	2.44	90.92	5.79	94.27	47.13	105.85
60.0	-55.0	2.66	99.80	8.64	105.78	52.89	123.06
65.0	-60.0	2.89	110.24	96.81	204.17	102.08	300.98
70.0	-65.0	3.11	120.82	77.04	194.76	97.38	271.80

*** ERROR *** PILE TIP EXCEEDS BORING LOG FOR LENGTH = 75.00 FT

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

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4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,
                         FOR TIP IN SOIL TYPE 3 OR 4,
                 = ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
                         FOR TIP IN SOIL TYPE 1 OR 2.

5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE
   NEGATIVE.

PROBLEM COMPLETED                                  ANALYSIS NO.  1
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FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B273.DAT
RUN DATE	11/09/94
RUN TIME	18:16:54
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-2 HP 14x73
DRILLING DATE	10/22/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	-5.00 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

-oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-2 HP 14x73

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	-6.5	1.0	3
2	4.0	-9.0	3.0	3
3	6.5	-11.5	3.0	3
4	9.0	-14.0	99.0	4
5	11.5	-16.5	99.0	4
6	16.5	-21.5	99.0	4
7	20.0	-25.0	99.0	4
8	25.0	-30.0	99.0	4
9	30.0	-35.0	99.0	4
10	35.0	-40.0	99.0	4
11	40.0	-45.0	99.0	4
12	45.0	-50.0	99.0	4
13	51.5	-56.5	57.0	4
14	56.5	-61.5	56.0	4
15	60.5	-65.5	99.0	4
16	65.0	-70.0	99.0	4
17	70.0	-75.0	99.0	4
18	75.0	-80.0	99.0	4
19	80.0	-85.0	.0	3
20	85.0	-90.0	99.0	4
21	90.0	-95.0	99.0	4
22	100.0	-105.0	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

C. PILE INFORMATION

TEST PILE SECTION	ISECT = 4 {steel H-pile}
WIDTH OF FLANGE	WIDTH = 14.00 INCHES
DEPTH OF SECTION	DEPTH = 13.61 INCHES
TRUE X-SECTIONAL AREA	TAREA = 21.4INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-15.0	.36	5.09	56.24	60.97	30.49	117.21
15.0	-20.0	.55	13.27	80.49	93.21	46.60	173.69
20.0	-25.0	.73	23.43	95.27	117.98	58.99	213.25
25.0	-30.0	.91	33.93	95.27	128.29	64.14	223.56
30.0	-35.0	1.09	44.42	95.27	138.60	69.30	233.87
35.0	-40.0	1.27	54.91	95.27	148.91	74.45	244.18
40.0	-45.0	1.46	65.40	94.30	158.24	79.12	252.54
45.0	-50.0	1.64	75.64	93.19	167.19	83.60	260.39
50.0	-55.0	1.82	86.07	92.46	176.70	88.35	269.16
55.0	-60.0	2.00	96.30	91.70	185.99	93.00	277.69
60.0	-65.0	2.18	106.20	92.96	196.98	98.49	289.94

*** THE MAXIMUM PILE LENGTH HAS BEEN REACHED

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,

FOR TIP IN SOIL TYPE 3 OR 4,
= ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
FOR TIP IN SOIL TYPE 1 OR 2.

5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE NEGATIVE.

PROBLEM COMPLETED ANALYSIS NO. 1

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B289.DAT
RUN DATE	11/09/94
RUN TIME	18:17:28
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-2 HP 14x89
DRILLING DATE	10/22/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	-5.00 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

Project No: C394348 BECKETT BRIDGE REPAIRS
Boring No: B-2 HP 14x89

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	-6.5	1.0	3
2	4.0	-9.0	3.0	3
3	6.5	-11.5	3.0	3
4	9.0	-14.0	99.0	4
5	11.5	-16.5	99.0	4
6	16.5	-21.5	99.0	4
7	20.0	-25.0	99.0	4
8	25.0	-30.0	99.0	4
9	30.0	-35.0	99.0	4
10	35.0	-40.0	99.0	4
11	40.0	-45.0	99.0	4
12	45.0	-50.0	99.0	4
13	51.5	-56.5	57.0	4
14	56.5	-61.5	56.0	4
15	60.5	-65.5	99.0	4
16	65.0	-70.0	99.0	4
17	70.0	-75.0	99.0	4
18	75.0	-80.0	99.0	4
19	80.0	-85.0	.0	3
20	85.0	-90.0	99.0	4
21	90.0	-95.0	99.0	4
22	100.0	-105.0	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-2 HP 14x89

C. PILE INFORMATION

TEST PILE SECTION	ISECT =	4 {steel H-pile}
WIDTH OF FLANGE	WIDTH =	14.00 INCHES
DEPTH OF SECTION	DEPTH =	13.83 INCHES
TRUE X-SECTIONAL AREA	TAREA =	26.1INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-15.0	.44	5.14	57.15	61.84	30.92	118.99
15.0	-20.0	.67	13.37	81.79	94.49	47.25	176.28
20.0	-25.0	.89	23.62	96.81	119.54	59.77	216.35
25.0	-30.0	1.11	34.20	96.81	129.90	64.95	226.71
30.0	-35.0	1.33	44.77	96.81	140.25	70.13	237.06
35.0	-40.0	1.55	55.35	96.81	150.60	75.30	247.41
40.0	-45.0	1.78	65.92	95.82	159.97	79.98	255.79
45.0	-50.0	2.00	76.24	94.70	168.94	84.47	263.64
50.0	-55.0	2.22	86.75	93.95	178.48	89.24	272.43
55.0	-60.0	2.44	97.06	93.18	187.80	93.90	280.98
60.0	-65.0	2.66	107.05	94.47	198.85	99.42	293.32

*** THE MAXIMUM PILE LENGTH HAS BEEN REACHED

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,

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                    FOR TIP IN SOIL TYPE 3 OR 4,
              = ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
                    FOR TIP IN SOIL TYPE 1 OR 2.

 5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE
    NEGATIVE.

 PROBLEM COMPLETED                            ANALYSIS NO.  1
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FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B373.DAT
RUN DATE	11/09/94
RUN TIME	18:17:55
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-3 HP 14x73
DRILLING DATE	10/20/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	3.50 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	2.0	5.0	3
2	4.0	-.5	5.0	3
3	6.5	-3.0	5.0	3
4	9.0	-5.5	19.0	3
5	11.5	-8.0	9.0	3
6	16.5	-13.0	3.0	2
7	20.0	-16.5	8.0	4
8	25.0	-21.5	99.0	4
9	30.0	-26.5	99.0	4
10	35.0	-31.5	99.0	4
11	40.0	-36.5	99.0	4
12	45.0	-41.5	99.0	4
13	51.5	-48.0	99.0	4
14	56.5	-53.0	99.0	4
15	60.5	-57.0	99.0	4
16	65.0	-61.5	99.0	4
17	69.0	-65.5	50.0	4
18	69.1	-65.6	.0	5
19	71.0	-67.5	.0	5
20	71.1	-67.6	29.0	4
21	75.0	-71.5	25.0	4
22	80.0	-76.5	61.0	4
23	90.0	-86.5	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

-oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-3 HP 14x73

C. PILE INFORMATION

TEST PILE SECTION	ISECT =	4 {steel H-pile}
WIDTH OF FLANGE	WIDTH =	14.00 INCHES
DEPTH OF SECTION	DEPTH =	13.61 INCHES
TRUE X-SECTIONAL AREA	TAREA =	21.4INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-6.5	.36	3.47	11.74	14.85	7.42	26.58
15.0	-11.5	.55	5.80	19.25	24.51	12.25	43.76
20.0	-16.5	.73	10.82	38.30	48.39	24.19	86.69
25.0	-21.5	.91	15.25	56.18	70.52	35.26	126.71
30.0	-26.5	1.09	24.51	86.96	110.38	55.19	197.34
35.0	-31.5	1.27	34.75	95.27	128.74	64.37	224.01
40.0	-36.5	1.46	45.11	95.27	138.92	69.46	234.19
45.0	-41.5	1.64	55.53	95.27	149.16	74.58	244.43
50.0	-46.5	1.82	65.97	95.27	159.42	79.71	254.69
55.0	-51.5	2.00	76.42	95.27	169.69	84.85	264.96
60.0	-56.5	2.18	86.89	92.50	177.20	88.60	269.69
65.0	-61.5	2.37	96.60	88.90	183.13	91.57	272.03
70.0	-66.5	2.55	108.70	.00	106.15	53.07	106.15
75.0	-71.5	2.73	114.09	47.09	158.44	79.22	205.53

*** ERROR *** PILE TIP EXCEEDS BORING LOG FOR LENGTH = 80.00 FT

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

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3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,
                         FOR TIP IN SOIL TYPE 3 OR 4,
                 = ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
                         FOR TIP IN SOIL TYPE 1 OR 2.

5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE
   NEGATIVE.

PROBLEM COMPLETED                                  ANALYSIS NO.  1
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FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE
STATIC PILE BEARING CAPACITY ANALYSIS PROGRAM
SPT94 - VERSION 1.0 JUNE, 1994
BASED ON RESEARCH BULLETIN RB-121
"GUIDELINES FOR USE IN THE SOILS INVESTIGATION
AND DESIGN OF FOUNDATIONS FOR
BRIDGE STRUCTURES IN THE STATE OF FLORIDA"

NOTE - THIS PROGRAM IS EXPANDED FROM SPT91
TO INCLUDE STEEL H AND PIPE PILES

A. GENERAL INFORMATION

INPUT FILE NAME	C:\SPT94\BECKETT\B389.DAT
RUN DATE	11/09/94
RUN TIME	18:18:21
PROJECT NUMBER	C394348
JOB NAME	BECKETT BRIDGE REPAIRS
SUBMITTING ENGINEER	LDS
BORING NO.	B-3 HP 14x89
DRILLING DATE	10/20/94
STATION NO.	N/A
GROUND SURFACE ELEVATION	3.50 FEET
TYPE OF ANALYSIS	2 - DETERMINATION OF STATIC PILE BEARING CAPACITIES FOR A RANGE OF PILE LENGTHS (CAPACITY VS. TIP ELEVATION)

oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-3 HP 14x89

B. BORING LOG

ENTRY NO.	DEPTH (FT) D(I)	ELEVATION (FT)	SPT BLOWS/FT N(I)	SOIL TYPE ST(I)
1	1.5	2.0	5.0	3
2	4.0	-.5	5.0	3
3	6.5	-3.0	5.0	3
4	9.0	-5.5	19.0	3
5	11.5	-8.0	9.0	3
6	16.5	-13.0	3.0	2
7	20.0	-16.5	8.0	4
8	25.0	-21.5	99.0	4
9	30.0	-26.5	99.0	4
10	35.0	-31.5	99.0	4
11	40.0	-36.5	99.0	4
12	45.0	-41.5	99.0	4
13	51.5	-48.0	99.0	4
14	56.5	-53.0	99.0	4
15	60.5	-57.0	99.0	4
16	65.0	-61.5	99.0	4
17	69.0	-65.5	50.0	4
18	69.1	-65.6	.0	5
19	71.0	-67.5	.0	5
20	71.1	-67.6	29.0	4
21	75.0	-71.5	25.0	4
22	80.0	-76.5	61.0	4
23	90.0	-86.5	.0	0

SOIL TYPE LEGEND

0 - BOTTOM OF BORING
1 - PLASTIC CLAYS
2 - CLAY/SILT SAND MIXTURES, SILTS & MARLS
3 - CLEAN SAND
4 - SOFT LIMESTONE, VERY SHELLY SANDS
5 - VOID (NO CAPACITY)

·oject No: C394348 BECKETT BRIDGE REPAIRS
ring No: B-3 HP 14x89

C. PILE INFORMATION

TEST PILE SECTION	ISECT = 4 {steel H-pile}
WIDTH OF FLANGE	WIDTH = 14.00 INCHES
DEPTH OF SECTION	DEPTH = 13.83 INCHES
TRUE X-SECTIONAL AREA	TAREA = 26.1INCH^2

D. PILE CAPACITY VS. PENETRATION

TEST PILE LENGTH (FT)	PILE TIP ELEV (FT)	WT. OF PILE (TONS)	ULT. SIDE FRICTION (TONS)	MOBILIZED END BEARING (TONS)	ESTIMATED FAILURE CAPACITY (TONS)	ALLOWABLE PILE CAPACITY (TONS)	ULTIMATE PILE CAPACITY (TONS)
10.0	-6.5	.44	3.50	11.93	14.98	7.49	26.91
15.0	-11.5	.67	5.85	19.56	24.75	12.37	44.31
20.0	-16.5	.89	10.91	38.92	48.93	24.47	87.85
25.0	-21.5	1.11	15.38	57.09	71.35	35.68	128.44
30.0	-26.5	1.33	24.70	88.37	111.74	55.87	200.11
35.0	-31.5	1.55	35.02	96.81	130.28	65.14	227.09
40.0	-36.5	1.78	45.47	96.81	140.50	70.25	237.31
45.0	-41.5	2.00	55.97	96.81	150.78	75.39	247.59
50.0	-46.5	2.22	66.49	96.81	161.08	80.54	257.89
55.0	-51.5	2.44	77.03	96.81	171.40	85.70	268.21
60.0	-56.5	2.66	87.58	93.99	178.91	89.45	272.90
65.0	-61.5	2.89	97.37	90.34	184.82	92.41	275.16
70.0	-66.5	3.11	109.56	.00	106.45	53.23	106.45
75.0	-71.5	3.33	115.00	47.85	159.51	79.76	207.36

*** ERROR *** PILE TIP EXCEEDS BORING LOG FOR LENGTH = 80.00 FT

NOTES

1. FOR PILE TIP EMBEDDED IN SOIL TYPE 3 AND 4, END BEARING IS CALCULATED BASED ON BLOCK AREA WHILE TRUE X-SECTIONAL AREA IS USED FOR SOIL TYPE 1 AND 2.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULT. CAPACITY = ULT. SKIN FRICTION + 2*MOBILIZED END BEARING,
   FOR TIP IN SOIL TYPE 3 OR 4,
   = ULT. SKIN FRICTION + 3*MOBILIZED END BEARING,
   FOR TIP IN SOIL TYPE 1 OR 2.

5. PILE CAPACITIES ARE SET TO ZERO IF THEIR COMPUTED VALUES ARE NEGATIVE.

PROBLEM COMPLETED ANALYSIS NO. 1

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, thanks to the Association of Soil and Foundation Engineers (ASFE).

When ASFE was founded in 1969, subsurface problems were frequently being resolved through lawsuits. In fact, the situation had grown to such alarming proportions that consulting geotechnical engineers had the worst professional liability record of all design professionals. By 1980, ASFE-*member consulting soil and foundation engineers had the best professional liability record*. This dramatic turn-about can be attributed directly to client acceptance of problem-solving programs and materials developed by ASFE for its members' application. *This acceptance was gained because clients perceived the* ASFE *approach to be in their own best interests.* Disputes benefit only those who earn their living from others' disagreements.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of his report may affect his recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

A geotechnical engineer cannot accept responsibility for problems which may develop if he is not consulted after factors considered in his report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by the geotechnical engineer who then renders an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those opined to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. For example, the actual interface between materials may be far more gradual or abrupt than the report indicates, and actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultant through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy

WILLIAMS
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Choose Integrity.

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www.williamsearthsciences.com

May 18, 2009

Murray McDonough, P.E.
URS Corporation
7650 W. Courtney Campbell Causeway
Tampa, FL 33607-1462

Subject: Phase 1 Geotechnical Report
Beckett Bridge
Pinellas County
Williams' Project No. 1309-004-01

Gentlemen:

Williams Earth Sciences, Inc. (Williams) has completed the Phase 1 Geotechnical work for the referenced project. This work was performed in accordance with our agreement with URS, dated April 17, 2009.

This report contains the results and discussion of the Electrical Resistivity Imaging (ERI) conducted during this Phase 1 Geotechnical study. In addition, recommendations for additional subsurface exploration, settlement and rotation monitoring are provided.

Williams Earth Sciences, Inc. appreciates this opportunity to provide this report and looks forward to continuing working with you on this project. If you have any questions concerning this report, please contact the undersigned.

Sincerely,

WILLIAMS EARTH SCIENCES, INC.

Larry D. Spears, P.E.
Senior Engineer
Florida Registration No. 52105

Brian Jory, P.E.
Senior Geotechnical Engineer
Florida Registration N. 46634

Distribution: (3) Addressee
(1) File

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Table of Contents

Appendices

1. Project Information

This Phase 1 study was performed to identify karst features in the area of the footprint of the Beckett Bridge foundation. Our original proposal included soil borings spread across the Beckett Bridge footprint to 1) identify the subsurface conditions and 2) to assist in the repair of the existing bridge or design of a replacement bridge. However, due to cost constraints, the scope of work was reduced to simply conducting the ERI study, and performing the soil borings later based on the results of the ERI study. The Beckett Bridge is located in Tarpon Springs, Florida, along Riverside Drive at the Anclote River, as shown on Figure 1, Site Location Map, in Appendix A.

The bridge is multi-spanned and has been experiencing lateral movement and subsidence. The bridge is a two-lane bascule bridge about 20 feet across and 360 feet in length with two-foot wide sidewalks on both sides. The approach span structures are constructed of 14-inch square prestressed concrete piles. There are four spans on the east approach and five spans on the west approach. The bascule is approximately 40 feet long and is supported on a concrete pier. The bridge was originally constructed in 1924 using timber piling and timber bents. The bridge approach spans were reconstructed in 1956 using reinforced concrete, however, the original bascule span remained. Structural repairs were performed in 1979 and crutch bents installed in 1995.

2. Previous Geotechnical Study

Williams provided a report dated November 10, 1994, which provided recommendations for the installation of crutch bents using H-Piles. During the 1994 study, Williams performed three Standard penetration Test (SPT) borings; one was performed at the west abutment, one at the east abutment, and one was performed in the vicinity of the Bent 5, adjacent to the bascule. The two abutment borings were performed from land and the Bent 5 boring was performed from the bridge (as opposed to a barge over water). The results of the borings are included in Appendix A. Two SPT borings were also performed by others (PSI). These two borings were performed at Bent 6 from the bridge. One was performed in the westbound lane and the other was performed in the eastbound lane.

3. Phase 1 Study

For this Phase 1 study, Electrical Resistivity Imaging (ERI) was conducted. The purpose of the ERI testing was to determine the vertical extent and lateral continuity of soil layers and to identify possible karst hazards within the river along the sides of the bridge. The ERI testing was performed by "Subsurface Evaluations, Inc." (SEI) and their report, dated April 28, 2009, is included in Appendix B.

The results of the ERI testing indicated several interesting features and anomalies within the vicinity of the bridge footprint. First, there appears to be an anomaly near Bent 6, with the center approximated just north of the bridge, as depicted on Figure 1 of the SEI report. In addition, there appears to be a shelf at about 20 to 40 feet in depth indicating a change in soil material and/or density, as indicated on Figure 1.

Boring B-1 was performed very close to the ERI anomaly indicated at Bent 6. The boring indicates that there is dense grading to medium dense dark brown to brown fine sand with trace of silt from the mud-line to about 10 feet below the mud-line, followed by a nine foot thick layer of stiff dark gray sandy silt layer, from 10 to 19 feet below the mud-line. The silt layer was underlain by a relatively thin layer of hard limestone, from 19 to 24 feet below the mud-line. From 24 to 40 feet below the mud-line, a medium dense grading to very loose layer of brown fine sand with trace of silt (SP-SM) was encountered. A second layer of hard limestone was present from 40 to 45 feet below the mud-line, followed by medium dense brown find sand with trace of silt (SP-SM) to the termination depth of the boring at about 57 feet below the mud-line.

Boring B-1 (PSI) and the ERI results correlate at Bent 6. In addition, this anomaly is indicative of a relic sinkhole, albeit in the Anclote River. Boring B-2 was also performed at Bent 6, on the opposite side of the bridge (eastbound lane). This boring indicated somewhat similar soils to Boring B-1, however, there was no evidence of the stiff silt layer at 10 to 19 feet below the mud-line.

The borings conducted by Williams in the 1994 study indicated a soil Stratigraphy that was quite dissimilar to the borings conducted at Bent 6 by PSI. These borings generally indicate a surficial layer of sands to silty sands or clayey soils, followed by very hard limestone to the full depth of the borings. There were a few minor variations in the subsurface soils, such as a thin layer of clay (CH) material in boring B-1 at a depth of 47 to 58 feet below the ground surface; a very loose shelly fine sand layer from 77 to 84 feet below the mud-line at boring B-2; and a possible void from 69 to 71 feet below the ground surface at boring B-3. Nonetheless, the medium dense fine sand with trace of silty soils was not encountered in the SPT borings conducted by Williams.

The nature of encountering highly dissimilar soils in a relatively short distance indicates that this area has localized karst features. Anclote River in known for its erratic karst features. The subsurface is characterized by a sand layer overlying a shallow limestone. There is a lack of clay layering in this area and therefore there is a high degree of localized subsidence and raveling of the surficial soils into the karst limestone. Review of the ERI results indicates that the surficial karst solution features, or surficial relic sinkhole features, may be more prevalent near the center of the bridge. There also appears to be an apparent shelf, as indicated on ERI transects T3 and T4. Review of ERI transects T3, T4 and T5 indicate the possibility of a solution zone near to below the bridge footprint that may be located in a southwest orientation. However, it may be possible that the bascule bridge footing and the piles may be providing interference of the ERI data.

It has been reported that there has been settlement and rotation of the bents and/or bascule pier. There are a number of potential causes for this, both structurally and geotechnically, however, from a geotechnical standpoint, the causes may be due to subsidence of the piles due to 1) active sinkhole conditions, or 2) insufficient pile bearing both axially and laterally, or some combination of all. Since the settlement and rotation is occurring slowly, it is difficult to ascertain if it is continuing or if the settlement has ceased. Another consideration is the age of the timber piles supporting the bascule pier, which are about 85 years old, and are likely in poor condition due to fatigue, rot, or some other form of deterioration.

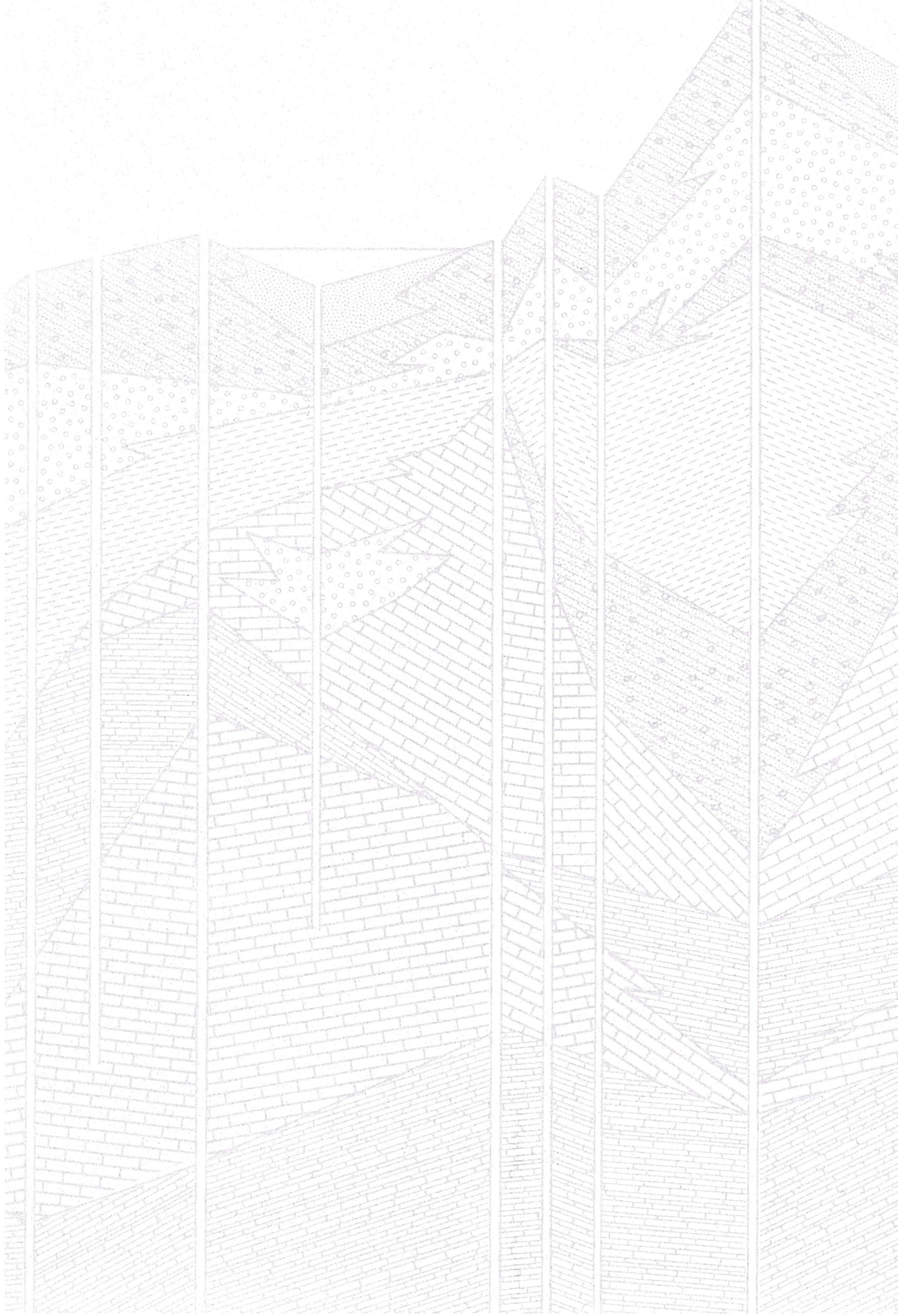
As previously mentioned, there was HP 14 X 73 crutch bent piles installed in 1996. The 1996 Plans indicate crutch bents at Bent 6 and Bent 7, and pier stabilizers for the bascule. The lengths of the crutch bent piles varied dramatically from tip elevations of about -30 to -200 feet. These lengths were taken from old facsimile correspondence between Williams and DSA. Interestingly, there was a minimum tip elevation of -35 feet indicated on the plans; therefore, one of the piles did not achieve the minimum tip elevation in accordance with the plans. The piles were also supposedly preformed to an elevation of -27 feet, and the preformed hole was supposed to be grouted. The HP crutch bent piles were also planned to be jacketed using an epoxy mix from elevation -4 to +4 feet, at the splash zone of the piles. Based on the 2007 Bridge Inspection Report, performed by Volkert & Associates, Inc., the "jackets are in good condition with no washouts or exposed base pile".

4. Recommendations

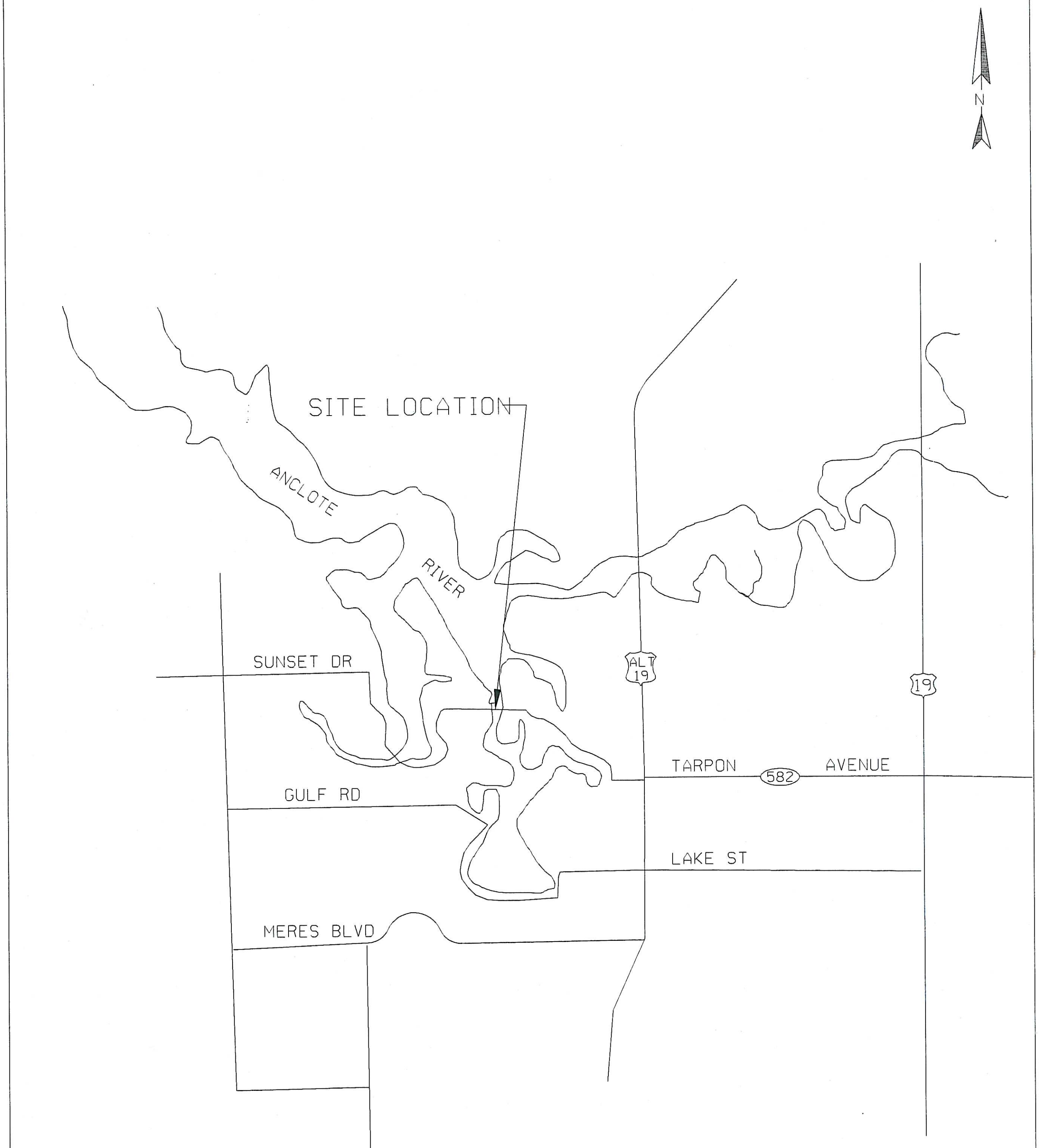
Williams understands that this bridge is under evaluation for repair or replacement. If repair is feasible, then settlement and rotation monitoring of the bents and piers is recommended to determine how, where and the amount that it is occurring so that the bents and/or piers can be shored to stabilize the settlement and rotation. Evaluation of how to shore the bents and/or piers can then be made, however, it will likely require additional crutch bents and stabilizers at the bascule pier if it is determined that the settlement and rotation can be stabilized by reinforcing the substructure.

Additional borings may be required if the settlement and rotation is occurring at locations where there is no soils information to assist in the design and construction of the crutch bents or pier stabilizers.

If it is determined that the bridge should be replaced, then additional soil borings will be required to assist in the design and construction. Williams would coordinate with URS on the number of borings, location and depth that best suites the needs of the design and construction, basing it on the subsurface conditions known to be suspect to subsidence for substructure units. Recommendations for foundation design and selection of foundation support, and recommendations for foundation installation would subsequently be provided in a substructures geotechnical report.



APPENDIX A



WILLIAMS EARTH SCIENCES, INC.

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Panama City: (904) 747-9419 FAX: (904) 763-2454

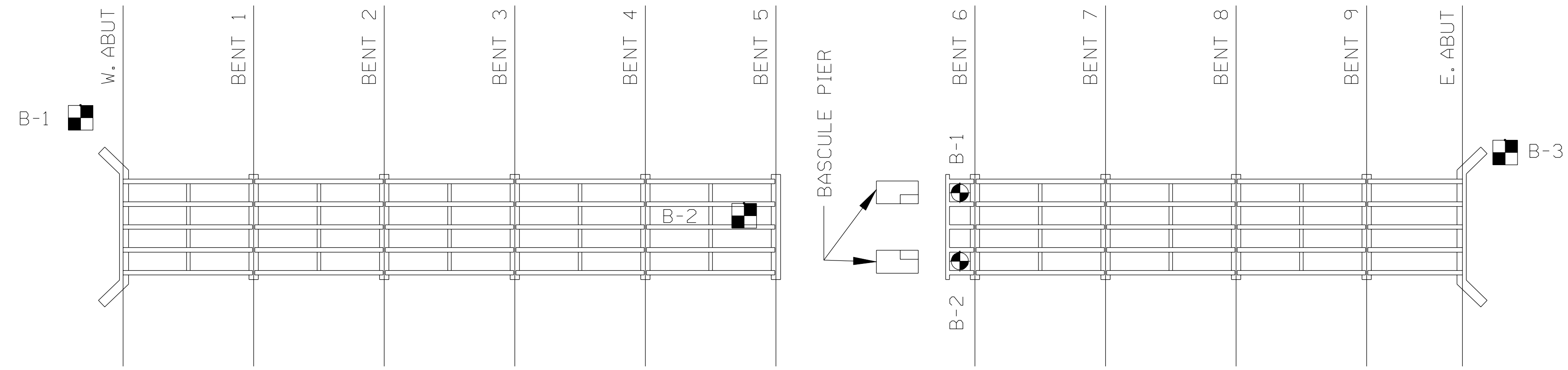
BECKETT BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

SITE LOCATION MAP

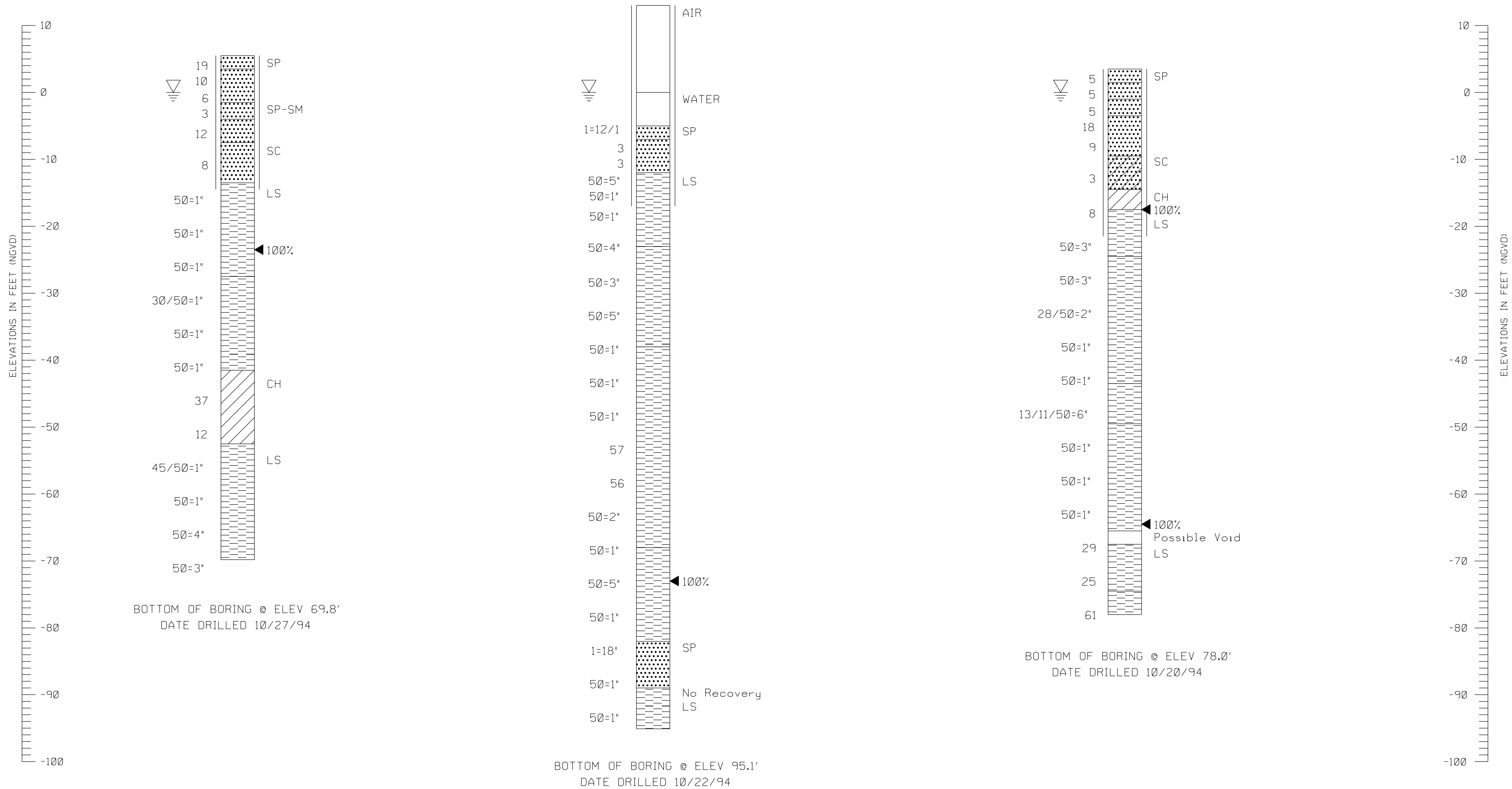
Drawn By: TEJ	Date: 9/11/94	Scale: N.T.S.
Checked By: LDS	Report No.C394348	Figure No. 1

site

FED. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
	FLA			



PLAN



LEGEND

= SP, SP-SM and SP-SC, Sands and slightly clayey sands

= CH, Inorganic clays of low plasticity

= SC, Clayey sands and very sandy clays

= LS, Limestone

GENERAL NOTES

DRILL AND PENETRATION TESTING WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. NUMBER TO LEFT OF BORING INDICATES BLOWS OF 1 3/8" I.D., 2" O.D. SPLIT-SPOON FOR 12" OF PENETRATION (UNLESS OTHERWISE NOTED) WITH A 140 LB. HAMMER DROPPED 30 INCHES.

THE BORING LOGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITION, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING.

ELEVATIONS SHOWN ARE APPROXIMATED BY WATER LEVEL AND WATER TABLE MEASURED AT TIME AND DATE BORINGS WERE COMPLETED.

REFER TO FINAL REPORT FOR ADDITIONAL BORING INFORMATION.

CREW CHIEF: SPOON
DRILLER: PATTERSON
DRILL RIG TYPE: FAILING 250

LEGEND

= Water Table @ end of drilling

= Casing used

= Shelby Tube

◀100% = Percent Loss of Circulation

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)

Granular Materials- Relative Density	SPT (Blows/Ft)
Very Loose	Less than 4
Loose	4 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Silts and Clays- Consistency	SPT (Blows/Ft)
Very Soft	Less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

C394348 BRDG1

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	TEJ	11/9/94
Checked by	LDS	11/9/94
Designed by	LDS	11/9/94
Checked by	KDB	11/9/94
Approved by	K. D. BENNETT	

ENGINEER OF RECORD:
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10600 ENDEAVOUR WAY
LARGO, FLORIDA 34647

LOGO:
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SEAL:

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE

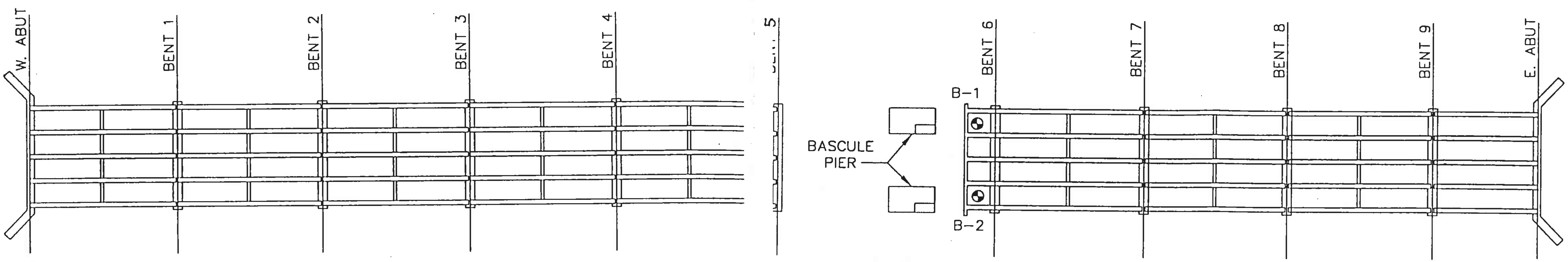
ROAD NO.	COUNTY	PROJECT NO.
SR936	PINELLAS	

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: BECKETT BRIDGE REPLACEMENT

Drawing No.

Index No.



BORING L CATION PLAN

SC LE: N.T.S.

L GEND

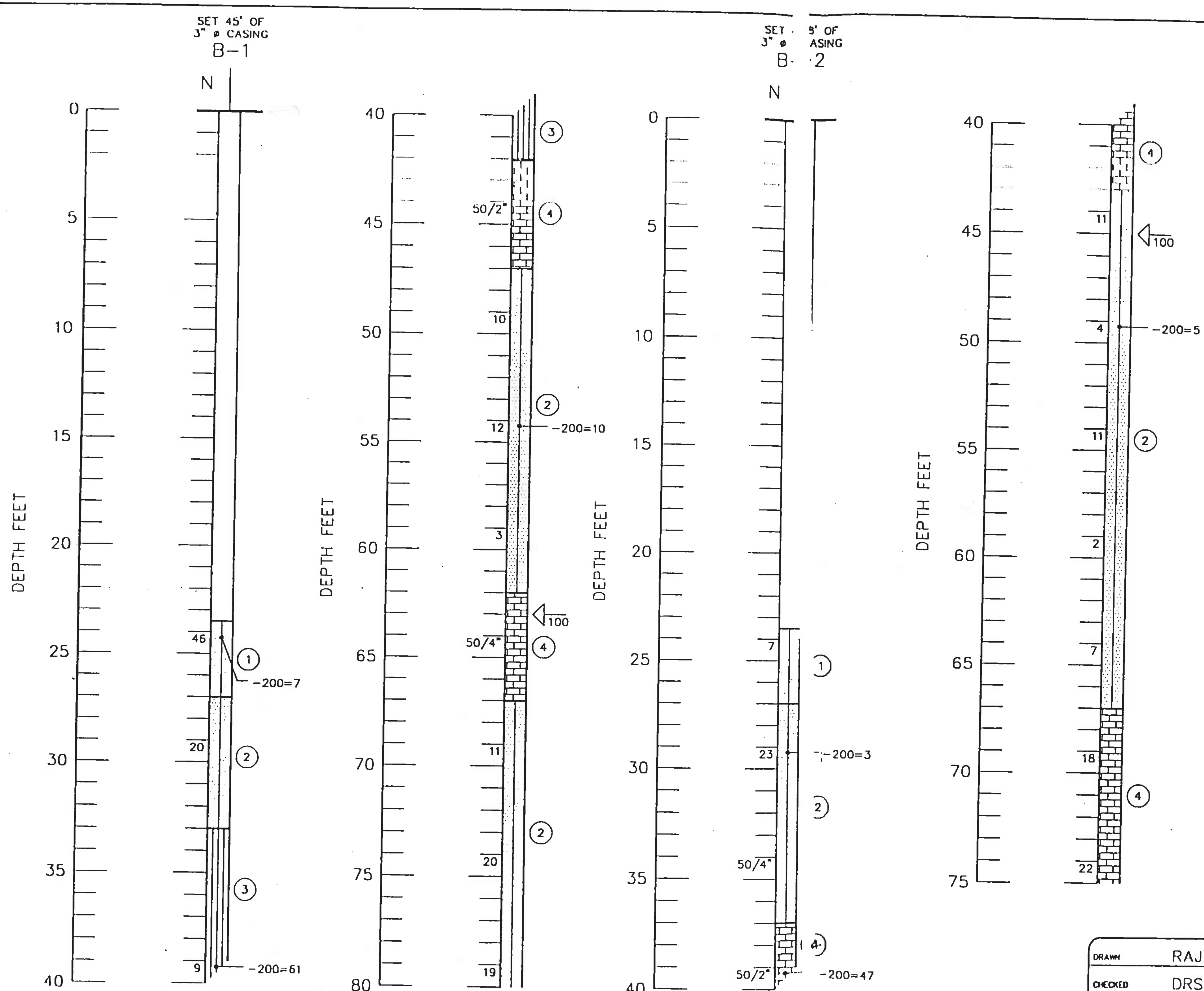
● Approxim e SPT boring location

DRAWN	RAJ
CHECKED	DRS
APPROVED	HVJ
SCALE	NOTED

GEOTECHNICAL SERVICES
BECKETT BASCULE BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

psi **Jammal & Associates, Inc.**
A Division of Professional Service Industries, Inc.

DATE	PROJ. NO.	
DEC 93	775−35264	SHEET 1



SOIL PROFILES

VERTICAL SCALE: 1"=5'

LEGEND

1 Dark brown fine SAND with trace silt (SP–SM)

2 Brown fine SAND with trace silt (SP–SM)

3 Dark gray sandy SILT (ML)

4 Calcareous silts and weathered LIMESTONE (rock)

SP Unified Soil Classification group symbol as determined by visual review

N SPT "N" value in blows/foot

50/3" Fifty blows for three inches

◁— Loss of circulation (%)

-200 Fines passing No. 200 sieve (%)

DRAWN	RAJ
CHECKED	DRS
APPROVED	HVJ
SCALE	NOTED

GEOTECHNICAL SERVICES
BECKETT BASCULE BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

psi Jammal & Associates, Inc.
A Division of Professional Service Industries, Inc.

DATE	PROJ. NO.	
DEC 93	775-35264	SHEET 2

7.2. SUBSURFACE EVALUATIONS ELECTRICAL RESISTIVITY IMAGING REPORT (2009)

APPENDIX B

SUBSURFACE EVALUATIONS, INC.
Engineering Geology & Geophysics

13617 North Florida Avenue
Tampa, FL 33613 USA
Voice: (813) 353-9083
Fax (813) 353-9653
www.sei-tampa.com

April 28, 2009

Mr. Larry Spears, P.E., Geotechnical Engineer
Williams Earth Sciences, Inc. (Client)
10600 Endeavour Way
Largo, Florida 33777

Subject: Electrical Resistivity Imaging Geophysical Survey Report
Beckett Bridge Project
Riverside Drive at the Anclote River
Tarpon Springs, Florida

Dear Mr. Spears:

In accordance with your authorization, Subsurface Evaluations, Inc. (SEI) has conducted an Electrical Resistivity Imaging (ERI) survey at the above-referenced subject site. The ERI survey was performed on April 21st and 22nd, 2009. This report is subject to the limitations shown on Attachment A.

Background and Purpose

The subject site is the existing Beckett Bridge located along Riverside Drive crossing the entrance to Minetta and Whitcomb Bayous in Tarpon Springs, Florida. The bridge is a Bascule bridge reconstructed in 1956. Through our discussions it was indicated that the supports for the bridge have undergone apparent subsidence and lateral displacement resulting in the misalignment of the bridge. The bridge was reported to have been repaired for similar subsidence problems approximately 15 years ago at which time additional supports (H-piles) were installed at the bridge.

The general soil conditions present along the bridge based upon soil borings were indicated to consist of approximately seven (7) feet of sand underlain by hard limestone. However, during the installation of the H-piles, apparent solution features were encountered resulting in some driven piling depths of as much as 120 feet.

The purpose of the geophysical survey is to document the vertical extent and lateral continuity of soil layers and to identify possible karst hazards within the river along the sides of the bridge. The objective of the survey is to characterize the geology directly underlying the river to assist in evaluating ground stability to promote effective geotechnical engineering design and testing.

Electrical Resistivity Imaging (ERI) Survey

ERI Methods and Equipment

Andrew Glasbrenner, P.G., Senior Geologist and Scott Purcell, SEI Project Manager, performed the survey assisted by additional SEI staff. Mr. Glasbrenner and SEI staff prepared the figures and text of the report.

ERI is a geophysical method of obtaining a virtual cross-section of subsurface soil and rock layers. It consists of two separate steps: 1) measuring the apparent (weighted average) electrical resistivity of the ground over numerous stations and 2) computerized processing of apparent resistivity data to obtain a virtual cross-section of estimated true resistivity values.

In the field, an electric current is passed into the ground or water by a pair of electrodes and the potential is measured at a second pair of electrodes. Multiple electrodes and a computerized switching system are used to speed data acquisition. A SuperSting/Swift R8® Memory Earth Resistivity Meter, a 28 takeout passive marine cable set, and stainless steel electrodes were used to perform the survey. Advanced Geosciences, Inc., (AGI), of Austin, Texas, manufactured the equipment, which is designed for shallow geotechnical and geological applications and engineered to have a high signal to noise ratio.

For quality assurance/quality control, SEI performs resistivity surveys in compliance with the ASTM Standard Guide for Using the Direct Current Resistivity Method for Subsurface Investigation, designation D 6431-99.

Array Type

Resistivity data were collected using a dipole-dipole array configuration with the extended data coverage option. This array type maximizes lateral resolution and the total number of data points collected on each transect. A dipole-dipole array places two current (transmitting) electrodes together as a pair and two potential (sensing) electrodes together as a pair. For each successive measurement, the potential electrode pair is moved farther away from the current electrode pair by a distance that is a multiple of the distance between the electrodes.

ERI Transects

Resistivity measurements were made along five (5) transects at the site. All transects consisted of a 28 electrode array on a spacing of 20 feet. Transects T1 and T2 were oriented west to east along the south and north sides of the bridge, respectively. These were placed so that a portion of each end of the transects were located above the waterline on dry ground, and passing approximately ten feet north or south of the edges of the bridge deck where submerged.

Transects T3, T4, and T5 were oriented south to north, crossing beneath the middle three sections of the bridge. These transects were completely submerged, and were deployed from a pontoon boat.

The pontoon boat also held the instrumentation for the duration of data collection for each of these transects.

The approximate location of the ERI transects are shown on the attached Figure 1: Site Location Map. Transect locations were measured and placed using a Trimble™ Differential Global Positioning System (DGPS).

Modeling

After the survey was performed, ERI field data was transferred to a computer and converted into data files for modeling. Two-dimensional inverse resistivity modeling was performed using the RES2DINV version 3.57.37 software package. Special modeling routines included for processing of submarine and mixed data sets were utilized in the processing of this data. The modeling method consists of estimating the true resistivity of the subsurface at points arranged in a grid on a vertical plane. The estimated true resistivity values are used to calculate apparent resistivity values, which are compared to the actual measured resistivity values. Adjustments are made in the model to make the calculated resistivity values more closely match the measured values. The modeling progresses toward better estimates of the true resistivity by iteration using the least-squares method. Up to five iterations were performed.

The iteration process was carried out until the convergence between iterations approached 5%. RMS errors less than 10% are considered ideal, but this cannot be obtained in all cases and is dependent upon local soil conditions. Highly resistive surficial soils, or shallow subsurface lithified materials reduce signal propagation and signal strength at depth, contributing to higher RMS error calculations in the model. Significant deviations from a horizontally layered, laterally homogenous model will also significantly increase the apparent RMS error. SEI reduced the error in the model by trimming data points that have high RMS error values using an editing feature of the RES2DINV software. The estimated true resistivity values were contoured to produce a two-dimensional pseudosection for the plane beneath the survey line. A contour interval was chosen to show minor variations in the lower resistivity values while covering the range of typical material values. Topographic corrections were made with respect to observed sea level at the time of the survey, but are not adjusted to match any formal elevation model.

Resistivity values are not necessarily dependent only on the type of soil or rock present, but are strongly influenced by the presence, salinity and pH of pore fluids in the earth materials. Dry clays may have resistivities that are higher than typical and saturated sands may have resistivities that are lower than typical. In particular, saltwater and low pH (acidic) fresh groundwater will greatly reduce the resistivity of non-conductive materials such as sand and limestone. Different materials and conditions may also present similar electrical signatures, such as dense plastic clays and loose saturated granular soils or voids.

Please note that the resistivity-modeling program contours the modeled data points in a manner that may show gradational changes, when in fact, abrupt contacts are present between layers of earth materials. Also, please be aware that actual lithological contacts can be difficult to identify on the ERI pseudosections without test boring data. Interpretations are made in the Results section, by assuming that certain contour intervals represent the contact between different types of materials, as described above.

Prints of the ERI pseudosections are provided on the attached Figure 2, and form the basis for this report. Other details about the survey and modeling are available in SEI's files should you need them in the future.

ERI Survey Results and Discussion

The results of the survey were apparently impacted by the presence of the steel H-piles, resulting in low resistivity anomalies coincident with the location of the submerged steel. However, despite this interference, the two transects that were oriented parallel to the bridge, T1 and T2, indicate low resistivity anomalies of greater extent than likely due to such interference. It is our interpretation that these larger anomalies may represent areas of increased porosity/lower density, or areas where higher resistivity shallow bedrock has been weathered or replaced. This anomaly is delineated on the Site Location Map (Figure 1) and labeled as Feature 1, and should be considered for additional direct investigation by soil boring or similar method.

Additionally, all five pseudosections indicate a transition in resistivities between 20 and 40 feet below sea level, from lower to higher resistivity. This may be indicative of a stratigraphic transition to bedrock, or perhaps from soil and weathered bedrock to competent bedrock.

Recommendations

SEI recommends that the center of the apparent anomaly documented in the ERI survey and identified as Feature 1 be considered for additional direct investigation. Advancing an SPT boring at the deepest part or center of each feature would serve to verify the inferred possible karst conditions. If the results of these test borings indicate anomalous conditions indicative of karst activity, SEI may be able to identify further appropriate locations for additional investigation after correlation of boring log data and ERI survey results. SEI would be pleased to assist you with further correlation and interpretation of this ERI survey and the findings from the drilling conducted as part of the initial soil boring investigation.

-oOo-

Closing Comments

We appreciate the opportunity of providing these geophysical services to you on this project. Should you have any questions or require additional information, please do not hesitate to contact our office at (813) 353.9083.

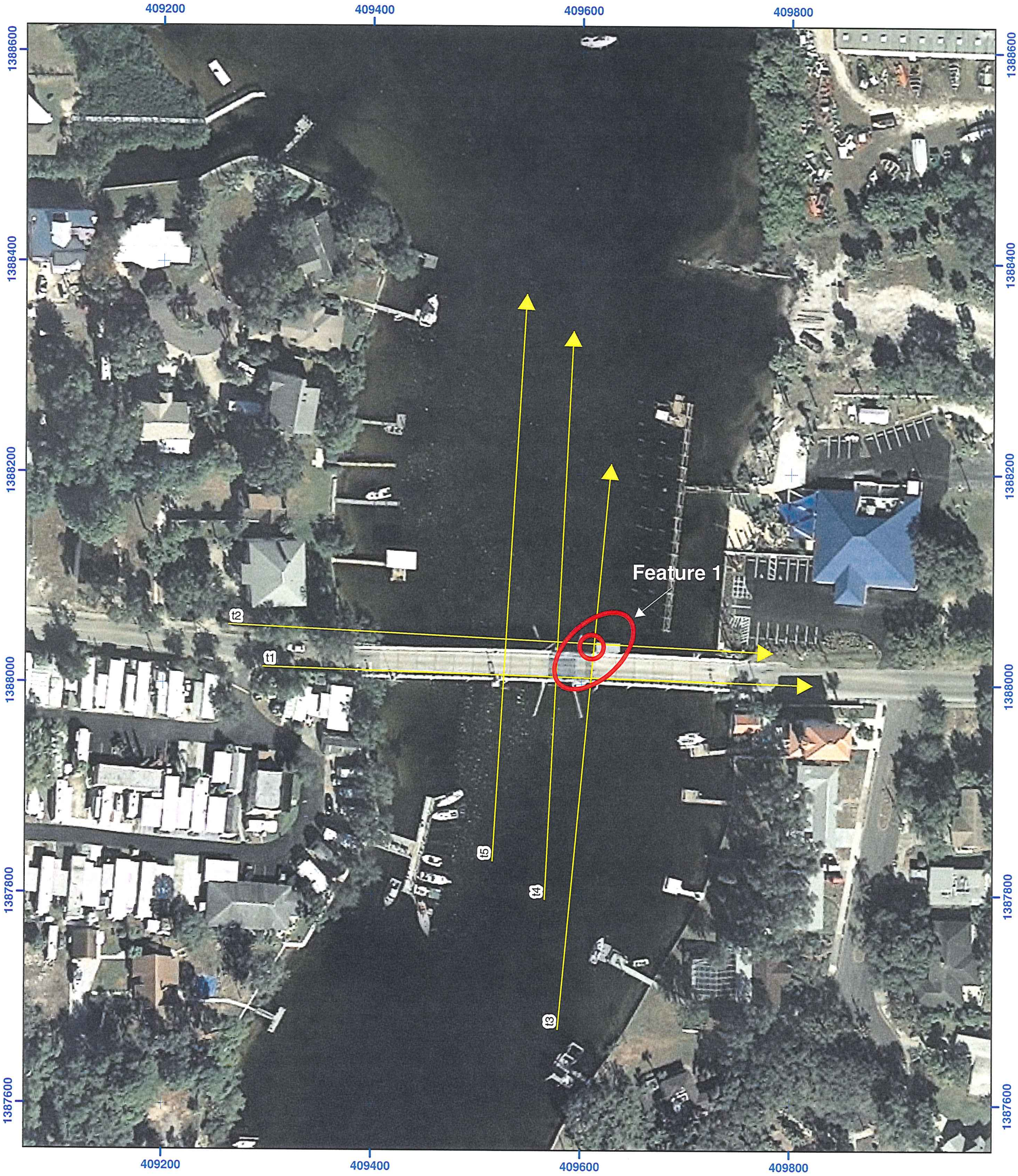
Sincerely,

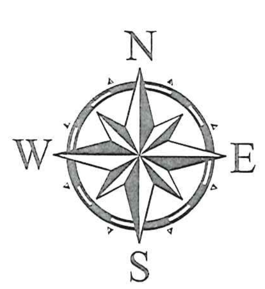
SUBSURFACE EVALUATIONS, INC.

Andrew Glasbrenner, P.G.
Licensed Professional Geologist, No. 2374 (Florida)
Senior Geologist
April 28th, 2009

Attachments: Attachment A – Limitations,
Figures 1 through 2

File: X:\2009\Williams Earth Sciences\Beckett Bridge\Beckett Bridge ERI Report.doc





Map is shown in State Plane Florida West 902 NAD 1983 Coordinate System (Feet)

Legend

ERI Transect

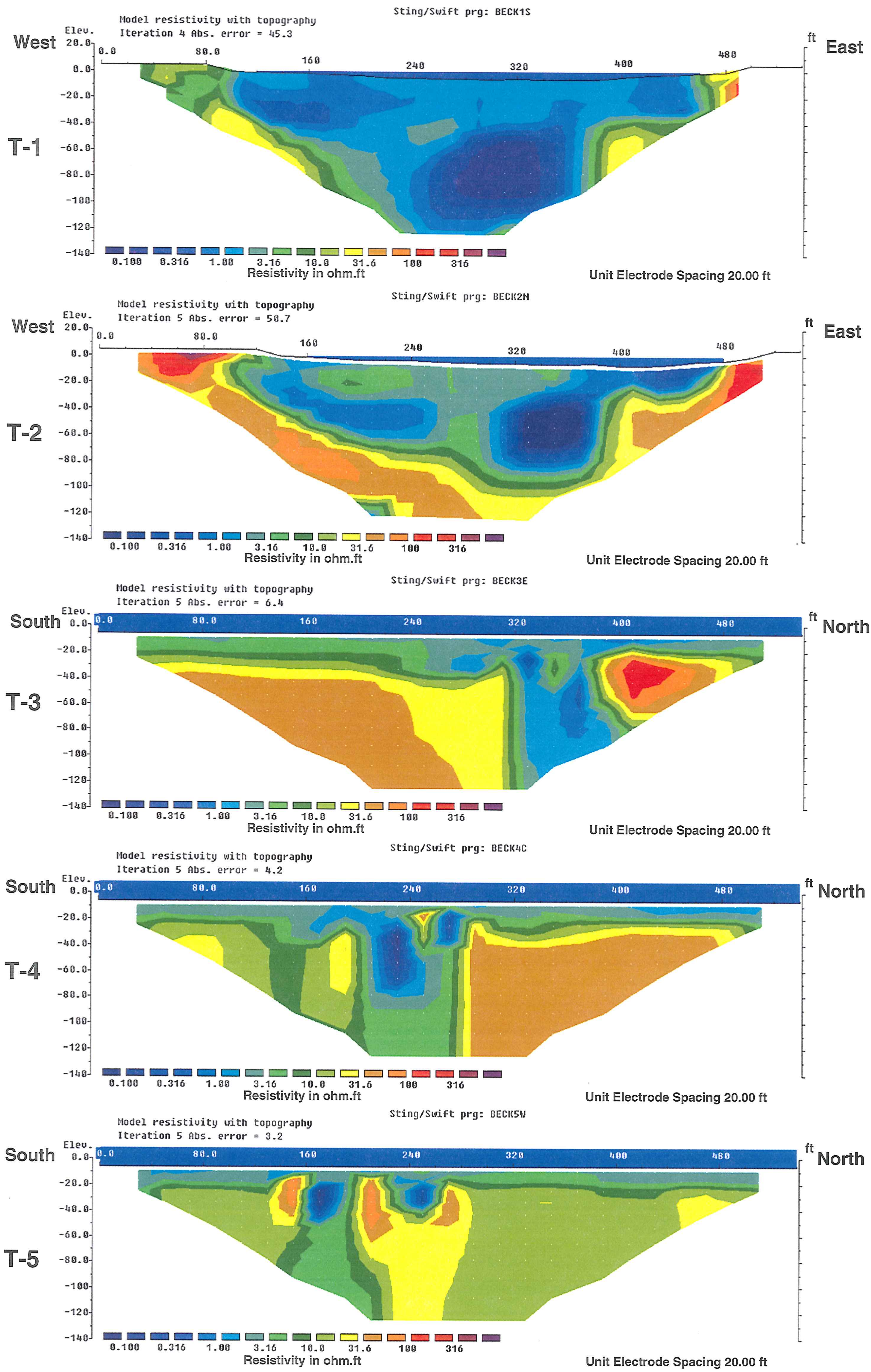
Feature

0 100 200 Feet

Figure 1: Site Location Map
Project: Beckett Bridge Riverside Drive Tarpon Springs, Florida
Client: Williams Earth Sciences, Inc.
Date: April 21-22, 2009
Created By: JRW

SUBSURFACE EVALUATIONS, INC.
Engineering Geology & Geophysics
8010 Woodland Center Blvd., Suite 100 Tampa, FL 33614
800-508-2509 (813) 353-9083 Fax: (813) 353-9653
www.SubsurfaceEvaluations.com

Fig 2: Electrical Resistivity Imaging Pseudosections T1-T5
Beckett Bridge, Tarpon Springs, Florida



7.3. TIERRA GEOTECHNICAL REPORT (2017)

TIERRA

January 28, 2019

Hardesty & Hanover, LLC
5110 Eisenhower Boulevard, Suite 310
Tampa, Florida 33634

Attn: Jim Phillips, P.E.

RE: Bridge Geotechnical Report
(For 90% Plan Submittal)
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No.: 6511-15-153

Mr. Phillips:

Tierra, Inc. (Tierra) has performed a geotechnical study for the proposed replacement bridge structure associated with Beckett Bridge (Bridge No. 154000) in Pinellas County, Florida. This report has been prepared to support the 90 percent plan submittal. This report presents the results of our study including field and laboratory testing, foundation design analyses and our geotechnical recommendations regarding the chosen foundations for the proposed replacement bridge structure.

Tierra appreciates the opportunity to be of service to Hardesty & Hanover, LLC on this project. If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Respectfully Submitted,

TIERRA, INC.

Erick M. Frederick, P.E.
Senior Geotechnical Engineer
Florida License No. 63920

Larry P. Moore, P.E.
Principal Geotechnical Engineer
Florida License No. 47673

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1.0 PROJECT INFORMATION

1.1 Project Authorization

Authorization to proceed with this project was issued by Hardesty & Hanover, LLC (H&H) in accordance with the Subconsultant Agreement.

1.2 Project Description

The project consists of the proposed replacement of the historic Beckett Bridge, which spans over the Whitcomb Bayou/Minetta Branch of the Anclote River in Pinellas County, Florida. The project limits extend along Riverside Drive from just west of Chesapeake Drive to just east of Pampas Avenue, a distance of approximately 0.3 mile. The existing two-lane bridge serves to connect areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire.

Beckett Bridge was originally constructed in 1924 as a timber structure with a steel movable span. The fixed timber approach spans were replaced with concrete approach spans in 1956. The bridge is considered historic, and is the only highway single-leaf rolling-lift bascule bridge remaining in Florida. Major repairs, including the installation of crutch bents, were performed in 1979, 1998 and in 2011. Due to its numerous issues, Beckett Bridge is considered functionally obsolete. Several of the prominent issues with the existing bridge structure include substandard lane and shoulder widths, substandard roadway safety features and a substandard load carrying capacity. In addition, lateral displacement and settlement of the bridge have occurred as the result of a potential relic sinkhole in proximity to the existing bridge structure. Following the completion of a PD&E study in 2012, a complete bridge replacement was determined as the chosen alternative for addressing the issues associated with Beckett Bridge. Tierra provided geotechnical services for the project PD&E.

This report provides geotechnical input for the 90 percent plans associated with the design of the proposed bridge replacement structure. The subsurface information obtained and engineering recommendations for the selected foundations are provided herein.

1.3 General Site Description

The existing Beckett Bridge is a multi-spanned, two-lane bascule bridge which extends approximately 20 feet across and is approximately 360 feet in length with two-foot, two-inch wide sidewalks on both sides. It is our understanding that the approach span structures are constructed on 14-inch pre-cast, pre-stressed, square, concrete (PSC) piles. There are four spans on the east approach and five spans on the west approach. The bascule is approximately 40 feet long and is supported on a concrete pier.

Whitcomb Bayou connects to the Gulf of Mexico via the Anclote River to the north. Boats docked along Whitcomb, Spring and Minetta Bayous, and along artificial canals which connect to the southeastern portion of the Whitcomb Bayou, must pass the Beckett Bridge to access the Gulf of Mexico. Land use in the vicinity of the bridge generally consists of mixed residential and commercial properties.

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of this study is to provide geotechnical (i.e. subsurface conditions and related engineering properties) input to the design team to assist with the design and construction of the proposed bridge replacement structure. The following services were provided in order to achieve the preceding objective:

1. Reviewed soil information from the Soil Survey of Pinellas County, Florida published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Reviewed topographic and potentiometric information obtained from the “Tarpon Springs, Florida” Quadrangle Map and the “Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida” Map published by the United States Geological Survey (USGS), respectively.

2. Reviewed existing geotechnical data related to Beckett Bridge.

3. Conducted a visual reconnaissance of the project site and located and coordinated utility clearances.

4. Executed a program of subsurface exploration consisting of subsurface sampling and field testing. Performed six (6) Standard Penetration Test (SPT) borings along the proposed bridge alignment.

5. Visually classified and stratified the soil samples in the laboratory using the Unified Soil Classification System (USCS) in general accordance with the American Society of Testing and Materials (ASTM) test designation D-2488.

6. Conducted laboratory testing on selected samples to confirm the visual classification, evaluated the corrosive nature of the soil and water, provided grain size values for use in scour analyses and determined the strength parameters of the natural limestone.

7. Evaluated foundation criteria and performed engineering analyses to develop design recommendations for the selected foundations associated with the proposed bridge replacement structure.

8. Provided engineering soil properties to support the design of the proposed seawalls associated with the bridge approaches.

9. Prepared this engineering report, which summarizes the course of study pursued, pertinent information from our review of previous geotechnical data, the field and laboratory data generated, the subsurface conditions encountered, and geotechnical recommendations for the design and construction of the proposed bridge replacement structure.

3.0 REVIEW OF PUBLISHED DATA

3.1 Regional Geology of Pinellas County

The Pinellas County Soil Survey published by the USDA was reviewed for information concerning the geology in the project area. In addition, the following paragraphs were paraphrased from the Florida Geological Survey, Open-File Report 80, 2001 and other geologic references:

The two major geologic formations in Pinellas County are the Hawthorn Formation of the lower Miocene and Caloosahatchee Marl of the lower Pliocene. The border between these formations extends across the peninsula north of the Cross Bayou Canal through Safety Harbor and Oldsmar. The Hawthorn Formation underlies soils north of this line.

The Hawthorn Formation consists of interbedded sand, clay, marl, limestone, lenses of fuller's earth, and land-pebble phosphate. Soils that occur on the side slopes of depressions northeast of Clearwater and in cuts made by Curlew Creek north of Dunedin contain phosphatic material from this formation.

During the Pleistocene, marine deposits that formed four terraces covered these formations. A mantle of sand that ranges from two to 35 feet in thickness covered these terraces. These terraces are described below:

The Pamlico terrace occurs at an elevation of 0 to 25 feet above mean sea level. It is mainly sand, one to 15 feet thick. In areas near Oldsmar, St. Petersburg, and Pinellas Park, the sand is only one to 4 feet thick and is underlain by Caloosahatchee Marl. Soils of the Oldsmar and Wabasso series that have acidic sand upper horizons and nonacidic, loamy subsoil formed on this terrace.

The Talbot terrace is 25 to 42 feet above mean sea level. It is fine sand not more than 16 feet thick. In a few places, the sand mantle is thin and soils have been affected by phosphatic material from underlying Hawthorn Formation. Most soils of the Talbot terrace are acidic. Soils of Astatula, Immokalee, Myakka, and Pomello series formed this terrace.

The Penholoway terrace is 42 to 70 feet above mean sea level. It is mostly fine sand as much as 28 feet thick. The Hawthorn Formation underlies it. On sides of depressions the sand mantle is thin, and materials from the Hawthorn Formation have affected the soils. Most soils on this terrace are acidic. A few nonacid soils occur in small isolated areas in depressions and along streams. Soils of the Astatula, Immokalee, Myakka, Paola, Pomello, and St. Lucie series formed this terrace.

The Wicomico terrace is 70 to 97 feet above mean sea level. It is mainly fine sand as much as 27 feet thick. The Hawthorn Formation underlies it. The soils on this terrace are dominantly acid sands of the Astatula, Immokalee, Paola, Pomello, and St. Lucie series.

A few pockets of recently deposited muck and freshwater marl occur in low areas. With few exceptions, individual soils are confined to a particular geologic formation or marine terrace. For example, Pinellas soil that formed in fresh-water alkaline deposits on upland terraces are very similar to Pinellas soil that formed in alkaline sediments of Caloosahatchee Marl. Though variations in characteristics of the parent material are apparent in the field, they do not affect soil classification.

3.2 USDA Soil Survey

Based on a review of the Soil Survey for Pinellas County published by the USDA NRCS, there are three (3) primary soil-mapping units noted at the bridge site. The general soil descriptions as provided in the Soil Survey are presented in the following paragraphs and table. The **USDA Soil Survey Map** for the bridge site is illustrated in **Appendix A**.

<u>Astatula Soils and Urban Land (Map Unit No. 4):</u>

The Astatula component makes up 50 percent of the map unit. Slopes are 0 to five percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches.

Generated brief soil descriptions are created for major soil components. The Urban land component is a miscellaneous area.

<u>Matlacha and St. Augustine Soils and Urban Land (Map Unit No. 16)</u>**:**

The Matlacha component makes up 32 percent of the map unit. Slopes are 0 to two percent. This component is on fills on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during June, July, August, September, and October.

The St. Augustine component makes up 32 percent of the map unit. Slopes are 0 to 2 percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during June, July, August, September, and October.

Generated brief soil descriptions are created for major soil components. The Urban land component is a miscellaneous area.

<u>Tavares Soils and Urban Land (Map Unit No. 29)</u>**:**

The Tavares component makes up 50 percent of the map unit. Slopes are 0 to 5 percent. This component is on knolls on marine terraces on coastal plains, ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 57 inches during June, July, August, September, October, November, and December.

Generated brief soil descriptions are created for major soil components. The Urban land component is a miscellaneous area.

SOIL SURVEY FOR PINELLAS COUNTY, FLORIDA							
USDA Map Unit and Soil Name	**Depth (in)**	**Soil Classification**		**Permeability (in/hr)**	**pH**	**Seasonal High Water Table**	
		USCS	**AASHTO**			**Depth (feet)**	**Months**
(4) Astatula-Urban land	0-3	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5	---	Jan-Dec
	3-80	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5		
	Information not provided for Urban land						
(16) Matlacha-St. Augustine-Urban land	0-42	SP, SP-SM	A-3	2.0 - 6.0	6.1-8.4	2.0-3.0	June-Oct
	42-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	0-8	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4	1.5-3.0	June-Oct
	8-33	SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	33-48	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	48-63	SM, SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	63-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	Information not provided for Urban land						
(29) Tavares-Urban Land	0-5	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5	3.5->6.0	June-Dec
	5-80	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5		
	Information not provided for Urban land						

It should be noted that information contained in the **USDA Soil Survey Map** may not be reflective of actual soil and groundwater conditions, particularly if development in the project vicinity has modified soil conditions or surface/subsurface drainage.

3.3 USGS Quadrangle Map

Based on a review of the “Tarpon Springs, Florida” USGS Quadrangle Map, it appears that the natural ground surface elevations at the ends of the bridge are on the order of approximately +0 to +10 feet, National Geodetic Vertical Datum of 1929 (NGVD 29), as illustrated on the **USGS Quadrangle Map** in **Appendix A**. The mudline elevations within the bottom of the Anclote River where the test borings were performed are estimated to range from approximately -3.0 to -6.0 feet NAVD 88.

3.4 Review of Potentiometric Surface Information

Based on a review of the “Potentiometric Surface Elevation of the Upper Floridan Aquifer, West-Central Florida” maps published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer at the bridge location is on the order of approximately +0 to +10 feet, NGVD 29. As indicated in **Section 3.3**, the project site elevations range from approximately +0 to +10 feet, NGVD 29. Mudline elevations within the bottom of the Anclote River where the test borings were performed are estimated to range from approximately -3.0 to -6.0 feet, NAVD 88. Artesian conditions were not observed at the time of our field activities; however, the Contractor should be prepared to address artesian conditions if encountered during construction at no additional cost to the County.

3.5 Review of Geophysical Survey Report

During the PD&E phase of the project and as a part of this study, Tierra reviewed Subsurface Evaluations, Inc. (SEI)'s **Electrical Resistivity Imaging Geophysical Survey Report** dated April 28, 2009, which is included in **Appendix B**. As stated above, over the years, Beckett Bridge has undergone apparent lateral displacement and settlement resulting in structural issues and numerous structural repairs dating back to 1956. The geophysical survey was completed in order to identify whether karst conditions were present at the bridge site. The results of the survey indicated several features and anomalies within the vicinity of the bridge footprint. First, there appears to be an anomaly near existing Bent 6, with the center approximated just north of the bridge, as depicted on Figure 1 of the SEI report. In addition, there appears to be a shelf at about 20 to 40 feet in depth indicating a change in soil material and/or density, as indicated on Figure 2 of the report.

4.0 SUBSURFACE EXPLORATION

4.1 Boring Location Plan

Prior to commencing our subsurface exploration, a boring location plan was developed based on preliminary design and survey information. The proposed boring location plan was provided by H&H. Tierra adopted the proposed boring location plan but had to modify several locations due to shallow water depths on the west and east ends of the bridge. The appropriate permit was obtained from Southwest Florida Water Management District (SWFWMD) for the mobilization of barge-mounted drilling equipment and geotechnical exploration within the waterway.

The borings performed by Tierra were located using hand-held Global Positioning System (GPS) equipment. Utility clearances for these borings were coordinated by Tierra and updated as required prior to performing the soil borings in order to reduce the potential for damage to the utilities during drilling. Generally, the borings were performed at the proposed boring locations. When not possible due to access or utility constraints, the boring locations were offset and the GPS coordinates of the relocated positions were recorded on the field boring logs. Following completion of the soil borings, the GPS coordinates were then converted to station and offset using project design files provided by H&H. The approximate locations of the soil borings performed by Tierra are presented on the **Boring Location Plan** in **Appendix A**.

The **Boring Location Plan** also depicts the locations of borings previously performed in the vicinity of the existing bridge structure by Williams Earth Sciences, Inc. (Williams) and Professional Service Industries, Inc. (PSI).

4.2 Soil Borings

To evaluate the subsurface conditions at the bridge structure location, Tierra performed six (6) Standard Penetration Test (SPT) borings in the Whitcomb Bayou along the limits of the bridge to depths ranging from 100 to 185 feet below the existing ground surface/mudline. The results of the SPT borings performed by Tierra are presented on the **Soil Profiles** sheets in **Appendix A**.

The SPT borings were performed with the use of a D-25 barge mounted drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with the ASTM test designation D-1586, titled “Penetration Test and Split-Barrel Sampling of Soils”. SPT resistance N-values were generally taken on intervals of 5 feet to the boring termination depth. Representative portions of the soil samples were sealed in glass jars, labeled and transferred to our laboratory for classification and analyses.

Rock coring was completed at various depths within several of the borings performed by Tierra. The cores were obtained with a 5 foot long, 2.4-inch inside diameter core barrel. The time required to advance the core was recorded. Measurements of the core recovered and general fracture locations were taken and the Percent Recovery (REC) and Rock Quality Designation (RQD) were recorded. Photographs were taken of the cores and are provided in in **Appendix E**. The samples were submitted to Tierra’s laboratory for unconfined compressive strength (q_u) and splitting tensile strength (q_t) testing.

The subsurface soil and rock stratification was determined based on a review of recovered samples, laboratory test results, and interpretation of field boring logs. Stratification lines represent approximate boundaries between soil layers of different engineering properties; however actual transitions between layers may be gradual. In some cases, small variations in properties that were not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The soil profiles represent the conditions at the particular boring location; variations do occur among the borings. Specific details about subsurface conditions and materials encountered at each test location can be obtained from the soil profiles presented on the **Soil Profiles** sheets in **Appendix A**. In addition, soil profiles depicting the results of the SPT borings performed by Williams and PSI are included in **Appendix A**.

5.0 LABORATORY TESTING

5.1 General

Representative soil samples collected from the SPT borings performed by Tierra were classified and stratified in general accordance with the Unified Soil Classification System (USCS). Our classification was based on visual observations, using the results from the laboratory testing as confirmation. Laboratory testing comprised of fines content, Atterberg Limits, natural moisture content determination and organic content determination was performed on representative soils encountered. Environmental corrosion tests were performed to evaluate the corrosive nature of the soil and water encountered at the bridge site. Limestone samples obtained from the rock cores were tested to determine strength characteristics of the natural limestone encountered at the bridge site.

5.2 Test Designation

The following list summarizes the laboratory tests performed and respective test methods.

- <u>Fines Content</u> - The fines content tests were conducted in general accordance with the AASHTO test designation T-088 (ASTM test designation D-422).

- Atterberg Limits - The liquid limit and the plastic limit tests ("Atterberg Limits") were conducted in general accordance with the AASHTO test designations T-089 and T-090, respectively (ASTM test designation D-4318).

- Natural Moisture Content - The moisture content tests were conducted in general accordance with the AASHTO test designation T-265 (ASTM test designation D-2216).

- Organic Content - The organic content test was conducted in general accordance with the AASHTO test designation T-267.

- Environmental Corrosion – The environmental corrosion tests were conducted in general accordance with the FDOT test designations FM 5-550, FM 5-551, FM 5-552, and FM 5-553.

- Splitting Tensile - The splitting tensile tests were conducted in general accordance with the ASTM test designation D-3967.

- Unconfined Compression - The unconfined compression tests were conducted in general accordance with the ASTM test designation D2938.

The laboratory test results are presented on the **Soil Profiles** sheets in **Appendix A**. In addition, summaries of the laboratory testing are presented on the **Summary of Laboratory Test Results for Soil Classification**, **Summary of Laboratory Test Results for Environmental Classification** and **Grain Size Distribution Report** (D_{50} Analysis) in **Appendix C**. A summary of the splitting tensile and unconfined compression tests performed for the rock cores is presented on the **Summary of Rock Core Laboratory Testing** in **Appendix E**.

6.0 RESULTS OF SUBSURFACE EXPLORATION

6.1 General Subsurface Conditions

The soil conditions encountered within the test borings performed by Tierra appear to be highly variable. Borings BB-1, BB-2 and BB-5 encountered sand to silty sand and clay from the mudline to depths ranging from approximately 13½ to 18½ feet below the mudline, generally underlain by hard weathered limestone to the boring termination depth. The soil conditions encountered in these borings are similar to those encountered by Williams in Borings B-1, B-2 and B-3.

Borings BB-3, BB-4 and BB-6 encountered sand to silty sand from the mudline to depths ranging from approximately 8 to 18½ feet below the mudline, underlain by stiff to hard calcareous clay and weathered limestone to depths ranging from approximately 28½ to about 80 feet. Beneath this hard layer, materials consisting of sand, silty sand and organic sand with silt to silty sand were encountered. Organic materials were encountered from depths of approximately 73½ to 98½ feet. An additional layer of organic material was encountered in Boring BB-3 at depths of approximately 128½ to 153½ feet. Karst conditions, including drilling fluid losses, Weight-of-Rod (WR) conditions above the limestone strata and/or interbedded zones of loose, apparently raveled sandy soils within the limestone substrata were also encountered within these borings. The results of these borings correlate to the results of the geophysical survey performed by SEI and are similar to the results of Borings B-1 and B-2 performed by PSI.

The **Soil Profiles** sheets in **Appendix A** provide detailed descriptions of the subsurface conditions encountered within each of the borings performed by Tierra. The soil descriptions and classifications associated with the borings performed by Tierra for the proposed bridge replacement structure are provided in the following table:

Soil Description	Unified Soil Classification Symbol
Gray to Brown to Dark Brown SAND to SAND with Silt	SP/SP-SM
Gray to Brown Silty SAND to Silty-Clayey SAND, occasionally with Weathered Limestone Fragments	SM/SM-SC
Brown Clayey SAND, occasionally with Weathered Limestone Fragments	SC
Pale Gray to Gray Calcareous CLAY with Weathered Limestone Fragments	CL/CH
Weathered Limestone	--(1)
Dark Brown Organic SAND with Silt to Organic Silty SAND	SP-SM/SM
--(1) USCS nomenclature does not include a soil classification for limestone	

The results of the borings performed by Williams and PSI are also included in **Appendix A**.

6.2 Groundwater

The depth of the water in Whitcomb Bayou/Minetta Branch was measured at each of Tierra's boring locations during our drilling activities. The depth of the water at the boring locations ranged between 3 to 6 feet deep. As Whitcomb Bayou/Minetta Branch of the Anclote River is a marine water body, the water levels at the bridge site are tidally influenced. The depth of water at each boring location is presented on the **Soil Profiles** in **Appendix A**.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, tidal conditions, as well as man-made influences (i.e. existing water management canals, swales, drainage ponds, underdrains and impervious areas). The water levels in Whitcomb Bayou/Minetta Branch of the Anclote River are tidal and can therefore influence the groundwater tables in the vicinity of the bridge end bents.

7.0 FOUNDATION DESIGN RECOMMENDATIONS

7.1 General

Foundation systems comprised of 42-inch diameter steel pipe piles and 42-inch diameter drilled shafts were analyzed for this Bridge Geotechnical Report. Based on the information provided by the design team, the structure will be supported on 42-inch diameter steel pipe pile foundations at Rest Pier 4 and Intermediate Pier 5 and 42-inch diameter drilled shafts at the Abutment 1, Intermediate Pier 2, Bascule Pier 3, Intermediate Pier 6 and Abutment 7. The pipe piles will be filled with concrete to a depth required for structural integrity of the pile as determined by H&H. The following sections present the results of the engineering analyses for the selected deep foundations.

7.2 Downdrag (Negative Skin Friction)

Negative side friction (downdrag) occurs when compressible soils move downward relative to a deep foundation (driven pile or drilled shaft) as a result of an increased overburden pressure. As the soils consolidate/compress, the adhesion between the piles and the soil creates a downward force on the pile.

Based on the evaluation of the subsurface soil conditions encountered in the borings and the anticipated minimal embankment fill, effects of downdrag loads acting at the end bents will be negligible. If applicable, the portion of the end bent shafts above grade and within embankment should be wrapped with polyethylene sheeting according to Section 459 of the FDOT Specifications in order to minimize the development of downdrag loads from the embankment fill.

7.3 Scour

Tierra performed sieve analyses on soils from depths of 0 to 2 feet below the mudline within Whitcomb Bayou/Minetta Branch of the Anclote River. The results of the grain size distribution analyses and D_{50} values for use in scour analyses are provided in **Appendix C**.

Due to the presence of very dense/hard calcareous clay and/or weathered limestone encountered in the upper substrata, preforming of pile holes will be required at all pier locations that are anticipated to be supported by pile foundations. Based on the subsurface conditions encountered and the anticipated minimum pile penetration required for lateral stability, the pre-form elevation will be below the 100-year scour elevation. As such, the net scour is taken as zero for driven pile foundations.

Permanent casing for the drilled shafts is proposed to be installed below the 100-year scour elevation. As a result, net scour for drilled shafts will be negligible.

7.4 Preforming

Based on the presence of very dense/hard calcareous clay and/or weathered limestone encountered at the locations of the anticipated pile foundations to elevations of approximately -30 to -85 feet, NAVD 88, preforming is recommended in order to obtain minimum pile penetration requirements for lateral stability and to ensure that piles are not founded above loose soil zones but instead extend to deeper, competent bearing substrata.

7.5 Axial Capacity for Driven Piles

Axial Nominal Bearing Resistance (Rn) of the driven piles for the proposed bridge replacement structure was estimated based on the subsurface conditions encountered in the borings. The Load and Resistance Factor Design (LRFD) method was utilized for the analysis. Davisson axial capacities were computed using the FDOT program FB-Deep for 42-inch diameter steel pipe piles. The Davisson axial capacity consists of the ultimate skin friction and mobilized end bearing (i.e., one-third of the ultimate end bearing). The Davisson Axial Capacities for the 42-inch diameter steel pipe piles were evaluated taking into account preforming activities. Axial pile capacity curves and FB-Deep Output files are presented in **Appendix C**.

As indicated in the FDOT Structures Design Guidelines, the required Nominal Bearing Resistance (R_n) is calculated utilizing the following equation:

$$R_n > \frac{(Factored\ Design\ Load + Downdrag + Net\ Scour)}{\phi}$$

Where ϕ = 0.75; assuming dynamic load testing will be performed on 100% of the piles.

Pile holes were preformed to elevations ranging from approximately -51 to -85 feet, NAVD 88. The preformed elevations for each of the pier locations are identified on the **Pile Data Table** in **Appendix A**. When evaluating R_n from the axial pile capacity curves, downdrag loads and scour should be utilized when applicable. Downdrag loads acting on the piles at Piers 4 and 5 are negligible and thus, downdrag is taken as zero. Due to recommended preforming depths extending below the 100-year scout elevation, net scour will be zero.

The results of the axial capacity pile analyses to estimate the test pile lengths based on the required Rn are summarized in the following table:

Abutment /Pier Location	Pile Type and Size[(1)]	Factored Design Load (tons)	Down Drag (tons)	R_n (tons)	Pile Cut-Off Elevation (ft. NAVD88)	Boring Analyzed	Estimated Pile Tip Elevation[(2)] (ft. NAVD88)	Test Pile Length (feet)
4	Pipe 42 In.	273	N/A	364	7.7	BB-3	-171	195
						BB-4	-131	
5	Pipe 42 in.	414	N/A	552	7.2	BB-4	-175	230
						BB-6	-202	

(1) Piles are open ended steel pipe piles 0.5” thick.
(2) Estimated pile tip elevations based on FB-Deep analyses, encountered subsurface conditions, and our engineering judgment.

It should be noted that based on updated design information the Nominal Bearing Resistance (Rn) for Pier 5 is not achieved within the current depth of the borings performed. Based on the updated design, span lengths were increased and as a result, pile loads increased beyond what was previously anticipated. Because pile capacities at Pier 5 are estimated to be achieved slightly below the test borings at the site, Tierra recommends that a pilot hole boring be completed as part of the construction activities in advance of pile driving. A note requiring a pilot hole boring is provided in **Appendix A** of this report.

7.6 Axial Capacity for Drilled Shafts

The Axial Nominal Bearing Resistances (R_n) for the drilled shaft foundations were determined based on the subsurface conditions encountered in the borings and the 2010 Federal Highway Administration (FHWA) alpha (α) method for clay and beta (β) method for sand (according to the 2017 FDOT Structures Design Guidelines (SDG) - Note 3 of Table 3.6.3-1). The R_n of natural limestone formation was determined based on the FDOT McVay's Method for rock socket. The design side shear resistance for rock socket was calculated in general accordance with the methodology presented in the FDOT Soils and Foundation Handbook (Appendix A), titled; "*Determination of Design Side Shear Resistance for Drilled Shafts Socketed in Florida Limestone"* and the "*Static and Dynamic Field Testing of Drilled Shafts: Suggested Guidelines on Their Use for FDOT Structures"*, prepared by the University of Florida for the FDOT by Principal Investigator: Michael C. McVay, 2003. Based on the rock core testing program and past experience in the general geographic area (West Central Florida), the ultimate side shear was multiplied by the RQD instead of the REC to determine the design side shear resistance values. This variation in the FDOT methodology is recommended when the rock cores result in relatively high REC but low RQD values where the rock quality is considered very poor (0<RQD<0.25), there is variability in the natural limestone formation (clay or sand within the limestone) and there is a limited amount of test data collected from the site. Furthermore, the use of REC would result in design values that exceed design values typically used on similar projects in West Central Florida. In addition, the upper and lower bounds were averaged to obtain a single value for the recommended design side shear resistance for refusal limestone.

Due to the difficulty in maintaining shaft cleanliness and the potential for solution cavities to be present near shaft tip elevations, end bearing was neglected from the axial analysis. As indicated in the FDOT SDG and LRFD methodology, the required R_n for drilled shafts must satisfy the following requirement:

$$R_n > \frac{(Factored\ Design\ Load + Downdrag + Net\ Scour\ Resistance)}{\phi}$$

Based on the foundation layout, a resistance factor (ϕ) of 0.6 should be utilized to evaluate the redundant drilled shafts in accordance with the FDOT SDG. Based on the anticipated foundation configuration, embankment fill heights and subsurface conditions encountered, downdrag loads acting on the shafts are anticipated to be negligible and therefore are considered zero.

Permanent casing is recommended for drilled shaft construction at all shaft locations. The axial analyses neglected the ultimate skin friction within the anticipated permanent casing zone. Recommendations regarding permanent casing are discussed in the Construction Considerations section of this report.

The **Summary of Rock Core Laboratory Testing, Data Reduction Table for Rock Cores**, **Drilled Shaft Nominal Bearing Resistance Curves,** sample **Drilled Shaft Analysis Spreadsheets** and photographs of the rock cores are presented in **Appendix E.**

The results of the axial capacity analyses to estimate drilled shaft lengths are summarized in the following table:

Abutment/ Pier Location	Drilled Shaft Diameter (in.)	Factored Design Load (tons)	Required Nominal Bearing Resistance (tons)	Top of Shaft Elevation (ft.,NAVD88)	Boring Analyzed	Estimated Shaft Tip Elevation (ft.,NAVD88)	Estimated Shaft Length (feet)
1	42	282	470	1.2	B-1 (Williams)	-40(1)	41.2
2	42	439	732	5.0	BB-2	-49	54.0
BASCULE PIER 3	42	552	920	-7.6	BB-1 BB-2	-54	46.4
6	42	418	697	5.9	BB-5	-45(1)	50.9
7	42	285	475	3.5	B-3 (Williams)	-38(1)	41.5

(1) Shaft tip elevation based on minimum tip elevation provided by H&H

7.7 Pile/Shaft Group Action

No reduction of the individual pile/shaft capacities will be required if piles/shafts are spaced center-to-center at 3 times their width or greater. Caps may contribute to the overall bearing capacity of the group, provided that the bottom of the cap is directly in contact with the soils underneath the cap. However, it is not recommended to include this additional capacity because of the potential for loss of soil at the cap.

7.8 Pile/Shaft Settlement

Settlement of pile/shaft supported bridge bents/piers should be small and tolerable for a typical single row group. However, the tolerance should be confirmed by the structural engineer. Individual pile/shaft head settlements are estimated to be on the order of ½ inch. Group settlements are estimated to be on the same order of magnitude for a single row group pattern but will increase slightly for other group configurations.

7.9 Lateral Load Capacity

Lateral load analyses for the proposed bridge foundations were performed by the design team. Tierra generated recommended soil parameters based on the borings completed at the bridge site for the team's use in the lateral load analyses. Minimum tip elevations were provided by the design team on the Pile/Shaft Data Tables. FB_Multipier parameters are provided in **Appendix D** and **Appendix E**.

7.10 Proposed Seawalls

Tierra has provided recommended soil parameters for sheet pile walls to assist the designer with the proposed seawalls at the abutment locations. The soil parameters provided are based on the borings completed by Williams. The table of parameters is presented in **Appendix F**.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 General

The overall site preparation and construction should be in accordance with Pinellas County requirements and FDOT Specifications and Standard Design Index requirements. Design notes have been included on the Pile Data Table and the Shaft Data Table in **Appendix A**.

Very dense limestone was encountered within the test borings. Excavation into and through these materials for preformed pile holes or drilled shaft installation will require non-conventional construction techniques and specialized equipment. Variability in the depth and hardness of these materials should be anticipated.

8.2 Excavations and Temporary Side Slopes

Excavations and temporary side slopes should comply with the Occupational Safety and Health Administration's (OSHA) trench safety standards, 29 C.F.R., s. 1926.650, Subpart P, all subsequent revisions or updates of OSHA's referenced standard adopted by the Department of Labor and Employment Security and Florida's Trench Safety Act, Section 553.62, Florida Statutes. Excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

8.3 Groundwater Control

Depending upon groundwater levels at the time of construction, some form of dewatering may be required. Due to groundwater levels during the wet season of the year, seepage may enter the bottom and sides of excavated areas. Such seepage will act to loosen soils and create difficult working conditions. Groundwater levels should be determined immediately prior to construction. Shallow groundwater should be kept below the lowest working area to facilitate proper material placement and compaction in accordance with Pinellas County and FDOT Specifications.

8.4 Permanent Casing for Drilled Shaft Construction

The use of permanent casing is recommended for construction of all drilled shafts proposed on the project. Oscillation or other non-vibratory installation of steel casing will be required for the abutment shafts. Vibration of the permanent steel casing adjacent to the existing structures should be prohibited.

Tierra estimates a likely bottom of casing elevation on the order of -16 feet NAVD88 at Abutment 1, -20 to -34 feet NAVD88 at Piers 2 & 3, -19 feet NAVD88 at Pier 6 and -22 feet NAVD88 at Abutment 7. This bottom of casing elevation is the highest elevation that the permanent casing should be installed unless geotechnical test data obtained from the pilot holes indicates a different elevation is appropriate. In addition, if the permanent casing is installed to an elevation that is deeper than the bottom of casing elevation shown in the plans, the shaft may need to be excavated to a revised tip elevation approved by the Engineer.

8.5 Protection of Existing Structures

The Pinellas County and FDOT Specifications should be followed for the protection of existing structures during foundation construction operations. Pre and post condition surveys are recommended to be completed for each of the structures adjacent to the bridge structure.

8.6 Dynamic Load Testing

Due to the karst conditions and variable depths to limestone encountered at the project site, it is recommended that 100% of the piles be dynamically monitored using the Pile Driving Analyzer (PDA). This monitoring will provide estimates of pile capacity versus pile penetration, stresses in the pile, and other relevant parameters used to evaluate the pile driving process. CAPWAP Analyses should be performed on selected conditions for evaluation of the PDA results. The results of the CAPWAP analyses will provide information for developing production pile length and driving criteria recommendations. The installation of the test piles should be carried out in accordance with Pinellas County and FDOT Specifications. It should be noted that since the recommended 42-inch diameter pile is larger than that of other piles typically utilized in West Central Florida, additional instrumentation will be required during PDA monitoring (8 channels of instrumentation compared to the typical 4 channels).

During pile installation, the Contractor should exercise caution as not to overstress the piles. Piles should not be driven beyond practical refusal (as defined in the FDOT Specifications) to meet the bearing requirements.

8.7 Drilled Shaft Recommendations

The installation of drilled shafts should be carried out in accordance with Pinellas County and FDOT Specifications. Drilled shaft recommendations have been developed and are provided on the Drilled Shaft Data Table in **Appendix A**.

9.0 ENVIRONMENTAL CLASSIFICATION

Environmental classification tests were performed on soil and water samples obtained from bridge site. The results of the corrosion laboratory tests performed by Tierra are presented in the **Summary of Laboratory Test Results for Environmental Classification** in **Appendix C**.

Based on the laboratory test results and the FDOT Structures Design Guidelines, the environmental classification of the proposed bridge replacement structure is as shown in the table below. The corrosion test results and the environmental classification for the proposed bridge replacement structure are also provided on the **Soil Profiles** sheets in **Appendix A**.

Description	Superstructure Environmental Classification	Concrete Substructure Environmental Classification	Steel Substructure Environmental Classification
Beckett Bridge	Extremely Aggressive	Extremely Aggressive (water chlorides = 30,000 PPM)	Extremely Aggressive (water chlorides = 30,000 PPM)

10.0 REPORT LIMITATIONS

Our services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions, or recommendations made by others based on this data.

The scope of the investigation was intended to evaluate soil conditions within the influence zone of the deep foundations. The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature or location of the proposed bridge replacement structure.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of the Hardesty & Hanover design team and Pinellas County.

APPENDIX A

USDA Soil Survey Map & USGS Quadrangle Map

Boring Location Plan

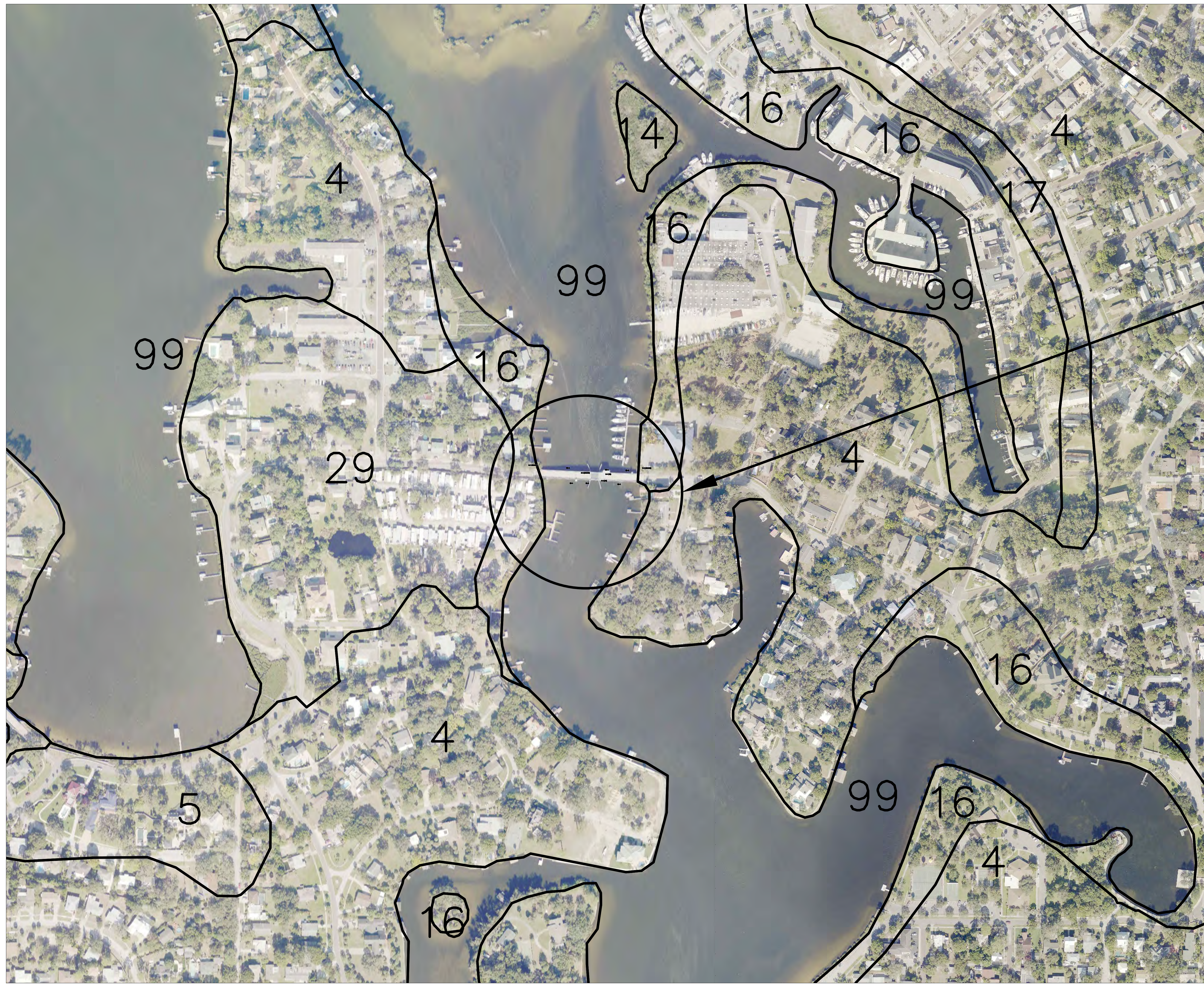
Soil Profiles Sheets (Borings Completed by Tierra)

Soil Profiles Sheets and Report of Core Borings Sheets (Borings Completed by Others)

Pile Data Table

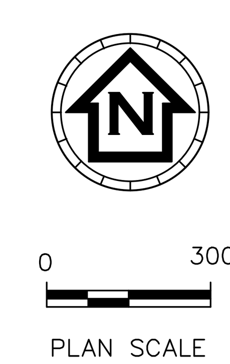
Drilled Shaft Data Table

USDA SOIL SURVEY MAP

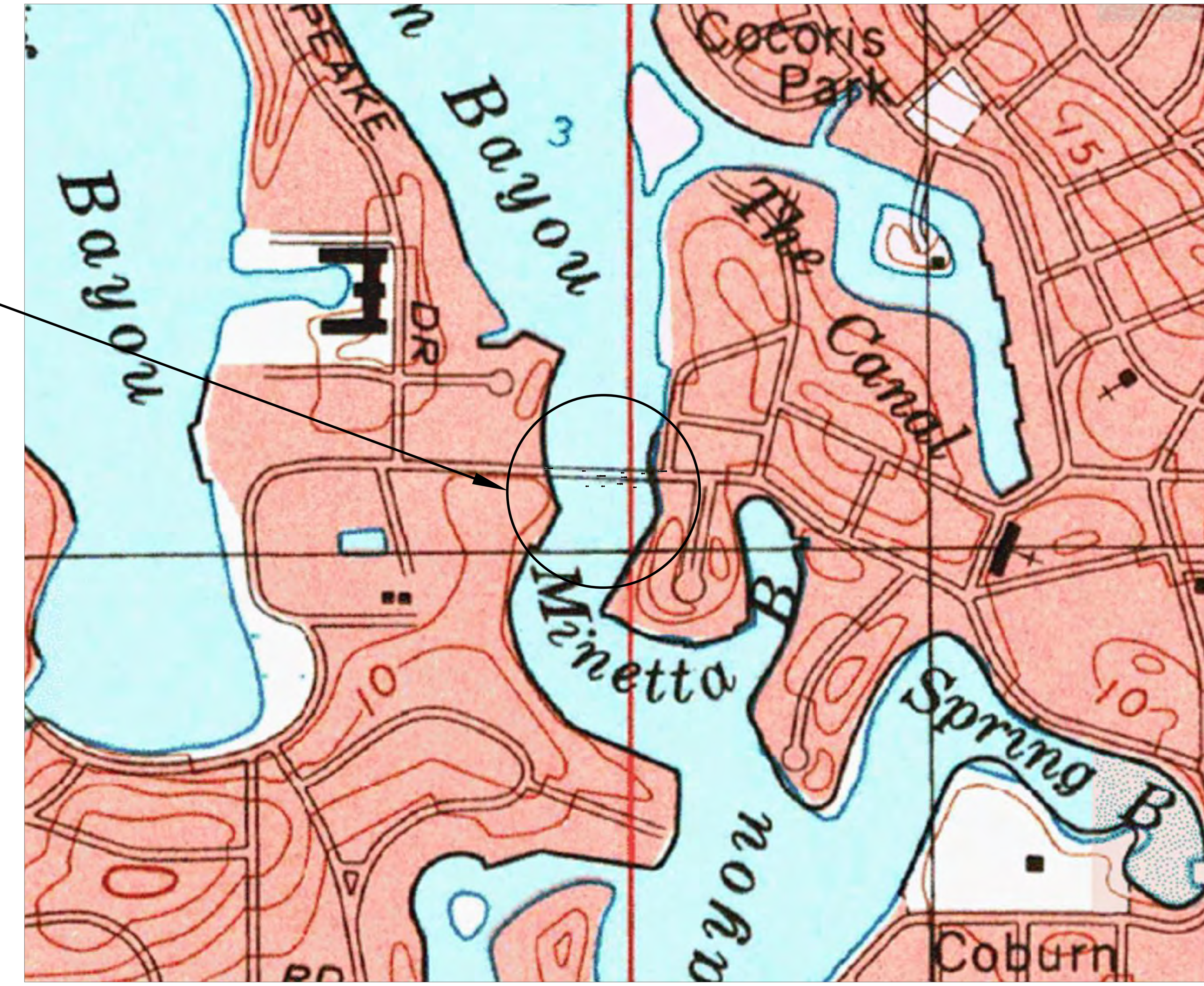


REFERENCE: USDA SOIL SURVEY OF PINELLAS COUNTY, FLORIDA

APPROXIMATE
PROJECT
LOCATION



USGS QUADRANGLE MAP



REFERENCE: "TARPON SPRINGS, FLORIDA" USGS QUADRANGLE MAP

TOWNSHIP: 27 S
RANGE: 15 E
SECTION: 11 & 12

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

PROJECT: BECKETT BRIDGE

DESCRIPTION: USDA SOIL SURVEY MAP & USGS QUADRANGLE MAP

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 1 OF 10

BORING LOCATION PLAN

0 20'
PLAN SCALE

NOTES:

1. BASE MAP PROVIDED BY HARDESTY & HANOVER, LLC
2. THE BORING LOCATIONS PERFORMED BY TIERRA WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE.

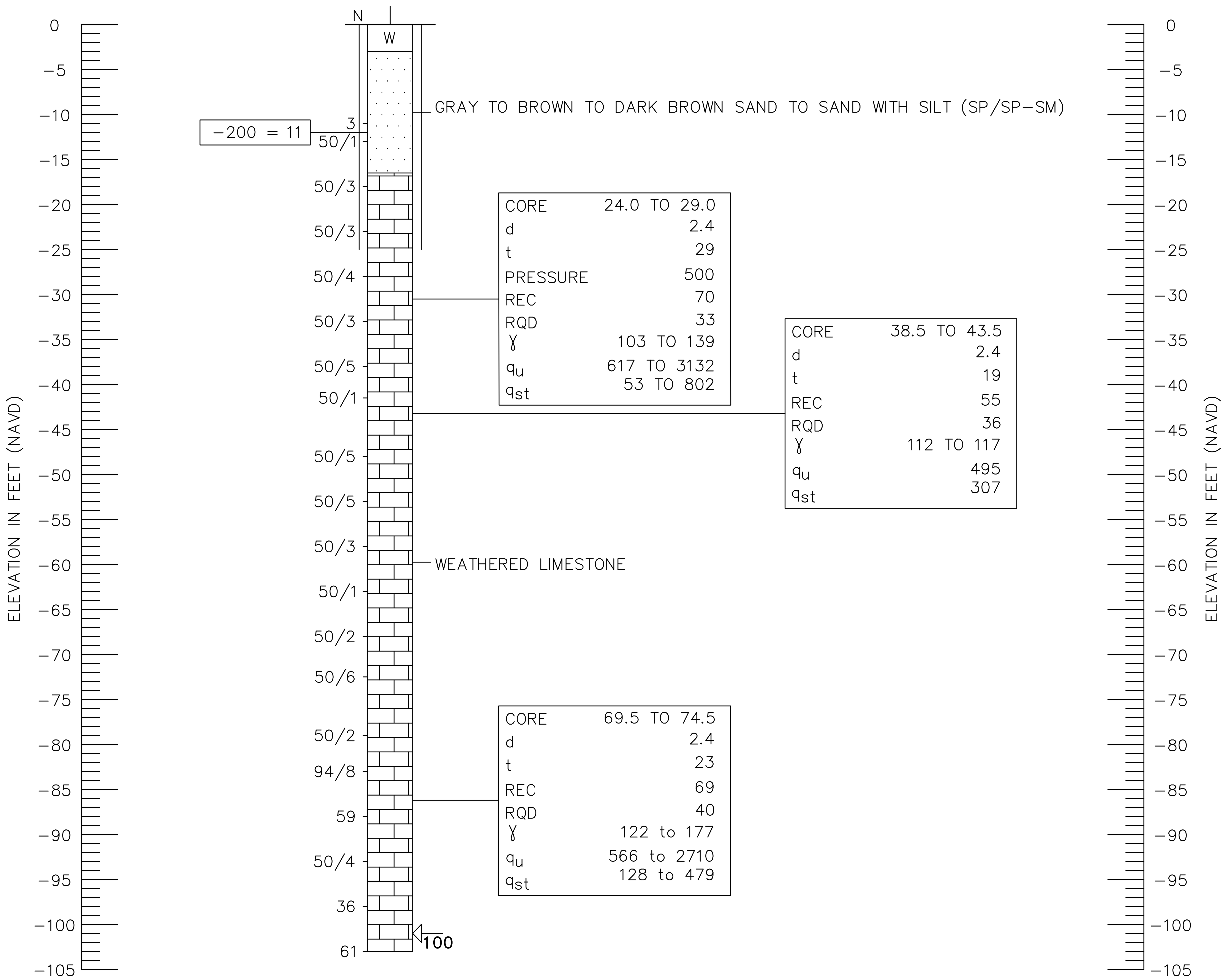
LEGEND

- APPROXIMATE LOCATION OF SPT BORING
- APPROXIMATE LOCATION OF BORING PERFORMED BY OTHERS

REV. NO.	DATE	DESCRIPTION	REV. BY	DESIGNED SW / DRAWN SW / CHECKED KW	Pinellas County PUBLIC WORKS	PROJECT: BECKETT BRIDGE	DESCRIPTION: BORING LOCATION PLAN REPORT OF CORE BORINGS	TIERRA 7351 Temple Terrace Highway, Tampa, Florida 33637, Phone: 813-989-1354 Fax: 813-989-1355, FL Cert. No.: 6486	APPROVED BY: ERICK M. FREDERICK, P.E. FLA. REG. NO 63920 DATE	DATE: MAR 2017 / PROJECT NO. 002125A / SHEET: 2 OF 10

SOIL PROFILES

BOR #	BB-1
STATION	1137+10
OFFSET	13' RT.
ELEV.	0.0
DATE	2/1/2017
DRILLER	J. ERICKSON
HAMMER	SAFETY
RIG	D-25 BARGE



RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:

RESISTIVITY	29 TO 30 OHM-CM
CHLORIDES	30,000 PPM
SULFATES	3,800 PPM
pH	8.0 TO 8.1

SOIL TEST RESULTS:

RESISTIVITY	160 TO 170 OHM-CM
CHLORIDES	7,200 TO 18,000 PPM
SULFATES	840 TO 960 PPM
pH	8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER,WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE BRIDGE LOCATION IS ON THE ORDER OF APPROXIMATELY + 0 TO +10 FEET, NGVD 29. THE CONTRACTOR SHOULD BE PREPARED TO CONTROL A POTENTIOMETRIC LEVEL UP TO +10 FEET, NGVD 29 AT NO ADDITIONAL COST TO THE COUNTY.

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

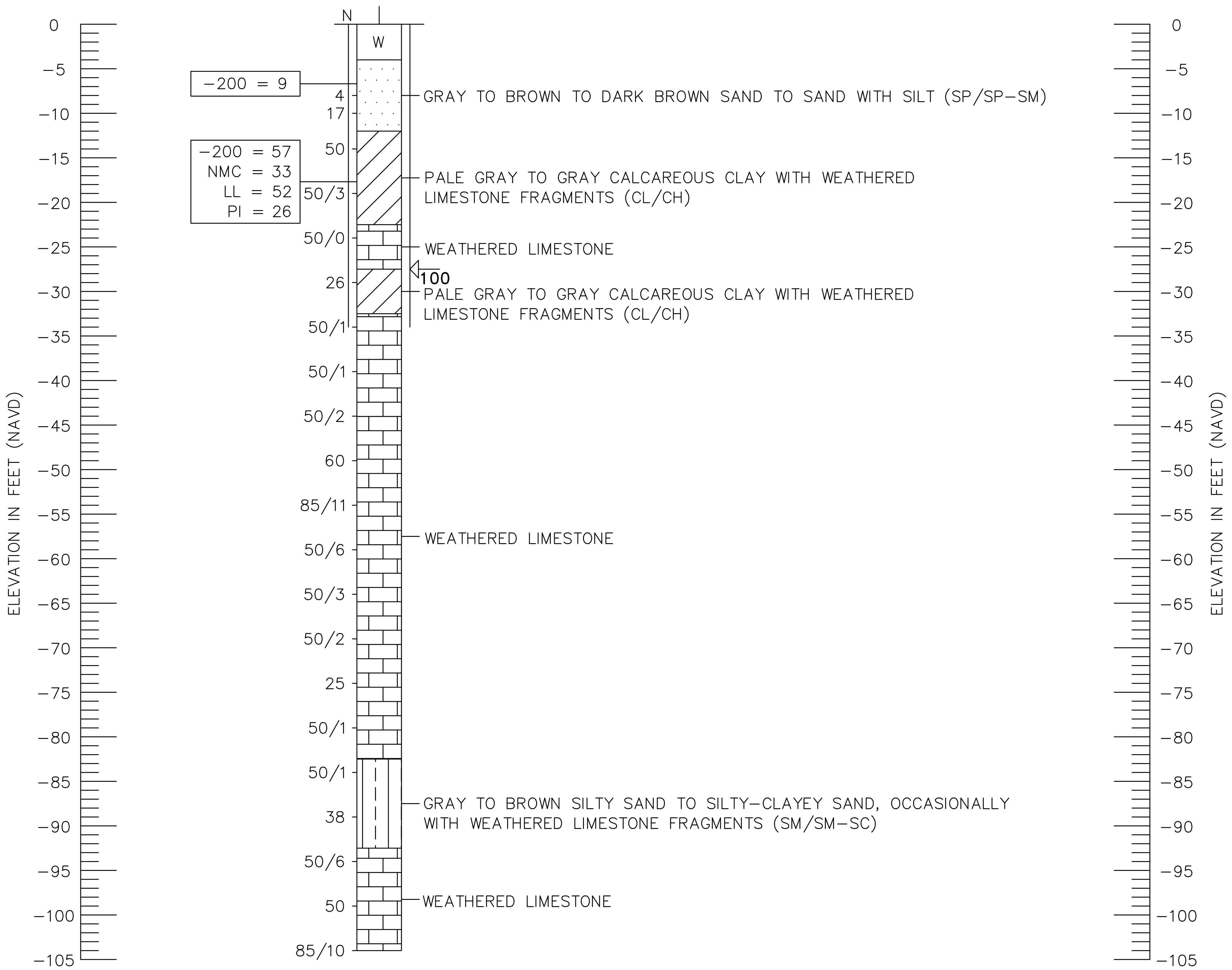
LEGEND

1	GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2	GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)
3	BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)
4	PALE GRAY TO GRAY CALCAREOUS CLAY WITH WEATHERED LIMESTONE FRAGMENTS (CL/CH)
5	WEATHERED LIMESTONE
6	DARK BROWN ORGANIC SAND WITH SILT TO ORGANIC SILTY SAND (SP-SM/SM)
	W - WATER
N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
t	ROCK CORE TIME (MINUTES)
PRESSURE	DOWN PRESSURE APPLIED DURING CORE RUN (PSI)
REC	PERCENT RECOVERY (%)
RQD	ROCK QUALITY DESIGNATION (%)
γ	TOTAL UNIT WEIGHT (PCF)
q_u	UNCONFINED COMPRESSION STRENGTH (PSI)
q_{st}	SPLITTING TENSILE STRENGTH (PSI)

REV. NO.	DATE	DESCRIPTION	REV. BY		PROJECT:	DESCRIPTION:		APPROVED BY:	
				DESIGNED SW	BECKETT BRIDGE	REPORT OF CORE BORINGS	TIERRA 7351 Temple Terrace Highway Tampa, Florida 33637 Phone: 813-989-1354 Fax: 813-989-1355 FL Cert. No.: 6486	ERICK M. FREDERICK, P.E. FLA. REG. NO 63920	DATE: MAR 2017
				DRAWN SW				DATE	PROJECT NO. 002125A
				CHECKED KW	Pinellas County PUBLIC WORKS				SHEET: 3 OF 10

SOIL PROFILES

BOR # BB-2
STATION 1136+98
OFFSET 22' LT.
ELEV. 0.0
DATE 1/10/2017
DRILLER J. ERICKSON
HAMMER SAFETY
RIG D-25 BARGE



RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:

RESISTIVITY	29 TO 30 OHM-CM
CHLORIDES	30,000 PPM
SULFATES	3,800 PPM
pH	8.0 TO 8.1

SOIL TEST RESULTS:

RESISTIVITY	160 TO 170 OHM-CM
CHLORIDES	7,200 TO 18,000 PPM
SULFATES	840 TO 960 PPM
pH	8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER,WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE BRIDGE LOCATION IS ON THE ORDER OF APPROXIMATELY + 0 TO +10 FEET, NGVD 29. THE CONTRACTOR SHOULD BE PREPARED TO CONTROL A POTENTIOMETRIC LEVEL UP TO +10 FEET, NGVD 29 AT NO ADDITIONAL COST TO THE COUNTY.

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

LEGEND

1 GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)

2 GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)

3 BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)

4 PALE GRAY TO GRAY CALCAREOUS CLAY WITH WEATHERED LIMESTONE FRAGMENTS (CL/CH)

5 WEATHERED LIMESTONE

6 DARK BROWN ORGANIC SAND WITH SILT TO ORGANIC SILTY SAND (SP-SM/SM)

W - WATER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
t	ROCK CORE TIME (MINUTES)
PRESSURE	DOWN PRESSURE APPLIED DURING CORE RUN (PSI)
REC	PERCENT RECOVERY (%)
RQD	ROCK QUALITY DESIGNATION (%)
γ	TOTAL UNIT WEIGHT (PCF)
q_u	UNCONFINED COMPRESSION STRENGTH (PSI)
q_{st}	SPLITTING TENSILE STRENGTH (PSI)

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

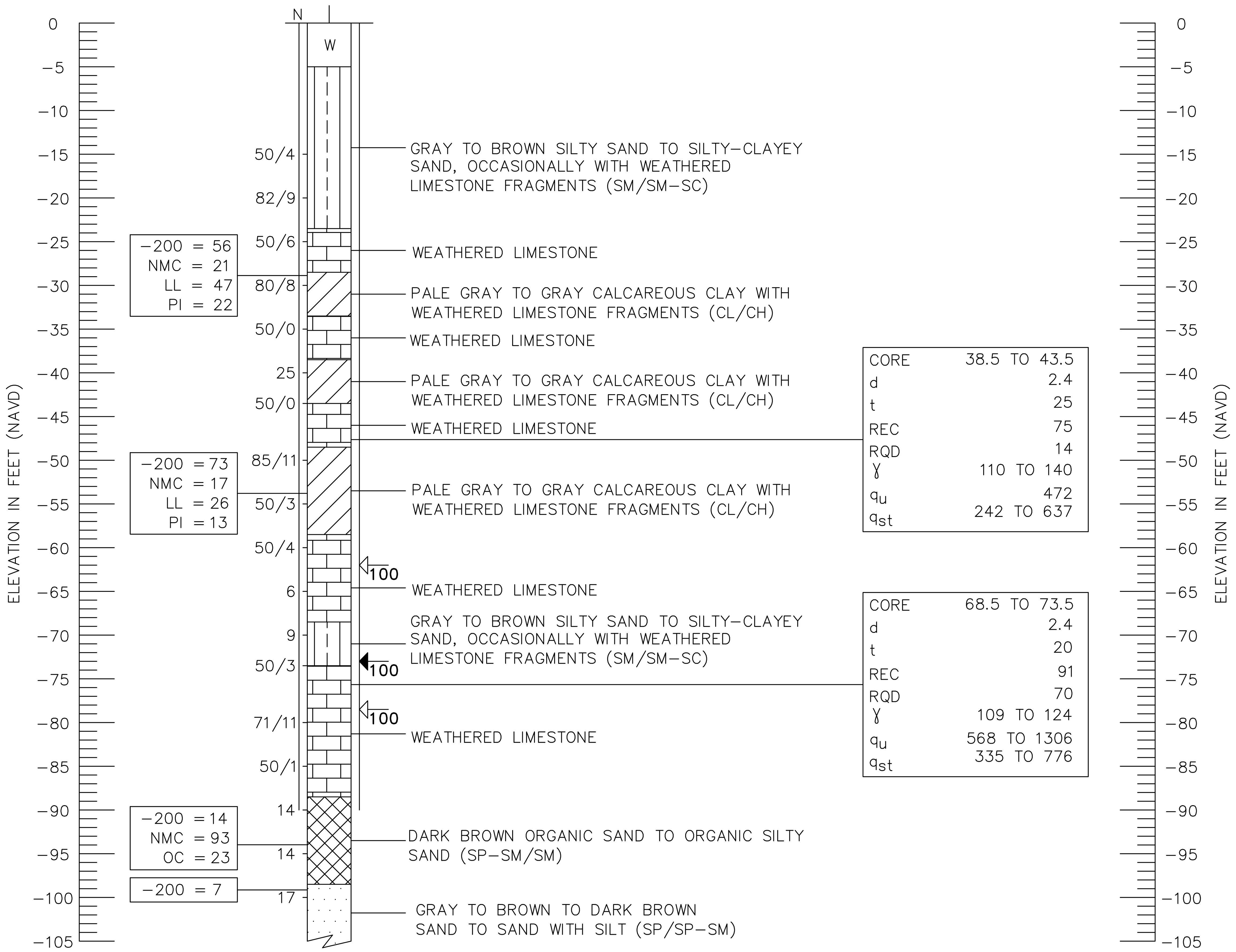
TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

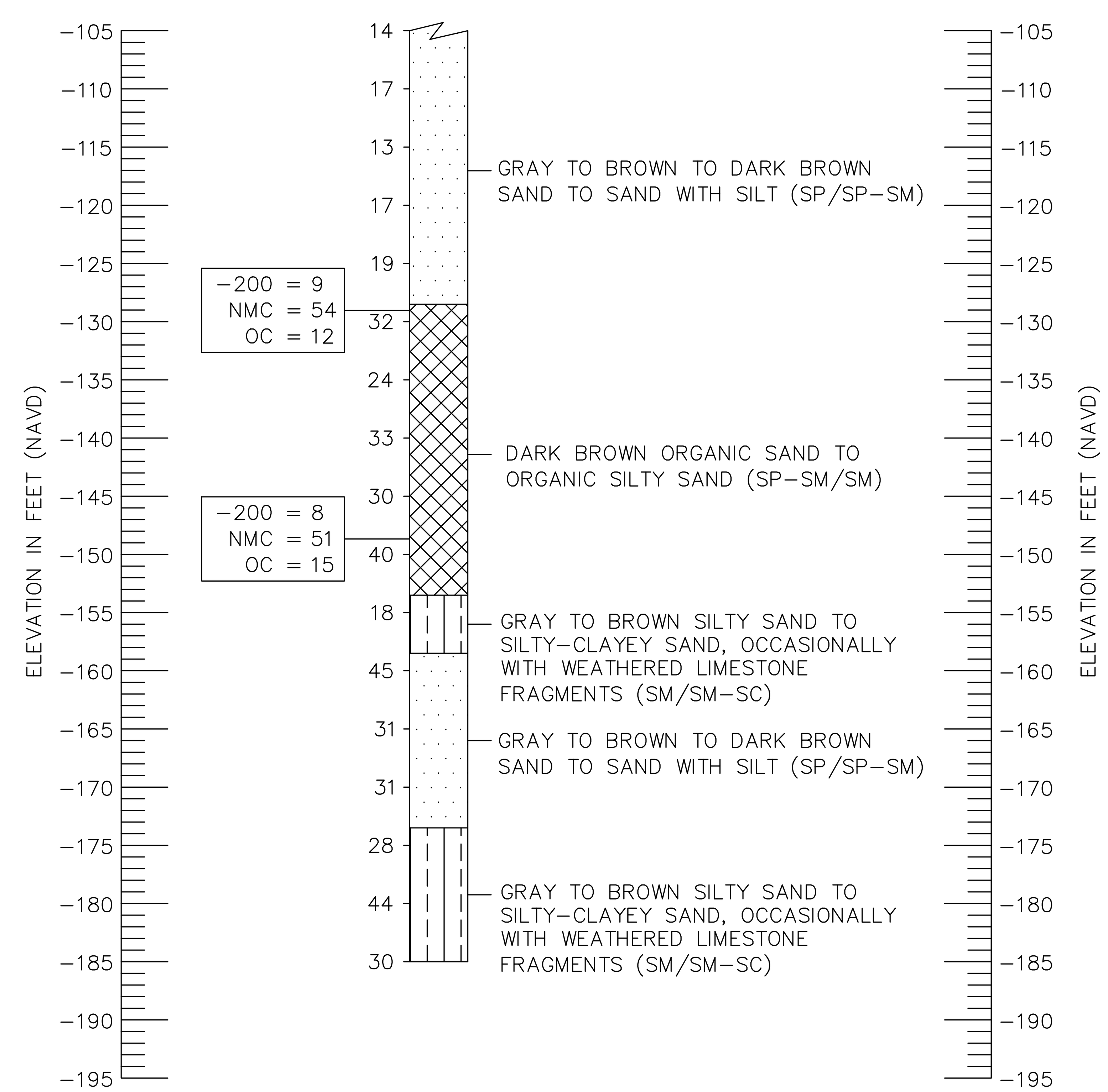
DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 4 OF 10

SOIL PROFILES

BOR # BB-3
STATION 1137+56
OFFSET 15' RT.
ELEV. 0.0
DATE 2/6/2017
DRILLER J. ERICKSON
HAMMER SAFETY
RIG D-25 BARGE



BB-3
CONTINUED



RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:
RESISTIVITY 29 TO 30 OHM-CM
CHLORIDES 30,000 PPM
SULFATES 3,800 PPM
pH 8.0 TO 8.1

SOIL TEST RESULTS:
RESISTIVITY 160 TO 170 OHM-CM
CHLORIDES 7,200 TO 18,000 PPM
SULFATES 840 TO 960 PPM
pH 8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER,WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE BRIDGE LOCATION IS ON THE ORDER OF APPROXIMATELY + 0 TO +10 FEET, NGVD 29. THE CONTRACTOR SHOULD BE PREPARED TO CONTROL A POTENTIOMETRIC LEVEL UP TO +10 FEET, NGVD 29 AT NO ADDITIONAL COST TO THE COUNTY.

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

LEGEND

1 GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2 GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)
3 BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)
4 PALE GRAY TO GRAY CALCAREOUS CLAY WITH WEATHERED LIMESTONE FRAGMENTS (CL/CH)
5 WEATHERED LIMESTONE
6 DARK BROWN ORGANIC SAND WITH SILT TO ORGANIC SILTY SAND (SP-SM/SM)

W - WATER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
t	ROCK CORE TIME (MINUTES)
PRESSURE	DOWN PRESSURE APPLIED DURING CORE RUN (PSI)
REC	PERCENT RECOVERY (%)
RQD	ROCK QUALITY DESIGNATION (%)
γ	TOTAL UNIT WEIGHT (PCF)
q_u	UNCONFINED COMPRESSION STRENGTH (PSI)
q_{st}	SPLITTING TENSILE STRENGTH (PSI)

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

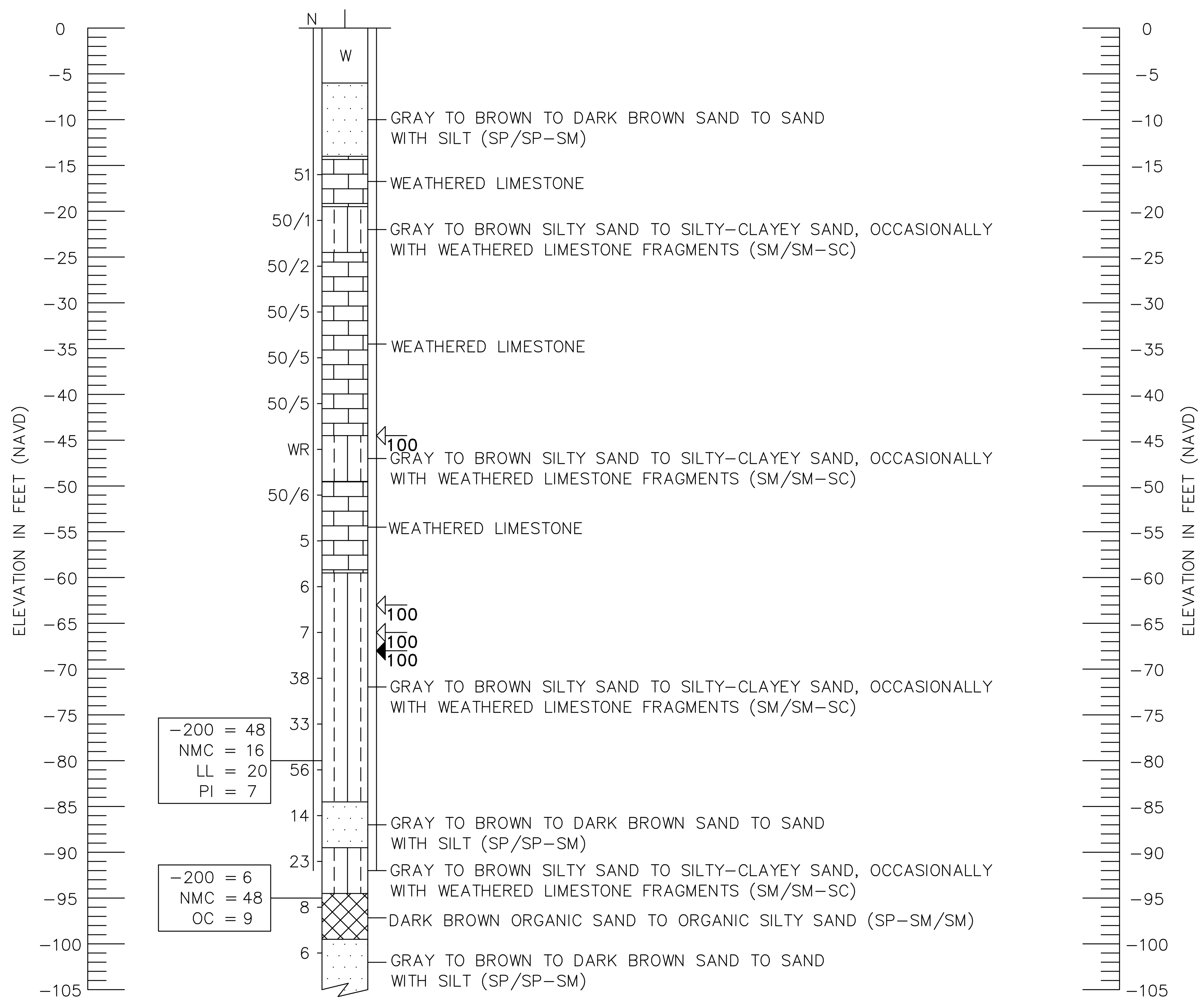
TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

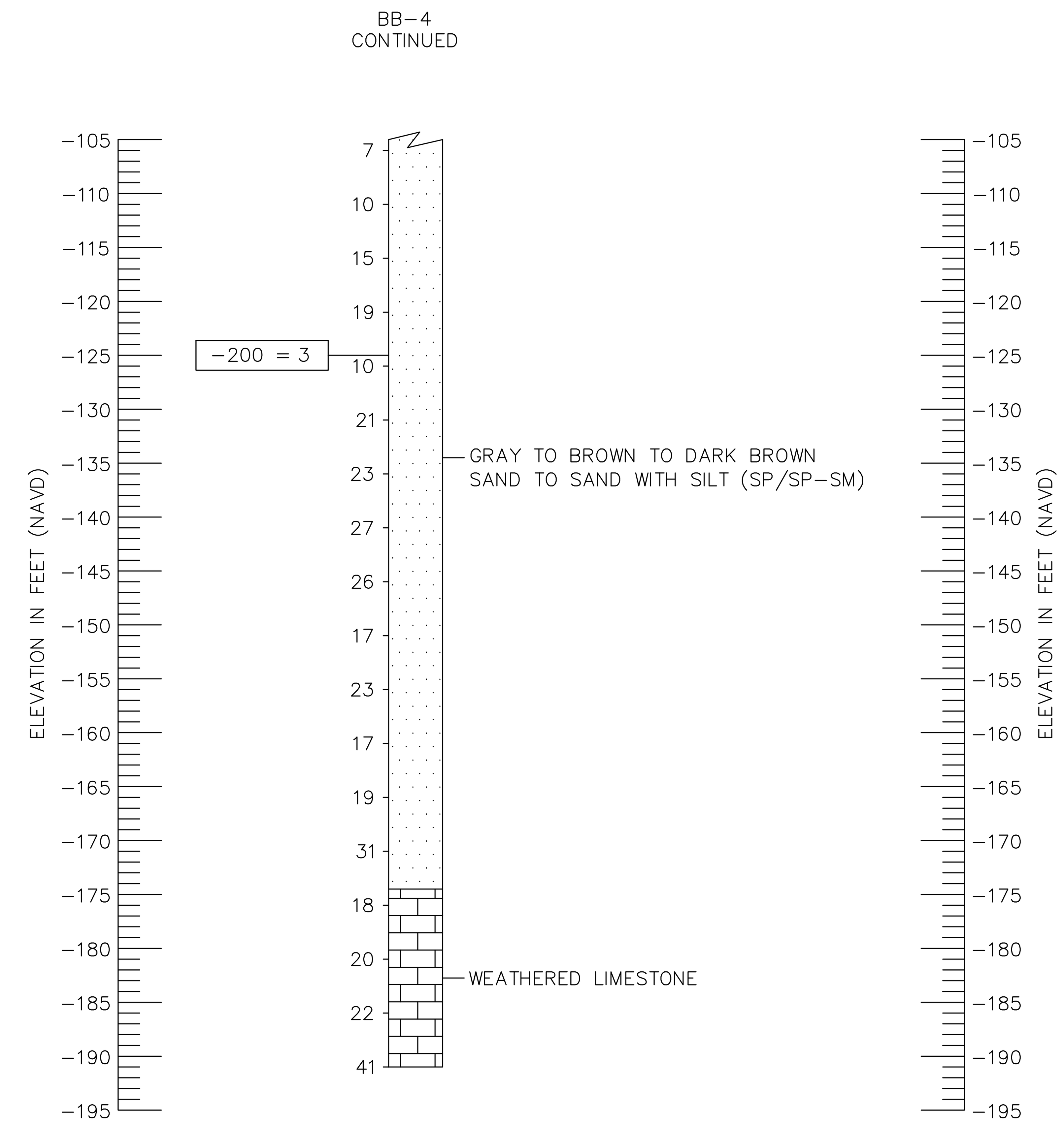
APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 5 OF 10

SOIL PROFILES

BOR #	BB-4
STATION	1138+20
OFFSET	28' LT.
ELEV.	0.0
DATE	1/12/2017
DRILLER	J. ERICKSON
HAMMER	SAFETY
RIG	D-25 BARGE





RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:

RESISTIVITY	29 TO 30 OHM-CM
CHLORIDES	30,000 PPM
SULFATES	3,800 PPM
pH	8.0 TO 8.1

SOIL TEST RESULTS:

RESISTIVITY	160 TO 170 OHM-CM
CHLORIDES	7,200 TO 18,000 PPM
SULFATES	840 TO 960 PPM
pH	8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER,WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE BRIDGE LOCATION IS ON THE ORDER OF APPROXIMATELY + 0 TO +10 FEET, NGVD 29. THE CONTRACTOR SHOULD BE PREPARED TO CONTROL A POTENTIOMETRIC LEVEL UP TO +10 FEET, NGVD 29 AT NO ADDITIONAL COST TO THE COUNTY.

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

LEGEND

1	GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2	GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)
3	BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)
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5	WEATHERED LIMESTONE
6	DARK BROWN ORGANIC SAND WITH SILT TO ORGANIC SILTY SAND (SP-SM/SM)

W - WATER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
t	ROCK CORE TIME (MINUTES)
PRESSURE	DOWN PRESSURE APPLIED DURING CORE RUN (PSI)
REC	PERCENT RECOVERY (%)
RQD	ROCK QUALITY DESIGNATION (%)
γ	TOTAL UNIT WEIGHT (PCF)
q_u	UNCONFINED COMPRESSION STRENGTH (PSI)
q_{st}	SPLITTING TENSILE STRENGTH (PSI)

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

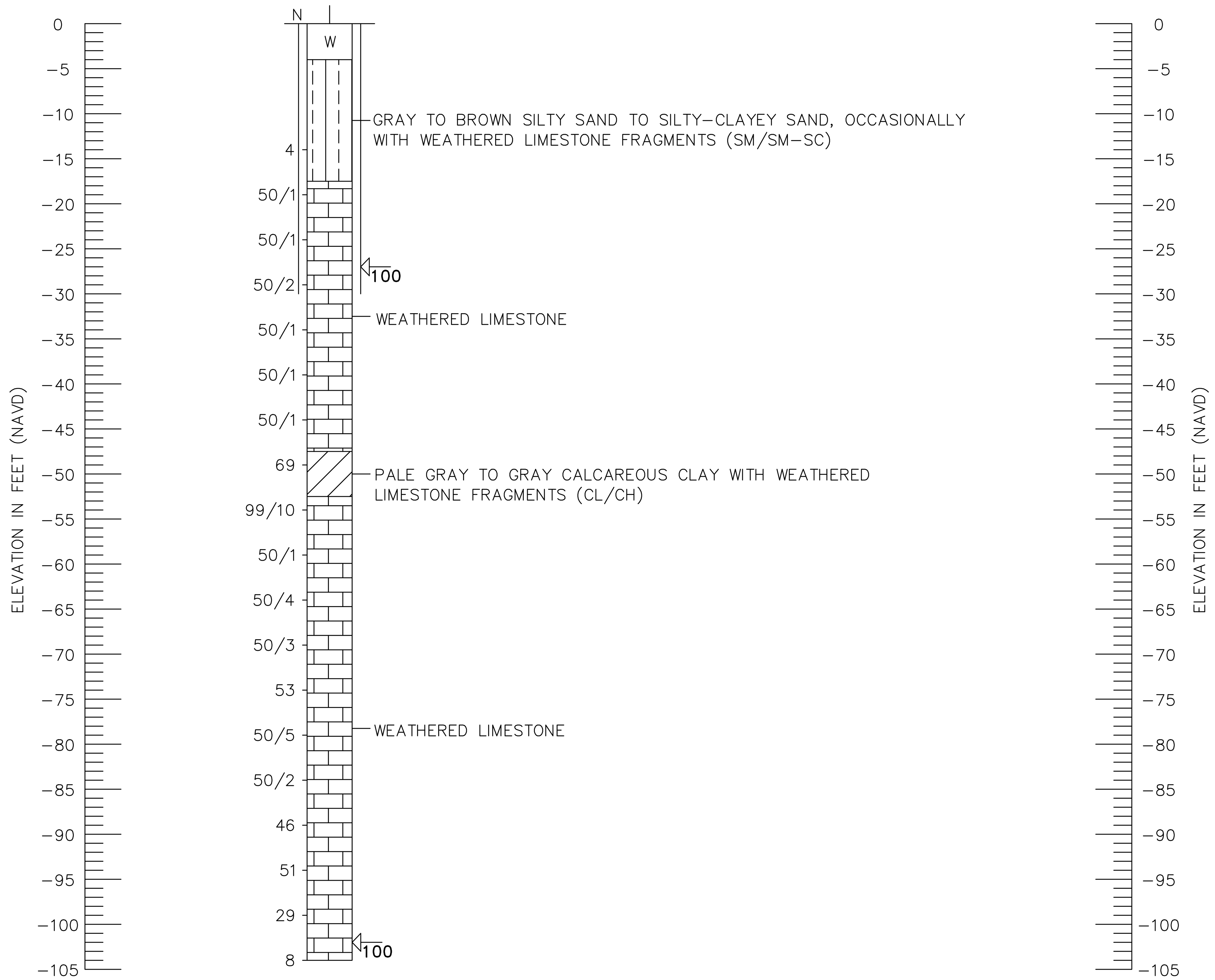
TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A

SOIL PROFILES

BOR # BB-5
STATION 1138+93
OFFSET 19' LT.
ELEV. 0.0
DATE 1/25/2017
DRILLER J. ERICKSON
HAMMER SAFETY
RIG D-25 BARGE



RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:
RESISTIVITY 29 TO 30 OHM-CM
CHLORIDES 30,000 PPM
SULFATES 3,800 PPM
pH 8.0 TO 8.1

SOIL TEST RESULTS:
RESISTIVITY 160 TO 170 OHM-CM
CHLORIDES 7,200 TO 18,000 PPM
SULFATES 840 TO 960 PPM
pH 8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER,WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE BRIDGE LOCATION IS ON THE ORDER OF APPROXIMATELY + 0 TO +10 FEET, NGVD 29. THE CONTRACTOR SHOULD BE PREPARED TO CONTROL A POTENTIOMETRIC LEVEL UP TO +10 FEET, NGVD 29 AT NO ADDITIONAL COST TO THE COUNTY.

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

LEGEND

1 GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2 GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)
3 BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)
4 PALE GRAY TO GRAY CALCAREOUS CLAY WITH WEATHERED LIMESTONE FRAGMENTS (CL/CH)
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6 DARK BROWN ORGANIC SAND WITH SILT TO ORGANIC SILTY SAND (SP-SM/SM)

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NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
||	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
t	ROCK CORE TIME (MINUTES)
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REC	PERCENT RECOVERY (%)
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q_{st}	SPLITTING TENSILE STRENGTH (PSI)

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

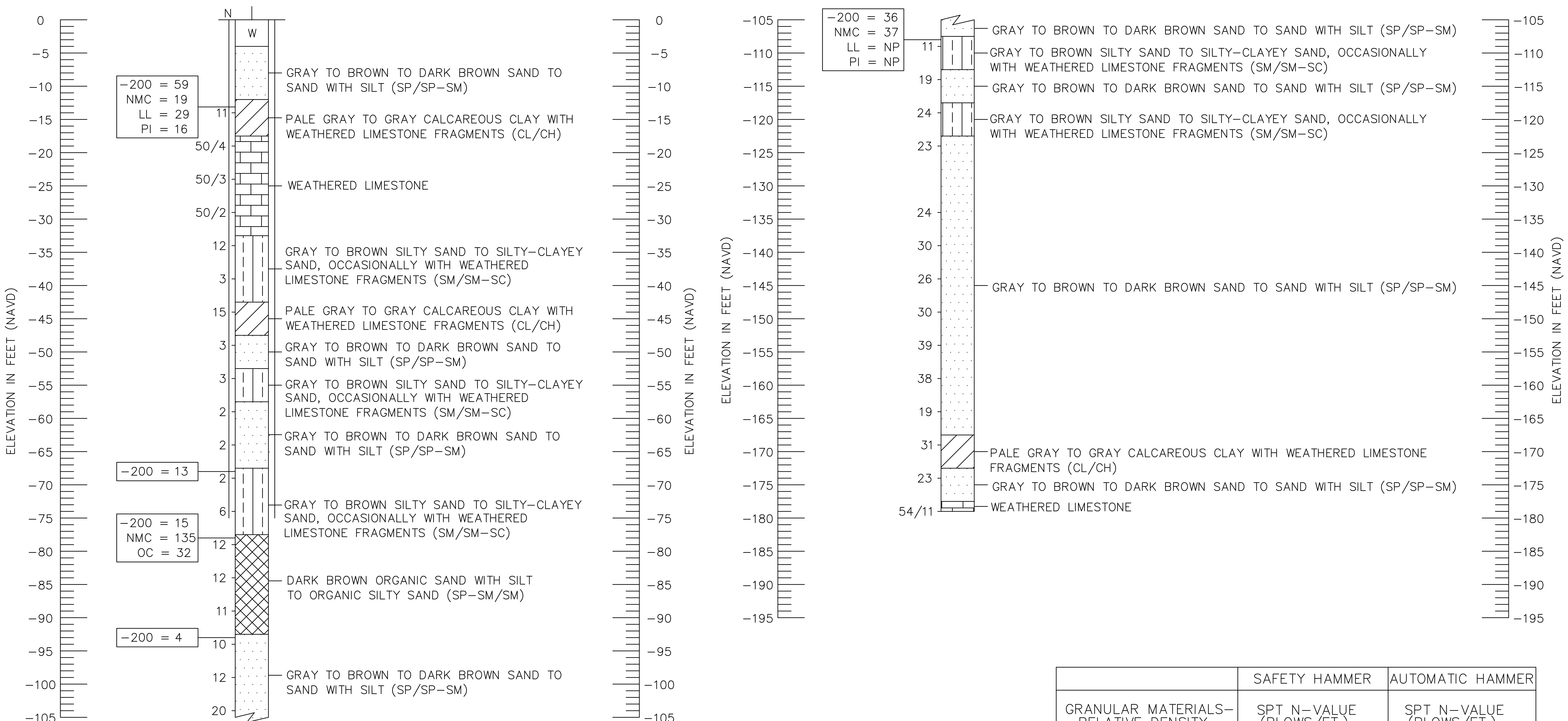
APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 7 OF 10

SOIL PROFILES

BOR # BB-6
STATION 1138+64
OFFSET 17' RT.
ELEV. 0.0
DATE 2/14/2017
DRILLER J. ERICKSON
HAMMER SAFETY
RIG D-25 BARGE

BB-6
CONTINUED



LEGEND

1 GRAY TO BROWN TO DARK BROWN SAND TO SAND WITH SILT (SP/SP-SM)

2 GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SM/SM-SC)

3 BROWN CLAYEY SAND, OCCASIONALLY WITH WEATHERED LIMESTONE FRAGMENTS (SC)

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50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WR	FELL UNDER WEIGHT OF ROD
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NP	NON PLASTIC
CORE	CORE DEPTH IS REFERENCED TO FEET BELOW THE GROUND SURFACE (MUDLIINE) AT THE TIME OF BORING COMPLETION
d	CORE BARRELL DIAMETER (INCHES)
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SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

RECOMMENDED ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUBSTRUCTURE STEEL: EXTREMELY AGGRESSIVE
(WATER CHLORIDES = 30,000 PPM)
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

WATER TEST RESULTS:

RESISTIVITY	29 TO 30 OHM-CM
CHLORIDES	30,000 PPM
SULFATES	3,800 PPM
pH	8.0 TO 8.1

SOIL TEST RESULTS:

RESISTIVITY	160 TO 170 OHM-CM
CHLORIDES	7,200 TO 18,000 PPM
SULFATES	840 TO 960 PPM
pH	8.7 TO 8.8

NOTES:

1. THE BORING LOCATIONS WERE ESTIMATED USING GPS COORDINATES OBTAINED BY TIERRA IN THE FIELD AND LATER CONVERTED TO STATION AND OFFSET USING DESIGN FILES PROVIDED BY HARDESTY & HANOVER. THE BORING LOCATIONS SHOULD THEREFORE BE CONSIDERED APPROXIMATE.

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REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

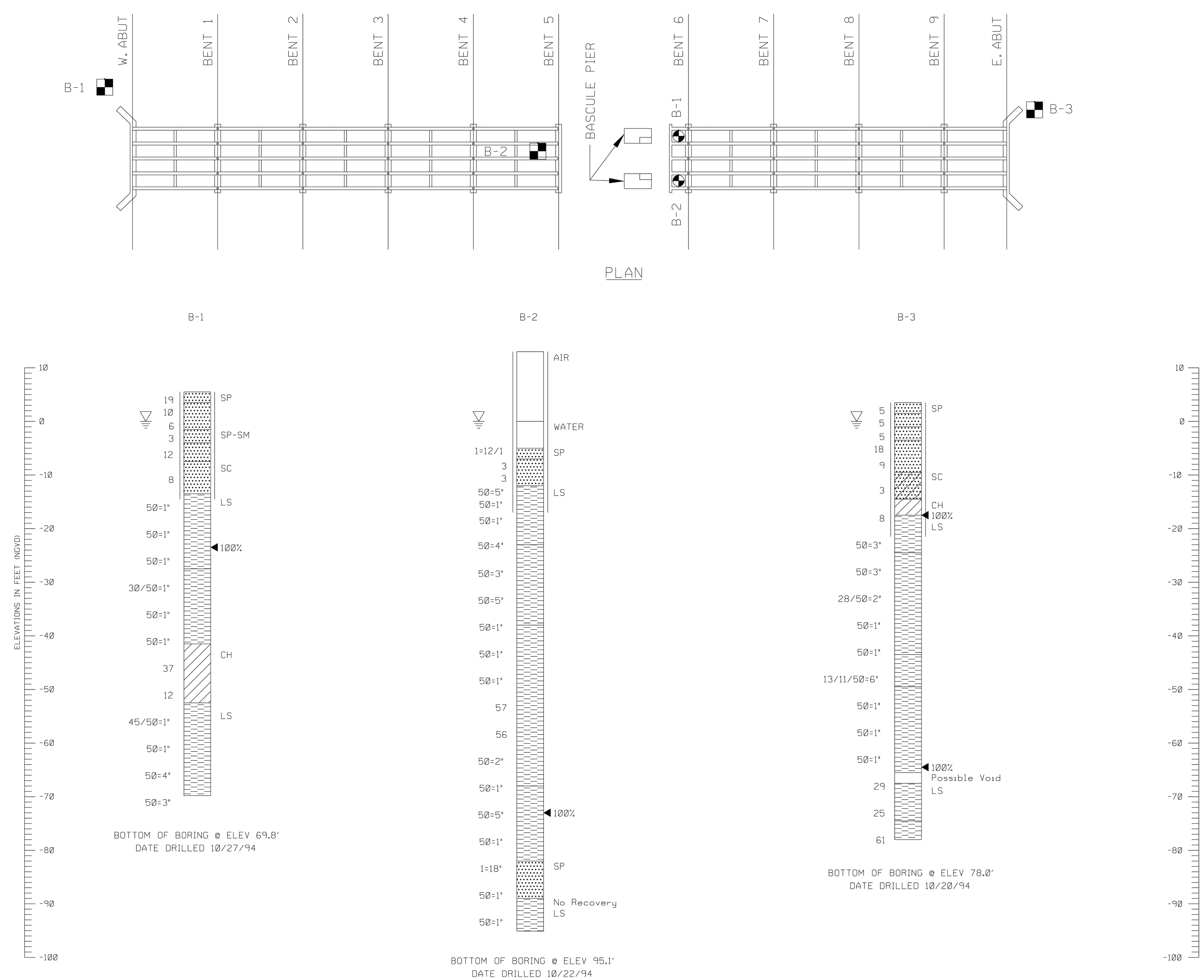
PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 8 OF 10



FED. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
	FLA			

LEGEND

= SP, SP-SM and SP-SC, Sands and slightly clayey sands

= CH, Inorganic clays of low plasticity

= SC, Clayey sands and very sandy clays

= LS, Limestone

GENERAL NOTES

DRILL AND PENETRATION TESTING WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. NUMBER TO LEFT OF BORING INDICATES BLOWS OF 1 3/8" I.D., 2" O.D. SPLIT-SPOON FOR 12" OF PENETRATION (UNLESS OTHERWISE NOTED) WITH A 140 LB. HAMMER DROPPED 30 INCHES.

THE BORING LOGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITION, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING.

ELEVATIONS SHOWN ARE APPROXIMATED BY WATER LEVEL AND WATER TABLE MEASURED AT TIME AND DATE BORINGS WERE COMPLETED.

REFER TO FINAL REPORT FOR ADDITIONAL BORING INFORMATION.

CREW CHIEF: SPOON
DRILLER: PATTERSON
DRILL RIG TYPE: FAILING 250

LEGEND

= Water Table @ end of drilling

= Casing used

= Shelby Tube

100% = Percent Loss of Circulation

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)
SUBSTRUCTURE: CORROSIVE (EXTREMELY AGGRESSIVE)

Granular Materials- Relative Density	SPT (Blows/Ft)
Very Loose	Less than 4
Loose	4 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Silts and Clays- Consistency	SPT (Blows/Ft)
Very Soft	Less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

C394348 BRDG1

Names		Dates
Drawn by	TEJ	11/9/94
Checked by	LDS	11/9/94
Designed by	LDS	11/9/94
Checked by	KDB	11/9/94
Approved by	K. D. BENNETT	

ENGINEER OF RECORD:
WILLIAMS EARTH SCIENCES, INC.
10600 ENDEAVOUR WAY
LARGO, FLORIDA 34647

FLORIDA DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN OFFICE

ROAD NO.	COUNTY	PROJECT NO.
SR936	PINELLAS	

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: BECKETT BRIDGE REPLACEMENT

NOTE:
BORING AND LABORATORY TESTING DATA PROVIDED ON THIS SHEET WAS PERFORMED BY WILLIAMS EARTH SCIENCES, INC. TIERRA, INC. HAS UTILIZED THE DATA IN OUR DESIGN IN ACCORDANCE WITH FLORIDA ADMINISTRATIVE CODE CHAPTER 61G15.

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

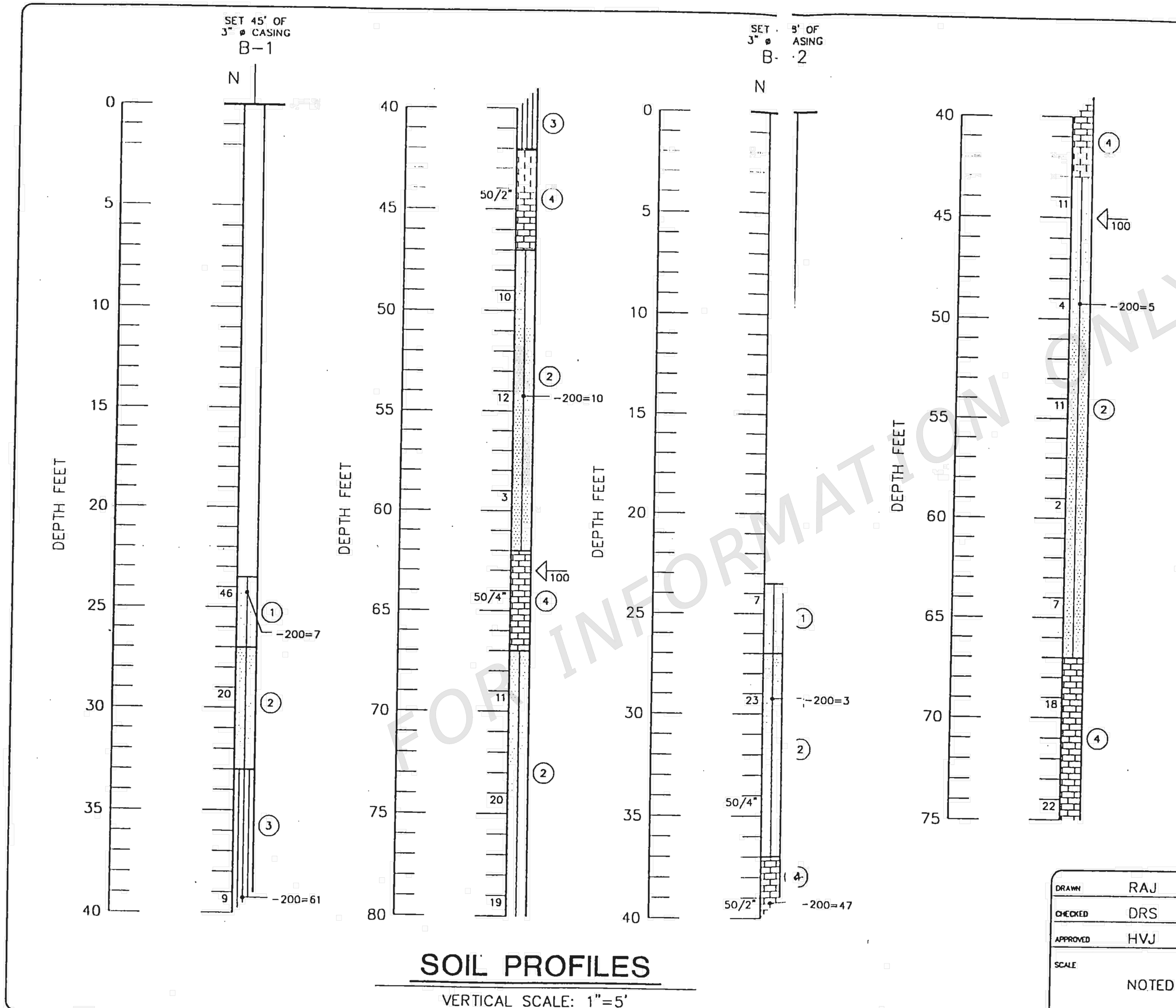
PROJECT: BECKETT BRIDGE

DESCRIPTION: REPORT OF CORE BORINGS

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 9 OF 10



LEGEND

(1)	Dark brown fine SAND with trace silt (SP–SM)
(2)	Brown fine SAND with trace silt (SP–SM)
(3)	Dark gray sandy SILT (ML)
(4)	Calcareous silts and weathered LIMESTONE (rock)
SP	Unified Soil Classification group symbol as determined by visual review
N	SPT "N" value in blows/foot
50/3"	Fifty blows for three inches
◁	Loss of circulation (%)
-200	Fines passing No. 200 sieve (%)

SOIL PROFILES

VERTICAL SCALE: 1"=5'

DRAWN	RAJ
CHECKED	DRS
APPROVED	HVJ
SCALE	NOTED

GEOTECHNICAL SERVICES
BECKETT BASCULE BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA

psi Jammal & Associates, Inc.
A Division of Professional Service Industries, Inc.

DATE	PROJ. NO.	
DEC 93	775-35264	SHEET 2

NOTE:
BORING AND LABORATORY TESTING DATA PROVIDED ON THIS SHEET WAS PERFORMED BY PSI, INC.
TIERRA, INC. HAS UTILIZED THE DATA IN OUR DESIGN IN ACCORDANCE WITH FLORIDA ADMINISTRATIVE CODE CHAPTER 61G15.

REV. NO.	DATE	DESCRIPTION	REV. BY

DESIGNED SW
DRAWN SW
CHECKED KW

Pinellas County PUBLIC WORKS

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TIERRA
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APPROVED BY:
ERICK M. FREDERICK, P.E.
FLA. REG. NO 63920
DATE

DATE: MAR 2017
PROJECT NO. 002125A
SHEET: 10 OF 10

BECKETT BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA
PID NO. 001037A
TIERRA PROJECT NO: 6511-15-153

PILE DATA TABLE																		Table Date: 12/19/2018
INSTALLATION CRITERIA								DESIGN CRITERIA										
PIER OR ABUTMENT NUMBER	PILE SIZE (in.)	NOMINAL BEARING RESISTANCE (tons)	NOMINAL UPLIFT RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft. NAVD 88)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft. NAVD 88)	REQUIRED PREFORM ELEVATION (ft. NAVD 88)	FACTORED DESIGN LOAD (tons)	FACTORED UPLIFT LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft. NAVD 88)	LONG TERM SCOUR ELEVATION (ft. NAVD 88)	ϕ COMPRESSION	ϕ UPLIFT	PILE CUT-OFF ELEVATIONS	
4	42	364	N/A	-35	195	N/A	-85	273	N/A	N/A	5	0	-12.7	N/A	0.75	N/A	7.7	
5	42	552	N/A	-36	230	N/A	-51	414	N/A	N/A	5	0	-12.7	N/A	0.75	N/A	7.2	

$$\frac{\text{Factored Design Load + Net Scour Resistance + Downdrag}}{\phi} < \text{Nominal Bearing Resistance (Rn)}$$

Nominal Uplift Resistance - The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires tension capacity).

Total Scour Resistance - An estimate of the ultimate static side friction resistance provided by the scourable soil.

Net Scour Resistance - An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-Year Scour Elevation - Estimated elevation of scour due to the 100 year storm event.

Long Term Scour Elevation - Estimated elevation of scour used in design for extreme event loading.

1. All piles are 42 inch diameter, 0.5 inch thick, uncoated steel pipe piles. See General Notes for steel pipe pile material specifications.

2. The Contractor shall verify the location of all utilities prior to driving any piles, notify all involved utility companies prior to excavation, pile driving or construction and shall assure that utilities are properly maintained and protected against damage during construction.

3. All piles shall be dynamically monitored in accordance with Section 455 of the FDOT Specifications. Additional instrumentation for the 42 inch diameter pile will be required, 8 channels of instumentation shall be used during Pile Driving Analyzer (PDA) testing.

4. Piles shall be driven at locations shown on the Foundation Layout sheet or as directed by the Engineer.

5. When a required jetting or preform elevation is not shown in the table, do not jet or preform pile locations without prior written approval of the Engineer. Do not advance jets or preformed pile holes deeper than the jetting or preformed elevations shown on the table without prior approval of the Engineer. If actual jetting or preforming elevations differ from those shown on the table, the Engineer shall determine the required driving resistance.

6. Minimum tip elevation is required for lateral stability.

7. The Contractor shall anticipate encountering variable subsurface conditions during pile driving which will require pile splices at the pile locations.

8. One pilot hole boring shall be performed at Pier 5 at the location of the proposed center Pile 2. The pilot hole boring shall be performed to a boring termination elevation of -210 feet NAVD 88.

9. Protection of existing structures shall be done in accordance with Pinellas County and FDOT Specifications. Pre and Post Condition surveys shall be completed at the following addresses:

408 Riverside Drive
350 North Spring Boulevard
2 Venetian Court
6 Venetian Court

BECKETT BRIDGE REPLACEMENT
PINELLAS COUNTY, FLORIDA
PID NO. 001037A
TIERRA PROJECT NO. 6511-15-153

DRILLED SHAFT DATA TABLE — Table Date: 12/19/2018

INSTALLATION CRITERIA						DESIGN CRITERIA								
PIER OR ABUTMENT NUMBER	SHAFT SIZE (in.)	(1) TIP ELEVATION (ft., NAVD88)	(2) MINIMUM TIP ELEVATION (ft., NAVD88)	MINIMUM ROCK SOCKET LENGTH (ft.)	MINIMUM TOP OF ROCK SOCKET ELEVATION (ft.)	FACTORED DESIGN LOAD (tons)	FACTORED DESIGN UPLIFT LOAD (tons)	DOWN DRAG (tons)	LONG TERM SCOUR ELEVATION (ft.)	100-YEAR SCOUR ELEVATION (ft.)	ϕ COMPRESSION	ϕ UPLIFT	CONSIDER NON-REDUNDANT	TOP OF DRILLED SHAFT ELEVATION (ft.)
1	42	-40	-40	24	-16	282	N/A	0	N/A	N/A	0.6	0.50	NO	1.2
2	42	-49	-46	21	-34	439	N/A	0	-11.6	-11.6	0.6	0.50	NO	5.0
BASCULE PIER 3	42	-54	-42	21	-34	552	N/A	0	-21.3	-21.3	0.6	0.50	NO	-7.6
6	42	-45	-45	26	-19	418	N/A	0	-11.6	-11.6	0.6	0.50	NO	5.9
7	42	-38	-38	20	-18	285	N/A	0	N/A	N/A	0.6	0.50	NO	3.5

Drilled Shaft General Notes:

1. The Tip Elevation is the highest elevation the shaft tip shall be constructed unless other geotechnical test data obtained during pilot holes allows the Geotechnical Foundation Design Engineer Of Record (GFDEOR) to authorize a different tip elevation.

2. Minimum Tip Elevation is required for lateral stability.

3. The location of all utilities shall be verified prior to construction of any drilled shafts. The utility companies shall be notified prior to excavation or construction and utilities shall be properly maintained and protected against damage during construction.

4. Pilot hole borings with Standard Penetration Test (SPT) borings are required at all drilled shaft locations. The pilot holes shall be located within each footprint of shaft. Perform the SPT borings in accordance with ASTM 1586 except as noted herein. Perform SPT sampling and testing at 2.5 feet intervals to a minimum depth of five (5) times the shaft diameter below the tip elevation shown in the Drilled Shaft Data Table or as directed by the GFDEOR. Prior to terminating each of the pilot holes, the termination depth of the pilot hole must be coordinated with the GFDEOR. Subsequent to the pilot hole borings being completed, production drilled shaft tips will be be calculated. Drilled Shaft tips may be revised from what is shown in the plans. It should be noted that, based on the results of the pilot hole borings, the Owner may elect to modify the foundation type from 42-inch drilled shafts to 42-inch steel pipe piles in the event that the subsurface conditions disclosed by the pilot hole borings indicate that steel pipe pile installation is desired in lieu of drilled shaft installation.

5. One (1) method shaft (test hole) shall be constructed for the project. The method shaft shall be excavated to the deepest production shaft tip elevation and be constructed to the lowest top of drilled shaft elevation presented in the Drilled Shaft Data Table. The method shaft shall be located no less than five (5) shaft diameters from the nearest permanent shaft at a location selected by the Contractor and approved by the GFDEOR. The method shaft shall be performed and accepted (including acceptable CSL test results) prior to installation of any production shafts for bridge foundations on this project. The method shaft shall be constructed as indicated by the Project Specifications.

6. Cross-hole-Sonic Logging (CSL) tubes shall be installed in all production shafts and the test hole/method shaft in accordance with the Project Specifications. CSL testing shall be performed according to Project Specifications on all shafts selected by the GFDEOR and on the method shaft. CSL testing on redundant drilled shafts will be completed as selected by the GFDEOR and will be completed on any shaft suspected of containing defects. At a minimum, CSL testing shall be completed on the method shaft and at least 20 percent of the production shafts or more in the event that construction records indicate the potential for construction defects.

7. Shaft Inspection Device (SID) equipment or an approved alternative down-hole camera shall be used to inspect the bottom of all bridge foundation shafts and the test hole/method shaft to verify shaft bottom cleanliness at the time of concreting.

8. Excavation of a shaft within six (6) shaft diameters of a recently poured shaft shall not commence within 12 hours following the completion of the concrete placement of that adjacent shaft. If shafts of different sizes are to be constructed adjacent to each other, the six (6) shaft diameter spacing shall be based on the larger of the two shaft diameters.

9. If loose or soft soil/rock conditions are encountered one foot above the proposed shaft tip elevation during the shaft excavation, the Contractor shall stop the shaft excavation and notify the GFDEOR immediately for further direction.

10. During installation of drilled shafts, hard limestone will be encountered. The Contractor shall anticipate that special tools and equipment may be required to penetrate these soils and install the shafts to the required tip elevation.

11. Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer in West Central Florida" Maps published by the USGS, the potentiometric surface elevation of the Upper Floridan Aquifer at the bridge site is approximately +10 feet, NGVD 29. The Contractor's equipment and construction methods shall be prepared to handle artesian potentiometric levels up to elevation +10 feet, NGVD 29 at no additonal cost to the Owner.

12. Due to the loose/soft soil conditions present within the borings, the Contractor shall anticipate that concrete volume overuns may occur during the shaft installation process.

13. Permanent casing shall be installed as shown in the plans and Drilled Shaft Data Table. Oscillating or non-vibratory methods of casing installation shall be employed at Abutment 1 and Abutment 7. Final casing tip elevations will be established once pilot hole borings are complete.

APPENDIX B

Electrical Resistivity Imaging Geophysical Survey Report dated April 28, 2009

REPEATED REPORT OMITTED
SEE APPENDIX 7.2 (ABOVE)

APPENDIX C

Summary of Laboratory Test Results for Soil Classification

Summary of Corrosion Test Results for Environmental Classification

Grain Size Distribution Report

Summary of Laboratory Test Results for Soil Classification
Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Boring[1]	Depth (ft.)	USCS Soil Classification	Sieve Analyses (Percent Passing)	Atterberg Limits			Organic Content (%)	Natural Moisture Content (%)
			#200	Liquid Limit	Plastic Limit	Plasticity Index		
BB-1	6.0 - 10.0	SP-SM	11					
BB-2	2.0 - 6.0	SP-SM	9					
BB-2	13.5 - 15.0	CH	57	52	26	26		33
BB-3	23.5 - 25.0	CL	56	47	25	22		21
BB-3	48.5 - 50.0	CL	73	26	13	13		17
BB-3	88.5 - 90.0	SM	14				23	93
BB-3	93.5 - 95.0	SP-SM	7					
BB-3	123.5 - 125.0	SP-SM	9				54	12
BB-3	143.5 - 145.0	SP-SM	8				51	15
BB-4	73.5 - 75.0	SM-SC	48	20	13	7		16
BB-4	88.5 - 90.0	SP-SM	6				9	48
BB-4	118.5 - 120.0	SP	3					
BB-6	8.0 - 10.0	CL	59	29	13	16		19
BB-6	63.5 - 65.0	SM	13					
BB-6	73.5 - 75.0	SM	15				32	135
BB-6	88.5 - 90.0	SP	4					
BB-6	103.5 - 105.0	SM	36	NP	NP	NP		37

[1] Refer to the Boring Location Plan in **Appendix A** of the Preliminary Bridge Geotechnical Report for the approximate test locations.

Summary of Laboratory Test Results for Environmental Classification
Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No.: 6511-15-153

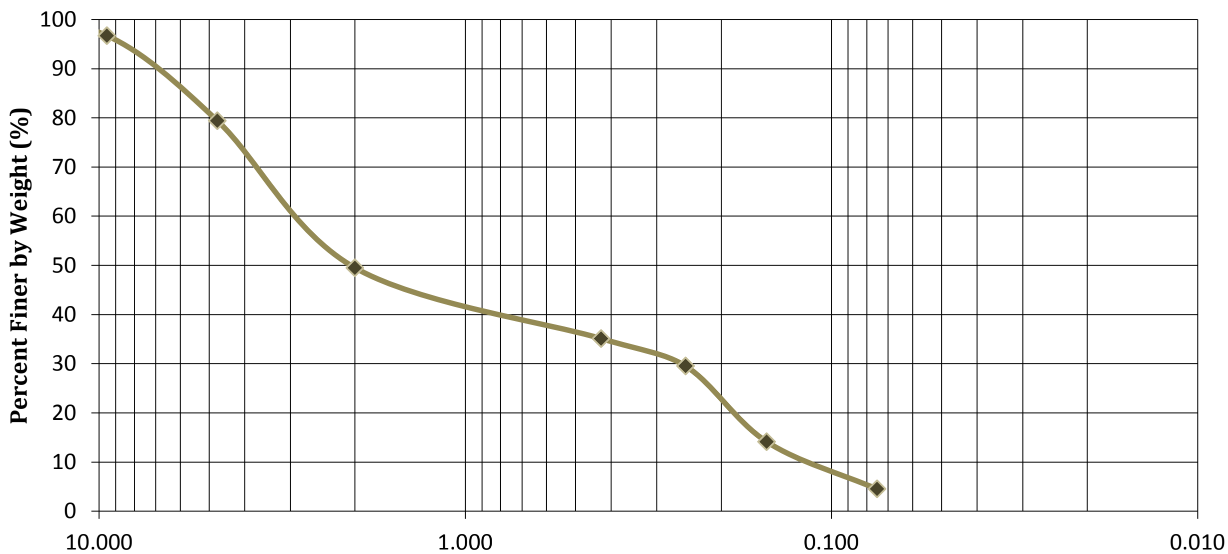
Boring[1]	Sample Depth (ft.)	Sample Type	pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	Environmental Classification[2]	
							Steel Substructure	Concrete Substructure
BB-1	6.0 - 10.0	Soil	8.7	170	7,200	960	Extremely Aggressive	Extremely Aggressive
BB-2	2.0 - 6.0	Soil	8.8	160	18,000	840	Extremely Aggressive	Extremely Aggressive
NE Sample	0.0 - 1.0	Water	8.0	29	30,000	3800	Extremely Aggressive	Extremely Aggressive
SW Sample	0.0 - 1.0	Water	8.1	30	30,000	3800	Extremely Aggressive	Extremely Aggressive

(1) Refer to the Boring Location Plan in **Appendix A** of the Preliminary Bridge Geotechnical Report for the approximate test locations.

(2) Environmental Classification based on the 2017 FDOT Structures Design Guidelines.

Grain Size Distribution Report
Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No.: 6511-15-153

Station	Offset	Sample No.	Depth (ft)
		Grab Sample	0.0 - 2.0



Material Description	Classification	
	USCS	AASHTO
	SP	A-3

Sieve Number	Diameter (mm)	Percent Finer by Weight (%)
3/4"	19.000	100
3/8"	9.500	96.7
4	4.750	79.4
10	2.000	49.5
40	0.425	35.1
60	0.250	29.5
100	0.150	14.1
200	0.075	4.5

Coefficients

D_{10}	0.112	D_{30}	0.262
D_{50}	*2.029*	D_{60}	2.710
D_{85}	5.945	D_{90}	7.263
D_{95}	8.874		
C_U	24.290	C_C	0.227

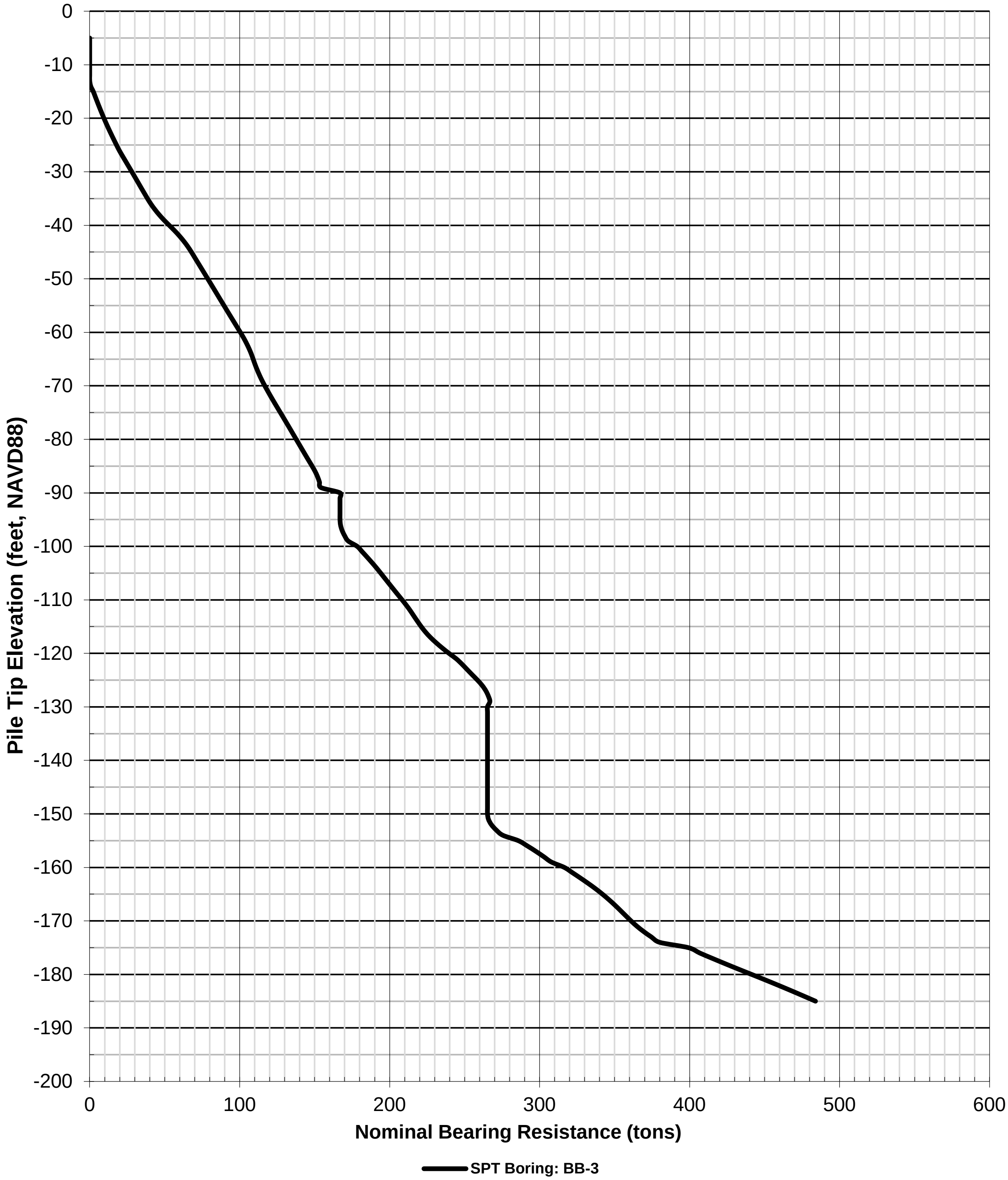
APPENDIX D

Axial Pile Capacity Curves for 42-Inch Steel Pipe Piles

Sample FB-Deep Output Files

FB-Multipier Parameters

Boring BB-3
42-Inch Diameter Open Ended Steel Pipe Pile



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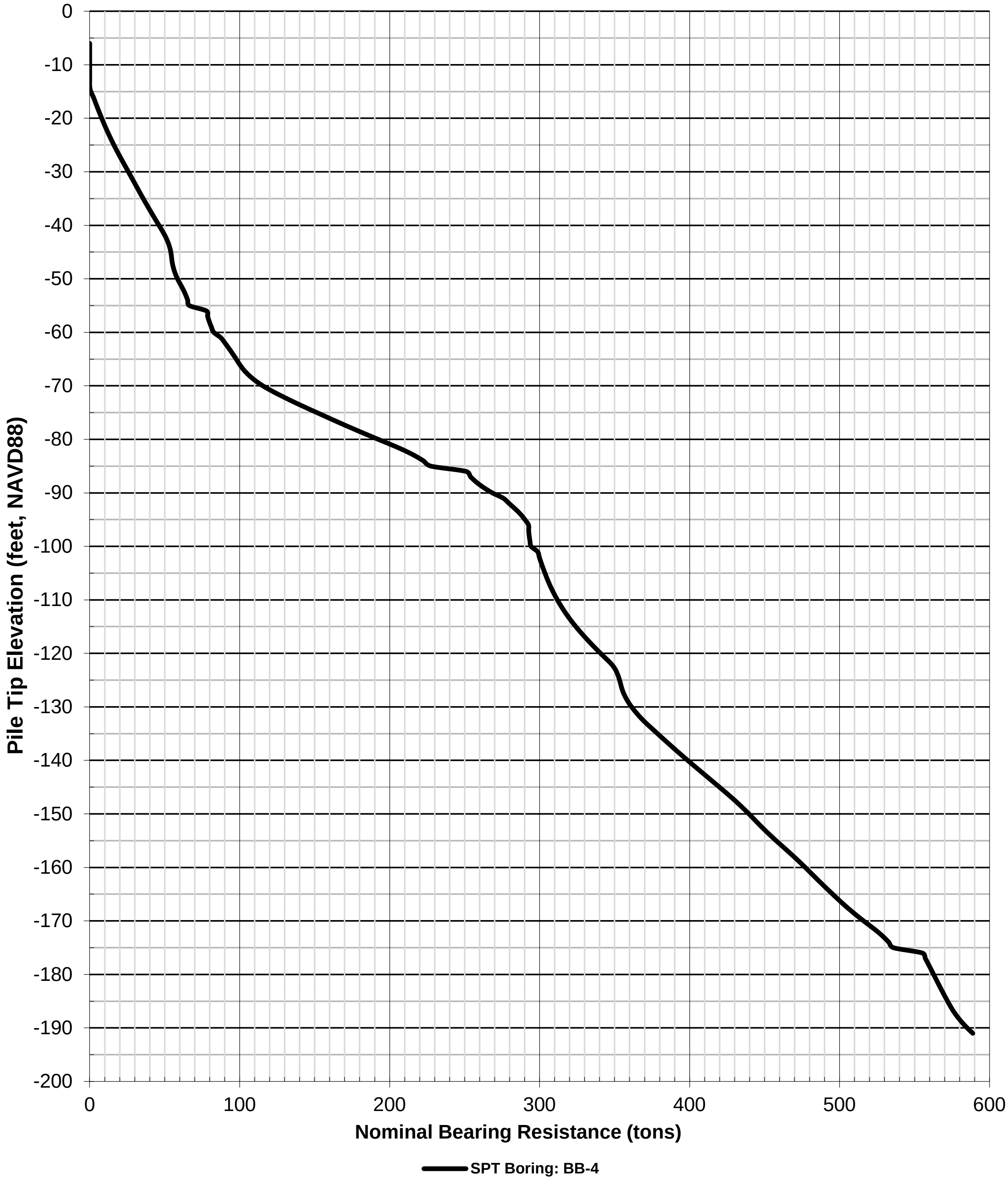
DRAWN BY:	SCALE:	PROJECT NO.
WA	Noted	6511-15-153
CHECKED BY:	DATE:	
EF	March 2017	

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida

Boring BB-4
42-Inch Diameter Open Ended Steel Pipe Pile



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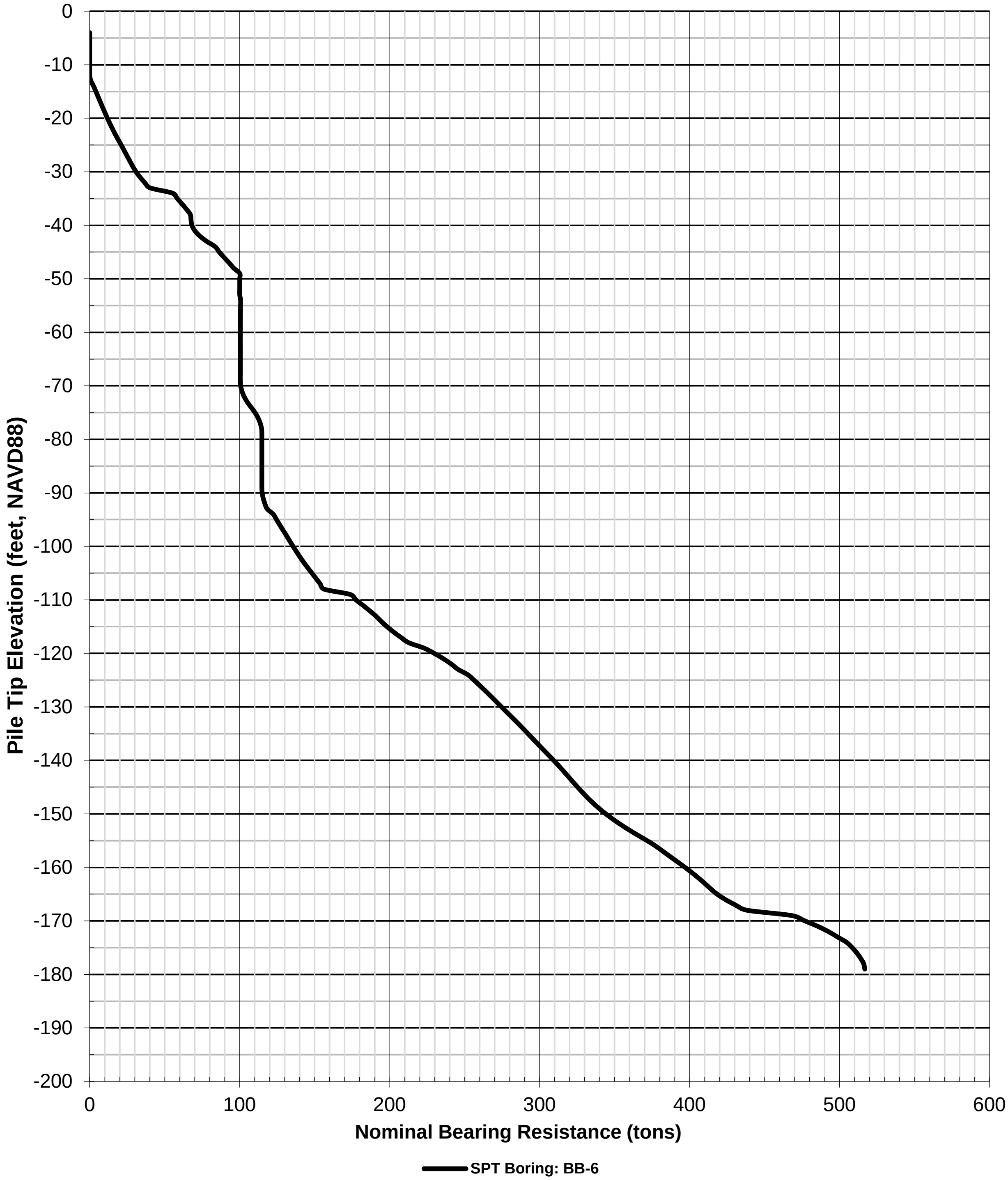
DRAWN BY:	SCALE:	PROJECT NO.
WA	Noted	6511-15-153
CHECKED BY:	DATE:	
EF	March 2017	

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida

Boring BB-6
42-Inch Diameter Open Ended Steel Pipe Pile



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DRAWN BY:	SCALE:	PROJECT NO.
WA	Noted	6511-15-153
CHECKED BY:	DATE:	
EF	March 2017	

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida

BB-3 Pre-Forming Post Lab

Florida Bridge Software Institute Date: March 01, 2017
Shaft and Pile Analysis (FB-Deep v.2.04) Time: 13:32:37

General Information:

Input file: .....11-15-153 Beckett Bridge\FB Deep\BB-3 Pre-Forming Post Lab.spc
Project number: 6511-15-153
Job name: Becket Bridge
Engineer: Tierra-WA
Units: English

Analysis Information:

Analysis Type: SPT

Soil Information:

Boring date: 02/06/17, Boring Number: BB-3
Station number: Offset:

Ground Elevation: -5.000(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	2.00	3- Clean sand
2	2.00	2.00	3- Clean sand
3	4.00	2.00	3- Clean sand
4	6.00	2.00	3- Clean sand
5	8.00	2.00	3- Clean sand
6	10.00	10.00	3- Clean sand
7	15.00	10.00	3- Clean sand
8	20.00	10.00	3- Clean sand
9	25.00	10.00	3- Clean sand
10	30.00	10.00	3- Clean sand
11	35.00	25.00	3- Clean sand
12	40.00	10.00	3- Clean sand
13	45.00	10.00	3- Clean sand
14	50.00	10.00	3- Clean sand
15	55.00	10.00	3- Clean sand
16	60.00	6.00	3- Clean sand
17	65.00	9.00	3- Clean sand
18	70.00	10.00	3- Clean sand
19	75.00	10.00	3- Clean sand
20	80.00	10.00	3- Clean sand
21	85.00	14.00	5- Cavity layer
22	90.00	14.00	5- Cavity layer
23	95.00	17.00	3- Clean sand
24	100.00	14.00	3- Clean sand
25	105.00	17.00	3- Clean sand
26	110.00	13.00	3- Clean sand
27	115.00	17.00	3- Clean sand
28	120.00	19.00	3- Clean sand
29	125.00	32.00	5- Cavity layer
30	130.00	24.00	5- Cavity layer
31	135.00	33.00	5- Cavity layer
32	140.00	30.00	5- Cavity layer

33	145.00	40.00	5- Cavity layer
34	150.00	18.00	2- Clay and silty sand
35	155.00	45.00	3- Clean sand
36	160.00	31.00	3- Clean sand
37	165.00	31.00	3- Clean sand
38	170.00	28.00	2- Clay and silty sand
39	175.00	44.00	2- Clay and silty sand
40	180.00	30.00	2- Clay and silty sand
41	195.00	30.00	2- Clay and silty sand

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	-5.00	-90.00	85.00	9.65	3-Clean Sand
2	-90.00	-100.00	10.00	14.00	5-Void
3	-100.00	-130.00	30.00	16.17	3-Clean Sand
4	-130.00	-155.00	25.00	31.80	5-Void
5	-155.00	-160.00	5.00	18.00	2-Clay and Silty Sand
6	-160.00	-175.00	15.00	35.67	3-Clean Sand
7	-175.00	-200.00	25.00	32.40	2-Clay and Silty Sand

Driven Pile Data:

Pile unit weight = 490.00(pcf), Section Type: Pipe

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)	Thickness (in)	Pile End
42.00	1.00	-6.00	0.50	OPEN
42.00	2.00	-7.00	0.50	OPEN
42.00	3.00	-8.00	0.50	OPEN
42.00	4.00	-9.00	0.50	OPEN
42.00	5.00	-10.00	0.50	OPEN
42.00	6.00	-11.00	0.50	OPEN
42.00	7.00	-12.00	0.50	OPEN
42.00	8.00	-13.00	0.50	OPEN
42.00	9.00	-14.00	0.50	OPEN
42.00	10.00	-15.00	0.50	OPEN
42.00	11.00	-16.00	0.50	OPEN
42.00	12.00	-17.00	0.50	OPEN
42.00	13.00	-18.00	0.50	OPEN
42.00	14.00	-19.00	0.50	OPEN
42.00	15.00	-20.00	0.50	OPEN
42.00	16.00	-21.00	0.50	OPEN
42.00	17.00	-22.00	0.50	OPEN
42.00	18.00	-23.00	0.50	OPEN
42.00	19.00	-24.00	0.50	OPEN
42.00	20.00	-25.00	0.50	OPEN
42.00	21.00	-26.00	0.50	OPEN
42.00	22.00	-27.00	0.50	OPEN
42.00	23.00	-28.00	0.50	OPEN
42.00	24.00	-29.00	0.50	OPEN
42.00	25.00	-30.00	0.50	OPEN

42.00	26.00	-31.00	0.50	OPEN
42.00	27.00	-32.00	0.50	OPEN
42.00	28.00	-33.00	0.50	OPEN
42.00	29.00	-34.00	0.50	OPEN
42.00	30.00	-35.00	0.50	OPEN
42.00	31.00	-36.00	0.50	OPEN
42.00	32.00	-37.00	0.50	OPEN
42.00	33.00	-38.00	0.50	OPEN
42.00	34.00	-39.00	0.50	OPEN
42.00	35.00	-40.00	0.50	OPEN
42.00	36.00	-41.00	0.50	OPEN
42.00	37.00	-42.00	0.50	OPEN
42.00	38.00	-43.00	0.50	OPEN
42.00	39.00	-44.00	0.50	OPEN
42.00	40.00	-45.00	0.50	OPEN
42.00	41.00	-46.00	0.50	OPEN
42.00	42.00	-47.00	0.50	OPEN
42.00	43.00	-48.00	0.50	OPEN
42.00	44.00	-49.00	0.50	OPEN
42.00	45.00	-50.00	0.50	OPEN
42.00	46.00	-51.00	0.50	OPEN
42.00	47.00	-52.00	0.50	OPEN
42.00	48.00	-53.00	0.50	OPEN
42.00	49.00	-54.00	0.50	OPEN
42.00	50.00	-55.00	0.50	OPEN
42.00	51.00	-56.00	0.50	OPEN
42.00	52.00	-57.00	0.50	OPEN
42.00	53.00	-58.00	0.50	OPEN
42.00	54.00	-59.00	0.50	OPEN
42.00	55.00	-60.00	0.50	OPEN
42.00	56.00	-61.00	0.50	OPEN
42.00	57.00	-62.00	0.50	OPEN
42.00	58.00	-63.00	0.50	OPEN
42.00	59.00	-64.00	0.50	OPEN
42.00	60.00	-65.00	0.50	OPEN
42.00	61.00	-66.00	0.50	OPEN
42.00	62.00	-67.00	0.50	OPEN
42.00	63.00	-68.00	0.50	OPEN
42.00	64.00	-69.00	0.50	OPEN
42.00	65.00	-70.00	0.50	OPEN
42.00	66.00	-71.00	0.50	OPEN
42.00	67.00	-72.00	0.50	OPEN
42.00	68.00	-73.00	0.50	OPEN
42.00	69.00	-74.00	0.50	OPEN
42.00	70.00	-75.00	0.50	OPEN
42.00	71.00	-76.00	0.50	OPEN
42.00	72.00	-77.00	0.50	OPEN
42.00	73.00	-78.00	0.50	OPEN
42.00	74.00	-79.00	0.50	OPEN
42.00	75.00	-80.00	0.50	OPEN
42.00	76.00	-81.00	0.50	OPEN
42.00	77.00	-82.00	0.50	OPEN
42.00	78.00	-83.00	0.50	OPEN
42.00	79.00	-84.00	0.50	OPEN
42.00	80.00	-85.00	0.50	OPEN
42.00	81.00	-86.00	0.50	OPEN
42.00	82.00	-87.00	0.50	OPEN
42.00	83.00	-88.00	0.50	OPEN
42.00	84.00	-89.00	0.50	OPEN
42.00	85.00	-90.00	0.50	OPEN
42.00	86.00	-91.00	0.50	OPEN
42.00	87.00	-92.00	0.50	OPEN
42.00	88.00	-93.00	0.50	OPEN

42.00	89.00	-94.00	0.50	OPEN
42.00	90.00	-95.00	0.50	OPEN
42.00	91.00	-96.00	0.50	OPEN
42.00	92.00	-97.00	0.50	OPEN
42.00	93.00	-98.00	0.50	OPEN
42.00	94.00	-99.00	0.50	OPEN
42.00	95.00	-100.00	0.50	OPEN
42.00	96.00	-101.00	0.50	OPEN
42.00	97.00	-102.00	0.50	OPEN
42.00	98.00	-103.00	0.50	OPEN
42.00	99.00	-104.00	0.50	OPEN
42.00	100.00	-105.00	0.50	OPEN
42.00	100.00	-105.00	0.50	OPEN
42.00	101.00	-106.00	0.50	OPEN
42.00	102.00	-107.00	0.50	OPEN
42.00	103.00	-108.00	0.50	OPEN
42.00	104.00	-109.00	0.50	OPEN
42.00	105.00	-110.00	0.50	OPEN
42.00	106.00	-111.00	0.50	OPEN
42.00	107.00	-112.00	0.50	OPEN
42.00	108.00	-113.00	0.50	OPEN
42.00	109.00	-114.00	0.50	OPEN
42.00	110.00	-115.00	0.50	OPEN
42.00	111.00	-116.00	0.50	OPEN
42.00	112.00	-117.00	0.50	OPEN
42.00	113.00	-118.00	0.50	OPEN
42.00	114.00	-119.00	0.50	OPEN
42.00	115.00	-120.00	0.50	OPEN
42.00	116.00	-121.00	0.50	OPEN
42.00	117.00	-122.00	0.50	OPEN
42.00	118.00	-123.00	0.50	OPEN
42.00	119.00	-124.00	0.50	OPEN
42.00	120.00	-125.00	0.50	OPEN
42.00	121.00	-126.00	0.50	OPEN
42.00	122.00	-127.00	0.50	OPEN
42.00	123.00	-128.00	0.50	OPEN
42.00	124.00	-129.00	0.50	OPEN
42.00	125.00	-130.00	0.50	OPEN
42.00	126.00	-131.00	0.50	OPEN
42.00	127.00	-132.00	0.50	OPEN
42.00	128.00	-133.00	0.50	OPEN
42.00	129.00	-134.00	0.50	OPEN
42.00	130.00	-135.00	0.50	OPEN
42.00	131.00	-136.00	0.50	OPEN
42.00	132.00	-137.00	0.50	OPEN
42.00	133.00	-138.00	0.50	OPEN
42.00	134.00	-139.00	0.50	OPEN
42.00	135.00	-140.00	0.50	OPEN
42.00	136.00	-141.00	0.50	OPEN
42.00	137.00	-142.00	0.50	OPEN
42.00	138.00	-143.00	0.50	OPEN
42.00	139.00	-144.00	0.50	OPEN
42.00	140.00	-145.00	0.50	OPEN
42.00	141.00	-146.00	0.50	OPEN
42.00	142.00	-147.00	0.50	OPEN
42.00	143.00	-148.00	0.50	OPEN
42.00	144.00	-149.00	0.50	OPEN
42.00	145.00	-150.00	0.50	OPEN
42.00	146.00	-151.00	0.50	OPEN
42.00	147.00	-152.00	0.50	OPEN
42.00	148.00	-153.00	0.50	OPEN
42.00	149.00	-154.00	0.50	OPEN
42.00	150.00	-155.00	0.50	OPEN

42.00	151.00	-156.00	0.50	OPEN
42.00	152.00	-157.00	0.50	OPEN
42.00	153.00	-158.00	0.50	OPEN
42.00	154.00	-159.00	0.50	OPEN
42.00	155.00	-160.00	0.50	OPEN
42.00	156.00	-161.00	0.50	OPEN
42.00	157.00	-162.00	0.50	OPEN
42.00	158.00	-163.00	0.50	OPEN
42.00	159.00	-164.00	0.50	OPEN
42.00	160.00	-165.00	0.50	OPEN
42.00	161.00	-166.00	0.50	OPEN
42.00	162.00	-167.00	0.50	OPEN
42.00	163.00	-168.00	0.50	OPEN
42.00	164.00	-169.00	0.50	OPEN
42.00	165.00	-170.00	0.50	OPEN
42.00	166.00	-171.00	0.50	OPEN
42.00	167.00	-172.00	0.50	OPEN
42.00	168.00	-173.00	0.50	OPEN
42.00	169.00	-174.00	0.50	OPEN
42.00	170.00	-175.00	0.50	OPEN
42.00	171.00	-176.00	0.50	OPEN
42.00	172.00	-177.00	0.50	OPEN
42.00	173.00	-178.00	0.50	OPEN
42.00	174.00	-179.00	0.50	OPEN
42.00	175.00	-180.00	0.50	OPEN
42.00	176.00	-181.00	0.50	OPEN
42.00	177.00	-182.00	0.50	OPEN
42.00	178.00	-183.00	0.50	OPEN
42.00	179.00	-184.00	0.50	OPEN
42.00	180.00	-185.00	0.50	OPEN

Driven Pile Capacity:

Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	42.0	0.00	0.00	0.00	0.00	0.00
2.00	42.0	0.00	0.00	0.00	0.00	0.00
3.00	42.0	0.00	0.00	0.00	0.00	0.00
4.00	42.0	0.00	0.00	0.00	0.00	0.00
5.00	42.0	0.00	0.00	0.00	0.00	0.00
6.00	42.0	0.00	0.00	0.00	0.00	0.00
7.00	42.0	0.00	0.00	0.00	0.00	0.00
8.00	42.0	0.00	0.00	0.00	0.00	0.00
9.00	42.0	0.35	0.34	0.69	0.35	1.37
10.00	42.0	1.35	1.03	2.38	1.19	4.44
11.00	42.0	2.64	1.12	3.76	1.88	6.00
12.00	42.0	3.93	1.21	5.14	2.57	7.56
13.00	42.0	5.25	1.30	6.55	3.27	9.15
14.00	42.0	6.61	1.39	8.00	4.00	10.78

15.00	42.0	8.02	1.48	9.50	4.75	12.46
16.00	42.0	9.49	1.57	11.06	5.53	14.20
17.00	42.0	11.03	1.66	12.69	6.34	16.01
18.00	42.0	12.63	1.75	14.38	7.19	17.88
19.00	42.0	14.25	1.86	16.11	8.06	19.83
20.00	42.0	15.88	2.00	17.88	8.94	21.89
21.00	42.0	17.52	2.19	19.70	9.85	24.07
22.00	42.0	19.43	2.33	21.76	10.88	26.41
23.00	42.0	21.37	2.50	23.87	11.93	28.86
24.00	42.0	23.33	2.65	25.98	12.99	31.29
25.00	42.0	25.31	2.77	28.09	14.04	33.64
26.00	42.0	27.32	2.86	30.18	15.09	35.91
27.00	42.0	29.34	2.92	32.25	16.13	38.09
28.00	42.0	31.37	2.94	34.31	17.16	40.20
29.00	42.0	33.42	2.99	36.41	18.20	42.38
30.00	42.0	35.48	3.03	38.51	19.26	44.58
31.00	42.0	37.70	3.07	40.77	20.39	46.92
32.00	42.0	40.26	3.09	43.35	21.67	49.53
33.00	42.0	43.15	3.09	46.24	23.12	52.43
34.00	42.0	46.38	3.08	49.46	24.73	55.61
35.00	42.0	49.97	3.04	53.01	26.50	59.09
36.00	42.0	53.58	3.01	56.58	28.29	62.60
37.00	42.0	56.88	2.98	59.86	29.93	65.83
38.00	42.0	59.87	2.95	62.82	31.41	68.72
39.00	42.0	62.55	2.92	65.47	32.73	71.31
40.00	42.0	64.89	2.91	67.81	33.90	73.63
41.00	42.0	67.07	2.91	69.99	34.99	75.81
42.00	42.0	69.26	2.91	72.17	36.09	78.00
43.00	42.0	71.44	2.91	74.36	37.18	80.18
44.00	42.0	73.63	2.91	76.54	38.27	82.35
45.00	42.0	75.82	2.89	78.71	39.36	84.50
46.00	42.0	78.01	2.87	80.88	40.44	86.62
47.00	42.0	80.20	2.84	83.04	41.52	88.72
48.00	42.0	82.40	2.80	85.20	42.60	90.79
49.00	42.0	84.59	2.76	87.35	43.68	92.88
50.00	42.0	86.79	2.73	89.52	44.76	94.98
51.00	42.0	88.99	2.71	91.69	45.85	97.10
52.00	42.0	91.18	2.69	93.87	46.94	99.25
53.00	42.0	93.38	2.68	96.06	48.03	101.41
54.00	42.0	95.58	2.67	98.25	49.13	103.58
55.00	42.0	97.79	2.66	100.44	50.22	105.76
56.00	42.0	99.89	2.66	102.55	51.27	107.86
57.00	42.0	101.79	2.66	104.45	52.23	109.78
58.00	42.0	103.50	2.67	106.17	53.08	111.51
59.00	42.0	105.00	2.68	107.68	53.84	113.05
60.00	42.0	106.30	2.68	108.98	54.49	114.35
61.00	42.0	107.57	2.67	110.24	55.12	115.59
62.00	42.0	109.01	2.64	111.65	55.82	116.93
63.00	42.0	110.60	2.59	113.19	56.59	118.38
64.00	42.0	112.35	2.54	114.89	57.44	119.97
65.00	42.0	114.25	2.50	116.76	58.38	121.76
66.00	42.0	116.26	2.47	118.74	59.37	123.68
67.00	42.0	118.32	2.46	120.77	60.39	125.68
68.00	42.0	120.41	2.45	122.86	61.43	127.76
69.00	42.0	122.55	2.44	124.98	62.49	129.86
70.00	42.0	124.72	2.40	127.13	63.56	131.93
71.00	42.0	126.93	2.34	129.27	64.63	133.96
72.00	42.0	129.13	2.27	131.39	65.70	135.92
73.00	42.0	131.33	2.17	133.50	66.75	137.83
74.00	42.0	133.53	2.06	135.59	67.80	139.72
75.00	42.0	135.74	1.96	137.69	68.85	141.61
76.00	42.0	137.94	1.85	139.79	69.90	143.49
77.00	42.0	140.14	1.75	141.89	70.95	145.38

78.00	42.0	142.35	1.64	143.99	72.00	147.28
79.00	42.0	144.55	1.56	146.12	73.06	149.25
80.00	42.0	146.76	1.52	148.28	74.14	151.33
81.00	42.0	148.76	1.52	150.29	75.14	153.33
82.00	42.0	150.36	1.57	151.93	75.97	155.07
83.00	42.0	151.55	1.66	153.21	76.61	156.54
84.00	42.0	152.34	1.77	154.11	77.05	157.65
85.00	42.0	166.89	0.00	166.89	83.45	166.89
86.00	42.0	166.89	0.00	166.89	83.45	166.89
87.00	42.0	166.89	0.00	166.89	83.45	166.89
88.00	42.0	166.89	0.00	166.89	83.45	166.89
89.00	42.0	166.89	0.00	166.89	83.45	166.89
90.00	42.0	166.89	0.00	166.89	83.45	166.89
91.00	42.0	167.23	0.00	167.23	83.62	167.23
92.00	42.0	168.26	0.00	168.26	84.13	168.26
93.00	42.0	169.96	0.00	169.96	84.98	169.96
94.00	42.0	172.35	0.00	172.35	86.17	172.35
95.00	42.0	175.41	2.91	178.32	89.16	184.14
96.00	42.0	178.76	2.91	181.67	90.84	187.49
97.00	42.0	182.01	2.91	184.92	92.46	190.74
98.00	42.0	185.18	2.91	188.09	94.04	193.91
99.00	42.0	188.22	2.91	191.14	95.57	196.96
100.00	42.0	191.11	2.92	194.03	97.01	199.86

Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
100.00	42.0	191.11	2.92	194.03	97.01	199.86
101.00	42.0	193.92	2.92	196.85	98.42	202.69
102.00	42.0	196.75	2.93	199.68	99.84	205.55
103.00	42.0	199.58	2.95	202.52	101.26	208.42
104.00	42.0	202.43	2.96	205.39	102.70	211.32
105.00	42.0	205.32	2.98	208.30	104.15	214.26
106.00	42.0	208.11	3.01	211.11	105.56	217.13
107.00	42.0	210.67	3.04	213.71	106.85	219.78
108.00	42.0	213.03	3.07	216.10	108.05	222.25
109.00	42.0	215.42	3.10	218.52	109.26	224.73
110.00	42.0	217.92	3.13	221.05	110.52	227.30
111.00	42.0	220.72	3.14	223.85	111.93	230.13
112.00	42.0	224.01	3.12	227.13	113.57	233.38
113.00	42.0	227.85	3.09	230.94	115.47	237.12
114.00	42.0	232.06	3.04	235.10	117.55	241.19
115.00	42.0	236.60	2.99	239.59	119.79	245.57
116.00	42.0	241.44	2.93	244.37	122.18	250.22
117.00	42.0	245.34	2.83	248.17	124.09	253.83
118.00	42.0	248.87	2.73	251.60	125.80	257.05
119.00	42.0	252.45	2.61	255.06	127.53	260.28
120.00	42.0	256.09	2.47	258.56	129.28	263.51
121.00	42.0	259.38	2.33	261.71	130.86	266.38
122.00	42.0	261.94	2.20	264.14	132.07	268.54
123.00	42.0	263.76	2.08	265.84	132.92	269.99
124.00	42.0	264.86	1.96	266.83	133.41	270.76
125.00	42.0	265.23	0.00	265.23	132.61	265.23
126.00	42.0	265.23	0.00	265.23	132.61	265.23

127.00	42.0	265.23	0.00	265.23	132.61	265.23
128.00	42.0	265.23	0.00	265.23	132.61	265.23
129.00	42.0	265.23	0.00	265.23	132.61	265.23
130.00	42.0	265.23	0.00	265.23	132.61	265.23
131.00	42.0	265.23	0.00	265.23	132.61	265.23
132.00	42.0	265.23	0.00	265.23	132.61	265.23
133.00	42.0	265.23	0.00	265.23	132.61	265.23
134.00	42.0	265.23	0.00	265.23	132.61	265.23
135.00	42.0	265.23	0.00	265.23	132.61	265.23
136.00	42.0	265.23	0.00	265.23	132.61	265.23
137.00	42.0	265.23	0.00	265.23	132.61	265.23
138.00	42.0	265.23	0.00	265.23	132.61	265.23
139.00	42.0	265.23	0.00	265.23	132.61	265.23
140.00	42.0	265.23	0.00	265.23	132.61	265.23
141.00	42.0	265.23	0.00	265.23	132.61	265.23
142.00	42.0	265.23	0.00	265.23	132.61	265.23
143.00	42.0	265.23	0.00	265.23	132.61	265.23
144.00	42.0	265.23	0.00	265.23	132.61	265.23
145.00	42.0	265.23	0.00	265.23	132.61	265.23
146.00	42.0	265.87	0.00	265.87	132.94	265.87
147.00	42.0	267.80	0.00	267.80	133.90	267.80
148.00	42.0	271.02	0.00	271.02	135.51	271.02
149.00	42.0	275.52	0.00	275.52	137.76	275.52
150.00	42.0	281.31	4.47	285.79	142.89	294.73
151.00	42.0	287.42	4.49	291.90	145.95	300.88
152.00	42.0	292.99	4.52	297.52	148.76	306.56
153.00	42.0	298.20	4.58	302.77	151.39	311.93
154.00	42.0	303.23	4.64	307.87	153.94	317.16
155.00	42.0	311.35	5.11	316.46	158.23	326.67
156.00	42.0	316.84	5.11	321.95	160.97	332.16
157.00	42.0	322.16	5.11	327.27	163.64	337.49
158.00	42.0	327.34	5.11	332.44	166.22	342.66
159.00	42.0	332.24	5.11	337.35	168.68	347.57
160.00	42.0	336.76	5.12	341.88	170.94	352.11
161.00	42.0	340.93	5.13	346.07	173.03	356.33
162.00	42.0	344.85	5.16	350.01	175.00	360.32
163.00	42.0	348.50	5.19	353.69	176.85	364.08
164.00	42.0	352.07	5.23	357.31	178.65	367.77
165.00	42.0	355.68	5.27	360.96	180.48	371.50
166.00	42.0	359.60	5.31	364.91	182.46	375.54
167.00	42.0	364.07	5.36	369.43	184.71	380.15
168.00	42.0	369.09	5.41	374.50	187.25	385.31
169.00	42.0	374.55	5.46	380.01	190.00	390.92
170.00	42.0	392.70	6.55	399.26	199.63	412.37
171.00	42.0	400.77	6.03	406.80	203.40	418.85
172.00	42.0	409.03	6.16	415.18	207.59	427.50
173.00	42.0	417.49	6.26	423.74	211.87	436.26
174.00	42.0	426.14	6.34	432.47	216.24	445.15
175.00	42.0	434.98	6.39	441.37	220.69	454.15
176.00	42.0	443.84	6.40	450.24	225.12	463.04
177.00	42.0	452.55	6.36	458.91	229.46	471.63
178.00	42.0	461.11	6.30	467.41	233.70	480.01
179.00	42.0	469.51	6.24	475.74	237.87	488.22
180.00	42.0	477.75	6.17	483.93	241.96	496.27

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS
   3 x THE MOBILIZED END BEARING.
   EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE
   ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS
   2 x THE MOBILIZED END BEARING.

General Information:
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Input file: .....11-15-153 Beckett Bridge\FB Deep\BB-4 Pre-Forming Post Lab.spc
Project number: 6511-15-153
Job name: Beckett Bridge
Engineer: Tierra-WA
Units: English

Analysis Information:
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Analysis Type: SPT

Soil Information:
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Boring date: 01/12/2017,   Boring Number: BB-4
Station number: Offset:

Ground Elevation: -6.000(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	2.00	3- Clean sand
2	2.00	2.00	3- Clean sand
3	4.00	2.00	3- Clean sand
4	6.00	2.00	3- Clean sand
5	8.00	2.00	3- Clean sand
6	10.00	10.00	3- Clean sand
7	15.00	10.00	3- Clean sand
8	20.00	10.00	3- Clean sand
9	25.00	10.00	3- Clean sand
10	30.00	10.00	3- Clean sand
11	35.00	10.00	3- Clean sand
12	40.00	0.00	3- Clean sand
13	45.00	10.00	3- Clean sand
14	50.00	5.00	4- Lime Stone/Very shelly sand
15	55.00	6.00	2- Clay and silty sand
16	60.00	7.00	2- Clay and silty sand
17	65.00	38.00	2- Clay and silty sand
18	70.00	33.00	2- Clay and silty sand
19	75.00	56.00	2- Clay and silty sand
20	80.00	14.00	3- Clean sand
21	85.00	23.00	2- Clay and silty sand
22	90.00	8.00	5- Cavity layer
23	95.00	6.00	3- Clean sand
24	100.00	7.00	3- Clean sand
25	105.00	10.00	3- Clean sand
26	110.00	15.00	3- Clean sand
27	115.00	19.00	3- Clean sand
28	120.00	10.00	3- Clean sand
29	125.00	21.00	3- Clean sand
30	130.00	23.00	3- Clean sand
31	135.00	27.00	3- Clean sand
32	140.00	26.00	3- Clean sand

33	145.00	17.00	3- Clean sand
34	150.00	23.00	3- Clean sand
35	155.00	17.00	3- Clean sand
36	160.00	19.00	3- Clean sand
37	165.00	31.00	3- Clean sand
38	170.00	18.00	4- Lime Stone/Very shelly sand
39	175.00	20.00	4- Lime Stone/Very shelly sand
40	180.00	22.00	4- Lime Stone/Very shelly sand
41	185.00	41.00	4- Lime Stone/Very shelly sand
42	200.00	41.00	4- Lime Stone/Very shelly sand

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	-6.00	-56.00	50.00	7.40	3-Clean Sand
2	-56.00	-61.00	5.00	5.00	4-Limestone, Very Shelly Sand
3	-61.00	-86.00	25.00	28.00	2-Clay and Silty Sand
4	-86.00	-91.00	5.00	14.00	3-Clean Sand
5	-91.00	-96.00	5.00	23.00	2-Clay and Silty Sand
6	-96.00	-101.00	5.00	8.00	5-Void
7	-101.00	-176.00	75.00	18.07	3-Clean Sand
8	-176.00	-206.00	30.00	30.50	4-Limestone, Very Shelly Sand

Driven Pile Data:
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Pile unit weight = 490.00(pcf), Section Type: Pipe

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)	Thickness (in)	Pile End
42.00	1.00	-7.00	0.50	OPEN
42.00	2.00	-8.00	0.50	OPEN
42.00	3.00	-9.00	0.50	OPEN
42.00	4.00	-10.00	0.50	OPEN
42.00	5.00	-11.00	0.50	OPEN
42.00	6.00	-12.00	0.50	OPEN
42.00	7.00	-13.00	0.50	OPEN
42.00	8.00	-14.00	0.50	OPEN
42.00	9.00	-15.00	0.50	OPEN
42.00	10.00	-16.00	0.50	OPEN
42.00	11.00	-17.00	0.50	OPEN
42.00	12.00	-18.00	0.50	OPEN
42.00	13.00	-19.00	0.50	OPEN
42.00	14.00	-20.00	0.50	OPEN
42.00	15.00	-21.00	0.50	OPEN
42.00	16.00	-22.00	0.50	OPEN
42.00	17.00	-23.00	0.50	OPEN
42.00	18.00	-24.00	0.50	OPEN
42.00	19.00	-25.00	0.50	OPEN
42.00	20.00	-26.00	0.50	OPEN
42.00	21.00	-27.00	0.50	OPEN

42.00	22.00	-28.00	0.50	OPEN
42.00	23.00	-29.00	0.50	OPEN
42.00	24.00	-30.00	0.50	OPEN
42.00	25.00	-31.00	0.50	OPEN
42.00	26.00	-32.00	0.50	OPEN
42.00	27.00	-33.00	0.50	OPEN
42.00	28.00	-34.00	0.50	OPEN
42.00	29.00	-35.00	0.50	OPEN
42.00	30.00	-36.00	0.50	OPEN
42.00	31.00	-37.00	0.50	OPEN
42.00	32.00	-38.00	0.50	OPEN
42.00	33.00	-39.00	0.50	OPEN
42.00	34.00	-40.00	0.50	OPEN
42.00	35.00	-41.00	0.50	OPEN
42.00	36.00	-42.00	0.50	OPEN
42.00	37.00	-43.00	0.50	OPEN
42.00	38.00	-44.00	0.50	OPEN
42.00	39.00	-45.00	0.50	OPEN
42.00	40.00	-46.00	0.50	OPEN
42.00	41.00	-47.00	0.50	OPEN
42.00	42.00	-48.00	0.50	OPEN
42.00	43.00	-49.00	0.50	OPEN
42.00	44.00	-50.00	0.50	OPEN
42.00	45.00	-51.00	0.50	OPEN
42.00	46.00	-52.00	0.50	OPEN
42.00	47.00	-53.00	0.50	OPEN
42.00	48.00	-54.00	0.50	OPEN
42.00	49.00	-55.00	0.50	OPEN
42.00	50.00	-56.00	0.50	OPEN
42.00	51.00	-57.00	0.50	OPEN
42.00	52.00	-58.00	0.50	OPEN
42.00	53.00	-59.00	0.50	OPEN
42.00	54.00	-60.00	0.50	OPEN
42.00	55.00	-61.00	0.50	OPEN
42.00	56.00	-62.00	0.50	OPEN
42.00	57.00	-63.00	0.50	OPEN
42.00	58.00	-64.00	0.50	OPEN
42.00	59.00	-65.00	0.50	OPEN
42.00	60.00	-66.00	0.50	OPEN
42.00	61.00	-67.00	0.50	OPEN
42.00	62.00	-68.00	0.50	OPEN
42.00	63.00	-69.00	0.50	OPEN
42.00	64.00	-70.00	0.50	OPEN
42.00	65.00	-71.00	0.50	OPEN
42.00	66.00	-72.00	0.50	OPEN
42.00	67.00	-73.00	0.50	OPEN
42.00	68.00	-74.00	0.50	OPEN
42.00	69.00	-75.00	0.50	OPEN
42.00	70.00	-76.00	0.50	OPEN
42.00	71.00	-77.00	0.50	OPEN
42.00	72.00	-78.00	0.50	OPEN
42.00	73.00	-79.00	0.50	OPEN
42.00	74.00	-80.00	0.50	OPEN
42.00	75.00	-81.00	0.50	OPEN
42.00	76.00	-82.00	0.50	OPEN
42.00	77.00	-83.00	0.50	OPEN
42.00	78.00	-84.00	0.50	OPEN
42.00	79.00	-85.00	0.50	OPEN
42.00	80.00	-86.00	0.50	OPEN
42.00	81.00	-87.00	0.50	OPEN
42.00	82.00	-88.00	0.50	OPEN
42.00	83.00	-89.00	0.50	OPEN
42.00	84.00	-90.00	0.50	OPEN

42.00	85.00	-91.00	0.50	OPEN
42.00	86.00	-92.00	0.50	OPEN
42.00	87.00	-93.00	0.50	OPEN
42.00	88.00	-94.00	0.50	OPEN
42.00	89.00	-95.00	0.50	OPEN
42.00	90.00	-96.00	0.50	OPEN
42.00	91.00	-97.00	0.50	OPEN
42.00	92.00	-98.00	0.50	OPEN
42.00	93.00	-99.00	0.50	OPEN
42.00	94.00	-100.00	0.50	OPEN
42.00	95.00	-101.00	0.50	OPEN
42.00	96.00	-102.00	0.50	OPEN
42.00	97.00	-103.00	0.50	OPEN
42.00	98.00	-104.00	0.50	OPEN
42.00	99.00	-105.00	0.50	OPEN
42.00	100.00	-106.00	0.50	OPEN
42.00	100.00	-106.00	0.50	OPEN
42.00	101.00	-107.00	0.50	OPEN
42.00	102.00	-108.00	0.50	OPEN
42.00	103.00	-109.00	0.50	OPEN
42.00	104.00	-110.00	0.50	OPEN
42.00	105.00	-111.00	0.50	OPEN
42.00	106.00	-112.00	0.50	OPEN
42.00	107.00	-113.00	0.50	OPEN
42.00	108.00	-114.00	0.50	OPEN
42.00	109.00	-115.00	0.50	OPEN
42.00	110.00	-116.00	0.50	OPEN
42.00	111.00	-117.00	0.50	OPEN
42.00	112.00	-118.00	0.50	OPEN
42.00	113.00	-119.00	0.50	OPEN
42.00	114.00	-120.00	0.50	OPEN
42.00	115.00	-121.00	0.50	OPEN
42.00	116.00	-122.00	0.50	OPEN
42.00	117.00	-123.00	0.50	OPEN
42.00	118.00	-124.00	0.50	OPEN
42.00	119.00	-125.00	0.50	OPEN
42.00	120.00	-126.00	0.50	OPEN
42.00	121.00	-127.00	0.50	OPEN
42.00	122.00	-128.00	0.50	OPEN
42.00	123.00	-129.00	0.50	OPEN
42.00	124.00	-130.00	0.50	OPEN
42.00	125.00	-131.00	0.50	OPEN
42.00	126.00	-132.00	0.50	OPEN
42.00	127.00	-133.00	0.50	OPEN
42.00	128.00	-134.00	0.50	OPEN
42.00	129.00	-135.00	0.50	OPEN
42.00	130.00	-136.00	0.50	OPEN
42.00	131.00	-137.00	0.50	OPEN
42.00	132.00	-138.00	0.50	OPEN
42.00	133.00	-139.00	0.50	OPEN
42.00	134.00	-140.00	0.50	OPEN
42.00	135.00	-141.00	0.50	OPEN
42.00	136.00	-142.00	0.50	OPEN
42.00	137.00	-143.00	0.50	OPEN
42.00	138.00	-144.00	0.50	OPEN
42.00	139.00	-145.00	0.50	OPEN
42.00	140.00	-146.00	0.50	OPEN
42.00	141.00	-147.00	0.50	OPEN
42.00	142.00	-148.00	0.50	OPEN
42.00	143.00	-149.00	0.50	OPEN
42.00	144.00	-150.00	0.50	OPEN
42.00	145.00	-151.00	0.50	OPEN
42.00	146.00	-152.00	0.50	OPEN

42.00	147.00	-153.00	0.50	OPEN
42.00	148.00	-154.00	0.50	OPEN
42.00	149.00	-155.00	0.50	OPEN
42.00	150.00	-156.00	0.50	OPEN
42.00	151.00	-157.00	0.50	OPEN
42.00	152.00	-158.00	0.50	OPEN
42.00	153.00	-159.00	0.50	OPEN
42.00	154.00	-160.00	0.50	OPEN
42.00	155.00	-161.00	0.50	OPEN
42.00	156.00	-162.00	0.50	OPEN
42.00	157.00	-163.00	0.50	OPEN
42.00	158.00	-164.00	0.50	OPEN
42.00	159.00	-165.00	0.50	OPEN
42.00	160.00	-166.00	0.50	OPEN
42.00	161.00	-167.00	0.50	OPEN
42.00	162.00	-168.00	0.50	OPEN
42.00	163.00	-169.00	0.50	OPEN
42.00	164.00	-170.00	0.50	OPEN
42.00	165.00	-171.00	0.50	OPEN
42.00	166.00	-172.00	0.50	OPEN
42.00	167.00	-173.00	0.50	OPEN
42.00	168.00	-174.00	0.50	OPEN
42.00	169.00	-175.00	0.50	OPEN
42.00	170.00	-176.00	0.50	OPEN
42.00	171.00	-177.00	0.50	OPEN
42.00	172.00	-178.00	0.50	OPEN
42.00	173.00	-179.00	0.50	OPEN
42.00	174.00	-180.00	0.50	OPEN
42.00	175.00	-181.00	0.50	OPEN
42.00	176.00	-182.00	0.50	OPEN
42.00	177.00	-183.00	0.50	OPEN
42.00	178.00	-184.00	0.50	OPEN
42.00	179.00	-185.00	0.50	OPEN
42.00	180.00	-186.00	0.50	OPEN
42.00	181.00	-187.00	0.50	OPEN
42.00	182.00	-188.00	0.50	OPEN
42.00	183.00	-189.00	0.50	OPEN
42.00	184.00	-190.00	0.50	OPEN
42.00	185.00	-191.00	0.50	OPEN

Driven Pile Capacity:

Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	42.0	0.00	0.00	0.00	0.00	0.00
2.00	42.0	0.00	0.00	0.00	0.00	0.00
3.00	42.0	0.00	0.00	0.00	0.00	0.00
4.00	42.0	0.00	0.00	0.00	0.00	0.00
5.00	42.0	0.00	0.00	0.00	0.00	0.00

6.00	42.0	0.00	0.00	0.00	0.00	0.00
7.00	42.0	0.00	0.00	0.00	0.00	0.00
8.00	42.0	0.00	0.00	0.00	0.00	0.00
9.00	42.0	0.35	0.34	0.69	0.35	1.37
10.00	42.0	1.35	1.03	2.38	1.19	4.44
11.00	42.0	2.64	1.12	3.76	1.88	6.00
12.00	42.0	3.93	1.21	5.14	2.57	7.56
13.00	42.0	5.25	1.30	6.55	3.27	9.15
14.00	42.0	6.61	1.39	8.00	4.00	10.78
15.00	42.0	8.02	1.48	9.50	4.75	12.46
16.00	42.0	9.49	1.57	11.06	5.53	14.20
17.00	42.0	11.03	1.66	12.69	6.34	16.01
18.00	42.0	12.63	1.75	14.38	7.19	17.88
19.00	42.0	14.30	1.84	16.14	8.07	19.82
20.00	42.0	16.04	1.93	17.97	8.99	21.83
21.00	42.0	17.86	2.02	19.88	9.94	23.92
22.00	42.0	19.78	2.04	21.83	10.91	25.91
23.00	42.0	21.73	2.07	23.80	11.90	27.93
24.00	42.0	23.71	2.07	25.78	12.89	29.92
25.00	42.0	25.70	2.05	27.75	13.88	31.86
26.00	42.0	27.71	2.01	29.72	14.86	33.75
27.00	42.0	29.74	1.95	31.69	15.84	35.59
28.00	42.0	31.78	1.87	33.65	16.82	37.38
29.00	42.0	33.83	1.83	35.66	17.83	39.31
30.00	42.0	35.90	1.80	37.70	18.85	41.30
31.00	42.0	37.97	1.80	39.77	19.89	43.38
32.00	42.0	40.06	1.82	41.88	20.94	45.52
33.00	42.0	42.15	1.86	44.01	22.01	47.73
34.00	42.0	44.25	1.91	46.16	23.08	49.97
35.00	42.0	46.36	1.96	48.31	24.16	52.23
36.00	42.0	48.29	2.01	50.30	25.15	54.33
37.00	42.0	49.87	2.07	51.94	25.97	56.07
38.00	42.0	51.08	2.11	53.20	26.60	57.43
39.00	42.0	51.92	2.15	54.08	27.04	58.38
40.00	42.0	52.39	2.19	54.58	27.29	58.95
41.00	42.0	52.84	2.21	55.05	27.53	59.48
42.00	42.0	53.66	2.21	55.87	27.93	60.29
43.00	42.0	54.84	2.18	57.02	28.51	61.39
44.00	42.0	56.39	2.14	58.53	29.27	62.82
45.00	42.0	58.32	2.09	60.41	30.20	64.59
46.00	42.0	60.30	2.04	62.33	31.17	66.40
47.00	42.0	61.99	1.98	63.97	31.99	67.94
48.00	42.0	63.40	1.93	65.33	32.67	69.19
49.00	42.0	64.53	1.91	66.44	33.22	70.26
50.00	42.0	75.92	1.94	77.85	38.93	81.73
51.00	42.0	76.68	1.94	78.62	39.31	82.50
52.00	42.0	77.78	1.96	79.74	39.87	83.65
53.00	42.0	79.13	1.99	81.12	40.56	85.11
54.00	42.0	80.67	2.05	82.72	41.36	86.82
55.00	42.0	84.66	2.73	87.39	43.69	92.85
56.00	42.0	87.45	2.74	90.20	45.10	95.69
57.00	42.0	90.01	2.79	92.80	46.40	98.37
58.00	42.0	92.44	2.85	95.29	47.65	100.99
59.00	42.0	94.73	2.95	97.68	48.84	103.58
60.00	42.0	96.88	3.09	99.97	49.99	106.15
61.00	42.0	99.36	3.27	102.63	51.31	109.17
62.00	42.0	102.56	3.49	106.06	53.03	113.04
63.00	42.0	106.52	3.76	110.27	55.14	117.78
64.00	42.0	111.42	4.02	115.45	57.72	123.49
65.00	42.0	117.43	4.27	121.70	60.85	130.24
66.00	42.0	124.17	4.50	128.67	64.33	137.66
67.00	42.0	131.26	4.70	135.96	67.98	145.35
68.00	42.0	138.72	4.87	143.59	71.80	153.33

69.00	42.0	146.45	5.03	151.48	75.74	161.55
70.00	42.0	154.32	5.03	159.35	79.67	169.41
71.00	42.0	162.30	5.02	167.32	83.66	177.36
72.00	42.0	170.50	4.98	175.49	87.74	185.46
73.00	42.0	178.92	4.93	183.84	91.92	193.69
74.00	42.0	187.54	4.82	192.36	96.18	201.99
75.00	42.0	196.37	4.66	201.03	100.51	210.34
76.00	42.0	204.78	4.46	209.24	104.62	218.17
77.00	42.0	212.13	4.27	216.39	108.20	224.93
78.00	42.0	218.38	4.07	222.45	111.23	230.59
79.00	42.0	223.52	3.90	227.43	113.71	235.23
80.00	42.0	248.50	2.54	251.04	125.52	256.12
81.00	42.0	251.41	2.55	253.96	126.98	259.07
82.00	42.0	255.24	2.56	257.80	128.90	262.93
83.00	42.0	260.03	2.57	262.60	131.30	267.74
84.00	42.0	265.86	2.57	268.43	134.21	273.57
85.00	42.0	274.26	1.48	275.74	137.87	278.70
86.00	42.0	278.15	1.56	279.71	139.86	282.83
87.00	42.0	282.08	1.60	283.68	141.84	286.87
88.00	42.0	285.68	1.61	287.29	143.64	290.51
89.00	42.0	288.56	1.60	290.15	145.08	293.35
90.00	42.0	292.58	0.00	292.58	146.29	292.58
91.00	42.0	292.69	0.00	292.69	146.34	292.69
92.00	42.0	293.02	0.00	293.02	146.51	293.02
93.00	42.0	293.56	0.00	293.56	146.78	293.56
94.00	42.0	294.32	0.00	294.32	147.16	294.32
95.00	42.0	295.30	3.37	298.66	149.33	305.39
96.00	42.0	296.42	3.35	299.76	149.88	306.45
97.00	42.0	297.61	3.34	300.94	150.47	307.62
98.00	42.0	298.86	3.34	302.21	151.10	308.89
99.00	42.0	300.19	3.35	303.54	151.77	310.24
100.00	42.0	301.59	3.35	304.93	152.47	311.63

Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
100.00	42.0	301.59	3.35	304.93	152.47	311.63
101.00	42.0	303.09	3.34	306.43	153.22	313.11
102.00	42.0	304.76	3.32	308.08	154.04	314.72
103.00	42.0	306.59	3.29	309.88	154.94	316.45
104.00	42.0	308.58	3.24	311.82	155.91	318.31
105.00	42.0	310.72	3.20	313.93	156.96	320.34
106.00	42.0	313.04	3.16	316.20	158.10	322.53
107.00	42.0	315.53	3.12	318.66	159.33	324.91
108.00	42.0	318.21	3.09	321.30	160.65	327.47
109.00	42.0	321.07	3.06	324.13	162.07	330.26
110.00	42.0	324.11	3.05	327.16	163.58	333.27
111.00	42.0	327.29	3.06	330.35	165.18	336.48
112.00	42.0	330.58	3.08	333.66	166.83	339.83
113.00	42.0	333.97	3.12	337.09	168.55	343.34
114.00	42.0	337.47	3.17	340.64	170.32	346.99
115.00	42.0	341.07	3.24	344.31	172.16	350.79
116.00	42.0	344.59	3.32	347.91	173.96	354.56
117.00	42.0	347.06	3.42	350.47	175.24	357.31

118.00	42.0	348.56	3.53	352.09	176.04	359.15
119.00	42.0	349.64	3.66	353.31	176.65	360.64
120.00	42.0	350.44	3.82	354.26	177.13	361.91
121.00	42.0	351.35	3.99	355.35	177.67	363.33
122.00	42.0	352.73	4.17	356.90	178.45	365.23
123.00	42.0	354.54	4.34	358.88	179.44	367.57
124.00	42.0	356.79	4.52	361.31	180.66	370.34
125.00	42.0	359.48	4.68	364.16	182.08	373.53
126.00	42.0	362.43	4.85	367.28	183.64	376.97
127.00	42.0	365.82	4.99	370.81	185.40	380.78
128.00	42.0	369.59	5.10	374.69	187.35	384.89
129.00	42.0	373.41	5.19	378.60	189.30	388.99
130.00	42.0	377.28	5.26	382.54	191.27	393.06
131.00	42.0	381.20	5.31	386.51	193.25	397.12
132.00	42.0	385.20	5.32	390.53	195.26	401.17
133.00	42.0	389.27	5.31	394.59	197.29	405.22
134.00	42.0	393.42	5.30	398.72	199.36	409.32
135.00	42.0	397.63	5.29	402.92	201.46	413.51
136.00	42.0	401.88	5.29	407.17	203.58	417.75
137.00	42.0	406.12	5.30	411.41	205.71	422.01
138.00	42.0	410.35	5.31	415.66	207.83	426.28
139.00	42.0	414.58	5.32	419.90	209.95	430.53
140.00	42.0	418.80	5.31	424.11	212.05	434.72
141.00	42.0	422.93	5.29	428.22	214.11	438.80
142.00	42.0	426.90	5.26	432.17	216.08	442.69
143.00	42.0	430.71	5.23	435.94	217.97	446.40
144.00	42.0	434.34	5.21	439.56	219.78	449.99
145.00	42.0	437.81	5.22	443.03	221.52	453.47
146.00	42.0	441.26	5.24	446.50	223.25	456.98
147.00	42.0	444.83	5.26	450.09	225.05	460.62
148.00	42.0	448.52	5.29	453.81	226.91	464.40
149.00	42.0	452.34	5.34	457.67	228.84	468.35
150.00	42.0	456.28	5.39	461.66	230.83	472.44
151.00	42.0	460.22	5.45	465.67	232.84	476.58
152.00	42.0	464.05	5.54	469.58	234.79	480.66
153.00	42.0	467.75	5.65	473.40	236.70	484.69
154.00	42.0	471.33	5.78	477.10	238.55	488.66
155.00	42.0	474.79	5.92	480.71	240.36	492.56
156.00	42.0	478.20	6.09	484.29	242.15	496.47
157.00	42.0	481.67	6.26	487.93	243.97	500.46
158.00	42.0	485.18	6.45	491.63	245.81	504.52
159.00	42.0	488.74	6.64	495.38	247.69	508.65
160.00	42.0	492.34	6.83	499.17	249.59	512.83
161.00	42.0	496.07	7.02	503.09	251.55	517.13
162.00	42.0	500.01	7.20	507.20	253.60	521.60
163.00	42.0	504.14	7.37	511.51	255.76	526.25
164.00	42.0	508.48	7.54	516.02	258.01	531.09
165.00	42.0	513.03	7.70	520.72	260.36	536.12
166.00	42.0	517.42	7.86	525.28	262.64	540.99
167.00	42.0	521.30	8.02	529.32	264.66	545.35
168.00	42.0	524.66	8.18	532.84	266.42	549.20
169.00	42.0	527.51	8.37	535.88	267.94	552.63
170.00	42.0	546.59	8.61	555.21	277.60	572.43
171.00	42.0	548.53	8.63	557.16	278.58	574.41
172.00	42.0	550.38	8.67	559.05	279.53	576.40
173.00	42.0	552.14	8.76	560.89	280.45	578.41
174.00	42.0	553.82	8.88	562.70	281.35	580.46
175.00	42.0	555.47	9.03	564.51	282.25	582.58
176.00	42.0	557.10	9.22	566.33	283.16	584.77
177.00	42.0	558.73	9.45	568.18	284.09	587.07
178.00	42.0	560.37	9.70	570.07	285.03	589.46
179.00	42.0	562.03	9.98	572.01	286.00	591.97
180.00	42.0	563.71	10.30	574.01	287.00	594.60

181.00	42.0	565.58	10.64	576.22	288.11	597.50
182.00	42.0	567.80	11.00	578.80	289.40	600.81
183.00	42.0	570.38	11.38	581.76	290.88	604.52
184.00	42.0	573.31	11.78	585.09	292.55	608.64
185.00	42.0	576.64	12.18	588.81	294.41	613.16

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING.
   EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 2 x THE MOBILIZED END BEARING.

General Information:

Input file: .....11-15-153 Beckett Bridge\FB Deep\BB-6 Pre-Forming Post Lab.spc
Project number: 6511-15-153
Job name: Beckett Bridge
Engineer: Tierra-WA
Units: English

Analysis Information:

Analysis Type: SPT

Soil Information:

Boring date: 02/14/2017, Boring Number: BB-6
Station number: Offset:

Ground Elevation: -4.000(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	2.00	3- Clean sand
2	2.00	2.00	3- Clean sand
3	4.00	2.00	3- Clean sand
4	6.00	2.00	3- Clean sand
5	8.00	2.00	3- Clean sand
6	10.00	11.00	3- Clean sand
7	15.00	10.00	3- Clean sand
8	20.00	10.00	3- Clean sand
9	25.00	10.00	3- Clean sand
10	30.00	12.00	2- Clay and silty sand
11	35.00	3.00	2- Clay and silty sand
12	40.00	15.00	1- Plastic Clay
13	45.00	3.00	3- Clean sand
14	50.00	3.00	2- Clay and silty sand
15	55.00	2.00	3- Clean sand
16	60.00	2.00	3- Clean sand
17	65.00	2.00	2- Clay and silty sand
18	70.00	6.00	2- Clay and silty sand
19	75.00	12.00	5- Cavity layer
20	80.00	12.00	5- Cavity layer
21	85.00	11.00	5- Cavity layer
22	90.00	10.00	3- Clean sand
23	95.00	12.00	3- Clean sand
24	100.00	20.00	3- Clean sand
25	105.00	11.00	2- Clay and silty sand
26	110.00	19.00	3- Clean sand
27	115.00	24.00	2- Clay and silty sand
28	120.00	23.00	3- Clean sand
29	130.00	24.00	3- Clean sand
30	135.00	30.00	3- Clean sand
31	140.00	26.00	3- Clean sand
32	145.00	30.00	3- Clean sand

33	150.00	39.00	3- Clean sand
34	155.00	38.00	3- Clean sand
35	160.00	19.00	3- Clean sand
36	165.00	31.00	1- Plastic Clay
37	170.00	23.00	3- Clean sand
38	175.00	10.00	4- Lime Stone/Very shelly sand
39	190.00	10.00	4- Lime Stone/Very shelly sand

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	-4.00	-34.00	30.00	7.50	3-Clean Sand
2	-34.00	-44.00	10.00	7.50	2-Clay and Silty Sand
3	-44.00	-49.00	5.00	15.00	1-Plastic Clay
4	-49.00	-54.00	5.00	3.00	3-Clean Sand
5	-54.00	-59.00	5.00	3.00	2-Clay and Silty Sand
6	-59.00	-69.00	10.00	2.00	3-Clean Sand
7	-69.00	-79.00	10.00	4.00	2-Clay and Silty Sand
8	-79.00	-94.00	15.00	11.67	5-Void
9	-94.00	-109.00	15.00	14.00	3-Clean Sand
10	-109.00	-114.00	5.00	11.00	2-Clay and Silty Sand
11	-114.00	-119.00	5.00	19.00	3-Clean Sand
12	-119.00	-124.00	5.00	24.00	2-Clay and Silty Sand
13	-124.00	-169.00	45.00	28.00	3-Clean Sand
14	-169.00	-174.00	5.00	31.00	1-Plastic Clay
15	-174.00	-179.00	5.00	23.00	3-Clean Sand
16	-179.00	-194.00	15.00	10.00	4-Limestone, Very Shelly Sand

Driven Pile Data:

Pile unit weight = 490.00(pcf), Section Type: Pipe

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)	Thickness (in)	Pile End
42.00	1.00	-5.00	0.50	OPEN
42.00	2.00	-6.00	0.50	OPEN
42.00	3.00	-7.00	0.50	OPEN
42.00	4.00	-8.00	0.50	OPEN
42.00	5.00	-9.00	0.50	OPEN
42.00	6.00	-10.00	0.50	OPEN
42.00	7.00	-11.00	0.50	OPEN
42.00	8.00	-12.00	0.50	OPEN
42.00	9.00	-13.00	0.50	OPEN
42.00	10.00	-14.00	0.50	OPEN
42.00	11.00	-15.00	0.50	OPEN
42.00	12.00	-16.00	0.50	OPEN
42.00	13.00	-17.00	0.50	OPEN
42.00	14.00	-18.00	0.50	OPEN
42.00	15.00	-19.00	0.50	OPEN
42.00	16.00	-20.00	0.50	OPEN
42.00	17.00	-21.00	0.50	OPEN

42.00	18.00	-22.00	0.50	OPEN
42.00	19.00	-23.00	0.50	OPEN
42.00	20.00	-24.00	0.50	OPEN
42.00	21.00	-25.00	0.50	OPEN
42.00	22.00	-26.00	0.50	OPEN
42.00	23.00	-27.00	0.50	OPEN
42.00	24.00	-28.00	0.50	OPEN
42.00	25.00	-29.00	0.50	OPEN
42.00	26.00	-30.00	0.50	OPEN
42.00	27.00	-31.00	0.50	OPEN
42.00	28.00	-32.00	0.50	OPEN
42.00	29.00	-33.00	0.50	OPEN
42.00	30.00	-34.00	0.50	OPEN
42.00	31.00	-35.00	0.50	OPEN
42.00	32.00	-36.00	0.50	OPEN
42.00	33.00	-37.00	0.50	OPEN
42.00	34.00	-38.00	0.50	OPEN
42.00	35.00	-39.00	0.50	OPEN
42.00	36.00	-40.00	0.50	OPEN
42.00	37.00	-41.00	0.50	OPEN
42.00	38.00	-42.00	0.50	OPEN
42.00	39.00	-43.00	0.50	OPEN
42.00	40.00	-44.00	0.50	OPEN
42.00	41.00	-45.00	0.50	OPEN
42.00	42.00	-46.00	0.50	OPEN
42.00	43.00	-47.00	0.50	OPEN
42.00	44.00	-48.00	0.50	OPEN
42.00	45.00	-49.00	0.50	OPEN
42.00	46.00	-50.00	0.50	OPEN
42.00	47.00	-51.00	0.50	OPEN
42.00	48.00	-52.00	0.50	OPEN
42.00	49.00	-53.00	0.50	OPEN
42.00	50.00	-54.00	0.50	OPEN
42.00	51.00	-55.00	0.50	OPEN
42.00	52.00	-56.00	0.50	OPEN
42.00	53.00	-57.00	0.50	OPEN
42.00	54.00	-58.00	0.50	OPEN
42.00	55.00	-59.00	0.50	OPEN
42.00	56.00	-60.00	0.50	OPEN
42.00	57.00	-61.00	0.50	OPEN
42.00	58.00	-62.00	0.50	OPEN
42.00	59.00	-63.00	0.50	OPEN
42.00	60.00	-64.00	0.50	OPEN
42.00	61.00	-65.00	0.50	OPEN
42.00	62.00	-66.00	0.50	OPEN
42.00	63.00	-67.00	0.50	OPEN
42.00	64.00	-68.00	0.50	OPEN
42.00	65.00	-69.00	0.50	OPEN
42.00	66.00	-70.00	0.50	OPEN
42.00	67.00	-71.00	0.50	OPEN
42.00	68.00	-72.00	0.50	OPEN
42.00	69.00	-73.00	0.50	OPEN
42.00	70.00	-74.00	0.50	OPEN
42.00	71.00	-75.00	0.50	OPEN
42.00	72.00	-76.00	0.50	OPEN
42.00	73.00	-77.00	0.50	OPEN
42.00	74.00	-78.00	0.50	OPEN
42.00	75.00	-79.00	0.50	OPEN
42.00	76.00	-80.00	0.50	OPEN
42.00	77.00	-81.00	0.50	OPEN
42.00	78.00	-82.00	0.50	OPEN
42.00	79.00	-83.00	0.50	OPEN
42.00	80.00	-84.00	0.50	OPEN

42.00	81.00	-85.00	0.50	OPEN
42.00	82.00	-86.00	0.50	OPEN
42.00	83.00	-87.00	0.50	OPEN
42.00	84.00	-88.00	0.50	OPEN
42.00	85.00	-89.00	0.50	OPEN
42.00	86.00	-90.00	0.50	OPEN
42.00	87.00	-91.00	0.50	OPEN
42.00	88.00	-92.00	0.50	OPEN
42.00	89.00	-93.00	0.50	OPEN
42.00	90.00	-94.00	0.50	OPEN
42.00	91.00	-95.00	0.50	OPEN
42.00	92.00	-96.00	0.50	OPEN
42.00	93.00	-97.00	0.50	OPEN
42.00	94.00	-98.00	0.50	OPEN
42.00	95.00	-99.00	0.50	OPEN
42.00	96.00	-100.00	0.50	OPEN
42.00	97.00	-101.00	0.50	OPEN
42.00	98.00	-102.00	0.50	OPEN
42.00	99.00	-103.00	0.50	OPEN
42.00	100.00	-104.00	0.50	OPEN
42.00	101.00	-105.00	0.50	OPEN
42.00	102.00	-106.00	0.50	OPEN
42.00	103.00	-107.00	0.50	OPEN
42.00	104.00	-108.00	0.50	OPEN
42.00	105.00	-109.00	0.50	OPEN
42.00	106.00	-110.00	0.50	OPEN
42.00	107.00	-111.00	0.50	OPEN
42.00	108.00	-112.00	0.50	OPEN
42.00	109.00	-113.00	0.50	OPEN
42.00	110.00	-114.00	0.50	OPEN
42.00	111.00	-115.00	0.50	OPEN
42.00	112.00	-116.00	0.50	OPEN
42.00	113.00	-117.00	0.50	OPEN
42.00	114.00	-118.00	0.50	OPEN
42.00	115.00	-119.00	0.50	OPEN
42.00	116.00	-120.00	0.50	OPEN
42.00	117.00	-121.00	0.50	OPEN
42.00	118.00	-122.00	0.50	OPEN
42.00	119.00	-123.00	0.50	OPEN
42.00	120.00	-124.00	0.50	OPEN
42.00	121.00	-125.00	0.50	OPEN
42.00	122.00	-126.00	0.50	OPEN
42.00	123.00	-127.00	0.50	OPEN
42.00	124.00	-128.00	0.50	OPEN
42.00	125.00	-129.00	0.50	OPEN
42.00	126.00	-130.00	0.50	OPEN
42.00	127.00	-131.00	0.50	OPEN
42.00	128.00	-132.00	0.50	OPEN
42.00	129.00	-133.00	0.50	OPEN
42.00	130.00	-134.00	0.50	OPEN
42.00	131.00	-135.00	0.50	OPEN
42.00	132.00	-136.00	0.50	OPEN
42.00	133.00	-137.00	0.50	OPEN
42.00	134.00	-138.00	0.50	OPEN
42.00	135.00	-139.00	0.50	OPEN
42.00	136.00	-140.00	0.50	OPEN
42.00	137.00	-141.00	0.50	OPEN
42.00	138.00	-142.00	0.50	OPEN
42.00	139.00	-143.00	0.50	OPEN
42.00	140.00	-144.00	0.50	OPEN
42.00	141.00	-145.00	0.50	OPEN
42.00	142.00	-146.00	0.50	OPEN
42.00	143.00	-147.00	0.50	OPEN

42.00	144.00	-148.00	0.50	OPEN
42.00	145.00	-149.00	0.50	OPEN
42.00	146.00	-150.00	0.50	OPEN
42.00	147.00	-151.00	0.50	OPEN
42.00	148.00	-152.00	0.50	OPEN
42.00	149.00	-153.00	0.50	OPEN
42.00	150.00	-154.00	0.50	OPEN
42.00	151.00	-155.00	0.50	OPEN
42.00	152.00	-156.00	0.50	OPEN
42.00	153.00	-157.00	0.50	OPEN
42.00	154.00	-158.00	0.50	OPEN
42.00	155.00	-159.00	0.50	OPEN
42.00	156.00	-160.00	0.50	OPEN
42.00	157.00	-161.00	0.50	OPEN
42.00	158.00	-162.00	0.50	OPEN
42.00	159.00	-163.00	0.50	OPEN
42.00	160.00	-164.00	0.50	OPEN
42.00	161.00	-165.00	0.50	OPEN
42.00	162.00	-166.00	0.50	OPEN
42.00	163.00	-167.00	0.50	OPEN
42.00	164.00	-168.00	0.50	OPEN
42.00	165.00	-169.00	0.50	OPEN
42.00	166.00	-170.00	0.50	OPEN
42.00	167.00	-171.00	0.50	OPEN
42.00	168.00	-172.00	0.50	OPEN
42.00	169.00	-173.00	0.50	OPEN
42.00	170.00	-174.00	0.50	OPEN
42.00	171.00	-175.00	0.50	OPEN
42.00	172.00	-176.00	0.50	OPEN
42.00	173.00	-177.00	0.50	OPEN
42.00	174.00	-178.00	0.50	OPEN
42.00	175.00	-179.00	0.50	OPEN

Driven Pile Capacity:
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Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	42.0	0.00	0.00	0.00	0.00	0.00
2.00	42.0	0.00	0.00	0.00	0.00	0.00
3.00	42.0	0.00	0.00	0.00	0.00	0.00
4.00	42.0	0.00	0.00	0.00	0.00	0.00
5.00	42.0	0.00	0.00	0.00	0.00	0.00
6.00	42.0	0.00	0.00	0.00	0.00	0.00
7.00	42.0	0.00	0.00	0.00	0.00	0.00
8.00	42.0	0.00	0.00	0.00	0.00	0.00
9.00	42.0	0.40	0.39	0.78	0.39	1.56
10.00	42.0	1.53	1.08	2.60	1.30	4.76
11.00	42.0	2.97	1.17	4.14	2.07	6.48
12.00	42.0	4.39	1.26	5.64	2.82	8.16

13.00	42.0	5.80	1.34	7.15	3.57	9.83
14.00	42.0	7.24	1.43	8.67	4.34	11.53
15.00	42.0	8.71	1.51	10.22	5.11	13.25
16.00	42.0	10.23	1.59	11.83	5.91	15.01
17.00	42.0	11.82	1.67	13.49	6.75	16.84
18.00	42.0	13.49	1.75	15.23	7.62	18.72
19.00	42.0	15.26	1.81	17.06	8.53	20.67
20.00	42.0	17.15	1.85	18.99	9.50	22.68
21.00	42.0	19.16	1.86	21.03	10.51	24.76
22.00	42.0	21.13	1.81	22.93	11.47	26.54
23.00	42.0	23.11	1.73	24.84	12.42	28.29
24.00	42.0	25.11	1.65	26.77	13.38	30.07
25.00	42.0	27.13	1.59	28.72	14.36	31.90
26.00	42.0	29.38	1.54	30.91	15.46	33.98
27.00	42.0	32.06	1.49	33.55	16.78	36.54
28.00	42.0	35.19	1.47	36.65	18.33	39.59
29.00	42.0	38.78	1.47	40.24	20.12	43.17
30.00	42.0	54.30	0.98	55.28	27.64	57.23
31.00	42.0	57.38	1.01	58.39	29.20	60.42
32.00	42.0	60.50	1.02	61.52	30.76	63.56
33.00	42.0	63.50	1.01	64.51	32.25	66.52
34.00	42.0	66.11	0.98	67.09	33.55	69.05
35.00	42.0	66.69	0.87	67.55	33.78	69.28
36.00	42.0	67.35	0.78	68.13	34.07	69.69
37.00	42.0	69.36	0.72	70.08	35.04	71.53
38.00	42.0	72.69	0.69	73.38	36.69	74.75
39.00	42.0	77.36	0.65	78.01	39.01	79.32
40.00	42.0	83.37	0.31	83.67	41.84	84.29
41.00	42.0	86.00	0.38	86.38	43.19	87.13
42.00	42.0	89.17	0.41	89.57	44.79	90.39
43.00	42.0	92.50	0.41	92.91	46.46	93.74
44.00	42.0	95.62	0.39	96.01	48.01	96.80
45.00	42.0	100.04	0.00	100.04	50.02	100.04
46.00	42.0	100.04	0.00	100.04	50.02	100.04
47.00	42.0	100.04	0.00	100.04	50.02	100.04
48.00	42.0	100.04	0.00	100.04	50.02	100.04
49.00	42.0	100.04	0.00	100.04	50.02	100.04
50.00	42.0	100.04	0.59	100.63	50.31	101.80
51.00	42.0	100.04	0.54	100.58	50.29	101.66
52.00	42.0	100.04	0.49	100.54	50.27	101.53
53.00	42.0	100.04	0.45	100.49	50.25	101.39
54.00	42.0	100.04	0.41	100.45	50.23	101.27
55.00	42.0	100.04	0.38	100.43	50.21	101.19
56.00	42.0	100.04	0.36	100.41	50.20	101.14
57.00	42.0	100.04	0.36	100.40	50.20	101.11
58.00	42.0	100.04	0.36	100.40	50.20	101.12
59.00	42.0	100.04	0.36	100.41	50.20	101.13
60.00	42.0	100.04	0.36	100.41	50.20	101.13
61.00	42.0	100.04	0.36	100.41	50.20	101.14
62.00	42.0	100.04	0.36	100.41	50.20	101.13
63.00	42.0	100.04	0.36	100.41	50.20	101.13
64.00	42.0	100.04	0.36	100.40	50.20	101.12
65.00	42.0	100.04	0.35	100.40	50.20	101.10
66.00	42.0	100.34	0.34	100.67	50.34	101.34
67.00	42.0	101.22	0.31	101.53	50.77	102.15
68.00	42.0	102.70	0.27	102.97	51.48	103.51
69.00	42.0	104.76	0.23	104.99	52.49	105.45
70.00	42.0	107.41	0.19	107.60	53.80	107.98
71.00	42.0	110.06	0.15	110.22	55.11	110.52
72.00	42.0	112.13	0.13	112.25	56.13	112.50
73.00	42.0	113.60	0.11	113.71	56.86	113.93
74.00	42.0	114.49	0.12	114.60	57.30	114.84
75.00	42.0	114.78	0.00	114.78	57.39	114.78

76.00	42.0	114.78	0.00	114.78	57.39	114.78
77.00	42.0	114.78	0.00	114.78	57.39	114.78
78.00	42.0	114.78	0.00	114.78	57.39	114.78
79.00	42.0	114.78	0.00	114.78	57.39	114.78
80.00	42.0	114.78	0.00	114.78	57.39	114.78
81.00	42.0	114.78	0.00	114.78	57.39	114.78
82.00	42.0	114.78	0.00	114.78	57.39	114.78
83.00	42.0	114.78	0.00	114.78	57.39	114.78
84.00	42.0	114.78	0.00	114.78	57.39	114.78
85.00	42.0	114.78	0.00	114.78	57.39	114.78
86.00	42.0	115.00	0.00	115.00	57.50	115.00
87.00	42.0	115.67	0.00	115.67	57.84	115.67
88.00	42.0	116.78	0.00	116.78	58.39	116.78
89.00	42.0	118.34	0.00	118.34	59.17	118.34
90.00	42.0	120.34	2.04	122.38	61.19	126.46
91.00	42.0	122.52	2.04	124.57	62.28	128.65
92.00	42.0	124.68	2.05	126.73	63.36	130.82
93.00	42.0	126.90	2.05	128.95	64.48	133.06
94.00	42.0	129.13	2.06	131.19	65.60	135.32
95.00	42.0	131.31	2.08	133.39	66.69	137.54
96.00	42.0	133.50	2.10	135.60	67.80	139.79
97.00	42.0	135.76	2.12	137.88	68.94	142.12
98.00	42.0	138.07	2.15	140.22	70.11	144.53
99.00	42.0	140.52	2.19	142.71	71.36	147.09
100.00	42.0	143.15	2.23	145.38	72.69	149.83

Section Type: Pipe
Pile Width: 42.00 (in)
Thickness: 0.50 (in)
End Type: open end

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
101.00	42.0	145.87	2.27	148.14	74.07	152.68
102.00	42.0	148.57	2.32	150.90	75.45	155.54
103.00	42.0	151.25	2.39	153.63	76.82	158.40
104.00	42.0	153.82	2.47	156.29	78.15	161.23
105.00	42.0	169.57	4.20	173.77	86.88	182.16
106.00	42.0	174.13	3.38	177.51	88.75	184.27
107.00	42.0	178.49	3.63	182.12	91.06	189.38
108.00	42.0	182.65	3.87	186.52	93.26	194.26
109.00	42.0	186.60	4.09	190.69	95.35	198.87
110.00	42.0	190.36	3.92	194.28	97.14	202.12
111.00	42.0	194.27	3.92	198.19	99.10	206.04
112.00	42.0	198.65	3.94	202.59	101.29	210.46
113.00	42.0	203.47	3.96	207.43	103.72	215.35
114.00	42.0	208.72	3.99	212.71	106.36	220.69
115.00	42.0	218.19	4.60	222.79	111.39	231.98
116.00	42.0	225.15	4.61	229.75	114.88	238.96
117.00	42.0	231.19	4.63	235.82	117.91	245.08
118.00	42.0	236.44	4.66	241.11	120.55	250.43
119.00	42.0	240.95	4.71	245.67	122.83	255.09
120.00	42.0	247.08	5.10	252.18	126.09	262.37
121.00	42.0	251.09	5.10	256.19	128.10	266.39
122.00	42.0	254.95	5.11	260.06	130.03	270.28
123.00	42.0	258.66	5.13	263.79	131.89	274.04
124.00	42.0	262.26	5.15	267.42	133.71	277.72
125.00	42.0	265.81	5.18	270.99	135.50	281.36

126.00	42.0	269.34	5.21	274.55	137.28	284.98
127.00	42.0	272.88	5.25	278.13	139.06	288.62
128.00	42.0	276.46	5.28	281.74	140.87	292.30
129.00	42.0	279.99	5.32	285.31	142.66	295.95
130.00	42.0	283.42	5.37	288.79	144.39	299.52
131.00	42.0	286.78	5.42	292.20	146.10	303.05
132.00	42.0	290.13	5.49	295.62	147.81	306.60
133.00	42.0	293.45	5.57	299.02	149.51	310.16
134.00	42.0	296.78	5.66	302.44	151.22	313.76
135.00	42.0	300.16	5.76	305.92	152.96	317.43
136.00	42.0	303.49	5.87	309.36	154.68	321.09
137.00	42.0	306.68	5.99	312.68	156.34	324.66
138.00	42.0	309.75	6.14	315.88	157.94	328.16
139.00	42.0	312.75	6.29	319.04	159.52	331.62
140.00	42.0	315.70	6.46	322.16	161.08	335.08
141.00	42.0	318.69	6.64	325.32	162.66	338.59
142.00	42.0	321.79	6.82	328.61	164.31	342.25
143.00	42.0	325.02	7.01	332.03	166.02	346.05
144.00	42.0	328.54	7.18	335.72	167.86	350.09
145.00	42.0	332.42	7.32	339.74	169.87	354.39
146.00	42.0	336.70	7.42	344.13	172.06	358.97
147.00	42.0	341.44	7.48	348.91	174.46	363.86
148.00	42.0	346.64	7.48	354.12	177.06	369.08
149.00	42.0	352.24	7.44	359.68	179.84	374.56
150.00	42.0	358.18	7.37	365.56	182.78	380.30
151.00	42.0	364.42	7.28	371.69	185.85	386.25
152.00	42.0	370.18	7.12	377.30	188.65	391.54
153.00	42.0	375.31	6.92	382.23	191.11	396.06
154.00	42.0	380.43	6.73	387.16	193.58	400.62
155.00	42.0	385.55	6.56	392.11	196.06	405.24
156.00	42.0	390.53	6.43	396.97	198.48	409.83
157.00	42.0	395.25	6.34	401.60	200.80	414.28
158.00	42.0	399.70	6.30	406.00	203.00	418.60
159.00	42.0	403.87	6.28	410.15	205.08	422.72
160.00	42.0	407.77	6.27	414.04	207.02	426.59
161.00	42.0	412.10	6.27	418.37	209.18	430.91
162.00	42.0	417.56	6.27	423.83	211.91	436.36
163.00	42.0	424.16	6.26	430.43	215.21	442.96
164.00	42.0	431.93	6.27	438.19	219.10	450.73
165.00	42.0	463.08	5.16	468.23	234.12	478.54
166.00	42.0	472.53	4.36	476.89	238.45	485.62
167.00	42.0	480.79	4.56	485.36	242.68	494.48
168.00	42.0	487.86	4.74	492.60	246.30	502.08
169.00	42.0	493.73	4.89	498.63	249.31	508.41
170.00	42.0	498.41	6.25	504.66	252.33	517.17
171.00	42.0	502.20	6.21	508.41	254.20	520.83
172.00	42.0	505.39	6.17	511.55	255.78	523.89
173.00	42.0	507.98	6.12	514.10	257.05	526.34
174.00	42.0	509.97	6.07	516.05	258.02	528.19
175.00	42.0	511.37	5.43	516.80	258.40	527.67

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING.
   EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE

ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS
2 x THE MOBILIZED END BEARING.

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	BB-3 (Tierra)
Ground Surface Elevation (ft)	-5.0
Ground Water Table Elevation (ft)	0.0

Foundation Type	Steel Pipe Pile
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	1.81

	Layer No.	1	2	3	4	5	6	7	8	9
	Soil Description	Sand	Limestone	Clay	Limestone	Limestone	Sand	Limestone	Sand	Sand
	Soil Type	Cohesionless	Rock	Cohesive	Rock	Rock	Cohesionless	Rock	Cohesionless	Cohesionless
	Top Boundary Elevation (ft)	-5.00	-23.50	-38.50	-43.50	-63.50	-68.50	-73.50	-88.50	-128.50
	Bottom boundary Elevation (ft)	-23.50	-38.50	-43.50	-63.50	-68.50	-73.50	-88.50	-128.50	-185.00
	Average SPT N-Value (Blows/ft)	130	133	31	122	7	11	114	20	40
LATERAL	Soil Model	Sand (Reese)	Limestone (McVay)	Clay (Stiff<Water)	Limestone (McVay)	Limestone (McVay)	Sand (Reese)	Limestone (McVay)	Sand (Reese)	Sand (Reese)
	Internal Friction Angle, ϕ	35	-	-	-	-	31	-	33	35
	Total Unit Weight (pcf), γ_t	125	135	125	135	115	105	135	110	120
	Subgrade Modulus (pci), k	125	-	1380	-	-	31	-	56	111
	Undrained Shear Strength (psf), c_u	-	-	3875	-	-	-	-	-	-
	Major Principal Strain @ ε_{50}	-	-	0.007	-	-	-	-	-	-
	Major Principal Strain @ ε_{100}	-	-	-	-	-	-	-	-	-
	Average Undrained Shear Strength (psf)	-	-	3875	-	-	-	-	-	-
	Unconfined Compressive Strength (psf)	-	80000	-	80000	5830	-	80000	-	-
AXIAL	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
	Total Unit Weight (pcf), γ_t	125	135	125	135	115	105	135	110	120
	Shear Modulus (ksi), G	3.47	92.59	4.62	92.59	95.79	0.88	92.59	1.60	3.42
	Poisson's ratio, ν	0.30	0.50	0.50	0.50	0.45	0.30	0.50	0.30	0.30
	Ultimate Unit Skin Friction (psf) (Pile)	1396	1200	1808	1200	140	418	1200	743	1245
	Undrained Shear Strength (psf), c_u	-	-	3875	-	-	-	-	-	-
	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	-	-	-	-	-	-	-
	Mass Modulus (ksi)	-	-	-	-	-	-	-	-	-
	Modulus Ratio	-	-	-	-	-	-	-	-	-
	Surface (Rough/Smooth)	-	-	-	-	-	-	-	-	-
	Unconfined Compressive Strength (psf)	-	-	-	-	-	-	-	-	-
	Split Tensile Strength (psf)	-	-	-	-	-	-	-	-	-
	Concrete Unit Weight (pcf)	-	-	-	-	-	-	-	-	-
	Slump (in)	-	-	-	-	-	-	-	-	-
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic
	Total Unit Weight (pcf), γ_t	125	135	125	135	115	105	135	110	120
	Internal Friction Angle, ϕ	35	-	-	-	-	31	-	33	35
	Undrained Shear Strength (psf), c_u	-	-	3875	-	-	-	-	-	-
	Shear Modulus (ksi), G	3.47	92.59	4.62	92.59	95.79	0.88	92.59	1.60	3.42
	Torsional Shear Stress (psf)	1396	1200	1808	1200	140	418	1200	743	1245
TIP	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
	Shear Modulus (ksi), G	3.47	92.59	4.62	92.59	95.79	0.88	92.59	1.60	3.42
	Poisson's ratio, ν	0.30	0.50	0.50	0.50	0.45	0.30	0.50	0.30	0.30
	Unit Bearing , ksf	216	258	43	258	50	70	258	128	200
	Axial Bearing Failure, kips	2077.9	2482.0	417.5	2482.0	484.8	677.2	2482.0	1231.4	1924.0
	Uncorrected SPT-N Value (blows/ft)	-	-	-	-	-	-	-	-	-
	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
	IGM Mass Modulus (ksi), E_m	-	-	-	-	-	-	-	-	-

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	BB-4 (Tierra)
Ground Surface Elevation (ft)	-6.0
Ground Water Table Elevation (ft)	0.0

Foundation Type	Steel Pipe Pile
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	1.81

	Layer No.	1	2	3	4	5	6	7	8	9
	Soil Description	Sand	Limestone	Sand	Limestone	Sand	Limestone	Limestone	Sand	Limestone
	Soil Type	Cohesionless	Rock	Cohesionless	Rock	Cohesionless	Rock	Rock	Cohesionless	Rock
	Top Boundary Elevation (ft)	-6.00	-14.00	-19.50	-24.50	-44.50	-49.50	-54.50	-59.50	-174.50
	Bottom boundary Elevation (ft)	-14.00	-19.50	-24.50	-44.50	-49.50	-54.50	-59.50	-174.50	-191.00
	Average SPT N-Value (Blows/ft)	5	63	124	124	1	124	6	25	31
LATERAL	Soil Model	Sand (Reese)	Limestone (McVay)	Sand (Reese)	Limestone (McVay)	Sand (Reese)	Limestone (McVay)	Limestone (McVay)	Sand (Reese)	Limestone (McVay)
LATERAL	Internal Friction Angle, ϕ	29	-	35	-	28	-	-	34	-
LATERAL	Total Unit Weight (pcf), γ_t	105	135	125	135	100	135	115	115	135
LATERAL	Subgrade Modulus (pci), k	14	-	125	-	3	-	-	69	-
LATERAL	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
LATERAL	Major Principal Strain @ ε_{50}	-	-	-	-	-	-	-	-	-
LATERAL	Major Principal Strain @ ε_{100}	-	-	-	-	-	-	-	-	-
LATERAL	Average Undrained Shear Strength (psf)	-	-	-	-	-	-	-	-	-
LATERAL	Unconfined Compressive Strength (psf)	-	60260	-	80000	-	80000	5000	-	26400
AXIAL	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
AXIAL	Total Unit Weight (pcf), γ_t	105	135	125	135	100	135	115	115	135
AXIAL	Shear Modulus (ksi), G	0.42	92.59	3.47	92.59	0.08	92.59	95.79	2.00	92.59
AXIAL	Poisson's ratio, ν	0.25	0.50	0.30	0.50	0.25	0.50	0.45	0.30	0.50
AXIAL	Ultimate Unit Skin Friction (psf) (Pile)	171	1200	1396	1200	6	1200	120	898	620
AXIAL	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
AXIAL	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	-	-	-	-	-	-	-
AXIAL	Mass Modulus (ksi)	-	-	-	-	-	-	-	-	-
AXIAL	Modulus Ratio	-	-	-	-	-	-	-	-	-
AXIAL	Surface (Rough/Smooth)	-	-	-	-	-	-	-	-	-
AXIAL	Unconfined Compressive Strength (psf)	-	-	-	-	-	-	-	-	-
AXIAL	Split Tensile Strength (psf)	-	-	-	-	-	-	-	-	-
AXIAL	Concrete Unit Weight (pcf)	-	-	-	-	-	-	-	-	-
AXIAL	Slump (in)	-	-	-	-	-	-	-	-	-
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic
TORSIONAL	Total Unit Weight (pcf), γ_t	105	135	125	135	100	135	115	115	135
TORSIONAL	Internal Friction Angle, ϕ	29	-	35	-	28	-	-	34	-
TORSIONAL	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
TORSIONAL	Shear Modulus (ksi), G	0.42	92.59	3.47	92.59	0.08	92.59	95.79	2.00	92.59
TORSIONAL	Torsional Shear Stress (psf)	171	1200	1396	1200	6	1200	120	898	620
TIP	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
TIP	Shear Modulus (ksi), G	0.42	92.59	3.47	92.59	0.08	92.59	95.79	2.00	92.59
TIP	Poisson's ratio, ν	0.25	0.50	0.30	0.50	0.25	0.50	0.45	0.30	0.50
TIP	Unit Bearing , ksf	32	258	216	258	6	258	43	160	217
TIP	Axial Bearing Failure, kips	307.8	2482.0	2077.9	2482.0	61.6	2482.0	415.6	1539.2	2091.4
TIP	Uncorrected SPT-N Value (blows/ft)	-	-	-	-	-	-	-	-	-
TIP	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
TIP	IGM Mass Modulus (ksi), E_m	-	-	-	-	-	-	-	-	-

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	BB-6 (Tierra)
Ground Surface Elevation (ft)	-4.0
Ground Water Table Elevation (ft)	0.0

Foundation Type	Steel Pipe Pile
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	1.81

	Layer No.	1	2	3	4	5	6	7	8	9
	Soil Description	Sand	Clay	Limestone	Sand	Clay	Sand	Clay	Sand	Limestone
	Soil Type	Cohesionless	Cohesive	Rock	Cohesionless	Cohesive	Cohesionless	Cohesive	Cohesionless	Rock
	Top Boundary Elevation (ft)	-4.00	-12.00	-17.50	-32.50	-42.50	-47.50	-167.50	-172.50	-177.50
	Bottom boundary Elevation (ft)	-12.00	-17.50	-32.50	-42.50	-47.50	-167.50	-172.50	-177.50	-179.00
	Average SPT N-Value (Blows/ft)	5	14	124	9	19	20	38	29	59
LATERAL	Soil Model	Sand (Reese)	Clay (Stiff<Water)	Limestone (McVay)	Sand (Reese)	Clay (Stiff<Water)	Sand (Reese)	Clay (Stiff<Water)	Sand (Reese)	Limestone (McVay)
	Internal Friction Angle, ϕ	29	-	-	30	-	33	-	35	-
	Total Unit Weight (pcf), γ_t	105	115	135	105	120	110	125	115	135
	Subgrade Modulus (pci), k	14	530	-	25	780	56	1730	81	-
	Undrained Shear Strength (psf), c_u	-	1750	-	-	2375	-	4750	-	-
	Major Principal Strain @ ε_{50}	-	0.010	-	-	0.007	-	0.007	-	-
	Major Principal Strain @ ε_{100}	-	-	-	-	-	-	-	-	-
	Average Undrained Shear Strength (psf)	-	1750	-	-	2375	-	4750	-	-
	Unconfined Compressive Strength (psf)	-	-	80000	-	-	-	-	-	58130
AXIAL	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
	Total Unit Weight (pcf), γ_t	105	115	135	105	120	110	125	115	135
	Shear Modulus (ksi), G	0.42	2.11	92.59	0.75	2.85	1.60	4.63	2.32	0.00
	Poisson's ratio, ν	0.25	0.50	0.50	0.25	0.50	0.30	0.50	0.30	0.50
	Ultimate Unit Skin Friction (psf) (Pile)	171	1199	1200	338	1455	743	1899	1009	1180
	Undrained Shear Strength (psf), c_u	-	1750	-	-	2375	-	4750	-	-
	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	-	-	-	-	-	-	-
	Mass Modulus (ksi)	-	-	-	-	-	-	-	-	-
	Modulus Ratio	-	-	-	-	-	-	-	-	-
	Surface (Rough/Smooth)	-	-	-	-	-	-	-	-	-
	Unconfined Compressive Strength (psf)	-	-	-	-	-	-	-	-	-
	Split Tensile Strength (psf)	-	-	-	-	-	-	-	-	-
	Concrete Unit Weight (pcf)	-	-	-	-	-	-	-	-	-
	Slump (in)	-	-	-	-	-	-	-	-	-
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic
	Total Unit Weight (pcf), γ_t	105	115	135	105	120	110	125	115	135
	Internal Friction Angle, ϕ	29	-	-	30	-	33	-	35	-
	Undrained Shear Strength (psf), c_u	-	1750	-	-	2375	-	4750	-	-
	Shear Modulus (ksi), G	0.42	2.11	92.59	0.75	2.85	1.60	4.63	2.32	0.00
	Torsional Shear Stress (psf)	171	1199	1200	338	1455	743	1899	1009	1180
TIP	Soil Model	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile
	Shear Modulus (ksi), G	0.42	2.11	92.59	0.75	2.85	1.60	4.63	2.32	0.00
	Poisson's ratio, ν	0.25	0.50	0.50	0.25	0.50	0.30	0.50	0.30	0.50
	Unit Bearing , ksf	32	20	258	58	27	128	53	186	257
	Axial Bearing Failure, kips	307.8	188.6	2482.0	554.1	255.9	1231.4	511.8	1785.5	2468.5
	Uncorrected SPT-N Value (blows/ft)	-	-	-	-	-	-	-	-	-
	Undrained Shear Strength (psf), c_u	-	-	-	-	-	-	-	-	-
	IGM Mass Modulus (ksi), E_m	-	-	-	-	-	-	-	-	-

APPENDIX E

Summary of Rock Core Laboratory Testing

Data Reduction Table for Rock Cores

Drilled Shaft Nominal Bearing Resistance Curves

Sample Drilled Shaft Analysis Spreadsheet

Photographs of the Rock Cores

FB-Multipier Parameters

Summary of Rock Core Laboratory Testing
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No. 6511-15-153

Boring	Depth (ft)	Associated Photo	Comment	Average Diameter (in)	Average Length (in)	L/D	Total Volume $(ft)^3$	Total Core Weight (lb)	Core Moisture Content (%)	Core Dry Weight (lb)	Unit Weight (pcf)	Splitting Tensile Strength (psi)	Max Unconfined Compression (psi)	Core Time (min)	Core Recovery (%)	Rock Quality Designation (RQD)
BB-1	24-29	B	---	2.40	4.03	1.68	0.0105	1.37	5.0	1.30	124	---	617	28	69%	33%
		E	---	2.39	2.52	1.05	0.0065	0.96	5.8	0.91	139	802	---	28	69%	33%
		E	---	2.39	4.93	2.06	0.0128	1.85	5.3	1.76	137	---	3132	28	69%	33%
		H	---	2.38	2.55	1.07	0.0066	0.73	8.1	0.68	103	53	---	28	69%	33%
	38.5-43.5	A	Sample Too Poor for Testing	---	---	---	---	---	---	---	---	---	---	---	---	---
		A	Sample Too Poor for Testing	---	---	---	---	---	---	---	---	---	---	---	---	---
		E	---	2.39	4.93	2.06	0.0128	1.56	4.1	1.50	117	---	495	19	55%	36%
		F	---	2.40	2.57	1.07	0.0067	0.80	6.2	0.75	112	307	---	19	55%	36%
	69.5-74.5	C	---	2.40	4.19	1.75	0.0110	1.52	4.9	1.45	132	---	2710	23	69%	40%
		D	---	2.42	2.52	1.04	0.0067	0.86	5.4	0.82	122	128	---	23	69%	40%
		H	---	2.40	3.53	1.47	0.0092	1.73	5.9	1.63	177	---	566	23	69%	40%
		I	---	2.39	2.54	1.06	0.0066	1.02	5.5	0.97	147	479	---	23	69%	40%
BB-3	38.5-43.5	B	---	2.39	2.46	1.03	0.0064	0.90	0.9	0.89	140	637	---	25	75%	14%
		H	Correction Factor Applied	2.39	3.63	1.52	0.0094	1.09	4.3	1.04	110	---	472	25	75%	14%
		F	---	2.39	2.52	1.05	0.0065	0.81	0.6	0.81	124	242	---	25	75%	14%
	68.5-73.5	A	---	2.38	2.46	1.03	0.0063	0.75	0.8	0.75	118	335	---	20	91%	70%
		B	---	2.38	4.82	2.03	0.0124	1.38	1.6	1.35	109	---	1135	20	91%	70%
		D	---	2.38	2.48	1.04	0.0064	0.77	0.9	0.76	120	403	---	20	91%	70%
		E	---	2.38	2.51	1.05	0.0065	0.81	0.5	0.80	124	776	---	20	91%	70%
		G	---	2.38	4.83	2.03	0.0124	1.57	2.4	1.54	124	---	1306	20	91%	70%
		H	---	2.39	4.82	2.02	0.0125	1.45	3.0	1.40	112	---	568	20	91%	70%

Data Reduction Table for Rock Cores
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No. 6511-15-153

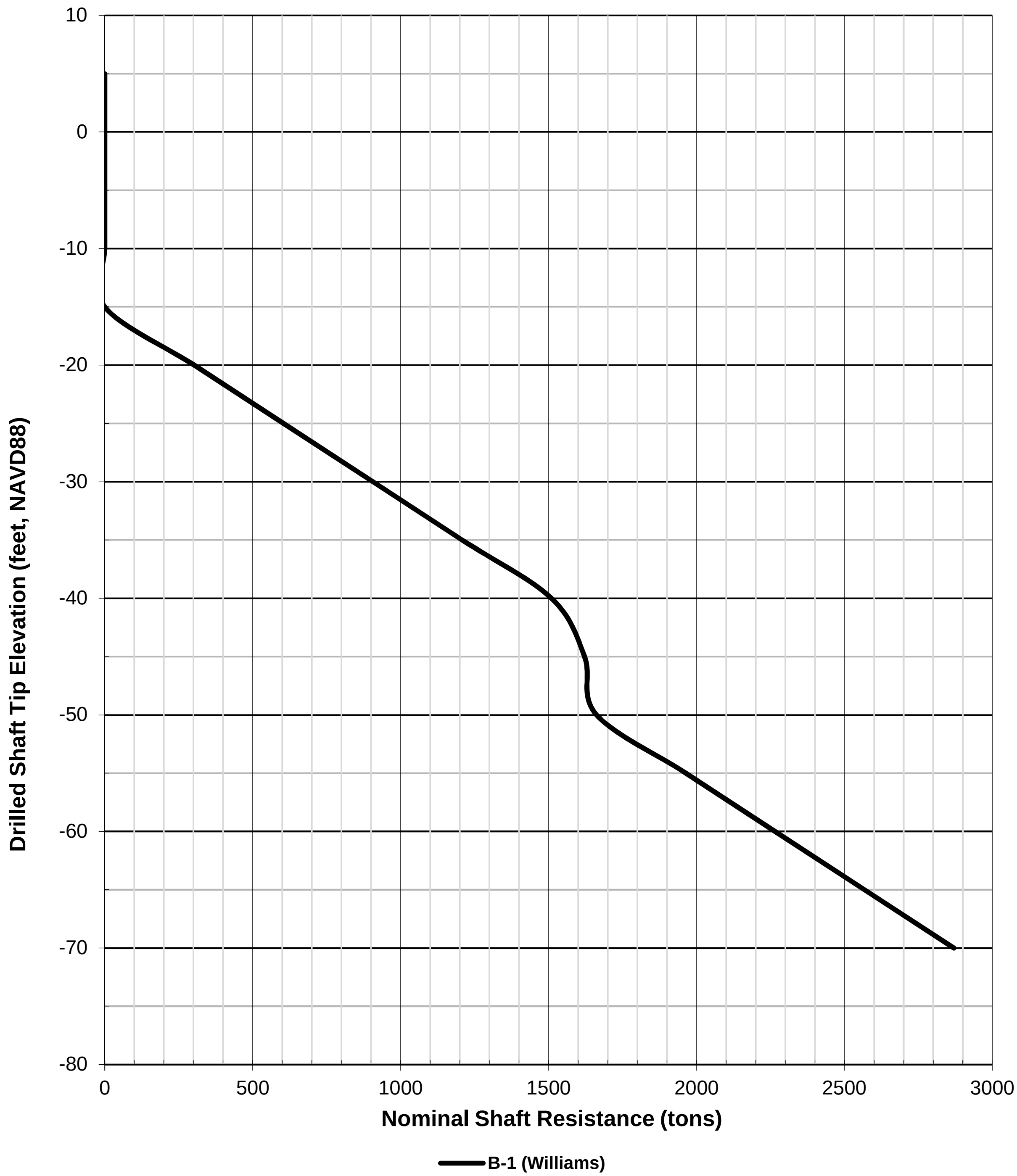
Boring	Depth (ft)	Assocaited Photo	Comment	Core Recovery (%)	Rock Quality Designation (RQD)	Splitting Tensile Strength, q_t (psi)	Unconfined Compression Strength, q_u (psi)	Convert to ksf: Splitting Tensile Strength, q_t (ksf)	Convert to ksf: Unconfined Compression Strength, q_u (ksf)	Removal of Outliers (Step 3)(1): Splitting Tensile Strength, q_t (ksf)	Removal of Outliers (Step 3)(1): Unconfined Compression Strength, q_u (ksf)
BB-1	24-29	E	---	70%	33%	802	---	115	---	---	---
		B	---	70%	33%	---	617	---	89	---	89
		E	---	70%	33%	---	3132	---	451	---	---
		H	---	70%	33%	53	---	8	---	8	---
	38.5-43.5	A	Sample Too Poor for Testing	---	---	---	---	---	---	---	---
		A	Sample Too Poor for Testing	---	---	---	---	---	---	---	---
		E	---	55%	36%	---	495	---	71	---	71
		F	---	55%	36%	307	---	44	---	44	---
	69.5-74.5	C	---	69%	40%	---	2710	---	390	---	---
		D	---	69%	40%	128	---	18	---	18	---
		H	---	69%	40%	---	566	---	82	---	82
		I	---	69%	40%	479	---	69	---	69	---
BB-3	38.5-43.5	B	---	75%	14%	637	---	92	---	92	---
		F	q_u Correction Factor Applied	75%	14%	---	472	---	68	---	68
		H	---	75%	14%	242	---	35	---	35	---
	68.5-73.5	A	---	91%	70%	335	---	48	---	48	---
		B	---	91%	70%	---	1135	---	163	---	163
		D	---	91%	70%	403	---	58	---	58	---
		E	---	91%	70%	776	---	112	---	---	---
		G	---	91%	70%	---	1306	---	188	---	188
		H	---	91%	70%	---	568	---	82	---	82

Data Reduction and Determination of Design Side Shear Values Based on Step 3 Data Set

Data Reduction Method		q_u (ksf)	q_t (ksf)
Step 1	Mean Value	60	176
	Standard Deviation	35	137
Step 2	Upper Limit	95	313
	Lower Limit	25	39
Determine Design Values		Mean %REC	Mean RQD
		75%	43%
		q_u (ksf)	q_t (ksf)
Step 4	Mean Value	47	106
	Standard Deviation	25	45
Step 5	~~Upper Limit~~	~~72~~	~~151~~
	Lower Limit	21	61
Step 6	Upper (Mean) Ultimate Side Shear Resistance	35	
	Lower Ultimate Side Shear Resistance	18	
~~Step 7 (%REC)~~	~~Upper Design Side Shear Resistance~~	27	
	~~Lower Design Side Shear Resistance~~	14	
Multiply by RQD(2)		15	
		8	
Recommended Design Side Shear Resistance		11	

Notes:
(1) Low outliers were not removed from the data set due to the lack of cores at the pier locations where substantial rock substrata were encountered.
(2) Based on the rock core testing program and past experience in the general geographic area (West Central Florida), the ultimate side shear was multiplied by RQD instead of the %REC to determine the design side shear resistance values. This variation is due to the limited amount of test data collected from the site and in this instance, the use of %REC would result in design values that exceed design values typically used on similar projects in West Central Florida.

Boring B-1 (Williams) Pier 1
42 Inch Diameter Drilled Shaft



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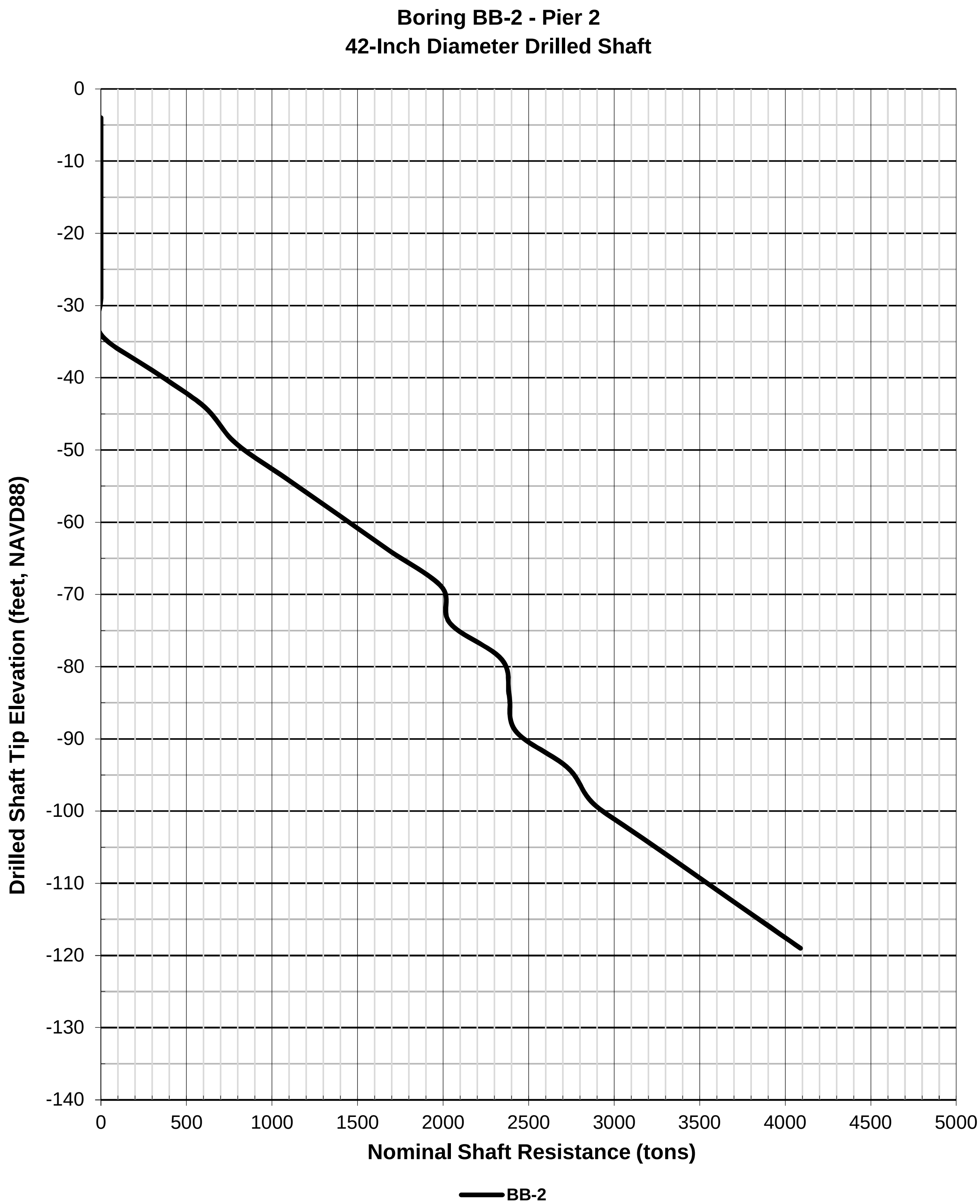
EF	March 2017	

Beckett Bridge Replacement
PID: 001037
Pinellas County, Florida



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EF	March 2017	

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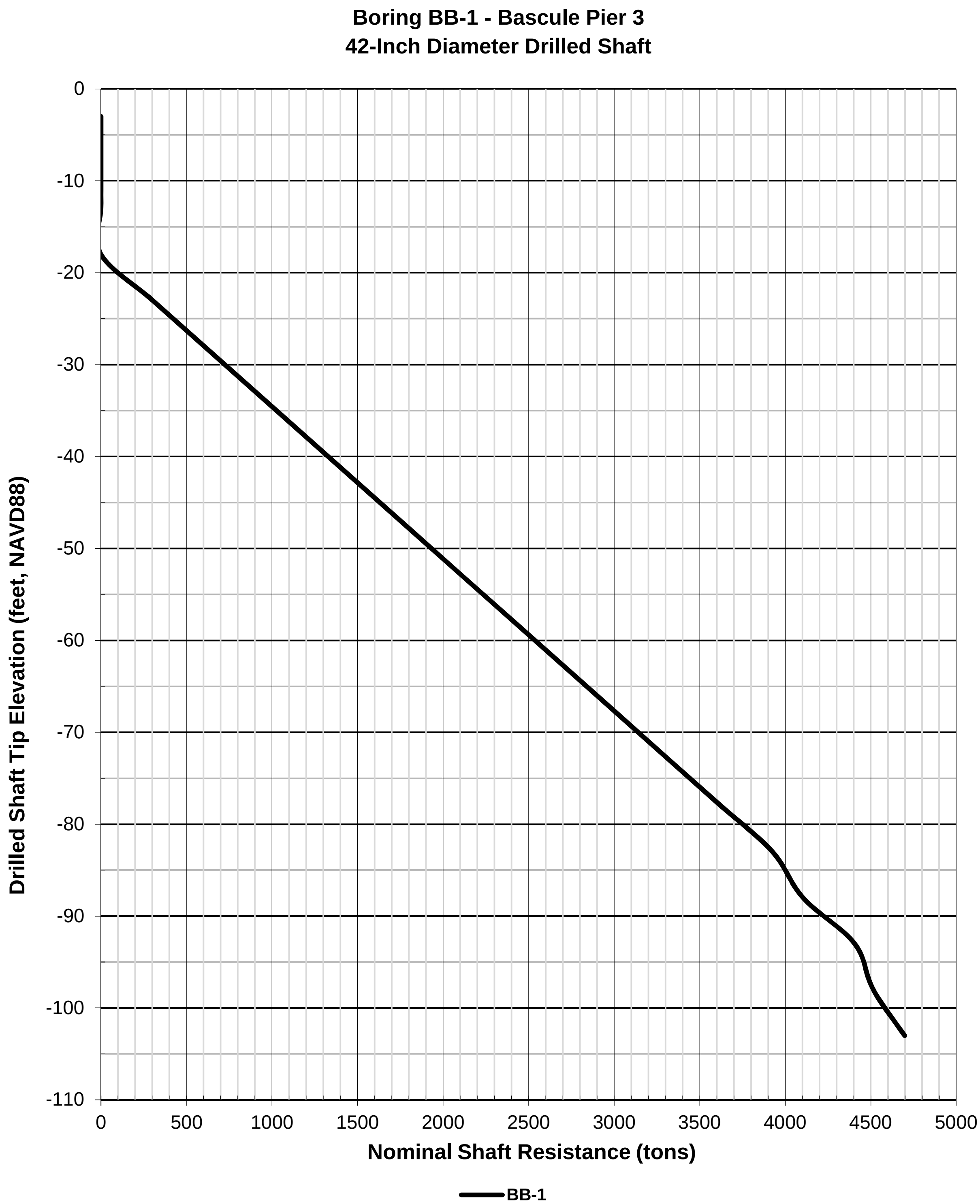

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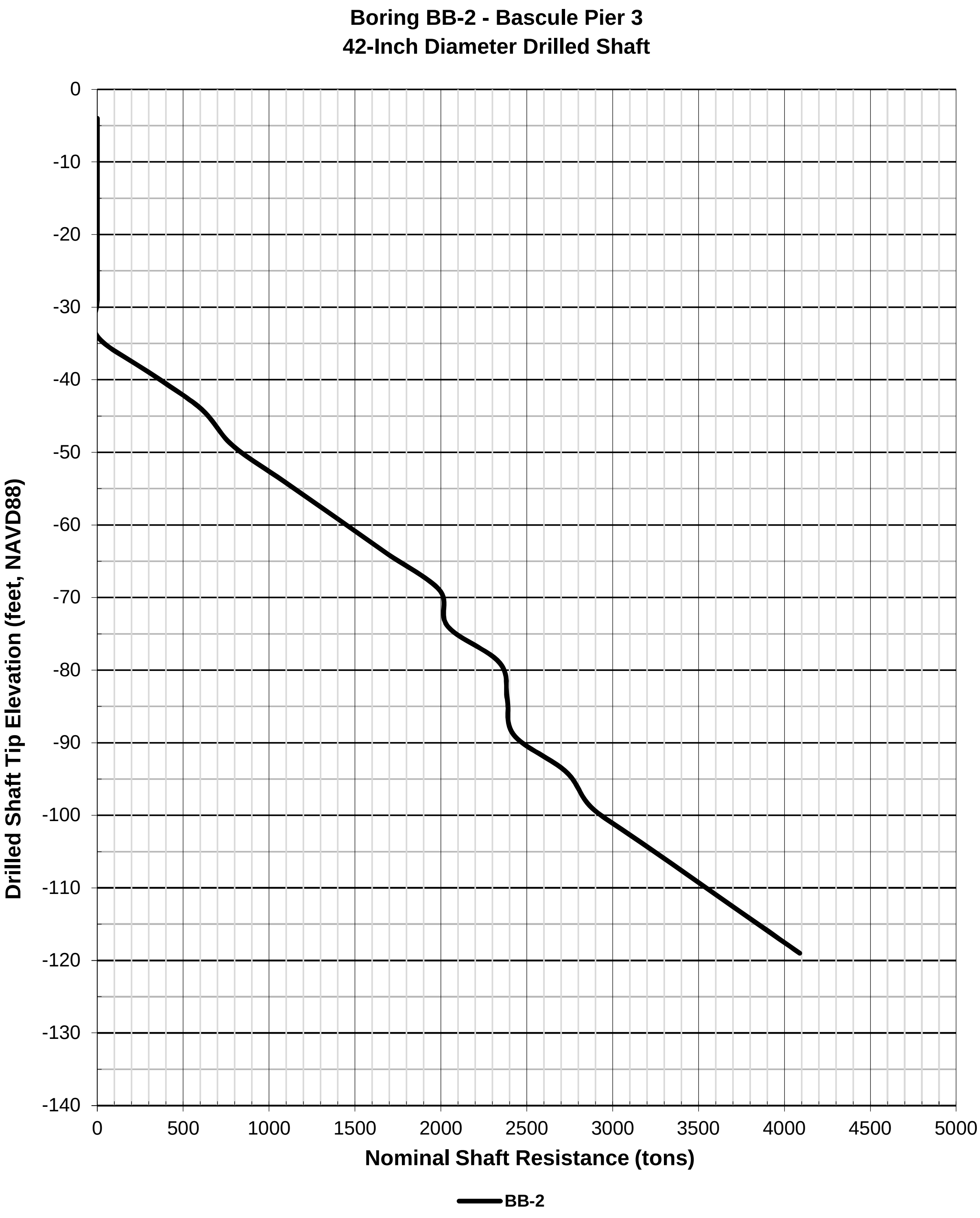
EF	March 2017	

Beckett Bridge Replacement
PID: 001037A
Pinellas County, FL



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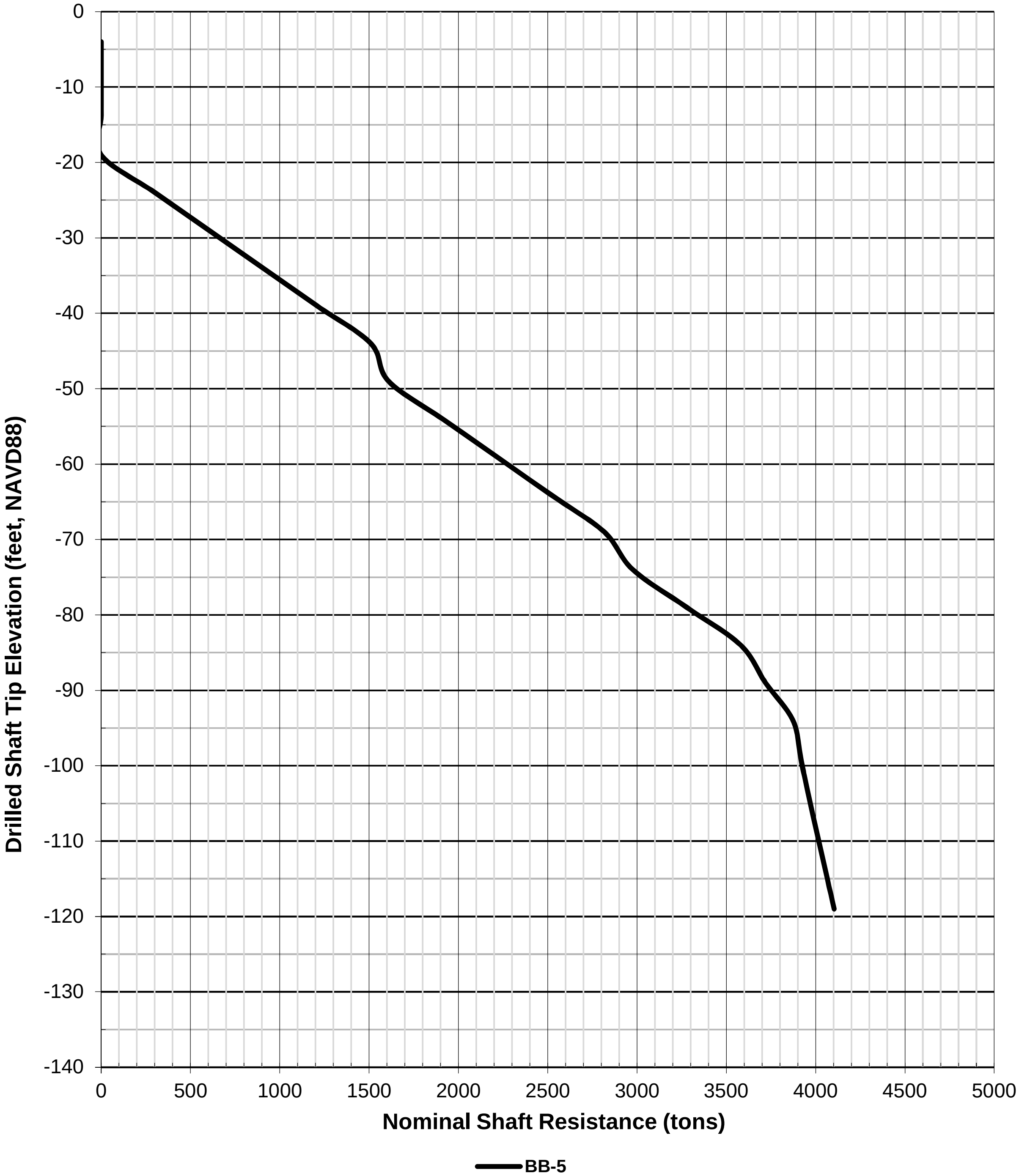
Beckett Bridge Replacement
PID: 001037A
Pinellas County, FL

Boring BB-5 - Pier 6
42-Inch Diameter Drilled Shaft



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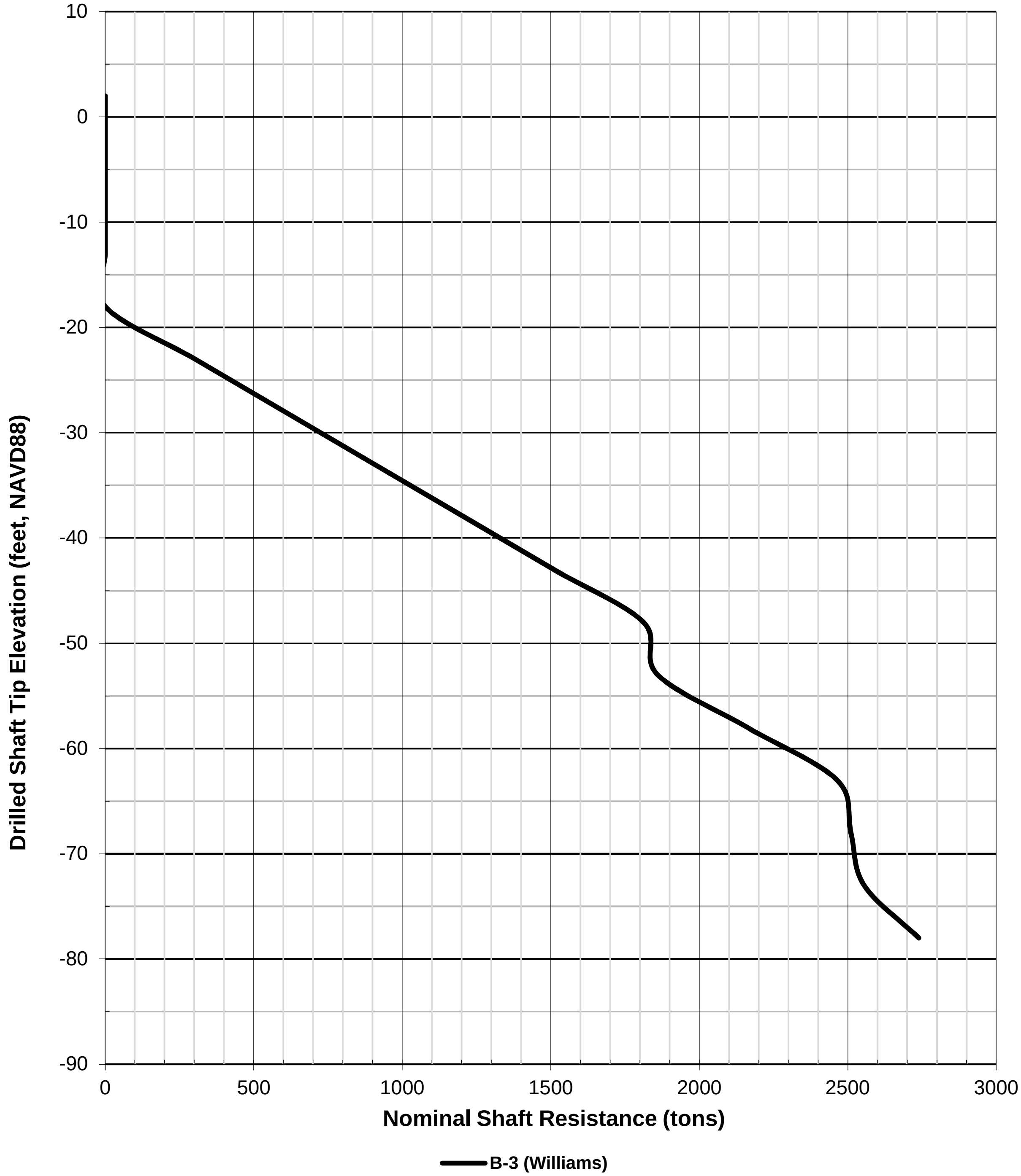
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida

Boring B-3 (Williams) Pier 7
42 Inch Diameter Drilled Shaft



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WA	Noted	6511-15-153
CHECKED BY: EF	DATE: March 2017	

Beckett Bridge Replacement
PID: 001037
Pinellas County, FL

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037
Pinellas County, FL
Tierra Project No.: 6511-15-153

Pier No.	1
Baseline	
Station	
SPT Boring Analyzed	B-1 (Williams)
Factored Design Load (tons)	282
Ground Elevation (ft.)	5.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	5.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-15.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	5.0	0.0	0.0
2	SAND	19	3.0	0.0	0.0
4	SAND	10	1.0	0.0	0.0
6	SAND	6	-1.0	0.0	0.0
8	SAND	3	-3.0	0.0	0.0
10	SAND	12	-5.0	0.0	0.0
15	SAND	8	-10.0	0.0	0.0
20	LIMESTONE	100	-15.0	0.0	0.0
25	LIMESTONE	100	-20.0	302.0	181.0
30	LIMESTONE	100	-25.0	604.0	362.0
35	LIMESTONE	100	-30.0	906.0	543.0
40	LIMESTONE	100	-35.0	1208.0	724.0
45	LIMESTONE	100	-40.0	1510.0	905.0
50	LIMESTONE	37	-45.0	1621.5	972.0
55	SAND	12	-50.0	1662.0	996.5
60	LIMESTONE	100	-55.0	1964.0	1177.5
65	LIMESTONE	100	-60.0	2266.0	1358.5
70	LIMESTONE	100	-65.0	2568.0	1539.5
75	LIMESTONE	100	-70.0	2870.0	1720.5

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No.: 6511-15-153

Pier No.	2
Baseline	
Station	1136+98
SPT Boring Analyzed	BB-2
Factored Design Load (tons)	439
Ground Elevation (ft.)	-4.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	-4.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-34.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	-4.0	0.0	0.0
2	SAND	2	-6.0	0.0	0.0
4	SAND	4	-8.0	0.0	0.0
6	SAND	17	-10.0	0.0	0.0
8	SAND	7	-12.0	0.0	0.0
10	CLAY	50	-14.0	0.0	0.0
15	CLAY	100	-19.0	0.0	0.0
20	LIMESTONE	100	-24.0	0.0	0.0
25	CLAY	26	-29.0	0.0	0.0
30	LIMESTONE	100	-34.0	0.0	0.0
35	LIMESTONE	100	-39.0	302.0	181.0
40	LIMESTONE	100	-44.0	604.0	362.0
45	LIMESTONE	60	-49.0	785.0	470.5
50	LIMESTONE	100	-54.0	1087.0	651.5
55	LIMESTONE	100	-59.0	1389.0	832.5
60	LIMESTONE	100	-64.0	1691.0	1013.5
65	LIMESTONE	100	-69.0	1993.0	1194.5
70	SAND	25	-74.0	2041.0	1223.0
75	LIMESTONE	100	-79.0	2343.0	1404.0
80	SAND	100	-84.0	2386.5	1430.0
85	SAND	38	-89.0	2427.0	1454.5
90	LIMESTONE	100	-94.0	2729.0	1635.5
95	LIMESTONE	50	-99.0	2880.0	1726.0
100	LIMESTONE	100	-104.0	3182.0	1907.0
115	LIMESTONE	100	-119.0	4089.0	2451.0

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No.: 6511-15-153

Pier No.	Bascule Pier 3
Baseline	
Station	1137+10
SPT Boring Analyzed	BB-1
Factored Design Load (tons)	552
Ground Elevation (ft.)	-3.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	-3.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-18.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	-3.0	0.0	0.0
2	SAND	2	-5.0	0.0	0.0
4	SAND	2	-7.0	0.0	0.0
6	SAND	2	-9.0	0.0	0.0
8	SAND	2	-11.0	0.0	0.0
10	SAND	2	-13.0	0.0	0.0
15	SAND	2	-18.0	0.0	0.0
20	LIMESTONE	100	-23.0	302.0	181.0
25	LIMESTONE	100	-28.0	604.0	362.0
30	LIMESTONE	100	-33.0	906.0	543.0
35	LIMESTONE	100	-38.0	1208.0	724.0
40	LIMESTONE	100	-43.0	1510.0	905.0
45	LIMESTONE	100	-48.0	1812.0	1086.0
50	LIMESTONE	100	-53.0	2114.0	1267.0
55	LIMESTONE	100	-58.0	2416.0	1448.0
60	LIMESTONE	100	-63.0	2718.0	1629.0
65	LIMESTONE	100	-68.0	3020.0	1810.0
70	LIMESTONE	100	-73.0	3322.0	1991.0
75	LIMESTONE	100	-78.0	3624.0	2172.0
80	LIMESTONE	100	-83.0	3926.0	2353.0
85	LIMESTONE	59	-88.0	4104.0	2460.0
90	LIMESTONE	100	-93.0	4406.0	2641.0
95	LIMESTONE	36	-98.0	4514.5	2706.0
100	LIMESTONE	61	-103.0	4698.5	2816.5

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No.: 6511-15-153

Pier No.	Bascule Pier 3
Baseline	
Station	1136+98
SPT Boring Analyzed	BB-2
Factored Design Load (tons)	552
Ground Elevation (ft.)	-4.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	-4.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-34.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	-4.0	0.0	0.0
2	SAND	2	-6.0	0.0	0.0
4	SAND	4	-8.0	0.0	0.0
6	SAND	17	-10.0	0.0	0.0
8	SAND	7	-12.0	0.0	0.0
10	CLAY	50	-14.0	0.0	0.0
15	CLAY	100	-19.0	0.0	0.0
20	LIMESTONE	100	-24.0	0.0	0.0
25	CLAY	26	-29.0	0.0	0.0
30	LIMESTONE	100	-34.0	0.0	0.0
35	LIMESTONE	100	-39.0	302.0	181.0
40	LIMESTONE	100	-44.0	604.0	362.0
45	LIMESTONE	60	-49.0	785.0	470.5
50	LIMESTONE	100	-54.0	1087.0	651.5
55	LIMESTONE	100	-59.0	1389.0	832.5
60	LIMESTONE	100	-64.0	1691.0	1013.5
65	LIMESTONE	100	-69.0	1993.0	1194.5
70	SAND	25	-74.0	2041.0	1223.0
75	LIMESTONE	100	-79.0	2343.0	1404.0
80	SAND	100	-84.0	2386.5	1430.0
85	SAND	38	-89.0	2427.0	1454.5
90	LIMESTONE	100	-94.0	2729.0	1635.5
95	LIMESTONE	50	-99.0	2880.0	1726.0
100	LIMESTONE	100	-104.0	3182.0	1907.0
115	LIMESTONE	100	-119.0	4089.0	2451.0

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Tierra Project No.: 6511-15-153

Pier No.	6
Baseline	
Station	1138+93
SPT Boring Analyzed	BB-5
Factored Design Load (tons)	418
Ground Elevation (ft.)	-4.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	-4.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-19.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	-4.0	0.0	0.0
2	SAND	2	-6.0	0.0	0.0
4	SAND	2	-8.0	0.0	0.0
6	SAND	2	-10.0	0.0	0.0
8	SAND	2	-12.0	0.0	0.0
10	SAND	4	-14.0	0.0	0.0
15	LIMESTONE	100	-19.0	0.0	0.0
20	LIMESTONE	100	-24.0	302.0	181.0
25	LIMESTONE	100	-29.0	604.0	362.0
30	LIMESTONE	100	-34.0	906.0	543.0
35	LIMESTONE	100	-39.0	1208.0	724.0
40	LIMESTONE	100	-44.0	1510.0	905.0
45	CLAY	69	-49.0	1608.5	964.0
50	LIMESTONE	100	-54.0	1910.5	1145.0
55	LIMESTONE	100	-59.0	2212.5	1326.0
60	LIMESTONE	100	-64.0	2514.5	1507.0
65	LIMESTONE	100	-69.0	2816.5	1688.0
70	LIMESTONE	53	-74.0	2976.5	1784.0
75	LIMESTONE	100	-79.0	3278.5	1965.0
80	LIMESTONE	100	-84.0	3580.5	2146.0
85	LIMESTONE	46	-89.0	3719.5	2229.0
90	LIMESTONE	51	-94.0	3873.5	2321.5
95	SAND	29	-99.0	3916.5	2347.0
100	SAND	8	-104.0	3961.0	2373.5
115	SAND	8	-119.0	4103.5	2459.0

Drilled Shaft Analysis
Beckett Bridge Replacement
PID: 001037
Pinellas County, Florida
Tierra Project No.: 6511-15-153

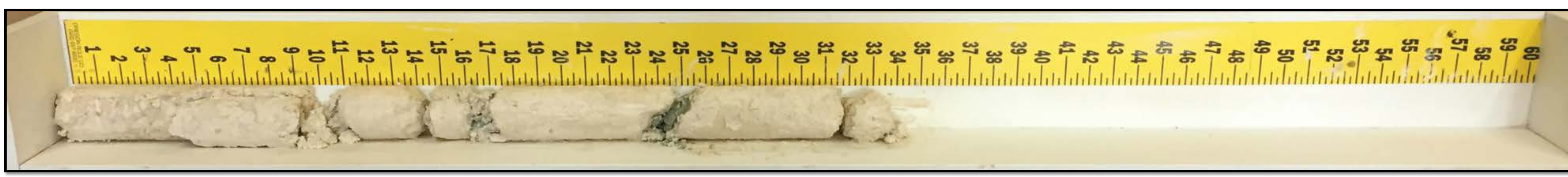
Pier No.	7
Baseline	
Station	
SPT Boring Analyzed	B-3 (Williams)
Factored Design Load (tons)	285
Ground Elevation (ft.)	2.0
Groundwater Elevation (ft.)	0.0
Top of Shaft Elevation (ft.)	2.0
Shaft Diameter (ft.)	3.5
SPT Hammer Type	Safety
SPT Hammer Efficiency Factor	1
Perm. Casing	Yes
Bottom Of Casing Elevation (ft.)	-18.0
Casing Reduction Factor	0.00
Drilled Shaft Type	Redundant
Static Load Testing on Soil	No
Static Load Testing on Rock	No
End Bearing Included	No

Depth Below Ground Elevation (ft.)	Soil Type	SPT N-Value	Elevation	Total Nominal Bearing Resistance, NBR (tons)	ϕ x Total Nominal Bearing Resistance, ϕ x NBR (tons)
0	SAND	2	2.0	0.0	0.0
2	SAND	5	0.0	0.0	0.0
4	SAND	5	-2.0	0.0	0.0
6	SAND	5	-4.0	0.0	0.0
8	SAND	18	-6.0	0.0	0.0
10	SAND	9	-8.0	0.0	0.0
15	SAND	3	-13.0	0.0	0.0
20	CLAY	8	-18.0	0.0	0.0
25	LIMESTONE	100	-23.0	302.0	181.0
30	LIMESTONE	100	-28.0	604.0	362.0
35	LIMESTONE	100	-33.0	906.0	543.0
40	LIMESTONE	100	-38.0	1208.0	724.0
45	LIMESTONE	100	-43.0	1510.0	905.0
50	LIMESTONE	100	-48.0	1812.0	1086.0
55	SAND	100	-53.0	1860.0	1114.5
60	LIMESTONE	100	-58.0	2162.0	1295.5
65	LIMESTONE	100	-63.0	2464.0	1476.5
70	SAND	29	-68.0	2510.5	1504.5
75	SAND	25	-73.0	2555.0	1531.0
80	LIMESTONE	61	-78.0	2739.0	1641.5

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Boring: BB-1
Depth: 24.0' to 29.0'

A B C D E F G H I J K

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Boring: BB-1
Depth: 38.5' to 43.5'



A B C D E F G

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Boring: BB-1
Depth: 69.5' to 74.5'

A B C D E F G H I J

Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Boring: BB-3
Depth: 38.5' to 43.5'

A B C D E F G H I J K L

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Beckett Bridge Replacement
PID: 001037A
Pinellas County, Florida
Boring: BB-3
Depth: 68.5' to 73.5'

A B C D E F G H I

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	B-1 (Williams)
Ground Surface Elevation (ft)	5.2
Ground Water Table Elevation (ft)	0.0

Foundation Type	Drilled Shaft
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	9.62

	Layer No.	1	2	3	4	5			
	Soil Description	Sand	Clayey Sand	Limestone	Clay	Limestone			
	Soil Type	Cohesionless	Cohesive	Rock	Cohesive	Rock			
	Top Boundary Elevation (ft)	5.20	-7.00	-13.00	-40.00	-52.00			
	Bottom boundary Elevation (ft)	-7.00	-13.00	-40.00	-52.00	-69.80			
	Average SPT N-Value (Blows/ft)	12	10	124	30	124			
LATERAL	Soil Model	Sand (Reese)	Clay (Stiff<Water)	Limestone (McVay)	Clay (Stiff<Water)	Limestone (McVay)			
LATERAL	Internal Friction Angle, ϕ	31	-	-	-	-			
LATERAL	Total Unit Weight (pcf), γ_t	105	115	135	120	135			
LATERAL	Subgrade Modulus (pci), k	33	330	-	1330	-			
LATERAL	Undrained Shear Strength (psf), c_u	-	1000	-	3750	-			
LATERAL	Major Principal Strain @ ε_{50}	-	0.010	-	0.007	-			
LATERAL	Major Principal Strain @ ε_{100}	-	-	-	-	-			
LATERAL	Average Undrained Shear Strength (psf)	-	1000	-	3750	-			
LATERAL	Unconfined Compressive Strength (psf)	-	-	80000	-	80000			
AXIAL	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)			
AXIAL	Total Unit Weight (pcf), γ_t	105	115	-	120	-			
AXIAL	Shear Modulus (ksi), G	0.96	1.57	92.59	4.48	92.59			
AXIAL	Poisson's ratio, ν	0.30	0.45	0.50	0.50	0.50			
AXIAL	Ultimate Unit Skin Friction (psf) (Pile)	-	-	-	-	-			
AXIAL	Undrained Shear Strength (psf), c_u	-	1000	-	3750	-			
AXIAL	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	12000	-	12000			
AXIAL	Mass Modulus (ksi)	-	-	-	-	-			
AXIAL	Modulus Ratio	-	-	-	-	-			
AXIAL	Surface (Rough/Smooth)	-	-	-	-	-			
AXIAL	Unconfined Compressive Strength (psf)	-	-	-	-	-			
AXIAL	Split Tensile Strength (psf)	-	-	-	-	-			
AXIAL	Concrete Unit Weight (pcf)	-	-	-	-	-			
AXIAL	Slump (in)	-	-	-	-	-			
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic			
TORSIONAL	Total Unit Weight (pcf), γ_t	105	115	135	120	135			
TORSIONAL	Internal Friction Angle, ϕ	31	-	-	-	-			
TORSIONAL	Undrained Shear Strength (psf), c_u	-	1000	-	3750	-			
TORSIONAL	Shear Modulus (ksi), G	0.96	1.57	92.59	4.48	92.59			
TORSIONAL	Torsional Shear Stress (psf)	260	1000	12000	3750	12000			
TIP	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (IGM)	Drilled Shaft (Clay)	Drilled Shaft (IGM)			
TIP	Shear Modulus (ksi), G	0.96	1.57	92.59	4.48	92.59			
TIP	Poisson's ratio, ν	0.30	0.45	0.50	0.50	0.50			
TIP	Unit Bearing , ksf	-	-	-	-	-			
TIP	Axial Bearing Failure, kips	-	-	-	-	-			
TIP	Uncorrected SPT-N Value (blows/ft)	12	-	-	-	-			
TIP	Undrained Shear Strength (psf), c_u	-	1250	-	3750	-			
TIP	IGM Mass Modulus (ksi), E_m	-	-	-	-	-			

<u>Geotechnical Parameters for FB-MultiPier Input</u>

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier		Foundation Type	Drilled Shaft
Reference Boring	BB-1 (Tierra)	Size (inch)	42
Ground Surface Elevation (ft)	-3.0	Base Area (ft^2)	9.62
Ground Water Table Elevation (ft)	0.0	Nominal Area (ft^2)	9.62

	Layer No.	1	2	3	4				
	Soil Description	Sand	Sand	Limestone	Limestone				
	Soil Type	Cohesionless	Cohesionless	Rock	Rock				
	Top Boundary Elevation (ft)	-3.00	-13.00	-16.50	-96.50				
	Bottom boundary Elevation (ft)	-13.00	-16.50	-96.50	-103.00				
	Average SPT N-Value (Blows/ft)	4	124	120	61				
LATERAL	Soil Model	Sand (Reese)	Sand (Reese)	Limestone (McVay)	Limestone (McVay)				
	Internal Friction Angle, ϕ	29	35	-	-				
	Total Unit Weight (pcf), γ_t	100	125	135	135				
	Subgrade Modulus (pci), k	11	125	-	-				
	Undrained Shear Strength (psf), c_u	-	-	-	-				
	Major Principal Strain @ ε_{50}	-	-	-	-				
	Major Principal Strain @ ε_{100}	-	-	-	-				
	Average Undrained Shear Strength (psf)	-	-	-	-				
	Unconfined Compressive Strength (psf)	-	-	80000	59200				
AXIAL	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Sand)	Drilled Shaft (Limestone)	Drilled Shaft (Limestone)				
	Total Unit Weight (pcf), γ_t	100	125	-	-				
	Shear Modulus (ksi), G	0.33	3.47	92.59	92.59				
	Poisson's ratio, ν	0.25	0.30	0.50	0.50				
	Ultimate Unit Skin Friction (psf) (Pile)	-	-	-	-				
	Undrained Shear Strength (psf), c_u	-	-	-	-				
	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	12000	8880				
	Mass Modulus (ksi)	-	-	-	-				
	Modulus Ratio	-	-	-	-				
	Surface (Rough/Smooth)	-	-	-	-				
	Unconfined Compressive Strength (psf)	-	-	-	-				
	Split Tensile Strength (psf)	-	-	-	-				
	Concrete Unit Weight (pcf)	-	-	-	-				
	Slump (in)	-	-	-	-				
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic				
	Total Unit Weight (pcf), γ_t	100	125	135	135				
	Internal Friction Angle, ϕ	29	35	-	-				
	Undrained Shear Strength (psf), c_u	-	-	-	-				
	Shear Modulus (ksi), G	0.33	3.47	92.59	92.59				
	Torsional Shear Stress (psf)	188	736	12000	8880				
TIP	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Sand)	Drilled Shaft (IGM)	Drilled Shaft (IGM)				
	Shear Modulus (ksi), G	0.33	3.47	92.59	92.59				
	Poisson's ratio, ν	0.25	0.30	0.50	0.50				
	Unit Bearing , ksf	-	-	-	-				
	Axial Bearing Failure, kips	-	-	-	-				
	Uncorrected SPT-N Value (blows/ft)	4	60	-	-				
	Undrained Shear Strength (psf), c_u	-	-	-	-			-	
	IGM Mass Modulus (ksi), E_m	-	-	-	-			-	

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	BB-2 (Tierra)
Ground Surface Elevation (ft)	-4.0
Ground Water Table Elevation (ft)	0.0

Foundation Type	Drilled Shaft
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	9.62

	Layer No.	1	2	3	4	5	6	7	
	Soil Description	Sand	Clay	Limestone	Clay	Limestone	Sand	Limestone	
	Soil Type	Cohesionless	Cohesive	Rock	Cohesive	Rock	Cohesionless	Rock	
	Top Boundary Elevation (ft)	-4.00	-12.00	-17.50	-27.50	-32.50	-82.50	-92.50	
	Bottom boundary Elevation (ft)	-12.00	-17.50	-27.50	-32.50	-82.50	-92.50	-104.00	
	Average SPT N-Value (Blows/ft)	13	62	124	32	109	86	104	
LATERAL	Soil Model	Sand (Reese)	Clay (Stiff<Water)	Limestone (McVay)	Clay (Stiff<Water)	Limestone (McVay)	Sand (Reese)	Limestone (McVay)	
	Internal Friction Angle, ϕ	31	-	-	-	-	35	-	
	Total Unit Weight (pcf), γ_t	105	125	135	125	135	125	135	
	Subgrade Modulus (pci), k	36	2000	-	1430	-	125	-	
	Undrained Shear Strength (psf), c_u	-	6000	-	4000	-	-	-	
	Major Principal Strain @ ε_{50}	-	0.005	-	0.007	-	-	-	
	Major Principal Strain @ ε_{100}	-	-	-	-	-	-	-	
	Average Undrained Shear Strength (psf)	-	6000	-	4000	-	-	-	
	Unconfined Compressive Strength (psf)	-	-	80000	-	80000	-	80000	
AXIAL	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)	Drilled Shaft (Sand)	Drilled Shaft (Limestone)	
	Total Unit Weight (pcf), γ_t	105	125	-	125	-	125	-	
	Shear Modulus (ksi), G	1.04	4.63	92.59	4.63	92.59	3.47	92.59	
	Poisson's ratio, ν	0.30	0.50	0.50	0.50	0.50	0.30	0.50	
	Ultimate Unit Skin Friction (psf) (Pile)	-	-	-	-	-	-	-	
	Undrained Shear Strength (psf), c_u	-	6000	-	4000	-	-	-	
	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	12000	-	12000	-	12000	
	Mass Modulus (ksi)	-	-	-	-	-	-	-	
	Modulus Ratio	-	-	-	-	-	-	-	
	Surface (Rough/Smooth)	-	-	-	-	-	-	-	
	Unconfined Compressive Strength (psf)	-	-	-	-	-	-	-	
	Split Tensile Strength (psf)	-	-	-	-	-	-	-	
	Concrete Unit Weight (pcf)	-	-	-	-	-	-	-	
	Slump (in)	-	-	-	-	-	-	-	
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	
	Total Unit Weight (pcf), γ_t	105	125	135	125	135	125	135	
	Internal Friction Angle, ϕ	31	-	-	-	-	35	-	
	Undrained Shear Strength (psf), c_u	-	6000	-	4000	-	-	-	
	Shear Modulus (ksi), G	1.04	4.63	92.59	4.63	92.59	3.47	92.59	
	Torsional Shear Stress (psf)	170	6000	12000	4000	12000	5227	12000	
TIP	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (IGM)	Drilled Shaft (Clay)	Drilled Shaft (IGM)	Drilled Shaft (Sand)	Drilled Shaft (IGM)	
	Shear Modulus (ksi), G	1.04	4.63	92.59	4.63	92.59	3.47	92.59	
	Poisson's ratio, ν	0.30	0.50	0.50	0.50	0.50	0.30	0.50	
	Unit Bearing , ksf	-	-	-	-	-	-	-	
	Axial Bearing Failure, kips	-	-	-	-	-	-	-	
	Uncorrected SPT-N Value (blows/ft)	13	-	-	-	-	60	-	
	Undrained Shear Strength (psf), c_u	-	6000	-	4000	-	-	-	
	IGM Mass Modulus (ksi), E_m	-	-	-	-	-	-	-	

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

	Reference Pier	
	Reference Boring	BB-5 (Tierra)
	Ground Surface Elevation (ft)	-4.0
	Ground Water Table Elevation (ft)	0.0

Foundation Type	Drilled Shaft
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	9.62

	Layer No.	1	2	3	4	5			
	Soil Description	Sand	Limestone	Clay	Limestone	Limestone			
	Soil Type	Cohesionless	Rock	Cohesive	Rock	Rock			
	Top Boundary Elevation (ft)	-4.00	-17.50	-47.50	-52.50	-87.50			
	Bottom boundary Elevation (ft)	-17.50	-47.50	-52.50	-87.50	-104.00			
	Average SPT N-Value (Blows/ft)	5	124	86	119	42			
LATERAL	Soil Model	Sand (Reese)	Limestone (McVay)	Clay (Stiff<Water)	Limestone (McVay)	Limestone (McVay)			
	Internal Friction Angle, ϕ	29	-	-	-	-			
	Total Unit Weight (pcf), γ_t	105	135	125	135	135			
	Subgrade Modulus (pci), k	14	-	2000	-	-			
	Undrained Shear Strength (psf), c_u	-	-	6000	-	-			
	Major Principal Strain @ ε_{50}	-	-	0.005	-	-			
	Major Principal Strain @ ε_{100}	-	-	-	-	-			
	Average Undrained Shear Strength (psf)	-	-	6000	-	-			
	Unconfined Compressive Strength (psf)	-	80000	-	80000	42000			
AXIAL	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Limestone)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)	Drilled Shaft (Limestone)			
	Total Unit Weight (pcf), γ_t	105	-	125	-	-			
	Shear Modulus (ksi), G	0.42	92.59	4.63	92.59	92.59			
	Poisson's ratio, ν	0.25	0.50	0.50	0.50	0.50			
	Ultimate Unit Skin Friction (psf) (Pile)	-	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	-	6000	-	-			
	Ultimate Unit Skin Friction (psf) (Shaft)	-	12000	-	12000	6300			
	Mass Modulus (ksi)	-	-	-	-	-			
	Modulus Ratio	-	-	-	-	-			
	Surface (Rough/Smooth)	-	-	-	-	-			
	Unconfined Compressive Strength (psf)	-	-	-	-	-			
	Split Tensile Strength (psf)	-	-	-	-	-			
	Concrete Unit Weight (pcf)	-	-	-	-	-			
	Slump (in)	-	-	-	-	-			
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic			
	Total Unit Weight (pcf), γ_t	105	135	125	135	135			
	Internal Friction Angle, ϕ	29	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	-	6000	-	-			
	Shear Modulus (ksi), G	0.42	92.59	4.63	92.59	92.59			
	Torsional Shear Stress (psf)	288	12000	6000	12000	6300			
TIP	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (IGM)	Drilled Shaft (Clay)	Drilled Shaft (IGM)	Drilled Shaft (IGM)			
	Shear Modulus (ksi), G	0.42	92.59	4.63	92.59	92.59			
	Poisson's ratio, ν	0.25	0.50	0.50	0.50	0.50			
	Unit Bearing , ksf	-	-	-	-	-			
	Axial Bearing Failure, kips	-	-	-	-	-			
	Uncorrected SPT-N Value (blows/ft)	5	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	-	6000	-	-			
	IGM Mass Modulus (ksi), E_m	-	-	-	-	-			

Geotechnical Parameters for FB-MultiPier Input

Beckett Bridge Replacement
Pinellas County, Florida
PID: 001037A
Tierra Project No. 6511-15-153

Reference Pier	
Reference Boring	B-3 (Williams)
Ground Surface Elevation (ft)	4.0
Ground Water Table Elevation (ft)	0.0

Foundation Type	Drilled Shaft
Size (inch)	42
Base Area (ft^2)	9.62
Nominal Area (ft^2)	9.62

	Layer No.	1	2	3	4	5			
	Soil Description	Sand	Clayey Sand	Clay	Limestone	Limestone			
	Soil Type	Cohesionless	Cohesive	Cohesive	Rock	Rock			
	Top Boundary Elevation (ft)	4.00	-9.00	-14.00	-17.00	-64.00			
	Bottom boundary Elevation (ft)	-9.00	-14.00	-17.00	-64.00	-78.00			
	Average SPT N-Value (Blows/ft)	10	4	10	124	47			
LATERAL	Soil Model	Sand (Reese)	Clay (Stiff<Water)	Clay (Stiff<Water)	Limestone (McVay)	Limestone (McVay)			
	Internal Friction Angle, ϕ	31	-	-	-	-			
	Total Unit Weight (pcf), γ_t	105	105	115	135	135			
	Subgrade Modulus (pci), k	28	55	330	-	-			
	Undrained Shear Strength (psf), c_u	-	400	1250	-	-			
	Major Principal Strain @ ε_{50}	-	0.020	0.010	-	-			
	Major Principal Strain @ ε_{100}	-	-	-	-	-			
	Average Undrained Shear Strength (psf)	-	400	1250	-	-			
	Unconfined Compressive Strength (psf)	-	-	-	80000	49060			
AXIAL	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (Clay)	Drilled Shaft (Limestone)	Drilled Shaft (Limestone)			
	Total Unit Weight (pcf), γ_t	105	105	115	-	-			
	Shear Modulus (ksi), G	0.83	0.64	1.57	92.59	92.59			
	Poisson's ratio, ν	0.25	0.45	0.45	0.50	0.50			
	Ultimate Unit Skin Friction (psf) (Pile)	-	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	400	1250	-	-			
	Ultimate Unit Skin Friction (psf) (Shaft)	-	-	-	12000	7360			
	Mass Modulus (ksi)	-	-	-	-	-			
	Modulus Ratio	-	-	-	-	-			
	Surface (Rough/Smooth)	-	-	-	-	-			
	Unconfined Compressive Strength (psf)	-	-	-	-	-			
	Split Tensile Strength (psf)	-	-	-	-	-			
	Concrete Unit Weight (pcf)	-	-	-	-	-			
	Slump (in)	-	-	-	-	-			
TORSIONAL	Soil Model	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic			
	Total Unit Weight (pcf), γ_t	105	105	115	135	135			
	Internal Friction Angle, ϕ	31	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	400	1250	-	-			
	Shear Modulus (ksi), G	0.83	0.64	1.57	92.59	92.59			
	Torsional Shear Stress (psf)	277	400	1250	12000	7360			
TIP	Soil Model	Drilled Shaft (Sand)	Drilled Shaft (Clay)	Drilled Shaft (Clay)	Drilled Shaft (IGM)	Drilled Shaft (IGM)			
	Shear Modulus (ksi), G	0.83	0.64	1.57	92.59	92.59			
	Poisson's ratio, ν	0.25	0.45	0.45	0.50	0.50			
	Unit Bearing , ksf	-	-	-	-	-			
	Axial Bearing Failure, kips	-	-	-	-	-			
	Uncorrected SPT-N Value (blows/ft)	10	-	-	-	-			
	Undrained Shear Strength (psf), c_u	-	500	1250	-	-			
	IGM Mass Modulus (ksi), E_m	-	-	-	-	-			

APPENDIX F

Recommended Soil Parameters for Sheet Pile Wall

RECOMMENDED SOIL PARAMETERS FOR SHEET PILE WALL

Beckett Bridge Replacement
PID: 001037A
TIERRA PROJECT NO. 6511-15-153

Boring B-1 (Williams)

(ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATION: +6', NGVD29)

Soil Classification	Elevation Range (feet, NGVD29)		Unit Weight (pcf)		Cohesion/ Ultimate Shear Strength (psf)	Internal Friction Angle	Wall Friction Angle(2)
	from	to	Saturated/ Total	Effective			
Loose to Medium Dense Sand	Ground Surface	-7	105	43	0	29°	14°
Clayey Sand	-7	-13	110	48	0	30°	14°
Weathered Limestone(1)	< -13		135	73	8,000	---	---

Boring B-3 (Williams)

(ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATION: +4', NGVD29)

Soil Classification	Elevation Range (feet, NGVD29)		Unit Weight (pcf)		Cohesion/ Ultimate Shear Strength (psf)	Internal Friction Angle	Wall Friction Angle(2)
	from	to	Saturated/ Total	Effective			
Loose to Medium Dense Sand to Clayey Sand	Ground Surface	-15	105	43	0	29°	14°
Stiff to Firm Clay	-15	-18	115	53	1,000	---	---
Weathered Limestone(1)	< -18		125	63	8,000	---	---

(1) Hard limestone, was encountered within the borings. Sheet pile installation into and/or through these layers may be difficult and may require specialized equipment to penetrate the limestone materials. The Contractor should be prepared for sheet pile installations into and through these materials if encountered during construction. Variations in the depth and consistency of these materials should be anticipated.

(2) Wall friction angles and adhesion values apply to concrete sheet pile only.

7.4. TIERRA GEOTECHNICAL REPORT (2012)

Beckett Bridge

Project Development & Environment (PD&E) Study

from **Chesapeake Drive** *to* **Forest Avenue**

Tarpon Springs, Pinellas County, FL

Pinellas County Project ID: PID 2161 • ETDM #: 13040

FDOT Financial Project ID: 424385-1-28-01

July 2012

Geotechnical Technical Memorandum

Prepared for:
Pinellas County
Department of Environment & Infrastructure
14 S Ft Harrison Avenue
Clearwater, FL 33756

Prepared by:
Tierra, Inc.
7351 Temple Terrace Highway
Tampa, Florida 33637

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1.0 PROJECT SUMMARY

1.1 PURPOSE

Pinellas County, in coordination with the Florida Department of Transportation (FDOT) District Seven, is conducting a Project Development and Environment (PD&E) Study to evaluate alternatives to remove, rehabilitate or replace the existing Beckett Bridge (Bridge No. 154000) in Tarpon Springs, Pinellas County, Florida.

1.2 PROJECT DESCRIPTION

The existing bridge was originally constructed in 1924 as a timber structure with a steel movable span. The fixed timber approach spans were replaced with concrete approach spans in 1956. The bridge is considered historic, and is the only highway single-leaf rolling-lift bascule bridge remaining in Florida. Major repairs were performed in 1979, 1998 and in 2011. Major rehabilitation or replacement of the bridge is needed to keep the bridge open and operating efficiently.

The project limits extend along Riverside Drive from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, a distance of approximately 0.3 mile. The existing two-lane bridge connects areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. (See Figure 1, Project Location.) Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire.

Beckett Bridge is owned and operated by Pinellas County. A bridge tender is only present when required to open the drawbridge for a vessel; there are no full-time bridge tenders. US Coast Guard drawbridge opening regulations (33CFR117.341) states that "The draw of the Beckett Bridge, mile 0.5, at Tarpon Springs, Florida shall open on signal if at least two hours' notice is given." Whitcomb Bayou connects to the Gulf of Mexico via the Anclote River to the north. Boats docked along Whitcomb, Spring and Minetta Bayous, and along artificial canals which connect to the southeastern portion of the Whitcomb Bayou, must pass the Beckett Bridge to access the Gulf of Mexico.

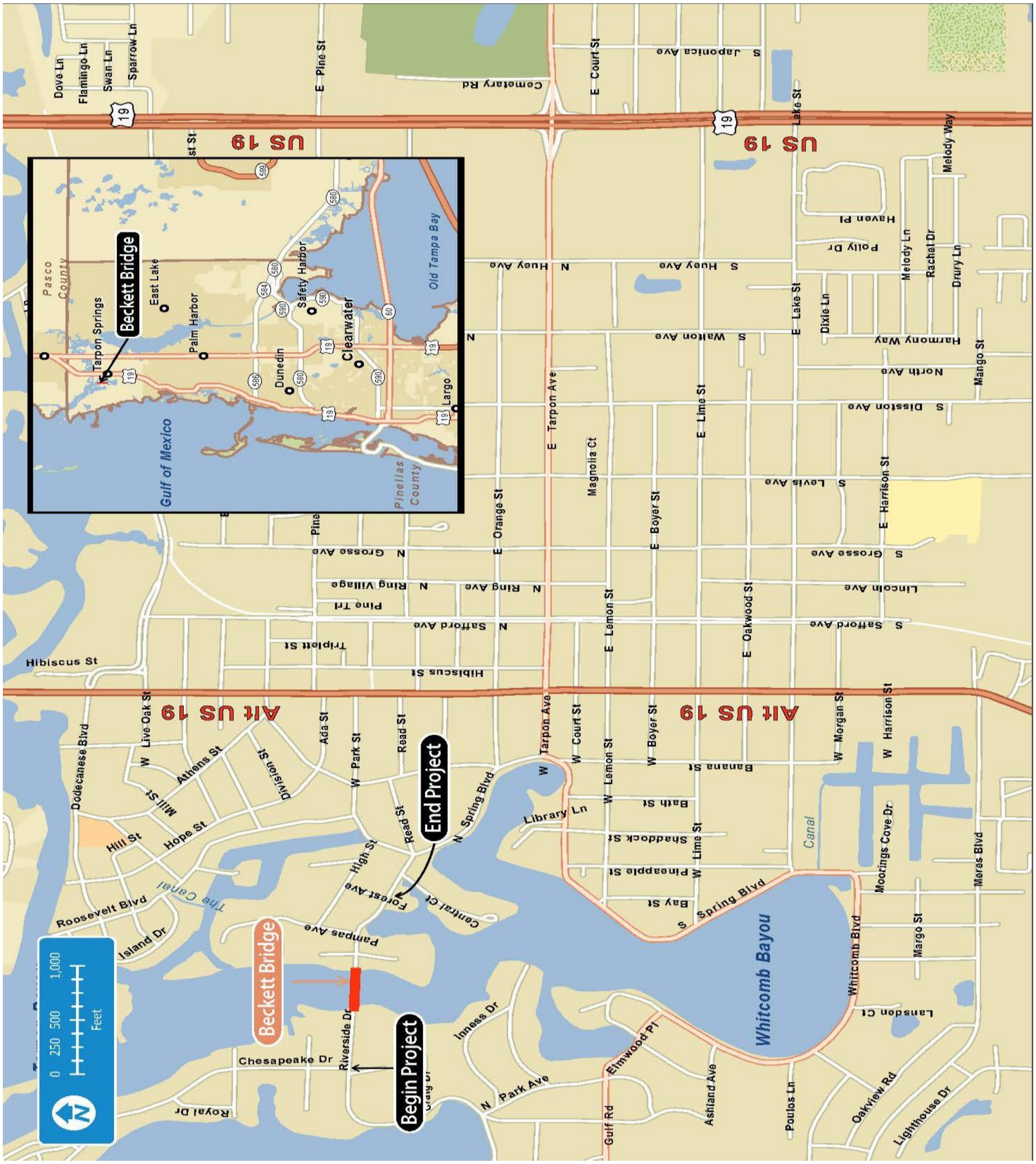

Figure 1 – Project Location Map

Project Need

The bridge is considered functionally obsolete. This designation is based primarily on the substandard clear roadway width of only 20 feet and substandard roadway safety features. The existing typical section consists of one, 10-foot wide travel lane in each direction and 2-foot 2-inch-wide sidewalks separated by a curb on both sides of the bridge. (See Figure 2 – Existing Bridge Typical Section.)

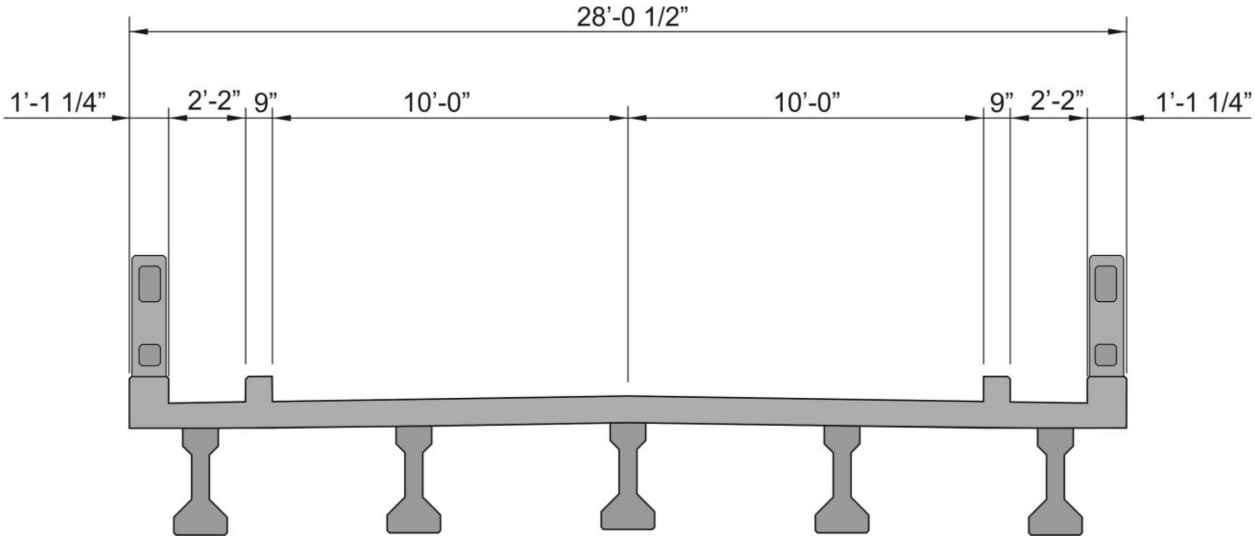

Figure 2 – Existing Bridge Typical Section

Minimum required lane and shoulder widths prescribed by the American Association of State Highway and Transportation Officials (AASHTO) are not met. The sidewalks on the bridge are narrow and do not meet current accessibility requirements established by the Americans with Disabilities Act (ADA). The bridge railings do not meet current standards for pedestrian safety or geometric and crash testing safety standards for vehicles. Approach guardrail and transitions and end treatments also do not meet current safety standards.

According to recent (10/27/09) FDOT inspection reports, the existing bridge has an overall Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. (Sufficiency ratings are a method of evaluating highway bridges by calculating a numeric value between 0 and 100, indicative of bridge sufficiency to remain in service). Bridges with a sufficiency rating less than 50 are eligible for federal replacement funds.

12- ton

Although the bridge is not considered Structurally Deficient, the bridge has a substandard load carrying capacity requiring weight restrictions. The bridge is currently posted for legal loads limited to two-ton Single Unit Trucks and 15-ton Combination Trucks. Repairs in 1979 and 1988 1998 included installation of crutch bents due to settlement and lateral stability concerns. Repairs in 2011 were performed to correct issues with the operating machinery and bascule leaf alignment.

The existing vertical clearance at the fenders is six feet. The tip of the bascule leaf overhangs the fender with the leaf fully raised and does not provide unlimited vertical clearance between the fenders. The existing horizontal clearance between the fenders is 25 feet.

Alternatives Considered

The following alternatives will be evaluated during the study:

- No-Build - Maintain Existing Bridge
- No-Build - Remove Existing Bridge (includes alternate routing of traffic)
- Rehabilitation of the Existing Bridge
- Replace with a new Movable Bridge
- Replace with a new Fixed Bridge

The "No-Build" alternative includes only routine maintenance to keep the bridge open to traffic until safety issues would require it to be closed. Evaluation of future improvements would occur at a later date. The "No Build with Removal of the Existing Bridge" would result in routine maintenance in the near future with the intent to demolish the bridge when it is no longer safe for traffic, with no plans to replace it with a new one. All bridge replacement alternatives considered will be constructed in approximately the same location as the existing bridge to minimize impacts.

Alternate corridors for bridge location will not be evaluated due to the extent of development in the vicinity of the existing bridge. Capacity improvements will not be considered. The complete removal alternative will examine alternative traffic routes and potential impacts to the community and on traffic operations.

Proposed Typical Sections

The proposed bridge typical section was based on a 35 mph design speed. The governing specifications include design criteria specified by the American Association of State Highway and Transportation Officials (AASHTO), the Florida Green Book and the FDOT Plans and Preparation Manual. A detailed discussion of design criteria will be included in the Preliminary Engineering Report, published separately for this project. The typical section has a total out-to-out width of 47 feet 1 inch as shown in Figure 3. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, 5.5 feet wide, are proposed on both sides of the bridge. Proposed sections on the roadway approaches were developed to avoid acquisition of additional right-of-way.

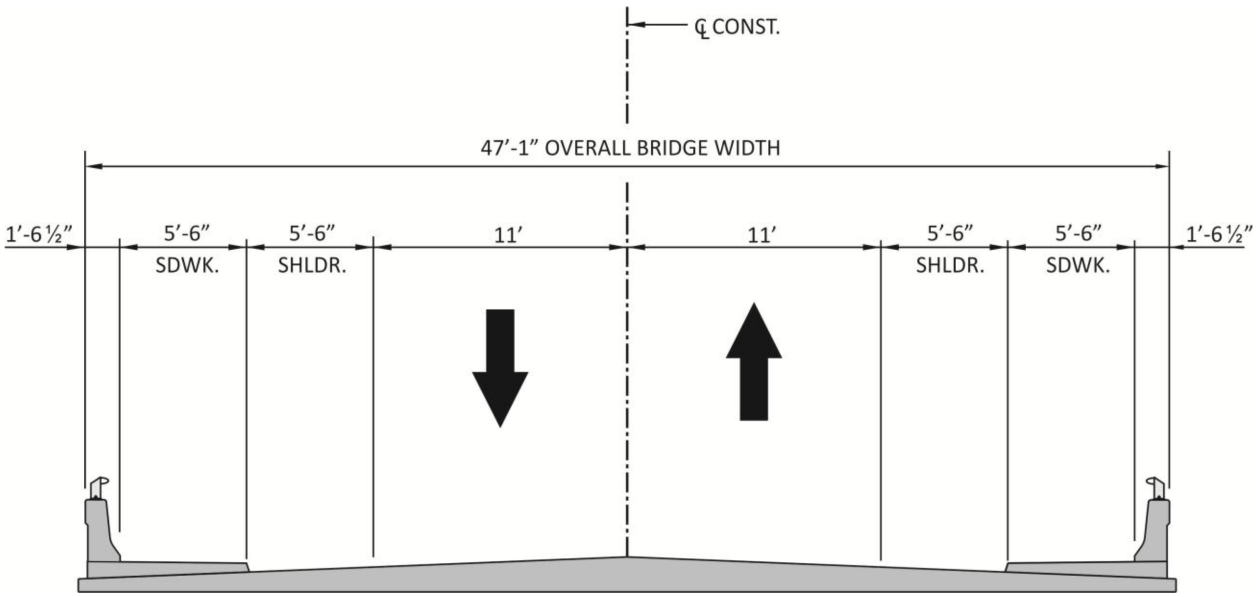

Figure 3 – Proposed Bridge Typical Section

2.0 SCOPE OF SERVICES

The geotechnical portion of the PD&E study was to obtain and evaluate information on the existing subsurface conditions within the project limits to assist in the preparation of the PD&E Report for the project. The following services were provided for this summary:

- Reviewed published information on topographic, soils and groundwater conditions. Soil, groundwater and regional geology information was obtained from the Web Soil Survey of Pinellas County, Florida published by the United States Department of Agriculture (USDA) – Natural Resource Conservation Service (NRCS). Topographic information was obtained from appropriate topographic maps published by United States Geological Survey (USGS).
- Reviewed previous geotechnical explorations and reports and summarized the collected data to support the PD&E study for the project.
- Prepared this Geotechnical Memorandum for the project.

3.0 SUBSURFACE CONDITIONS

3.1 USGS TOPOGRAPHIC SURVEY

The USGS topographic survey map titled "Tarpon Springs, Florida" was reviewed. The natural ground surface elevations appear to be within a range of about +5 feet to +10 feet National Geodetic Vertical Datum of 1929 (NGVD29). A reproduction of the USGS maps is presented on **Figure 4.0**.

3.2 REGIONAL GEOLOGY

The regional geology presented below is as presented in the USDA Soil Survey of Pinellas County, Florida.

The two major geologic formations in Pinellas County are the Hawthorn Formation of the lower Miocene and Caloosahatchee Marl of the lower Pliocene. The border between these formations extends across the peninsula north of the Cross Bayou Canal through Safety Harbor and Oldsmar. The Hawthorn Formation underlies soils north of this line.

The Hawthorn Formation consists of interbedded sand, clay, marl, limestone, lenses of fuller's earth, and land-pebble phosphate. Soils that occur on the side slopes of depressions northeast of Clearwater and in cuts made by Curlew Creek north of Dunedin contain phosphatic material from this formation.

During the Pleistocene, marine deposits that formed four terraces covered these formations. A mantle of sand that ranges from two to 35 feet in thickness covered these terraces. These terraces are described below:

The Pamlico terrace occurs at an elevation of 0 to 25 feet above mean sea level. It is mainly sand, one to 15 feet thick. In areas near Oldsmar, St. Petersburg, and Pinellas Park, the sand is only one to 4 feet thick and is underlain by Caloosahatchee Marl.

Soils of the Oldsmar and Wabasso series that have acidic sand upper horizons and nonacidic, loamy subsoil formed on this terrace.

The Talbot terrace is 25 to 42 feet above mean sea level. It is fine sand not more than 16 feet thick. In a few places, the sand mantle is thin and soils have been affected by phosphatic material from underlying Hawthorn Formation. Most soils of the Talbot terrace are acidic. Soils of Astatula, Immokalee, Myakka, and Pomello series formed this terrace.

The Penholoway terrace is 42 to 70 feet above mean sea level. It is mostly fine sand as much as 28 feet thick. The Hawthorn Formation underlies it. On sides of depressions the sand mantle is thin, and materials from the Hawthorn Formation have affected the soils. Most soils on this terrace are acidic. A few nonacid soils occur in small isolated areas in depressions and along streams. Soils of the Astatula, Immokalee, Myakka, Paola, Pomello, and St. Lucie series formed this terrace.

The Wicomico terrace is 70 to 97 feet above mean sea level. It is mainly fine sand as much as 27 feet thick. The Hawthorn Formation underlies it. The soils on this terrace are dominantly acid sands of the Astatula, Immokalee, Paola, Pomello, and St. Lucie series.

A few pockets of recently deposited muck and freshwater marl occur in low areas. With few exceptions, individual soils are confined to a particular geologic formation or marine terrace. For example, Pinellas soil that formed in fresh-water alkaline deposits on upland terraces are very similar to Pinellas soil that formed in alkaline sediments of Caloosahatchee Marl. Though variations in characteristics of the parent material are apparent in the field, they do not affect soil classification.

3.3 PINELLAS COUNTY SOIL SURVEY

Based on a review of the Pinellas County Soil Survey published by USDA-NRCS, it appears that there are three soil-mapping units noted within the project limits. A detailed soil survey map is shown on **Figure 4.** The general soil descriptions are presented in the sub-sections below, as described in the Web Soil Survey. Table 3-1 summarizes information on the soil mapping units obtained from the Web Soil Survey.

3.3.1 Astatula Soils and Urban Land (Unit 4)

The Astatula component makes up 50 percent of the map unit. Slopes are 0 to five percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches.

Generated brief soil descriptions are created for major soil components. The Urban land is a miscellaneous area.

3.3.2 Matlacha and St. Augustine Soils and Urban Land (Unit 16)

The Matlacha component makes up 32 percent of the map unit. Slopes are 0 to two percent. This component is on fills on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill.

This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during June, July, August, September, and October.

The St. Augustine component makes up 32 percent of the map unit. Slopes are 0 to 2 percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during June, July, August, September, and October.

Generated brief soil descriptions are created for major soil components. The Urban land is a miscellaneous area.

3.3.3 Tavares Soils and Urban Land (Unit 29)

The Tavares component makes up 50 percent of the map unit. Slopes are 0 to 5 percent. This component is on knolls on marine terraces on coastal plains, ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 57 inches during June, July, August, September, October, November, and December.

Generated brief soil descriptions are created for major soil components. The Urban land is a miscellaneous area.

Table 3-1
Pinellas County USDA NRCS Soil Survey Information

USDA Map Unit and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(4) Astatula-Urban land	0-3	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5	---	Jan-Dec
	3-80	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(16) Matlacha St. Augustine-Urban land	0-42	SP, SP-SM	A-3	2.0 - 6.0	6.1-8.4	2.0-3.0	June-Oct
	42-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	0-8	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4	1.5-3.0	June-Oct
	8-33	SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	33-48	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	48-63	SM, SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	63-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(29) Tavares-Urban Land	0-5	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5	3.5->6.0	June-Dec
	5-80	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec

3.4 GROUNDWATER CONDITIONS

Riverside Drive and the Beckett Bridge crosses the Whitcomb Bayou/Minetta Branch of the Anclote River. Based on the USDA Soil Survey of Pinellas County, Florida, the seasonal high groundwater table ranges from about 1½ to greater than six feet below grade. Due to the proximity of the project to the river and Bayou it is anticipated that the water table is tidally influenced.

Verify that the potential for artesian conditions are addressed with notes in the Plans.

3.5 Review of Potentiometric Surface Maps

Based on a review of the “Potentiometric Surface of the Upper Floridan Aquifer, West Central Florida” maps published by the USGS, the potentiometric surface elevation at the bridge site ranges from approximately +5 feet to +10 feet NGVD 29. As indicated in Section 3.1, the project site elevations range from approximately +5 feet to +10 feet, NGVD 29. It should be noted that artesian conditions were not noted within test borings completed by others at the project site.

4.0 PRELIMINARY ENGINEERING EVALUATIONS

4.1 Shallow Soil Suitability

Based upon the USDA-NRSC Soil Survey for Pinellas County, sandy soils to depths of 80 inches below the natural ground surface are reported along the entire project limits. In general, these sandy soils are suitable for supporting the proposed improvements after proper subgrade preparation and removal of unsuitable materials.

The near surface soils within 80 inches are reported to consist of A-3 and A-2-4 select sandy soils. These soils are anticipated to be suitable for roadway subgrade and roadway fill materials. It is recommended that soil test borings be completed during final design activities to verify soil suitability.

4.2 Roadway Construction

Site preparation should consist of normal clearing and grubbing followed by compaction of subgrade soils. Subgrade preparation will include the removal of plastic soils and top-soils and organic soils in accordance with FDOT Design Standard Index 500. Backfill embankment materials should consist of materials conforming to FDOT Design Standard Index 505. Clearing and grubbing and compaction should be accomplished in accordance with the latest FDOT Standard Specifications for Road and Bridge Construction (SSRBC).

The overall site preparation and mechanical densification work for the construction of the proposed roadway should be in accordance with the FDOT SSRBC and Standard Index requirements. In general, the existing subsurface soils appear capable of supporting the construction of the proposed roadway improvements subject to the above geotechnical considerations and after proper subgrade preparation.

4.3 GEOTECHNICAL BRIDGE CONSIDERATIONS

The Beckett Bridge is a multi-spanned bridge that has been reported to have experienced lateral movement and subsidence. The bridge is a two- lane bascule bridge about 20 feet across and 360 feet in length with two-foot 2 inch wide sidewalks on both sides. We understand the approach span structures are constructed on 14- inch square prestressed concrete piles. There are four spans on the east approach and five spans on the west approach. The bascule is approximately 40 feet long and is supported on a concrete pier. The bridge was originally constructed in 1924 using timber piling and timber bents. The bridge approach spans were reconstructed in 1956 using reinforced concrete, however, the original bascule span remained. Structural repairs were performed between 1979 and 2011 including the installation of crutch bents.

4.3.1 Previous Geotechnical Studies

Williams Earth Sciences provided a report dated November 10, 1994, which provided recommendations for the installation of crutch bents using H-Piles. During the 1994 study, Williams preformed three Standard Penetration Tests (SPT) borings; one was performed at the west abutment, one at the east abutment, and one was performed in the vicinity of the Bent 5, adjacent to the bascule. The two abutment borings were performed from land and the Bent 5 boring was performed from the bridge (as opposed to a barge over water). Two SPT borings were also performed by Professional Service Industries (PSI). These two borings were performed at Bent 6 from the bridge. One was performed in the westbound lane and the other was performed in the eastbound lane. The report for this study, as submitted to the E.C. Driver team, is attached as **Appendix A**.

An additional geotechnical study was completed in 2009 by Williams Earth Sciences which included an Electrical Resistivity Geophysical Report by Subsurface Evaluations, Inc. (SEI). The Williams report along with the SEI report is provided as **Appendix B** and the soil descriptions and discussion is summarized below.

During the 2009 study, Electrical Resistivity Imaging (ERI) was conducted. The purpose of the ERI testing was to determine the vertical extent and lateral continuity of soil layers and to identify possible karst hazards within the river along the sides of the bridge. The ERI testing was performed by "Subsurface Evaluations, Inc." (SEI) and their report, dated April 28, 2009, is included in Appendix B.

The results of the ERI testing indicated several features and anomalies within the vicinity of the bridge footprint. First, there appears to be an anomaly near Bent 6, with the center approximated just north of the bridge, as depicted on Figure 1 of the SEI report. In addition, there appears to be a shelf at about 20 to 40 feet in depth indicating a change in soil material and/or density, as indicated on Figure 1 of the 2009 report.

Boring B-1 (PSI) was performed very close to the ERI anomaly indicated at Bent 6. PSI Boring B-1 indicates that there is a dense grading to medium dense dark brown to brown fine sand with trace of silt from the mud-line to about 10 feet below the mud-line, followed by a nine foot thick layer of stiff dark gray sandy silt, from 10 to 19 feet below the mud-line.

The silt layer was underlain by a relatively thin layer of hard limestone, from 19 to 24 feet below the mud-line. From 24 to 40 feet below the mud-line, a medium dense grading to very loose layer of brown sand with trace of silt (SP-SM) was encountered.

A second layer of hard limestone was present from 40 to 45 feet below the mud-line, followed by a medium dense brown fine sand with trace of silt (SP-SM) to the termination depth of the boring at about 57 feet below the mud-line.

Boring B-1 (PSI) and the ERI results correlate at Bent 6. In addition, this anomaly can be considered indicative of Karst conditions and potential weathering/ solutioning of the limestone. Boring B-2 was also performed at Bent 6, on the opposite side of the bridge (eastbound lane). This boring indicated somewhat similar soils to Boring B-1, however, there was no evidence of the stiff silt layer at 10 to 19 feet below the mud-line.

The borings conducted by Williams in the 1994 study indicated a soil stratigraphy that was quite dissimilar to the borings conducted at Bent 6 by PSI. These borings generally indicate a surficial layer of sands to silty sands or clayey soils, followed by very hard limestone to the full depth of the borings. There were a few minor variations in the subsurface soils, such as a thin layer of clay (CH) material in boring B-1 at a depth of 47 to 58 feet below the ground surface; a very loose shelly fine sand layer from 77 to 84 feet below the mud-line at boring B-2; and a possible void from 69 to 71 feet below the ground surface at boring B-3. The medium dense fine sand with trace of silt soil was not encountered in the SPT borings conducted by Williams.

Encountering highly dissimilar soils in a relatively short distance indicates that this area potentially has localized karst features. The Anclote River area is known for variable subsurface conditions and karst features. The subsurface is characterized by a sand layer overlying a shallow limestone. There is a lack of clay layering in this area and this condition can promote localized subsidence and raveling of the surficial soils into the karst limestone. Review of the ERI results indicates that the surficial karst solution features, or surficial relic sinkhole features, may be more prevalent near the center of the bridge. There also appears to be an apparent shelf, as indicated on ERI transects T3 and T4. Review of ERI transects T3, T4 and T5 indicate the possibility of a solution zone near to and below the bridge footprint that may be located in a southwest orientation. However, it should be noted that the bascule bridge footing and the piles may be providing interference of the ERI data and therefore **additional geotechnical exploration is warranted to verify subsurface conditions.**

The Williams report indicates that there has been settlement and rotation of the bents and/or bascule pier. There are a number of potential causes for this, both structurally and geotechnically, however, from a geotechnical standpoint, the causes may be due to subsidence of the piles due to 1) active solutioning of the limestone, or 2) insufficient pile bearing both axially and laterally, or a combination of both. Another consideration is the age of the timber piles supporting the bascule pier, which are more than 85 years old. The timber piles could be in poor condition due to fatigue, rot or some other form of deterioration.

HP 14x73 crutch bent piles were installed in 1996. The 1996 plans indicate crutch bents at Bent 6 and Bent 7, and pier stabilizers for the bascule. The lengths of the crutch bent piles varied dramatically from tip elevations of about -30 to -200 feet. These lengths were taken from old facsimile correspondence between Williams and DSA.

There was a minimum tip elevation of -35 feet indicated on the plans; therefore, one of the piles did not achieve the minimum tip elevation in accordance with the plans. The piles were also supposedly preformed to an elevation of -27 feet, and the preformed hole was supposed to be grouted. The HP crutch bent piles were also planned to be jacketed using an epoxy mix from elevation -4 to +4 feet, at the splash zone of the piles. Based on the 2007 Bridge Inspection Report, performed by Volkert & Associates, Inc., the “jackets are in good condition with no washouts or exposed base pile”.

4.4 Geotechnical Bridge Recommendations

Tierra understands that the bridge is under evaluation for:

- No-Build - Maintain Existing Bridge
- No-Build - Remove Existing Bridge (includes alternate routing of traffic)
- Rehabilitation of the Existing Bridge
- Replace with a new Movable Bridge
- Replace with a new Fixed Bridge

For the maintenance and rehabilitation alternatives, settlement and rotation monitoring of the bents and piers is recommended to determine the location and rate of movement that it is occurring so that the bents and/or piers can be shored to stabilize the settlement and rotation. Evaluation of how to shore the bents and/or piers can then be made.

Additional test borings will be required if settlement and rotation is ongoing to use as part of the design and construction of repair/modifications.

4.4.1 Geotechnical Bridge Replacement Considerations

If it is determined that the bridge will be replaced, then additional soil borings will be required as part of the design process.

Evaluations of foundation alternatives for a bridge replacement were based on the results of subsurface conditions encountered in the borings performed by others at the bridge site. Based on our experience with similar projects, we initially considered the following foundation alternatives:

- Shallow Foundations
- Steel Piles, including Pipe and H Sections

- Pre-stressed Square Concrete (PSC) Piles (18 and 24 inch square)
- Drilled Shafts

The following paragraphs discuss each of these alternatives briefly.

4.4.2 Shallow Foundations

With shallow foundation systems, the structure loads are supported by the bearing capacity of the foundation soils. The design of shallow foundations is typically governed by the soil bearing capacity and the total and differential settlement criteria. Based on the soil boring profiles, loose/soft soil zones at shallow depths and potential Karst/solutioned limestone were encountered in some of the borings performed.

The surficial soils throughout the project site would likely require soil improvement to achieve an adequate bearing resistance and minimize the potential for differential settlements. Shallow foundations can also be undermined by scour unless the foundations are constructed at depths that are too deep to be practical. Therefore, considering the scour effects, impacts of the soil improvement operations and associated costs, shallow foundations were not considered further for this preliminary bridge geotechnical report.

4.4.3 Steel Piles

Steel pile types include pipe and H-piles. Previous experience has shown that steel piles are generally more expensive per lineal foot than PSC piles. Steel piles may more easily penetrate dense layers to achieve a desired penetration depth. Typical sizes of pipe piles range from 18 to 24 inches in diameter. Steel pipe piles do not develop as much capacity for similar penetration depths as PSC piles. Steel H-piles often provide lower capacities than pipe piles at similar costs. Steel piles although structurally viable, are susceptible to corrosion in aggressive – high chloride content environments as is present at the Beckett Bridge site.

Steel piles are well suited to conditions with high variability in anticipated penetration depths where frequent splicing is expected. The environment of the substructure at the bridge site is extremely aggressive due to saltwater and high chloride contents. Steel piles are therefore not typically considered appropriate for a bridge replacement project in an extremely aggressive saltwater environment.

4.4.4 Drilled Shafts

Drilled cast-in-place straight-sided concrete shafts have the ability to develop high axial and lateral capacities. One drilled shaft could potentially take the place of several driven piles. The quality control of drilled shaft installation requires more engineering judgment and precaution compared with driven piles to ensure that the construction is in accordance with the specifications. This type of foundation system is often the chosen alternative for sites where competent limestone or very dense bearing strata are present at a relatively shallow depth with a sufficient thickness. Drilled shafts are also considered for sites where limiting vibrations and noise are important as is applicable to the Beckett Bridge project.

Drilled shafts are considered to be feasible for this project and therefore warrant further evaluation as the project proceeds into design. It should be noted that the potential potentiometric head pressure (potential artesian head) is reported at an elevation +0 to +10 NGVD. The potential for artesian conditions will need to be evaluated as part of the planned design of the bridge substructure. Drilled shaft cut-off elevations should ideally be set above the potential artesian head elevation to avoid construction problems with artesian flow. Benefits of a drilled shaft foundation include reduced noise and vibrations when compared to a driven pile system.

4.4.5 PSC Piles

Prestressed concrete pile foundations are a feasible foundation alternative. They are a widely used and proven foundation system in central Florida. PSC pile foundations are readily available and generally have a lower cost per ton of capacity than other pile types. Based on the environmental corrosion tests performed on recovered water samples obtained from the bridge site, the environment of the substructure at the bridge site is classified as extremely aggressive due to the chlorides content of the water. As a result it is recommended that the minimum size for PSC pile foundations be 24 inches square as referenced in the FDOT Structures Design Guidelines. Benefits of a driven pile system include typical Contractor familiarity and experience with driven pile installation.

It should be noted that the pile installation process creates both noise and induces vibrations to the surrounding environment. Vibration considerations are the primary concern with a driven pile foundation at the project site.

5.0 PRELIMINARY CONSTRUCTION CONSIDERATIONS

5.1 GENERAL

The overall site preparation and construction should be in accordance with the FDOT Standard Specifications for Road and Bridge Construction (SSRBC) and Standard Index Requirements.

5.2 TEMPORARY SIDE SLOPES

Side slopes for temporary excavations above the water table may stand near 1.5H:1V for short dry periods of time; however, it is recommended that temporary excavations that are deeper than 4 feet be cut on slopes of 2H:1V or flatter. Where restrictions will not permit slopes to be laid back as recommended above, the excavation should be shored in accordance with OSHA requirements. Furthermore, open-cut excavations exceeding 10 feet in depth should be properly dewatered and sloped 2H:1V or flatter or be benched using a bracing plan approved by a professional engineer licensed in the State of Florida. During foundation construction, excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

5.3 GROUNDWATER CONTROL

Depending upon groundwater levels at the time of construction, some form of dewatering may be required to achieve the required compaction. Due to groundwater levels during the wet season of the year, seepage may enter the bottom and sides of excavated areas. Such seepage will act to loosen soils and create difficult working conditions. Groundwater levels should be determined immediately prior to construction. Shallow groundwater should be kept below the lowest working area to facilitate proper material placement and compaction in accordance with the FDOT SSRBC.

5.4 PROTECTION OF EXISTING STRUCTURES

FDOT, SSRBC Section 455-1 should be followed for the protection of existing structures during foundation construction operations. It should be noted that some of the proposed bridge pier foundation locations will likely be situated in close proximity (distances less than 100 feet) to existing structures.

5.5 DYNAMIC LOAD TESTING FOR DRIVEN PILE FOUNDATIONS

In the event a driven pile foundation is considered for the project, we recommend that a test pile program be conducted for the proposed bridge construction including testing of at least 10% of the total piles, and that the test piles be monitored dynamically utilizing the Pile Driving Analyzer (PDA). The monitoring will provide estimates of pile capacity versus pile penetration, stresses in the pile, and other relevant parameters used to evaluate the pile driving process. CAPWAP analyses should be performed on selected conditions for evaluation of the PDA results. The results of the CAPWAP analyses will provide information for developing production pile length and driving criteria recommendations. The installation of the piles should be carried out in accordance with the FDOT SSRBC Section 455.

5.6 DRILLED SHAFT CONSTRUCTION

In the event a drilled shaft foundation is considered for the project FDOT requires that non-production test-hole shafts be installed to determine if the Contractor's methods and equipment are sufficient for the project. It is recommended that the Contractor perform one test hole for each shaft size proposed to be completed. The test hole should be installed in accordance with the FDOT SSRBC Section 455.

To verify the integrity of drilled shafts, Cross-hole Sonic Logging tubes should be installed in all drilled shafts in accordance with the FDOT SSRBC Section 455. It is our recommendation that Cross-hole Sonic Logging testing be performed on all test-hole shafts, and selected production shafts on the project. Recommended general notes for drilled shaft construction would occur during project design.

6.0 ENVIRONMENTAL CLASSIFICATION

Corrosion tests were performed as part of one of the previous geotechnical explorations on both soil and water samples from the site. The results of the tests are included in Appendix A and summarized below:

Table 6-1
Environmental Testing

Sample ID	Sample Date	Sample Location	Sample Type	Sample Depth	pH	Chlorides ppm	Sulfates ppm	Resistivity ohm-cm
S-1	10/20/94	North Side	Soil	1.0	8.8	300	<2	1440
W-1	10/20/94	Middle of Channel	Water	1.0	7.9	14,000	7,920	41

Based on the above laboratory test results and the FDOT Structures Design Guidelines, the environmental classification of the bridge site is shown in the following table.

Table 6-2
Environmental Classification

Description	Superstructure Environmental Classification	Concrete Substructure Environmental Classification	Steel Substructure Environmental Classification
Beckett Bridge	Extremely Aggressive	Extremely Aggressive	Extremely Aggressive

APPENDIX A

Williams Earth Science Report for Crutch Bent Foundations, Dated 1994

REPEATED REPORT OMITTED
SEE APPENDIX 7.1 (ABOVE)

APPENDIX B

Williams Earth Science Phase 1 Geotechnical Report, Dated May 18, 2009

REPEATED REPORT OMITTED

SEE APPENDIX 7.1 (ABOVE)

8. PHOTOS

Photo 1 - West Approach Looking East

Photo 2 - West Approach Spans

Photo 3 - Crutch Bent at Rest Pier/Bent 6

Photo 4 - Bascule Span

Photo 5 - East Approach Spans

Photo 6 - Crutch Bent at Bent 7

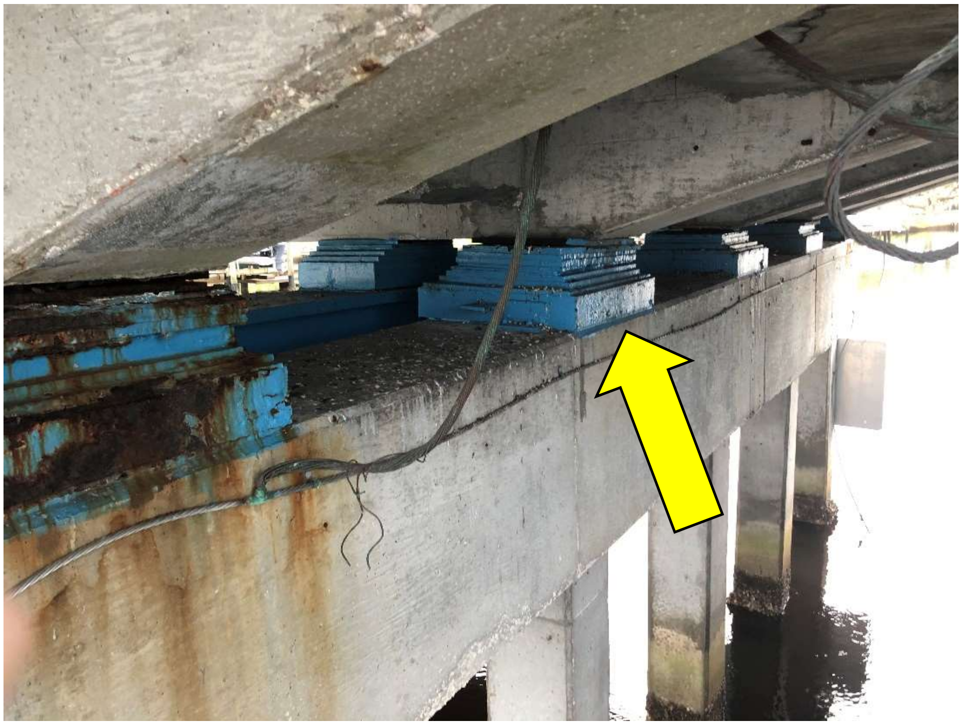

Photo 7 - Shims/Blocking at Bent 7 to Address Prior Settlement

Photo 8 - Bascule Pier Helper Piles at North Side

Photo 9 - Bascule Pier Helper Piles at South Side

Photo 10 - Monitoring Devices on Top of Curb with Evidence of Lateral Movement/Rotation

Photo 11 - Monitoring Devices at Face of Curb with Evidence of Settlement/Rotation

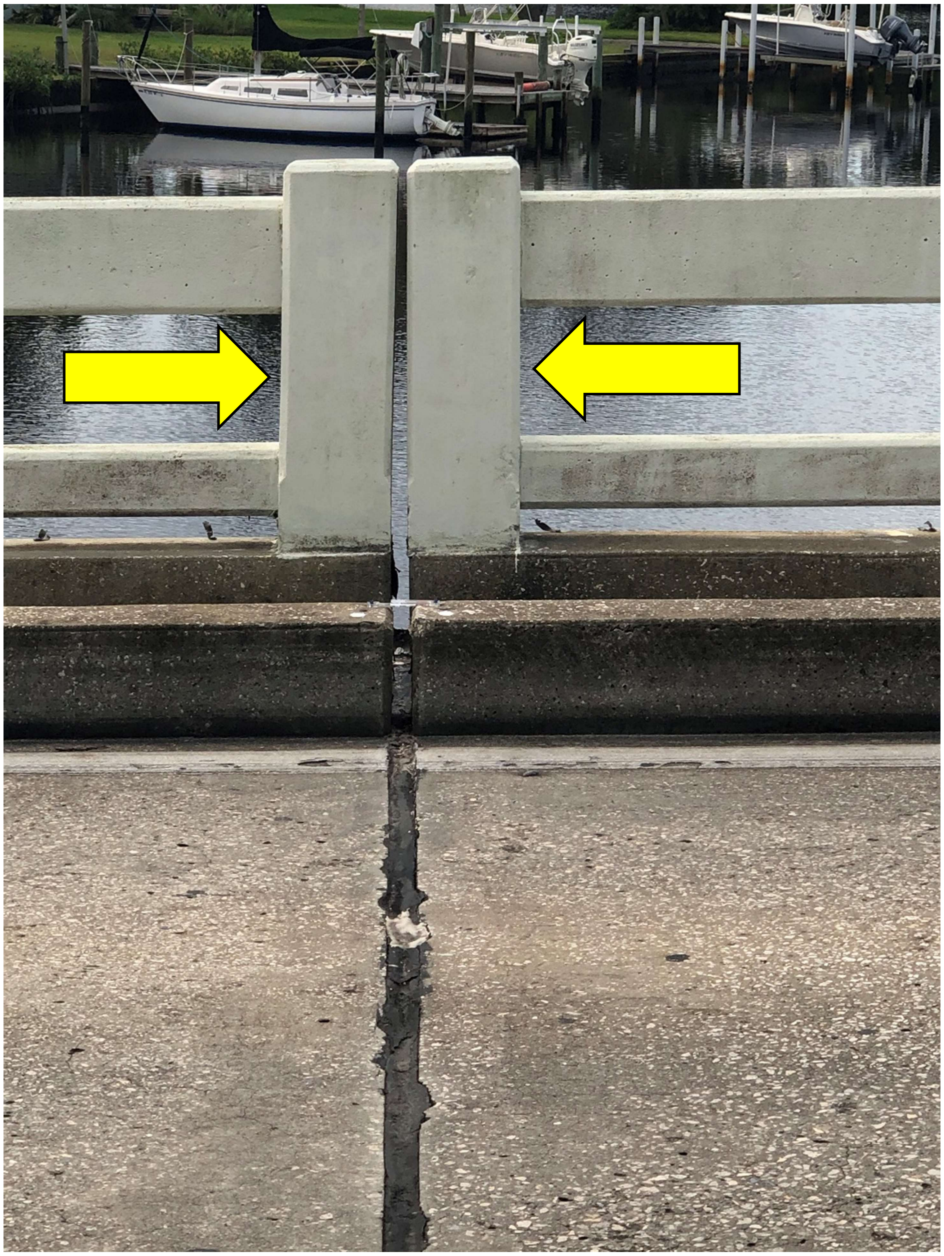

Photo 12- Bridge Railing with Evidence of Settlement/Rotation

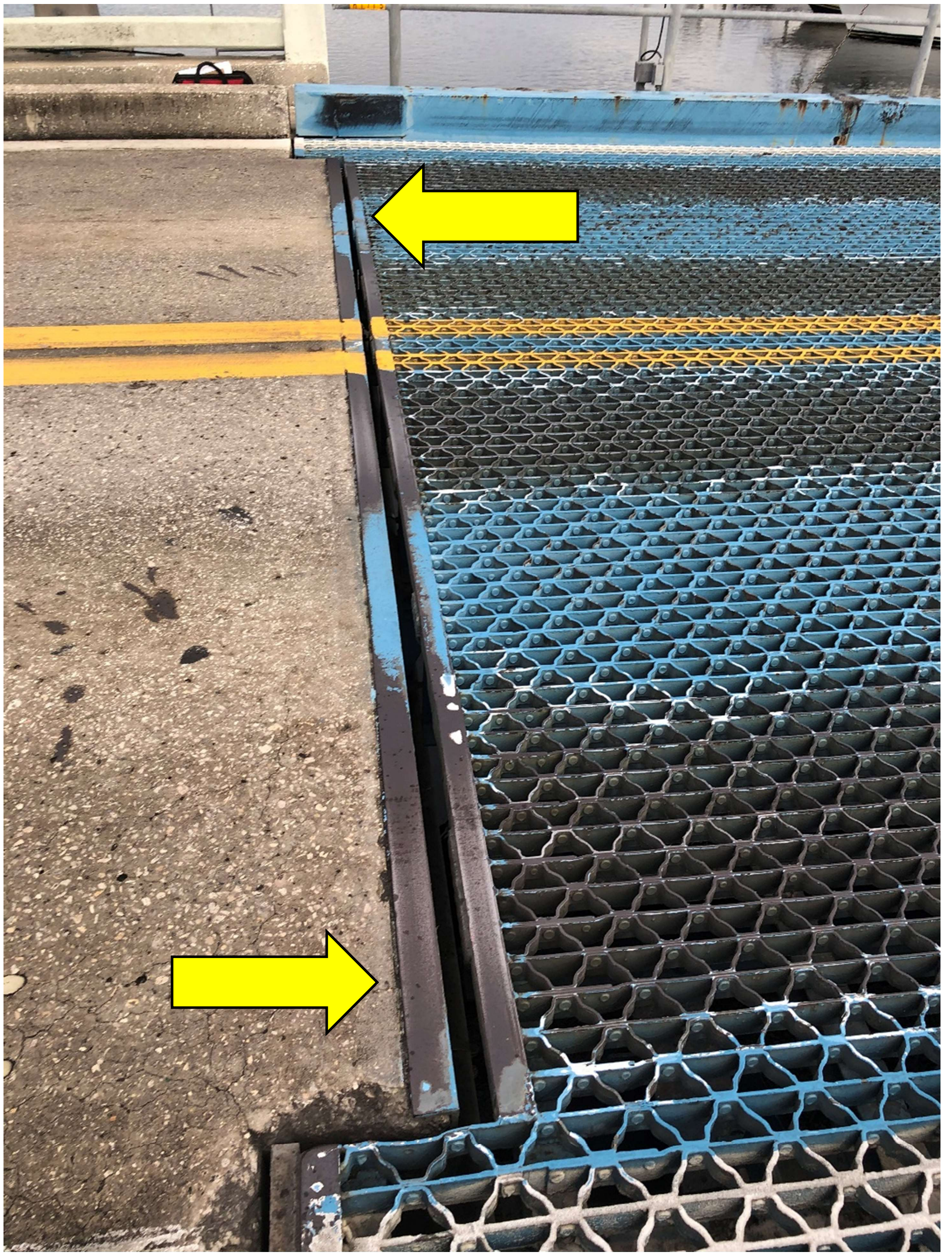

Photo 13 - Deck Joint at Bascule Span with Evidence of Horizontal & Longitudinal Movement/Rotation

Photo 14 Sidewalk Joint at Bascule Span with Evidence of Horizontal & Longitudinal Movement/Rotation

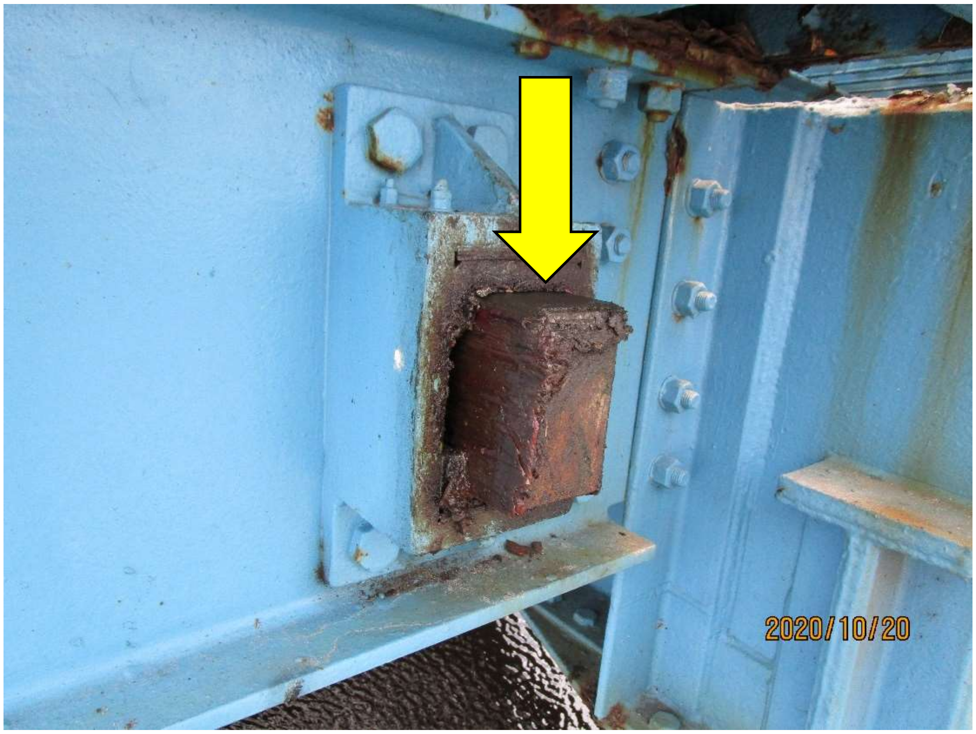

Photo 15 - Span Lock Bar with Evidence of Tight Contact with Receiver from Rest Pier Settlement

Photo 16 - Span Lock Receiver with Evidence of Tight Contact with Lock Bar from Rest Pier Settlement

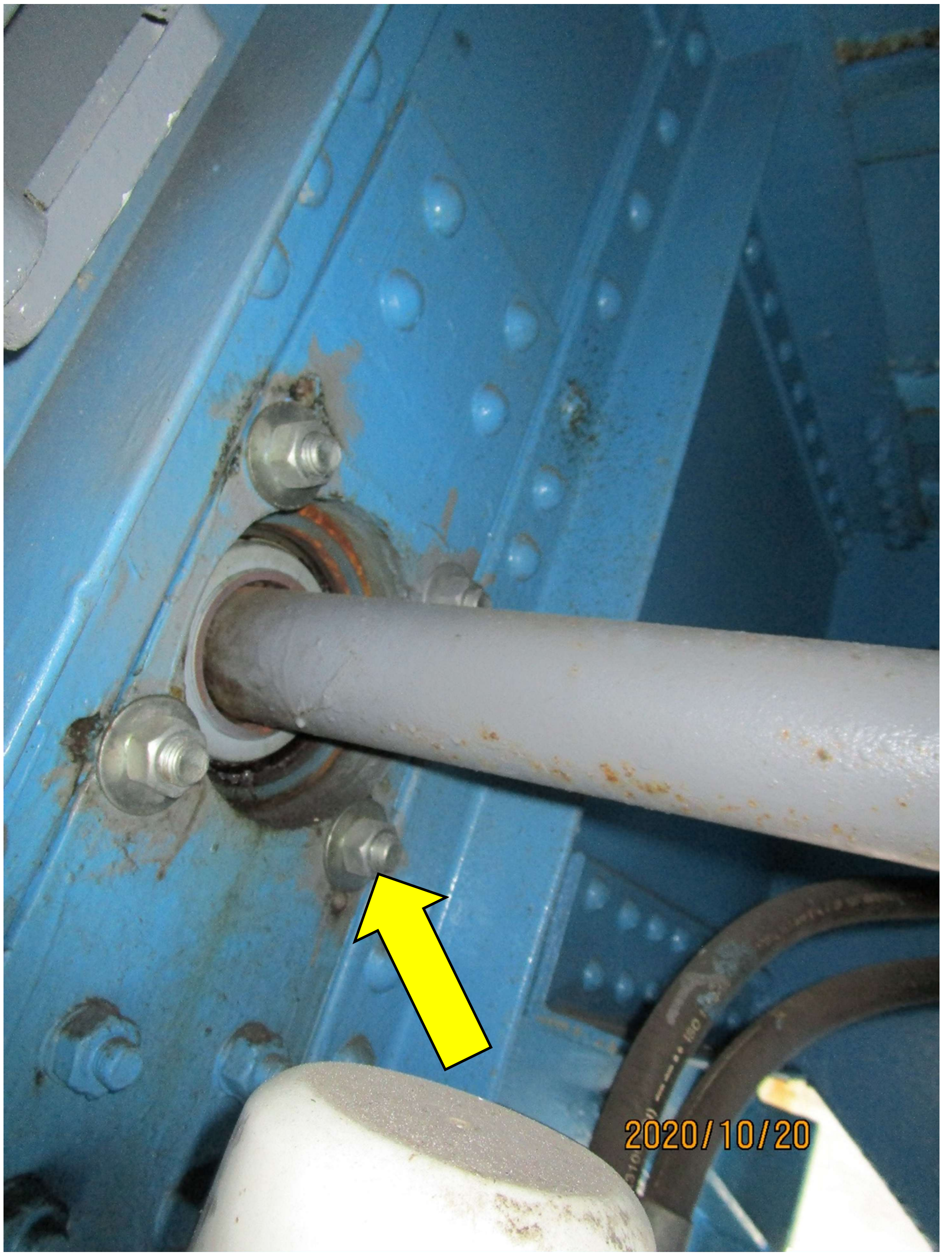

Photo 17 - Prior Replacement of Failed Pinion Shaft Bearing Hub from Rest Pier Settlement

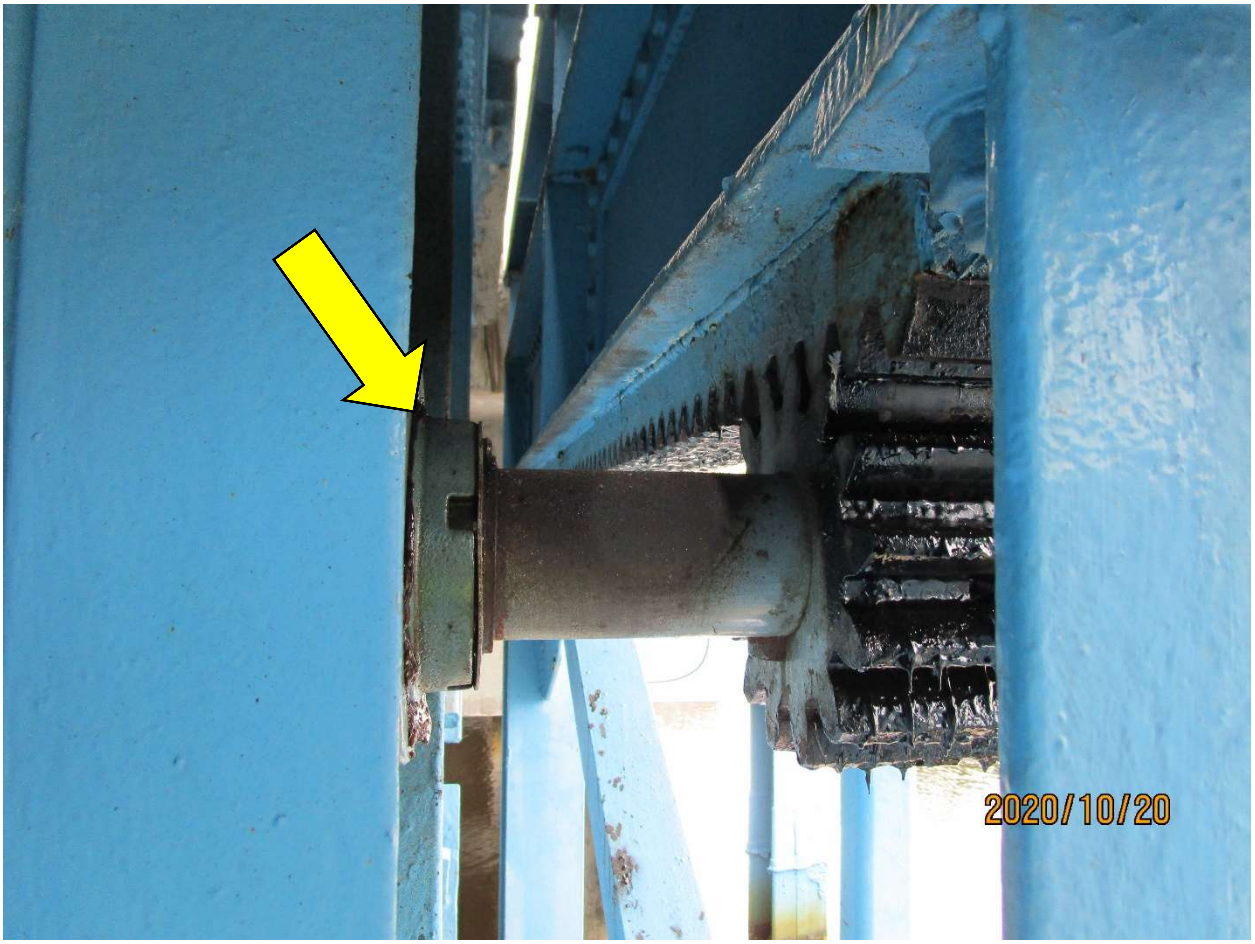

Photo 18 - Prior Replacement of Failed Pinion Shaft Bearing Hub from Rest Pier Settlement

Beckett Bridge

Project Development & Environment (PD&E) Study

from **Chesapeake Drive** *to* **Forest Avenue**
Tarpon Springs, Pinellas County, FL

Pinellas County Project ID: PID 2161 • ETDM #: 13040
FDOT Financial Project ID: 424385-1-28-01

February 2015

Preliminary Engineering Report

Volume 1: **Documentation**

Prepared for:
Pinellas County
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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway Transportation Officials
ABC	Accelerated Bridge Construction
ADA	Americans with Disabilities Act
AN	Advanced Notification
APE	Area of Potential Effect
BCC	Board of County Commissioners
BDR	Bridge Development Report
CAC	Citizens Advisory Committee
CEI	Construction Engineering and Inspection
CFR	Code of Federal Regulations
CID	Comprehensive Inventory Data
CIP	Capital Improvements Program
CRAS	Cultural Resource Assessment Survey
CRC	Cultural Resource Committee
CSER	Contamination Screening Evaluation Report
DOE	Determination of Eligibility
DOT Act	U.S. Department of Transportation Act of 1966
EFH	Essential Fish Habitat
ERI	Electrical Resistivity Imaging
ESBA	Endangered Species Biological Report
ETAT	Environmental Technical Advisory Team
ETDM	Efficient Transportation Decision Making
FAC	Freight Activity Center
F.A.C.	Florida Administrative Code
FDA	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDHR	Florida Department of Historic Resources
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FNAI	Florida Natural Areas Inventory
FR	Federal Register
F.S.	Florida Statute
FWC	Florida Fish and Wildlife Conservation Commission
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
GMFMC	Gulf of Mexico Fishery Management Council
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
IMA	Important Manatee Area

LIST OF ACRONYMS (Continued)

LOS	Level of Service
LRFD	Load and Resistance Factor
LRTP	Long Range Transportation Plan
MHP	Mobile Home Park
MHW	Mean High Water
mph	Miles per Hour
MPO	Metropolitan Planning Organization
MSE	Mechanically Stabilized Earth
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OFW	Outstanding Florida Waters
PCDEM	Pinellas County Department of Environmental Management
pcf	Per Cubic Foot
PCPT	Pinellas County Public Transit
PER	Preliminary Engineering Report
PD&E	Project Development and Environment
PPM	Plans Preparation Manual (FDOT)
PSI	Professional Service Industries
PSTA	Pinellas Suncoast Transit Authority
SEI	Subsurface Evaluations, Inc.
SHPO	State Historic Preservation Officer
SPT	Standard Penetration Tests
STIP	State Transportation Improvement Program
SU	Single Unit Truck
SWFWMD	Southwest Florida Water Management District
TBRPM	Tampa Bay Regional Planning Model
TCC	Technical Coordinating Committee
TIP	Transportation Improvement Program
TSM	Transportation System Management
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
vpd	Vehicles per Day
WQIE	Water Quality Impact Evaluation

1.0 SUMMARY

Pinellas County conducted a PD&E Study for proposed improvements to the Beckett Bridge in Tarpon Springs, Pinellas County, FL, in coordination with the Florida Department of Transportation (FDOT) and the Federal Highway Administration (FHWA). A project location map is provided in **Figure 1-1**. The following alternatives were evaluated during the Study:

- No-Build
- No-Build with Removal of the Existing Bridge
- Rehabilitation of the Existing Bridge
- Replacement with a New Movable Bridge
- Replacement with a New Nigh-Level Fixed Bridge

This Preliminary Engineering Report contains detailed engineering information that fulfills the purpose and need for the proposed replacement of the Beckett Bridge, from Chesapeake Drive to Forest Avenue, City of Tarpon Springs, Pinellas County, Florida. The project numbers are as follows:

County PID	2161
ETDM	13040
FDOT Financial Mgmt.	424385-1-20-01

The report documents the development and evaluation of alternatives for the proposed improvements and summarizes the public involvement activities conducted during the PD&E study.

1.1 PROJECT COMMITMENTS

To minimize impacts to navigation and to comply with USCG requirements, the contractor will be required to coordinate any full or partial closures of the channel to marine traffic during construction with the USCG in Miami FL (telephone 305.415.6744) at least 60 days prior to the planned closing.

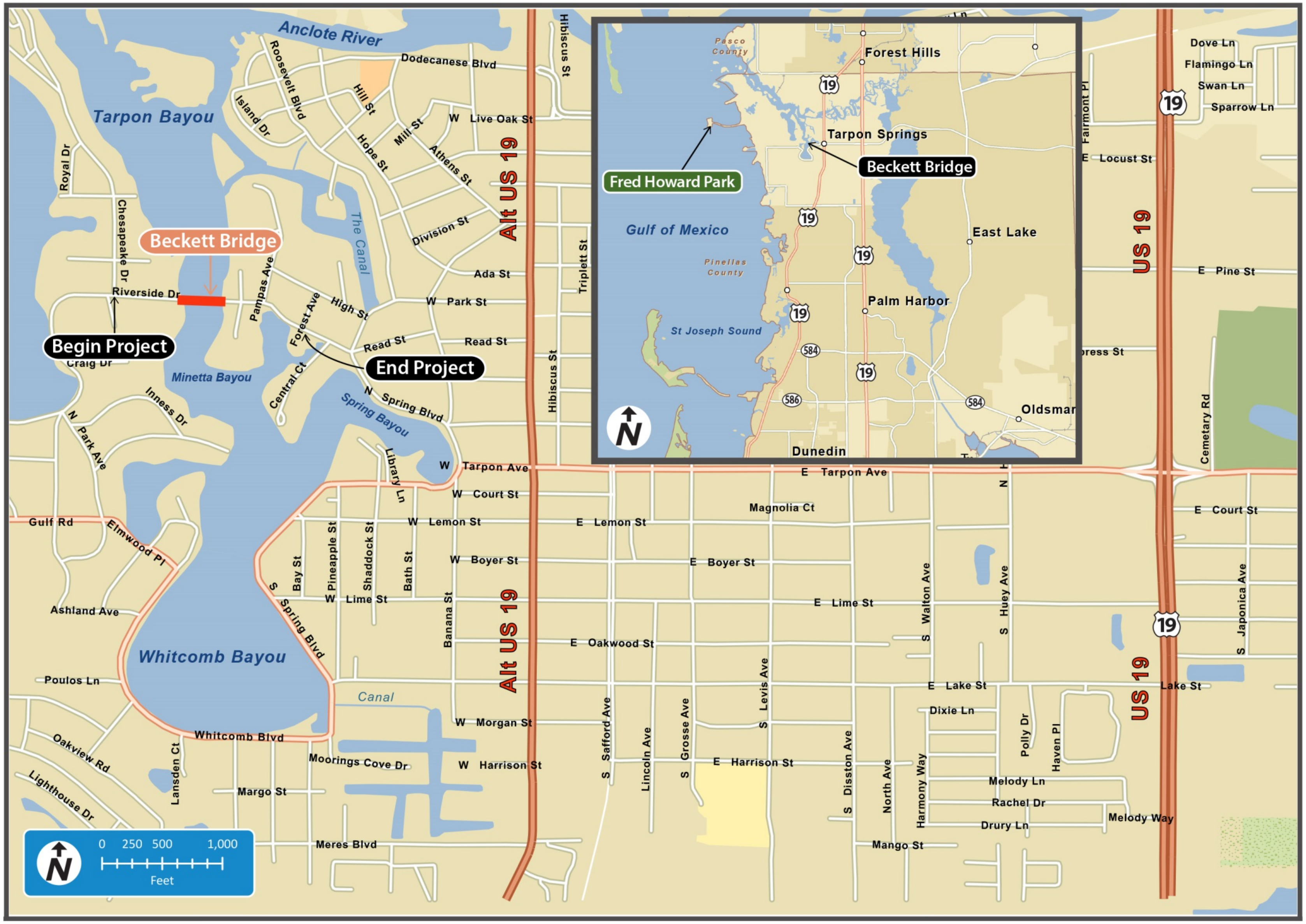


Figure 1-1 – Project Location

SHPO, FHWA, FDOT and Pinellas County signed a Section 106 Memorandum of Agreement (MOA) which specifies conditions required to mitigate for the adverse impacts resulting from demolition of the existing historic bridge on January 29, 2014. The MOA requires the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. The MOA stipulates that the design of the new bridge will be a single-leaf, rolling lift bridge type of similar design and scale to the historic Beckett Bridge. Additional mitigation measures as described in the MOA are also required. A copy of the MOA is included in Appendix J of this document.

The Section 106 MOA also stipulates that Pinellas County will create an aesthetics committee consisting of representatives from the adjacent community, City of Tarpon Springs, Tarpon Springs Historical Society, FHWA, and Florida SHPO to serve in an advisory capacity regarding appropriate design elements for the replacement bridge that may be addressed during the development of the Project.

The National Marine Fisheries Service (NMFS) requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed. Accordingly, Pinellas County will coordinate potential wetland and essential fish habitat impacts and proposed mitigation with the NMFS during the design phase of the project.

Pinellas County will comply with the current version of the US Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC) approved “Standard Manatee Construction Conditions” during all in-water construction phases of the project. In addition, the County will coordinate with both agencies concerning site specific manatee protection measures to be implemented during construction.

Pinellas County will submit a blasting plan to USFWS and FWC for review and approval prior to construction if blasting is proposed for demolition. The plan will include the use of qualified observers and an aerial survey.

As requested by the FWC, Pinellas County will coordinate wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

Pinellas County will coordinate with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

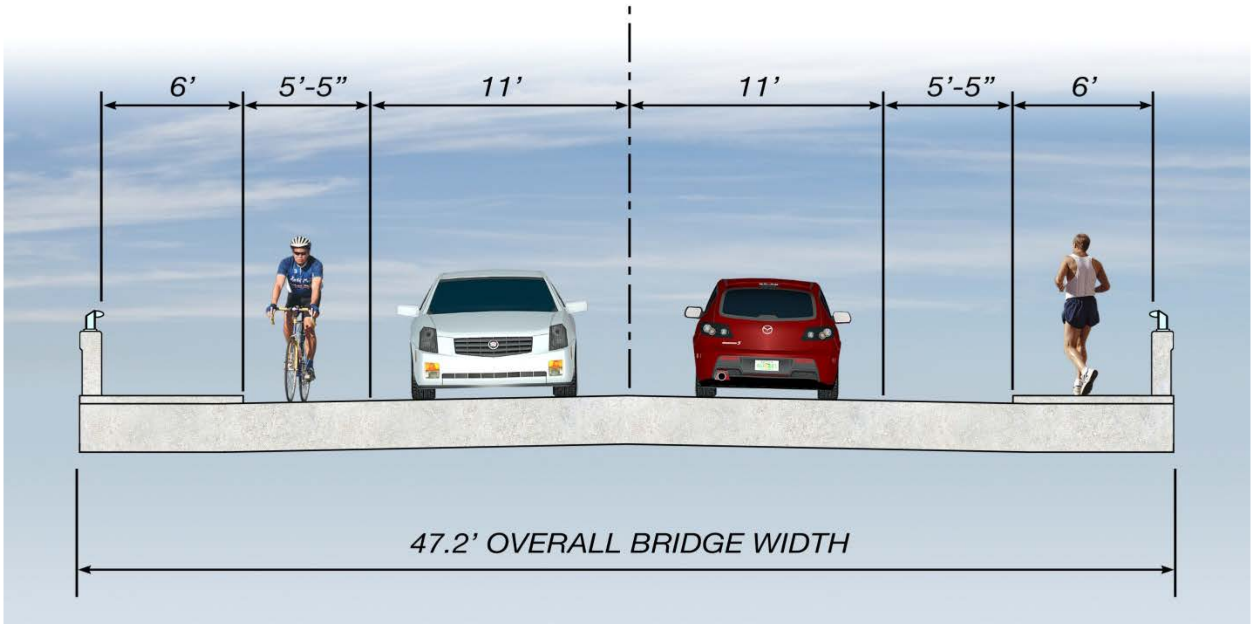
1.2 PROPOSED ACTION

The Recommended Alternative is replacement of the existing two-lane bascule Beckett Bridge with a new two-lane movable bridge. In accordance with the Section 106 Memorandum of Agreement, the design of the new bridge will be a single-leaf, rolling lift bridge type of similar design and scale of the historic Beckett Bridge. The proposed bridge would provide 7.8 feet of vertical clearance over the navigation channel at the fenders in the closed position. Unlimited vertical clearance will be provided in the open position for the width of the channel between the fenders. The horizontal clearance between the fenders will be 25 feet. The new bridge would be constructed within existing right-of-way, on approximately the same alignment as the existing bridge. The proposed bridge will be approximately 19 feet wider than the existing bridge.

No additional right-of-way will be required. No business or residential relocations will result from construction of the proposed improvements. The proposed bridge is likely to qualify for a General Permit from SWFWMD and treatment of stormwater runoff from the bridge would not be required. However, if treatment of stormwater is required, it is anticipated that compensatory, offsite treatment will be acceptable. Accordingly, acquisition of additional right-of-way is not anticipated to address water quality concerns.

The proposed bridge typical section for the replacement low-level movable bridge has a total out-to-out width of 47.2 feet as shown in **Figure 1-2**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, 6 feet wide, are proposed on both sides of the bridge.

The maximum proposed grade is five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore Mobile Home Park, the Tarpon Springs Yacht Club and Venetian Court to allow connection of



these driveways with minimal re-grading.

Figure 1-2 – Proposed Movable Bridge Typical Section

Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues. The proposed roadway profile would be approximately two feet higher than the existing roadway at the west end of the bridge, and approximately four feet higher at east end of the bridge.

Approximately 0.03 acre of wetlands will be impacted by the proposed replacement bridge. No perceptible noise impacts are anticipated.

2.0 LOCATION AND NEED

2.1 PROJECT DESCRIPTION

Pinellas County, in coordination with the Florida Department of Transportation (FDOT) District Seven, and the Federal Highway Administration (FHWA) is conducting a Project Development and Environment (PD&E) Study to evaluate alternatives to remove, rehabilitate or replace the existing Beckett Bridge (Bridge no. 154000) in Tarpon Springs, Pinellas County, Florida. The existing bridge was originally constructed in 1924 as a timber structure with a steel movable span. The fixed timber approach spans were replaced with concrete approach spans in 1956. The bridge has been determined to be eligible for listing in the National Register of Historic Places (NRHP). Eligibility is based on the bridge's contribution to early development of the area and because it is one of a few known, pre-1965, highway single-leaf rolling-lift bascule bridges remaining in Florida. Since 1956, major repairs were performed in 1979, 1998, and in 2011. Major rehabilitation or replacement of the bridge is needed to keep the bridge open and operating efficiently.

The project limits extend along Riverside Drive from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, a distance of approximately 0.3 mile. The existing two-lane bridge connects areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. (See **Figure 2-1**, Project Location.) Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire. Alternate routes (that do not require crossing of the Beckett Bridge) are available for travel to and from the areas mentioned above, and for emergency response.

Beckett Bridge is owned and operated by Pinellas County. A bridge tender is only present when required to open the drawbridge for a vessel, there are no full-time bridge tenders. U.S. Coast Guard (USCG) drawbridge opening regulations (33CFR117.341) states that "The draw of the Beckett Bridge, mile 0.5, at Tarpon Springs, Florida shall open on signal if at least two hours' notice is given."

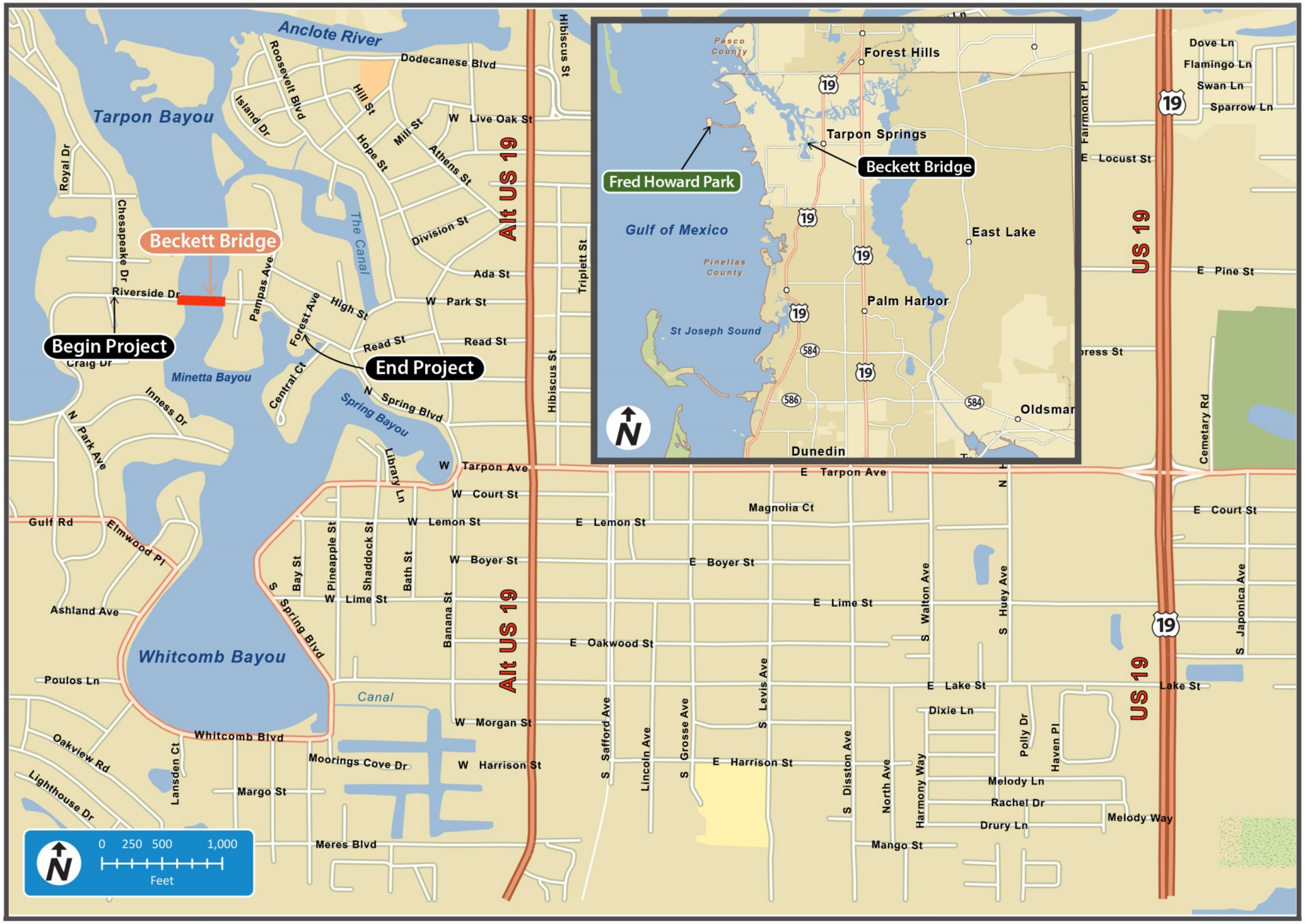


Figure 2-1 – Project Location

Beckett Bridge – Elevation View

Beckett Bridge – View from Roadway

Whitcomb Bayou connects to the Gulf of Mexico via the Anclote River to the north. Boats docked along Whitcomb, Spring and Minetta Bayous, and along artificial canals which connect to the southeastern portion of the Whitcomb Bayou, must pass the Beckett Bridge to access the Gulf of Mexico. The following alternatives were evaluated during the study:

- No-Build - Maintain Existing Bridge
- No-Build - Remove Existing Bridge (includes alternate routing of traffic)
- Rehabilitation of the Existing Bridge
- Replace with a new Movable Bridge
- Replace with a new Fixed Bridge

The "No-Build" alternative includes only routine maintenance to keep the bridge open to boaters and vehicular traffic until safety issues would require it to be closed. Evaluation of future improvements would occur at a later date. The "No Build with Removal of the Existing Bridge" would result in routine maintenance in the near future with the intent to demolish the bridge when it is no longer safe for traffic, with no plans to replace it with a new one. All bridge replacement alternatives considered will be constructed in approximately the same location as the existing bridge to minimize impacts. A USCG bridge permit will be required if a replacement bridge is selected as the Preferred Alternative. Accordingly, the USCG has requested to be a cooperating agency for this PD&E Study.

Alternate corridors for bridge location will not be evaluated due to the extent of development in the vicinity of the existing bridge. Capacity improvements will not be considered. The complete removal alternative will examine alternative traffic routes and potential impacts to the community and on traffic operations.

2.2 PURPOSE AND NEED FOR IMPROVEMENTS

According to recent (07/31/2012) FDOT inspection reports, the existing bridge has an overall Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. (Sufficiency ratings are a method of evaluating highway bridges by calculating a numeric value between 0 and 100, indicative of bridge sufficiency to remain in service). The bridge is considered functionally obsolete. This designation is based primarily on the substandard clear roadway width of only 20 feet and substandard roadway safety features. The existing typical section consists of one, 10-foot wide travel lane in each direction and 2-foot 2-inch-wide sidewalks separated by a curb on both sides of the bridge. (See **Figure 2-2**, Existing Bridge Typical Section.)

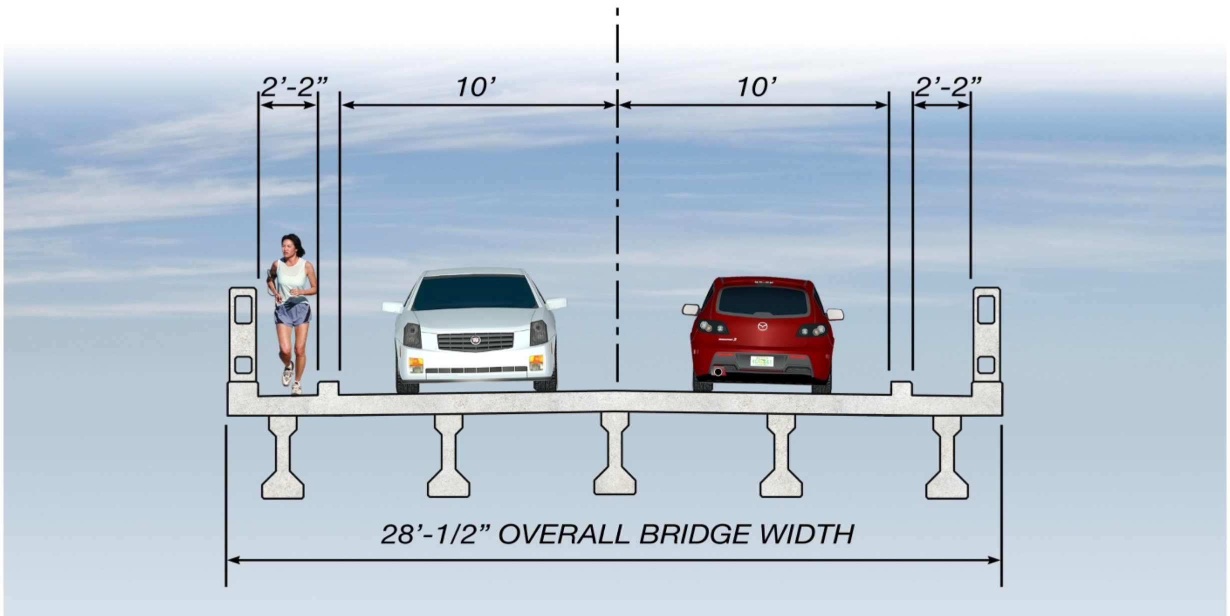


Figure 2-2 – Existing Bridge Typical Section

Minimum required lane and shoulder widths prescribed by the American Association of State Highway and Transportation Officials (AASHTO) are not met. The sidewalks on the bridge are narrow and do not meet current accessibility requirements established by the Americans with Disabilities Act (ADA). The bridge railings do not meet current standards for pedestrian safety or geometric and crash testing safety standards for vehicles. Approach guardrail and transitions and end treatments also do not meet current safety standards.

There are no official USCG navigational clearance guidelines for this waterway at this location. The existing vertical clearance at the fenders is six feet. The tip of the bascule leaf overhangs the fender with the leaf fully raised, limiting the clearance for a portion of the channel between the fenders. It is likely that unlimited vertical clearance was provided for the entire width of the channel when the bridge was originally constructed. The existing horizontal clearance between the fenders is 25 feet.

Bascule Leaf in Full Open Position

Bascule Leaf in Closed Position

Although the bridge is not considered Structurally Deficient, the bridge has a substandard load carrying capacity requiring weight restrictions. The bridge is currently posted for legal loads limited to 12-ton Single Unit Trucks and 15-ton Combination Trucks. Repairs in 1979 and 1988 included installation of crutch bents due to settlement and lateral stability concerns. Repairs in 2011 were performed to correct issues with the operating machinery and bascule leaf alignment.

FDOT District 7 completed the Program Screening Evaluation phase of the Efficient Transportation Decision Making (ETDM) process for this project. The ETDM Summary Report (ETDM Project Number 13040) was published on June 30, 2011 and is included in Appendix A of this report. The Advance Notification Package was mailed to the Florida State Clearinghouse on October 6, 2010. A copy of the package is also included in Appendix A.

2.3 CONSISTENCY WITH LOCAL TRANSPORTATION PLANS

The proposed project is a non-capacity bridge replacement. According, the Pinellas County 2035 Cost Feasible Long Range Transportation Plan (LRTP) was modified on June 11, 2014 to include information about the anticipated replacement of the Beckett Bridge and need for federal funding. The plan states the following:

"Many bridge projects do not increase the physical capacity of the transportation system, but rather serve as an in-kind replacement for what already exists. Some of these bridges are regionally significant, while others serve more of the local travel needs in Pinellas County. The following bridges in Pinellas County will soon be in need of replacement and federal funding will be sought to assist with the construction of new facilities:

- Beckett Bridge
- Dunedin Causeway
- San Martin Bridge"

Based on the Pinellas County 2035 LRTP and Transportation Element of the 2008 Comprehensive Plan, the current lane configuration for the project corridor is expected to remain two-lanes through 2035. Accordingly, replacement of the existing two-lane bridge with a new two-lane bridge is consistent with both plans. Rehabilitation, repair or replacement of the existing bridge is consistent with the goals and policies of Objective 1.10 of the Pinellas County 2035 LRTP which is to "Ensure the safe accommodation of motorized and non-motorized traffic while reducing the incidence of vehicular conflicts with the county's major transportation corridors."

The Pinellas County Transportation Improvement Program (TIP) – Fiscal Year (FY) 2011/12 through 2015/16 indicated that $750,000 was funded for the PD&E phase of the project. The PD&E phase was also included in the Pinellas County Capital Improvements Program (CIP), the FDOT Work Program, and the FDOT FY 2011 State Transportation Improvement Program (STIP). Copies of the appropriate sections of the Pinellas County TIP and CIP, FDOT Work Program, and FDOT District 7 STIP are included in Appendix B.

2.4 MODAL INTERRELATIONSHIPS

Transit

The Pinellas Suncoast Transit Authority (PSTA) does not operate transit service within the project limits. According to the most recent (October 2011) PSTA System Map, Route 66 provides hourly service daily along Alt US 19. Partial service is provided along Martin Luther King Boulevard. The nearest transit stops are on PSTA Route 66 along Pinellas Avenue North at Orange Street and Cypress Street, approximately one-half mile from the bridge. At this time, PSTA has no plans to expand transit service to include the Spring Boulevard/Riverside Drive within the project limits. Pasco County Public Transit (PCPT) operates Route 18 north of Live Oak Street and Dodecanese Boulevard near the Tarpon Springs Sponge Docks, approximately 0.9 miles northeast of the bridge.

Freight

As indicated in the ETDM Program Summary Report, the 2008 Pinellas County Metropolitan Planning Organization (MPO) Goods Movement Study identifies the Northwest Tarpon Springs Industrial Area as a potential Regional Freight Activity Center (FAC). This area is located north of the Spring Boulevard/Riverside Drive and west of Alternate US 19 at Anclote Boulevard and Anclote Roads (see **Figure 2-3**). FACs are major generators of truck trip activity, which include long-haul trips extending beyond the region. Alternate US 19 (SR 595), Anclote Boulevard, Anclote Road, Live Oak Street and Tarpon Avenue are all unrestricted truck routes (as shown on the Pinellas County Truck Route Plan.) At this time the Beckett Bridge is currently posted for legal loads limited to 12-ton Single Unit Trucks and 15-ton Combination Trucks. If the bridge is rehabilitated or replaced, and the speed limit of 20 mph through the project area is increased and the speed bumps were removed, Spring Boulevard/Riverside Drive could improve access to these truck routes.

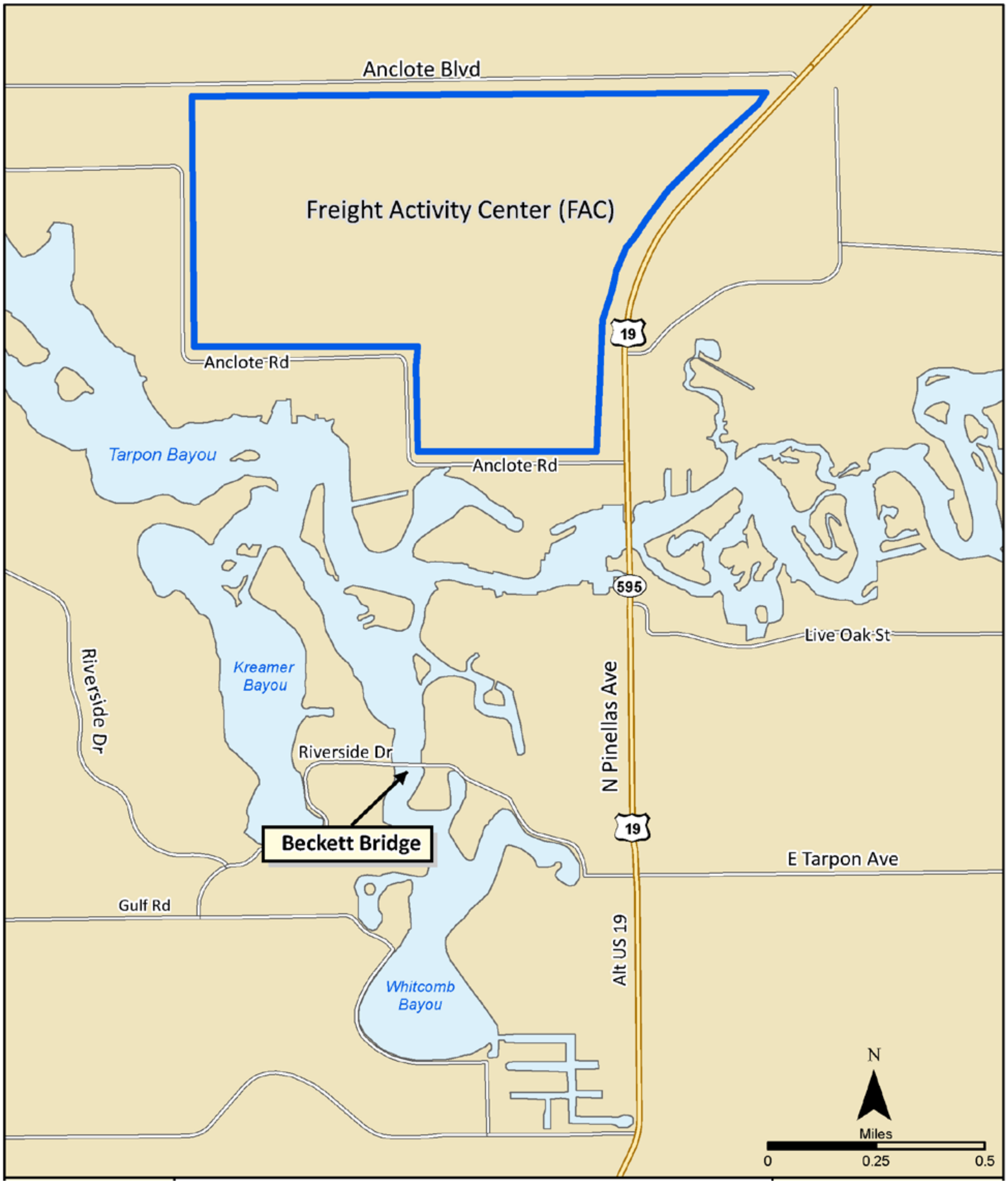


Figure 2-3 – Freight Activity Center (FAC) Location

School Transportation

Six public schools are located within three miles of the Beckett Bridge. The Beckett Bridge is currently load posted as follows: Single Unit Truck – 12 Tons, Combination Truck – 15 tons, and Truck and Trailer – 15 tons. School busses weigh on average 10-15 tons (empty) and have been prohibited from safely crossing the bridge. Accordingly, an alternate longer route is required. According to Mr. Mike Burke, Route and Safety Auditor for the Pinellas County School Board, if the bridge were rehabilitated or replaced school bus traffic would be re-routed to travel along Spring Boulevard/Riverside Drive and cross the Beckett Bridge. Approximately 15 to 20 school busses per day could potentially use the bridge. The detour results in additional costs for busses that service schools in the vicinity of the project.

Trails and Blueways

No officially designated county or regional trails cross the Beckett Bridge. However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 LRTP, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. The locations of these trails are shown on **Figure 2-4**. The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge. The Whitcomb Bayou Trail and Meres trails will also connect to the Pinellas trail and extend west. Both trails provide alternate routes to Howard Park that do not include crossing the Beckett Bridge. Both of these trails are located along potential detour routes during construction.

According to Ms. Susan Miller, Bicycle and Pedestrian Planner at Pinellas County, there has been no engineering or other evaluation of these planned cost feasible trailways projects. The MPO 2035 LRTP identifies "Present Day Costs" for the proposed trailways. The estimated cost for the Howard Park Trail is \$3.25M and is based on a standard per mile cost for construction of multi-use trails along existing roadways. The MPO is anticipating that improved facilities along these existing routes will be constructed as part of future roadway resurfacing or widening projects.

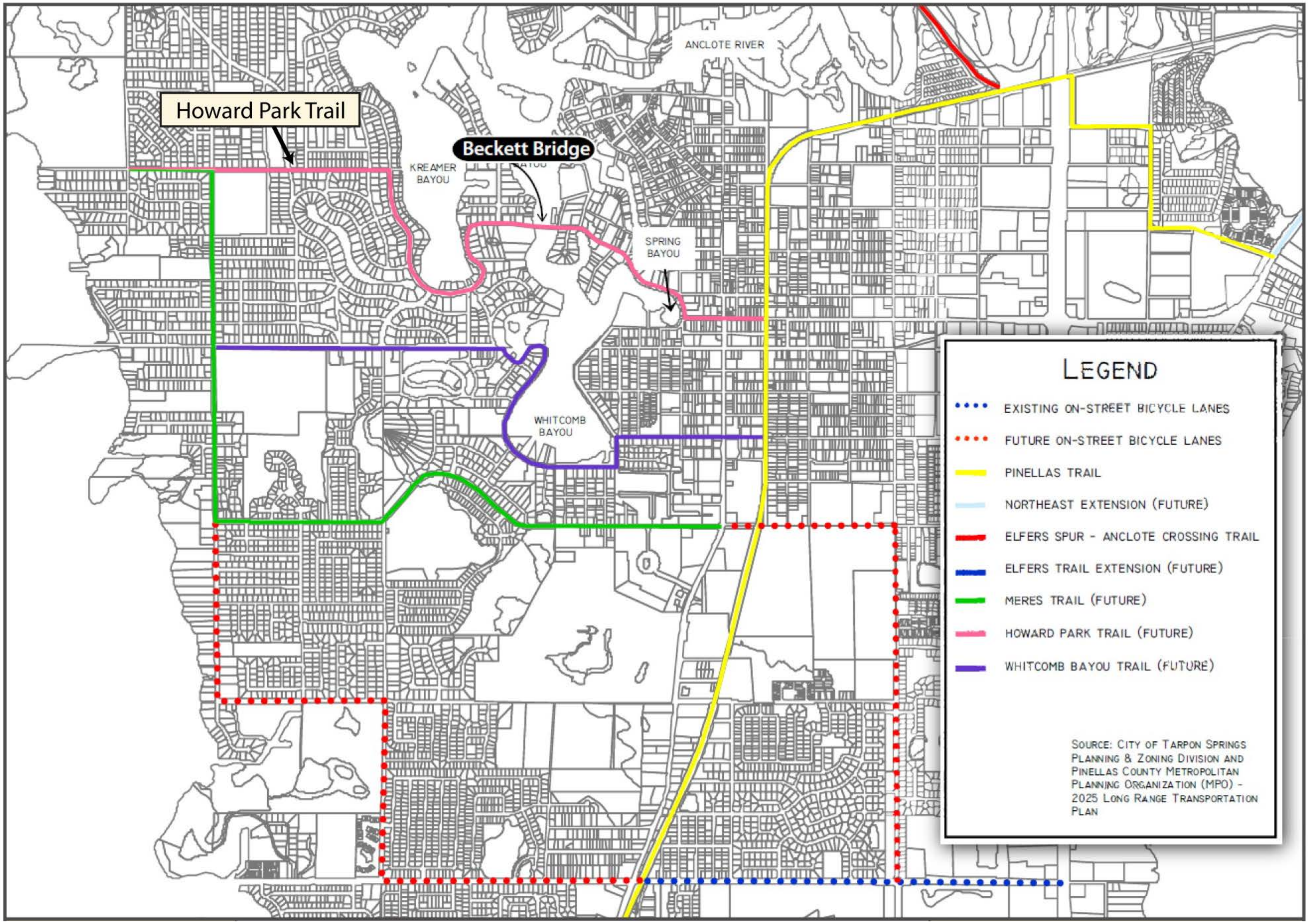


Figure 2-4 – Existing and Future Bicycle and Pedestrian Facilities

Marked and unmarked paddle trails are identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. A map from this guide for trails in northern Pinellas County is provided in **Figure 2-5**. An unmarked trail begins in Spring Bayou at Craig Park, just south of the Beckett Bridge. The trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico. The yearly Greek Orthodox Church Epiphany celebration is also held in Spring Bayou. In addition, paddlers visit this area to view manatees that seek warmer water in the winter.

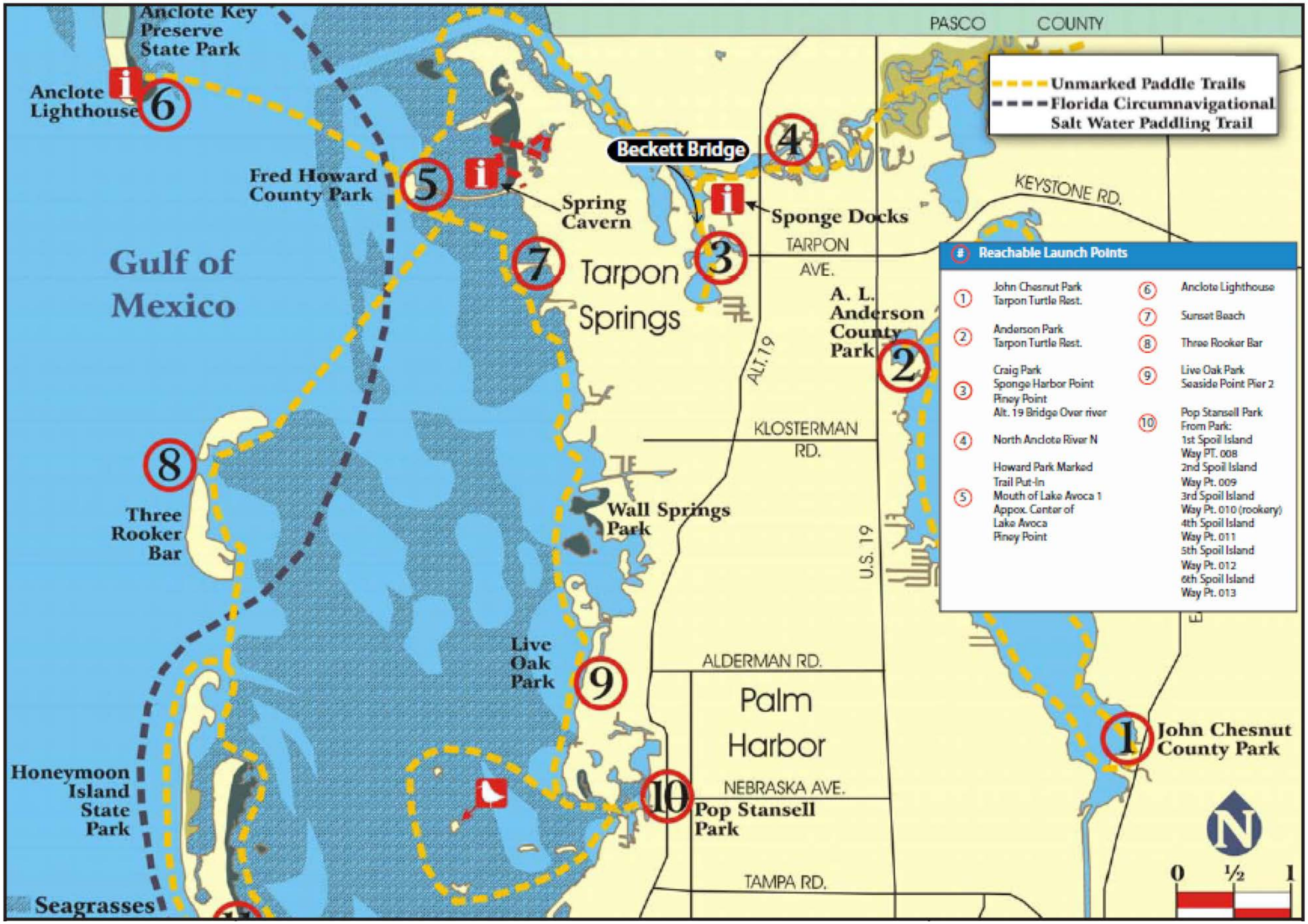


Figure 2-5 – Paddling Trails

3.0 EXISTING CONDITIONS

3.1 EXISTING ROADWAY CHARACTERISTICS

3.1.1 Functional Classification

According to the City of Tarpon Springs Comprehensive Plan and the Pinellas County Comprehensive Plan, the majority of the facilities located within the study area, including Riverside Drive/North Spring Boulevard and the Beckett Bridge from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, are functionally classified as “collector” roadways. Only Alternate US 19 is functionally classified as a “minor arterial.”

3.1.2 Roadway Sections

West of the bridge, the existing roadway section consists of two ten-foot travel lanes, with a four to five foot wide utility strip and four to four and a half foot wide sidewalk on the north side. There is no sidewalk on the south side of the roadway. The existing roadway section east of the bridge consists of two 11-foot wide travel lanes with outside shoulders of varying width. Some sections of discontinuous sidewalk do occur on both sides of the roadway. The sidewalks vary in width from four to five feet. Additional discussion concerning existing sidewalks on the roadway is provided in Section 3.1.3 Bicycle and Pedestrian Facilities.

3.1.3 Bicycle and Pedestrian Facilities

Sidewalks, approximately four to five-foot wide, are present on portions of the approach roadway within the project limits. West of the bridge, sidewalks are continuous on the north side of Riverside drive from the bridge extending west of Chesapeake Drive. No sidewalks occur on the south side of the roadway in this area. East of the bridge, continuous five-foot wide sidewalks are present on the north side of Riverside Drive between Pampas and Forest Avenue. A few sections of discontinuous sidewalk do occur on the south side of the roadway between the bridge and Pampas Avenue, and for a short distance just west of Forest Avenue.

Narrow sidewalks, approximately 2’2” in width (between the brush curb and the bridge railing), occur on both sides of the existing bridge. The sidewalks on the bridge are set behind a 9-inch wide, 9-inch tall brush curb, but are not separated from the travel lanes by a traffic barrier. Bicycle lanes are not currently provided on the roadway or bridge within the project limits. Bicyclists have been observed using the travel lanes and the narrow sidewalks.

3.1.4 Right-of-Way

Existing right-of-way varies between 37 feet and 50 feet within the project limits. The existing right-of-way is 40 feet wide from the bridge west to Chesapeake Drive. From the bridge east to Pampas Avenue the right-of-way is 50 feet wide. Between Pampas Avenue and Forest Avenue, the existing right-of-way varies from 37 feet to 43 feet wide. The roadway is approximately centered within the existing right-of-way. The existing bridge is approximately centered within a 50-foot wide Sovereign Submerged Land Easement. The width of the easement increases to 100 feet at the channel to accommodate the fender system.

3.1.5 Horizontal and Vertical Alignment

The existing horizontal alignment of Riverside Drive/Spring Boulevard through the project limits is curvilinear, encompassing four horizontal curve segments separated by connecting tangents. The western most section east of Chesapeake Drive follows a tangent alignment with a bearing of S 89º 10’ 16” E. From Chesapeake Drive to the bridge there is a 28º 39’ horizontal curve with a connecting tangent to the east on a bearing of S 84º 55’ 16” E. The west approach to the bridge is on a 28º 39’ horizontal curve that transitions to a tangent alignment across the bridge with a bearing S 89º 19’ 12” E. The alignment east of the bridge transitions to a 34º 43’ horizontal curve at Pampas Avenue. The tangent alignment east of Pampas Avenue transitions from a bearing of S 44º 05’ 54” E to a 38º 12’ horizontal curve to Forest Avenue. The tangent alignment east of Forest Avenue is on a bearing of S 64º 04’ 20” E.

The existing vertical alignment within the project limits consists of a bridge profile with a crest near the center of the channel. The roadway profile grades along the bridge approaches and adjoining roadway segments range from a minimum of 0.20 percent to a maximum of 1.30 percent.

3.1.6 Drainage

The existing drainage system within the project limits is predominantly sheet flow along the Riverside Drive roadway to Whitcomb Bayou/Spring Bayou which outfall to the Anclote River. The existing Beckett Bridge discharges directly to the Whitcomb Bayou/ Spring Bayou via scuppers and at the bridge approaches. Currently no existing stormwater management facilities are located within or adjacent to the project limits.

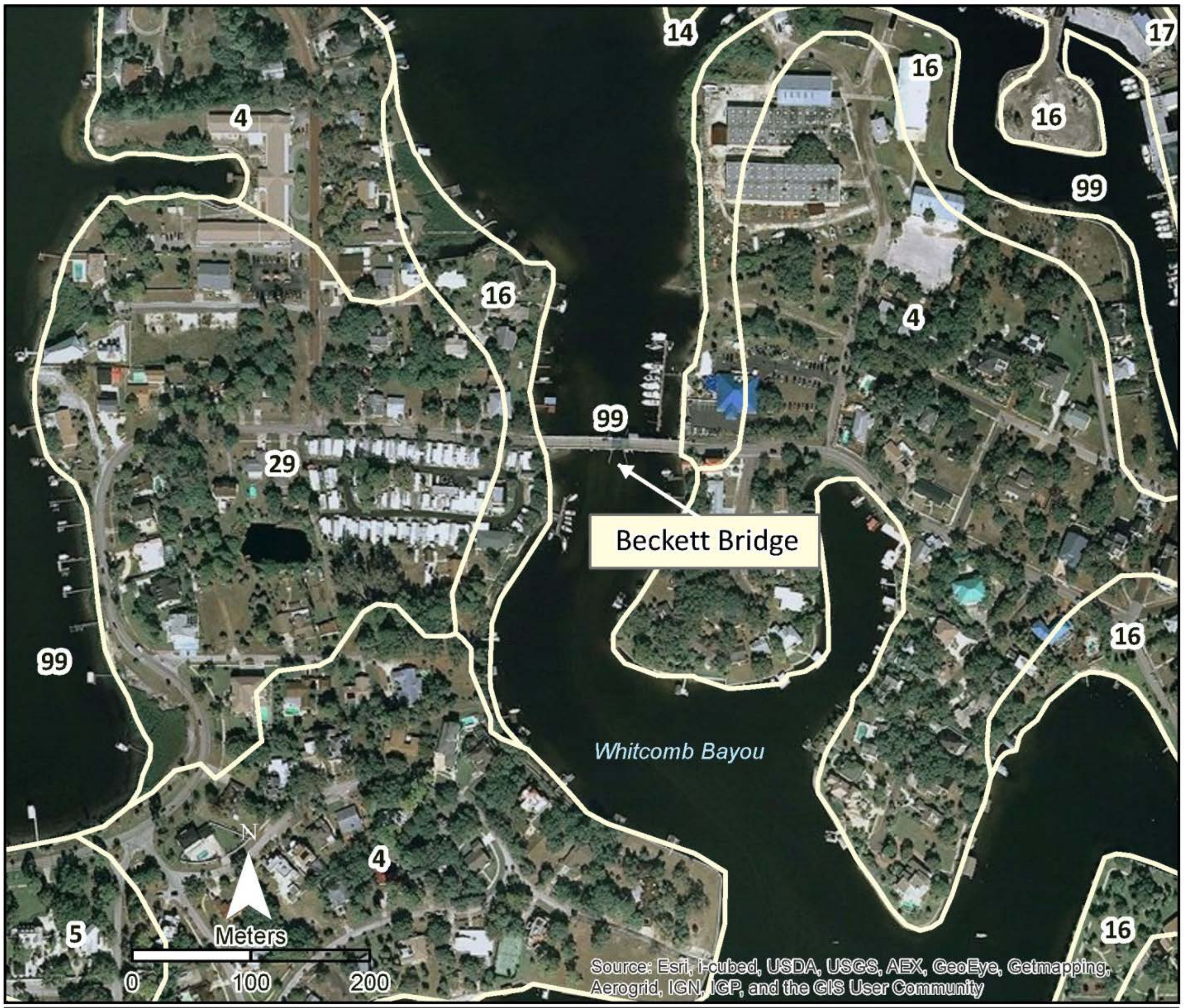
3.1.7 Geotechnical Conditions

3.1.7.1 Soils

Based on a review of the Pinellas County Soil Survey published by USDA Natural Resources Conservation Service (NRCS), it appears that there are three soil-mapping units noted within the project limits. A detailed soil survey map is shown in **Figure 3-1**. The general soil descriptions are presented in the sub-sections below, as described in the Web Soil Survey. **Table 3-1** summarizes information on the soil mapping units obtained from the Web Soil Survey.

Table 3-1 – Pinellas County USDA NRCS Soil Survey Information

USDA Map Unit and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(4) Astatula-Urban land	0-3	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5	---	Jan-Dec
	3-80	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(16) Matlacha-St. Augustine Urban land	0-42	SP, SP-SM	A-3	2.0 - 6.0	6.1-8.4	2.0-3.0	June-Oct
	42-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	0-8	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4	1.5-3.0	June-Oct
	8-33	SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	33-48	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	48-63	SM, SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	63-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(29) Tavares-Urban Land	0-5	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5	3.5->6.0	June-Dec
	5-80	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec



Legend

- 4 - Astatula Soils and Urban Land, 0 to 5% Slopes
- 5 - Astatula Soils and Urban Land, 5 to 12% Slopes
- 14 - Kesson Fine Sand, Very Frequently Flooded
- 16 - Matlacha and St. Augustine Soils and Urban Land
- 17 - Myakka Soils and Urban Land
- 29 - Tavares Soils and Urban Land
- 99 - Water

Figure 3-1 – USDA Soils Map

Astatula Soils and Urban Land (Unit 4)

The Astatula component makes up 50 percent of the map unit. Slopes are zero to five percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded or ponded. There is no zone of water saturation within a depth of 72 inches.

Matlacha and St. Augustine Soils and Urban Land (Unit 16)

The Matlacha component makes up 32 percent of the map unit. Slopes are zero to two percent. This component is on fills on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded or ponded. A seasonal zone of water saturation is at 30 inches during June, July, August, September, and October.

The St. Augustine component makes up 32 percent of the map unit. Slopes are zero to two percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during June, July, August, September, and October.

Tavares Soils and Urban Land (Unit 29)

The Tavares component makes up 50 percent of the map unit. Slopes are zero to five percent. This component is on knolls on marine terraces on coastal plains, ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 57 inches during June, July, August, September, October, November, and December.

Riverside Drive, via the Beckett Bridge, crosses the Whitcomb Bayou/Minetta Branch of the Anclote River. Based on the USDA Soil Survey of Pinellas County, Florida, the seasonal high groundwater table ranges from about 1½ to greater than six feet below grade. Due to the proximity of the project to the river and Bayou it is anticipated that the water table is tidally influenced.

3.1.7.2 Geotechnical Bridge Considerations

A *Geotechnical Technical Memorandum* was prepared in April 2012 as part of this PD&E Study by Tierra, Inc. The memorandum was published separately and can be found in the County's project files. Additional detailed information can be found in this memorandum. This section of the Preliminary Engineering Report (PER) summarizes the findings of that memorandum.

The Beckett Bridge is a multi-spanned bridge that has been reported to have experienced lateral movement and subsidence. The bridge approach spans were reconstructed in 1956 using reinforced concrete, however, the original bascule span remained. Structural repairs were performed between 1979 and 2011 including the installation of crutch bents.

Williams Earth Sciences provided a report dated November 10, 1994, which provided recommendations for the installation of crutch bents using H-Piles. During the 1994 study, Williams preformed three Standard Penetration Tests (SPT) borings; one was performed at the west abutment, one at the east abutment, and one was performed in the vicinity of the Bent 5, adjacent to the bascule. The two abutment borings were performed from land and the Bent 5 boring was performed from the bridge (as opposed to a barge over water). Two SPT borings were also performed by Professional Service Industries (PSI). These two borings were performed at Bent 6 from the bridge. One was performed in the westbound lane and the other was performed in the eastbound lane. The report for this study is attached as Appendix C.

An additional geotechnical study was completed in 2009 by Williams Earth Sciences which included an Electrical Resistivity Geophysical Report by Subsurface Evaluations, Inc. (SEI). The Williams report along with the SEI report is provided as Appendix C. Soil descriptions and discussion are summarized below.

During the 2009 study, Electrical Resistivity Imaging (ERI) was conducted. The purpose of the ERI testing was to determine the vertical extent and lateral continuity of soil layers and to identify possible karst hazards within the river along the sides of the bridge. The ERI testing was performed by SEI and their report, dated April 28, 2009, is included in Appendix C.

The results of the ERI testing indicated several features and anomalies within the vicinity of the bridge footprint. First, there appears to be an anomaly near Bent 6, with the center approximated just north of the bridge, as depicted on Figure 1 of the SEI report. In addition, there appears to be a shelf at about 20 to 40 feet in depth indicating a change in soil material and/or density, as indicated on Figure 1 of the 2009 report.

Boring B-1 (PSI) was performed very close to the ERI anomaly indicated at Bent 6. PSI Boring B-1 indicates that there is a dense grading to medium dense dark brown to brown fine sand with a trace of silt from the mud-line to about 10 feet below the mud-line, followed by a nine foot thick layer of stiff dark gray sandy silt, from 10 to 19 feet below the mud-line. The silt layer was underlain by a relatively thin layer of hard limestone, from 19 to 24 feet below the mud-line. From 24 to 40 feet below the mud-line, a medium dense grading to very loose layer of brown sand with a trace of silt (SP-SM) was encountered. A second layer of hard limestone was present from 40 to 45 feet below the mud-line, followed by medium dense brown fine sand with a trace of silt (SP-SM) to the termination depth of the boring at about 57 feet below the mud-line.

Boring B-1 (PSI) and the ERI results correlate at Bent 6. In addition, this anomaly can be considered indicative of Karst conditions and potential weathering/ solutioning of the limestone. Boring B-2 was also performed at Bent 6, on the opposite side of the bridge (eastbound lane). This boring indicated somewhat similar soils to Boring B-1, however, there was no evidence of the stiff silt layer at 10 to 19 feet below the mud-line.

The borings conducted by Williams in the 1994 study indicated a soil stratigraphy that was quite dissimilar to the borings conducted at Bent 6 by PSI. These borings generally indicate a surficial layer of sands to silty sands or clayey soils, followed by very hard limestone to the full depth of the borings. There were a few minor variations in the subsurface soils, such as a thin layer of clay (CH) material in boring B-1 at a depth of 47 to 58 feet below the ground surface; a very loose shelly fine sand layer from 77 to 84 feet below the mud-line at boring B-2; and a possible void from 69 to 71 feet below the ground surface at boring B-3. The medium dense fine sand with a trace of silt soil was not encountered in the SPT borings conducted by Williams.

Encountering highly dissimilar soils in a relatively short distance indicates that this area potentially has localized karst features. The Anclote River area is known for variable subsurface conditions and karst features. The subsurface is characterized by a sand layer overlying shallow limestone. There is a lack of clay layering in this area and this condition can promote localized subsidence and raveling of the surficial soils into the karst limestone. Review of the ERI results indicates that the surficial karst solution features, or surficial relic sinkhole features, may be more prevalent near the center of the bridge. There also appears to be an apparent shelf, as indicated on ERI transects T3 and T4. Review of ERI transects T3, T4 and T5 indicate the possibility of a solution zone near to and below the bridge footprint that may be located in a southwest orientation. However, it should be noted that the bascule bridge footing and the piles may be providing interference of the ERI data and therefore additional geotechnical exploration is warranted to verify subsurface conditions.

The Williams report indicates that there has been settlement and rotation of the bents and/or bascule pier. There are a number of potential causes for this, both structurally and geotechnically; however, from a geotechnical standpoint, the causes may be due to subsidence of the piles due to 1) active solutioning of the limestone, or 2) insufficient pile bearing both axially and laterally, or a combination of both. Another consideration is the age of the timber piles supporting the bascule pier, which are more than 85 years old. The timber piles could be in poor condition due to fatigue, rot or some other form of deterioration.

HP 14x73 crutch bent piles were installed in 1996. The 1996 plans indicate crutch bents at Bent 6 and Bent 7, and pier stabilizers for the bascule. The lengths of the crutch bent piles varied dramatically from tip elevations of about -30 to -200 feet. These lengths were taken from old facsimile correspondence between Williams and DSA.

There was a minimum tip elevation of -35 feet indicated on the plans; therefore, one of the piles did not achieve the minimum tip elevation in accordance with the plans. The piles were also supposedly preformed to an elevation of -27 feet, and the preformed hole was supposed to be grouted. The HP crutch bent piles were also planned to be jacketed using an epoxy mix from elevation -4 to +4 feet, at the splash zone of the piles. The 2007 Bridge Inspection Report, prepared by Volkert & Associates, Inc., states that the "jackets are in good condition with no washouts or exposed base pile".

3.1.8 Crash Data

Crash data was obtained from Pinellas County for the five-year period from 2005 to 2009. A summary of crashes occurring at six intersections, five within the project limits and one east of the project, are provided in **Table 3-2**. The location of these intersections is shown on **Figure 3-2**. A total of nine crashes occurred between 2005 and 2009. The highest number of crashes (three) occurred at the intersection of Spring Boulevard and Pampas Avenue within this time period.

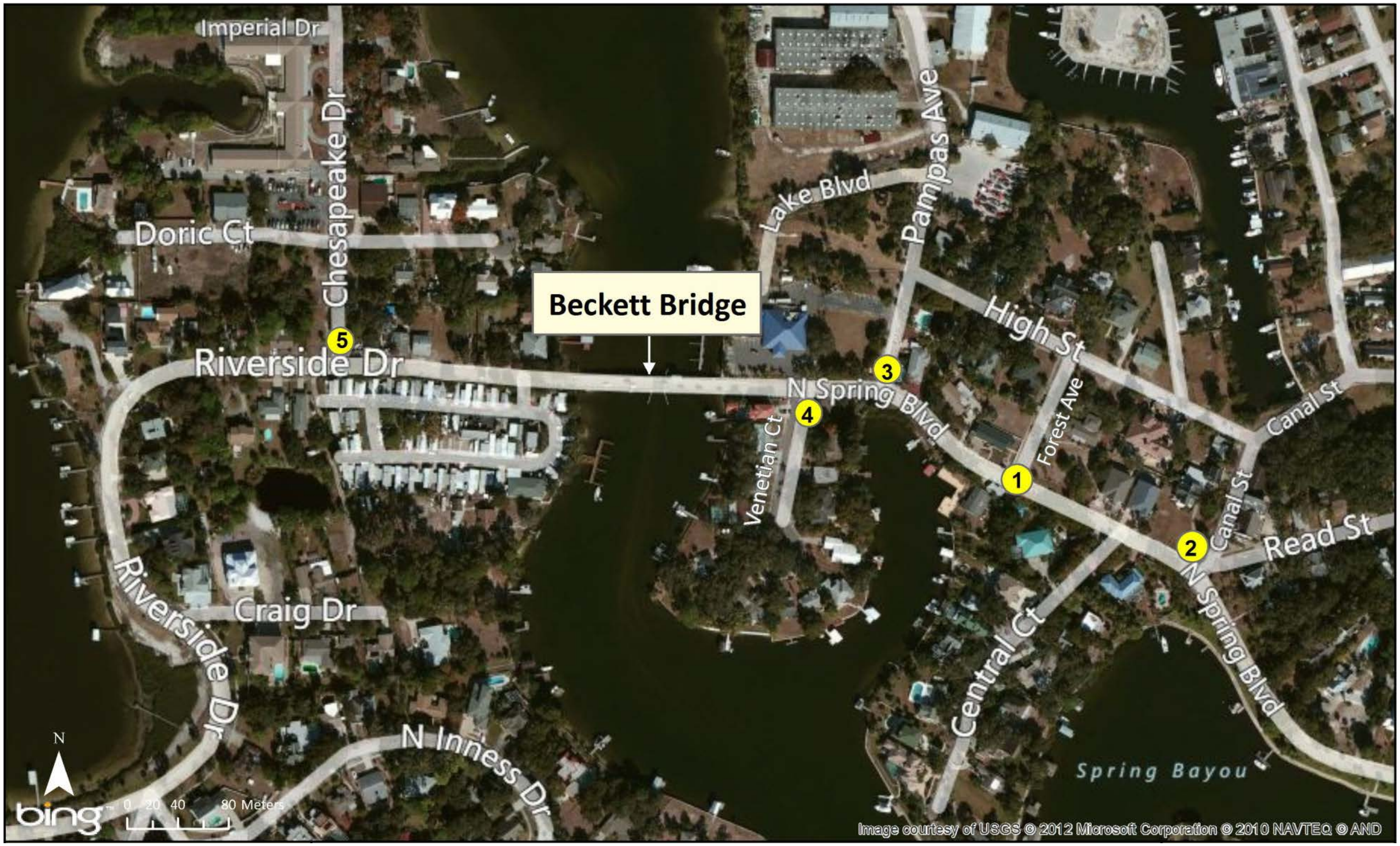


Figure 3-2 – Location of Crash Data Nodes

Table 3-2 – Intersection Crash Summary (2005 – 2009)

Intersections	Node	Year/Number of Crashes Year/Number of Crashes						Intersection Crash Rate Intersection Crash Rate	
		2005	2006	2007	2008	2009	Total	Project Crash Rate (Crashes/MEV)	Statewide Crash Rate (Crashes/MEV)
Spring Boulevard/ Forest Avenue	**1**					1	**1**	0.071	0.338
Spring Boulevard/ Canal Street	**2**				1		**1**	0.071	
Spring Boulevard/ Pampas Avenue	**3**	2		1			**3**	0.213	
Spring Boulevard/ Venetian Court	**4**				1		**1**	0.071	
Riverside Drive/ Chesapeake Drive	**5**			1	2		**3**	0.213	
Total **Total**		2 **2**	0 **0**	2 **2**	4 **4**	1 **1**	9 **9**		

Source: Pinellas County.

Table 3-3 shows the crash frequency by type of crash, crash frequency by severity, and comparison of the corridor crash rate with the statewide average for similar roadways. Of the nine crashes, one involved rear-end collisions, one was classified as a side swipe, and one involved collision with a fixed object (sign). The remaining four were classified as types other than those described above. Review of the accident reports indicate that these accidents involved a bicyclist losing control of a bicycle, a motorcyclist losing control of a motorcycle, and a driver falling asleep at the wheel and running off the road. The average crash rate for the Riverside Drive/Spring Boulevard corridor in the vicinity of the Beckett Bridge was 2.669. This crash rate is less than the statewide average of 3.243 for similar facilities.

3.1.9 Intersections and Signalization

There are no signalized intersections within the project limits. Four local roads intersect Riverside Drive/Spring Boulevard within the project limits. Chesapeake Drive intersects Riverside Drive west of the bridge. Venetian Court, Pampas Avenue and Forest Drive intersect Spring Boulevard east of the bridge.

Table 3-3 – Corridor Crash Summary (2005 – 2009)

Corridor			Frequency by Crash Type									Frequency by Crash Severity			Corridor Crash Rates	
Description	Functional Class	Length (Miles)		Total	Angle[1]	Over Turned	Rear End	Side Swipe	Head On	Collision with Other Object	All Other[2]	Fatality	Injury	Property Damage	Project Crash Rate (crashes/MVMT)	Statewide Average Rate[3] (crashes/MVMT)
Riverside Drive/Spring Boulevard	Urban Collector	0.24	5-Year	9	0	0	3	1	0	1	4	0	1	8	2.669	3.243
			Average	1.8	0.0	0.0	0.6	0.2	0.0	0.2	0.8	0.0	0.2	1.6		

Source: Pinellas County Traffic Records 2005 – 2009
1 Includes left-turn and right-turn type crashes
2 Includes all other crash types for which specific crash type is not listed
3 Statewide average crash rate based on the five-year data from 2005 to 2009
MVMT = million vehicle miles traveled

3.1.10 Lighting

Existing lighting consists of standard cobra head luminaires mounted on steel poles or wood utility poles. West of the bridge, light fixtures are located on the south side of the roadway. East of the bridge, lighting is provided on the north side of the roadway. One steel light pole is attached to the bridge just west of the bascule span.

3.1.11 Utilities

Knology Broadband of Florida, Bright House Networks, Progress Energy Florida, Verizon, and the City of Tarpon Springs operate utilities within the project area. Knology Broadband has aerial coaxial cables entering the project area along Spring Boulevard on the east side of the bridge and along Riverside Drive on the west side of the bridge. These Knology cables are co-located on Progress Energy utility poles. Spurs of the aerial coaxial cables extend along Chesapeake Drive from Doric Court to the Bayshore Cove Mobile Park, and along Forest Avenue from North Spring Boulevard to High Street. In addition, a Knology broadband underground coaxial cable is located adjacent to the Tarpon Springs Yacht Club along the north side of Spring Boulevard.

City of Tarpon Springs wastewater force mains are located along Riverside Drive. A six inch force main is located on the south side of the bridge and a 12 inch force main is located on the north side of the bridge; however, these mains are located outside of the bridge fender system. A pump station is located on the north side of Riverside Drive at Chesapeake Drive. No other City utilities occur within the project limits.

3.2 EXISTING BRIDGE

3.2.1 Bridge Repair History

The Beckett Bridge was first constructed in 1924. It featured timber approach spans, a concrete bascule pier and steel draw span. All original foundations consisted of timber piling. Beckett Bridge connected east and west Tarpon Springs, carrying travelers over Whitcomb Bayou. Prior to construction of the bridge, the only available route for travel to the eastern side of Tarpon Springs from the west was Meres Boulevard or Whitcomb Boulevard, both located south of Whitcomb Bayou. The Beckett Bridge created a shorter travel route to both the eastern residential areas and the newly constructed Sunset Hills Country Club.

In 1955, the County deemed the Beckett Bridge unsafe and determined repairs to the original timber approach spans would not be feasible. Local newspaper articles indicate that a contract was let in 1956 to reconstruct the bridge. The reconstruction of the approach spans was completed in 1956 and retained the original concrete bascule pier, steel draw span and machinery. The remainder of the bridge was reconstructed with a concrete superstructure, supported on concrete bent caps, founded on concrete piles. Plans for the 1955 – 1956 reconstruction have not been located. The USCG has no record of a request for a bridge permit for these changes.

By 1995 differential settlement of the structure was evident. The settlement resulted in misalignment of the steel draw span, causing it to rub against the adjacent fixed concrete approach structure. Uneven wear on the machinery was noticeable. The County let a contract for a major rehabilitation of the bridge in 1996. The rehabilitation included the addition of steel crutch bents to stabilize the settlement, repair of the steel draw span and the concrete approach spans, refurbishment of the machinery, replacement of the electrical system, and construction of a new control house. Rehabilitation did not include bridge widening.

In 1997, the main machinery drive shafts failed during testing of the draw span subsequent to the 1996 repairs described above. The failure was attributed to bridge tender error when operating the bridge. Repairs to correct this problem were completed in December 1997. Subsequent to these repairs, wear on the machinery system due to the inherent misalignment of the draw span continued to develop. In 2011, the bridge became inoperable due to continued deterioration and misalignment, including development of an offset in the curb line between the bascule span and approach span. To correct this, another contract was let for additional bridge repairs that included modification of the curb and deck joints to compensate for misalignment, replacement of the span lock mechanisms, installation of a centering device, replacement of a pinion shaft and pinion bearing, and repair of the rack gears. Cleaning and painting of corroded structural steel was also performed.

3.2.2 Structure Type/Span Arrangement

The existing bridge is a 358'-6" long low-level bridge consisting of ten spans, including a 40'-3 ¾" long bascule span over Whitcomb Bayou. Horizontally, the bridge is aligned normal to the navigation channel within the bayou. Vertically, the bridge profile features a crest centered approximately at the navigation channel. The approach span superstructure consists of a reinforced concrete deck supported by five AASHTO type beams. The sidewalk deck is cantilevered beyond the exterior beams. The superstructure is supported by pile bents consisting of reinforced concrete caps and driven prestressed concrete piles.

The bascule portion of the bridge consists of a steel single-leaf rolling lift span with a length of 31’-3” from centerline roll to leaf tip. The bascule span superstructure consists of a steel open grid deck supported by a framework of steel stringers, floorbeams and two main girders. The sidewalks on the bascule span cantilever outboard of the main girders and are supported with brackets. The leaf is balanced by a concrete counterweight at the tail of the leaf to reduce the power requirements needed to raise the bridge. A reinforced concrete bascule pier supports the bascule leaf at the center of roll. The tip of the leaf is supported by a pile bent when the bridge is in the lowered position. A control house, located at the northeast portion of the bascule span, contains the electrical equipment needed to operate the bridge.

The bascule leaf is a Scherzer rolling-lift type. The leaf and counterweight pivot about an axis that also moves horizontally as it rotates on curved tread plates attached to each bascule girder and supported on flat tracks located on the bascule pier. The leaf is driven by an electric motor coupled to bridge mounted drive machinery consisting of open spur gears. A pinion located at the center of roll of each bascule girder engages a horizontal flat rack, supported on the bascule pier, to actuate span motion. Vehicular traffic is controlled by traffic gates and traffic signals located on the bridge approach spans. Additionally, a barrier gate located on the west approach spans provides a physical deterrent to inhibit vehicles from approaching the deck opening when the span is in the open position.

The bridge intersects the navigation channel at a 90^{o} angle. Waterborne vessels are guided between the bascule piers by a fender system consisting of timber rub rails attached to driven timber piles. Navigation lights mounted to the fender system and the bascule leaf provides a warning indication. The channel has a minimum horizontal width of 25 feet between faces of fenders. When the bascule leaf is in the closed position there is approximately six feet of vertical clearance at the face of the east fender. When the bridge opens, the leaf rolls away from the channel and rotates to a 49 degree angle. The angle of opening is limited by physical constraints present in the geometric configuration of the counterweight, bascule pier, and approach span. It is not known if these limitations are the result of original construction or subsequent reconstruction and/or repair. However, in this position the bridge provides unlimited vertical clearance only between the west fender and the tip of the span of approximately 14 feet. The rest of the channel is obstructed by the bascule span.

3.2.3 Current Condition and Year of Construction

General Condition: The description of the overall condition of the existing bridge is based on the FDOT Bridge Management System *Inspection/CID (Comprehensive Inventory Data) Reports* including Special-Other Bridge Report dated June 27, 2013, Special Movable Inspection Report dated July 31, 2012, and Regular NBI with Movable dated July 28, 2011. The bridge was constructed in 1924 and currently has a Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. The Health Index is 88.44.

The 2011, 2012 and 2013 Inspection Reports are provided in **Appendix D.** Pictures of bridge elements, including bridge machinery and electrical systems, which illustrate their current condition are included in the 2011 Addendum and 2012 Addendum.

The Sufficiency Rating is a method of evaluating highway bridge data by calculating factors to obtain a numeric value, which is indicative of bridge sufficiency to remain in service. The sufficiency rating includes the following applicable primary factors:

1. Structural Adequacy and Safety including:
    a. Superstructure Condition
    b. Substructure Condition
    c. Load Carrying Capacity
2. Serviceability and Functional Obsolescence including:
    a. Deck Condition
    b. Overall Structural Condition
    c. Roadway Geometry
    d. Traffic Volume
3. Essentiality for Public Use including:
    a. Traffic Volume

b. Detour Length

c. Probability of Bridge Closure

The overall condition of the bridge is consistent with the age and severe exposure conditions. The movable span of the bridge has been in service for 88 years. At the time of construction it was customary to design a bridge with an anticipated service life of 50 years. Although the bridge operates infrequently, functional and operational deficiencies have developed despite efforts to correct these deficiencies. There have been recurring misalignment issues at the joints of the approach spans, as well as at the joint between the bascule leaf and bascule rest pier. These misalignments have led to lack of continuity of the curb line and rubbing of the bascule leaf railing on the railing at the bascule leaf pier. The discontinuity of the curb has reportedly led to several tire punctures. Periodic attempts have been made to correct and/or arrest these alignment issues.

The most recent Bridge Inspection Report (November 2011) indicates that the overall condition rating of the deck is *Good*, the superstructure is considered *Satisfactory*, and the substructure is considered *Satisfactory*. The overall performance rating is *Good* but the bridge is classified as *Functionally Obsolete*. The bridge has reached a threshold at which deficiencies and deterioration are expected to accelerate. Specifically, conditions of concern include:

Misalignment and Settlement: While some remedial measures in the form of crutch bents and helper piles have been installed in an attempt to mitigate the long term settlement and associated misalignment of the structure, evidence of continued problems remains. Specifically, the bascule span continues to trend towards one side and the deck joints and curbs exhibit misalignment. It appears unlikely that correction of one deficiency or symptom would provide full resolution. A comprehensive rehabilitation would be required to correct the leaf misalignment and secure it from further abnormal movement. The corrective measures implemented in 2011 are expected to only provide a short term solution. In addition to the effects of settlement, the curved tread plates and flat track plates exhibit problems that contribute to the bascule span's overall misalignment issues.

Bascule Drive System: The condition of the drive system (i.e., machinery) is consistent with the age and misalignment of the structure. In general, the machinery, including the rack and pinion teeth, pinion shafts, and bascule track and treads exhibits advanced wear and deterioration. The wear has advanced to the point where it is expected to accelerate. With worn gears there is more clearance (backlash) between meshing teeth. As the backlash increases, the wear to the teeth accelerates. In addition, the bascule tracks and treads are not properly aligned. This has resulted in uneven wear to these components and may be a contributing factor to the variations in load on the main rack and pinions. During the 2011 repairs, deficiencies in the design of the drive machinery were also identified. The current pinion shafts do not meet current design requirements established by AASHTO.

Span Locks: The forward span lock assemblies at the tip end of the bascule leaf were replaced in 2011 and are in good working condition.

Load Capacity: The bridge load capacity was determined in 1987. According to the load rating, the structure should be posted at or below the following: Single Unit Truck – 12 tons and Combination Trucks – 20 tons. The bridge is actually posted at both approaches as follows: Single Unit Truck – 12 Tons, Combination Truck – 15 tons, and Truck and Trailer – 15 tons.

Fender System: The 2011 bridge inspection report notes that marine borer activity is evident on several of the fender piles and lower wales. It is likely that this activity will cause the piles and wales to deteriorate near the waterline. Affected piles will need to be replaced.

Safety Considerations: There are several factors that contribute to the functional obsolescence of the existing bridge. The concrete post and beam bridge railings are substandard, as they do not meet current standards for roadside safety in terms of both geometry and impact resistance. Railings for new bridges are required to meet specific crash testing and geometric requirements outlined in *National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedure for the Safety Performance Evaluation of Highway Features* which has been adopted by AASHTO and FDOT. The 9-inch curbs along the edge of travel lanes are generally considered a safety concern due to the propensity to launch errant vehicles. The approach guardrails, guardrail end treatments and transitions do not meet current design standards.

Wave Vulnerability: The existing bridge is low and susceptible to waves from a coastal storm event. According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D.*

Max Sheppard and William Miller Jr., September 2003, the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation and the existing bridge low member elevations are below the storm surge elevation.

It is anticipated that wave heights at the bridge during a coastal storm event would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves and the presence of topographical features, including numerous adjacent residential buildings and trees that reduce wind velocities at the surface of the water. Although the waves are not expected to be large, the existing bridge contains details that make it susceptible to damage from waves. Specifically, the beams introduce multiple vertical surfaces exposed to the waves that can yield large wave forces even when the waves are not large. The presence of diaphragms at each end of the spans creates conditions that can trap air and magnify vertical forces that act to lift the span. Because the simple-span superstructure is not anchored to the substructure, there are no lateral restraints to prevent the waves from pushing the superstructure off of the substructure. The pile bent substructures have limited capacity to resist lateral wave forces.

The existing Beckett Bridge is important for evacuation during a storm event. Although it is not considered a designated emergency evacuation route, it is considered an extension of Tarpon Avenue, which is a designated emergency evacuation route. Wave vulnerability during a storm event could impact the reliability of the existing bridge for evacuation.

3.2.4 Typical Section

The existing bridge typical section consists of one 10-foot wide through lane in each direction and 2’-2” sidewalks on both sides of the roadway. The sidewalks are level with the roadway surface and are separated from the travel lanes by 9-inch high by 9-inch wide curbs. Concrete post and beam railings 2’-8” high are located at the back of the sidewalk. Separate bicycle lanes are not provided; both bicyclist and pedestrians share the sidewalk. The overall existing bridge width is 28 feet (see **Figure 3-3**).

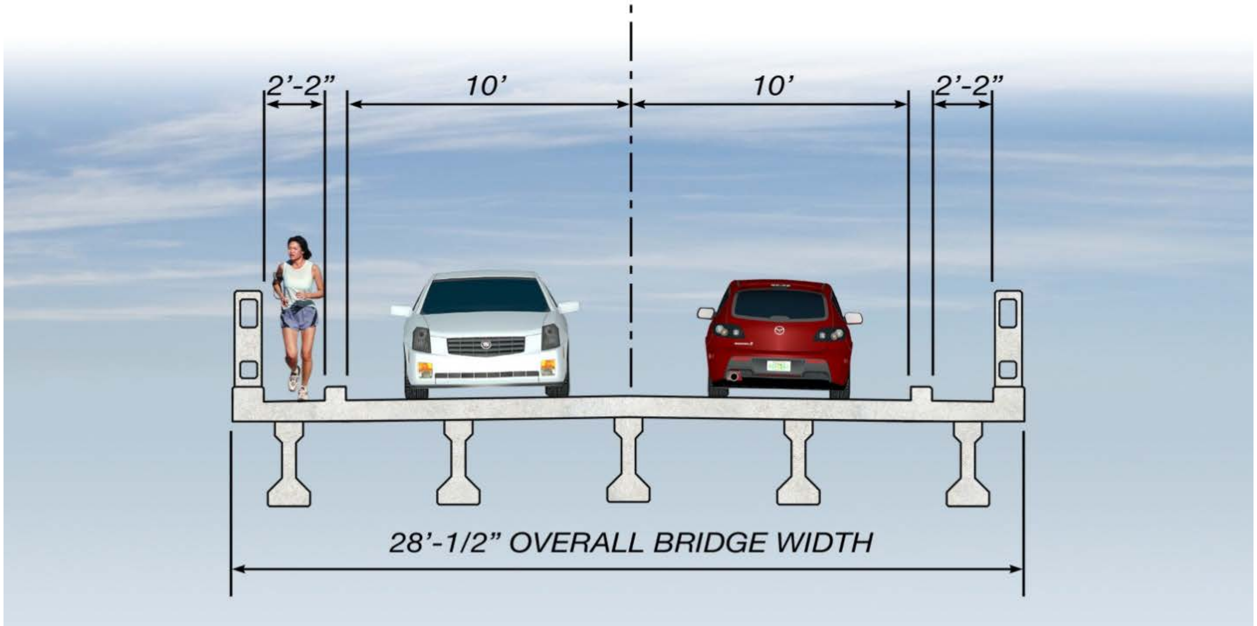


Figure 3-3 – Existing Bridge Typical Section

3.2.5 Horizontal and Vertical Alignment

The bridge is aligned horizontally at a 90^{o} angle to the channel. Vertical curve information for the bridge is not known with certainty. The 1923 permit sketches for the original bridge indicate a +1.29% grade west of the bridge, a level section 100 feet long over the channel (offset to the west from the centerline of the channel), and a -0.71% grade east of the bridge. No information is available from the 1955 reconstruction to indicate if the approach grades were modified at that time. Survey information along the bridge is also inconclusive. The survey indicates a level section across the channel, but the approaches exhibit a varying grade. Some of this may be due to past settlement. However, a best fit vertical curve created to match the surveyed profile appears to meet current minimum design standards for stopping distance and headlight distance for the 35 mph design speed.

3.2.6 Bridge Openings

Pinellas County owns and operates the Beckett Bridge. The US Coast Guard regulations state that the bridge will open on demand with two hours advance notice. Pinellas County maintains records of bridge opening requests. The number of openings for each month in 2009 through 2012 are provided in **Table 3-4**.

Table 3-4 – Number of Bridge Openings 2009 – 2012

Month	2009	2010	2011	2012
January	1	1	1	2
February	1		2	
March	4	1	1	2
April	1	5	2	2
May		1	7	2
June	1	2	2	
July		2	1	4
August		2	1	
September	1	2		
October		2	1**	
November				1
December	1*	3	1	1*
TOTAL	**10**	**21**	**18**	**14**

* Opened for Holiday Boat Parade, Dec 12, 2009 from 7:00 – 9:30 pm and Dec 7, 2012
** Test Opening after Repairs

The bridge opened ten times in 2009, 21 times in 2010, 18 times in 2011 and 14 times in 2012. The highest number of openings occurred in March 2009 and July 2012 (four), April 2010 (five) and May 2011 (seven).

3.2.7 Channel Data

The existing bascule bridge crosses Whitcomb Bayou approximately perpendicular to the channel. Waterborne vessels are guided between the bascule piers by a fender system consisting of timber rub rails attached to driven timber piles. Navigation lights mounted to the fender system and the bascule leaf provides a warning indication. The channel has a minimum horizontal width of 25 feet between faces of fenders. When the bascule leaf is in the closed position there is approximately six feet of vertical clearance at the face of the east fender for the entire width of the channel. When the bridge opens, the leaf rolls away from the channel and rotates to a 49 degree angle. In this open position the bridge provides unlimited vertical only between the west fender and the tip of the span of approximately 14 feet. The remaining 11 feet of the channel is obstructed by the raised bascule span.

Bascule Leaf in Full Open Position – Unlimited Clearance Restricted

3.2.8 Ship Impact Data

The bridge, which crosses Whitcomb Bayou, is not required to be designed to resist vessel impact. The low member vertical clearance is six feet with the bascule span in the closed position. There is no evidence that the existing vertical clearances, in the restricted open and in the closed position, are insufficient for current marine usage, or that the type and number of vessels using the bayou will change dramatically in the future. There are no commercial marinas present in Whitcomb Bayou.

3.3 Environmental Characteristics

3.3.1 Existing and Future Land Use

Existing land use was determined by a field review of the project corridor and review of Existing Land Use maps (July 2007) published in the City of Tarpon Springs Comprehensive Plan. Land use in the area is predominantly residential. Bayshore Mobile Home Park (MHP) is located on the southwest corner of the bridge immediately adjacent to Riverside Drive. The Tarpon

Springs Yacht Club is located on the northeast side of the bridge. Two assisted living facilities, Serenity on the Bayou and Tarpon Bayou Center are located on Chesapeake Drive, just north of Riverside Drive. Stamas Yacht Repair and Restoration is located on Pampas Drive, north of Spring Boulevard. Existing land uses are shown in **Figure 3-4**.

No notable changes in future land use in the vicinity of the project are shown on the 2025 Future Land Use Map (Tarpon Springs Comprehensive Plan). The predominant land use in the vicinity will remain low to medium density residential. The area surrounding the Beckett Bridge is largely built out; accordingly, land for potential new development is limited. Future land uses as identified in the 2025 Comprehensive Plan are shown on **Figure 3-5**.

3.3.2 Community Resources/Emergency Services

Community resources, including those providing emergency services located within approximately 1.5 miles of the project include two fire stations, one police station, one hospital, five religious institutions, and five schools. In addition, the Pinellas County Health Department operates a health center within the City of Tarpon Springs, located approximately 1.2 miles from the Beckett Bridge. The location of these resources and services are provided in **Table 3-5** and on **Figure 3-6**.

The western boundary of the local Tarpon Springs Historic District is located just east of the project at Canal Street. The District, created in 1990, comprises a total land area of approximately 700 acres. The Tarpon Springs Heritage Museum is located in Craig Park south of the project on Whitcomb Bayou. Three City of Tarpon Springs parks, Rotary Park, Sissler Field and Craig Park occur in the project vicinity. Additional information about these cultural resources is provided in Section 3.4 of this report.

Figure 3-4 – City of Tarpon Springs Existing Land Use

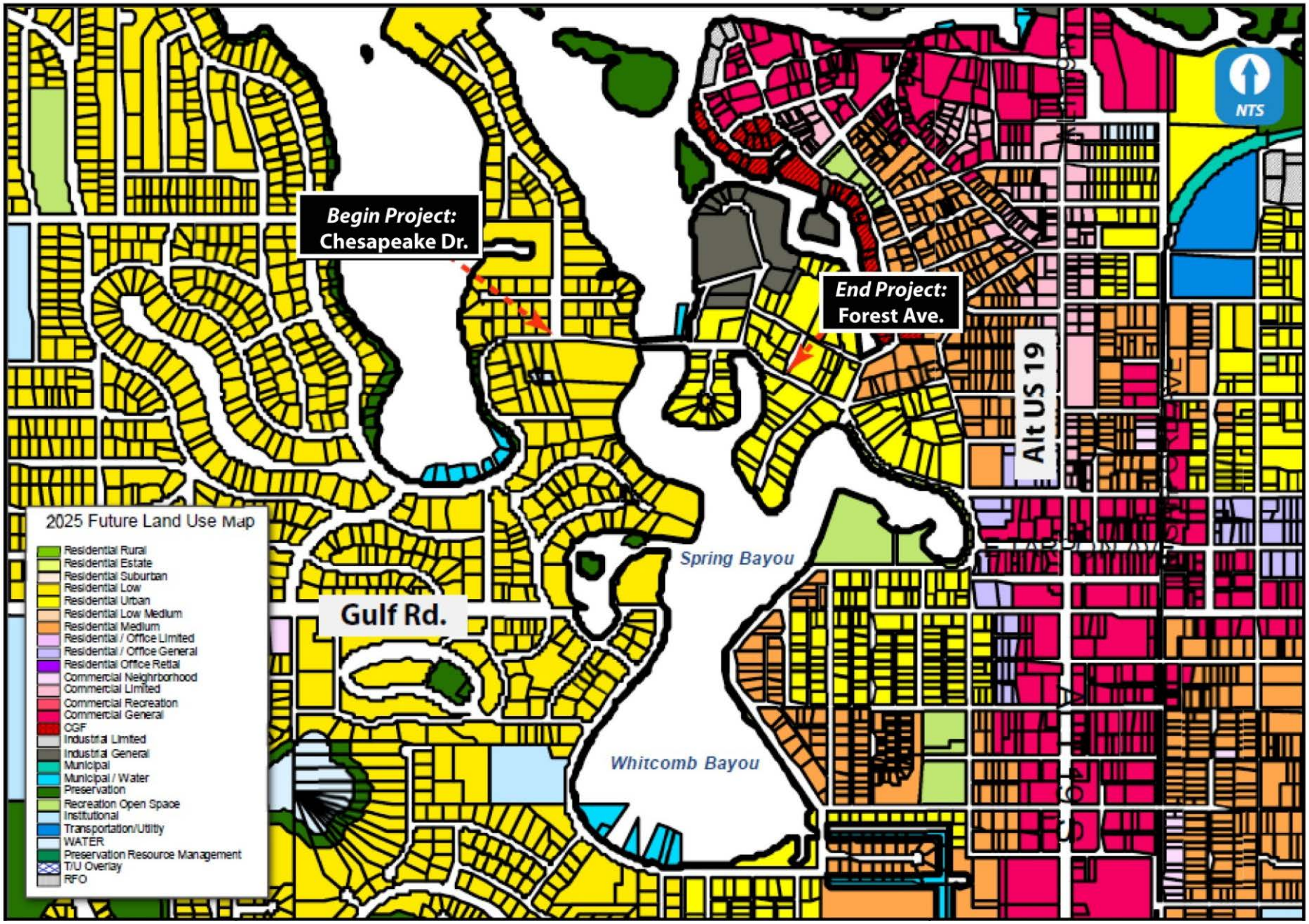


Figure 3-5 – City of Tarpon Springs Future Land Use

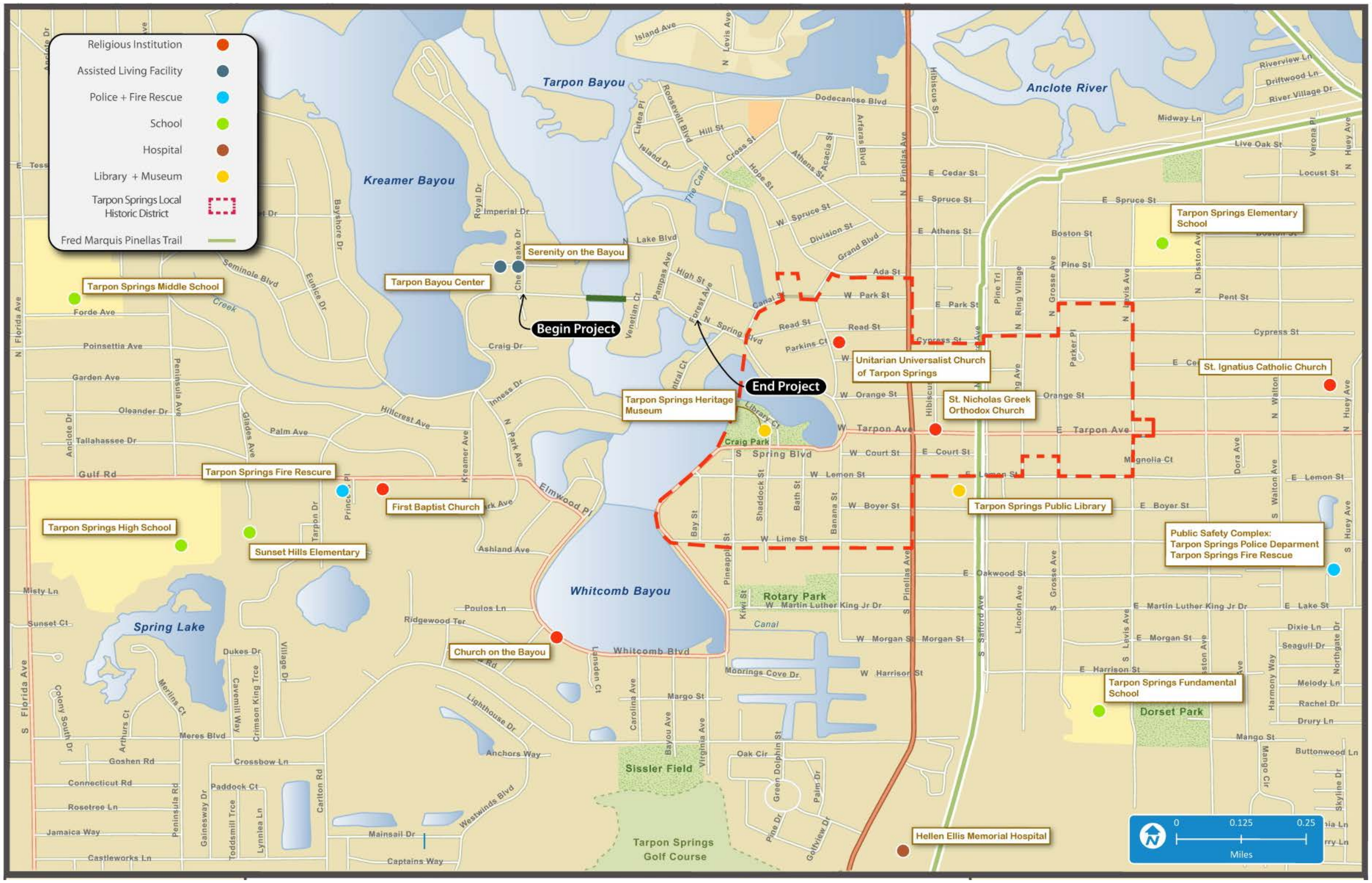


Figure 3-6 – Community Resources/Emergency Services

Table 3-5 – Location of Community Resources

Fire Department		Distance from Beckett Bridge (approximate)
Tarpon Springs Fire Rescue[1]	444 Huey Avenue South Tarpon Springs, FL 34689	1.3 miles
Tarpon Springs Fire Rescue #70	1025 Gulf Road Tarpon Springs, FL 34689	0.6 mile
Law Enforcement		
Tarpon Springs Police Department[1]	444 Huey Avenue South Tarpon Springs, FL 34689	1.3 miles
Hospitals		
Helen Ellis Memorial Hospital	1395 South Pinellas Avenue Tarpon Springs, FL 34689	1.2 miles
Religious Organizations		
St. Ignatius Catholic Church	715 E. Orange Street Tarpon Springs, FL 34689	1.3 miles
St. Nicholas Greek Orthodox Church	36 North Pinellas Avenue (Alt US 19) Tarpon Springs, FL 34689	0.6 mile
Unitarian Universal Church of Tarpon Springs	230 Grand Boulevard Tarpon Springs, FL 34689	0.4 mile
First Baptist Church	1021 Gulf Road Tarpon Springs, FL 34689	0.5 mile
Church on the Bayou	409 Whitcomb Boulevard Tarpon Springs, FL 34689	0.7 mile
Schools		
Tarpon Springs High School	1411 Gulf Road Tarpon Springs, FL 34689	0.8 mile
Tarpon Springs Middle School	501 North Florida Avenue Tarpon Springs, FL 34689	0.9 mile
Tarpon Springs Elementary School	555 E. Pine Street Tarpon Springs, FL 34689	1 mile
Sunset Hills Elementary School	1347 Gulf Road Tarpon Springs, FL 34689	0.8 mile
Tarpon Springs Fundamental School	400 E. Harrison Street Tarpon Springs, FL 34689	1.2 miles

1 Tarpon Springs Police Department and Tarpon Springs Fire Rescue Share the Public Safety Facility.

3.3.3 Wetlands

In February 2012, environmental scientists familiar with Florida wetland communities conducted a field review of the project study area. The purpose of the review was to verify and/or refine preliminary wetland boundaries and classification codes established through in-office literature reviews and photo-interpretation.

In June 2012, environmental scientists familiar with seagrass beds conducted a field review to verify the presence/non-presence of seagrass beds within the project study area. During field investigations, each wetland within the project study area was visually inspected. Attention was given to identifying plant species composition for each wetland and adjacent upland habitats.

Exotic plant infestations and any other disturbances, such as soil subsidence, canals, power lines, etc. were noted.

Based on field data and in-house reviews, one surface water was identified within the project study area. This tidally-influenced, estuarine surface water is known as Whitcomb Bayou. Two wetland habitat types are included within the Whitcomb Bayou boundaries of the project study area. A detailed description of Whitcomb Bayou and the wetland habitat types are presented below, which includes the Florida Land Use, Cover and Forms Classification System (FLUCFCS) and U.S. Fish and Wildlife Service (FWS) wetland classifications, listings of dominant vegetation, bordering habitat types, size, connections to other wetlands, and observed wildlife utilization. The Land Use/Vegetative Cover Type Map (**Figure 3-7**) shows the land use/habitat types and approximate boundary of Whitcomb Bayou within the project study area. A Wetland Evaluation/Essential Fish Habitat (EFH) Technical Memorandum was prepared for this project and is published separately. Additional information can be found in this document.

Figure 3-7 – Land Use/Vegetative Cover

Surface Water (Whitcomb Bayou)

FLUCFCS: 540 (Bays and Estuaries)

FWS: E2UB3 (Estuarine, Intertidal, Unconsolidated Bottom, Mud)

Bays and estuaries are tidally influenced inlets or large bodies of water that extend from the ocean into the land mass of Florida. Within the project study area, this category includes 10.38 acres of Whitcomb Bayou. Whitcomb Bayou is part of the Anclote River Bayou complex. The Anclote River Bayou complex is a Class III Outstanding Florida Water in the Pinellas County Aquatic Preserve. Within the project area, the west and east shorelines of the bayou are hardened with vertical seawalls.

Bottom sediments within the project study area consist of unconsolidated mud. According to the Florida Fish and Wildlife Conservation Commission (FWC) (2010), the nearest documented seagrass beds are located approximately 200 feet north of the project study area. However, no seagrass or attached macro-algae were observed within the project study area during the June 2012 field review. No seagrass blades or macro algae branchlets were present within the rack line in or adjacent to the project study area.

During the field review, a number of wildlife species were observed utilizing Whitcomb Bayou within and adjacent to the project study area such as mullet (*Mugil* spp.) and sheepshead (*Archosargus probatocephalus*). Two osprey (*Pandion haliaetus*) nests were observed on the same utility pole on the east end of Beckett Bridge on the south side of North Spring Boulevard. At the time of the field review, the nest was occupied by a foraging osprey. Gulls (*Larus* spp.), pigeons (*Columba livia*), royal terns (*Sterna maxima*), and a great egret (*Ardea alba*) were observed outside of the project study area during the review.

Mangrove Swamps

FLUCFCS: 612

FWS: E2SS3 (Estuarine, Intertidal, Scrub-Shrub, Broad-Leaved Evergreen)

Mangrove swamps are typically coastal hardwood swamps where red mangrove (*Rhizophora mangle*) and/or black mangroves (*Avicennia germinans*) are pure or predominant. White mangroves (*Laguncularia racemosa*) are also typically found within these swamps. Within the project study area, mangrove stands are dominated by black mangrove, white mangrove, red mangrove, saltweed (*Philoxerus vermicularis*), and marsh elder (*Iva frutescens*). Mangroves were observed on the west end of Beckett Bridge, north and south of the existing roadway. In addition, mangroves and associated species were observed along Whitcomb Bayou on the south side of North Spring Boulevard. The mangroves in this area are trimmed and maintained. Mangrove swamps comprise 0.12 acre of the total project study area.

<u>Oyster Bars</u>
FLUCFCS: 654
FWS: E2RF2 (Estuarine, Intertidal, Reef, Mollusk)

Barnacles (*Balanus* sp.) and oysters (*Crassostrea virginica*) were observed attached to the bridge pilings, seawall face, and pieces of debris on the bottom of the bayou. An accumulation of oysters was observed under the east and west ends of Beckett Bridge. Oyster bars comprise 0.17 acre of the total project study area.

Mitigation through Chapter 373.4137, Florida Statute (F.S.) (i.e., Senate Bill, 1986) is not available for this project because FDOT is not the applicant. A review of the available data from Florida Department of Environmental Protection (FDEP) and the water management districts indicates that the proposed project is not located within the service area of any permitted mitigation banks. For the reasons listed above, any unavoidable wetland impacts will have to be mitigated (if required) by creating, restoring, enhancing, or preserving wetlands on-site or off-site within the same drainage basin if there are no mitigation opportunities at the project site.

3.3.4 Water Quality

A Water Quality Impact Evaluation (WQIE) was prepared for this project in accordance with Part 2, Chapter 20 of the *FDOT PD&E Manual*. A copy of the WQIE is included in Appendix E. Whitcomb Bayou is located with the Pinellas County Aquatic Preserve, an Outstanding Florida Waters (OFW) according to the FDEP.

Whitcomb and Spring Bayous are embayments of the lower Anclote River and are included in the Anclote River Bayou complex watershed (EPA WBID 1440A) and the flows into the tidal segment of the Anclote River (EPA WBID 1440). These watersheds have been identified to be impaired for dissolved oxygen, nutrients, coliform and mercury in fish. During the field review, Whitcomb Bayou was mostly clear with a light sheen on the surface. Water quality in the Whitcomb Bayou (part of the Anclote River Watershed basin) is monitored and recorded by the Pinellas County Department of Environmental Management (PCDEM) Water Resources Department. A general review of the data from sampling station 01-05, which is located south of Beckett Bridge near Whitcomb Boulevard between West Lake Street and Manatee Lane, indicates that salinity concentrations in the Whitcomb Bayou tend to average in the lower to mid-20 parts per thousand.

3.3.5 Wildlife and Habitat

The project study area was evaluated for potential occurrences of federal and state listed protected plant and animal species in accordance with Section 7 of the Endangered Species Act of 1973, as amended, and Chapters 5B-40 and 68A-27 of the Florida Administrative Code (F.A.C.). The evaluation included coordination with the FWS and the Florida Natural Areas Inventory (FNAI). The evaluation also included literature searches and field reviews to identify the potential occurrence of listed species and any designated critical habitat located within the project study area. An Endangered Species Biological Assessment (ESBA) has been prepared for this project in accordance with Part 2, Chapter 27 of the *FDOT PD&E Manual*. The ESBA is published separately for this project and includes more detailed information concerning wildlife and habitat.

The evaluation included coordination with the FWS, the National Marine Fisheries Service (NMFS), and the FWC through the FDOT's ETDM process. Verbal correspondence with FWC via a phone conversation was also conducted during this evaluation regarding potential impacts to the Florida manatee. Additionally, information was obtained from the FNAI. The evaluation also included literature searches and field reviews to identify the potential occurrence of listed species and any designated critical habitat located within the project study area.

Ten federal and/or state listed plant species and thirty-four federal and/or state listed animal species occur or have been historically documented in Pinellas County. Listed species with a potential to occur within the project study area were determined based on the habitat requirements of each species, presence of their preferred habitat within the project study area, their geographic range, and documented occurrences of the species within the vicinity of the project study area. Based on this analysis, one state listed plant species and twenty-one federally and/or state listed animal species have a potential to occur within the project study area. Each species with a potential to occur within the project study area is described below

3.3.5.1 Federal Listed Species

Fauna

Mammals

The **West Indian manatee** (*Trichechus manatus*) is listed as endangered by the FWS. The manatee is an herbivorous marine mammal found statewide in coastal or estuarine waters, rivers, and (occasionally) lakes, but is most common in waters of peninsular Florida. Sheltered coves are important for feeding, resting, and rearing of young. No manatees were observed during the field review of the project study area. However, the project study area is located in a FWS Consultation Area for the West Indian manatee. Based on the U.S. Army Corps of Engineers (USACE) 2011 Manatee Key, Whitcomb Bayou is designated as an Important Manatee Area (IMA) where increased densities of manatees occur due to the proximity of warm water discharges, freshwater discharges, natural springs and other habitat features that are attractive to manatees. Within this IMA, dredging is not allowed to occur between November 15 and March 31.

Birds

The **piping plover** (*Charadrius melodus*) is listed as threatened by the FWS. The piping plover utilizes sandy beaches for foraging and nesting, but also feeds in tidal mud and sand flats. According to FNAI, no individuals have been documented within one mile of the project study area. Even though foraging habitat is available within the project study area, no piping plovers were observed during the field review. However, the project study area is located in a FWS Consultation Area for the piping plover. Within the project study area, minimal impacts to wetland habitat utilized by the piping plover may occur as a result of construction activities along the shorelines of Whitcomb Bayou.

The **wood stork** (*Mycteria americana*) is listed as endangered by the FWS. This wading bird species is opportunistic and utilizes various habitats, including forested wetlands, freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures, and ditches. However, a specialized feeding technique commonly referred to as “groping” limits the wood stork to feeding in shallow water. Based on information provided by the FWS and FNAI, the project study area is located within the 15-mile core foraging area of eight active wood stork rookeries.

Reptiles

The **American alligator** (*Alligator mississippiensis*) is listed as threatened by the FWS and a species of special concern by the FWC. The FWS classifies this species as threatened because of its similar appearance to the threatened American crocodile (*Crocodylus acutus*). The American alligator is an opportunistic feeder and can be found in both freshwater and brackish environments, but their preferred habitat is freshwater lakes, slow moving rivers, and associated wetlands. According to FNAI, no alligators have been documented within one mile of the project study area and none were observed during the field review of the project study area.

The **green turtle** (*Chelonia mydas*) is listed as endangered by the FWS. This sea turtle occurs in estuarine and marine coastal and oceanic waters. Nesting occurs on coastal sand beaches, often near the dune line. Large juveniles and adults feed on seagrasses and algae. Hatchlings use offshore floating sargassum mats and juveniles frequent coastal bays, inlets, lagoons, and offshore worm reefs. According to FNAI, no green turtles have been documented within one mile of the project study area and none were observed during the field review.

The **eastern indigo snake** (*Drymarchon corais couperi*) is listed as threatened by the FWS. The eastern indigo snake can be found in a variety of habitats including swamps, wet prairies, xeric pinelands, and scrub areas. The eastern indigo snake commonly utilizes gopher tortoise burrows for shelter to escape hot or cold ambient temperatures within its range. According to FNAI, no eastern indigo snakes have been documented within one mile of the project study area and none were observed during the field review.

Fish

The **Gulf sturgeon** (*Acipenser oxyrinchus desotoi*) is listed as threatened by the FWS. The Gulf sturgeon is typically found in the Gulf of Mexico and associated near-shore marine, estuarine, and riverine habitat. According to FNAI, no individuals have been documented within one mile of the project study area and no individuals were observed during the field review of the project study area.

3.3.5.2 State Listed Species

Fauna

Wading birds including the **limpkin** (*Aramus guarauna*), **little blue heron** (*Egretta caerula*), **snowy egret** (*Egretta thula*), **tricolored heron** (*Egretta tricolor*), and **white ibis** (*Eudcimus albus*) have been documented within Pinellas County, but none have been documented within one mile of the project study area. All of these species are listed as a species of special concern by the FWC. While each species is distinct, wading birds are discussed collectively since they occupy similar habitats and generally have similar feeding patterns (i.e., waders). The populations of these species have been impacted by the destruction of wetlands for development and by the drainage of wetlands for flood control and agriculture. None of these listed wading birds were observed within the project study area during the field review and no wading bird rookeries are documented within one mile of the project study area.

The **snowy plover** (*Charadrius alexandrinus*) is listed as threatened by the FWC. The snowy plover utilizes dry, sandy beaches for foraging and nesting, but also feeds on tidal mud and sand flats along inlets and creeks. Even though foraging habitat is available within the project study area, no snowy plovers were observed during the field review and none have been documented within one mile of the project study area.

The **reddish egret** (*Egretta rufescens*) is listed as a species of special concern by the FWC. This wading bird species is almost exclusively found along the coast foraging in shallow saltwater habitats and marine tidal flats with sparse vegetation. FNAI reports indicate that the reddish egret has been documented in Pinellas County and habitat is present within the project study area. However, no individuals were observed during the field review and none have been documented within one mile of the project study area.

The **southeastern American kestrel** (*Falco sparverius paulus*) is listed as threatened by the FWC. This species typically nests in tree cavities that were excavated by woodpeckers. Kestrels prefer open habitats for foraging, such as pine savannas, pine flatwoods, farmlands, suburban golf courses and residential areas which provide enough cover to support small terrestrial prey animals. Some suitable foraging habitat is available within the project study area, but nesting habitat is minimal due to the lack of large, dead nesting trees. Based on information from FNAI, the southeastern American kestrel has been documented within Pinellas County, but no individuals have been documented within one mile of the project study area. No kestrels were observed during the field review.

The **Florida sandhill crane** (*Grus canadensis pratensis*) is listed as threatened by the FWC. The sandhill crane is associated with shallow fresh water areas, pasture and open woods habitats. Habitats such as wet and dry prairies, marshes, and marshy lake margins are optimum for the sandhill crane. According to FNAI, no sandhill cranes have been documented within one mile of the project study area and none were observed during the field review.

The **American oystercatcher** (*Haematopus palliates*) is listed as a species of special concern by the FWC. This shorebird requires large areas of beach, sandbar, mud flat, and shellfish beds for foraging. Sparsely vegetated, sandy areas are generally used for nesting, but they will also use beach wrack and marsh grass. According to FNAI reports, the project study area is within the geographic range of the American oystercatcher and suitable habitat is present. However, no individuals have been documented by FNAI within one mile of the project study area and no individuals were observed during the field review.

The **brown pelican** (*Pelecanus occidentalis*) is listed as a species of special concern by the FWC. The brown pelican's preferred foraging habitat is primarily coastal estuarine waters and can be frequently found resting on near-shore sandbars. This species tends to nest in trees on small coastal islands, but some ground nesting has been documented. Based on information from FNAI, the brown pelican has been documented within one mile of the project study area; however, none were observed during the field review of the project study area.

The **roseate spoonbill** (*Platalea niger*) is listed as a species of special concern by the FWC. This species is typically found foraging along tidal mudflats and coastal beaches and roosting in mangrove swamps. However, roseate spoonbills are occasionally found in forested freshwater swamps and herbaceous freshwater marshes. Based on information from FNAI, the roseate spoonbill has not been documented within one mile of the project study area and none were observed during the field review

The **black skimmer** (*Rynchops niger*) is listed as a species of special concern by the FWC. This species typically forages in coastal and inland waters, including beaches, bays, estuaries, tidal creeks, large lakes, phosphate pits, and flooded agricultural fields. Nests are primarily found on sandy beaches, small coastal islands, and dredge spoil islands. According to FNAI, the black skimmer has been documented in Pinellas County, but not within one mile of the project study area. No individuals were observed during the field review of the project study area.

The **least tern** (*Sterna antillarum*) is listed as threatened by the FWC. The preferred nesting habitat for this species is sparsely vegetated coastal beaches above the high tide line. The least tern forages in near-shore open water habitats by diving into the water after prey items. Based on information received from FNAI, the least tern has been documented within Pinellas County, but not within one mile of the project study area and no individuals were observed during the field review.

Flora

A review of state-listed plants that have been documented within Pinellas County and their potential habitats was performed prior to the field visit. One state-listed plant species with habitat available within the project study area is described below.

The **golden leather fern** (*Acrostichum aureum*) is listed as threatened by the Florida Department of Agriculture and Consumer Services (FDA). This species is a member of the fern (*Pteridaceae*) family and is typically found in tropical hardwood hammocks, as well as fresh and brackish water marshes. While limited suitable habitat for this species is available within the project study area, no leather ferns were observed during the field review. In addition, FNAI does not have any recorded documentations of this species within one mile of the project study area.

Other Species of Concern

Although the **bald eagle** (*Haliaeetus leucephalus*) is no longer state-or federally-listed, it is still federally-protected by the Bald and Golden Eagle Protection Act in accordance with 16 United States Code (U.S.C.) 668. It is also state-protected by Chapter 68A-16.002, F.A.C., and the FWC Bald Eagle Management Plan (2008). The bald eagle typically uses riparian habitat associated with coastal areas, lake shorelines, and river banks for foraging. The nests are generally located near bodies of water that provide a dependable food source. According to FWC's online bald eagle nest locator, there are no active bald eagle nests documented within one mile of the project study area. No bald eagles or nests were observed within the project study area during the field review.

During the field reviews, two **osprey** nests were observed on the east side of Beckett Bridge on the south side of North Spring Boulevard. Both nests were supported by the same utility pole and may be used by the same osprey. An osprey was present within one nest at the time of the February 2012 field inspection and empty oyster shells and fish remains were visible on the ground directly below the nest.

The osprey is state-listed as a species of special concern in Monroe County only. However, it is still federally-protected by the U.S. Migratory Bird Treaty Act (16 U.S.C. 703-712) and state protected by Chapter 68A of the F.A.C. Authorization is required from the FWC to take any osprey nest while federal permits are only required for the taking of "active" nests. "Inactive" nests may normally be taken and may be determined as inactive by the absence of any egg or dependent (i.e., flightless) young in the nest. While nesting typically occurs in December and may extend into late February, the nest may remain active throughout the summer months. Requests from the FWC for removal of active nests are only issued if the nest presents a safety hazard for the birds or humans. Active nest removal permits are issued with less frequency on a case-by-case basis.

Critical Habitat and Consultation Areas

The project study area was also evaluated for the potential occurrence of Critical Habitat as defined by 17 Code of Federal Regulations (CFR) 35.1532, but no designated Critical Habitat was identified within the project study area.

The project study area is located within a designated FWS consultation area and IMA for the West Indian manatee. The project study area is located within a designated FWS consultation area for the piping plover. Potential impacts to piping plover habitat will be coordinated with the FWS, FWC, and the Southwest Florida Water Management District (SWFWMD) during the design and permitting phases of this project.

The project study area is located within a designated FWS consultation area for the Florida scrub jay (*Aphelocoma coeruluscens*). Based on a review of available sources referenced in Section 2.0 of this technical memorandum and field reviews, no scrub jay habitat is available within the project study area and no populations have been reported or observed. Therefore, no further scrub jay consultation with FWS should be required for this project.

3.3.6 Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Panel 19 of Map Number 12103C00196 (September 2003), the Beckett Bridge and immediate vicinity are located within the 100 year floodplain in designated Zone AE. The Base Flood Elevation established for Minnetta Bayou/Spring Bayou is elevation 10 feet which is associated with coastal tidal surge conditions. Detailed information about floodplains within the project area is also discussed in the *Locations Hydraulic Report* published separately for this project.

3.3.7 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act required each regional Fishery Management Council to amend their existing fishery management plans to identify and describe EFH for each species under management. EFH is defined by the Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Whitcomb Bayou is within the Gulf of Mexico Fishery Management Council's (GMFMC) area of jurisdiction, which extends from the coasts of Texas, Louisiana, Mississippi, Alabama, and west Florida to Key West. GMFMC's limits of jurisdiction also extend seaward to the limit of the Exclusive Economic Zone (200 nautical miles from the baseline of the territorial sea.

The GMFMC separates EFH into estuarine and marine components. For the estuarine category, EFH includes estuarine emergent wetlands (saltmarsh and brackish marsh), mangrove wetlands, submerged aquatic vegetation (seagrass), algal flats, mud, sand, shell, and rock substrates, and estuarine water column. The marine category includes the water column, vegetated bottoms, non-vegetated bottoms, live bottoms, coral reefs, geologic features, and Continental shelf features (GMFMC, 2010).

The GMFMC manages 55 species for the Gulf of Mexico area. Of these 55 species, the GMFMC has identified and described EFH for 26 representative managed species. Species accounts of each of the 26 representative managed species were reviewed to assess the potential occurrence of these species within the project study area during any stage of their life cycle. Table 4 lists each of these species and its potential to occur in the project limits. Of the 26 representative fish, shrimp, and crab species listed by the GMFMC, one is considered to have a high potential to occur within the project limits, the gray snapper (*Lutjanus griseus*). The remaining 25 representative species and the coral complex are considered to have a low to no potential to occur within the project limits.

A Wetland Evaluation/Essential Fish Habitat Technical Memorandum was prepared for this project and is published separately. Additional information can be found in this document.

3.3.8 Contamination

A Contamination Screening Evaluation has been conducted as required by FDOT's PD&E Manual, Part 2, Chapter 22 (revised January 17th, 2008) and in accordance with the FHWA Technical Advisory T 6640.8a (dated October 30th, 1987). The results of this evaluation were published separately in a Contamination Screening Evaluation Report (CSER). Refer to this report for additional information.

Consistent with the guidance provided by FDOT and FHWA, and based on environmental records searches, land use surveys, field surveys and other screening methodologies cited within the PD&E manual, eight potential contamination sites were identified within the vicinity of the project corridor. The location of these sites is shown on **Figure 3-8** and described in **Table 3-6**. Of the eight sites, six were identified as "No" contamination risk, one was identified as "Low" contamination risk, and one was identified as "Medium" contamination risk. Accordingly, no further evaluation of these sites is recommended during the design phase of the project unless changes are made to the project design that could potentially change the location or alignment of the bridge.

Figure 3-8 – Potentially Contaminated Sites

Table 3-6 – Potentially Contaminated Sites within the Project Limits

Map ID	Site Name	Site Address	Risk Rating
01	Stamas Yacht, Inc.	300 Pampas Ave.	Medium
02	Ericson Marine	435 Roosevelt Blvd.	No
03	N/A	Roosevelt Blvd. and Canal St.	No
04	N/A	200 High St.	No
05	Beckett Bridge (fender system)	Riverside Dr.	Low
06	City of Tarpon Springs Sewage Pumping Station (1 of 2)	Doric Ct.	No
07	City of Tarpon Springs Sewage Pumping Station (2 of 2)	Riverside Dr. and Chesapeake Dr.	No
08	Tarpon Springs Yacht Club	350 N Spring Blvd.	No

The "Low" risk site corresponds to the piles of the fender system immediately adjacent to the Beckett Bridge which could contain creosote and/or arsenic as preservatives. Should some or all of these piles require removal or disturbance during the construction period, they should be evaluated beforehand to verify the presence or absence of these substances. If these substances are present, precautions should be taken by the contractor to help prevent the leaching of creosote into the waterway or the generation of arsenic-containing dust.

The "Medium" risk site (i.e., the Stamas facility) presents a contamination potential based on current and historical environmental records, however, it is not anticipated that this facility will be impacted as part of the current project design. Should project design elements change such that implementation would require FDOT to acquire, engage or otherwise alter this property, it is recommended that further assessment be conducted.

3.4 CULTURAL RESOURCES

3.4.1 Historic and Archaeological Sites

A *Cultural Resource Assessment Survey (CRAS)* was conducted for this study. The results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013. The concurrence letter is included in Appendix F. The objective of this survey was to identify cultural resources within or adjacent to the Area of Potential Effect (APE) and assess their eligibility for listing in the NRHP according to the criteria set forth in 36 CFR Section 60.4.

This assessment was designed and implemented to comply with Section 106 of the *National Historic Preservation Act of 1966* (NHPA) (Public Law 89-655, as amended), as implemented by 36 CFR 800 (*Protection of Historic Properties*, effective January 2001); Chapter 267, F.S.; Section 4(f) of the *Department of Transportation Act of 1966* (DOT Act), as amended (49 U.S.C. 303); and the minimum field methods, data analysis, and reporting standards embodied in the Florida Department of Historic Resources (FDHR) *Historic Preservation Compliance Review Program* (November 1990), *Cultural Resource Management Standards and Operational Manual* (February 2003), and Chapter 1A-46 (*Archaeological and Historical Report Standards and Guidelines*), F.A.C. In addition, this report was prepared in conformity with standards set forth in Part 2, Chapter 12 (*Archaeological and Historic Resources*) FDOT *Project Development and Environment Manual* (revised, January 1999).

All work conforms to professional guidelines set forth in the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* [48 Federal Register (FR) 44716, as amended and annotated]. Principal investigators meet the minimum qualifications for archaeology, history, architecture, architectural history, or historic architecture contained in 36 CFR 61 (*Procedures for Approved State and Local Historic Preservation Programs*, Professional Qualifications Standards). Archaeological investigations were conducted under the direction of James Pepe, M.A., RPA. Historic resource investigations were conducted under the direction of Amy Groover Streelman, M.H.P.

The APE was determined by evaluating the improvements that may be implemented as part of the bridge construction. The improvements under consideration may range from rehabilitation of the existing bridge to the construction of a 28 foot high fixed bridge. The determination also considered the surrounding character of the area and the existing facilities found throughout the corridor. Additionally, a detour would be required for removal of the existing bridge, rehabilitation or replacement alternatives. The proposed detour plan was considered when determining the limits of the APE. The proposed APE for historic and archaeological resources is shown on **Figures 3-9 and 3-10**. The APE was reviewed and approved by FHWA and State Historic Preservation Officer (SHPO) by letter dated March 27, 2012, which is included in **Appendix F**.

Figure 3-9 – Proposed Historic Resources Area of Potential Effect (APE)

Figure 3-10 – Proposed Archaeological Resources Area of Potential Effect (APE)

The APE for historic resources includes any historic properties adjacent to the current roadway and any new proposed right of way acquisitions beginning at Chesapeake Drive and ending at Forest Avenue. This APE provides appropriate coverage for the alternatives related directly to Beckett Bridge PD&E project. In regard to the mid-level fixed bridge alternative that is being studied, the APE includes properties along the riverfront that can physically be seen from a from a reasonable distance in order to address any viewshed/visual effects. This APE extends two to four parcels on either side of the current bridge location on both sides of the bayou.

The goal of this cultural resource survey was to locate and document evidence of historic or prehistoric occupation or use within the APE (archaeological or historic sites, historic structures, or archaeological occurrences [isolated artifact finds]), and to evaluate these for their potential eligibility for listing on the NRHP. The research strategy was composed of background investigation, a historical document search, and field survey. The background investigation involved a perusal of relevant archaeological literature, producing a summary of previous archaeological work undertaken near the project area.

This survey resulted in the identification of 16 newly recorded historic resources within the APE including one bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, 8PI2069) (**Table 3-7**). One of these newly recorded historic resources, Beckett Bridge (8PI12017), was determined to be eligible for listing in the NRHP by FHWA and SHPO. The remaining resources (8PI12043-8PI12055, 8PI12068, 8PI12069) are considered ineligible for listing in the NRHP as individual historic resources or as contributing resources to a historic district.

Determination of Eligibility (DOE) forms were prepared for the Beckett Bridge (8P112017) and submitted to the FHWA in August 2012. The purpose of this early coordination, prior to submitting the CRAS, was to obtain early input from FHWA and the SHPO on the potential eligibility of the bridge for the NRHP. The DOE concluded that the Beckett Bridge was eligible for listing in the NRHP. Both FHWA and SHPO concurred with this determination in September and October 2012, respectively. The Letter from FDOT to FHWA dated August 24, 2012 which includes FHWA and SHPO concurrence is included in Appendix F.

Table 3-7 – Historic Resources Identified within the Project APE

FMSF #	Site Name / Address	Style	Const. Date	National Register Status
8PI12017	Beckett Bridge Riverside Drive/Spring Boulevard	Bascule Bridge	1924	Determined Eligible
8PI12069	435 Doric Court	Masonry Vernacular	c. 1947	Ineligible
8PI12068	425 Doric Court	Frame Vernacular	c. 1954	Ineligible
8PI12043	438 Riverside Drive	Craftsman	c. 1925	Ineligible
8PI12044	434 Riverside Drive	Frame Vernacular	c. 1929	Ineligible
8PI12045	412 Riverside Drive	Masonry Vernacular	c. 1946	Ineligible
8PI12046	403 Riverside Drive	Mission	c. 1949	Ineligible
8PI12047	438 Craig Drive	Frame Vernacular	c. 1940	Ineligible
8PI12048	Tarpon Springs Yacht Club/350 North Spring Boulevard	Masonry Vernacular	1954	Ineligible
8PI12049	6 Venetian Court	Ranch	c. 1952	Ineligible
8PI12050	8 Venetian Court	Ranch	c. 1954	Ineligible
8PI12051	12 Venetian Court	Masonry Vernacular	c. 1953	Ineligible
8PI12052	101 Pampas Avenue	Masonry Vernacular	c. 1954	Ineligible
8PI12053	330 North Spring Avenue	Masonry Vernacular	c. 1956	Ineligible
8PI12054	302 North Spring Boulevard	Masonry Vernacular	c. 1950	Ineligible
8PI12055	301 North Spring Boulevard	Frame Vernacular	c. 1953	Ineligible

No archaeological sites were newly identified within or adjacent to the project corridor during the current survey and no previously recorded archaeological sites were located within the archaeological APE.

In addition to the CRAS, a Cultural Resource Reconnaissance Survey was performed to provide preliminary cultural resource information for a proposed detour route of Beckett Bridge outside the established APE. One previously recorded historic resource was identified that is NRHP-listed and six previously recorded historic resources were identified that are considered individually eligible for inclusion in the NRHP. These resources were evaluated in the Historic Resources Survey of Tarpon Springs, conducted in July 2009 by Janus Research for the City of Tarpon Springs. Some of these resources are located in the Beckett Bridge proposed detour route.

These seven previously identified resources include the NRHP-listed Tarpon Springs Historic District (8PI1712), the Edward Newton Knapp House (8PI238), the William T. Fleming House (8PI1617), the George Clemson House (8PI1619), the George Clemson Auxiliary (8PI1620), the Marshall H. Alworth House (8PI1621) and the Bigelow Cottage (8PI1625). The six individually eligible buildings are part of the National Register-listed Tarpon Springs Historic District (8PI1712). Only one new property along this route was identified as potentially NRHP–eligible during the reconnaissance survey and is located at 115 North Park Avenue.

3.4.1.1 8PI12017 (Beckett Bridge)

The Beckett Bridge is located in Township 27 South, Range 15 East, and Sections 11 and 12 of [U.S. Geological Survey (USGS) Quadrangle Tarpon Springs 1973, Photorevised 1987], in Pinellas County, Florida. The bridge is a steel, single-leaf, under-deck counterweight, Scherzer rolling-lift (bascule) bridge, approximately 360 feet long and about 28 feet wide. It carries Riverside Drive/North Spring Boulevard over Whitcomb Bayou in Tarpon Springs, Florida.

The existing typical section of the bridge consists of two 10-foot wide travel lanes and 2’2” sidewalks and concrete railing on both sides. Nine approach spans and one main span are present. The main bridge span is a steel structure with an open steel grid deck. Railings flank the bridge approaches and the bascule span; these are simple concrete rails with concrete posts on the approach spans and steel rails and posts on the main span. Concrete piers support the prestressed concrete girder spans of this bridge. A galvanized pipe staircase with handrails leads to the bridge substructure from a utilitarian bridge tender’s station that consists of a simple one-story rectangular building with a steel shed roof and Plexiglas windows. This structure is located on the north side of the bridge.

Beckett Bridge was originally built in 1924 and called the Chilito Street Bridge until it was renamed in 1948 for Edward H. Beckett to honor him for his 34 years of service as a County Commissioner (Freedman 1948). The original bridge was of wood construction with a concrete pier and a steel drawbridge span. The bridge was the shortest way of connecting east and west Tarpon Springs. In 1956, the Beckett Bridge was almost entirely reconstructed after Pinellas County decided repairs to the original wooden structure would be wasteful (Twitty 1955). The new structure utilized the original steel bascule, draw, and machinery for operation, but the wooden approach spans were replaced with new concrete spans, spanning 350 feet (n.a. 1956). The 1956 plans have not been located.

Since the major alterations to the bridge in 1956, the Beckett Bridge underwent repairs again in 1996. The rehabilitation repairs included the addition of steel crutch bents to stabilize settlement, repair of the steel draw span as well as the concrete approach spans, refurbishment of the machinery, replacement of the electrical system, and construction of the tender station. The tender station is a non-historic alteration because it was built after the historic period in 1996; it is considered a non-contributing element to the historic bridge. The traffic and barrier gates were also added during the 1996 repairs.

In 1997, the main machinery drive shafts failed during testing of the draw span subsequent to the 1996 repairs. Repairs were completed in December 1997. Recent repairs in 2011 were performed to correct issues with the operating machinery and the movable bridge span.

The Beckett Bridge remains one of seven pre-1965 single-leaf bascule bridges in Florida. It is considered eligible for listing in the National Register under Criterion A for its contributions to the patterns of development and transportation in the State, as well as Criterion C for its distinct engineering.

3.4.2 Recreation Areas/Potential Section 4(f) Properties

Section 4(f) lands include publicly owned parks, recreation areas, wildlife and waterfowl refuges; properties that represent multiple public land use holdings; and historical and archaeological sites (regardless of ownership). Section 4(f) of the DOT Act [Title 49, U.S.C., Section 1653(f)] was enacted to encourage preservation of Section 4(f) lands.

Potential Section 4(f) resources identified during the ETDM screening process include historical or archaeological sites located within the project corridor and the Pinellas County Aquatic Preserve (OFWs). The Beckett Bridge is considered eligible for listing in the NRHP (See Section 3.4.1 Historic and Archaeological Sites).

The ETDM metadata also identifies areas of statewide greenways critical and low priority linkages, low priority paddling trails, and high and low priority multi-use trails that could be associated with the proposed project. These FDEP designations contain all of the largest areas of ecological and natural resource landscapes and the linkages necessary to link them together in a statewide system. There are no existing FDEP, County or Regional officially designated, marked or signed greenways or trails within, along or perpendicular to the project study limits.

However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located approximately 0.7 mile east of the Bridge. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2025 LRTP, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. (The locations of these trails are shown on Figure 2-4.) The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

An unmarked paddling trail beginning at Craig Park, south of the bridge is identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. (A map from this guide for trails in northern Pinellas County is provided in Figure 2-5.) The unmarked trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico.

4.0 DESIGN CRITERIA

4.1 BRIDGE

4.1.1 Channel Clearance Requirements

The proposed bridge will provide horizontal and vertical navigation clearances that are, at a minimum, equal to those of the existing bridge. The existing horizontal clearance is approximately 25 feet between fenders. The vertical clearance for the existing movable span in the closed position is approximately 6 feet. The maximum vertical clearance for the movable bridge in the fixed position which avoids impacts to adjacent right-of-way is 7.5 feet. Discussions with the USCG indicated that a bridge with at least 6 feet of vertical clearance would be permittable.

A waterway survey of waterfront property owners on Whitcomb Bayou was conducted to determine the number and types of boats that would need to pass under the bridge to reach deeper water. The results showed that six sailboats requiring 14-38 feet of vertical clearance were owned by waterfront property owners in the Bayou. Based on this information and discussions with the USCG, a fixed bridge alternative was developed which provided the maximum vertical clearance practical to provide access to these vessels. The maximum vertical clearance that could be obtained without impacting the intersections at the western and eastern limits of the project (Riverside Drive with Chesapeake Drive and Forest Avenue) was determined to be 28 feet.

In summary, these clearances used to develop alternatives include:

1. 25 ft. horizontal between fenders.
2. 28 ft. vertical clearance above mean high water (MHW) between fenders for a fixed span.
3. 7.8 ft. vertical clearance above MHW between fenders for a movable span bridge with the movable span in the closed position.
4. Unrestricted vertical clearance in the channel for a movable span in the open position.

4.1.2 Design Method

Replacement Bridge

The replacement bridge will be designed for a 75 year service life. Concrete may include additives as well as having additional cover over reinforcing steel for increased corrosion protection.

Substructure Elements

Substructure elements, including precast and cast-in-place concrete piles, footings, caps, and columns will be designed for dead load, live load, wind load, etc. in accordance the Load and Resistance Factor (LRFD) method.

Superstructure Elements

Superstructure elements, including prestressed and cast-in-place deck slab, beams, and barrier rails will be designed for dead load, live load, and crash resistance in accordance with the LRFD method.

Bascule Span Superstructure

Structural steel (main girders, floor beams, stringers, bracing, etc.) for the bascule span superstructure will be designed for dead load, live load, and wind load in accordance with the LRFD method.

Bascule Span Electrical and Mechanical

The bascule span machinery and electrical control system will be designed in accordance with the LRFD method. The design will be based on 3,000 (open and close) operation cycles over the proposed 75-yr service life.

4.1.3 Design Loads and Load Factors

Live Load

HL-93 Design Vehicular Live Loading, including design truck or design tandem and design lane load, per *AASHTO LRFD Bridge Design Specifications, 6th Edition – 2012,* Section 3.6, shall be used. The load results from the HL-93 Design Vehicular Live Loading envelopes the load results for all LRFD Design Live Loads. The movable span shall also be designed for HL-93 Design Vehicular Live Loading when the span locks are not engaged for a Strength II Load Combinations, per *FDOT Structures Design Guidelines*, Section 8.4.

Wind Loads

Section 2.4 of the *FDOT Structures Design Guidelines* shall be used to determine the wind on structure loads for the bridge design. A Basic Wind Speed (V) of 130 mph as per Table 2.4.1-2 shall be used.

Wave Loads

In accordance with the *FDOT Structures Design Guidelines*, Section 2.5, the level of importance classification for the proposed bridge is recommended to be "Critical." This recommendation is based on a combination of factors including projected traffic volumes, route impacts on local residents and businesses, and use of this facility as an evacuation and emergency response route. This classification requires that the replacement bridge be designed to resist wave forces at the Extreme Event Limit State with a performance level of "Repairable Damage." Using thisdesign criteria, the bridge would be designed to survive a 100-year storm event but may experience some damage that would require minimal repair before bridge is returned to service. The use of "Sacrificial Spans" that would require replacement after a 100-year storm event is not recommended.

According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D. Max Sheppard and William Miller Jr., September 2003*, the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation. Portions of the superstructure will be below the wave crest elevation. Accordingly, wave forces need to be considered in the design of the bridge. However, it is anticipated that wave heights and corresponding force at the bridge would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves. Furthermore, the presence of topographical features, including numerous adjacent residential buildings and trees, reduce wind velocities at the surface of the water with lower corresponding wave heights.

As the superstructure for the movable bridge alternative will be below the storm surge elevation, it will be subject to waves and thus will be required to be designed to resist the design wave loads. Accordingly, the movable bridge alternative may require wave force-mitigation measures such as a shallow slab type superstructure. The superstructure for the fixed bridge alternatives is anticipated to be above the maximum wave crests and thus it will not be necessary to design these spans for the wave loads.

During final design, a Coastal Engineer will be required to perform a wave analysis to determine the anticipated wave heights and corresponding wave design loads. A Level I Analysis per *AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms* will yield conservative design wave loads.

Seismic Loads

The superstructure spans will be supported on elastomeric bearings. Therefore, the bridge will be categorized as "exempt" for seismic loads per *FDOT Structures Design Guidelines* Section 2.3. The minimum bearing support dimensions only need to be satisfied as required by *AASHTO Bridge Design Guidelines*, Section 4.7.4.4 for seismic adequacy.

Vehicular Collision Loads

Traffic railing (barriers) on the fixed spans will be in accordance with NCHRP Report 350 Performance Level TL-4 (AASHTO Level PL-2), including crash testing. Traffic railing on the movable span may be constructed of structural steel, and if so, will be designed as an equivalent to a crash tested TL-4 railing, including similar geometry and strength.

4.1.4 Movable Span Operation Requirements

The movable span will be a single-leaf bascule. The movable span drive machinery may be either an electro-mechanical or hydraulic system.

Time of Operation

The normal operating cycle from fully closed to fully opened, or fully open to fully closed, will be a maximum of 60 seconds. The 60 seconds will include a zero to ten second acceleration period and a zero to five second period deceleration, creep speed and seating. This operating cycle will apply for wind loads defined in AASHTO.

Redundancy

Primary span drive components including motors, brakes, reducers, driver machinery, pump/motor groups, hydraulic cylinders, and valving will be designed for redundancy such that one component or system can be removed from service for repair or replacement without disabling the bridge for opening under maximum constant velocity torque wind loads per

AASHTO.

Service Duty

The design life for reducers, bearings and other similar mechanical components will be 50 years. The design life for cylinder seals, hydraulic pumps, and other hydraulic seals will be 20 years.

Electrical Service

Electrical service will be 480 volts 3 phase, "wye" for motor loads.

Bridge Control System

Bridge control and operation will be by way of a relay logic with bypass capability.

4.1.5 Environmental Classification

The following environmental classifications apply:

- Superstructure: Corrosive (Extremely Aggressive)
- Substructure: Corrosive (Extremely Aggressive)
- Location: Coastal (Saltwater)

4.2 ROADWAY

Roadway design criteria are summarized in Table 4-1 below. Conceptual plans have been developed using the current editions of the documents listed below. If the project proceeds to the Design phase, the editions current at that time will be used for final design of the proposed improvements.

4.2.1 Vertical Clearance over Roadways

The minimum vertical clearance used to develop alternatives for the bridge structure overpasses is 14.5 feet from the bottom of the structure member to the crown (or high point) of the roadway travel way underpass. This clearance height is consistent with AASHTO required minimum criteria.

Table 4-1 – Roadway Design Criteria

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Traffic Volumes [Annual Average Daily Traffic (AADT)] **Design Year**	9,700 2038	*9,700 vehicles per day (vpd)*	Design Traffic Technical Memorandum (URS, April 2012 prepared for this PD&E Study)
Functional Classification: Riverside Drive/ N Spring Blvd	**Rural** Collector	**Urban** Collector	City of Tarpon Springs and Pinellas County Comprehensive Plans
Design Speed Collector Roadway	20 & 30 miles per hour (mph) (Posted)	**35** mph* (Greenbook) >30 mph** (AASHTO) 35-50 mph*** (FDOT) ***Use 35 mph****	*Greenbook, Table 3-1 ** AASHTO, Chapter 6 ***FDOT PPM, Table 1.9.1
Design Vehicle Single Unit Truck (SU) 8' wide x 30' long Conventional School Bus (S-Bus36) 8' wide x 35.8' long Recreational Vehicle (MH/B) 8' wide x 53' long per AASHTO and Greenbook.	N/A	SU* (Greenbook) SU-30,SU-40, S-BUS36, MH-B** (AASHTO) WB-62 FL*** (FDOT) ***Use SU, S-BUS36, MH-B design vehicles*****	*Greenbook, Table 3-2 **AASHTO, Table 2-1b ***FDOT PPM, Sec. 1.12
Minimum Width of Travel Lane	10 ft.	11 ft.* (Greenbook) 10-12 ft** (AASHTO) 11 ft.*** (FDOT) ***Use 11 ft.****	*Greenbook, Table 3-7 **AASHTO, Chapter 6 ***FDOT PPM, Table 2.1.1
Bicycle Lane	N/A	4.0 ft.* (Greenbook) Varies (2ft. min.) ** (AASHTO) 4.0 ft.*** (FDOT) ***Use 4 ft.****	*Greenbook, Ch. 3, sec. C.10.b **AASHTO, Chapter 2 (Pg. 2-81) ***FDOT PPM, Table 2.1.2
Sidewalk	4-5 ft.	4 ft.* Min. (Greenbook) 5 ft. ** (AASHTO) (ADA) 5 ft. (On Bridge)*** (FDOT) ***Use 5 ft. min. sidewalk******	*Greenbook, Ch. 3, Sec. C.7.d. **AASHTO, Chapter 6 ***FDOT PPM, Figure 2.0.4
Shared Use Path (S.U.P.)	N/A	10 ft. (2-way only)* (Greenbook) N/A ** (AASHTO) 6 ft. (1-way),10 ft.(2-way)*** FDOT ***N/A******	*Greenbook, Ch. 9, sec. C.2 **AASHTO Bicycle Handbook ***FDOT PPM, Sec. 8.6.2
Shoulder Width (Outside)	No Shoulder	8' * (Greenbook) 8' ** (AASHTO) 16" (raised sidewalk), 8' min. long bridge*** (FDOT) ***N/A****	*Greenbook, Table 3-8 **AASHTO, Exhibit 6-5. Ch. 6 ***FDOT PPM, Fig. 2.03, 2.04

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Shoulder Width (Inside) Distance from travel lane to longitudinal barrier. For FDOT Plans Preparation Manual (PPM) and Greenbook, median shoulder only applies to multi-lane highways.	None	6' * (Greenbook) 4' ** (AASHTO) 2'-6" with raised median / 6' flush shoulder*** (FDOT) ***N/A***	*Greenbook, Table 3-9 **AASHTO, Chapter 6, ***FDOT PPM, Fig. 2.0.4
Breakdown Vehicle Width on Travel Lane This is the width of the travel lane that can be used to accommodate a "break down" situation for a narrow shoulder.	N/A	[1' to 4'] encroachment onto travel lane is allowed for a narrow shoulder** (AASHTO) ***N/A***	**AASHTO, Chapter 4, "Width of Shoulders" Section 4.4.2
Cross Slope	Not Available	1.5% to 4%* (Greenbook) 1.5% to 3%** (AASHTO) 2% from crown*** (FDOT) ***Use 2% Cross Slope****	*Greenbook, Chapter 3, C.7.B.2 **AASHTO, Chapter 6, pg. 6-13 ***FDOT PPM, Figure 2.1.1
Roadside Slopes Anything steeper than 1:3 will need to be shielded per all references.	Not Available	1:4 or flatter* (Greenbook) 1:3 or flatter** (AASHTO) 1:2, not flatter than 1:6*** (FDOT) ***N/A****	*Greenbook, Ch. 3, sec. C.7.f.2 **AASHTO, Ch. 4, pg. 6-13 ***FDOT PPM, Table 2.1.1
Clear Zone Based on Design Speed.	N/A	10' (Rural), 4' (Urban)* (Greenbook) 14' (Rural), 1.5' back of face of curb (Urban)** 18' (Rural), 4' (Urban but not < 2.5')***(FDOT)) ***Use 4'****	*Greenbook, Table 3-12 **AASHTO Roadside Guideline Chapter 3 and Chapter 10 ***FDOT PPM, Chapter 4
Border Width Based on Design Speed.	Not Available	N/A * (Greenbook) 8 ft.** (AASHTO) 33' Rural, 12' Urban, 10' w/bike lane*** (FDOT) ***Use 8 ft.*****	*Greenbook, N/A **AASHTO, Chapter 8 ***FDOT PPM, Table 2.5.1, 2.5.2
Drop-Off Hazard For Vehicles and Cyclists on Road	N/A	Hazard when less than 22 ft. from traveled way, steeper than 1:3 slope and 6 ft. or greater drop.*** (FDOT) ***Identify Hazards less than 22'/ steeper than 1/3 > 6' drop ****	***FDOT PPM 2012, Section 4.2.2

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Drop-Off Hazard For Pedestrians on Sidewalk	N/A	Case I: When Drop-off is > 10" and within 2 ft. of Back-of-Sidewalk. Case II: When Total Drop-off is > 60" and slope steeper than 1:2 and begins within 2 ft. of Back-of-Sidewalk *** (FDOT) ***Identify Hazards that meet Case I or II****	***FDOT PPM 2012 Figure 8.8.1
Maximum Grade Based on Design Speed of 35 mph.	1.3 % max.	9% * (Greenbook) 9% ** (AASHTO) 9% *** (FDOT PPM) 5% **** (ADA) ***Use 5% maximum grade******	*Greenbook, Table 3-4 **AASHTO, Exhibit 6-8 ***FDOT PPM, Tables 2.6.1 ****ADA
Minimum Grade	0.2 % min.	0.3%* (Greenbook) 0.3%** (AASHTO) 0.3 %*** (FDOT) ***Maintain 0.3% minimum grade****	*Greenbook Chapter 6, C.5.b **AASHTO Chapter 6, Pg 3-119 ***FDOT PPM, Table 2.6.4
Maximum change in grade w/out using vertical curve Based on Design Speed of 35 mph.	N/A	0.9%* (Greenbook) N/A ** (AASHTO) 0.9%*** (FDOT) ***Use 0.9%****	*Greenbook, Table 3-5 **N/A (AASHTO) ***FDOT PPM, Table 2.6.2
Minimum Length of Crest Vertical Curve Based on K-value. Based on Design Speed of 35 mph.	360' existing	K=47 but not L < 105* (Greenbook) K=29** (AASHTO) K=47 but not L < 105*** (FDOT) ***Use k=47 for minimum length******	*Greenbook, Table 3-6 **AASHTO, Table 3-34 ***FDOT PPM, Table 2.8.5
Minimum Length of Sag Vertical Curve Based on K-value. Based on Design Speed of 35 mph.	N/A	K=49 but not L < 105* (Greenbook) K=49** (AASHTO) K=49*** (FDOT) ***Use k=49 for minimum length******	*Greenbook, Table 3-6 **AASHTO, Table 3-36 ***FDOT PPM, Table 2.8.6
Maximum Degree of Curvature Without Superelevation Based on Normal Cross Slope = -0.02. Based on Design Speed of 35 mph.	4 existing Curves: 28° - 1st curve 28° - 2nd curve 34° - 3rd curve 38° - 4th curve	N/A* (Greenbook) R=510'** (AASHTO) 5°*** (FDOT) ***Maintain existing degree of curvature*****	*Greenbook, N/A **AASHTO, Table 3-13 ***FDOT PPM, Table 2.8.4

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Minimum Length of Horizontal Curve Based on Design Speed.	4 existing Curves: 14.84' – 1st curve 15.36' - 2nd curve 130' - 3rd curve 52.29' - 4th curve	N/A* (Greenbook) 500'** (AASHTO) 525' but not < 400'*** (FDOT) ***Maintain existing length of curve***	*Greenbook, N/A **AASHTO, Ch. 3 Sec 3.3.13 ***FDOT PPM, Table 2.8.2a
Maximum Deflection without a Horizontal Curve Based on Design Speed of 35 mph.	N/A	2° *** (FDOT) ***Use 2 degrees ****	***FDOT PPM, Table 2.8.1a
Traffic Control Through Work Zones (Minimum Regulatory Speed) FDOT states that the Regulatory Speed should never be below the minimum statutory speed for this facility. See "Design Speed". AASHTO follows Manual on Uniform Traffic Control Devices (MUTCD) criteria.		20 mph & 30 mph Posted*** (FDOT) Existing Roadway Regulatory Speeds**** (MUTCD) ***Use 20 mph & 30 mph posted speeds ****	***FDOT Design Standards, Index 600 ****MUTCD, Chapter 6C
Traffic Control Through Work Zones (Clear Zone Width for Work Zones)		14' or 4' behind face of curb and gutter *** *(FDOT)* ***Use 14' or 4' behind face of curb and gutter ****	***FDOT Design Standards, Index 600
Traffic Control Through Work Zones (Minimum Radii for Normal Cross Slope) Based on Design Speed.		610' *** (FDOT) ***Use 610' ****	***FDOT Design Standards, Index 600
Traffic Control Through Work Zones (Minimum Lane Widths)		10' *** (FDOT) ***Use 10' ****	***FDOT Design Standards, Index 600

References:
2013 FDOT Plans Preparation Manual
2013 FDOT Design Standards
2011 AASHTO "A Policy on Geometric Design of Highways and Streets"
2011 FDOT "Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways" (Green Book)
2011 AASHTO Roadside Design Guide
2009 Manual on Traffic Control Devices
Note: The latest adopted versions of all references will be used in final design.

5.0 TRAFFIC

A *Design Traffic Technical Memorandum* was prepared in accordance with the FDOT *Design Traffic Handbook (Topic No. 525-030-120)*). Detailed information concerning the methodology employed for this traffic study can be found in this report, published separately from the PER. Traffic for the following years was analyzed:

- Existing Year 2012
- Opening Year 2018
- Design Year 2038

The Study area encompassed Riverside Drive/North Spring Boulevard including the Beckett Bridge from Chesapeake Drive, across Whitcomb Bayou to Forest Avenue, Alternate US 19, Florida Avenue, Meres Boulevard, Gulf Road, Whitcomb Boulevard, East Tarpon Drive and Tarpon Avenue.

5.1 EXISTING TRAFFIC CONDITIONS

Traffic counts were conducted in January and February of 2012 at key locations in the study area. Pinellas County provided 72-hour directional volume counts on Meres Boulevard, Whitcomb Drive, East Tarpon Drive, and Spring Boulevard. URS conducted 72-hour directional volume counts on Riverside Drive just east and west of the Beckett Bridge, as well as intersection turning movement counts from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. (including bicycles and pedestrians) at the following locations:

- Alternate US 19 at Tarpon Avenue, and
- Alternate US 19 at Meres Boulevard.

Additionally, traffic counts along Alternate US 19 and Florida Avenue were obtained from FDOT Florida Traffic Online for the latest available year (2010). The traffic count data is documented in the *Design Traffic Technical Memorandum*, published separately. The existing (2012) AADT volumes are illustrated in **Figure 5-1**. The segment of Alternate US 19 located north of Tarpon Avenue is posted with a speed limit of 45 mph. All other roadways in the study area have a posted speed limit of 30 mph. It should also be noted that the Beckett Bridge is currently load-posted to a maximum weight limit of 15 tons, which prohibits certain trucks and buses from using the bridge.

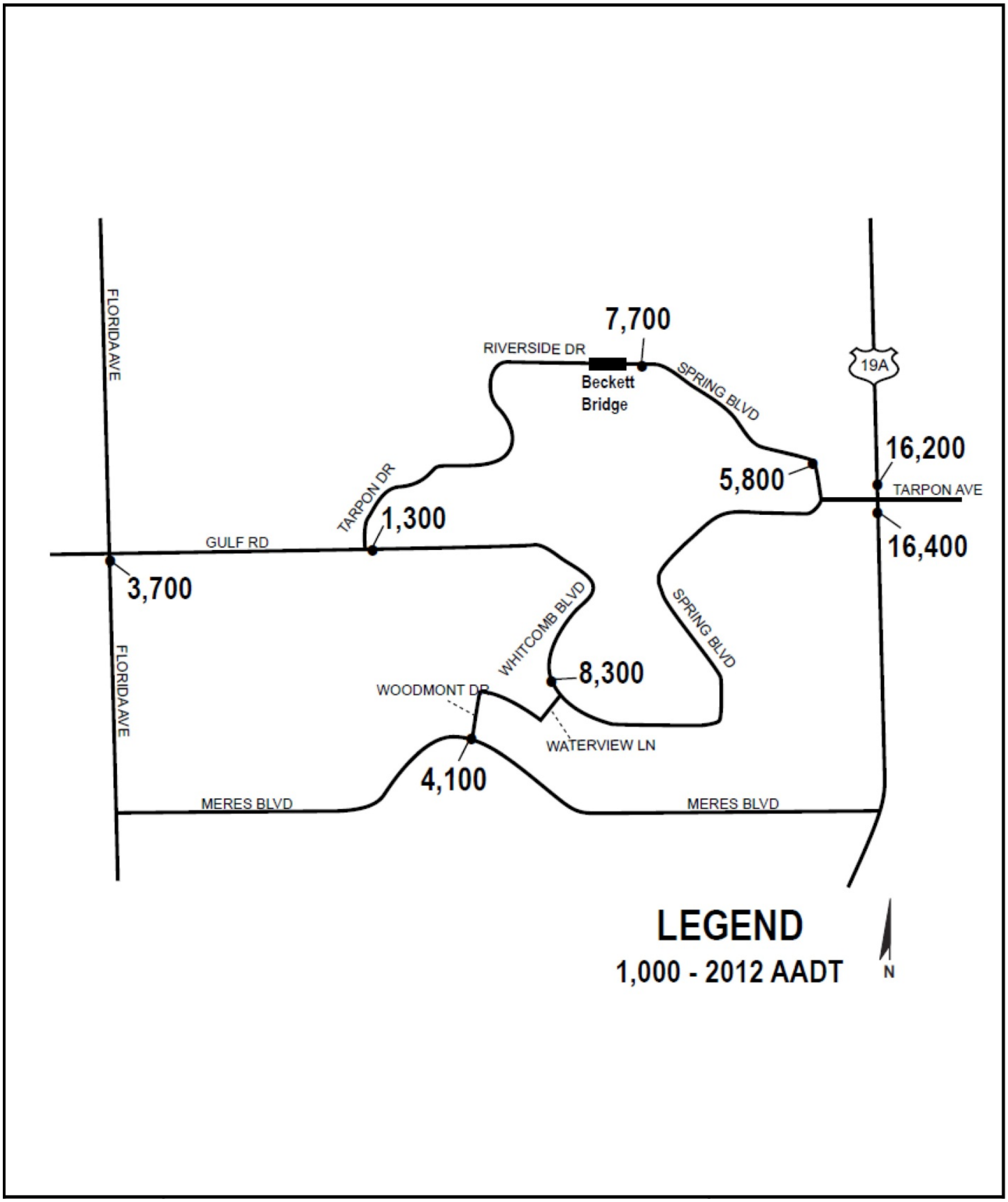


Figure 5-1 – Existing (2012) AADT Volumes

5.1.1 Existing Traffic Volumes

Twenty-four hour counts were averaged for a three-day period and multiplied by the appropriate weekly seasonal adjustment factor to obtain the AADT volumes. Since the latest available data on Alternate US 19 and Florida Avenue was based on 2010 AADT information from FDOT, these counts were adjusted to the year 2012 based on historical traffic growth in the area. The existing (2012) AADT volumes are illustrated in **Figure 5-1**.

To obtain the existing peak hour directional traffic, the AADT volumes were multiplied by the appropriate K and D factors. The K-factor utilized is based upon consultation with the FDOT District Seven Office, where a K-factor of 9.0 percent for Alternate US 19 and 9.5 percent for other collector roadways was determined to be acceptable. The D-factor utilized is based upon an evaluation of the existing directional traffic volumes in the study area, which ranges between 55.2 percent and 63.8 percent. For consistency, these factors were used for both the existing and future traffic volumes. Existing (2012) peak hour directional volumes and intersection peak hour volumes (turning movement volumes) are provided in **Figure 5-2** and **Figure 5-3**, respectively.

5.1.2 Existing Conditions Traffic Operations Analysis

Intersection traffic operations for existing conditions within the study area were determined by inputting the peak hour traffic volumes into the latest version of the *Highway Capacity Software* (HCS+), which is based upon fundamental principles found in the Transportation Research Board's *Highway Capacity Manual*.

Table 5-1 summarizes the existing intersection delay and level of service (LOS) results based on the analysis for the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. Currently, Alternate US 19 at Meres Boulevard operates at LOS C overall in both the a.m. and p.m. peak hours, while Alternate US 19 at Tarpon Avenue operates at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. The northbound approach at the Alternate US 19 at Tarpon Avenue intersection currently operates at LOS E during the p.m. peak hour.

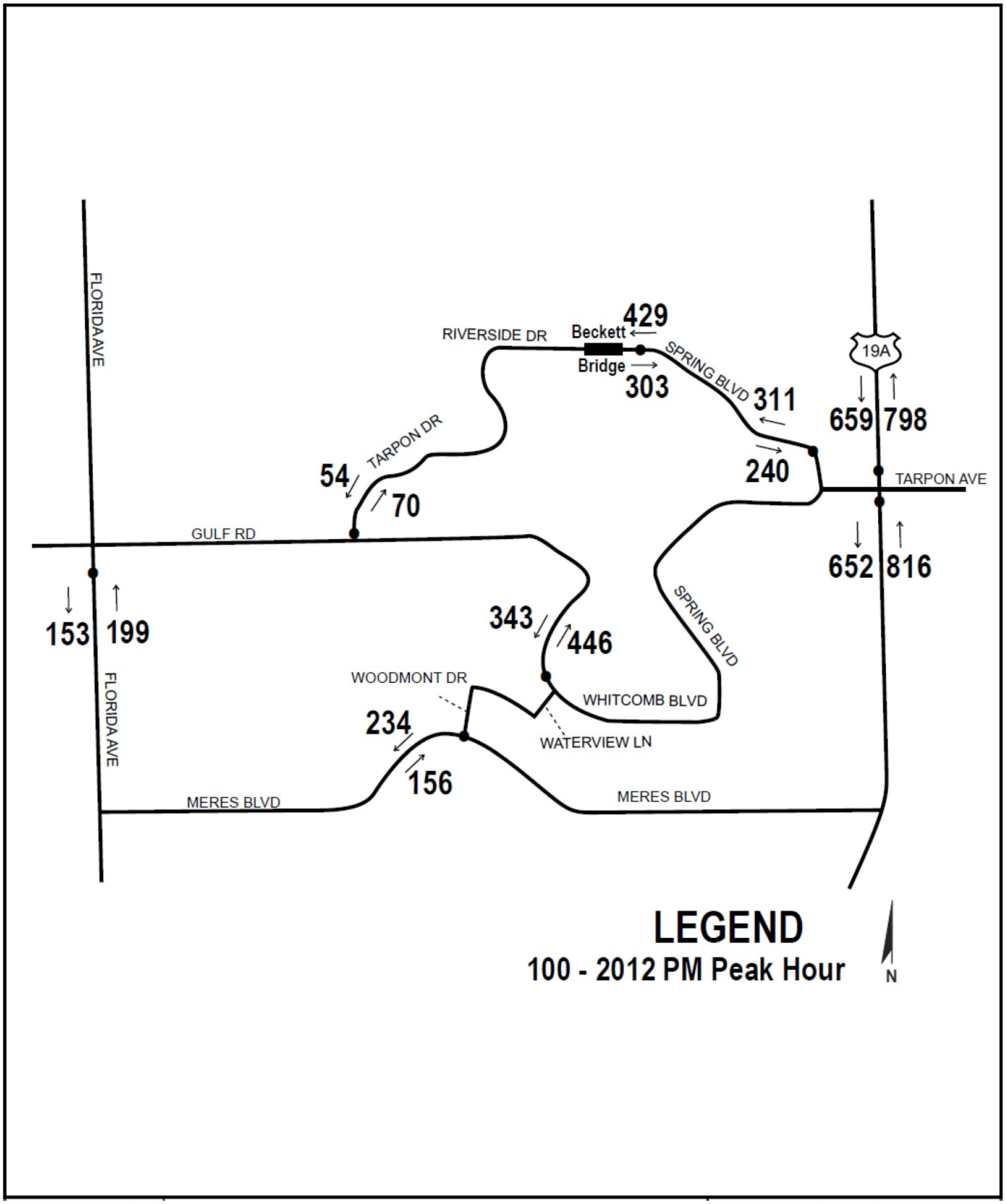


Figure 5-2 – Existing (2012) Peak Hour Directional Volumes

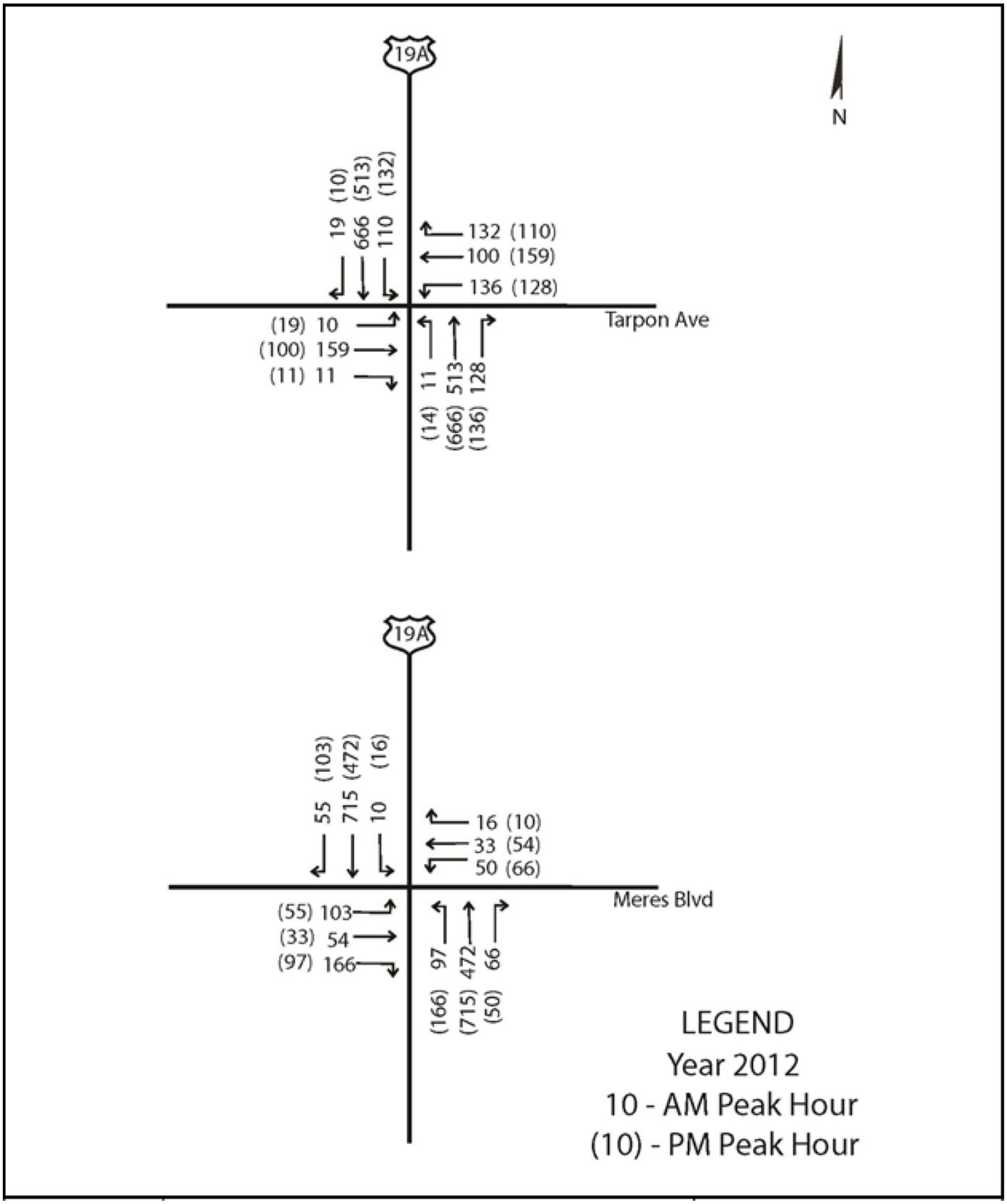


Figure 5-3 – Existing (2012) Intersection Peak Hour Volumes
(Intersection Turning Movements)

Table 5-1 – Existing (2012) Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	635	931	28.4	C	27.7	C
	Southbound	780	591	30.3	C	18.4	B
	Eastbound	323	185	27.1	C	33.6	C
	Westbound	99	130	39.0	D	46.6	D
			Overall	**29.6**	**C**	**26.6**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	652	816	25.9	C	55.7	E
	Southbound	795	655	21.7	C	22.5	C
	Eastbound	180	130	44.1	D	48.5	D
	Westbound	368	397	30.3	C	34.4	C
			Overall	**26.9**	**C**	**40.1**	**D**

5.1.3 Existing Conditions Arterial Analysis

An arterial analysis was conducted using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is currently operating over capacity (LOS E). It should be noted that Alternate US 19 has been designated by Pinellas County as a constrained roadway. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-2** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-2 – Existing (2012) Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	311	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	429	C
Tarpon Drive (North of Gulf Road)	2U	630	70	B
Florida Avenue (South of Gulf Road)	2U	630	199	B
Meres Boulevard (West of Woodmont Drive)	2U	630	234	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	446	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	816	E
Alternate US 19 (North of Tarpon Avenue)	2U	880	798	C

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

5.2 OPENING YEAR AND DESIGN YEAR ANALYSIS

5.2.1 Traffic Forecasting Methodology

Two scenarios were used to develop the traffic projections for the Opening Year (2018) and Design Year (2038). **Scenario 1** assumes that a two-lane bridge (the Beckett Bridge) connects Riverside Drive with Spring Boulevard across Whitcomb Bayou. This scenario is intended to illustrate the traffic conditions for the following PD&E alternatives:

- No-Build (Maintain Existing Bridge)
- Rehabilitation of the Existing Bridge
- Replacement with a New Movable Bridge
- Replacement with a New Fixed Bridge

Scenario 2 assumes that there is no bridge connection across Whitcomb Bayou. This scenario is intended to illustrate the traffic conditions for the following PD&E alternatives:

- No-Build with Removal of the Existing Bridge

Methodology to develop future traffic projections for both scenarios is described in detail in the *Design Traffic Technical Memorandum*. The redistribution of traffic under Scenario 2 was determined from a comparison of the Tampa Bay Regional Planning Model (TBRPM), Version 7.1 with and without the Beckett Bridge. The redistribution of Beckett Bridge traffic under Scenario 2 is illustrated in **Figure 5-4**. As discussed previously, the Beckett Bridge is currently load-posted to a maximum weight limit of 15 tons, which prohibits certain trucks and buses from using the bridge. The actual truck/heavy vehicle percentage is less than one percent. If any of the proposed bridge rehabilitation or replacement alternatives are selected, this load restriction will no longer be applicable to the bridge. Accordingly, a peak hour heavy vehicle percentage of two percent was assumed in the analysis to provide a conservative estimate for future scenarios.

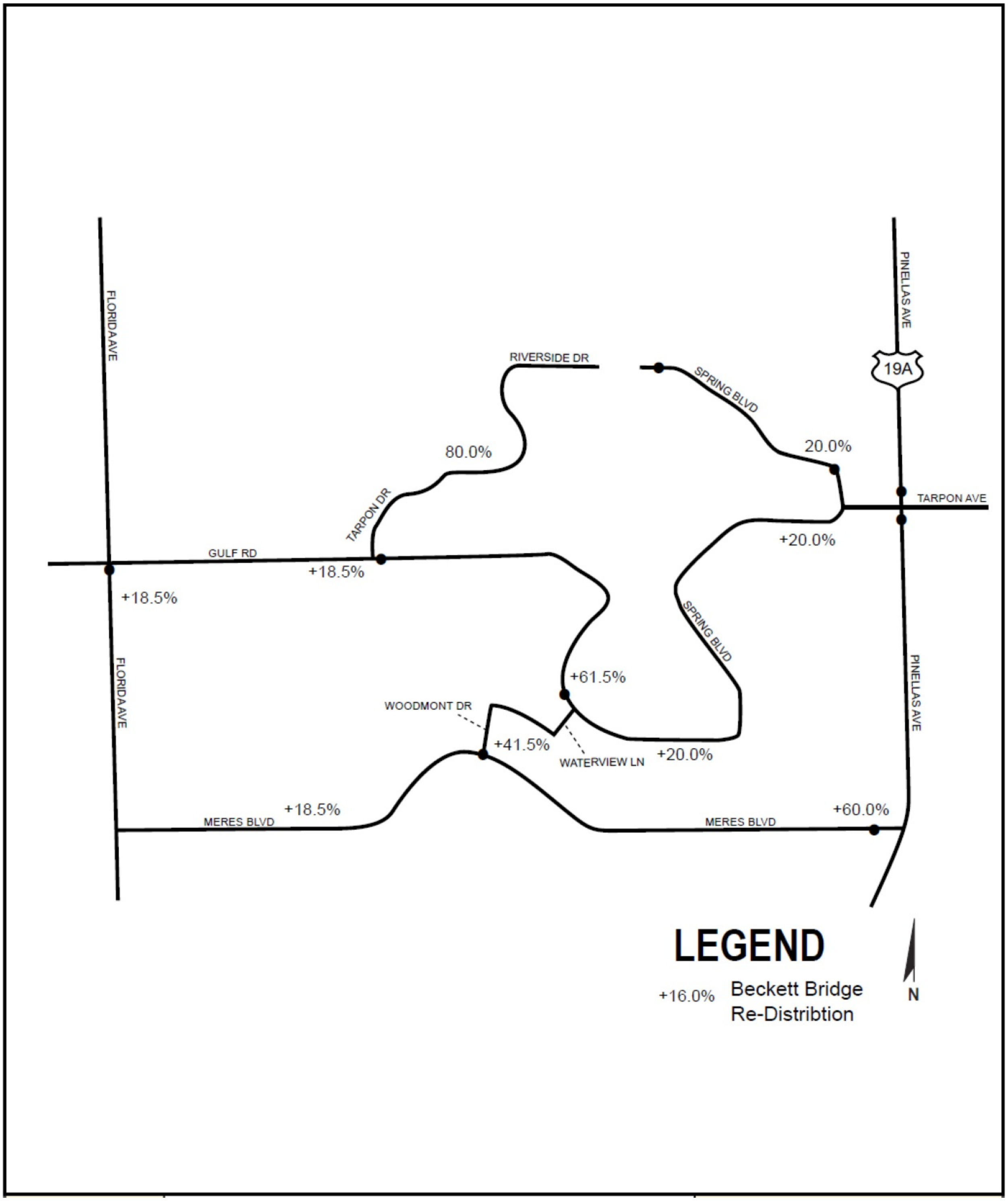


Figure 5-4 – Redistribution of Beckett Bridge Traffic

5.2.2 Opening Year (2018) and Design Year (2038) AADT Volumes

Daily traffic projections were based on applying a growth rate of 1.03 percent per year to the existing (2012) AADT volumes. Projections were based on increases from 2012 to the 2018 Opening Year (for 6 years) and from 2012 to the 2038 Design Year (for 26 years). For Scenario 2, the AADT volumes were reallocated based on the redistribution of traffic provided on **Figure 5-4**. Opening Year (2018) and Design Year (2038) AADT volumes under both scenarios are illustrated on **Figures 5-5 through 5-8**.

5.2.3 Opening Year (2018) and Design Year (2038) Peak Hour Volumes

Directional peak hour traffic projections were derived by applying the K and D factors to the Opening Year (2018) and Design Year (2038) AADT volumes. Opening Year (2018) and Design Year (2038) directional peak hour volumes under both scenarios are illustrated on **Figures 5-9 through 5-12**.

The peak hour traffic projections at the intersections of Alternate US 19 at Tarpon Avenue and Alternate US 19 at Meres Boulevard were developed by applying a 1.03 percent growth rate annually to the existing (2012) counts. Opening Year (2018) and Design Year (2038) intersection peak hour volumes under both scenarios are illustrated on **Figures 5-13 through 5-16**.

5.2.4 Opening Year (2018) Intersection Analysis

The Opening Year (2018) traffic conditions were analyzed under both scenarios using the Transportation Research Board's *Highway Capacity Manual* (HCM) and HCS+ for the two study area intersections.

Scenario 1 – Bridge Remains

Table 5-3 summarizes the intersection delay and LOS results based on the Opening Year (2018) analysis with the Beckett Bridge (Scenario 1) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue.

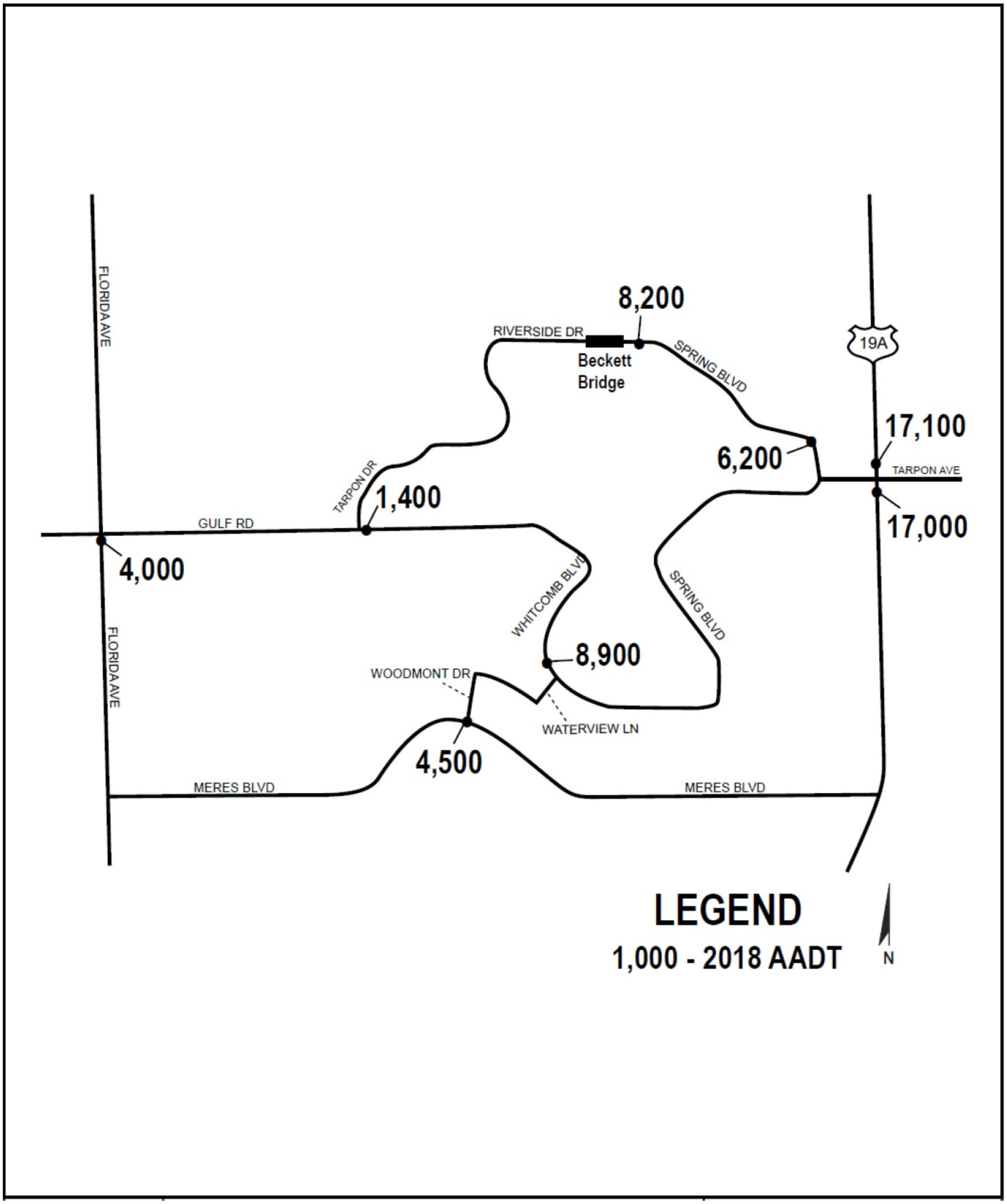


Figure 5-5 – Opening Year (2018) AADT Volumes – Scenario 1

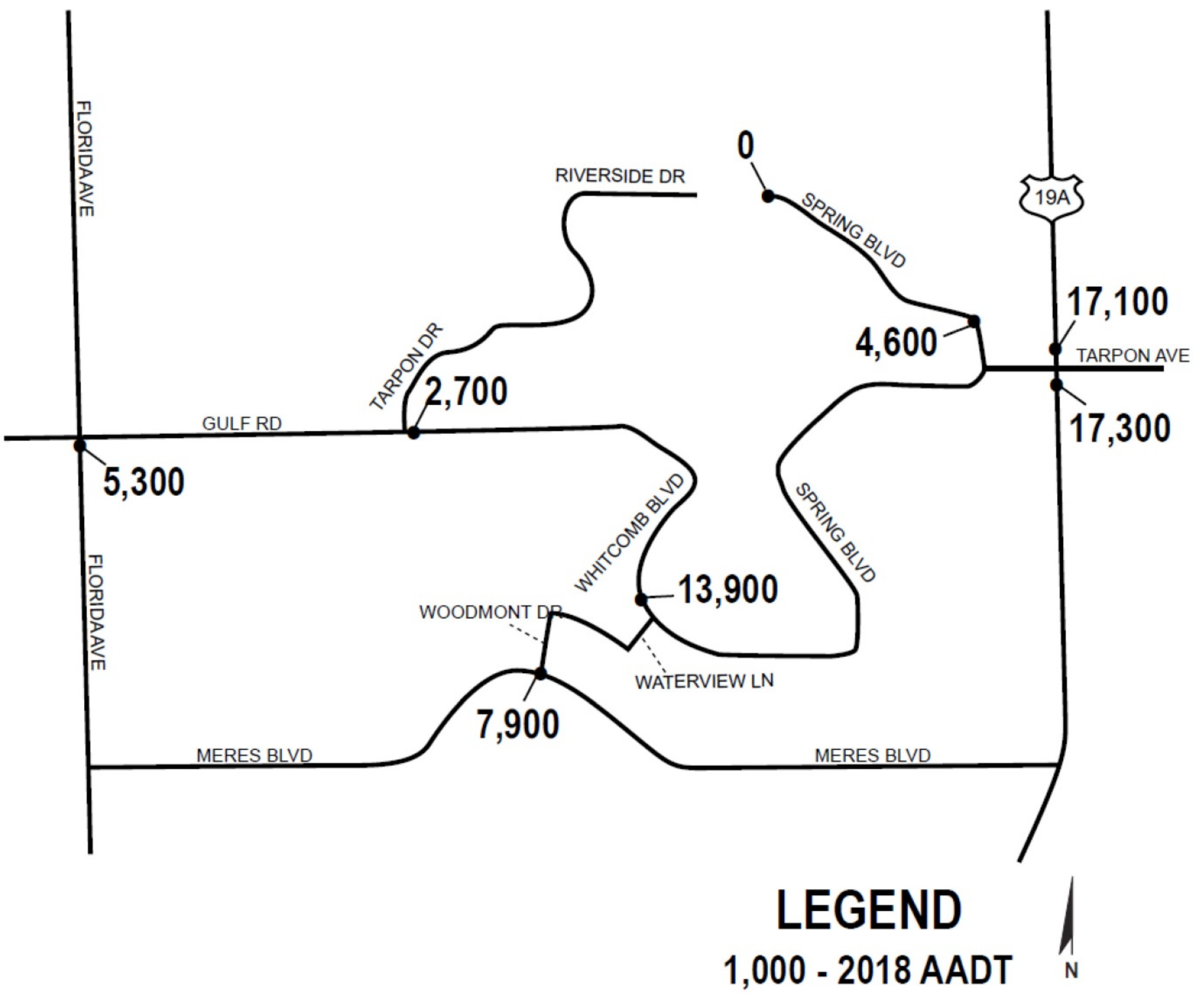


Figure 5-6 – Opening Year (2018) AADT Volumes – Scenario 2

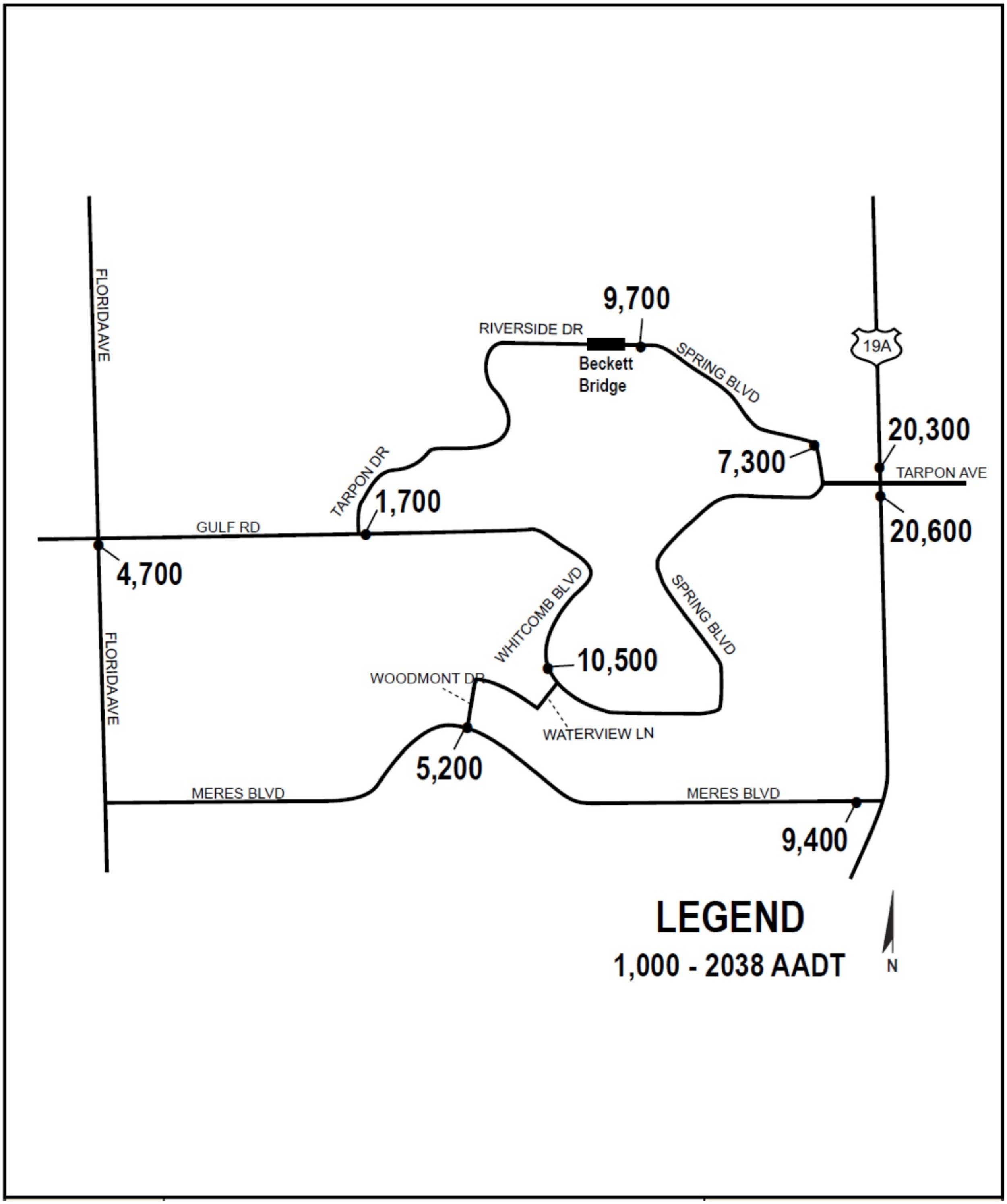


Figure 5-7 – Design Year (2038) AADT Volumes – Scenario 1

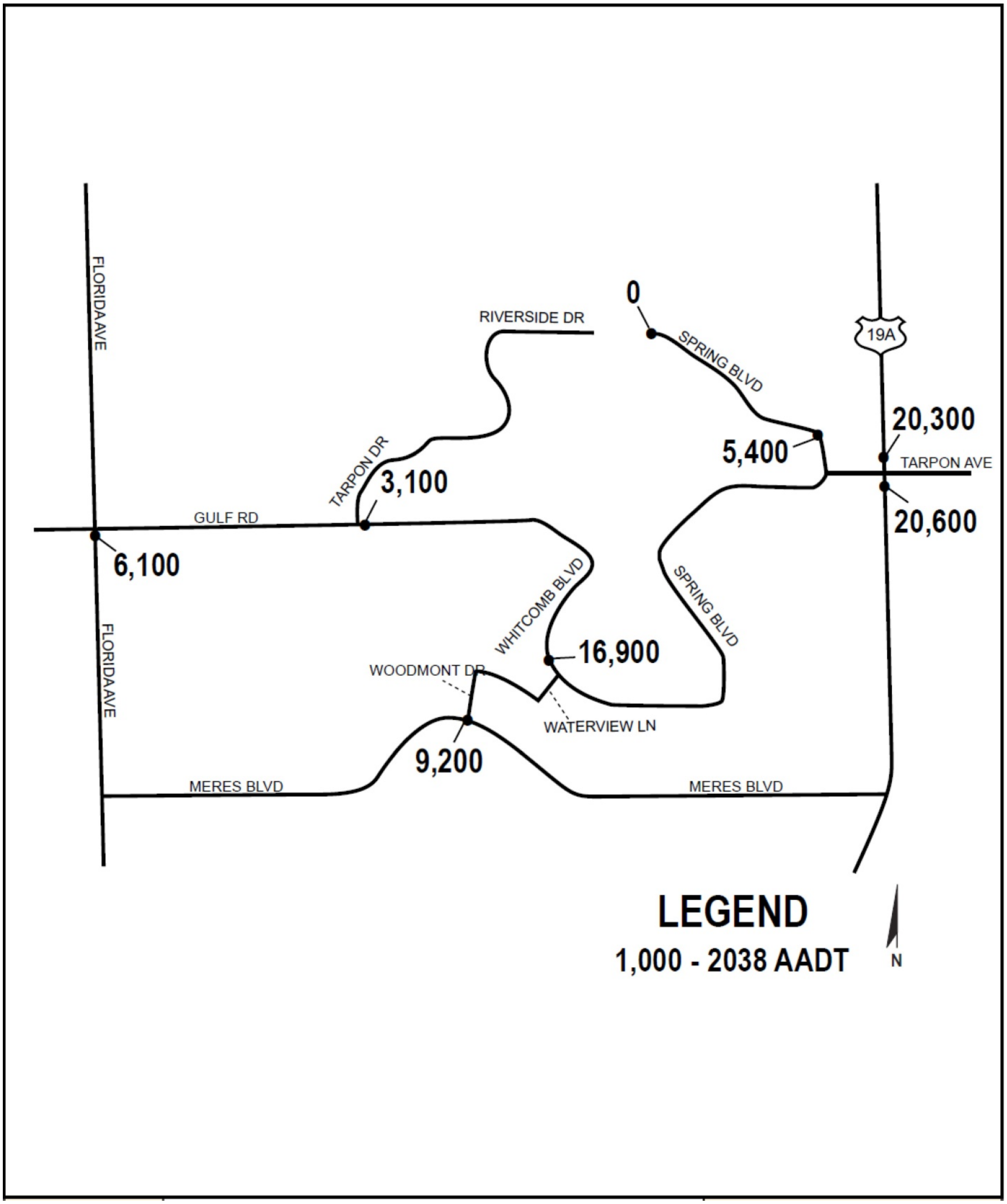


Figure 5-8 – Design Year (2038) AADT Volumes – Scenario 2

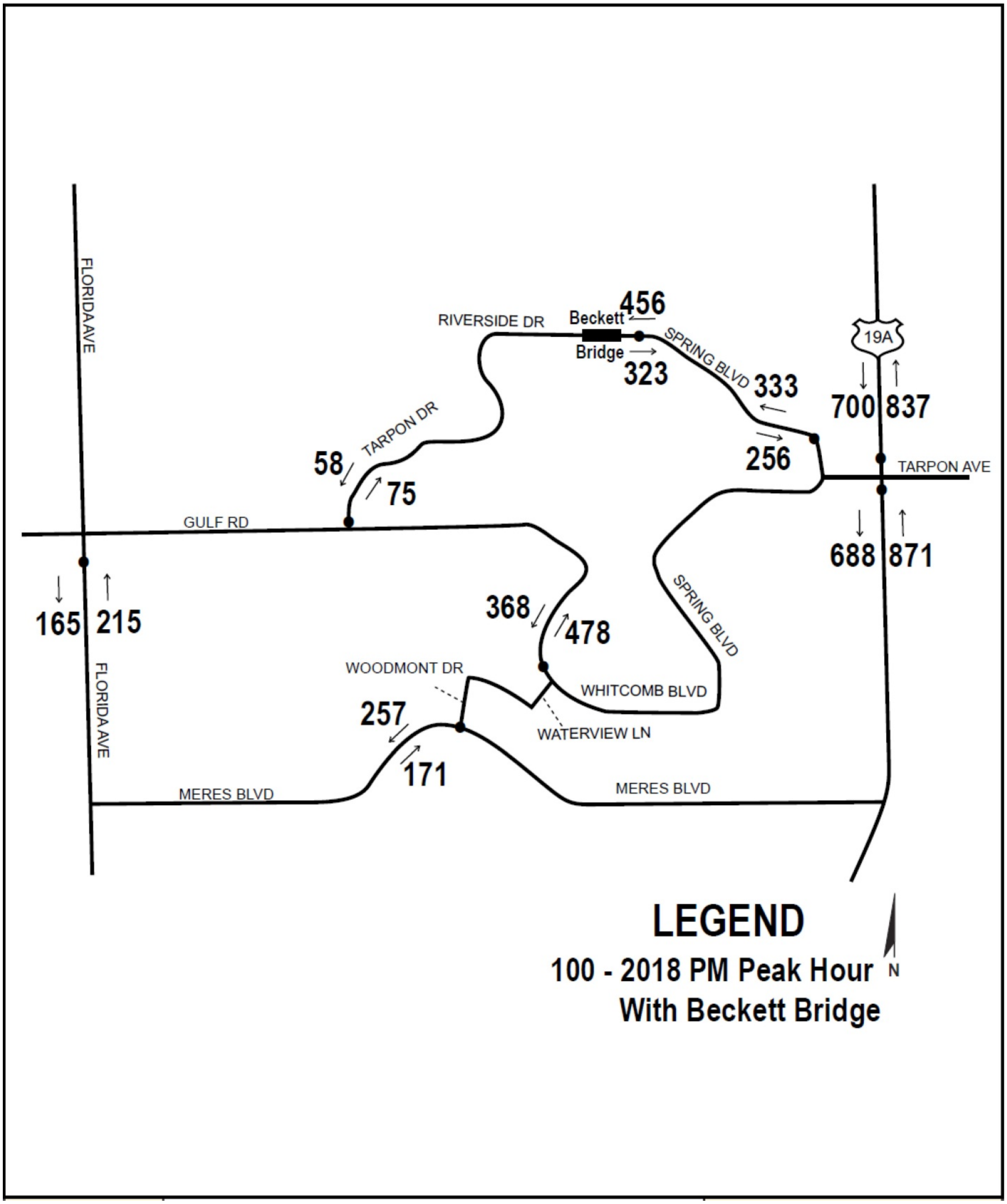


Figure 5-9 – Opening Year (2018) Peak Hour Directional Volumes – Scenario 1

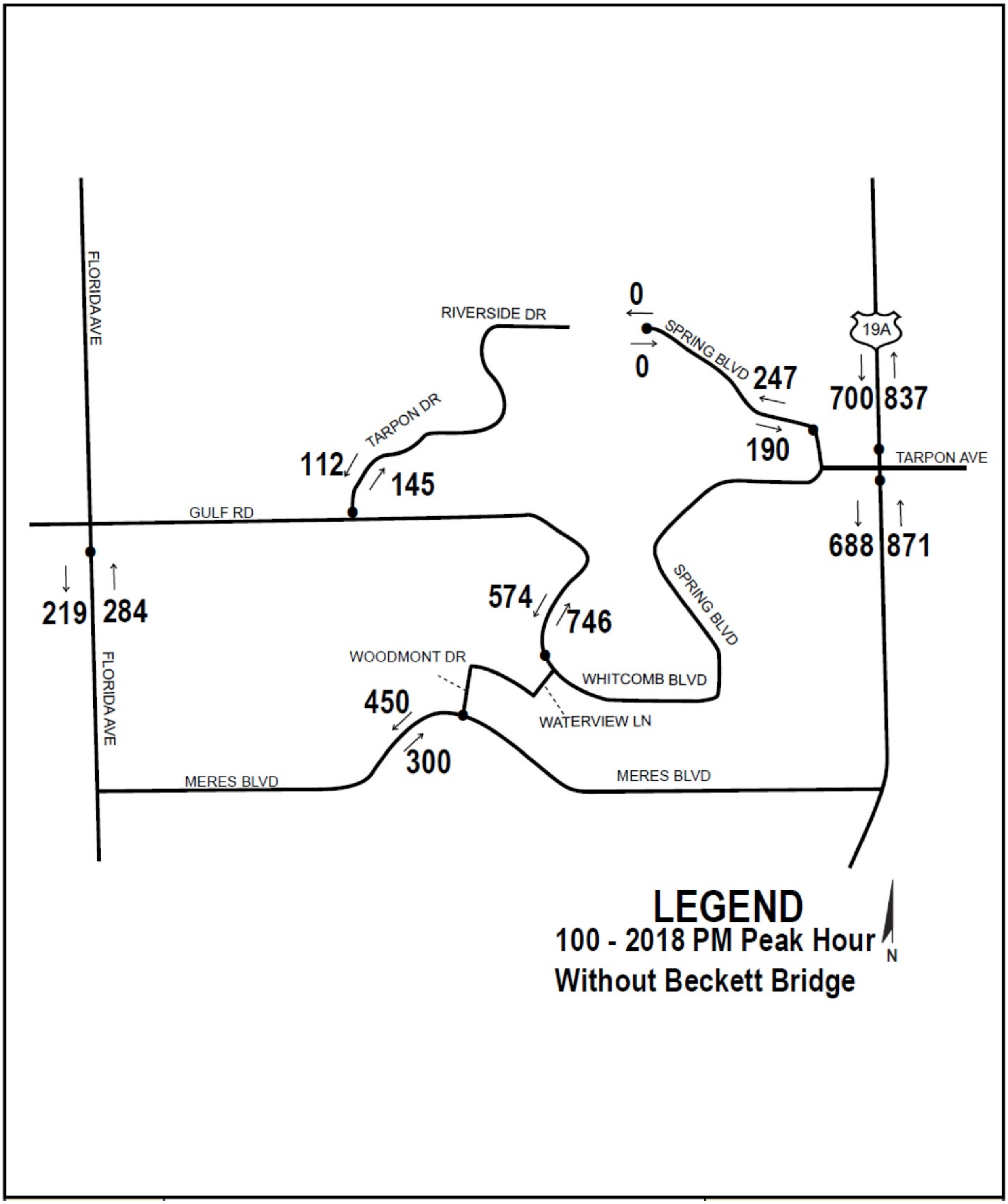


Figure 5-10 – Opening Year (2018) Peak Hour Directional Volumes – Scenario 2

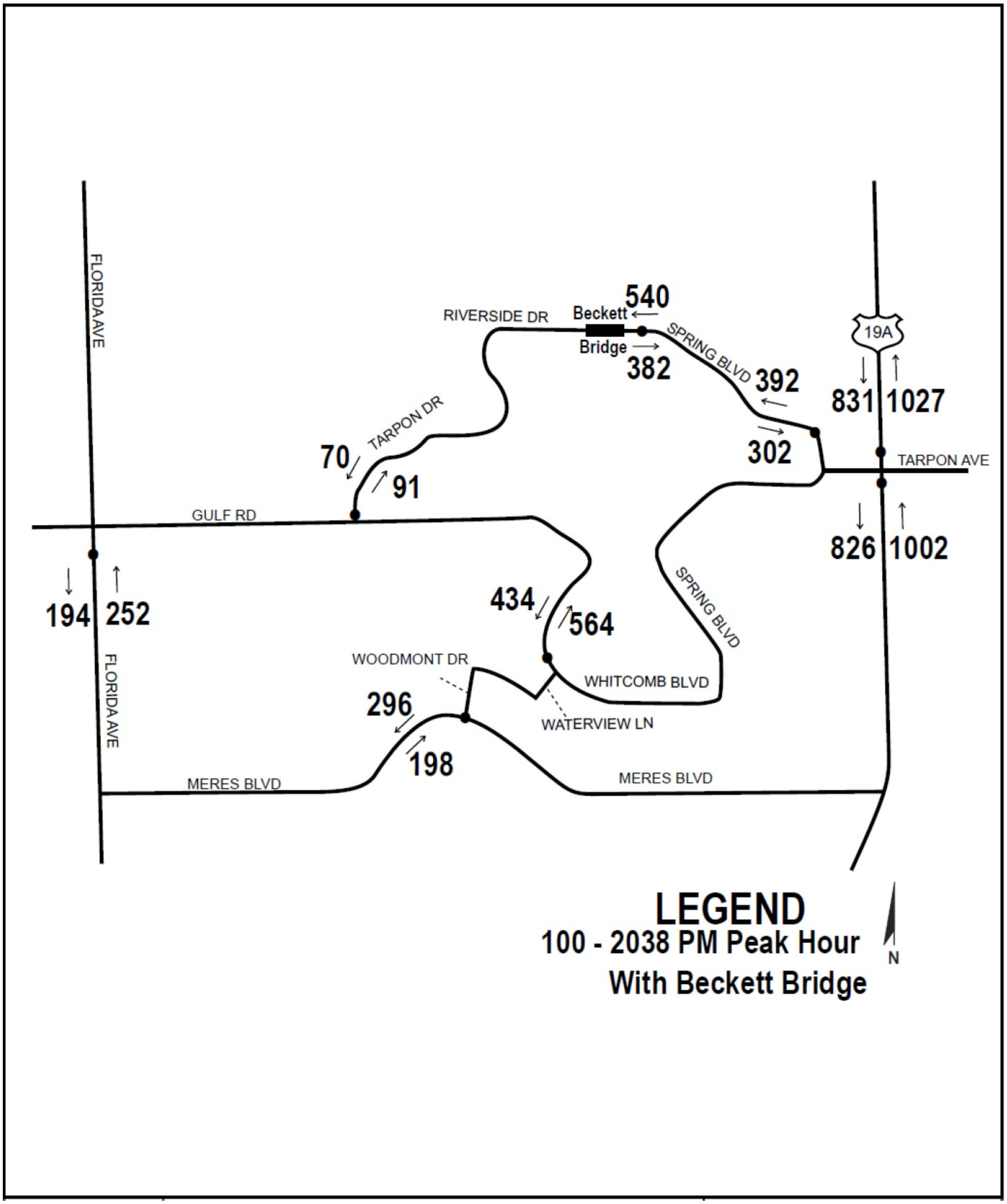


Figure 5-11 – Design Year (2038) Peak Hour Directional Volumes – Scenario 1

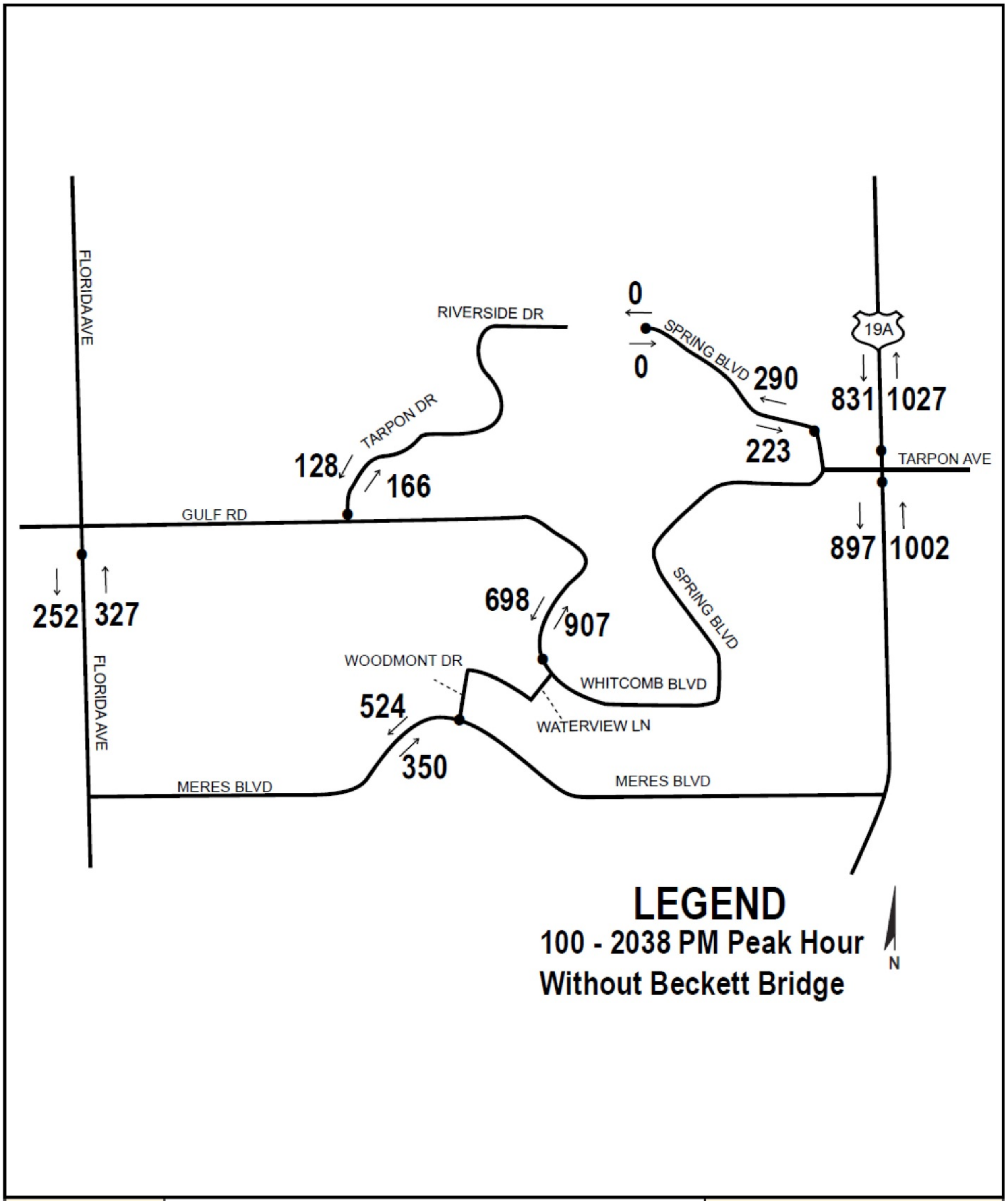


Figure 5-12 – Design Year (2038) Peak Hour Directional Volumes – Scenario 2

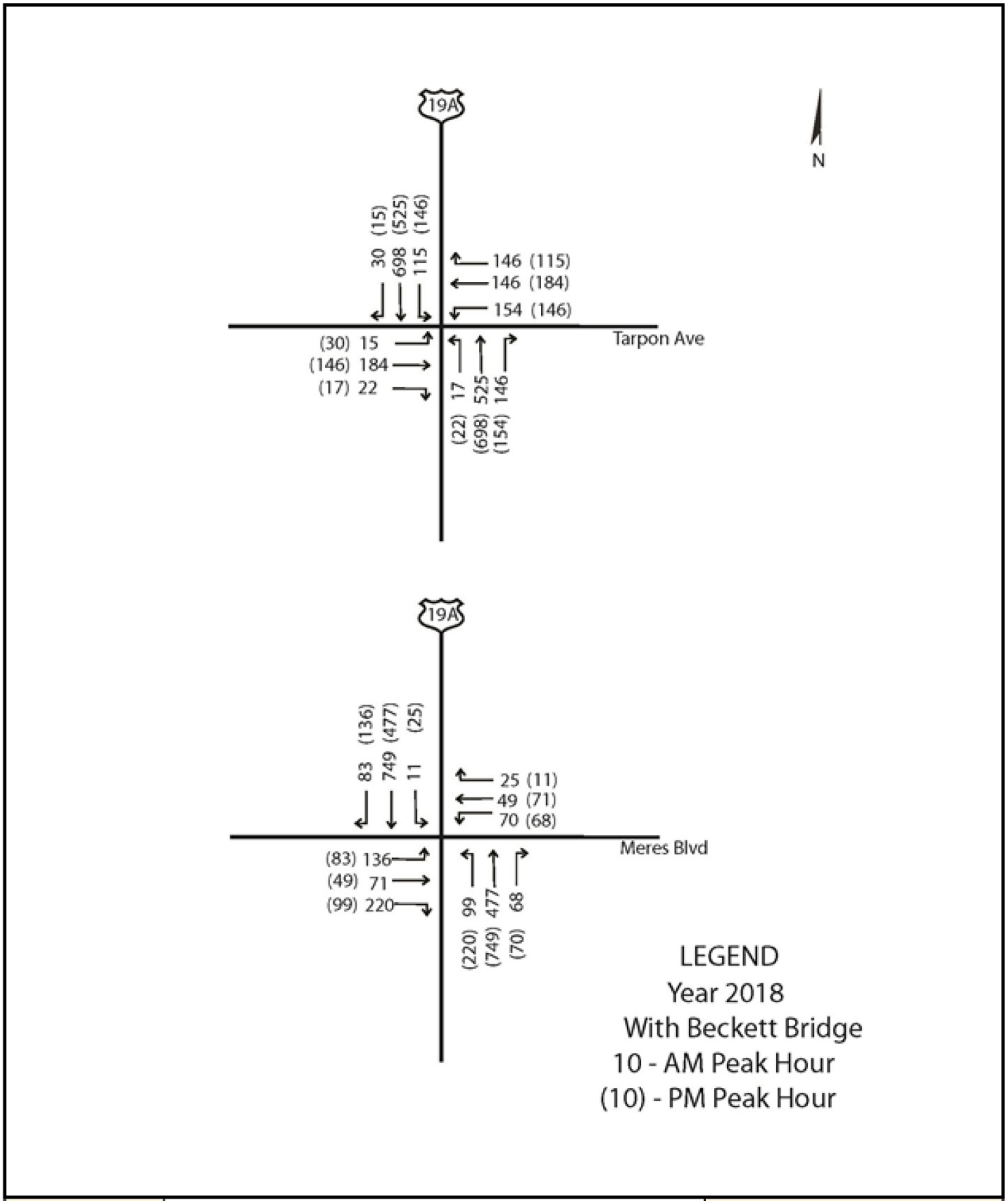


Figure 5-13 – Opening Year (2018) Intersection Peak Hour Volumes – Scenario 1

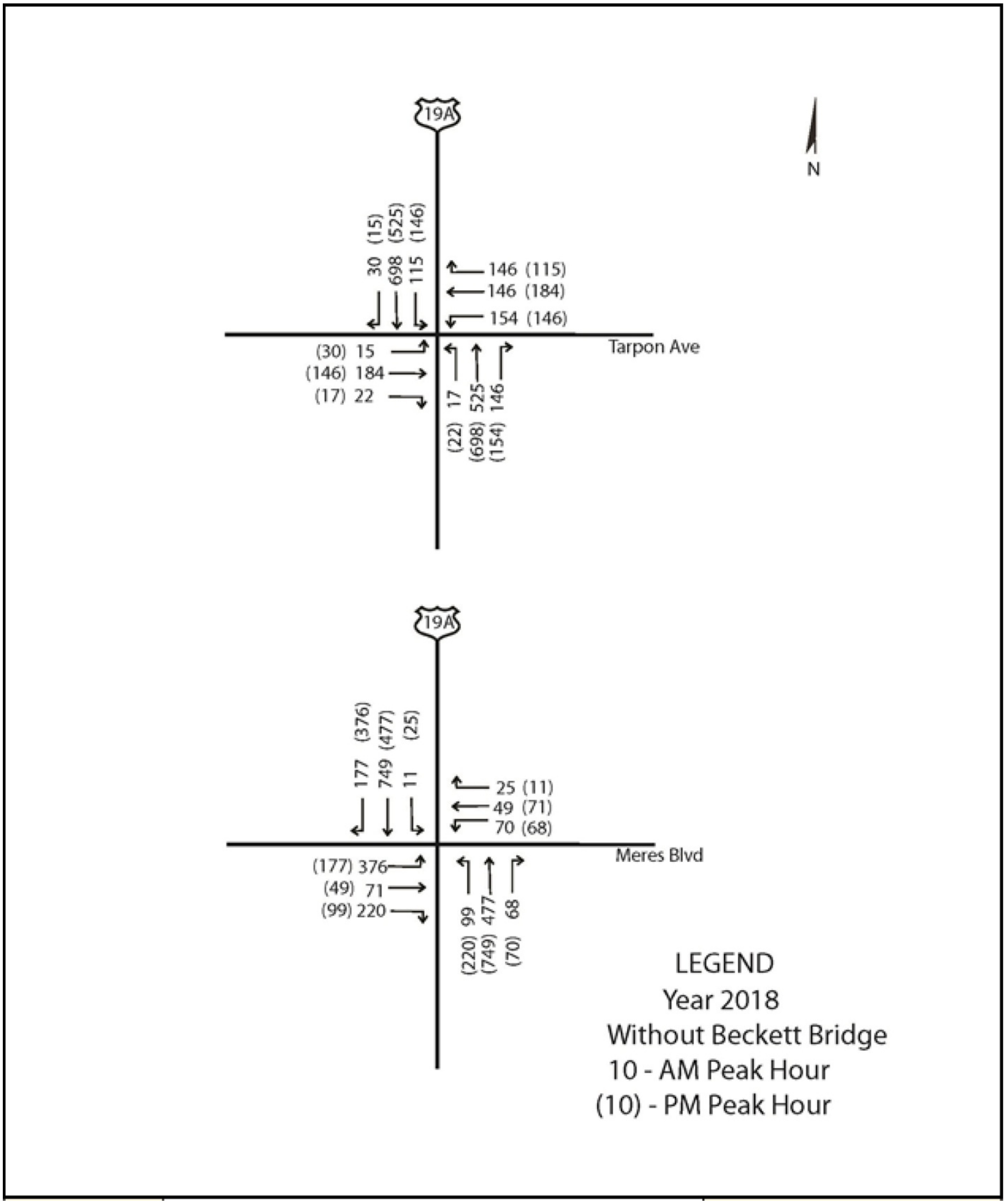


Figure 5-14 – Opening Year (2018) Intersection Peak Hour Volumes – Scenario 2

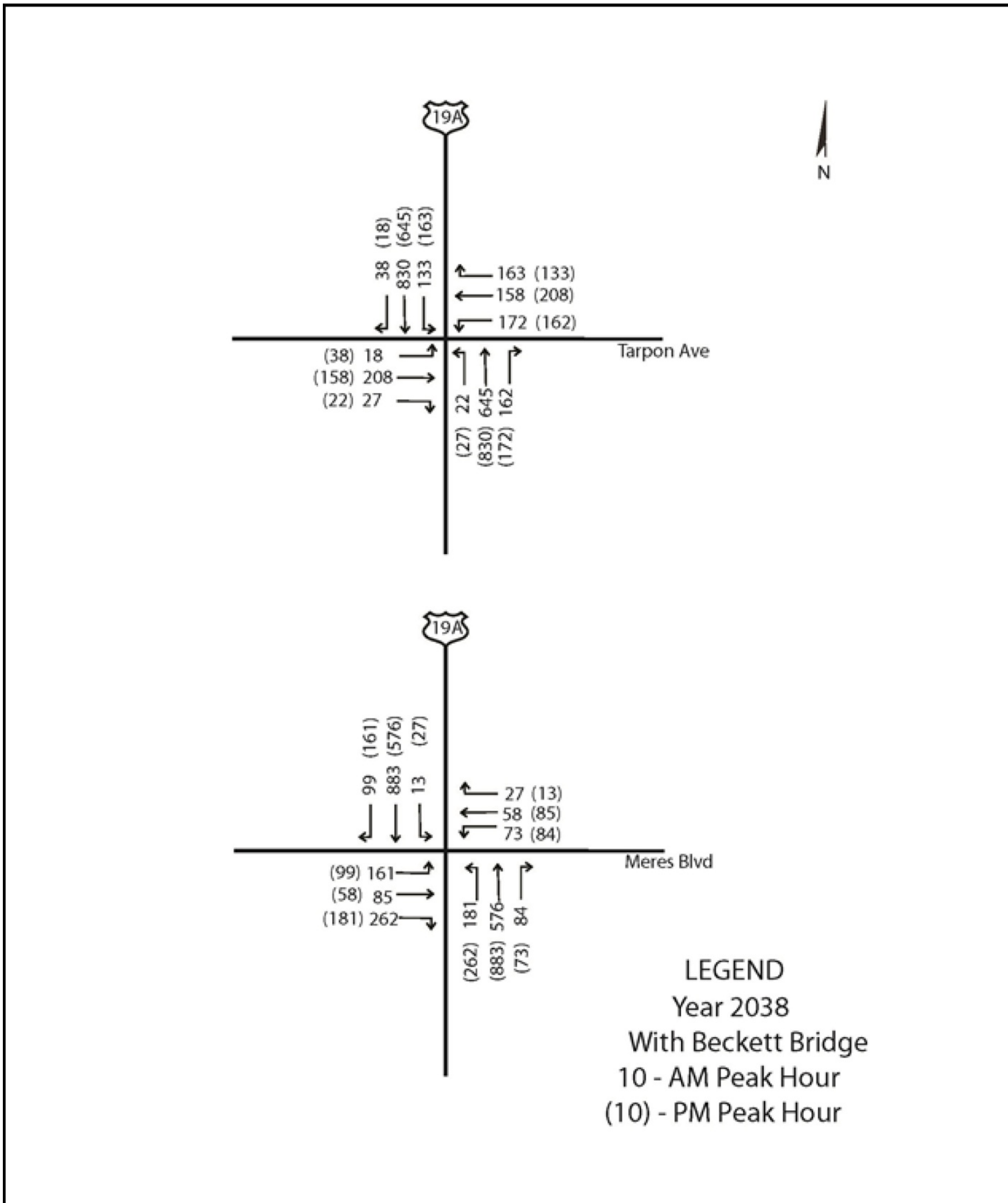


Figure 5-15 – Design Year (2038) Intersection Peak Hour Volumes – Scenario 1

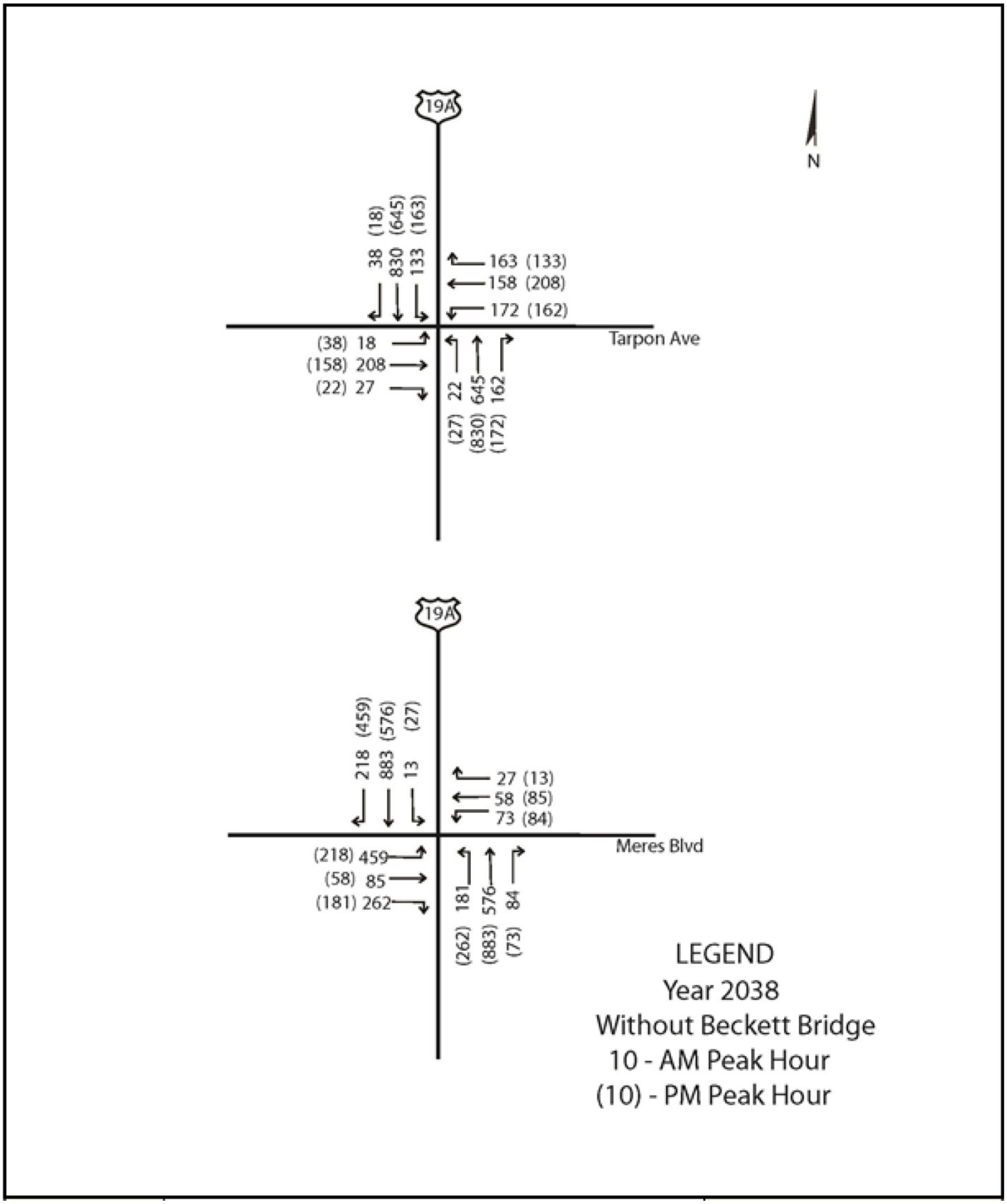


Figure 5-16 – Design Year (2038) Intersection Peak Hour Volumes – Scenario 2

Table 5-3 – Opening Year (2018) Signalized Intersection
Peak Hour Level of Service – Scenario 1

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	18.4	B	31.8	C
	Southbound	843	638	22.2	C	18.4	B
	Eastbound	427	231	35.8	D	34.0	C
	Westbound	144	150	51.4	D	46.9	D
			Overall	**25.9**	**C**	**29.0**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	688	874	20.1	C	59.9	E
	Southbound	843	686	18.3	B	23.2	C
	Eastbound	221	193	47.4	D	53.1	D
	Westbound	446	445	39.2	D	36.6	D
			Overall	**26.1**	**C**	**43.1**	**D**

In 2018, with the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS C overall during both the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the existing (2012) conditions analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour.

Scenario 2 – Bridge Removed

Table 5-4 summarizes the intersection delay and LOS results based on the Opening Year (2018) analysis without the Beckett Bridge (Scenario 2) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2018, without the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS C overall in the a.m. peak and the p.m. peak hour. The intersection of Alternate US 19 at Tarpon Avenue is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. During the p.m. peak hour, the northbound approach of Alternate US 19 at Tarpon Avenue is anticipated to continue to operate at LOS E. It should be noted that in Scenario 2, the same level of traffic is projected to utilize the Alternate US 19 at Tarpon Avenue intersection after the redistribution around Whitcomb Bayou.

Table 5-4 – Opening Year (2018) Signalized Intersection Peak Hour Level of Service – Scenario 2

Intersection	Approach	Approach Traffic Volume AM	Approach Traffic Volume PM	A.M. Peak Hour Delay (in sec/veh)	A.M. Peak Hour LOS	P.M. Peak Hour Delay (in sec/veh)	P.M. Peak Hour LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	19.4	B	27.6	C
	Southbound	937	878	22.4	C	17.3	B
	Eastbound	667	325	53.7	D	38.6	D
	Westbound	144	150	49.5	D	49.6	D
			Overall	**32.0**	**C**	**26.7**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	688	874	20.1	C	59.9	E
	Southbound	843	686	18.3	B	23.2	C
	Eastbound	221	193	47.4	D	53.1	D
	Westbound	446	445	39.2	D	36.6	D
			Overall	**26.1**	**C**	**43.1**	**D**

5.2.5 Opening Year (2018) Arterial Analysis

An arterial analysis was conducted for the Opening Year (2018) under both scenarios using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.*

Scenario 1 – Bridge Remains

An arterial analysis was conducted for the Opening Year (2018) with the Beckett Bridge (Scenario 1) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-5** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-5 – Opening Year (2018) Arterial Level of Service – Scenario 1

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	333	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	456	C
Tarpon Drive (North of Gulf Road)	2U	630	75	B
Florida Avenue (South of Gulf Road)	2U	630	215	B
Meres Boulevard (West of Woodmont Drive)	2U	630	257	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	478	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

Scenario 2 – Bridge Removed

An arterial analysis was conducted for the Opening Year (2018) without the Beckett Bridge (Scenario 2) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the direct removal of the bridge. Additionally, without the bridge, the redistribution of traffic is projected to degrade the operations on Whitcomb Boulevard to LOS F. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-6** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-6 – Opening Year (2018) Arterial Level of Service – Scenario 2

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	145	B
Florida Avenue (South of Gulf Road)	2U	630	284	B
Meres Boulevard (West of Woodmont Drive)	2U	630	450	C
Whitcomb Boulevard (South of Poulos Lane)	2U	630	746	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS D.

5.2.6 Design Year (2038) Intersection Analysis

The Design Year (2038) traffic conditions were analyzed under both scenarios using the Transportation Research Board's HCM and HCS+ for the two study area intersections.

Scenario 1 - Bridge Remains

Table 5-7 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis with the Beckett Bridge (Scenario 1) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, with the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS D overall during the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the Opening Year (2018) analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour. Additionally, the northbound approach is projected to operate at LOS E in the a.m. peak hour.

Table 5-7 – Design Year (2038) Signalized Intersection Peak Hour Level of Service – Scenario 1

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	45.6	D
	Southbound	995	764	23.9	C	18.0	B
	Eastbound	508	338	49.1	D	39.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	**49.3**	**D**	**36.9**	**D**
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	**31.1**	**C**	**52.3**	**D**

Scenario 2 – Bridge Removed

Table 5-8 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis without the Beckett Bridge (Scenario 2) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, without the bridge, operations at the intersection of Alternate US 19 at Meres Boulevard are projected to deteriorate to LOS E overall in the a.m. peak hour and LOS D in the p.m. peak hour. Additionally, the northbound approach is anticipated to operate at LOS E and the eastbound approach is anticipated to deteriorate to LOS F in the a.m. peak hour.

The intersection of Alternate US 19 at Tarpon Avenue is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. During the p.m. peak hour, the northbound approach of Alternate US 19 at Tarpon Avenue is anticipated to continue to operate at LOS E. It should be noted that in Scenario 2, the same level of traffic is projected to utilize the Alternate US 19 at Tarpon Avenue intersection after the redistribution without the bridge.

5.2.7 Design Year (2038) Arterial Analysis

An arterial analysis was conducted for the Design Year (2038) under both scenarios using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.*

Table 5-8 – Design Year (2038) Signalized Intersection Peak Hour Level of Service – Scenario 2

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	43.9	D
	Southbound	1114	1062	22.6	C	18.8	B
	Eastbound	806	457	163.5	F	43.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	79.5	E	35.2	D
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	31.1	C	52.3	D

Scenario 1 – Bridge Remains

An arterial analysis was conducted for the Design Year (2038) with the Beckett Bridge (Scenario 1) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-9** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Scenario 2 – Bridge Removed

An arterial analysis was conducted for the Design Year (2038) without the Beckett Bridge (Scenario 2) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the removal of the bridge.

Table 5-9 – Design Year (2038) Arterial Level of Service – Scenario 1

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	392	C
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	540	C
Tarpon Drive (North of Gulf Road)	2U	630	91	B
Florida Avenue (South of Gulf Road)	2U	630	252	B
Meres Boulevard (West of Woodmont Drive)	2U	630	296	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	564	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS.

Additionally, without the bridge, the redistribution of traffic is projected to degrade the operations on Whitcomb Boulevard to LOS F. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-10** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-10 – Design Year (2038) Arterial Level of Service – Scenario 2

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	290	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	166	B
Florida Avenue (South of Gulf Road)	2U	630	327	B
Meres Boulevard (West of Woodmont Drive)	2U	630	524	C
Whitcomb Boulevard (South of Poulos Lane)	2U	630	907	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS D.

5.3 Detour Analysis

5.3.1 Proposed Detour Route Alternatives

In order to evaluate potential traffic impacts to the surrounding study area roadways during the period of rehabilitation or replacement of the existing bridge structure, several detour options were explored. Construction for bridge rehabilitation or replacement is anticipated to occur for six to 24 months, depending on the extent of the improvements. **Figure 5-17** illustrates the proposed detour route alternatives, which include the following:

1. Whitcomb Boulevard - traffic diverted using Whitcomb Boulevard/South Spring Boulevard around Whitcomb Bayou - a distance of approximately 2.5 miles.

2. Meres Boulevard - traffic diverted using Meres Boulevard from Alternate US 19 to Florida Avenue

3. Klosterman Road-Carlton Road-Curlew Road - traffic diverted from Alternate US 19 using Klosterman Road, Carlton Road, and Curlew Road to Florida Avenue

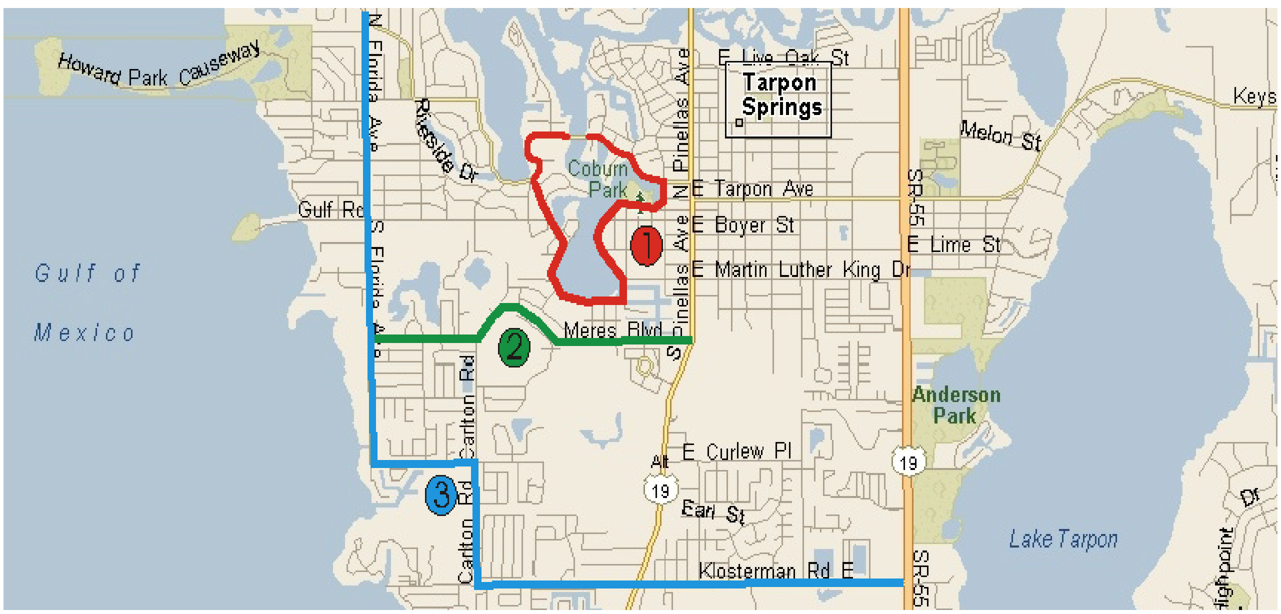


Figure 5-17 – Proposed Detour Route Alternatives

It should be noted that a comparison of the TBRPM origin/destination traffic patterns with and without the Beckett Bridge showed that none of the existing or future traffic traveling across the bridge would redistribute using the Klosterman Road-Carlton Road-Curlew Road alternative. In addition, this route is the longest and most circuitous of the alternatives, at approximately 2.75 miles in length. For these reasons, this alternative was eliminated from further consideration.

Results of the analysis indicate that in the event of closure of the Beckett Bridge, reassigning traffic to Whitcomb Boulevard would increase congestion on this roadway to failing levels of service (LOS F). Conversely, if the traffic was rerouted via Meres Boulevard, then the study area roadways are anticipated to continue to operate at acceptable levels of service with the additional traffic. Detour route LOS analyses are summarized below in **Tables 5-11 through 5-14**.

Table 5-11 – Whitcomb Boulevard Detour Route Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	427	C
Florida Avenue (South of Gulf Road)	2U	630	215	B
Meres Boulevard (West of Woodmont Drive)	2U	630	257	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	830	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS D.

Table 5-12 – Whitcomb Boulevard Detour Route
Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Tarpon Avenue	Northbound	705	902	53.5	D	91.0	F
	Southbound	984	800	97.1	F	60.3	E
	Eastbound	505	387	85.5	F	146.9	F
	Westbound	472	577	24.9	C	27.2	C
			Overall	**70.3**	**E**	**76.2**	**E**

Table 5-13 – Meres Boulevard Detour Route Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	427	C
Florida Avenue (South of Gulf Road)	2U	630	567	C
Meres Boulevard (West of Woodmont Drive)	2U	630	609	D
Whitcomb Boulevard (South of Poulos Lane)	2U	630	478	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

Table 5-14 – Meres Boulevard Detour Route Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	19.4	B	27.6	C
	Southbound	937	878	22.4	C	17.3	B
	Eastbound	667	325	53.7	D	38.6	D
	Westbound	144	150	49.5	D	49.6	D
			Overall	**32.0**	**C**	**26.7**	**C**

Based on these results, it is recommended that the detour route for the project occur along Meres Boulevard. Detour signage, including the use of Intelligent Transportation Systems (ITS), specifically electronic message panels, should be placed well in advance of the route location along Florida Avenue and Alternate US 19 (at a minimum). Additional electronic signage may also be needed at key locations throughout the neighborhood surrounding the Beckett Bridge and should provide (if at all possible) real-time information regarding potential delays on the route.

It should be noted that portions of Alternate US 19 operate at LOS F under either scenario, as well as the detour alternatives, in both the Opening Year (2018) and Design Year (2038). However, this corridor has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the project.

6.0 ALTERNATIVES CONSIDERED

6.1 CORRIDOR ANALYSIS

Beckett Bridge was originally constructed in 1924. Since that time, the existing two-lane bridge has provided an important link to areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire. The AADT volume is currently 7,700. In the design year (2038), the AADT is predicted to increase to 9,700.

Areas to the east and west of the bridge are densely developed. Therefore, other corridors for construction of a new bridge would result in substantial impacts to adjacent properties. In addition, construction of a new bridge on a new corridor would result in more impacts to the natural environment. If a replacement bridge is selected as the Preferred Alternative, construction along the existing corridor will best serve the purpose and need of the project and result in fewer impacts than a bridge constructed within a new corridor.

6.2 TRANSPORTATION SYSTEM MANAGEMENT MULTI-MODAL IMPROVEMENTS

Transportation System Management (TSM) multi-modal improvements are strategies for reduction of existing and potential future congestion. Typically TSM improvements include traffic signal and intersection improvements, transit improvements and changes in access management. These improvements are designed to improve efficiency without costly infrastructure improvements.

The purpose of this project is to establish a preferred alternative to remove, repair or replace a deteriorating existing bridge. Improving efficiency within the project corridor is not the objective of the proposed improvements considered for this project. There are no signalized intersections within the project limits. Accordingly, it was determined that TSM improvements are not feasible to address the project need.

6.3 No-Build Alternatives

Two No-Build Alternatives were considered, No-Build and No-Build with Removal of the Existing Bridge.

6.3.1 No-Build

The No-Build Alternative includes only routine maintenance performed as needed to keep the bridge open to traffic until safety issues, such as reduced capacity due to ongoing deterioration, would require it to be closed. Repair or replacement could be considered at a later date. The No-Build Alternative does not include modification or improvements to the existing bridge or approach roadway. Existing geometric and other deficiencies, including substandard lane width and curbs would remain. No changes to the existing horizontal and vertical navigational clearances would occur.

There are a number of components of the bridge that are in an advanced state of deterioration that are not likely to be economically corrected by routine maintenance or in-kind repair. Estimating the remaining service life of these components is more subjective than quantitative analysis. However, given the age of the bridge and the extent of the deficiencies, without major rehabilitation the existing bridge is estimated to have no more than 10 years of remaining service. The No-Build Alternative was retained as a viable alternative throughout the duration of the PD&E study, though it is not the Preferred Alternative. The Preferred Alternative is described in Section 7.0 of this document.

6.3.2 No-Build with Removal of the Existing Bridge

This alternative is the same as the No-Build Alternative described above, except that the bridge would be demolished when it is no longer safe for traffic. No plans for future rehabilitation would be considered and a replacement bridge would not be constructed.

6.4 Rehabilitation Alternative

The existing bridge service life can be extended with extensive repairs and modifications, implementation of measures that slow the rate of concrete and structural steel deterioration, replacement of severely deteriorated structural elements, replacement of worn, deteriorated, and outdated electrical and mechanical systems and replacement of substandard bridge railings. However, even after major rehabilitation, due to its age and condition, it is anticipated that the bridge will require significant ongoing maintenance and periodic additional major repairs with corresponding disruptions to traffic. Rehabilitation to restore structural capacity, bring the bridge rails up to current safety standards, and mitigate future settlement would involve replacement of the bascule leaf (the steel draw span), the operating system (electrical and mechanical), and construction of crutch bents at each approach bent. These improvements, in conjunction with continued maintenance and periodic repair and/or rehabilitation, could extend the service life of the bridge 25 to 30 years (from 2013). It is not practical to extend the life of the bridge indefinitely.

Generally, if proposed improvements include substantial modification to the superstructure or substructure, the USCG is likely to require that the navigational clearances be improved to meet current USCG guide clearances for the affected waterway. However, there are no USCG guide clearances for the channel over which the Beckett Bridge is constructed. Accordingly, it is anticipated that the USCG will permit the proposed improvements described below for the Rehabilitation Alternative provided the proposed clearances are at least the same as the existing clearances. No changes in the navigational clearances are proposed. Replacement of the fender system would require a USCG permit.

The proposed Rehabilitation Alternative would include the following work and would extend the service life of the bridge a maximum of 25-30 years:

- Replace the sand-cement riprap at the abutments.
- Replace substandard approach guardrails.
- Remove all existing pile jackets and install new cathodic protection jackets on all concrete bent piles as well as steel bascule pier helper piles.
- Repair deteriorated concrete of the pile bent caps, bascule pier and rest pier, and provide cathodic protection in the form of zinc spray metalizing.
- Install crutch bents at Bents 2, 3, 4, 5, 8, 9, 10.
- Replace substandard concrete bridge railings with new traffic railings meeting crash testing requirements of NCHRP 350 (i.e. FDOT Standard Index 422 – 42" Vertical Face Traffic Railing).
- Hydro-blast the deteriorated concrete deck surface and install a new concrete overlay.

- Replace the expansion joints.
- Repair deteriorated concrete of the deck underside, beams and diaphragms, and provide cathodic protection in the form of zinc spray metalizing.
- Rehabilitate the control house including roof, windows and door or replace the control house.
- Replace the bascule leaf including counterweight, open steel and concrete filled grid deck.
- Replace the bascule span main drive machinery as well as the span locks and live load shoes.
- Replace the bascule span electrical system.
- Replace the bascule span traffic gates.
- Replace the bascule span barrier gate.
- Replace the fender system.

6.5 BRIDGE REPLACEMENT ALTERNATIVES

Two bridge types were considered for replacement alternatives:

1. A new, two lane, movable span bridge (with 7.8 feet of vertical clearance)
2. A new, two lane, mid-level fixed span bridge (with 28 feet of vertical clearance)

All build alternatives would be constructed on approximately the same alignment as the existing bridge to minimize environmental impacts and impacts to adjacent properties. An analysis of future LOS needs indicates that a two lane bridge will provide sufficient capacity in the design year. (This analysis is presented in Section 5 of this report.) No additional travel lanes are proposed. Conceptual plans for all replacement alternatives are included in Appendix G.

In general, the existing bridge would be demolished prior to construction of a replacement bridge. Accordingly, a detour would be required for all or part of the construction duration. The worst case detour, approximately 2.6 miles long, would be required for someone traveling from Bayshore Mobile Home Park (MHP), located immediately west of the bridge, to the Yacht Club located on the east shoreline of the channel. Analyses of other potential detour routes for traffic using the bridge are discussed in Section 5.3 of this report. (Note: The traffic patterns for the No-Build with Removal of the Existing Bridge Alternative, after the bridge is removed, are likely to be similar to traffic patterns during the construction detour.) Demolition includes disposal of removed material in accordance with applicable state and federal regulations. Specific disposal requirements, such as identification and handling of hazardous materials, recycling, or artificial reef placement will be addressed in the design phase.

The navigational channel at the bridge site is not federally maintained. The USCG has not established guide clearances for movable or fixed bridges at this channel crossing. It is anticipated that a movable bridge providing at least the same horizontal and vertical clearances as the existing bridge would be permitted. The maximum vertical clearance that avoids impacts to the intersections of Riverside Drive with Chesapeake Drive and Forest Avenue at the project limits is 28 feet (at the fenders) for the fixed span alternatives. When the bridge is in the closed position, the maximum vertical clearance over the channel for the movable bridge alternative that would avoid impacts to the driveways to the Bayshore MHP on the west, and the Yacht Club on the east is 7.8 feet at the fenders.

Aesthetics for the proposed bridge will be based on Level Two criteria in accordance with the *FDOT Plans Preparation Manual.* This emphasizes full integration of efficiency, economy and elegance in all bridge components and the structure as a whole with consideration given to structural systems that are inherently more appealing. The project cost estimates include 10% of the construction costs for aesthetic enhancements.

Constraints affecting construction access and methods at the bridge site include the following:

- Shallow water depths
- Narrow channel at the bridge crossing
- Location of Tarpon Springs Yacht Club and Bayshore MHP docks immediately adjacent to the bridge
- Highly developed adjacent lands with limited areas for construction staging.

Construction methods to reduce the duration of detours and the corresponding disruptions to the traveling public were investigated. Typical means of reducing detour durations include offline construction and phased construction. Offline construction, where a new bridge alignment is shifted away from an existing bridge so that traffic can be maintained on the existing bridge while the new bridge is constructed, is not practical for this site due to limited right-of-way, adjacent properties, and adjacent wetlands.

Phased construction involves construction of one side of a new bridge while maintaining traffic on a portion of the old bridge. Phased construction is not viable for the Beckett Bridge replacement for two reasons. First, it would require a slight offset of the existing alignment, or a temporary bridge, which would result in additional impacts to adjacent properties and to wetlands. Secondly, the existing bridge's bascule span is a two girder structural system which is not conducive to removal of part of the bridge. Given the above conditions and since the bridge replacement alternatives were developed with the goal of limiting impacts and right-of-way acquisition, neither offline nor phased construction were considered further.

Accelerated Bridge Construction (ABC) is another means of reducing detour durations and construction impacts. ABC utilizes a combination of construction means and technologies to increase the speed of construction, with particular emphasis on reducing the duration of on-site construction. Implementing ABC technology could reduce the required detour time by maximizing off-site prefabrication and taking advantage of partial construction of the proposed bridge while the existing bridge is still in service. Once the existing bridge was removed, the remaining portion of the bridge would be constructed. Pre-cast components would be transported to the site and erected until the bridge was complete. Reduced construction time would be realized by minimizing the amount of conventional cast-in-place concrete which typically requires a curing period to gain its required strength. Accordingly, costs and detour times developed for replacement alternatives assumed that ABC methods are proposed to be employed for all build alternatives.

6.5.1 Replacement with a Movable Bridge

The proposed movable span will provide 7.8 feet of vertical clearance at the fenders (in the closed position) and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. Unlimited vertical clearance will be provided in the open position for the width of the channel between the fenders. (Vertical clearance is measured at the lowest point of clearance within the navigation channel. The low point is generally located at one or both sides of the channel, directly above the fender system that marks the channel limits.)

The maximum proposed grade is five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore MHP, the Tarpon Springs Yacht Club and Venetian Court to allow connection of these driveways with minimal re-grading. Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues.

The proposed roadway profile would be approximately two feet higher than the existing roadway at the west end of the bridge (Begin Bridge Station 135+95 as shown on concept plans), and approximately four feet higher at east end of the bridge ("End Bridge" Station 139+55). The proposed improvements can be constructed within the existing right-of-way. Purchase of additional right-of-way is not required.

Based on meetings with Southwest Florida Water Management District (SWFWMD) staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required. If treatment of stormwater is required by the Southwest Florida Water Management District, it is anticipated that compensatory, offsite treatment will be acceptable. Accordingly, acquisition of additional right-of-way is not anticipated to address water quality concerns.

Bridge Description

The total length of the proposed movable span bridge is 360 feet. The bridge includes a 123-foot long east approach, 152-foot long west approach, and an 85-foot long bascule span. A continuous superstructure is proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure may consist of bents or piers supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

A single-leaf bascule span is proposed. The proposed configuration is similar to that of the existing bridge. The bascule leaf rotates about a horizontal axis located on one side of the channel to provide unlimited vertical clearance over the channel with the leaf in the fully open position. The bascule leaf will consist of steel main girders, floor beams, stringers, and a solid surface deck. The counterweight will be located inside the bascule pier and consist of concrete with steel ballast blocks for balancing the leaf. The bascule pier, approximately 56 feet by 40 feet will be supported by prestressed concrete piles or drilled shafts and feature concrete pier walls to enclose the machinery and counterweight. The rest pier, which supports the tip of the bascule span when in the fully closed position, will be similar to the other bents or piers.

The new movable bridge will feature traffic control safety devices that are required for movable bridges. These elements include traffic signals and traffic warning gates on both approaches and a resistance barrier gate on the rest pier side of the bascule span. The bridge will also feature a fender system equipped with standard navigation lights and clearance signs.

Proposed Movable Bridge Typical Section

The proposed bridge typical section for the Movable Bridge Alternative has a total out-to-out width of 47.2 feet as shown in **Figure 6-1**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, 6 feet wide, are proposed on both sides of the bridge.

Proposed Roadway Sections

The proposed roadway section for the Movable Bridge Alternative west of the bridge consists of two 10-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Because of the limited right-of-way, a six-foot wide sidewalk is proposed only on the north side of the roadway. No sidewalks are proposed on the south side of the roadway, adjacent to the Bayshore MHP. East of the bridge, the roadway section consists of two 11-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Six-foot wide sidewalks are proposed on both sides of the roadway. **Figures 6-2 and 6-3** illustrate the proposed roadway sections for the west and east sides of the bridge, respectively.

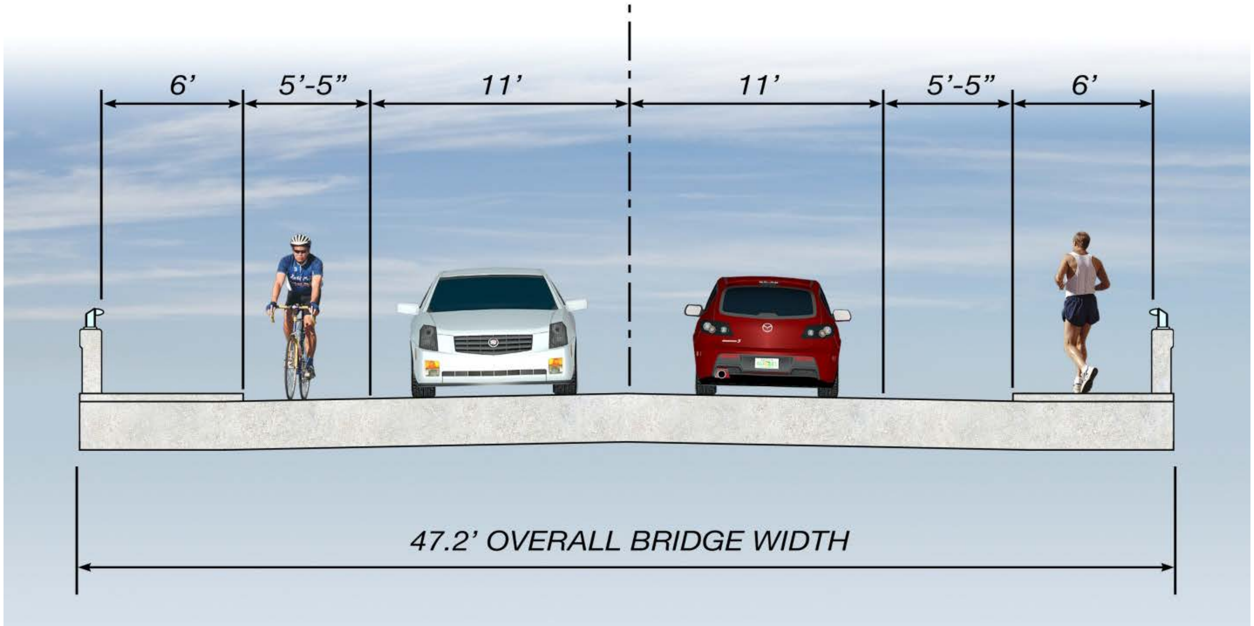


Figure 6-1 – Proposed Movable Bridge Typical Section

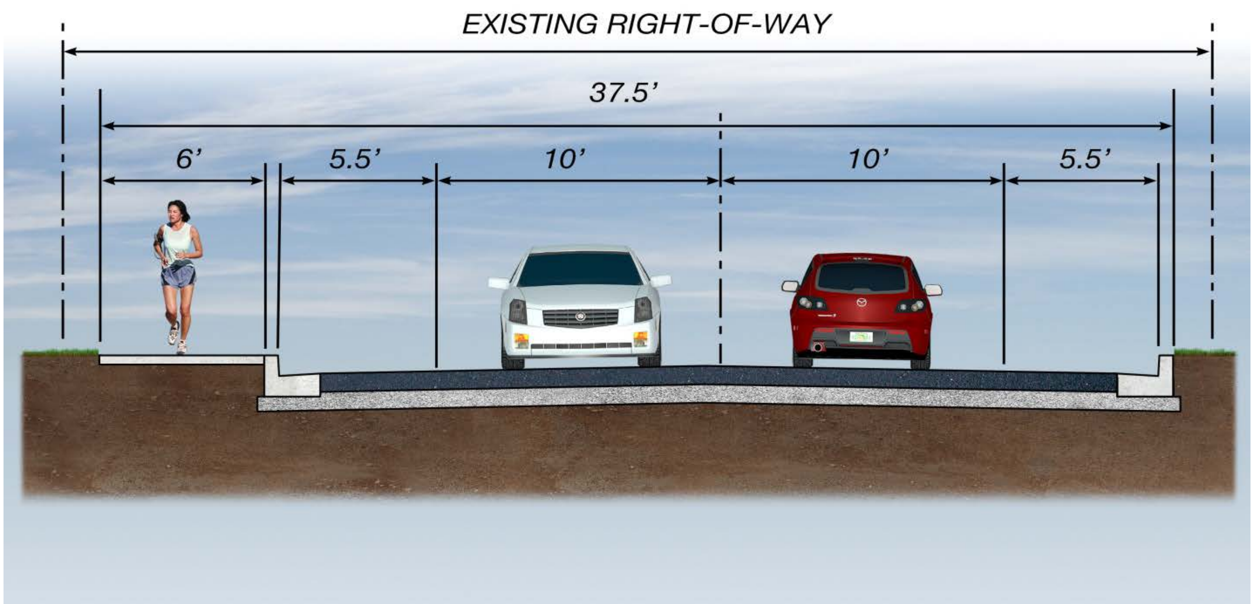


Figure 6-2 – Proposed Roadway Section West of Proposed Movable Bridge

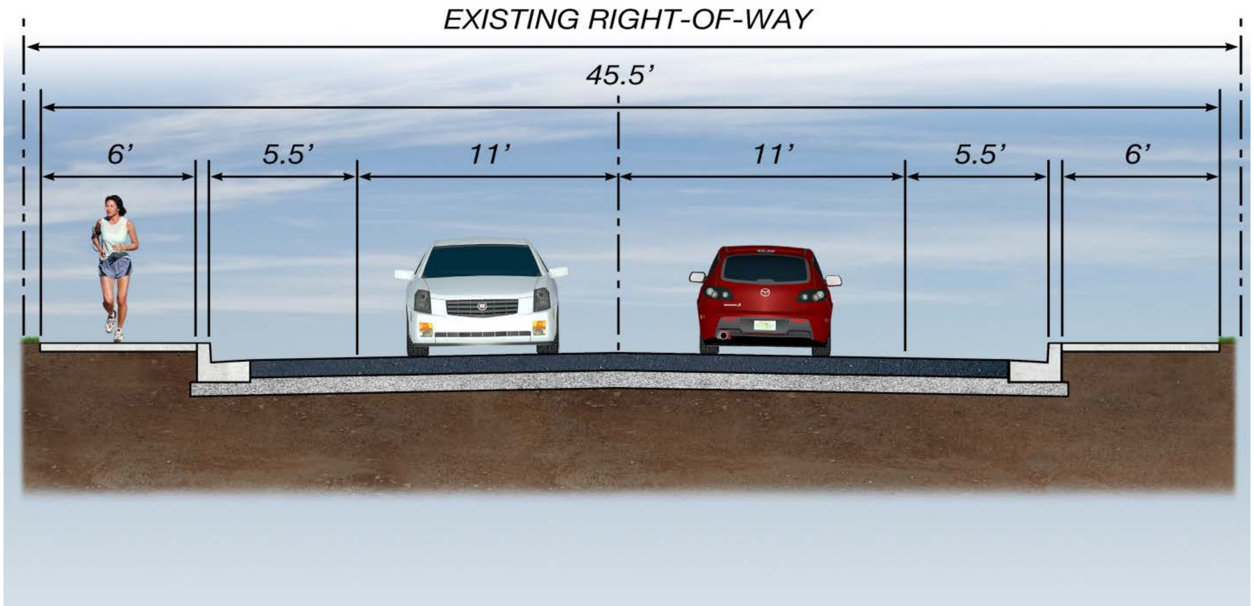


Figure 6-3 – Proposed Roadway Section East of Proposed Movable Bridge

6.5.2 Replacement with a Fixed Bridge

Two options, A and B, were developed for the fixed bridge alternative. Both options provide approximately 28 feet of vertical clearance over Whitcomb Bayou and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. The proposed maximum grade is 5%. The total length of the proposed fixed span bridge is 720 feet.

Both fixed bridge options require acquisition of additional right-of-way. Although the proposed roadway typical sections were developed to tie into the existing roadway right-of-way once the bridge structure returns to existing grade, impacts from gravity walls required to contain the fill for the much steeper slope of these alternatives block access to existing properties. Construction of new access roads is required to maintain access to the Bayshore MHP on the west side and to Venetian Court east of the bridge. The two fixed bridge options differ in the properties that are impacted to maintain access. Option A impacts the residential parcels on the north side of Riverside Drive. Option B impacts the Bayshore MHP on the south side of the roadway. More detail about the impacts of each option is provided later in this section.

The proposed bridge typical section for the fixed bridge alternative options has an out to out width of 39.6 feet. It consists of two, 11-foot travel lanes, 4.5-foot shoulders (which can be used as undesignated bicycle lanes) on both sides and a 6-foot sidewalk on the north side of the bridge. To minimize impacts to property owners, a sidewalk is not proposed on the south side of the bridge. (See **Figure 6-4**.) Shoulder widths for the fixed bridge alternative are limited to 4.5 feet to avoid additional right-of-way impacts.

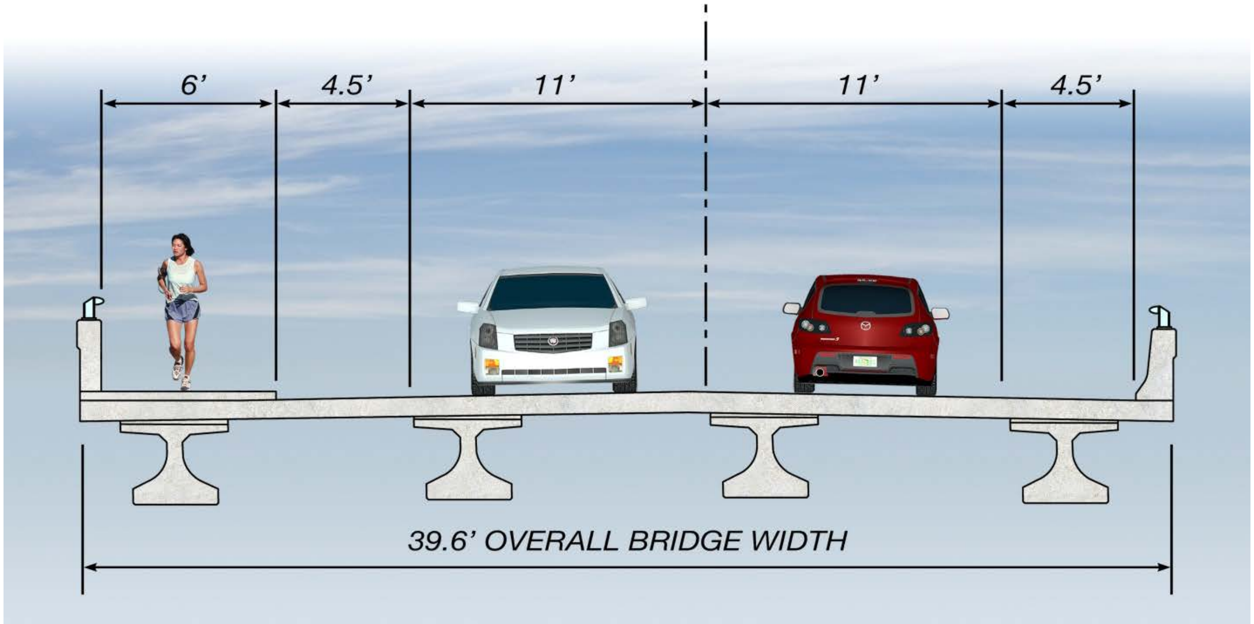


Figure 6-4 – Proposed Fixed Bridge Typical Section

The proposed roadway section west of the bridge consists of two, ten-foot wide travel lanes, a 5.5-foot wide shoulder, a six-foot wide sidewalk on the north side of the bridge, and a 5.5-foot wide shoulder on the south side of the bridge. Because of limited right-of-way, a sidewalk is not proposed on the south side of the bridge. Although the roadway section is 37 feet wide, the total width of the proposed section, including bridge railings in areas where the roadway is constructed on a raised embankment between retaining walls, is 39.6 feet. This section can be constructed in the approximately 40 feet of existing right-of-way.

East of the bridge, the proposed roadway section provides two, 11-foot wide travel lanes, a 5.5-foot wide shoulder and six-foot wide sidewalk on the north side of the bridge. A sidewalk is not proposed on the south side of the bridge to minimize impacts to adjacent property owners. Although the roadway section is 39 feet wide, the total width of the proposed section, including bridge railings in areas where the roadway is constructed on a raised embankment between retaining walls, is 41.6 feet. This section on embankment will require acquisition of some right-of-way on the north side of the road between Pampas Avenue and Forest Avenue, where the right-of-way narrows. **Figures 6-5 and 6-6** illustrate the proposed roadway sections for the fixed bridge alternatives.

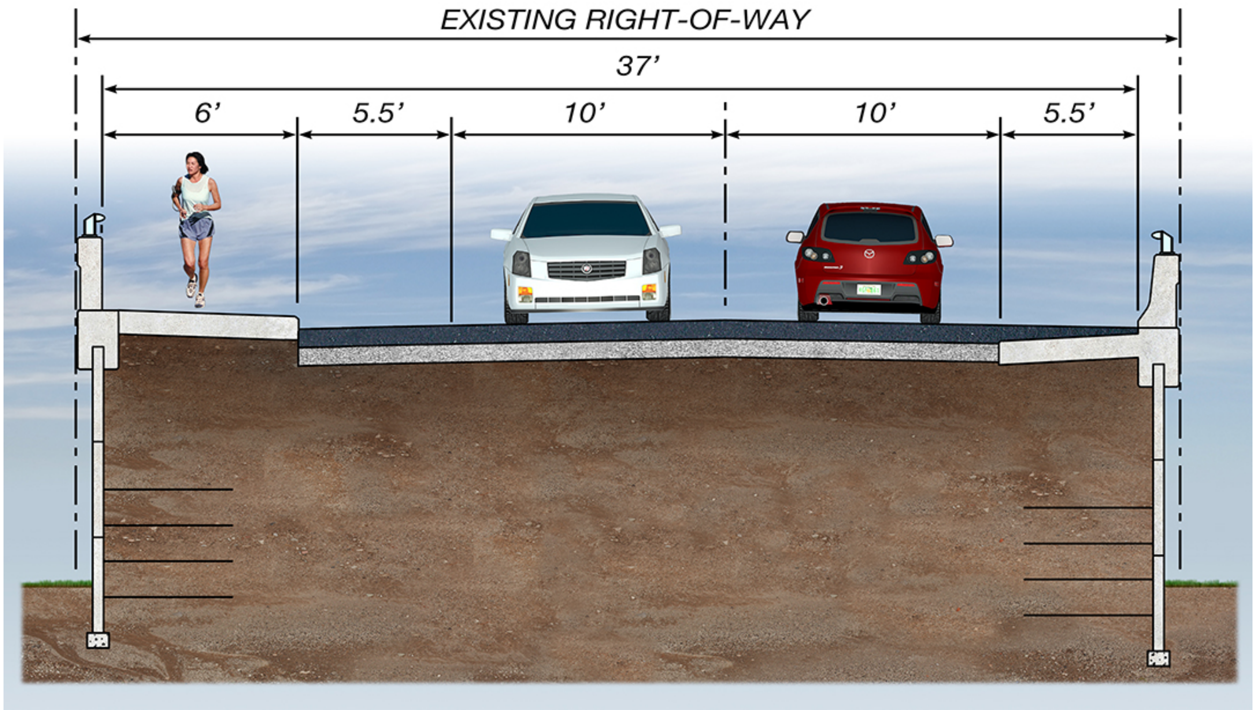


Figure 6-5 – Proposed Roadway Section West of Proposed Fixed Bridge

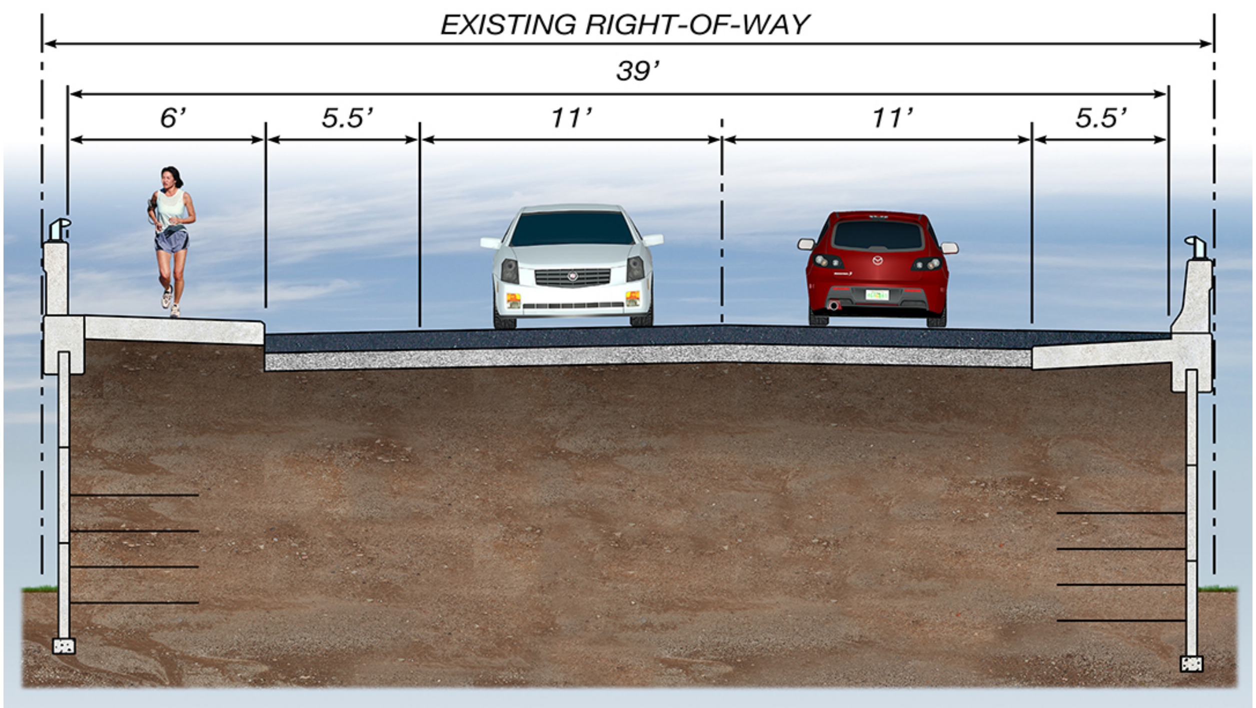


Figure 6-6 – Proposed Roadway Section East of Proposed Fixed Bridge

Fixed Bridge Alternative – Option A

The superstructure will may consist of prestressed concrete girder (Florida I-Beams) construction with a concrete deck. To span the access road to the Bayshore MHP, waterway, navigation channel and new Venetian Court extension, it is likely that the span lengths will vary slightly. The bridge may consist of nine spans, each approximately 80 feet long. Continuous superstructure units with a limited number of joints could be proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the bridge could consist of piers and/or bents supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps. The total length of the proposed fixed span bridge is 720 feet.

The roadway profile at the intersection of Chesapeake Drive and Riverside Drive will be only about one to two feet above existing grade. A proprietary retaining wall system, such as Mechanically Stabilized Earth (MSE) walls, will be required on both sides of the roadway from Chesapeake Drive to station 134+42, where the bridge begins. The wall will begin just east of Chesapeake Drive on the north side of Riverside Drive and extend approximately 360 feet east.

On the south side of the roadway, the wall will begin just west of Chesapeake Drive and extend approximately 420 feet east. The height of the wall will increase to approximately 19 feet above existing ground, just west of the entrance driveway to the Bayshore MHP.

East of the proposed bridge, an MSE wall will extend approximately 340 feet on the north side and about 400 feet on the south side. The wall will end west of Forest Avenue where the approach roadway will return to the existing grade. The proposed retaining wall will block access to Riverside Drive for five single family residences west of the bridge, on the north side of the roadway. A new access road for the Bayshore MHP will be constructed north of Riverside Drive. The access road will connect with Chesapeake Drive and extend east through the parcels immediately adjacent to the north side of the roadway. The access road will then turn south and extend under the proposed bridge to connect to the Bayshore MHP driveway.

The minimum vertical clearance at the MHP driveway will be 14'6". The five single family residences impacted are expected to require relocation.

On the east side of the bridge, the proposed bridge will eliminate access to Riverside Drive from

Venetian Court and Pampas Avenue. An extension of Venetian Court will be constructed from Pampas Avenue through the vacant lot adjacent to the Tarpon Springs Yacht Club, extend under the proposed bridge, and tie into the existing Venetian Court. A minimum vertical clearance of 14'6" is provided at Venetian Court.

Direct access to Riverside Drive for the single family residence on the corner of Pampas Avenue and Riverside Drive will be eliminated by the proposed retaining wall. Access from this location and from Venetian Court to Riverside Drive can be accomplished by traveling north on Pampas Avenue, turning east on High Street and south on Forest Avenue. The single family residence driveway located at approximately Station 145+20 will be modified (raised) to provide direct access to Riverside Drive. Vehicular access to private docks located south of Riverside Drive in the area between Station 144+00 and 145+20 will be blocked by the proposed retaining wall.

Fixed Bridge Alternative – Option B

The total length of the proposed fixed span bridge, Option B, is approximately 720 feet. The superstructure may consist of prestressed concrete girder (Florida I-Beams) construction with a concrete deck. To span the waterway, navigation channel and new Venetian Court extension, the span lengths will vary slightly. The bridge may consist of nine spans, each approximately 80 feet long. The last span on the east end of the bridge could include a skewed abutment to reduce the span length. The end bridge location could be moved further east, extending the bridge to provide a perpendicular abutment in final design. Continuous superstructure units with a limited number of joints are proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the bridge could consist of piers and/or bents supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

The roadway is raised about one to two feet above existing grade at Chesapeake Drive. A retaining wall on both sides of the roadway will extend approximately 429 feet east, and vary in height from 1- 22 feet. The height of the wall will be approximately 22 feet at the location of the existing entrance driveway to the Bayshore MHP. East of the proposed bridge, along the north side of the road, the retaining wall will extend from the end of the bridge approximately 340 feet, to west of Forest Avenue where the approach roadway will return to the existing grade. East of the proposed bridge, along the south side of the road, the retaining wall will extend from the end of the bridge approximately 400 feet. The wall will be approximately 21 feet high at the east end of the bridge.

The proposed retaining wall will block access to Riverside Drive for five single family residences west of the bridge, immediately north of the roadway. An access road will be constructed through the impacted parcels to provide access to Chesapeake Drive for the two waterfront parcels in this area. It is anticipated that three relocations on the north side of the road will be required. The driveway entrance to Bayshore MHP will be eliminated. Construction of a new entrance and exit for the MHP at Chesapeake Drive will impact approximately seven mobile home lots on the west end of the development.

As in Alternative A above, the proposed fixed bridge will eliminate the access to Riverside Drive from Venetian Court and Pampas Avenue. An extension of Venetian Court will be constructed from Pampas Avenue through the vacant lot adjacent to the Tarpon Springs Yacht Club, and extend under the proposed bridge with a minimum vertical clearance of 14'6". Although the proposed connector for this option minimizes impacts to the Tarpon Springs Yacht Club property, the connector will extend through the vacant residential lot just east of the Venetian Court intersection south of Riverside Drive and connect to Venetian Court.

Direct access to Riverside Drive for the single family residence on the corner of Pampas Avenue and Riverside Drive will be eliminated by the proposed retaining wall. Access from this location and Venetian Court to Riverside Drive can be accomplished by traveling north on Pampas Avenue, turning east on High Street and south on Forest Avenue. The single family residence driveway at approximately station 145+20 will be modified (raised) to provide direct access to Riverside Drive. Vehicular access will be blocked to docks located south of Riverside Drive in this area.

6.6 PROJECT COSTS

Cost estimates were prepared for the no-build and build alternatives (**Table 6-1**). In addition, demolition costs were estimated which apply to both the No-Build and No-Build with Removal of the Existing Bridge Alternatives. All estimates were based on the following:

- FDOT Structures Design Guidelines, Chapter 9-Bridge Development Report (BDR) Cost Estimating

- Historical Unit Prices for Similar Projects
- Conceptual Quantities

Table 6-1 – Estimated Construction Costs

	No Build (Removal of Existing Bridge)	Rehabilitation (25-30 Year)	New Low-Level Bascule Bridge	New Fixed Bridge Option A	New Fixed Bridge Option B
Construction	$475 K (Demolition)	$4.85 M	$7.92 M	$6.25 M	$6.25 M
Mobilization	$48 K (10%)	$0.39 M (8%)	$0.792 M (10%)	$0.63 M (10%)	$0.63 M (10%)
Maintenance of Traffic	$48 K (10%)	$0.48 M (8%)	$0.792 M (10%)	$0.62 M (10%)	$0.62 M (10%)
Aesthetic Enhancements	N/A	N/A	$0.792 M (10%) (10%)	$0.62 M (10%)	$0.62 M (10%)
Contingency	$143 K (30%)	$1.46 M (30%)	$1.58 M (20%)	$0.94 M (15%)	$0.94 M (15%)
Construction Total	**$714 K**	**$7.18 M**	**$11.87 M**	**$9.06 M**	**$9.06 M**
Design	$71 K (10%)	$1.08 M (15%)	$1.78 (15%)	$0.91 M (10%)	$0.91 M (10%)
CEI	$71 K (10%)	$1.06 M (15%)	$1.78 (15%)	$0.91 M (10%)	$0.91 M (10%)
Post Design	N/A	0.14 M (2%)	$0.36 M (3%)	$0.18 M (2%)	$0.18 M (2%)
Right-of-Way	N/A	N/A	N/A	$4.0M	$2.9 M
Project Total	**$0.9 M**	**$9.5 M**	**$15.8 M**	**$15.1 M**	**$14.0 M**

Construction cost estimates are based on the baseline structure described for each alternative. Contingencies are added to each alternative in accordance with engineering judgment and experience. Contingencies account for miscellaneous items that are not quantifiable at the conceptual design stage. For all alternatives a percentage of the basic construction costs were calculated to account for mobilization, maintenance of traffic, contingencies, design and construction engineering and inspection (CEI). Mobilization costs were estimated as 10% of construction for all alternatives except the Rehabilitation Alternative which was estimated at 8% due to the work requiring less material than replacement. Maintenance of traffic costs were estimated as 10% of construction for all alternatives.

For this project, 30% contingency was assumed for the Rehabilitation Alternative as is typical within the industry for work of that nature. Rehabilitation is typically more prone to scope expansion as the project develops and therefore the percent contingency is higher than for build alternatives. A 15% contingency was assumed for the fixed bridge alternatives, assuming accelerated construction methods. A 20% contingency was assumed for the movable bridge alternative due to the more complex nature of movable bridge design and construction. Design and CEI costs were each estimated to be 10% of construction for two alternatives – no build with permanent removal of the bridge and replacement with a fixed bridge. CEI costs are estimated to be 15% of construction for rehabilitation or replacement with a movable bridge. All estimates need to be adjusted for inflation based upon the schedule of implementation. It is recommended that construction cost estimates be adjusted to the midpoint of construction when programming funds. Detailed cost estimates are provided in Appendix H.

Cost estimates for bridge replacement assume Level Two Aesthetics, as defined in the *FDOT PPM* (Section 26.9.4, January 1, 2013 edition). An additional 10% of the construction costs have been included to account for aesthetic enhancements. Aesthetic enhancements may include concrete surface finishes, decorative railings, light poles, light fixtures, landscaping and/or hardscaping features.

6.6.1 Right-of-Way Costs

Right-of-way costs for potential right-of-way takes of property impacted by the proposed fixed bridge alternatives were estimated using the "Just Market Value", the "Assessed Value" and the "Sales Comparison Value" determined by the Pinellas County Property Appraiser. The area impacted was multiplied by the estimated square foot value to obtain a "Right-of-Way Value." The "Right-of-Way Value" was then multiplied by factors of 2.5 and 3.0 to account for potentially negotiated higher price, administrative costs and other unknowns to estimate a low to high range of potential costs. A summary of the results is presented in **Table 6-2**.

Table 6-2 – Right-of-Way Cost Estimates

Fixed Bridge Alternative	Total Row Required (square feet)	Raw ROW Cost ($ millions)	Row Cost x 2.5 ($ millions)	ROW Cost x 3.0 ($ millions)
Option A	86,620	1.35	3.4	4.1
Option B	80,856	0.96	2.4	2.9

The estimated cost multiplied by a factor of 3.0 was used in the Life Cycle Cost Analysis and shown in the Alternatives Evaluation Matrix. Additional information about the methodology used to estimate the costs is included in Appendix H.

6.6.2 Life Cycle Cost Analysis

A life cycle cost comparison was performed in accordance with the FDOT Manual *Life-Cycle Cost Analysis for Transportation Projects* to more completely evaluate and compare the costs for replacement vs. repair/rehabilitation. The costs used for the analysis came from several sources. The costs for the replacement bridges are as summarized above. Estimated costs for right-of-way and relocation are included. Operating and maintenance costs for the existing bridges were derived from data provided by the County and from similar projects. The timeline for rehabilitation assumes that the project starts with design in 2016 and is completed in 2020. The timeline for replacement is similar, assuming that construction is completed in 2020. Rehabilitation is assumed to provide a bridge that remains in service for an additional 25 years (from 2013) before being replaced.

Life-cycle costs were generated for the following four bridge rehabilitation and/or replacement scenarios. The detailed estimates are provided in Appendix H.

- Rehabilitate the bridge in 2020 then replace it with a new movable bridge in 2038 (25 years from 2013),
- Rehabilitate the bridge in 2020 then replace it with a new mid-level fixed bridge in 2038 (25 years from 2013),
- Replace the bridge in 2020 with a new movable bridge,
- Replace the bridge in 2020 with a new mid-level fixed bridge.

Life-cycle costs were computed on the basis of present worth. For each of the alternatives, a period of 107 years was used in the analysis for consistency. Replacement bridge alternatives are assumed to have a service life of 75 years. Cost expenditures beyond this period have a negligible effect on the cost comparison. At the recommendations of FDOT, District 7 Structures and FDOT, Central Office, Structures, a discount rate of 5% was used in the analysis. The effect of inflation and the cost of future construction are accounted for in the discount rate. As recommended by FDOT, discount rates of 4% and 6% were used to test the sensitivity of the analysis. In addition, the estimated life of a rehabilitated bridge was tested by running the scenarios assuming a 20 year remaining service life and a 30 year service life, in addition to the baseline estimate of 25 years. The results of the life cycle cost comparison are presented in **Table 6-3**.

Table 6-3 – Results of Life Cycle Cost Comparison of Rehabilitation and Replacement Alternatives

Rehabilitation Service Life (years)	Discount Rate (percent)	Alternative					
		Rehabilitate / Replace with Movable Bridge	Rehabilitate / Replace with Fixed Bridge		Replace with Movable Bridge	Replace with Fixed Bridge	
			Opt. A	Opt. B		Opt. A	Opt. B
		Present Value ($Millions)					
20	4	17.6	16.7	16.2	14.8	13.0	12.2
20	5	15.3	14.7	14.3	13.3	11.8	11.1
20	6	13.5	13.0	12.6	12.2	10.9	10.2
25	4	16.4	15.7	15.3	14.8	13.0	12.2
25	**5**	**14.2**	**13.6**	**13.2**	**13.3**	**11.8**	**11.1**
25	6	12.4	11.9	11.7	12.2	10.9	10.2
30	4	15.3	14.6	14.3	14.8	13.0	12.2
30	5	13.0	12.6	12.4	13.3	11.8	11.1
30	6	11.3	11.0	10.8	12.2	10.9	10.2

Each row in the table represents a comparison of alternatives in terms of life-cycle costs. Values in different rows cannot be compared. For most scenarios considered, it is more economical to replace the bridge now than to repair/rehabilitate the bridge now and replace the bridge at a later date. However, at discount rates of 5%, and 6%, assuming that the remaining service life of the existing bridge is 30 years, it is more economical to repair/rehabilitate the movable bridge now and replace the bridge later than it is to replace the movable bridge now. Given that the life cycle cost analysis for this project is sensitive to the discount rate used (i.e., the lowest cost alternative varies depending on the discount rate) and rehabilitation service life, the costs can be considered relatively equal within the tolerances of the analysis. Furthermore, only direct (capital) costs were considered in the analysis; indirect (non-capital) costs such as user delay and accident costs were not included in the analysis. These costs are difficult to accurately quantify and are considered somewhat subjective. In all alternatives, indirect costs support the decision to replace the bridge now. Costs associated with user delays and accidents are anticipated to decrease with improvements in the facility (e.g., improved roadway geometry that decreases accidents.)

6.7 EVALUATION OF ALTERNATIVES

An Evaluation Matrix was developed (**Table 6-4**) to facilitate comparison of alternatives. Evaluation Criteria for operational and engineering issues, right-of-way impacts, environmental impacts, parks and recreation impacts, costs and construction time were considered for each alternative. The relative impact for each criterion is stated in the evaluation matrix. Advantages and disadvantages of each alternative are discussed below.

No-Build Alternative

The expected service life of the existing bridge is approximated at ten years or less. The advantages and disadvantages of this alternative are discussed below.

Advantages

- No adverse impacts to historic structures, recreational areas, wetlands and wildlife
- No noise or visual impacts.
- No changes in access to local streets.

Table 6-4 – Evaluation Matrix

Impact Evaluation Criteria	No Build	No Build/Remove Bridge	Rehabilitation	New Low-Level Movable Bridge	New Mid-Level Fixed Bridge Option A	New Mid-Level Fixed Bridge Option B
Roadway/Bridge Issues						
Width of Vehicular Travel Lanes	10 feet	N/A	10 feet	11 feet	11 feet	11 feet
Shoulders	None	N/A	None	5.5 feet	4.5 feet	4.5 feet
Sidewalks	2’2”	N/A	2’2”	6 feet– Both Sides	6 feet – One Side Only	6 feet – One Side Only
Meets Current Design/Safety Standards	No	N/A	No	Yes	Yes	Yes
Structural Deficiencies Corrected	No	N/A	Yes	Yes	Yes	Yes
Vertical/Horizontal Channel Clearance	6 feet/25 feet	N/A	6 feet/25 feet	7.8 feet/25 feet	28 feet/25 feet	28 feet/25 feet
Bridge Openings	No Change	N/A	No Change	Minimal to No Change	None	None
Right of Way Issues						
Overall Bridge Width	28 feet	N/A	28 feet	47.2 feet	39.6 feet	39.6 feet
Right-of-Way Required	None	None	None	None	2 acres	2 acres
Relocations	None	None	None	None	5 Residences	3 Residences, 7 Mobile Homes
Other Impacts	None	None	None	None	Yacht Club Parking Driveways on South Side, East of Bridge	Yacht Club Parking Driveways on South Side, East of Bridge
Environmental Impacts						
Impacts to Historic Bridge	None	High	High	High	High	High
Wetlands	None	Low	Low	0.03 acre	0.02 acre	0.02 acre
Wildlife	None	Low	Low	Low	Low	Low
Parks/Recreation	None	None	None	None	None	None
Visual Impacts	None	None	Low	Low	High	High
Noise Impacts (Permanent)	None	None	None	Low	Low	Low
Costs						
Total Project Costs[1]	N/A	$0.9 M (Demolition)	$9.5 M	$15.8 M	$15.0 M (ROW Costs= $4.0 M)	$13.9 M (ROW Costs=$2.9 M)
Construction Impacts						
Detour Duration	N/A	Permanent	6 months	12 months	24 months	24 months
Total Construction Time	N/A	N/A	12 months	24 months	24 months	24 months
Anticipated Service Life (2010)	10 years or less	10 years or less	25-30 years	75 years	75 years	75 years

[1] Costs include demolition, roadway and bridge construction, mobilization, maintenance of traffic, aesthetic enhancements, engineering design, construction engineering inspection (CEI) and contingency.

- Minor impacts to traffic as a result of on-going maintenance are anticipated.

Disadvantages

- Existing geometric deficiencies would not be corrected (e.g. narrow sidewalks).
- Structural and electrical deficiencies would not be corrected.
- Substantial continuing bridge maintenance would be required.
- Maintenance repairs could further disfigure the historic resource.
- Expected service life would be relatively short (about 10 years).
- Existing horizontal and vertical clearances will not be improved.

No-Build with Removal of Existing Bridge

Advantages and disadvantages of this alternative are the same as those stated for the No-Build Alternative above while the bridge is still serviceable. Additional advantages and disadvantages resulting from eventual permanent removal of the bridge include the following.

Advantages

- Any perceived visual impacts of the existing bridge will be eliminated.
- Noise impacts will be reduced to properties adjacent to the existing bridge.
- Maintenance costs associated with the existing bridge will be eliminated.
- Restriction of the navigation channel will be eliminated.

Disadvantages

- Removal of the NRHP Eligible bridge may result in an adverse impact.
- A crucial link to the Pinellas Trail east of the bridge will be eliminated for the proposed Howard Park Trail.
- Traffic on Whitcomb Drive and Meres Blvd. will increase during peak hours.
- Travelers coming from outlying areas will have a longer travel route to the recreational areas west of the bridge.
- An alternate route will not be available during local special local events
- A local emergency evacuation route from areas west of the bridge will be eliminated.

Rehabilitation Alternative

The existing service life of the bridge, if the repairs described for this alternative are made, is estimated to be 25-30 years. The extensive structural deterioration would need to be corrected by replacing portions of the superstructure and substructure. Some costly improvements that improve safety, but do not extend the service life of the existing bridge, may be required if federal funding is obtained. The return on the investment of funds for these improvements will be relatively short-lived.

Advantages

- Mechanical and electrical systems will be updated.
- Structural deficiencies will be corrected.
- No adverse impacts to recreational areas.
- Minimal to no impacts to wetlands and wildlife.
- No changes in access to local streets.
- A complete detour of only about six months is required for construction, which is less than the detour required for construction of a replacement bridge.

Disadvantages

- Replacement of the bascule leaf from the NRHP eligible bridge may result in an adverse impact.
- Installation of additional crutch bents and pile jackets would alter the appearance of the bridge and further diminish its appearance.
- Temporary noise impacts could occur during construction.
- No changes to the existing geometry of the bridge will occur.
- The substandard sidewalks would remain.
- The substandard shoulder width would remain.
- The bridge will continue to require openings to allow vessels to pass through the channel
- A six month detour will be required during construction

- Rehabilitation will only extend the service life of the existing bridge approximately 25-30 years.

Replacement with a Low-Level Movable Bridge

The anticipated service life of a new movable bridge is about 75 years. Advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an "undesignated" bicycle lane.
- Six-foot wide sidewalks will be provided on both sides of the bridge.
- The replacement bridge can be constructed within existing right-of-way.
- No impacts to existing intersections with Riverside Drive/Spring Boulevard will occur.
- No impacts to driveways within the project corridor will occur.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Construction and life-cycle costs for a movable bridge are higher than for a fixed bridge.
- Operation and maintenance costs are higher for a movable bridge than for a fixed bridge.
- The bridge will continue to require openings to allow vessels to pass through the channel.
- A complete detour will be required for about one year for construction.
- Minor impacts to wetlands will occur (about 0.03 acre).

Replacement with a Mid-Level Fixed Bridge – Option A

The anticipated service life of the new bridge is about 75 years. The advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an "undesignated" bicycle lane.
- Bridge openings that disrupt vehicular traffic will be eliminated.
- Initial and long term maintenance costs will be reduced.
- Construction cost is less than cost of a new movable bridge.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Boats requiring more than 28 feet of vertical clearance will not be able to navigate through the channel.
- Sidewalks will only be provided on the north side of the bridge.
- Substantial visual impacts to the surrounding area will result from construction of the higher bridge.
- A complete detour will be required for approximately two years during construction.
- Five residential relocations will be required.
- The existing intersections of Pampas Avenue and Venetian Court with Riverside Drive/Spring Boulevard will be eliminated.
- Construction of a connector road to re-establish the connections of Pampas Avenue and Venetian Court to Riverside Drive/Spring Boulevard will impact Tarpon Springs Yacht Club property
- Private docks on the south side of Riverside Drive, between Pampas Avenue and Forest Avenue will be inaccessible from the roadway due to retaining wall construction.

Replacement with a Mid-Level Fixed Bridge – Option B

The anticipated service life of the new bridge is about 75 years. The advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an "undesignated" bicycle lane.
- Bridge openings that disrupt vehicular traffic will be eliminated.
- Initial and long term maintenance costs will be reduced.
- Construction cost is less than cost of a new movable bridge.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Boats requiring more than 28 feet of vertical clearance will not be able to navigate through the channel.
- Sidewalks will only be provided on the north side of the bridge.
- Substantial visual impacts to the surrounding area will result from construction of the higher bridge with retaining walls.
- A complete detour will be required for approximately two years during construction.
- Three residential relocations will be required.
- The existing intersections of Pampas Avenue and Venetian Court with Riverside Drive/Spring Boulevard will be eliminated.
- Construction of a connector road to re-establish the connections of Pampas Avenue and Venetian Court to Riverside Drive/Spring Boulevard will impact Tarpon Springs Yacht Club property and a vacant residential property on south of Riverside Drive.
- Private docks on the south side of Riverside Drive, between Pampas Avenue and Forest Avenue will be inaccessible from the roadway due to retaining wall construction.

6.8 ADDITIONAL REHABILITATION ALTERNATIVES EVALUATED AFTER THE ALTERNATIVES PUBLIC MEETING AT THE REQUEST OF THE STATE HISTORIC PRESERVATION OFFICER

The Alternatives discussed in Sections 6.3 through 6.7 (with minor variations of the typical sections) were presented at an Alternatives Public Meeting on January 23, 2013. Based on potential social and environmental impacts and input from the community, No-build with

Removal of the Existing Bridge and Replacement of the Existing Bridge with a New Fixed Bridge were eliminated from further consideration. The majority of written comments received from the public after the Alternatives Public Meeting supported the "Rehabilitation" and/or "Replacement with a New Movable Bridge" alternative. Many members of the community also expressed support for improvements to the existing pedestrian facilities.

The Beckett Bridge remains one of seven, pre-1965 single-leaf bascule roadway bridges in Florida. It has been determined to be eligible for listing in the NRHP under Criterion A for its contributions to the patterns of development and transportation in the State, and under Criterion C for its distinct engineering. A Cultural Resource Committee (CRC) was established as part of the ongoing PD&E Study. Two meetings have been held to date. The first Meeting was held on October 29, 2012 and the second was held on March 13, 2013. At the second meeting, representatives of the SHPO stated that the SHPO strongly supported rehabilitation of the existing bridge in lieu of constructing a replacement bridge.

The Rehabilitation alternative, as presented to the Public at the January 23, 2013 Alternatives Public Meeting, described in Section 6.7 above, and presented to the CRC does not include widening the existing bridge. The CRC recognized that widening the sidewalks on the existing bridge, which are only 2'2" wide, was warranted to provide a safe facility and acknowledged input from the community on this issue. Accordingly, the CRC requested that the project team develop and evaluate a second rehabilitation alternative which included widening the existing sidewalks. Accordingly, the project engineers developed another alternative which will be referred to as the "Rehabilitation with Widening" Alternative in this document.

The results of the evaluation of the Rehabilitation with Widening alternative was presented to SHPO, FHWA, and FDOT staff on June 11, 2013 in Tallahassee. SHPO concurred that this alternative did not promote preservation of the existing bridge and requested evaluation of an additional rehabilitation alternative that did not require widening, but that provided a single wider sidewalk on one side of the existing bridge. Accordingly, this alternative was evaluated. The following sections summarize the evaluation of these two additional alternatives.

6.8.1 Evaluation of the Rehabilitation with Widening Alternative

Development of a Minimum Acceptable Typical Section for Rehabilitation

The first step in development of the Rehabilitation with Widening alternative was to establish the *minimum acceptable typical section*. Pinellas County, in coordination with FDOT District 7 staff, determined that widening the existing bridge would require compliance with the Florida Green Book to bring the bridge up to acceptable minimum current safety standards. Accordingly, a minimum acceptable typical section was developed based on these criteria. This typical section consists of two 11-foot travel lanes, one in each direction, 3-foot wide shoulders on both sides and 5.5 foot wide sidewalks on both sides of the bridge. The total width of the bridge would be 42 feet. The total width of the existing bridge is only 28 feet.

Description of Required Improvements to the Bascule Span and Approach Spans Required to Construct the "Rehabilitation with Widening" Alternative

Detailed engineering analysis indicates that the additional weight of the wider roadway (which provides the minimum acceptable typical section with shoulders, described above) and the proposed sidewalks cannot be accommodated by the existing bascule span or bascule pier.

Major modifications would be required to the existing bascule span, bascule pier and approach spans to accommodate the additional load and wider typical section. These include:

- The existing 28 foot wide steel bascule leaf will be replaced with a 42 foot wide bascule leaf.
- The bascule pier (the structure that supports the leaf) will be replaced to accommodate the wider bascule leaf and larger counterweight.
- The approach spans will be widened by adding two new prestressed concrete beams, one along each side of the bridge, to support the wider bridge deck.
- The existing bridge railing will be replaced with a light-weight steel, crash tested railing.

Other Structural Improvements include the following:

- The existing pile bents will be replaced.
- The bridge abutments will be replaced.
- The Control House will be relocated 7 feet to the north.

- Cathodic protection will be required in the remaining existing concrete elements of the bridge.

Conclusion

Rehabilitation of the existing bridge will require that the bridge meet current minimum safety standards. Widening of the bridge to provide shoulders and wider sidewalks will result in substantial alteration to look of the bridge and will require substantial modification to the existing bascule piers. The final structure will no longer resemble the original historic bridge. Replacement with a new movable bridge, of similar design, which is consistent with and compliments the local environment, is recommended.

6.8.2 Evaluation of Rehabilitation Alternative which Provides a Single Code Compliant Sidewalk without Widening, or with Minimal Widening of the Existing Bridge

At the June 11, 2013 meeting in Tallahassee, attended by URS, Pinellas County, FDOT, FHWA, and SHPO, representatives from SHPO requested consideration of an additional concept that would modify the existing bridge cross section to accommodate a single, code compliant, sidewalk, rather than two sidewalks has had been previously proposed. This section summarizes URS's technical evaluation of concepts with a sidewalk on one side only.

Reconfiguration of the Existing Bridge without Widening

The most desirable concept from a historic preservation perspective would be to avoid widening of the bridge and simply rework the arrangement of lanes and sidewalk(s) within the width of the existing bridge (28'-0½"). A modified section of the narrowest practical width would include minimum shoulders, a traffic railing (barrier) on the south side, two travel lanes, a sidewalk on a raised curb on the north side, and a traffic railing at the back of sidewalk. Assuming that design exceptions are granted for lane width (to allow two 10-foot wide lanes rather than the 11-foot minimum) and shoulder width (to allow a 2.5-foot shoulder adjacent to a traffic railing and a 1.5-foot shoulder adjacent to the curb rather than the 3-foot minimum required) the minimum clear roadway width for this configuration is 24 feet. With a minimum 5.5 foot wide sidewalk and two traffic railings (1.5' on the south side adjacent to traffic and 1'-1" at the back of sidewalk on the north side) the minimum bridge width that would accommodate this section is 32'-1", which is 4'-0½" wider that the existing bridge. Therefore, the existing bridge width is not sufficient to support two lanes and a single sidewalk without widening.

Reconfiguration of the Existing Bridge with Minimal Widening

The next most desirable concept from a historic preservation perspective would be one that limits bridge widening and associated impacts such that the existing bascule pier foundations can be saved. As discussed in the June 11 meeting, if the bridge is widened, the new bridge section must meet minimum standards. The minimum width of a bridge featuring a single sidewalk under this scenario would include 3-foot wide shoulders, a traffic railing on the south side (1.5'), two 11-foot wide travel lanes, a 5.5-foot wide sidewalk on a raised curb on the north side, and a traffic railing at the back of sidewalk (1'-1") on the north side. The clear roadway with of this section is 28 feet and the overall width of is 36'-1". To accommodate this section the bridge would need to be widened by 8'-0½".

The technical issues associated with widening the bridge by 8'-0½" were examined. The evaluation included calculating live load distribution factors (as an indicator of the increase in live load on a main girder due to widening) and approximating dead and live load changes associated with the proposed modifications. The analysis also included determining approximate span balance conditions and corresponding density of the counterweight needed to balance the bridge. The following summarizes the technical challenges disclosed in this investigation:

- As with any solution, the current live load (HL-93) is approximately 32% heavier than the original design load (HS-15 assumed based on year of construction).
- Live load distribution factor for the main girders of the bascule span would increase by 117%.
- The net of the above is an increased live load on the main girders that is 2.8 times the original design load.
- The movable span dead load (weight) would increase by approximately 49%.
- The density of the counterweight would need to be increased to approximately 360 per cubic foot (pcf) to properly balance the bascule span (note that the AASHTO recommended maximum density for counterweight concrete is 280 pcf).

Based on this evaluation it is our conclusion that widening the bridge to include a single sidewalk that meets current design criteria is not technically feasible unless the bascule pier is replaced as well. The increased dead load and live loads are beyond what the existing foundations can handle without extensive strengthening. The physical size of the existing bascule pier footing precludes increasing the size of the counterweight and the density required of the existing size counterweight is well in excess of that recommended by AASHTO.

6.9 CONCLUSION

The existing bridge width is not sufficient to support two lanes and a single sidewalk without widening. In comparison to the widening concepts originally developed with two sidewalks (presented in Sections 6.x – 6.x of this report), a single sidewalk concept does not offer any significant improvements or reductions in impacts to the scope of bridge rehabilitation. Both require complete replacement of the bascule span and bascule piers.

6.10 SELECTION OF A RECOMMENDED ALTERNATIVE

As a result of public input, local government coordination, state and federal agency coordination, project costs, and a detailed comparative analysis of viable alternatives, Replacement of the Existing Bridge with a new Movable Bridge was selected as the Recommended Alternative.

By email, dated 08/03/13, SHPO concurred that replacing the existing bridge with a new movable bridge is preferable to rehabilitation of the existing bridge (based in part on the evaluation discussed in Section 6.8 above). In addition, FHWA concurred that replacement of the existing bridge with a new movable bridge rather than a fixed bridge was consistent with FHWA 23 CFR 650H. FHWA 23 CFR 650H Se 650.890 Movable Bridges states *"A fixed bridge shall be selected wherever practicable. If there are social, economic, environmental or engineering reasons which favor the selection of a movable bridge, a cost benefit analysis to support the need for the movable bridge shall he prepared as a part of the preliminary plans."*

7.0 RECOMMENDED CONCEPT

7.1 TYPICAL SECTION

The proposed bridge typical section for the Recommended Alternative – Replacement with a Low-Level Movable Bridge, has a total out-to-out width of 47.2 feet as shown in **Figure 7-1**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, six feet wide, are proposed on both sides of the bridge.

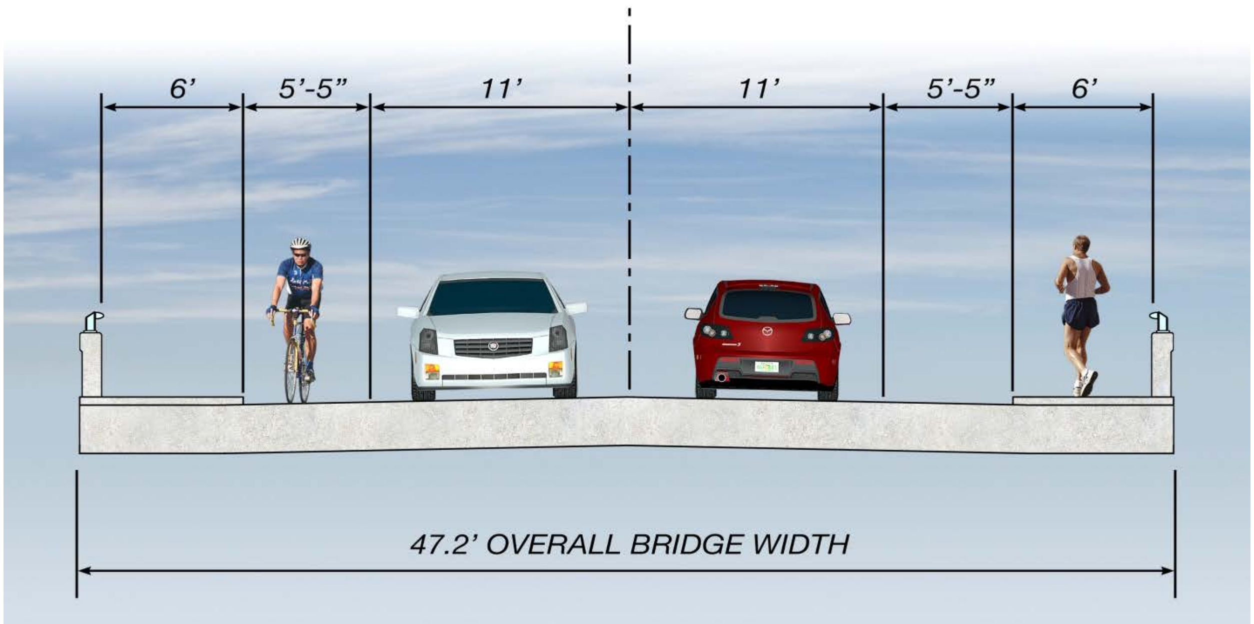


Figure 7-1 – Proposed Bridge Typical Section – Recommended Alternative

The proposed roadway section west of the bridge consists of two 10-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Because of the limited right-of-way, a six-foot wide sidewalk is proposed only on the north side of the roadway. No sidewalks are proposed on the south side of the roadway, adjacent to the Bayshore Mobile Home Park.

East of the bridge, the roadway section consists of two 11-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Six-foot wide sidewalks are proposed on both sides of the roadway. **Figures 7-2 and 7-3** illustrate the proposed roadway sections for the west and east sides of the bridge, respectively.

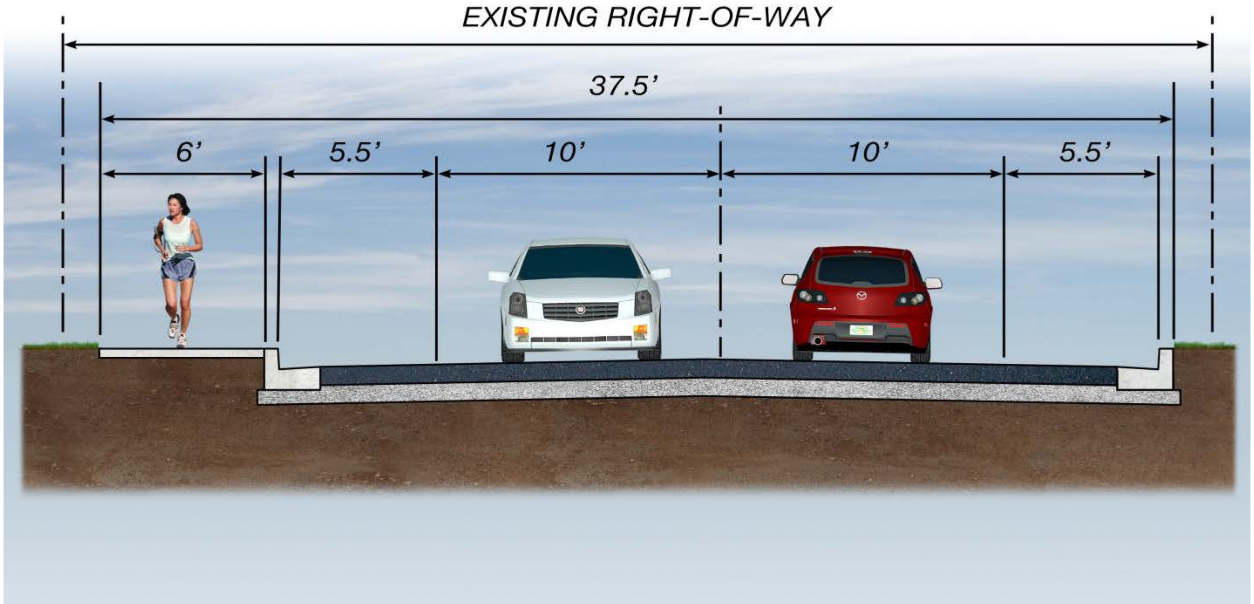


Figure 7-2 – Proposed Roadway Section West of Proposed Movable Bridge

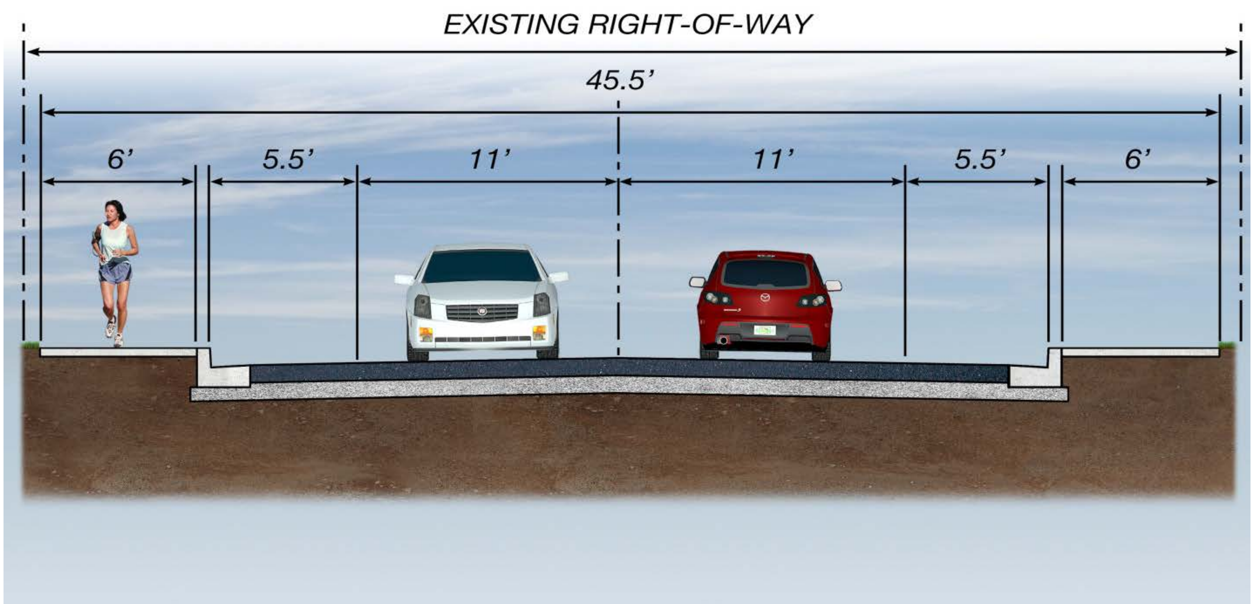


Figure 7-3 – Proposed Roadway Section East of Proposed Movable Bridge

7.2 INTERSECTION CONCEPTS AND SIGNAL ANALYSIS

There are no signalized intersections within the project limits. No changes to the intersections of Chesapeake Drive, Venetian Court or Forest Avenue are proposed.

7.3 DESIGN TRAFFIC VOLUMES

A Design Traffic Technical Memorandum was prepared in accordance with the FDOT Design Traffic Handbook (Topic No. 525-030-120)). Detailed information concerning the methodology employed for this traffic study can be found in this report, published separately from the PER.

Design Year (2038) AADT Volumes

Daily traffic projections were based on applying a growth rate of 1.03 percent per year to the existing (2012) AADT volumes. Projections were based on increases from 2012 to the 2038 Design Year (for 26 years). Design Year (2038) AADT volumes are illustrated on **Figure 7-4**.

Design Year (2038) Peak Hour Volumes

Directional peak hour traffic projections were derived by applying the K and D factors to the Design Year (2038) AADT volumes. Design Year (2038) directional peak hour volumes under both scenarios are illustrated on **Figure 7-5.**

The peak hour traffic projections at the intersections of Alternate US 19 at Tarpon Avenue and Alternate US 19 at Meres Boulevard were developed by applying a 1.03 percent growth rate annually to the existing (2012) counts. Design Year (2038) intersection peak hour volumes under both scenarios are illustrated on **Figure 7-6**.

Design Year (2038) Intersection Analysis

The Design Year (2038) traffic conditions for the Recommended Alternative were analyzed using the Transportation Research Board's HCM and HCS+ for the two study area intersections.

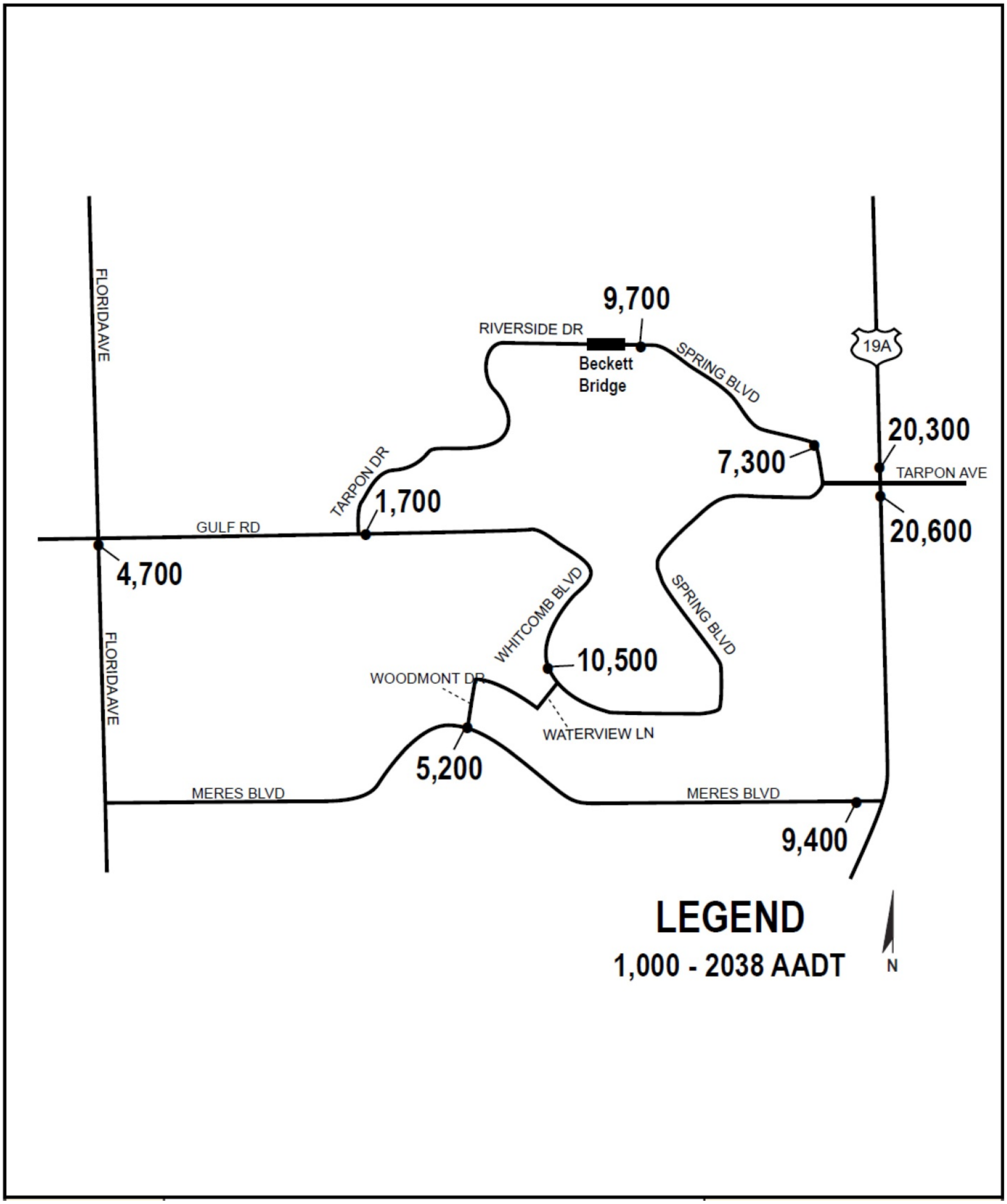


Figure 7-4 – Design Year (2038) AADT Volumes

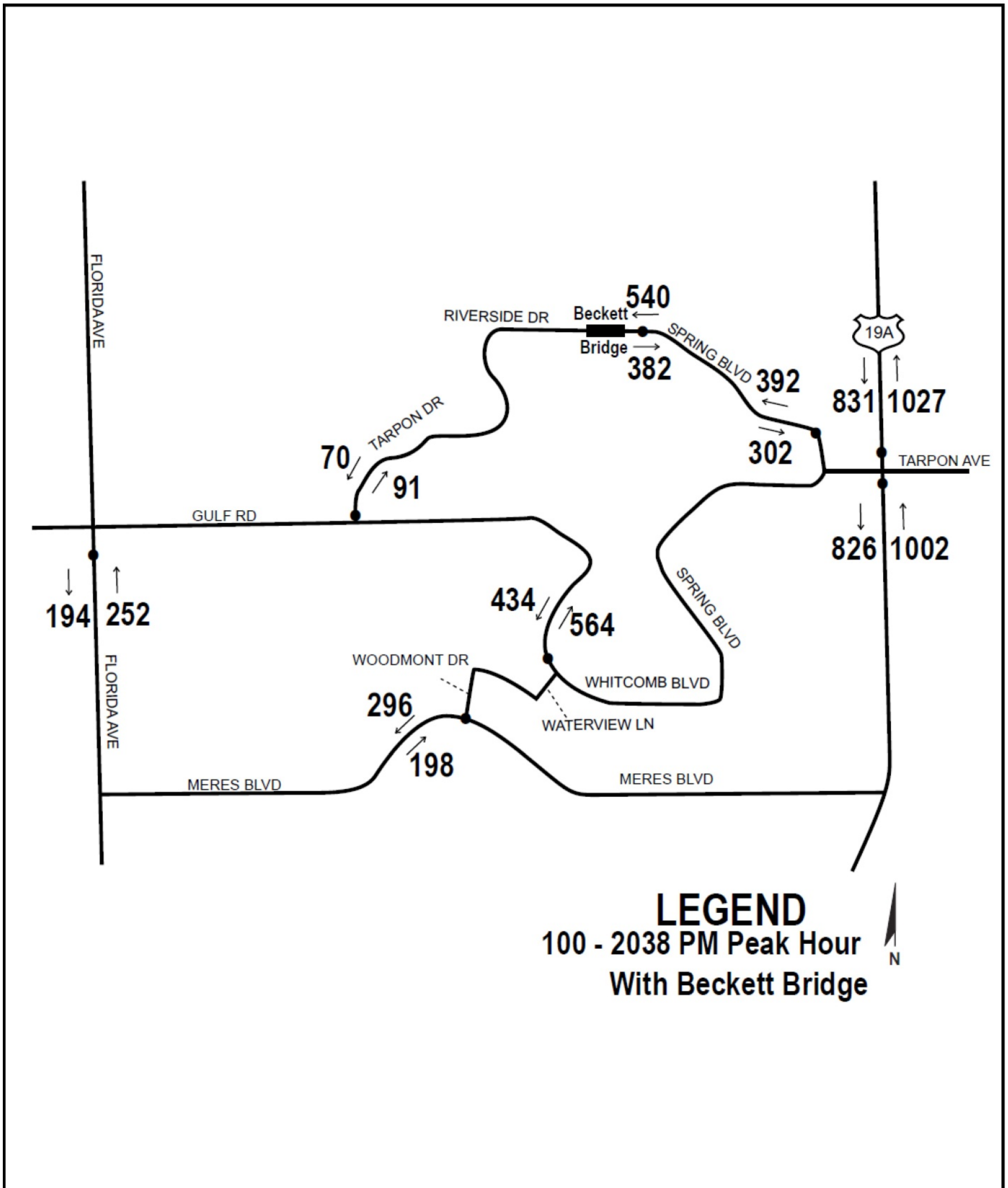


Figure 7-5 – Design Year (2038) Intersection Peak Hour Volumes

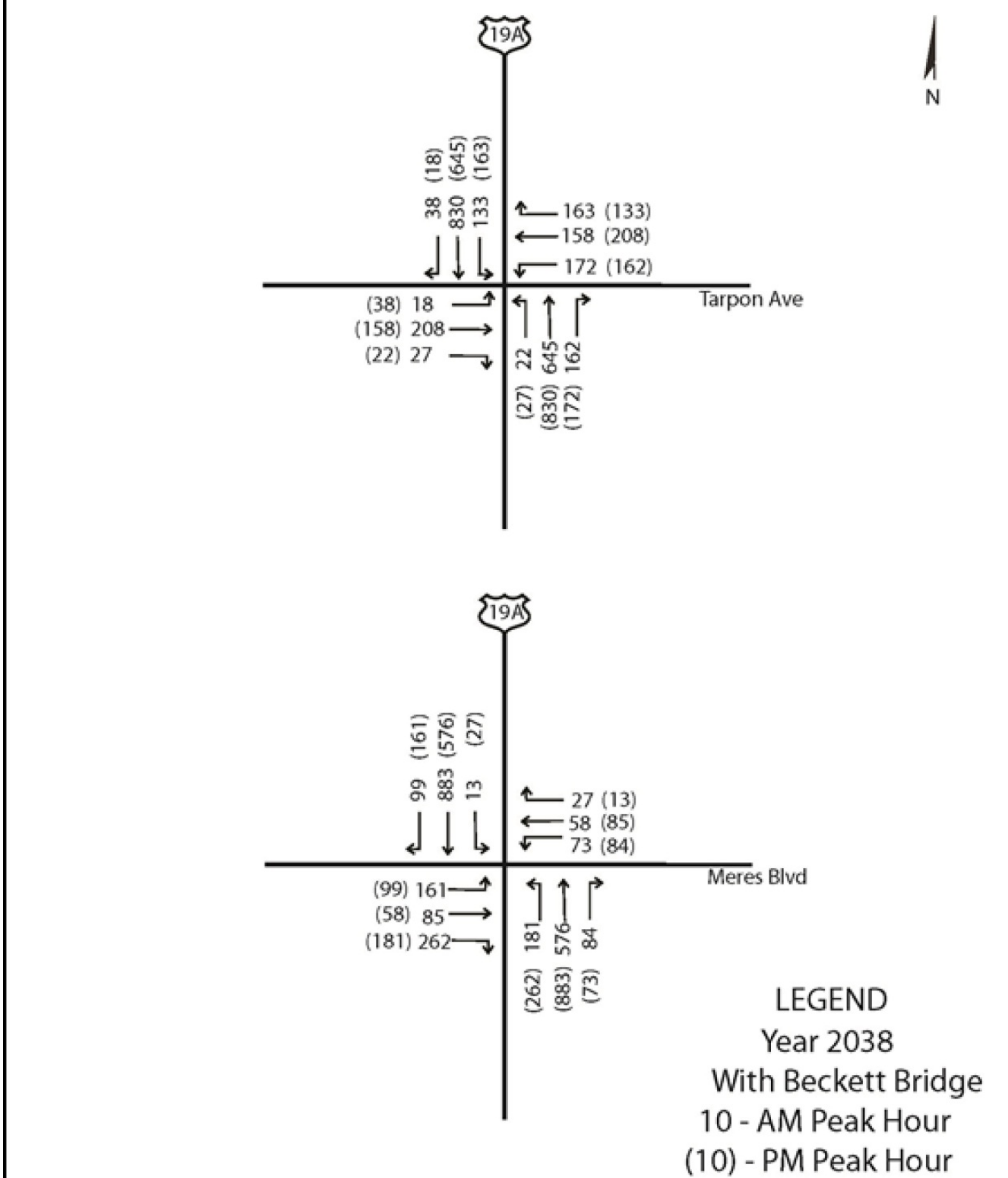


Figure 7-6 – Design Year (2038) Intersection Peak Hour Volumes

Table 7-1 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS D overall during the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the Opening Year (2018) analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour. Additionally, the northbound approach is projected to operate at LOS E in the a.m. peak hour.

Table 7-1 – Design Year (2038) Signalized Intersection Peak Hour Level of Service Recommended Alternative

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	45.6	D
	Southbound	995	764	23.9	C	18.0	B
	Eastbound	508	338	49.1	D	39.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	**49.3**	**D**	**36.9**	**D**
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	**31.1**	**C**	**52.3**	**D**

Design Year (2038) Arterial Analysis

An arterial analysis was conducted for the Design Year (2038) using the capacities provided in the 2009 FDOT Quality/LOS Generalized Tables. An arterial analysis was conducted for the Design Year (2038) using the capacities provided in the 2009 FDOT Quality/LOS Generalized Tables. Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 7-2** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 7-2 – Design Year (2038) Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	392	C
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	540	C
Tarpon Drive (North of Gulf Road)	2U	630	91	B
Florida Avenue (South of Gulf Road)	2U	630	252	B
Meres Boulevard (West of Woodmont Drive)	2U	630	296	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	564	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS.

7.4 Right-of-Way Needs and Relocations

The proposed bridge replacement and associated roadway improvements will be constructed within the County’s right-of-way. Construction of the proposed bridge will not require acquisition of any additional right-of-way and will not result in the relocation of any residences or businesses.

7.5 Cost Estimates

The cost estimate for the Recommended Alternative is provided in **Table 7-3**. The estimates were based on the following:

- FDOT Structures Design Guidelines, Chapter 9-Bridge Development Report (BDR) Cost Estimating
- Historical Unit Prices for Similar Projects
- Conceptual Quantities

Table 7-3 – Estimated Construction Costs

	Recommended Alternative Low-Level Movable Bridge
Construction	$7.92 M
Mobilization	$0.792 M (10%)
Maintenance of Traffic	$0.792 M (10%)
Aesthetic Enhancements	$0.792 M (10%)
Contingency	$1.58 M (20%)
Construction Total	**$11.87 M**
Design	$1.78 (15%)
CEI	$1.78 (15%)
Post Design	$0.36 M (3%)
Right-of-Way	N/A
Project Total	**$15.8 M**

Construction cost estimates are based on the baseline structure. Contingencies were added in accordance with engineering judgment and experience. Contingencies account for miscellaneous items that are not quantifiable at the conceptual design stage. A percentage of the basic construction costs were calculated to account for mobilization, maintenance of traffic, contingencies, design and construction engineering and inspection (CEI). Mobilization costs were estimated as 10% of construction. Maintenance of traffic costs were estimated as 10% of construction. A 20% contingency was assumed for the Recommended Alternative, a replacement movable bridge, assuming ABC methods. This percentage was applied due to the complex nature of movable bridge design and construction.

Design and CEI costs were each estimated to be 15% of construction costs. All estimates need to be adjusted for inflation based upon the schedule of implementation. It is recommended that construction cost estimates be adjusted to the midpoint of construction when programming funds. Detailed cost estimates are provided in **Appendix H**.

Cost estimates for the Recommended Alternative assume Level Two Aesthetics, as defined in the *FDOT PPM* (Section 26.9.4, January 1, 2012 edition). An additional 10% of the construction costs have been included to account for aesthetic enhancements. Aesthetic enhancements may include concrete surface finishes, decorative railings, light poles, light fixtures, architectural features of the control house, landscaping and/or hardscaping features. An "Aesthetic Committee", which will include members of the community and local governments, will address the aesthetics of the bridge design during the Design Phase of the project.

7.6 PEDESTRIAN AND BICYCLE FACILITIES

The proposed replacement bridge will provide six foot wide sidewalks and 5.5 foot wide shoulders on both sides of the bridge. The shoulders will function as undesignated bicycle lanes for experienced cyclists. These facilities will be continued on the approach roadways east of the existing bridge. West of the proposed bridge, the six foot sidewalk on the south side will be eliminated because of right of way constraints. Construction of a sidewalk in this area would require acquisition of property from the Bayshore Mobile Home Park. It is anticipated that if the existing mobile home park is redeveloped in the future, sidewalks could be added. These improvements will provide safer bicycle and pedestrian facilities on the bridge and approach roadways. The proposed sidewalk approaching the western terminus of the bridge will be tapered to transition to the narrower roadway section. Signs will be installed which clearly indicate that the sidewalk will end.

No officially designated County or regional pedestrian or bicycle trails cross the Beckett Bridge. However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

7.7 UTILITY IMPACTS

Knology Broadband of Florida, Bright House Networks, Progress Energy Florida, Verizon, and the City of Tarpon Springs operate utilities within the project area. Knology Broadband has aerial coaxial cables entering the project area along Spring Boulevard on the east side of the bridge and along Riverside Drive on the west side of the bridge. These Knology cables are co-located on Progress Energy utility poles. Spurs of the aerial coaxial cables extend along Chesapeake Drive from Doric Court to the Bayshore Cove Mobile Park, and along Forest Avenue from North Spring Boulevard to High Street. In addition, a Knology broadband underground coaxial cable is located adjacent to the Tarpon Springs Yacht Club along the north side of Spring Boulevard.

City of Tarpon Springs wastewater force mains are located along Riverside Drive. A six inch force main is located on the south side of the bridge and a 12 inch force main is located on the north side of the bridge; however, these mains are located outside of the bridge fender system. A pump station is located on the north side of Riverside Drive at Chesapeake Drive. No other City utilities occur within the project limits.

Utilities will be located more precisely during the Design phase of the project and coordination with utility owners will continue. Depending on the location and depth of the utilities, construction of the proposed project may require adjustment of some of these facilities. Since no construction will occur outside of existing right-of-way, relocation or adjustment of most utilities located outside the existing County right-of-way is not anticipated. Cost for relocation or adjustment of activities is not included in the cost estimates prepared for the project since most are anticipated to be incurred by the utility owner. It is not anticipated that the proposed project will impact the existing City of Tarpon Springs Force Main.

7.8 TEMPORARY TRAFFIC CONTROL PLAN

Construction of a replacement bridge will require approximately 18 months of work at the project site. Initial work will be performed while the route remains open to traffic. During this period of approximately four months, work will be performed at the site that may require disruptions to traffic, including lane closures and short-term, off peak hour, road and/or sidewalk closures. These disruptions will be necessary to move equipment and materials to and from the site and to perform demolition and construction activities outside of the travel way.

Following this initial work phase, the majority of the demolition and construction work will be performed during a full detour of approximately 12 months. **Figure 7-7** illustrates the proposed detour route alternatives which were evaluated during the PD&E Study. Details of this evaluation are provided in Section 5.0 of this report. The alternative detour routes include the following:

- Whitcomb Boulevard - traffic diverted using Whitcomb Boulevard/South Spring Boulevard around Whitcomb Bayou - a distance of approximately 2.5 miles.
- Meres Boulevard - traffic diverted using Meres Boulevard from Alternate US 19 to Florida Avenue
- Klosterman Road-Carlton Road-Curlew Road - traffic diverted from Alternate US 19 using Klosterman Road, Carlton Road, and Curlew Road to Florida Avenue.

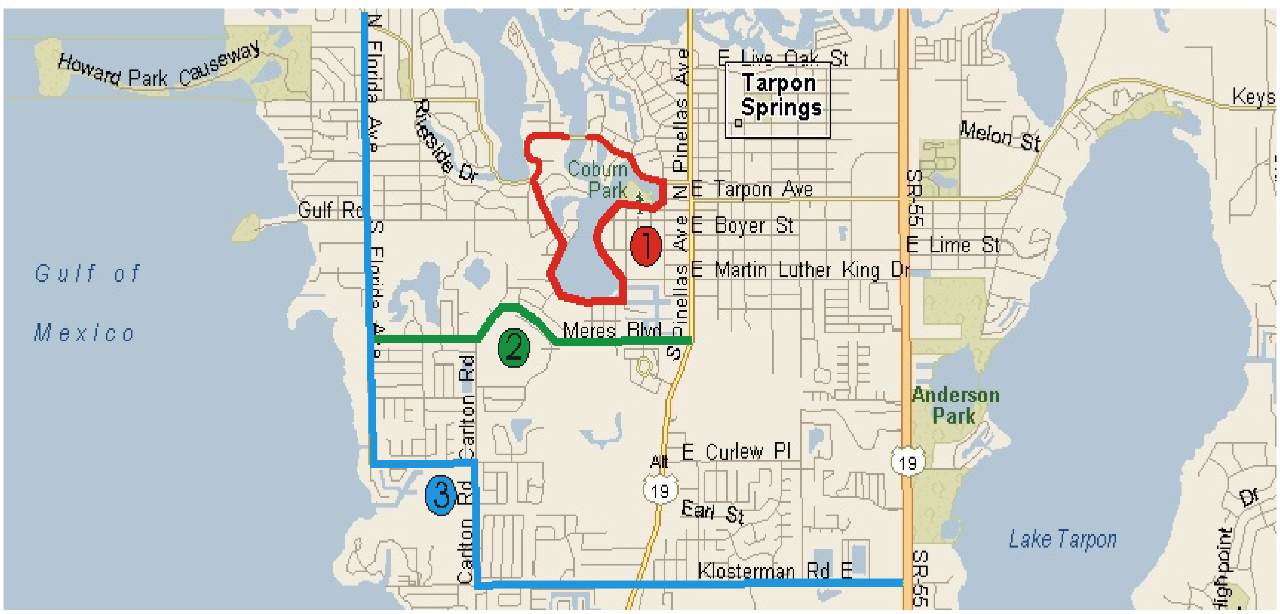


Figure 7-7 – Detour Routes

Upon completion of the detour period the new bridge and roadway will be reopened to traffic. However, construction activities, including commissioning and testing of the movable span will still be required. During this period of approximately two months some single lane closures and/or short-term, off-peak hour closures may be required to test the operation of the new movable span, deliver materials and perform work outside of the travel way.

Throughout construction, barge mounted construction equipment, delivery barges, and supporting tugs and skiffs may occupy part of the waterway. Operations in the water will be coordinated with the USCG. Temporary restrictions to navigation will be required to perform the construction work. Such work will be conducted in accordance with the requirements established by the USCG and published via a Notice to Mariners.

It should be noted that a comparison of the TBRPM origin/destination traffic patterns with and without the Beckett Bridge showed that none of the existing or future traffic traveling across the bridge would redistribute using the Klosterman Road-Carlton Road-Curlew Road alternative. In addition, this route is the longest and most circuitous of the alternatives, at approximately 2.75 miles in length. For these reasons, this alternative was eliminated from further consideration.

Results of the analysis indicate that in the event of closure of the Beckett Bridge, reassigning traffic to Whitcomb Boulevard would increase congestion on this roadway to failing levels of service (LOS F). Conversely, if the traffic was rerouted via Meres Boulevard, then the study area roadways are anticipated to continue to operate at acceptable levels of service with the additional traffic.

Based on these results, it is recommended that the detour route for the project occur along Meres Boulevard. Detour signage, including the use of Intelligent Transportation Systems (ITS), specifically electronic message panels, should be placed well in advance of the route location along Florida Avenue and Alternate US 19 (at a minimum). Additional electronic signage may also be needed at key locations throughout the neighborhood surrounding the Beckett Bridge and should provide (if at all possible) real-time information regarding potential delays on the route.

It should be noted that portions of Alternate US 19 operate at LOS F under either scenario, as well as the detour alternatives, in both the Opening Year (2018) and Design Year (2038). However, this corridor has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the project.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signs will be used as appropriate to provide notice of detours, lane closures and other pertinent information to the traveling public. The local news media will be notified in advance of detour lane closings and other construction-related activities, which could excessively inconvenience the community.

7.9 DRAINAGE

The existing drainage system within the project limits is predominantly sheet flow along the Riverside Drive roadway to Whitcomb Bayou/Spring Bayou which outfalls to the Anclote River. The existing Beckett Bridge discharges directly to the Whitcomb Bayou/ Spring Bayou via scuppers and at the bridge approaches. Currently no existing stormwater management facilities are located within or adjacent to the project limits.

Based on meetings with Southwest Florida Water Management District (SWFWMD) staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required.

Conceptual drainage proposed for the Recommended Alternative will include the installation of scuppers for bridge deck drainage as well as a curb and gutter drainage system along the roadway east and west of the bridge. The roadway currently has no stormwater management system in place, so the proposed curb and gutter drainage system may help lessen reported flooding along portions of the roadway. The proposed system will convey collected stormwater runoff from the roadway to the tidal Whitcomb Bayou in the vicinity of the bridge.

During the Design phase, the proposed drainage system for this project will be designed in accordance with the FDOT and Pinellas County drainage standards and procedures to carry stormwater runoff away from the roadway. If water quality treatment is required by the SWFWMD, the possibility of providing compensatory off-site treatment will be further explored (during the Design phase). Other treatment options, including stormwater ponds along the corridor, are limited. All discharge piping that leads to Whitcomb Bayou will be equipped with approved Manatee Exclusion Devices, as described in a February 2011 information circular developed by the Florida Fish and Wildlife Conservation Commission. Preliminary drainage calculations for the proposed improvements are included as **Appendix I**.

7.10 BRIDGE ANALYSIS

The proposed replacement bridge is a low-level bridge with a movable span over the navigation channel. The total length of the proposed new bridge is 360 feet. The bridge includes a 123-foot long east approach, 152-foot long west approach, and an 85-foot long bascule span.

The maximum proposed grades on either end of the bridge are five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore MHP, the Tarpon Springs Yacht Club and Venetian Court to allow connection of these driveways with minimal re-grading. Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues.

A continuous superstructure, from abutment to movable span, is proposed for the approach spans to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the prestressed slab unit spans are bents or piers supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

A single-leaf rolling-lift bascule span, with an underdeck counterweight (deck girder configuration with the girders and counterweight located below the deck), is proposed for the movable span. The proposed configuration is similar to that of the existing bridge. The bascule leaf rotates about a horizontal axis located on one side of the channel and rolls back on a track as it opens to provide unlimited vertical clearance over the channel with the leaf in the fully open position. The proposed movable span will provide 7.8 feet of vertical clearance at the fenders (in the closed position) and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. (Vertical clearance is measured at the lowest point of clearance within the navigation channel. The low point is located at the side of the channel closest to the bascule pier, directly above the fender system that marks the channel limits.) The bascule leaf will consist of steel main girders, floor beams, stringers, and a solid surface deck. The counterweight will consist of concrete with steel ballast blocks for balancing the leaf. The bascule pier will be supported by prestressed concrete piles or drilled shafts and feature concrete pier walls to enclose the machinery and counterweight. The rest pier, which supports the tip of the bascule span when in the fully closed position, will be similar to the other bents or piers.

The new movable bridge will feature traffic control safety devices that are required for movable bridges. These elements include traffic signals and traffic warning gates on both approaches and a resistance barrier gate on the rest pier side of the bascule span. The bridge will also feature a fender system equipped with standard navigation lights and clearance signs.

The bridge, which crosses Whitcomb Bayou, is not required to be designed to resist vessel impact. The low member vertical clearance of the proposed bridge is less than eight feet with the bascule span in the closed position. There is no evidence that the existing vertical clearances of the fixed approach span and movable span (6-feet) are not sufficient for current marine usage, or that the type and number of vessels using the bayou will change dramatically in the future. There are no commercial marinas present in Whitcomb Bayou.

Wave Vulnerability: According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D. Max Sheppard and William Miller Jr., September 2003,* the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation. It is anticipated that wave heights at the bridge during a coastal storm event would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves. In addition, the presence of topographical features, including numerous adjacent residential buildings and trees reduce wind velocities at the surface of the water. The Beckett Bridge is important for evacuation during a storm event. Although it is not considered a designated emergency evacuation route, it is considered an extension of Tarpon Avenue, which is a designated emergency evacuation route. The proposed bridge, while non-critical, and therefore not required to be designed for wave forces, should be designed with consideration for reducing the potential effects of wave action.

7.11 NAVIGATION

The existing bridge crosses a narrow channel of Whitcomb Bayou. The bridge provides approximately six feet of vertical clearance at the fenders, and approximately 25 feet of horizontal clearance between the fenders. A USCG bridge permit will be required for construction of the proposed replacement single-leaf movable bridge. The USCG is a cooperating agency for this project. Coordination concerning navigational issues has been ongoing throughout the PD&E Study.

The proposed replacement bridge will be constructed on approximately the same alignment as the existing bridge and provide approximately 7.8 feet of vertical clearance in the closed position at the fenders, slightly more than the existing bridge. In the open position, unlimited clearance will be provided between the fenders. This is an improvement to the existing condition since the bascule leaf currently does not open fully and unlimited clearance is not provided for the entire width of the channel. The proposed horizontal clearance is the same as the existing bridge, 25 feet. Construction of the replacement bridge will not adversely impact navigation in the channel.

7.12 ENVIRONMENTAL IMPACTS

Detailed studies and evaluations were conducted to determine the potential for adverse impacts associated with construction of the proposed improvements to the Beckett Bridge. Baseline data, evaluation criteria and the results of these studies are contained in the project files and published separately in the following reports or technical memoranda: Air Quality Technical Memorandum, NESHAP Asbestos and Protective Coatings Survey Report, Contamination Screening Evaluation Technical memorandum, Noise Study Report, Biological Assessment Technical Memorandum, Wetland Evaluation/Essential Fish Habitat Technical Memorandum, Cultural Resources Assessment Survey Report, Section 106 Determination of Availability, Section 106 Case Study Report, Programmatic Section 4(f) Document.

It is anticipated that environmental impacts associate with the Recommended Alternative will be minimal, except for adverse impacts to the historic bridge. The following summarizes anticipated impacts associated with the Recommended Alternative. The Type II Categorical Exclusion Determination Form, published separately, provided a detailed analysis of potential impacts and addresses agency comments and concerns expressed in the ETDM Program Summary Report.

7.12.1 Social and Economic Impacts

Land Use: Land use patterns are established in the vicinity of the project and not expected to change substantially over the next few years. The proposed improvements will not require acquisition of additional right-of-way. Replacement of the functionally obsolete bridge in the same location with a similar movable bridge will have minimal impact on land use in the area. The proposed project will not adversely impact the cohesion of the communities in the vicinity of the bridge.

Community Resources: Community services, including those providing emergency services located within approximately 1.5 miles of the project include two fire stations, one police station, one hospital, five religious institutions, and five schools. In addition, the Pinellas County Health Department operates a health center within the City of Tarpon Springs, located approximately 1.2 miles from the Beckett Bridge.

Replacement of the existing bridge will have a positive impact on access to community resources. The existing bridge is currently load posted. School busses and large emergency vehicles are prohibited from crossing the bridge. Six public schools are located within three miles of the Beckett Bridge. According to the Route and Safety Auditor for the Pinellas County School Board, if the bridge were rehabilitated or replaced, school bus traffic would be re-routed to travel along Spring Boulevard/Riverside Drive and cross the Beckett Bridge. Approximately 15 to 20 school busses per day could potentially use the bridge. The detour results in additional costs for busses that service schools in the vicinity of the project. The proposed replacement bridge would result in a cost savings for operation of school busses in the community.

Traffic will be detoured during construction of a replacement bridge, if selected as Preferred Alternative. Two detour routes are proposed, the longest is approximately 2.75 miles. Emergency response times could be affected for some areas in the immediate vicinity of the bridge while the detour is in effect

7.12.2 Impacts to Cultural Resources

Section 4(f): Marked and unmarked paddle trails are identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. One unmarked trail begins in Spring Bayou at Craig Park, just south of the Beckett Bridge. The trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico. Access to navigational opportunities will be maintained to the greatest extent possible during construction. No impacts to this unmarked trail will result by replacement of the Beckett Bridge with the proposed new movable bridge.

Whitcomb Bayou is located within the Pinellas County Aquatic Preserve. The proposed project will be constructed within the existing Pinellas County transportation right-of-way which is designated for transportation. An Environmental Resource Permit, a USCG bridge permit and a Section 10/Section 404 permit will be required from the USACOE. Compliance with all requirements and conditions of these permits will ensure that potential impacts to water quality, fish and wildlife are avoided or minimized. The proposed project will not cause any proximity impacts that would permanently impair or diminish the Pinellas County Aquatic Preserve resources' attributes which qualify the preserve for protection under the provisions of Section 4(f).

The existing historic bridge was determined to be eligible for listing in the National Register of Historic Places (NRHP). Since the bridge will be demolished, a Programmatic Section 4(f) Evaluation was prepared to evaluate avoidance alternatives and minimization of impacts. Mitigation to offset the impacts to this resource are outlined in the Evaluation and in the Memorandum of Agreement (MOA) among SHPO, FHWA, FDOT and Pinellas County. The conclusion of Programmatic Section 4(f) Evaluation is that the provisions of Section 4(f) and 36 CFR Part 8—will be fully satisfied.

Historic and Archaeological Sites: A CRAS was conducted for this study. The results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013. No archaeological sites were newly identified within, or adjacent to, the project corridor during the current survey. No previously recorded archaeological sites were located within the archaeological APE.

This survey resulted in the identification of 16 newly recorded historic resources within the APE including one bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, 8PI2069). One of these newly recorded historic resources, Beckett Bridge (8PI12017), was determined to be eligible for listing in the NRHP by FHWA and SHPO. The remaining resources (8PI12043-

8PI12055, 8PI12068, 8PI12069) are considered ineligible for listing in the NRHP as individual historic resources or as contributing resources to a historic district.

A Cultural Resource Committee (CRC) was established to address Section 106 issues and conduct good faith consultation with affected parties. After consideration of a detailed evaluation of rehabilitation alternatives described in Section 6 of this document, SHPO stated that ample evidence had been provided to support that a new movable bridge would be preferable to rehabilitation.

A Section 106 Case Study Report was prepared to document the impacts to the historic resource. A Section 106 MOA among SHPO, FHWA, FDOT and Pinellas County which specifies conditions required to mitigate for the adverse impacts resulting from demolition of the existing bridge was prepared. This MOA is included in the Programmatic 4(f) Evaluation and in Appendix J of this document.

This MOA requires the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. In addition, the following mitigation measures are included:

The replacement bridge will be a single-leaf, rolling lift bridge type of similar design and scale. However, other aesthetic elements of the bridge will be determined by an aesthetics committee that will be assembled during the Design phase. This committee will include representatives of the community and local governments, including the Tarpon Springs Historical Society.

- Pinellas County will ensure representative, significant engineering elements from the Beckett Bridge will be identified and salvaged. These elements may be incorporated into the design of the new bridge. The reuse of these historic elements will be determined by Pinellas County in coordination with the aesthetics committee and will not require consultation with FDOT, FHWA or SHPO. If during construction it is determined that the existing bridge elements are not salvageable for reuse into the design of the new bridge, Pinellas County will salvage a few intact elements for display in a location identified by Pinellas County and within the vicinity of the new bridge.

- Pinellas County will ensure that the existing historic bridge plaque will be removed and stored in an area protected from human and natural damage until it can be incorporated into the new control house that will be constructed as part of the new bridge. The bridge plaque will be placed on the new control house so that it is visible to pedestrians.

- Pinellas County will ensure that information regarding the Beckett Bridge, which is suitable for inclusion in a "public-facing website for project information and educational purposes" and/or suitable for use on a mobile device, such as "What Was There" or "Next Exit History", is developed. This information will provide a historic account of the bridge to educate the public on its history.

7.12.3 Impacts to Natural Resources

Wetlands: The proposed project will impact approximately 0.01 acre of mangrove swamp and 0.02 acre of oyster bars. No seagrass beds will be impacted. The wetlands within the project study area impacted by the proposed improvements were assessed using the Uniform Mitigation Assessment Methodology (UMAM) per Chapter 62-345, FAC. Based on meetings with regulatory agencies, it is anticipated that mitigation for these impacts will not be required. However, if mitigation is required by one of the reviewing agencies, "in-kind" mitigation at the project site may not be a feasible option due to the limited ROW and surrounding developments. Therefore, an "out-of-kind" mitigation option, such as water quality improvements, may be requested during the design and permitting phases of this project. Any proposed mitigation will be coordinated with the NMFS, FWS, and the SWFWMD during the Design phase.

Water Quality: A Water Quality Impact Evaluation (WQIE) was conducted in accordance with the FDOT PD&E Manual. The WQIE checklist is included in **Appendix E**. The project is located within the Pinellas County Aquatic Preserve which is an Outstanding Florida Water. Based on meetings with SWFWMD staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required.

The County will implement appropriate best management practices during construction to prevent water quality violations. An Environmental Resource Permit will be required for construction of the proposed project. The contractor will comply with all permit requirements and conditions related to water quality. Because the proposed new bridge does not provide any additional capacity, it is not anticipated that this project will have a substantial impact on water quality.

Floodplains: In accordance with the requirements set forth in 23 CFR 650A, the project corridor was evaluated to determine the effects, if any, of the proposed alternatives on the hydrology and hydraulics of the area.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Panel 19 of Map Number 12103C00196 (September 2003), the Beckett Bridge and immediate vicinity are located within the 100 year floodplain in designated Zone AE. The Base Flood Elevation established for Minnetta Bayou/ Spring Bayou is elevation 10 feet which is associated with coastal tidal surge conditions.

The proposed replacement bridge will be constructed in approximately the same location as the existing bridge to minimize impacts. There are no existing or proposed cross drains within the project limits. The proposed structure (replacement bridge) will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. Within the project corridor, the improvements to the existing Riverside Drive and Beckett Bridge represent transverse encroachments on the floodplain. This encroachment should remain at existing levels. As a result, the project will not affect existing flood heights or floodplain limits.

Cut and fill activities required as part of the roadway improvements are not expected to significantly impact the fauna, flora, and open space environments along the corridor. The project will not result in substantial adverse environmental impacts. The proposed project will not significantly change the risks or damages associated with roadway flooding. There will not be significant change in the potential for interruption or termination of emergency services or emergency evacuation routes. Therefore it has been determined that this encroachment is not significant.

The encroachments for the bridge will mainly involve modifications at the approaches to the bridges as well as incidental encroachments due to bridge modification or replacement activities, where applicable. Since the existing flood zones are associated with coastal surge, compensation for the floodplain impacts is not anticipated to be required by the regulatory agencies.

Coastal Zone Consistency: According to the ETDM Program Screening Tool Track Clearinghouse Projects Report for this project, the State of Florida has determined that this project is consistent with the Florida Coastal Zone Management Plan (FCMP). The State's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting process in accordance with Section 373.428, Florida Statutes.

Wildlife and Habitat: Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC). Project biologists made a finding of "no effect" for the southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. The FWC, by letter dated April 22, 2013 concurred with these determinations and supported the protected species commitments identified in the report which include the following:

1. Compliance with the USFWS "Standard Protection Protocols for the Eastern Indigo Snake" and paragraph E of the U.S. Army Corps of Engineers Eastern Indigo Snake Programmatic Key.

2. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.

3. Submission of a blasting plan (if blasting occurs), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.

4. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

5. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.
6. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

By letter dated June 12, 2013, the USFWS concurred with the Biological Assessment's determination that the project may affect, but is not likely to adversely affect the piping plover, is not likely to adversely affect the wood stork or eastern indigo snake, and will have no effect on federally listed plants. The USFWS further noted that there is no appropriate habitat for the piping plover, no suitable foraging habitat for the woodstork. In addition the Service states that no undisturbed upland habitat near the project that might support the eastern indigo snake or listed plants. Accordingly, the USFWS will not require implementation of the "Standard Construction Measures for the Eastern Indigo Snake".

USFW also stated that they will not be able to make an impact determination for the Florida manatee, gulf sturgeon or sea turtles until more specific information is available concerning construction. The timing and duration of construction, as well as construction methods, will determine the appropriate conditions to safeguard manatees and other aquatic species. Accordingly, Pinellas County has committed to continued coordination with the USFWS during the Design phase concerning potential impacts to these species.

Because of the constrained project location, it is not anticipated that blasting will be employed for demolition of the existing bridge. However, if blasting is proposed, the selected contractor will be required to submit a blasting plan which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.

The project study area is located within a designated FWS consultation area for the Florida scrub jay (*Aphelocoma coeruluscens*). Based on a review of available and field reviews, no scrub jay habitat is available within the project study area and no populations have been reported or observed. Therefore, no further scrub jay consultation with USFWS should be required for this project.

Essential Fish Habitat: Construction of the proposed project will not result in the loss of open water area designated as EFH. However, approximately 0.02 acre of oyster beds and 001 acre of mangroves will be impacted. Impacts to oyster beds will likely be temporary; live oysters can be relocated prior to construction and oysters may recolonize the area following construction. If required by conditions of the environmental permits or the USCG Bridge Permit, all permanent and temporary loss of these habitats will be mitigated. Accordingly, no populations of any of the 26 representative fish, shrimp, and crab species and the coral complex listed by the GMFMC are expected to be adversely affected by the proposed project.

By email dated, April 15, 2013, the NMFS stated that the essential fish habitat effect determinations presented in the Wetland Evaluation/Essential Fish Habitat technical memorandum appear to accurately reflect potential impacts to NMFS trust resources for the proposed bridge replacement. Given the relatively low quantity of impacts to fish habitats estimated for all the alternatives, NMFS also stated that they would be generally more inclined to accept appropriate off-site (but within the same drainage basin) "in-kind" mitigation, rather than "out-of-kind" mitigation for unavoidable project impacts. NMFS also requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed.

7.12.4 Physical Impacts

Noise: A noise study analysis was performed for this project following FDOT procedures that comply with Title 23 Code of Federal Regulations (CFR), Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. The evaluation used methodologies established by the FDOT and documented in the PD&E Manual, Part 2, Chapter 17 (May 2011). The prediction of traffic noise levels, with and without the proposed improvements (replacement of the Beckett Bridge), was performed using the FHWA's Traffic Noise Model (TNM-Version 2.5).

Twenty-seven noise sensitive sites, including 26 residential sites and one meeting room (Tarpon Springs Yacht Club) were identified. The existing (2012) traffic noise levels are predicted to range from 54.6 to 63.2 decibels on the "A" weighted scale (dB(A)), which are traffic noise levels that would not approach, meet, or exceed the Noise Abatement Criteria (NAC) at any of the evaluated noise sensitive sites. In the future without the proposed improvements (no-build), traffic noise levels were predicted to range from 55.8 to 64.4 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. In the future with the proposed improvements (build), traffic noise levels were predicted to range from 56.9 to 64.7 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. Additionally, when compared to the existing condition, traffic noise levels with the improvements are not predicted to increase more than 2.8 dB(A). As such, the project would not substantially increase traffic noise (i.e., an increase in traffic noise of 15 dB(A) or more).

Since future traffic noise levels with the proposed improvements are not predicted to approach, meet, or exceed the NAC at any of the noise sensitive sites or substantially increase, noise abatement measures were not considered. However, Pinellas County commits to review the project for any changes in land use during the Design Phase of the project to ensure that all noise sensitive sites that received a building permit prior to the project's Date of Public Knowledge (i.e., the date the environmental documentation is approved) have been evaluated. No construction or posted building permits were observed within the project limits during a land use survey that was performed on November 13, 2012.

Construction of the proposed project would result in temporary construction-related noise and vibration. It is anticipated that the application of the *FDOT Standard Specifications for Road and Bridge Construction* will minimize or eliminate this noise and/or vibration. Should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the Contractor, will investigate additional methods of controlling these impacts.

Land uses such as residential, offices, and parks are considered incompatible with highway noise levels exceeding the NAC. In order to reduce the possibility of new noise-related impacts, noise level contours were developed for the future improved roadway facility (see Section 6 of this NSR). These noise contours delineate the distance from the improved roadway's edge-of-travel lane to where 56, 66, and 71 dB(A) (the FDOT's NAC for Activity Categories A, B/C, and E, respectively) is expected to occur in the year 2038 with the proposed improvements. Local officials will be provided a copy of the Final NSR to promote compatibility between land development in the area and the project should it be selected as the Preferred Alternative and completed.

Air Quality: The US Environmental Protection Agency does not anticipate any negative air quality impacts relating specifically to the project. Pinellas County is currently designated to be an attainment area for all of the National Ambient Air Quality Standards (NAAQS). Accordingly, the transportation conformity requirements of the Clean Air Act are not applicable to the project. The proposed replacement two-lane bridge is not a capacity improvement.

The project alternatives were subjected to the FDOT's screening model, CO Florida 2004 (Version 2.0.5, which employs United States Environmental Protection Agency (USEPA)-developed software (MOBILE6 and CAL3QHC). This model is a carbon monoxide (CO) screening model that makes various conservative worst-case assumptions related to site conditions, meteorology, and traffic. The results of the screening analysis indicate that the greatest one- and eight-hour CO concentrations would be 6.1 and 3.7 ppm, respectively - levels that would not meet or exceed the NAAQS for this pollutant. Accordingly, the project "passes" the screening model. An Air Quality Technical Memorandum documenting the air quality screening analysis was prepared for this project and is available at the County offices.

Construction: Construction activities for the proposed improvements will have air, noise, water quality, traffic flow, and visual impacts for those residents and travelers within the immediate vicinity of the project. The air quality impact will be temporary and will primarily be in the form of emissions from diesel powered construction equipment and dust from demolition activities, embankment and haul road areas. Air pollution associated with the creation of airborne particles will likely be effectively controlled through the use of watering or the application of calcium chloride in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* as directed by the County Project Manager.

Noise and vibration impacts will be from the heavy equipment movement and construction activities, such as demolition, pile driving and vibratory compaction of embankments. Noise control measures will likely include those contained in FDOT's *Standard Specifications for Road and Bridge Construction*.

Water quality impacts resulting from erosion and sedimentation will likely be controlled in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* and through the use of Best Management Practices. Stormwater pollution prevention measures will likely be developed per FDOT standards and in accordance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signs will be used as appropriate to provide notice of detours, lane closures and other pertinent information to the traveling public. The local news media will be notified in advance of detour lane closings and other construction-related activities, which could excessively inconvenience the community.

A sign providing the name, address, and a contact telephone number will be displayed on-site to assist the public in obtaining immediate answers to questions and logging complaints about project activity. In general, the objective of the maintenance of traffic plan for the project will be to detour traffic away from the construction zone. No temporary roads or temporary bridges will be required.

Construction of the roadway may require minor excavation of unsuitable material (muck). Construction of the roadway will require placement of embankments, and use of materials such as lime rock, asphaltic concrete, and Portland cement concrete. Although not anticipated, if demucking is required, it will likely be performed in accordance with Section 120 of the FDOT *Standard Specifications for Road and Bridge Construction*. The removal of structures and debris will be in accordance with local and State regulatory agencies permitting this operation. The contractor is responsible for methods of controlling pollution on haul roads (if used), in borrow pits, other materials pits, and areas used for disposal of waste materials from the project. Temporary erosion control features, as specified in the FDOT's *Standard Specifications for Road and Bridge Construction*, Section 104, will likely consist of temporary grassing, sodding, mulching, sandbagging, hay bales, slope drains, sediment basins, sediment checks, artificial coverings, and berms.

Contamination: A Contamination Screening Evaluation Report (CSER) was prepared as part of the Beckett Bridge Pinellas County Study as required by FDOT's PD&E Manual, Part 2, Chapter 22 (revised January 17th, 2008) and in accordance with the Federal Highway Administration (FHWA) Technical Advisory T 6640.8a (dated October 30th, 1987). Consistent with this guidance and based on environmental records searches, land use surveys, field surveys and other screening methodologies cited within the PD&E manual, eight potential contamination sites were identified within the vicinity of the project corridor. Of the eight sites, six were identified as "No" contamination risk, one was identified as "Low" contamination risk, and one was identified as “Medium” contamination risk.

The “Low” risk site corresponds to the wooden structures (i.e., piles) immediately adjacent to the Beckett Bridge which could contain creosote and/or arsenic as preservatives. Should some or all of these piles require removal or disturbance during the construction period, they should be evaluated beforehand to verify the presence or absence of these substances. If these substances are present, precautions should be taken by the contractor to help prevent the leaching of creosote into the waterway or the generation of arsenic-containing dust.

The “Medium” risk site, Stamas Yacht, Inc., presents a contamination potential based on current and historical environmental records, however, the site is located a substantial distance from the existing Riverside Drive right-of-way and will not be impacted as part of the current project design. Accordingly, no further evaluation of these sites is recommended during the Design phase of the project unless changes are made to the project design that could potentially change the location or alignment of the bridge.

An asbestos survey of the Beckett Bridge structure was conducted as part of the PD&E Study. The purpose of this survey was to identify and sample suspect asbestos-containing materials (ACM) and heavy metals based protective coatings to provide information regarding the identity, location, condition and approximate quantities of these materials so that proper remediation and disposal methods can be evaluated.

The survey was conducted on April 29, 2012 by an Asbestos Hazard Emergency Response Act (AHERA) accredited inspector in general accordance with the sampling protocols established in Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) 763. Thirteen bulk samples were collected from four homogeneous areas of suspect ACM. No Asbestos Containing Materials were identified as a result of the survey. Three painted surfaces, suspected of containing heavy metal based paints, were observed during the survey and sampled. None of the sample results indicated that the paints were Lead Based Paint (LBP).

7.13 AESTHETICS AND LANDSCAPING

A Section 106 Memorandum of Agreement (MOA) was signed by the County, FDOT, FHWA and SHPO, which outlines mitigation and conditions required to offset the impacts of removing the historic Beckett Bridge. SHPO has requested that the design of the replacement bridge, in terms of engineering, be similar to the existing bridge. Accordingly, the MOA requires that the design consist of a single-leaf, rolling-lift bridge to preserve the character of the area. In addition, the MOA specifies that some elements of the existing bridge may be incorporated into the new bridge, or displayed in a location within the vicinity of the bridge. (The MOA is published separately for this project and is included in Appendix J.)

SHPO has agreed; however, that decisions regarding the specifics of the design, in terms of aesthetic elements, will be determined during the Design phase by an “Aesthetics Committee”. The committee will include members of the community, Tarpon Springs Historical Society and local government. The County has proposed a budget of ten percent of the construction cost for aesthetics for the replacement bridge.

8.0 SUMMARY OF PERMITS AND NAVIGATION

8.1 PERMITS

The ETDM screening process, Advanced Notification process and subsequent agency coordination provided opportunities for preliminary coordination with regulatory and commenting agencies during the PD&E study. EPA, USFWS, FDEP and USACE provided comments concerning the proposed project during the PD&E study. A meeting with SWFWMD was held to discuss preliminary drainage plans and requirements.

The USACE and the SWFWMD regulate impacts to wetlands and surface waters within the project study area. Other agencies, including the USFWS, NMFS, EPA and FWC, review and comment on environmental permit applications. In addition, the FDEP manages the use of sovereign submerged, state-owned lands and regulating stormwater discharges from construction sites. The USCG will require a Bridge Permit for the replacement bridge.

The following permits are anticipated to be required for construction of the Recommended Alternative.

- **US Coast Guard** – A Bridge Permit will be required. The proposed replacement bascule bridge will provide approximately 7.8 feet of vertical clearance at the fenders and a minimum of 25 feet of horizontal clearance between the fenders. There are no USCG bridge clearance guidelines for this waterway. The proposed design and navigation clearances have been coordinated with the USCG throughout the study.

- **Southwest Florida Water Management District (SWFWMD)** – Based on a meeting with SWFWMD staff, on November 13, 2012, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required. The meeting notes are included at the end of this section.

- **US Army Corps of Engineers** – It is anticipated that the project will qualify for a Nationwide Permit, or a combination of Nationwide Permits (Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act).

Chapter 253 Florida Statute states that authorization is required from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on, or over state-owned, sovereign submerged lands (state lands). The public; to maintain traditional uses, such as navigation and fishing; to provide maximum protection of all state lands; and to ensure that all private uses of state lands will generate revenue as just compensation for that privilege. The existing bridge is located within a Sovereign Submerged Lands Easement granted by the Board to the Pinellas County Board of County Commissioners on February 1, 1996. This easement authorized repairs of the existing FDEP, Division of State Lands has been delegated by the Board to manage the use of State Lands for the good of the bridge. It is likely that construction of a new bridge will require modification of this easement. This authorization will be obtained during the ERP permitting process.

40 CFR Part 122 prohibits point source discharges of stormwater to waters of the United States without an NPDES permit. Under the State of Florida's delegated authority to administer the NPDES program, construction sites that will result in greater than one acre of disturbance must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, FAC, or an individual permit issued pursuant to Chapter 62-620, FAC. A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices (i.e. best management practices) that will be used to reduce the potential for pollutant discharges during construction.

8.2 AVOIDANCE, MINIMIZATION AND MITIGATION

During the evaluation of the alternatives and selection of the Recommended Alternative, avoidance and minimization of environmental impacts was a major consideration. Issues of special concern include natural resources (mangroves and other wetlands, wildlife and habitat), socioeconomic impacts (right-of-way acquisition, noise and access to community resources, impacts to navigation and motorists), cultural resource impacts (NRHP eligible site and recreational lands), cost, and construction time frames.

Construction of a new bridge on an alignment north or south of the existing bridge would result in additional wetland impacts and additional right-of-way impacts. The Recommended Alternative consists of construction of a replacement bridge on approximately the same alignment as the existing bridge. Detouring traffic for the duration of construction is proposed. Accordingly, phased construction – which could result in additional impacts – will not be required. Reduction in the width of the typical section was also considered to minimize environmental impacts. Eleven-foot wide travel lanes are proposed, rather than 12-foot wide lanes.

Retaining walls are proposed at the bridge approaches to minimize and avoid right-of-way and wetland impacts. The proposed design will include piers spaced further apart than the existing pile bents. Accordingly, an overall reduction in the footprint of the structure on the bay bottom may result, depending on final design.

8.2.1 Best Management Practices

Construction related impacts to wetlands and water quality will be avoided and minimized to the maximum extent practical through the use of Best Management Practices and erosion control methods found in the latest edition of FDOT's *Standard Specifications for Road and Bridge Construction.* Wetland areas that are not permitted to be impacted will be delineated in the field and staked silt fence will be used to protect these areas. Delineation of wetland areas within the project corridor will be shown on final construction plans.

Construction areas will be contained in turbidity curtains and the project will follow all general and specific regulatory permit conditions regarding turbidity during construction. Final plans will also include a Stormwater Pollution Protection Plan that shows the locations of the turbidity curtains and silt fence.

8.2.2 Protected Species Minimization Measures

A Biological Assessment was prepared for the project and coordinated with the US Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC). Project biologists made a finding of "no effect" for the Southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. The FWC, by letter dated April 22, 2013 concurred with these determinations and supported the protected species commitments identified in the report. The following commitments will minimize potential adverse impacts to protected wildlife species in the project area.

1. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.

2. Submission of a blasting plan (if blasting occurs), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.

3. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

4. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

5. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

By letter dated June 12, 2013, USFWS stated that they will not be able to make an impact determination for the Florida manatee, gulf sturgeon or sea turtles until more specific information is available concerning construction. The timing and duration of construction, as well as construction methods, will determine the appropriate conditions to safeguard manatees and other aquatic species. Accordingly, Pinellas County has committed to continued coordination with the USFWS during the design phase concerning potential impacts to these species.

8.2.3 Mitigation

Wetlands

Mitigation through Chapter 373.4137, F.S. (i.e., Senate Bill, 1986) is not available for this project because FDOT is not the applicant. A review of the available data from FDEP and the water management districts indicates that the proposed project currently is not located within the service area of any permitted mitigation banks. Accordingly, if mitigation is required, unavoidable wetland impacts will have to be mitigated by creating, restoring, enhancing, or preserving wetlands on-site or off-site within the same drainage basin if there are no mitigation opportunities at the project site.

Anticipated wetland impacts to mangroves and oyster beds are minimal. No seagrass beds will be impacted. Utilizing the calculated wetland impact acres and the existing condition UMAM scores, the proposed construction will result in 0.003 to 0.005 units of wetland functional loss. Mitigation is not anticipated to be required by the SWFWMD since the project should qualify for a general permit. It is also anticipated that the project will qualify for a nationwide permit from the USACOE. However, if regulatory policies or preliminary determinations change during the design phase and mitigation is required, "in-kind" mitigation at the project site may not be a feasible option due to the limited ROW and surrounding developments. Therefore, an "out-of-kind" mitigation option, such as water quality improvements, may be requested during the design and permitting phase of this project. Any proposed mitigation will be coordinated with the NMFS, FWS, and the SWFWMD during the design phase.

Historic Resources

Mitigation is required for demolition of the NRHP eligible Beckett Bridge. A Memorandum of Agreement (MOA) among SHPO, FHWA, FDOT and Pinellas County was prepared to address appropriate mitigation of the historic bridge. This MOA includes the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. In addition, the following mitigation measures, recommended by the CRC are included:

- The replacement bridge will be a single-leaf, rolling-lift bridge of similar design. However, other aesthetic elements of the bridge will be determined by an aesthetics committee that will be assembled during the design phase. This committee will include representatives of the community and local governments, including the Tarpon Springs Historical Society.

- Elements of the old bridge will be salvaged and incorporated into the design of the new bridge. The specifics of the design will be determined by the aesthetics committee and community during the design phase.

- There is an existing historic marker or plaque on the current bridge which includes the date the bridge was erected and names of Pinellas County Commissioners at that time. This historic plaque will be incorporated into a new plaque or monument which provides some "bullet history" of the bridge. In lieu of an actual 'monument", the new plaque or marker could be attached to the control house so that it could be seen by pedestrians crossing the bridge.

- Information will be prepared which is suitable for the existing "NextExitHistory" and "Whatwashere" Apps. These are free Apps that use gps technology to identify the location of the historic site relative to the App user's location.

THIS FORM IS INTENDED TO FACILITATE AND GUIDE THE DIALOGUE DURING A PRE-APPLICATION MEETING BY PROVIDING A PARTIAL "PROMPT LIST" OF DISCUSSION SUBJECTS. IT IS NOT A LIST OF REQUIREMENTS FOR SUBMITTAL BY THE APPLICANT.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT RESOURCE REGULATION DIVISION PRE-APPLICATION MEETING NOTES	FILE NUMBER: PA 399655

Date: **Time:** **Project Name:** **Attendees:**	11/13/2012 10:00 AM Beckett Bridge Richard Alt, Joe Andress, Julie Brennan, Pinellas County, 727-464-3946, Ann Venables, Robert Johnson, Tony Horrnik jbrennan@co.pinellas.fl.us		
County: **Total Land Acreage:**	Pinellas 3.5 acres	**Sec/Twp/Rge:** **Project Acreage:**	11, 12/27/15 3.5 acres

Prior On-Site/Off-Site Permit Activity:

- Existing drawbridge

Project Overview:

- Upgrade bridge – three scenarios, final design based on public input
- Low level – could qualify for N.G. permit 40D-400.443 – no drainage issues
- Mid level – ERP General permit for new road area

Environmental Discussion: (Wetlands On-Site, Wetlands on Adjacent Properties, Delineation, T&E species, Easements, Drawdown Issues, Setbacks, Justification, Elimination/Reduction, Permanent/Temporary Impacts, Secondary and Cumulative Impacts, Mitigation Options, SHWL, Upland Habitats, Site Visit, etc.)

- Provide the limits of jurisdictional wetlands.
- Surface water/wetlands limits at replacement of bridge will be the existing seawall.
- Provide appropriate mitigation using UMAM for impacts, if applicable.
- Demonstrate elimination and reduction of wetland impacts.
- Maintain minimum 15 foot, average 25 foot wetland conservation area setback or address secondary impacts.
- Add manatee exclusion devices where necessary.

Site Information Discussion: (SHW Levels, Floodplain, Tailwater Conditions, Adjacent Off-Site Contributing Sources, Receiving Waterbody, etc.)

- Existing road.
- WBID 1440A – impaired for nutrients
- OFW
- No floodplain issues (hurricane surge only)

Water Quantity Discussions: (Basin Description, Storm Event, Pre/Post Volume, Pre/Post Discharge, etc.)

- Discharges to an infinite basin (Whitcomb Bayou); attenuation not necessary.

Water Quality Discussions: (Type of Treatment, Technical Characteristics, Non-presumptive Alternatives, etc.)

- Provide water quality treatment for new road.
- In addition, must provide a net environmental improvement.
- Applicant must demonstrate a net improvement for the parameters of concern by performing a pre/post pollutant loading analysis based on existing land use and the proposed land use.
- Will acknowledge compensatory treatment to offset pollutant loads associated with portions of the project area that cannot be physically treated (Venetian Court).

Sovereign Lands Discussion: (Determining Location, Correct Form of Authorization, Content of Application, Assessment of Fees, Coordination with FDEP)

- May have to adjust existing easement due to lane widening.
- Title determination for the project will be required.

Operation and Maintenance/Legal Information: (Ownership or Perpetual Control, O&M Entity, O&M Instructions, Homeowner Association Documents, Coastal Zone requirements, etc.)

- The permit must be issued to the county
- Provide detailed construction surface water management plan.

Application Type and Fee Required:

- Notice General Construction ERP – Sections A and B of the ERP Application - $250
- General Construction ERP – Sections A, C and E of the ERP Application.
- < 10 acres of project area and < 5000 sf of wetland or surface water impacts - $1456.00

Other: (Future Pre-Application Meetings, Fast Track, Submittal Date, Construction Start Date, Required District Permits – WUP, WOD, Well Construction, etc.)

-

Disclaimer: The District ERP pre-application meeting process is a service made available to the public to assist interested parties in preparing for submittal of a permit application. Information shared at pre-application meetings is superseded by the actual permit application submittal. District permit decisions are based upon information submitted during the application process and Rules in effect at the time the application is complete.

9.0 SUMMARY OF PUBLIC INVOLVEMENT

A project specific Public Involvement Program was implemented for this PD&E study. The program identified the key stakeholders and recommended activities to inform and solicit input from the community. Opportunities for community, stakeholder and agency input were provided throughout the duration of the study. A stakeholders' mailing list, which included property owners, local government staff and officials, agency representatives, special interest groups and other interested parties was maintained and updated throughout the study. More detailed information, including copies of all newsletters, handouts, meeting materials and comments received from the public are available in the *Comments and Coordination Report*, published separately.

This section documents public involvement efforts to date. It will be updated in the Final PER.

9.1 PROJECT WEBSITE

A project specific web page was established on the Pinellas County website (pinellascounty.org\beckettbridge.com) at the beginning of the study to provide updated information about the project and upcoming public meetings for the duration of the study. Comments and questions can be forwarded to the project team by email via the contact page on the website. Visitors to the website are also invited to email, write or call the County Project Manager with questions or concerns. The project schedule, newsletters, and meeting exhibits are posted on the website.

9.2 NEWSLETTERS

A newsletter was prepared and mailed with the invitation to the January 23, 2013 Alternatives Public Workshop.

9.3 AGENCY AND LOCAL GOVERNMENT COORDINATION

9.3.1 Efficient Transportation Decision Making (ETDM)/Advanced Notification (AN)

FDOT District Seven initiated the ETDM screening phase of the project. This process initiated early coordination with all Environmental Technical Advisory Team (ETAT) members. The process began with distribution of the Advanced Notification (AN) in October 2010. The *ETDM Programming Screen Summary Report* was published on June 30, 2011. A copy of the AN package and the summary report are included in Appendix A.

9.3.2 Kick-Off Presentation and other Presentations to the Pinellas County Board of County Commissioners (BCC)

A "Kick-Off Presentation" was made to the Pinellas County BCC to introduce the project on March 13, 2012 at a regularly scheduled BCC meeting. Invitations to the meeting were distributed to all federal, state and local government officials; Pinellas County and City of Tarpon Springs staff; and FDOT.

Alternatives proposed to be shown to the public at the January 2013 Alternatives Public Workshop were presented to the BCC on October 30, 2012.

The staff "Recommended Alternative", replacement of the existing movable bridge with a new two lane movable bridge on approximately the same alignment as the existing bridge, was presented to the BCC at their October 22, 2013 meeting. The BCC approved the staff's recommendation to move forward and present the Recommended Alternative to the public at a Public Hearing in February 2014. After consideration of all public input received at the Public Hearing, the BCC agreed to meet at a regularly scheduled BCC meeting on April 15, 2014 to decide whether to confirm their approval of the Recommended Alternative. The invitation to the public hearing included an invitation to the April 15, 2014 BCC meeting.

A presentation was made to the BCC on April 15, 2014 which summarized the results of the February 26, 2014 Public Hearing. The Commission confirmed and ratified their approval of the "Recommended Alternative" to move forward as the "Preferred Alternative", and to be submitted to the Federal Highway Administration for approval.

9.3.3 City of Tarpon Springs Staff Coordination Meeting

Pinellas County hosted a coordination meeting with the Tom Funcheon, City of Tarpon Springs Public Works Director, and Gary Schurman, Engineering Projects Supervisor, on September 13, 2012. Alternatives developed to date were presented and discussed. Strategies to involve the local communities and City officials and staff were also discussed.

9.3.4 Pinellas County Metropolitan Planning Organization (MPO) Meetings

Presentations were made at MPO Board and MPO Advisory Committee meetings between October 15, 2012 and November 14, 2012. This presentation included a discussion of the PD&E Process and the status of the ongoing study. In addition, conceptual designs and anticipated environmental impacts of alternatives that were anticipated to be carried forward to the Alternatives Community Workshop were presented. The meetings were held on the following dates.

- MPO Pedestrian Transportation Advisory Committee Meeting - 10/15/12
- MPO Bicycle Advisory Committee Meeting - 10/22/12
- MPO Technical Coordinating Committee (TCC) - 10/24/12
- MPO Citizens Advisory Committee (CAC) - 10/25/12
- Pinellas County MPO Board - 11/14/12

After the BCC approved the "Recommended Alternative" at their October 22, 2013 meeting, presentations were made to the MPO CAC, TCC and MPO Board. This presentation included information about the "Recommended Alternative" proposed to be presented at the February 2014 public hearing. The meetings were held on the following dates.

- MPO Technical Coordinating Committee (TCC) - 10/23/13
- MPO Citizens Advisory Committee (CAC) - 10/25/13
- Pinellas County MPO Board - 11/13/13

9.3.5 City of Tarpon Springs Commission Presentations

A presentation was made to the City of Tarpon Springs Commission on November 20, 2012, prior to the January 2013 Alternative Workshop. A presentation was also made to the Tarpon Springs City Commission on October 1, 2013 to update them on the status of the project.

9.3.6 Other Stakeholder Groups

Presentations about the alternatives evaluated during the study were made to the following groups.

Tarpon Springs Yacht Club Board Meetings

- October 17, 2012
- December 18, 2013

Tarpon Springs Chamber of Commerce breakfast meeting - November 21, 2012.

Tarpon Springs Rotary Club - January 31, 2012

Tarpon Springs Historical Society – January 16, 2014

A PowerPoint presentation was made about the status of the project and evaluation of alternatives at all meetings. Members of the project team were available to address questions and concerns at all meetings.

9.3.7 Cultural Resource Committee Meetings (CRC)

A number of historic structures are located within the vicinity of the Beckett Bridge project corridor. In addition, the Beckett Bridge was determined to be eligible for listing in the National Register of Historic Places by FHWA and SHPO early in the project. Accordingly, a Cultural Resource Committee (CRC) was assembled to address historic resource issues during the study. Three meetings were held during the course of the study. The first CRC meeting was held on October 29, 2012 at the Tarpon Springs Heritage Museum. Representatives from SHPO, FHWA, FDOT, Tarpon Springs Historic Society, USCG, City of Tarpon Springs and Pinellas County were invited. The purpose of the meeting was to discuss alternatives currently under consideration, the historic significance of the bridge and to provide an opportunity for input into the Section 106 process.

A second CRC meeting was held on March 13, 2013. At this meeting, public comments received at the Alternatives Community Workshop were presented. Discussion also included a review of the rehabilitation and movable bridge alternatives, potential effects to the historic bridge and discussion of possible mitigation/minimization measures. As a result of this meeting, the project team investigated three additional rehabilitation concepts that would provide safer and wider sidewalks.

A third CRC meeting was held on April 24, 2014, after the Public Hearing and subsequent County Commission Meeting. The “Replacement of the Existing Bridge with a New Low-Level Movable Bridge Alternative” was presented as the Recommended Alternative at the February 26, 2014 Public Hearing. At the subsequent County Commission meeting on April 15, 2014, the Commission concurred that the Recommended Alternative could proceed to FHWA as the

Preferred Alternative. The April 24, 2014 CRC meeting included an update on the results of the Public Hearing and Commission meeting, a discussion of the Section 106 process completed to date, a discussion of effects, and a discussion of desired mitigation measures to be included in the Memorandum of Agreement.

9.4 PUBLIC MEETINGS

9.4.1 Alternatives Community Workshop

An Alternatives Community Workshop was held on January 23, 2013 at the Tarpon Springs Yacht Club in Tarpon Springs Florida, located adjacent to the Beckett Bridge. The meeting was well attended; 120 individuals signed in. The purpose of the meeting was to present the alternatives under evaluation, and provide an opportunity for community input. Graphics and informational boards about the alternatives considered were on display and a short video presentation was shown continuously throughout the evening. Project team members and County staff were available to address individual questions and accept comments. Comment forms and the Alternatives Evaluation Matrix were provided to attendees. A court reporter was also available to record public comments.

A total of 71 individuals submitted comments between December 28, 2012 (the date the workshop invitation letter was mailed) and February 28. These comments included those submitted on comment forms, in letters, via email or via the "contact us" page on the website, or verbally provided to the court reporter at the meeting. A summary of comments received, as well as a summary of responses, was provided to all those who submitted comments and posted on the project website. Summary of comments received is provided below.

Summary of Comments

Not all comments included a preference for a specific proposed alternative. Some comments requested alternatives other than those presented. The following summary accounts for comments that did state a preference for an alternative that was presented at the Workshop. Please note that a decision regarding the selection of a "Preferred Alternative" is based on many factors, one of which is community input. **These numbers are not considered "votes."**

No-Build	7
No-Build with Removal of Existing Bridge	2
Rehabilitation	11

Rehabilitation or Movable Bridge	12
New Movable Bridge	32
New Fixed Bridge (Vertical Clearance 28 feet)	4

Preference for Alternatives Other than those Presented

- Construction of a fixed bridge with only seven to eight feet of clearance
- Rehabilitation with widening to provide bicycle lanes and sidewalks
- Rehabilitation with an inoperable movable span
- Rehabilitation with improved sidewalks to accommodate disabled
- Rehabilitation with current weight restrictions enforced
- Consider a tunnel

Many individuals expressed strong opposition to removing the existing bridge permanently.

Many individuals commented on specific concerns. A summary of issues raised follows:

Pedestrian/Bicycle Facilities

- Bicycle lanes and sidewalks are needed on the new bridge.
- The existing sidewalk is not adequate, wider sidewalks are needed.
- Bicycle lanes and sidewalks should be constructed on Riverside Drive approaching the bridge.
- Bicycle lanes and sidewalks are important especially since there is a nationwide emphasis on health and exercise
- Money should not be spent for bicycle lanes or sidewalks on the bridge since there are currently no bicycle lanes and sidewalks on Riverside Drive approaching the bridge.
- Only one sidewalk is needed; there is no need to impact property owners with two sidewalks.
- Bicycle lanes and sidewalks should be added to the bridge if rehabilitated.
- Bicycle lanes are not needed and a sidewalk is needed only on one side
- Sidewalks should accommodate those with disabilities.

- The bridge should be closed to traffic and open only to pedestrians and bicycles.
- The bridge should have one walking lane and one lane for vehicles.

Vertical Clearance

- Limiting clearance will negatively affect waterfront property values by restricting access to deeper water for tall boats.
- Constructing a movable bridge to accommodate all boats is desirable.
- Tarpon Springs is a “water-based” community. There are too many “water –based” events to construct a fixed bridge.
- Whitcomb Bayou serves as a refuge for all boats during storm events. Clearance should not be limited.
- There are not enough boats requiring more than 28 feet of clearance to justify the cost of a new movable bridge or for a fixed bridge higher than 7 or 8 feet.
- Limiting clearance will not affect waterfront property values.
- Constructing a movable bridge to accommodate a few tall boats is not economical.
- The fixed bridge will provide enough vertical clearance since the water depth in the bayou and channel does not allow for large sail-boats.
- Opportunities to relocate existing boats that require the bridge to open at docking facilities on the other side of the bridge should be explored.

Historical Context and Significance

- A new bridge should be similar in design to the existing historic bridge.
- Tarpon Springs is and important heritage tourist attraction and the historic bridge is part of the attraction for tourists.
- The historical character of the bridge should be preserved.
- A fixed bridge will negatively affect the historic character, beauty and aesthetics of the area.
- Construction of a replacement bridge will negatively impact the historic character of the community.
- The Tarpon Springs Historical Society opposed replacement of the historic bridge and supports rehabilitation.

Costs

- Spending additional money to accommodate boats with high masts is not reasonable.
- Spending money on a new bridge is not acceptable.
- Rehabilitation is not a long-term solution.
- A new bridge should be constructed now since construction will cost more in the future.
- A mid-level fixed bridge will save bridge tender costs and allow most boats to pass under.
- Money should not be spent to continually repair the bridge, it should be replaced.
- Costs to buy right-of-way and possible legal challenges if eminent domain is necessary to acquire the right-of- way for the fixed bridge will likely exceed the cost of the movable bridge.
- The bridge will last more than ten years if No-Build is selected.

Flooding and Roadway Repairs

- Riverside Drive and the Bridge cannot function as an effective evacuation route because the bridge approaches flood in storm conditions.
- Potholes should be repaired and flooding issues on Riverside Drive should be addressed before money is spent replacing the bridge.
- Repair or replacement of Riverside Drive is needed between the bridge and Alternate US 19.
- Detour
  - Damage to local roads on the detour route should be repaired after construction is complete.
  - The Moorings Condominium entrance is located on a blind curve on Whitcomb Bayou. A detour will increase traffic to this area and possibly create a dangerous situation. The Moorings representative requested that traffic not be detoured to Whitcomb Boulevard, but should be directed from South Florida Avenue to Meres Boulevard.

Community/Property Impacts

- A new bridge will destroy the uniqueness of the community.
- The fixed bridge options will destroy the ambiance of the community.
- The fixed bridge will impact property and destroy waterfront views.
- The fixed bridge looks like a freeway and is not compatible with the community.
- A new bridge should minimally impact the current residents.
- Impacting property to construct the proposed fixed bridge is not acceptable.
- Retaining walls are intrusive on views of the mobile home park and others.
- The movable bridge is less intrusive on nearby properties.
- The movable bridge maintains the "community" feeling of the area.

Traffic and Evacuation

- The bridge should not be removed since it is important for emergency evacuation.
- The assisted living facilities on Chesapeake Drive rely on the bridge for immediate access for emergency response.
- The bridge is important for moving traffic from the Sunset Hills area into town.
- The fixed bridge will negatively impact traffic patterns for adjoining residents.
- The bridge is important for access to downtown Tarpon Springs.
- More speed bumps should be installed on Riverside Drive.

Other

- The trailer park should be purchased for a city park.

9.4.2 Public Hearing

A Public Hearing was held on February 26, 2014 at the Tarpon Springs Yacht Club. Information about the "Recommended Alternative" and all other alternatives evaluated during the PD&E study was presented. An invitation letter, project fact sheet, public notice and comment form were mailed to approximately 1,200 property owners and other stakeholders three weeks prior to the Public Hearing. One hundred persons signed in at the meeting.

Graphics and informational boards about the alternatives considered were on display prior to and after the formal portion of the Public Hearing. The formal portion of the hearing consisted of an introduction by County staff, a 30 minute video presentation and a formal public comment period. Project team members and County staff were available to address individual questions and accept comments. A Public Hearing Handout which included the Alternatives Evaluation Matrix was provided to attendees. Comment forms were available. A court reporter recorded the formal portion of the Public Hearing and was also available to record public comments on a one-to-one basis during the informal portion of the hearing.

Six individuals spoke at the public hearing. Twenty-two individuals submitted comments during the official Public Hearing comment period. These comments included those submitted on comment forms, in letters, via email or via the "contact us" page on the website, or verbally provided to the court reporter at the meeting. A summary of the comments is provided below.

- 19 – Supported Recommended Alternative
- 1 – Requested a new low-level fixed bridge
- 1 - Requested preservation of existing bridge
- 1 – Requested consideration of a fixed bridge or repair of existing bridge with the elimination of the "drawbridge functionality".

Speakers at Public Hearing:

Five of the six speakers specifically stated that they supported the Recommended Alternative.

One objected and expressed desire for a low-level fixed bridge.

Comment Forms, Letters and Emails Received

Fourteen individuals specifically supported Recommended Alternative.

One individual expanded on comments made at public hearing.

Two individuals (Ms. Cyndi Tarapani and Mr. Robert Faison) objected to the Recommended Alternative.

- Ms. Tarapani requested preservation of the existing bridge

- Mr. Faison requested consideration of a fixed bridge or repair of the existing bridge but eliminate the functionality of the drawbridge.

Four individuals did not specifically state support for the Recommended Alternatives, but stated concerns or raised questions associated with the proposed replacement of the existing bridge.

Summary of Comments and Concerns:

Comments related to the Proposed Detour

- Is it possible to construct a temporary pedestrian bridge or provide a "ferry" for pedestrians during construction?
- Requested a temporary bridge during construction for vehicles and for emergency evacuation
- Suggested that construction techniques exist that could reduce detour time in half
- Requested detour signage that was clear to travelers, provided a specific detour signage plan
- Requested that roadways on the detour routes be repaired prior to closing the bridge

Comments related to the design/looks of the Recommended Alternative

- Requested design similar to existing, but wider with sidewalks and bike lanes as proposed.
- Requested that the new bridge be designed similar to existing historic bridge

Comments Related to Roadway and Drainage

- Spring Boulevard needs to be elevated because it floods during high tides during storms, preventing access to the bridge for evacuation.
- Requested that drainage improvements be made to the approach roadways.

Funding and Cost

- How will the bridge be funded?
- Will my property taxes be raised to pay for the bridge?

Other Comments

- Can future Commissioners change the status of the project since it will take several years to design?
- Boat access to the Bayou is needed for sanctuary during hurricanes.
- The new bridge should be “boat friendly” with bumpers that don’t obstruct the slips at the Tarpon Springs Yacht Club.
- A number of individuals expressed support for incorporating parts of the existing bridge into the new bridge.
- The existing speed bumps are not necessary. The speed bumps cause safety problems for two-wheel vehicles. Local police should enforce the speed limits.
- Are there plans to deepen or restore the channel?
- There is an active osprey nest near the site.
- Requested that boat owners be able to operate the movable span remotely to eliminate the need for County staff to open the bridge

Two individuals who own property immediately adjacent to the bridge expressed concerns about how the proposed project could affect their property.

Stephen Katsarelis, owner of the single family residence in the southeast corner of the bridge, across from the Yacht Club supported the recommended alternative but expressed the following concerns:

- Concerned about privacy of his pool and hot tub from the raised bridge
- Concerned about impacts to his privacy fence and hedge
- Concerned about safety – specifically speeding on wider bridge, stated that more effective speed bumps should be considered
- Requested additional information about contaminated sites mentioned in the public hearing presentation

Robert Faison, resident at 408 Riverside Drive, immediately adjacent to the bridge in the northwest quadrant, across from Bayshore Mobile Home Park, objected to the Recommended Alternative. Mr. Faison recommended that the County consider a fixed bridge or repair the existing bridge but eliminate “the draw bridge functionality”. He also expressed the following concerns about impacts from the Recommended Alternative:

- Impacts from traffic noise from additional traffic
- Impacts to view
- Safety exiting residential driveway
- Increase in traffic accidents
- Impacts of Construction noise
- Impacts to wood privacy fence
- Impacts to his current access to the sidewalk on Riverside Drive

Ms. Tarapani, president of the Tarpon Springs Preservation Society, requested that the existing bridge be restored.

Beckett Bridge

Project Development & Environment (PD&E) Study

from **Chesapeake Drive** *to* **Forest Avenue**

Tarpon Springs, Pinellas County, FL

Pinellas County Project ID: PID 2161 • ETDM #: 13040

FDOT Financial Project ID: 424385-1-28-01

February 2015

Preliminary Engineering Report

Volume 1: Documentation

Prepared for:
Pinellas County
Department of Environment & Infrastructure
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Clearwater, FL 33756

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway Transportation Officials
ABC	Accelerated Bridge Construction
ADA	Americans with Disabilities Act
AN	Advanced Notification
APE	Area of Potential Effect
BCC	Board of County Commissioners
BDR	Bridge Development Report
CAC	Citizens Advisory Committee
CEI	Construction Engineering and Inspection
CFR	Code of Federal Regulations
CID	Comprehensive Inventory Data
CIP	Capital Improvements Program
CRAS	Cultural Resource Assessment Survey
CRC	Cultural Resource Committee
CSER	Contamination Screening Evaluation Report
DOE	Determination of Eligibility
DOT Act	U.S. Department of Transportation Act of 1966
EFH	Essential Fish Habitat
ERI	Electrical Resistivity Imaging
ESBA	Endangered Species Biological Report
ETAT	Environmental Technical Advisory Team
ETDM	Efficient Transportation Decision Making
FAC	Freight Activity Center
F.A.C.	Florida Administrative Code
FDA	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDHR	Florida Department of Historic Resources
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FNAI	Florida Natural Areas Inventory
FR	Federal Register
F.S.	Florida Statute
FWC	Florida Fish and Wildlife Conservation Commission
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
GMFMC	Gulf of Mexico Fishery Management Council
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
IMA	Important Manatee Area

LIST OF ACRONYMS (Continued)

LOS	Level of Service
LRFD	Load and Resistance Factor
LRTP	Long Range Transportation Plan
MHP	Mobile Home Park
MHW	Mean High Water
mph	Miles per Hour
MPO	Metropolitan Planning Organization
MSE	Mechanically Stabilized Earth
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OFW	Outstanding Florida Waters
PCDEM	Pinellas County Department of Environmental Management
pcf	Per Cubic Foot
PCPT	Pinellas County Public Transit
PER	Preliminary Engineering Report
PD&E	Project Development and Environment
PPM	Plans Preparation Manual (FDOT)
PSI	Professional Service Industries
PSTA	Pinellas Suncoast Transit Authority
SEI	Subsurface Evaluations, Inc.
SHPO	State Historic Preservation Officer
SPT	Standard Penetration Tests
STIP	State Transportation Improvement Program
SU	Single Unit Truck
SWFWMD	Southwest Florida Water Management District
TBRPM	Tampa Bay Regional Planning Model
TCC	Technical Coordinating Committee
TIP	Transportation Improvement Program
TSM	Transportation System Management
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
vpd	Vehicles per Day
WQIE	Water Quality Impact Evaluation

1.0 SUMMARY

Pinellas County conducted a PD&E Study for proposed improvements to the Beckett Bridge in Tarpon Springs, Pinellas County, FL, in coordination with the Florida Department of Transportation (FDOT) and the Federal Highway Administration (FHWA). A project location map is provided in **Figure 1-1**. The following alternatives were evaluated during the Study:

- No-Build
- No-Build with Removal of the Existing Bridge
- Rehabilitation of the Existing Bridge
- Replacement with a New Movable Bridge
- Replacement with a New Nigh-Level Fixed Bridge

This Preliminary Engineering Report contains detailed engineering information that fulfills the purpose and need for the proposed replacement of the Beckett Bridge, from Chesapeake Drive to Forest Avenue, City of Tarpon Springs, Pinellas County, Florida. The project numbers are as follows:

County PID	2161
ETDM	13040
FDOT Financial Mgmt.	424385-1-20-01

The report documents the development and evaluation of alternatives for the proposed improvements and summarizes the public involvement activities conducted during the PD&E study.

1.1 PROJECT COMMITMENTS

To minimize impacts to navigation and to comply with USCG requirements, the contractor will be required to coordinate any full or partial closures of the channel to marine traffic during construction with the USCG in Miami FL (telephone 305.415.6744) at least 60 days prior to the planned closing.

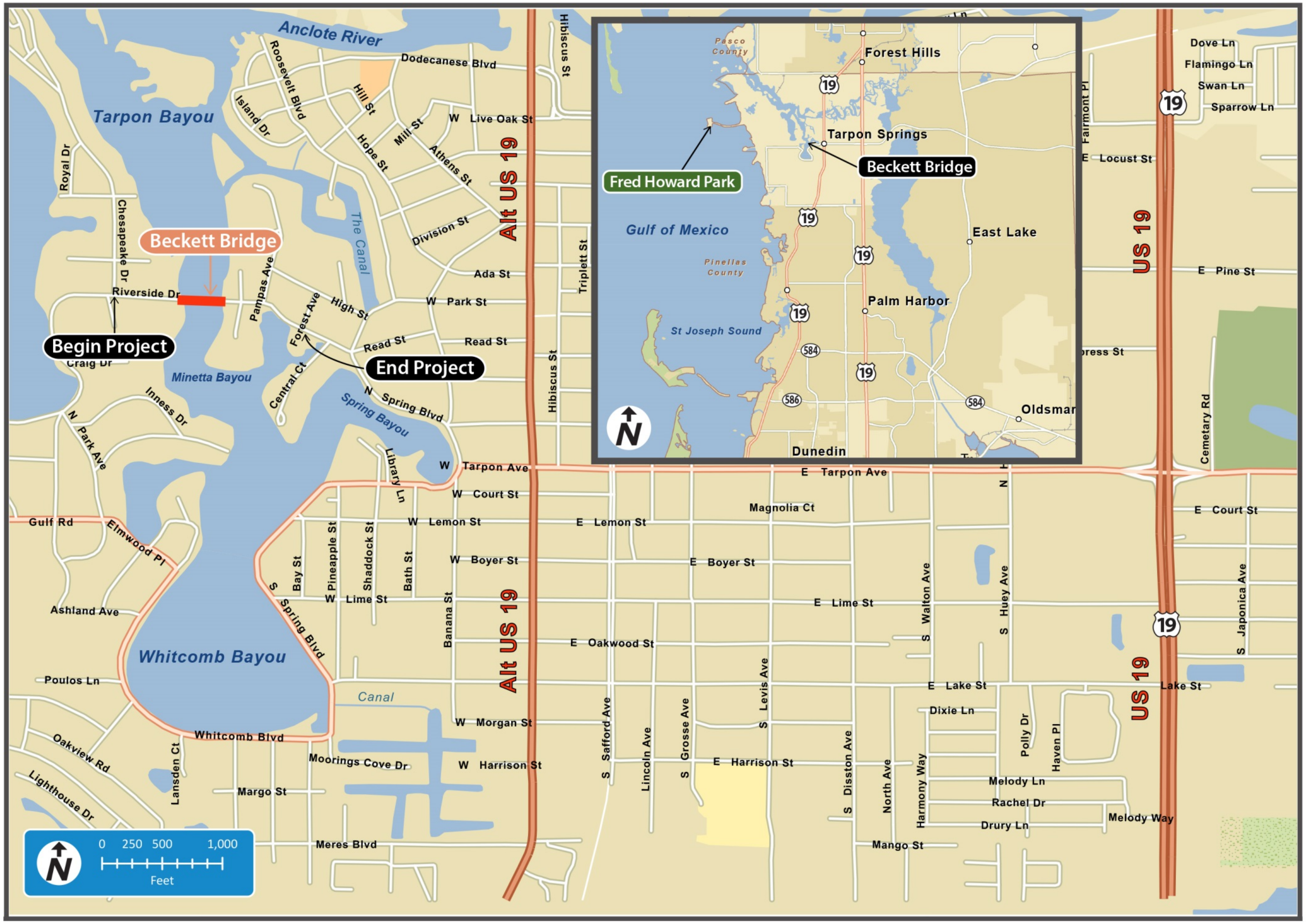


Figure 1-1 – Project Location

SHPO, FHWA, FDOT and Pinellas County signed a Section 106 Memorandum of Agreement (MOA) which specifies conditions required to mitigate for the adverse impacts resulting from demolition of the existing historic bridge on January 29, 2014. The MOA requires the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. The MOA stipulates that the design of the new bridge will be a single-leaf, rolling lift bridge type of similar design and scale to the historic Beckett Bridge. Additional mitigation measures as described in the MOA are also required. A copy of the MOA is included in Appendix J of this document.

The Section 106 MOA also stipulates that Pinellas County will create an aesthetics committee consisting of representatives from the adjacent community, City of Tarpon Springs, Tarpon Springs Historical Society, FHWA, and Florida SHPO to serve in an advisory capacity regarding appropriate design elements for the replacement bridge that may be addressed during the development of the Project.

The National Marine Fisheries Service (NMFS) requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed. Accordingly, Pinellas County will coordinate potential wetland and essential fish habitat impacts and proposed mitigation with the NMFS during the design phase of the project.

Pinellas County will comply with the current version of the US Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC) approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project. In addition, the County will coordinate with both agencies concerning site specific manatee protection measures to be implemented during construction.

Pinellas County will submit a blasting plan to USFWS and FWC for review and approval prior to construction if blasting is proposed for demolition. The plan will include the use of qualified observers and an aerial survey.

As requested by the FWC, Pinellas County will coordinate wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

Pinellas County will coordinate with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

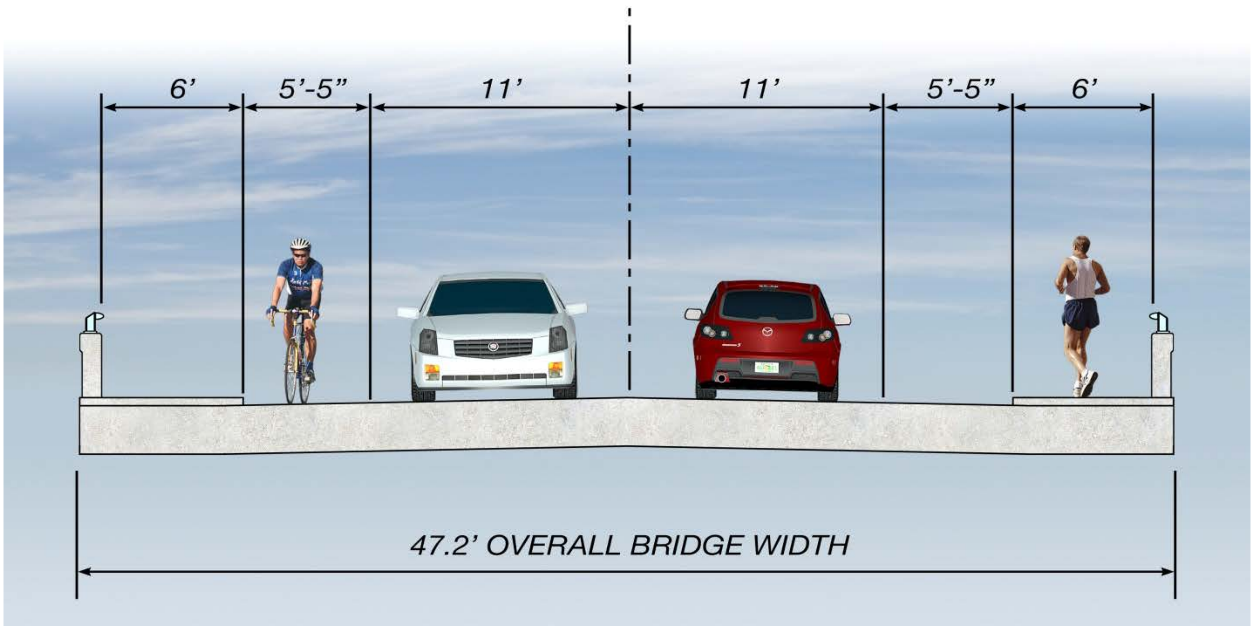
1.2 Proposed Action

The Recommended Alternative is replacement of the existing two-lane bascule Beckett Bridge with a new two-lane movable bridge. In accordance with the Section 106 Memorandum of Agreement, the design of the new bridge will be a single-leaf, rolling lift bridge type of similar design and scale of the historic Beckett Bridge. The proposed bridge would provide 7.8 feet of vertical clearance over the navigation channel at the fenders in the closed position. Unlimited vertical clearance will be provided in the open position for the width of the channel between the fenders. The horizontal clearance between the fenders will be 25 feet. The new bridge would be constructed within existing right-of-way, on approximately the same alignment as the existing bridge. The proposed bridge will be approximately 19 feet wider than the existing bridge.

No additional right-of-way will be required. No business or residential relocations will result from construction of the proposed improvements. The proposed bridge is likely to qualify for a General Permit from SWFWMD and treatment of stormwater runoff from the bridge would not be required. However, if treatment of stormwater is required, it is anticipated that compensatory, offsite treatment will be acceptable. Accordingly, acquisition of additional right-of-way is not anticipated to address water quality concerns.

The proposed bridge typical section for the replacement low-level movable bridge has a total out-to-out width of 47.2 feet as shown in **Figure 1-2**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, 6 feet wide, are proposed on both sides of the bridge.

The maximum proposed grade is five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore Mobile Home Park, the Tarpon Springs Yacht Club and Venetian Court to allow connection of



these driveways with minimal re-grading.

Figure 1-2 – Proposed Movable Bridge Typical Section

Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues. The proposed roadway profile would be approximately two feet higher than the existing roadway at the west end of the bridge, and approximately four feet higher at east end of the bridge.

Approximately 0.03 acre of wetlands will be impacted by the proposed replacement bridge. No perceptible noise impacts are anticipated.

2.0 LOCATION AND NEED

2.1 PROJECT DESCRIPTION

Pinellas County, in coordination with the Florida Department of Transportation (FDOT) District Seven, and the Federal Highway Administration (FHWA) is conducting a Project Development and Environment (PD&E) Study to evaluate alternatives to remove, rehabilitate or replace the existing Beckett Bridge (Bridge no. 154000) in Tarpon Springs, Pinellas County, Florida. The existing bridge was originally constructed in 1924 as a timber structure with a steel movable span. The fixed timber approach spans were replaced with concrete approach spans in 1956. The bridge has been determined to be eligible for listing in the National Register of Historic Places (NRHP). Eligibility is based on the bridge's contribution to early development of the area and because it is one of a few known, pre-1965, highway single-leaf rolling-lift bascule bridges remaining in Florida. Since 1956, major repairs were performed in 1979, 1998, and in 2011. Major rehabilitation or replacement of the bridge is needed to keep the bridge open and operating efficiently.

The project limits extend along Riverside Drive from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, a distance of approximately 0.3 mile. The existing two-lane bridge connects areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. (See **Figure 2-1**, Project Location.) Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire. Alternate routes (that do not require crossing of the Beckett Bridge) are available for travel to and from the areas mentioned above, and for emergency response.

Beckett Bridge is owned and operated by Pinellas County. A bridge tender is only present when required to open the drawbridge for a vessel, there are no full-time bridge tenders. U.S. Coast Guard (USCG) drawbridge opening regulations (33CFR117.341) states that "The draw of the Beckett Bridge, mile 0.5, at Tarpon Springs, Florida shall open on signal if at least two hours' notice is given."

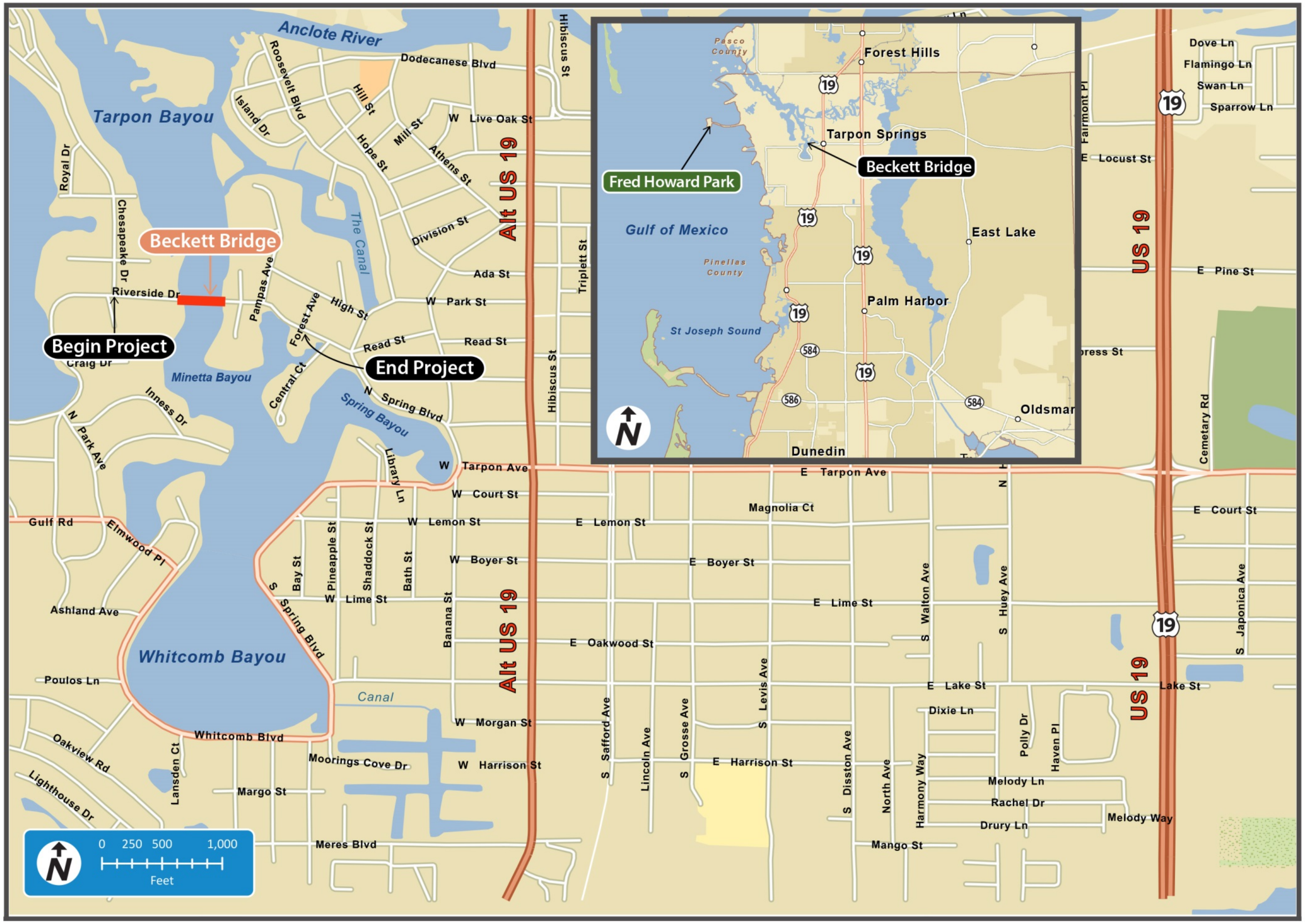


Figure 2-1 – Project Location

Beckett Bridge – Elevation View

Beckett Bridge – View from Roadway

Whitcomb Bayou connects to the Gulf of Mexico via the Anclote River to the north. Boats docked along Whitcomb, Spring and Minetta Bayous, and along artificial canals which connect to the southeastern portion of the Whitcomb Bayou, must pass the Beckett Bridge to access the Gulf of Mexico. The following alternatives were evaluated during the study:

- No-Build - Maintain Existing Bridge
- No-Build - Remove Existing Bridge (includes alternate routing of traffic)
- Rehabilitation of the Existing Bridge
- Replace with a new Movable Bridge
- Replace with a new Fixed Bridge

The "No-Build" alternative includes only routine maintenance to keep the bridge open to boaters and vehicular traffic until safety issues would require it to be closed. Evaluation of future improvements would occur at a later date. The "No Build with Removal of the Existing Bridge" would result in routine maintenance in the near future with the intent to demolish the bridge when it is no longer safe for traffic, with no plans to replace it with a new one. All bridge replacement alternatives considered will be constructed in approximately the same location as the existing bridge to minimize impacts. A USCG bridge permit will be required if a replacement bridge is selected as the Preferred Alternative. Accordingly, the USCG has requested to be a cooperating agency for this PD&E Study.

Alternate corridors for bridge location will not be evaluated due to the extent of development in the vicinity of the existing bridge. Capacity improvements will not be considered. The complete removal alternative will examine alternative traffic routes and potential impacts to the community and on traffic operations.

2.2 Purpose and Need for Improvements

According to recent (07/31/2012) FDOT inspection reports, the existing bridge has an overall Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. (Sufficiency ratings are a method of evaluating highway bridges by calculating a numeric value between 0 and 100, indicative of bridge sufficiency to remain in service). The bridge is considered functionally obsolete. This designation is based primarily on the substandard clear roadway width of only 20 feet and substandard roadway safety features. The existing typical section consists of one, 10-foot wide travel lane in each direction and 2-foot 2-inch-wide sidewalks separated by a curb on both sides of the bridge. (See **Figure 2-2**, Existing Bridge Typical Section.)

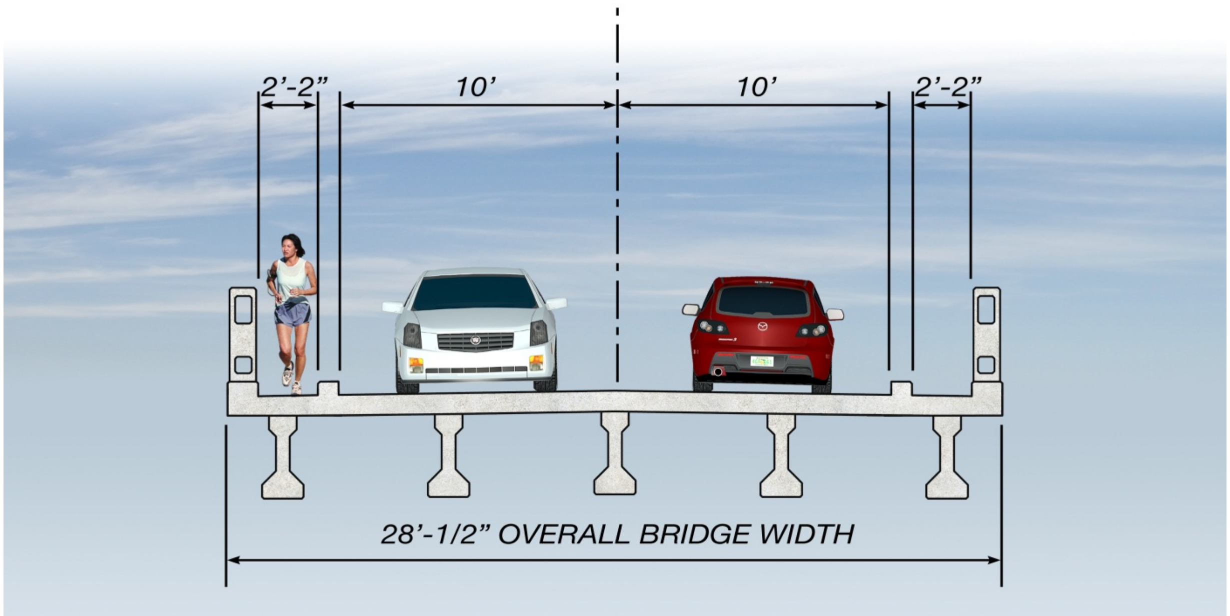


Figure 2-2 – Existing Bridge Typical Section

Minimum required lane and shoulder widths prescribed by the American Association of State Highway and Transportation Officials (AASHTO) are not met. The sidewalks on the bridge are narrow and do not meet current accessibility requirements established by the Americans with Disabilities Act (ADA). The bridge railings do not meet current standards for pedestrian safety or geometric and crash testing safety standards for vehicles. Approach guardrail and transitions and end treatments also do not meet current safety standards.

There are no official USCG navigational clearance guidelines for this waterway at this location. The existing vertical clearance at the fenders is six feet. The tip of the bascule leaf overhangs the fender with the leaf fully raised, limiting the clearance for a portion of the channel between the fenders. It is likely that unlimited vertical clearance was provided for the entire width of the channel when the bridge was originally constructed. The existing horizontal clearance between the fenders is 25 feet.

Bascule Leaf in Full Open Position

Bascule Leaf in Closed Position

Although the bridge is not considered Structurally Deficient, the bridge has a substandard load carrying capacity requiring weight restrictions. The bridge is currently posted for legal loads limited to 12-ton Single Unit Trucks and 15-ton Combination Trucks. Repairs in 1979 and 1988 included installation of crutch bents due to settlement and lateral stability concerns. Repairs in 2011 were performed to correct issues with the operating machinery and bascule leaf alignment.

FDOT District 7 completed the Program Screening Evaluation phase of the Efficient Transportation Decision Making (ETDM) process for this project. The ETDM Summary Report (ETDM Project Number 13040) was published on June 30, 2011 and is included in Appendix A of this report. The Advance Notification Package was mailed to the Florida State Clearinghouse on October 6, 2010. A copy of the package is also included in Appendix A.

2.3 CONSISTENCY WITH LOCAL TRANSPORTATION PLANS

The proposed project is a non-capacity bridge replacement. According, the Pinellas County 2035 Cost Feasible Long Range Transportation Plan (LRTP) was modified on June 11, 2014 to include information about the anticipated replacement of the Beckett Bridge and need for federal funding. The plan states the following:

"Many bridge projects do not increase the physical capacity of the transportation system, but rather serve as an in-kind replacement for what already exists. Some of these bridges are regionally significant, while others serve more of the local travel needs in Pinellas County. The following bridges in Pinellas County will soon be in need of replacement and federal funding will be sought to assist with the construction of new facilities:

- Beckett Bridge
- Dunedin Causeway
- San Martin Bridge"

Based on the Pinellas County 2035 LRTP and Transportation Element of the 2008 Comprehensive Plan, the current lane configuration for the project corridor is expected to remain two-lanes through 2035. Accordingly, replacement of the existing two-lane bridge with a new two-lane bridge is consistent with both plans. Rehabilitation, repair or replacement of the existing bridge is consistent with the goals and policies of Objective 1.10 of the Pinellas County 2035 LRTP which is to "Ensure the safe accommodation of motorized and non-motorized traffic while reducing the incidence of vehicular conflicts with the county's major transportation corridors."

The Pinellas County Transportation Improvement Program (TIP) – Fiscal Year (FY) 2011/12 through 2015/16 indicated that $750,000 was funded for the PD&E phase of the project. The PD&E phase was also included in the Pinellas County Capital Improvements Program (CIP), the FDOT Work Program, and the FDOT FY 2011 State Transportation Improvement Program (STIP). Copies of the appropriate sections of the Pinellas County TIP and CIP, FDOT Work Program, and FDOT District 7 STIP are included in Appendix B.

2.4 MODAL INTERRELATIONSHIPS

Transit

The Pinellas Suncoast Transit Authority (PSTA) does not operate transit service within the project limits. According to the most recent (October 2011) PSTA System Map, Route 66 provides hourly service daily along Alt US 19. Partial service is provided along Martin Luther King Boulevard. The nearest transit stops are on PSTA Route 66 along Pinellas Avenue North at Orange Street and Cypress Street, approximately one-half mile from the bridge. At this time, PSTA has no plans to expand transit service to include the Spring Boulevard/Riverside Drive within the project limits. Pasco County Public Transit (PCPT) operates Route 18 north of Live Oak Street and Dodecanese Boulevard near the Tarpon Springs Sponge Docks, approximately 0.9 miles northeast of the bridge.

Freight

As indicated in the ETDM Program Summary Report, the 2008 Pinellas County Metropolitan Planning Organization (MPO) Goods Movement Study identifies the Northwest Tarpon Springs Industrial Area as a potential Regional Freight Activity Center (FAC). This area is located north of the Spring Boulevard/Riverside Drive and west of Alternate US 19 at Anclote Boulevard and Anclote Roads (see **Figure 2-3**). FACs are major generators of truck trip activity, which include long-haul trips extending beyond the region. Alternate US 19 (SR 595), Anclote Boulevard, Anclote Road, Live Oak Street and Tarpon Avenue are all unrestricted truck routes (as shown on the Pinellas County Truck Route Plan.) At this time the Beckett Bridge is currently posted for legal loads limited to 12-ton Single Unit Trucks and 15-ton Combination Trucks. If the bridge is rehabilitated or replaced, and the speed limit of 20 mph through the project area is increased and the speed bumps were removed, Spring Boulevard/Riverside Drive could improve access to these truck routes.

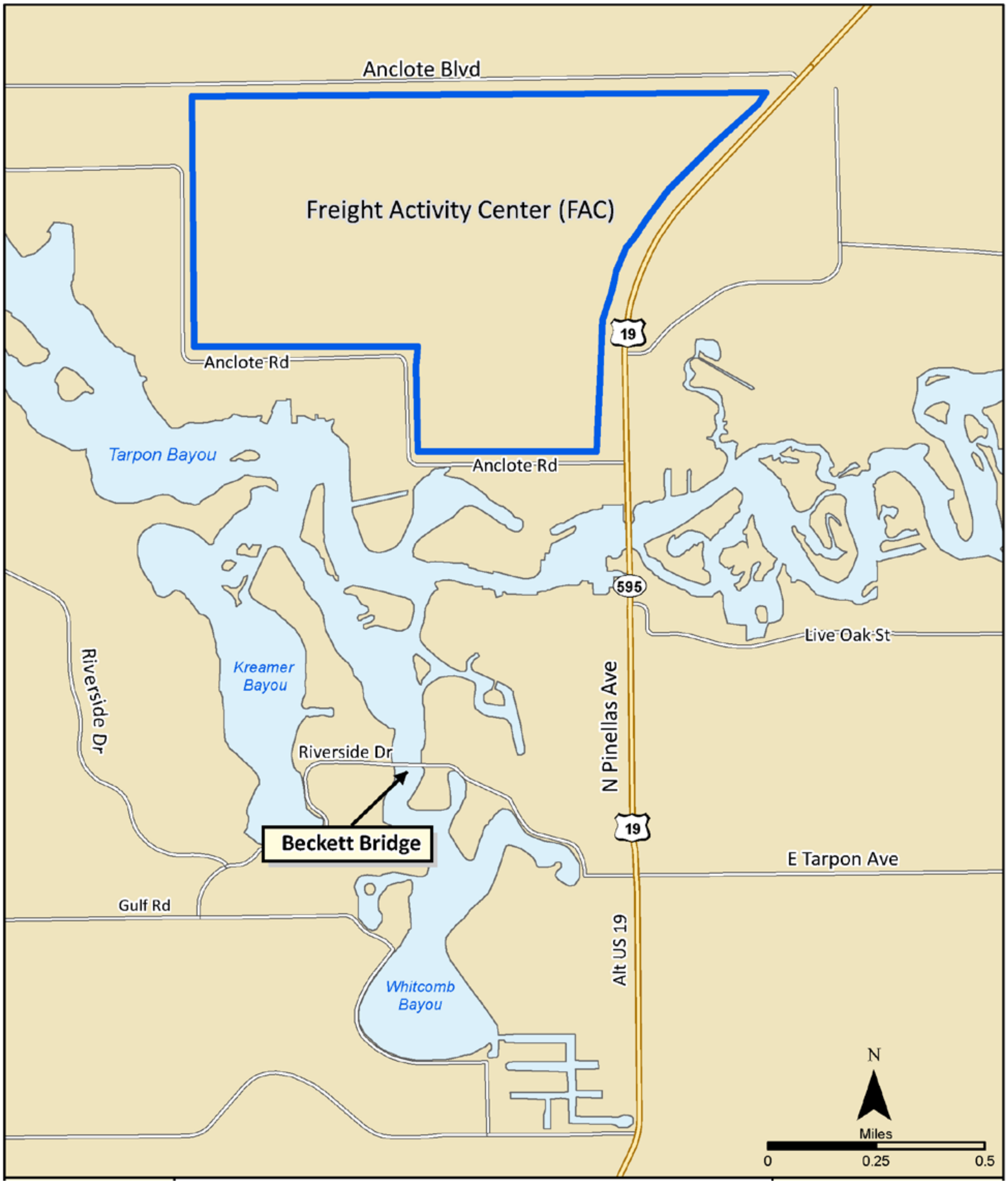


Figure 2-3 – Freight Activity Center (FAC) Location

School Transportation

Six public schools are located within three miles of the Beckett Bridge. The Beckett Bridge is currently load posted as follows: Single Unit Truck – 12 Tons, Combination Truck – 15 tons, and Truck and Trailer – 15 tons. School busses weigh on average 10-15 tons (empty) and have been prohibited from safely crossing the bridge. Accordingly, an alternate longer route is required. According to Mr. Mike Burke, Route and Safety Auditor for the Pinellas County School Board, if the bridge were rehabilitated or replaced school bus traffic would be re-routed to travel along Spring Boulevard/Riverside Drive and cross the Beckett Bridge. Approximately 15 to 20 school busses per day could potentially use the bridge. The detour results in additional costs for busses that service schools in the vicinity of the project.

Trails and Blueways

No officially designated county or regional trails cross the Beckett Bridge. However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 LRTP, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. The locations of these trails are shown on **Figure 2-4**. The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge. The Whitcomb Bayou Trail and Meres trails will also connect to the Pinellas trail and extend west. Both trails provide alternate routes to Howard Park that do not include crossing the Beckett Bridge. Both of these trails are located along potential detour routes during construction.

According to Ms. Susan Miller, Bicycle and Pedestrian Planner at Pinellas County, there has been no engineering or other evaluation of these planned cost feasible trailways projects. The MPO 2035 LRTP identifies "Present Day Costs" for the proposed trailways. The estimated cost for the Howard Park Trail is $3.25M and is based on a standard per mile cost for construction of multi-use trails along existing roadways. The MPO is anticipating that improved facilities along these existing routes will be constructed as part of future roadway resurfacing or widening projects.

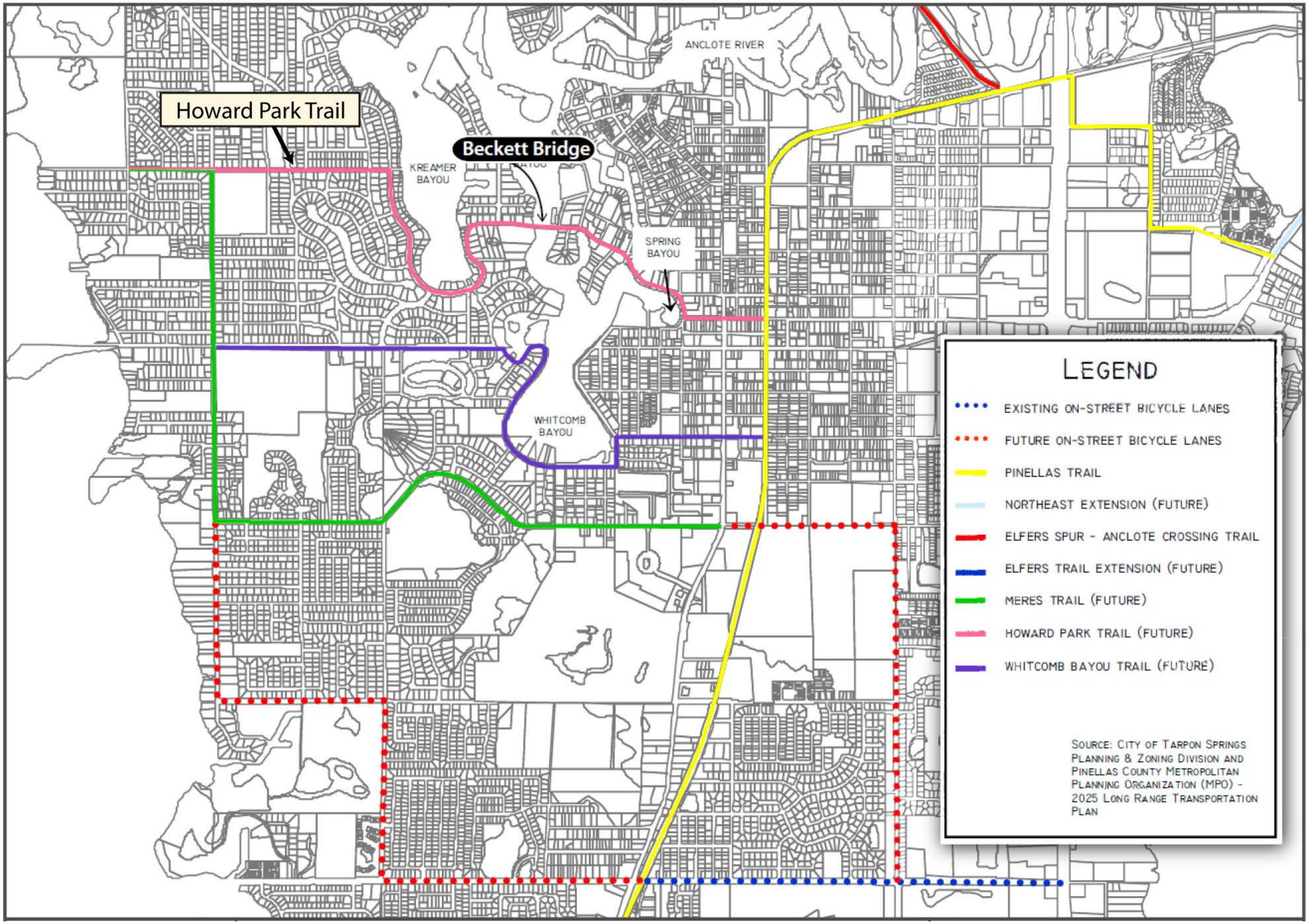


Figure 2-4 – Existing and Future Bicycle and Pedestrian Facilities

Marked and unmarked paddle trails are identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. A map from this guide for trails in northern Pinellas County is provided in **Figure 2-5**. An unmarked trail begins in Spring Bayou at Craig Park, just south of the Beckett Bridge. The trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico. The yearly Greek Orthodox Church Epiphany celebration is also held in Spring Bayou. In addition, paddlers visit this area to view manatees that seek warmer water in the winter.

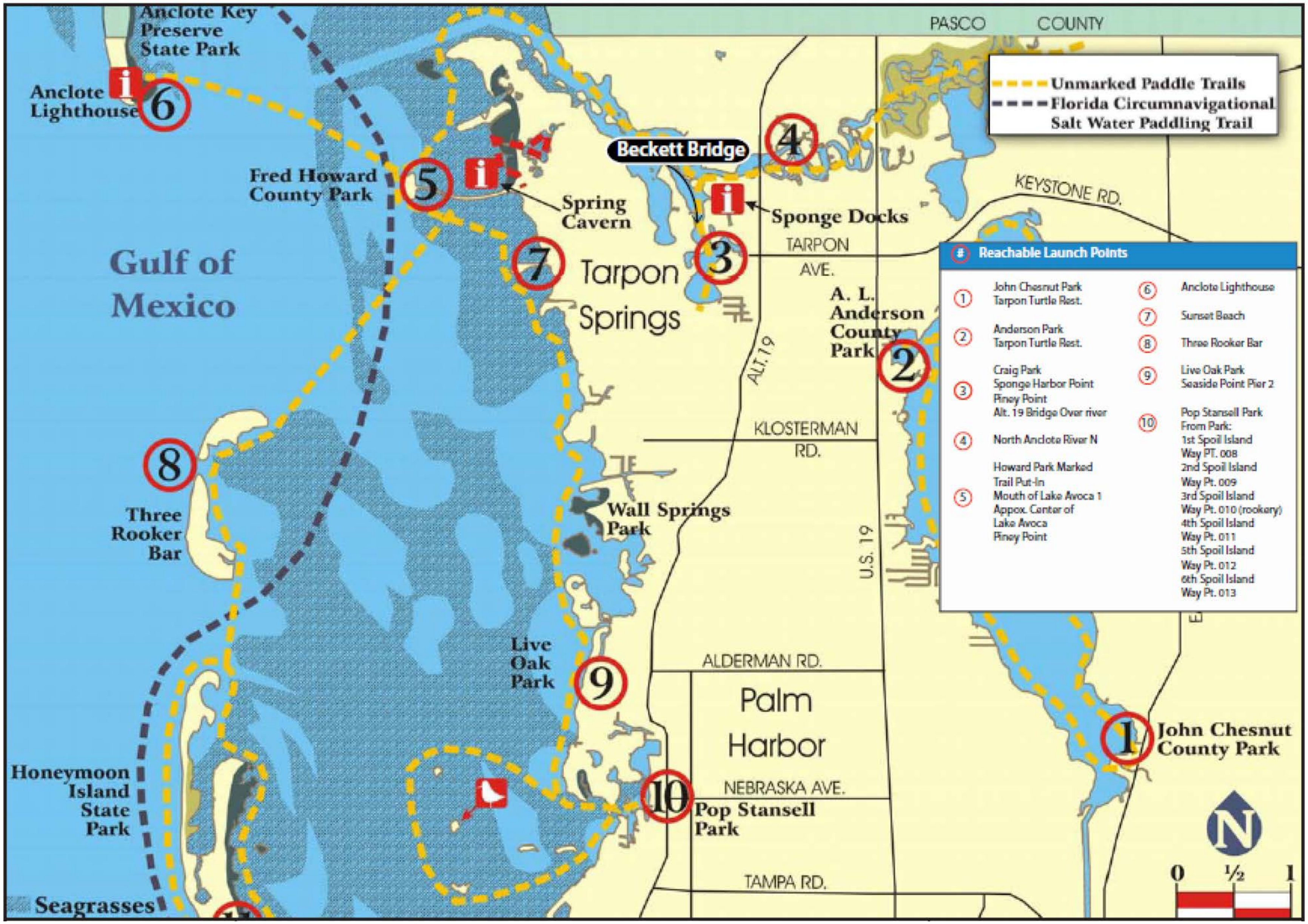


Figure 2-5 – Paddling Trails

3.0 EXISTING CONDITIONS

3.1 EXISTING ROADWAY CHARACTERISTICS

3.1.1 Functional Classification

According to the City of Tarpon Springs Comprehensive Plan and the Pinellas County Comprehensive Plan, the majority of the facilities located within the study area, including Riverside Drive/North Spring Boulevard and the Beckett Bridge from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, are functionally classified as “collector” roadways. Only Alternate US 19 is functionally classified as a “minor arterial.”

3.1.2 Roadway Sections

West of the bridge, the existing roadway section consists of two ten-foot travel lanes, with a four to five foot wide utility strip and four to four and a half foot wide sidewalk on the north side. There is no sidewalk on the south side of the roadway. The existing roadway section east of the bridge consists of two 11-foot wide travel lanes with outside shoulders of varying width. Some sections of discontinuous sidewalk do occur on both sides of the roadway. The sidewalks vary in width from four to five feet. Additional discussion concerning existing sidewalks on the roadway is provided in Section 3.1.3 Bicycle and Pedestrian Facilities.

3.1.3 Bicycle and Pedestrian Facilities

Sidewalks, approximately four to five-foot wide, are present on portions of the approach roadway within the project limits. West of the bridge, sidewalks are continuous on the north side of Riverside drive from the bridge extending west of Chesapeake Drive. No sidewalks occur on the south side of the roadway in this area. East of the bridge, continuous five-foot wide sidewalks are present on the north side of Riverside Drive between Pampas and Forest Avenue. A few sections of discontinuous sidewalk do occur on the south side of the roadway between the bridge and Pampas Avenue, and for a short distance just west of Forest Avenue.

Narrow sidewalks, approximately 2’2” in width (between the brush curb and the bridge railing), occur on both sides of the existing bridge. The sidewalks on the bridge are set behind a 9-inch wide, 9-inch tall brush curb, but are not separated from the travel lanes by a traffic barrier. Bicycle lanes are not currently provided on the roadway or bridge within the project limits. Bicyclists have been observed using the travel lanes and the narrow sidewalks.

3.1.4 Right-of-Way

Existing right-of-way varies between 37 feet and 50 feet within the project limits. The existing right-of-way is 40 feet wide from the bridge west to Chesapeake Drive. From the bridge east to Pampas Avenue the right-of-way is 50 feet wide. Between Pampas Avenue and Forest Avenue, the existing right-of-way varies from 37 feet to 43 feet wide. The roadway is approximately centered within the existing right-of-way. The existing bridge is approximately centered within a 50-foot wide Sovereign Submerged Land Easement. The width of the easement increases to 100 feet at the channel to accommodate the fender system.

3.1.5 Horizontal and Vertical Alignment

The existing horizontal alignment of Riverside Drive/Spring Boulevard through the project limits is curvilinear, encompassing four horizontal curve segments separated by connecting tangents. The western most section east of Chesapeake Drive follows a tangent alignment with a bearing of S 89º 10’ 16” E. From Chesapeake Drive to the bridge there is a 28º 39’ horizontal curve with a connecting tangent to the east on a bearing of S 84º 55’ 16” E. The west approach to the bridge is on a 28º 39’ horizontal curve that transitions to a tangent alignment across the bridge with a bearing S 89º 19’ 12” E. The alignment east of the bridge transitions to a 34º 43’ horizontal curve at Pampas Avenue. The tangent alignment east of Pampas Avenue transitions from a bearing of S 44º 05’ 54” E to a 38º 12’ horizontal curve to Forest Avenue. The tangent alignment east of Forest Avenue is on a bearing of S 64º 04’ 20” E.

The existing vertical alignment within the project limits consists of a bridge profile with a crest near the center of the channel. The roadway profile grades along the bridge approaches and adjoining roadway segments range from a minimum of 0.20 percent to a maximum of 1.30 percent.

3.1.6 Drainage

The existing drainage system within the project limits is predominantly sheet flow along the Riverside Drive roadway to Whitcomb Bayou/Spring Bayou which outfall to the Anclote River. The existing Beckett Bridge discharges directly to the Whitcomb Bayou/ Spring Bayou via scuppers and at the bridge approaches. Currently no existing stormwater management facilities are located within or adjacent to the project limits.

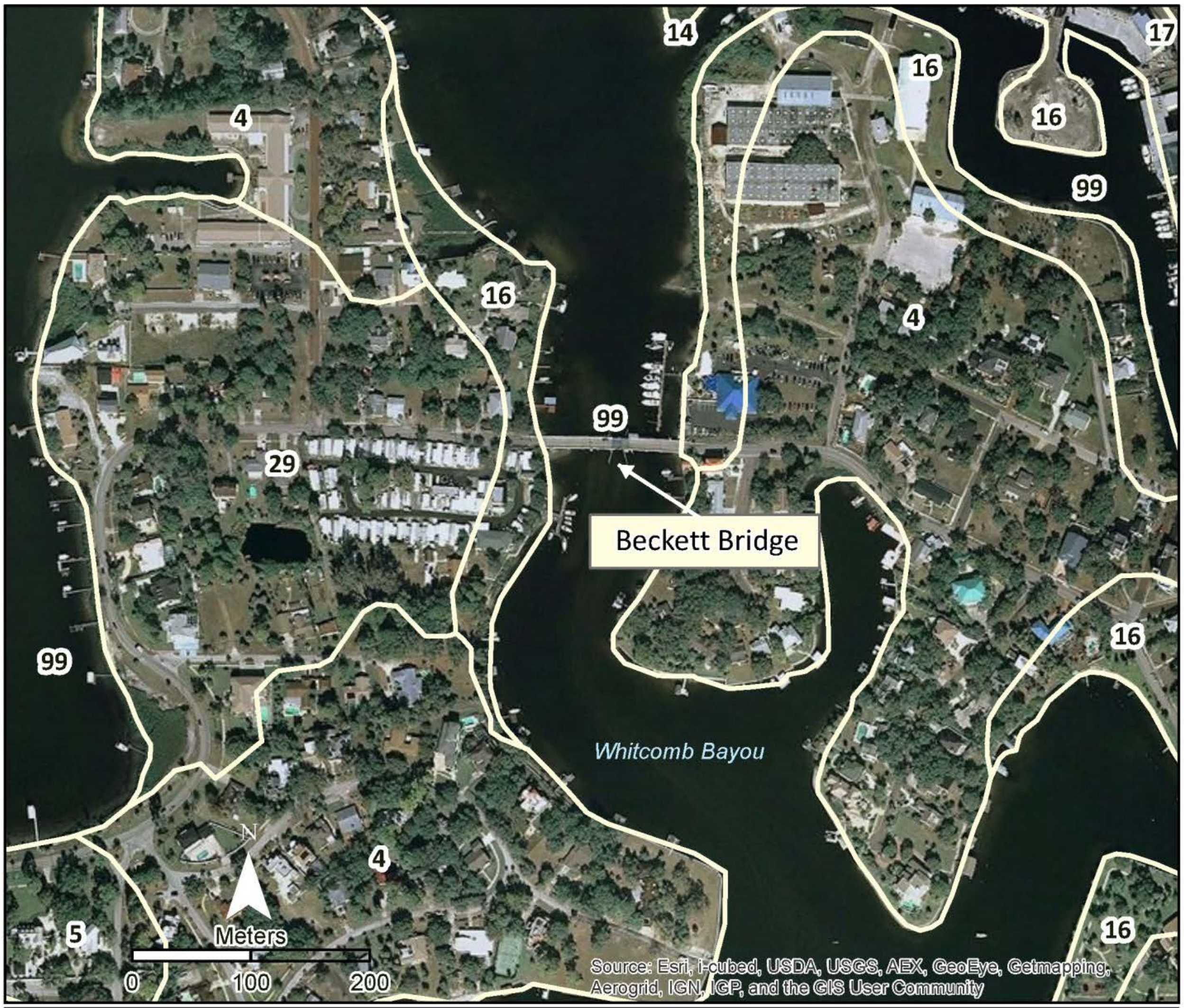
3.1.7 Geotechnical Conditions

3.1.7.1 Soils

Based on a review of the Pinellas County Soil Survey published by USDA Natural Resources Conservation Service (NRCS), it appears that there are three soil-mapping units noted within the project limits. A detailed soil survey map is shown in **Figure 3-1**. The general soil descriptions are presented in the sub-sections below, as described in the Web Soil Survey. **Table 3-1** summarizes information on the soil mapping units obtained from the Web Soil Survey.

Table 3-1 – Pinellas County USDA NRCS Soil Survey Information

USDA Map Unit and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(4) Astatula-Urban land	0-3	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5	---	Jan-Dec
	3-80	SP, SP-SM	A-3	20.0 - 49.9	4.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(16) Matlacha-St. Augustine Urban land	0-42	SP, SP-SM	A-3	2.0 - 6.0	6.1-8.4	2.0-3.0	June-Oct
	42-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	0-8	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4	1.5-3.0	June-Oct
	8-33	SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	33-48	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	48-63	SM, SP-SM	A-2-4	2.0 - 20.0	6.1-8.4		
	63-80	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec
(29) Tavares-Urban Land	0-5	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5	3.5->6.0	June-Dec
	5-80	SP, SP-SM	A-3	6.0 - 20.0	3.5-6.5		
	---	---	---	0.0 - 0.0	---	---	Jan-Dec



Legend

4 - Astatula Soils and Urban Land, 0 to 5% Slopes
5 - Astatula Soils and Urban Land, 5 to 12% Slopes
14 - Kesson Fine Sand, Very Frequently Flooded
16 - Matlacha and St. Augustine Soils and Urban Land
17 - Myakka Soils and Urban Land
29 - Tavares Soils and Urban Land
99 - Water

Figure 3-1 – USDA Soils Map

Astatula Soils and Urban Land (Unit 4)

The Astatula component makes up 50 percent of the map unit. Slopes are zero to five percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded or ponded. There is no zone of water saturation within a depth of 72 inches.

Matlacha and St. Augustine Soils and Urban Land (Unit 16)

The Matlacha component makes up 32 percent of the map unit. Slopes are zero to two percent. This component is on fills on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded or ponded. A seasonal zone of water saturation is at 30 inches during June, July, August, September, and October.

The St. Augustine component makes up 32 percent of the map unit. Slopes are zero to two percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of sandy mine spoil or earthy fill. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during June, July, August, September, and October.

Tavares Soils and Urban Land (Unit 29)

The Tavares component makes up 50 percent of the map unit. Slopes are zero to five percent. This component is on knolls on marine terraces on coastal plains, ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 57 inches during June, July, August, September, October, November, and December.

Riverside Drive, via the Beckett Bridge, crosses the Whitcomb Bayou/Minetta Branch of the Anclote River. Based on the USDA Soil Survey of Pinellas County, Florida, the seasonal high groundwater table ranges from about 1½ to greater than six feet below grade. Due to the proximity of the project to the river and Bayou it is anticipated that the water table is tidally influenced.

3.1.7.2 Geotechnical Bridge Considerations

A *Geotechnical Technical Memorandum* was prepared in April 2012 as part of this PD&E Study by Tierra, Inc. The memorandum was published separately and can be found in the County's project files. Additional detailed information can be found in this memorandum. This section of the Preliminary Engineering Report (PER) summarizes the findings of that memorandum.

The Beckett Bridge is a multi-spanned bridge that has been reported to have experienced lateral movement and subsidence. The bridge approach spans were reconstructed in 1956 using reinforced concrete, however, the original bascule span remained. Structural repairs were performed between 1979 and 2011 including the installation of crutch bents.

Williams Earth Sciences provided a report dated November 10, 1994, which provided recommendations for the installation of crutch bents using H-Piles. During the 1994 study, Williams preformed three Standard Penetration Tests (SPT) borings; one was performed at the west abutment, one at the east abutment, and one was performed in the vicinity of the Bent 5, adjacent to the bascule. The two abutment borings were performed from land and the Bent 5 boring was performed from the bridge (as opposed to a barge over water). Two SPT borings were also performed by Professional Service Industries (PSI). These two borings were performed at Bent 6 from the bridge. One was performed in the westbound lane and the other was performed in the eastbound lane. The report for this study is attached as Appendix C.

An additional geotechnical study was completed in 2009 by Williams Earth Sciences which included an Electrical Resistivity Geophysical Report by Subsurface Evaluations, Inc. (SEI). The Williams report along with the SEI report is provided as Appendix C. Soil descriptions and discussion are summarized below.

During the 2009 study, Electrical Resistivity Imaging (ERI) was conducted. The purpose of the ERI testing was to determine the vertical extent and lateral continuity of soil layers and to identify possible karst hazards within the river along the sides of the bridge. The ERI testing was performed by SEI and their report, dated April 28, 2009, is included in Appendix C.

The results of the ERI testing indicated several features and anomalies within the vicinity of the bridge footprint. First, there appears to be an anomaly near Bent 6, with the center approximated just north of the bridge, as depicted on Figure 1 of the SEI report. In addition, there appears to be a shelf at about 20 to 40 feet in depth indicating a change in soil material and/or density, as indicated on Figure 1 of the 2009 report.

Boring B-1 (PSI) was performed very close to the ERI anomaly indicated at Bent 6. PSI Boring B-1 indicates that there is a dense grading to medium dense dark brown to brown fine sand with a trace of silt from the mud-line to about 10 feet below the mud-line, followed by a nine foot thick layer of stiff dark gray sandy silt, from 10 to 19 feet below the mud-line. The silt layer was underlain by a relatively thin layer of hard limestone, from 19 to 24 feet below the mud-line. From 24 to 40 feet below the mud-line, a medium dense grading to very loose layer of brown sand with a trace of silt (SP-SM) was encountered. A second layer of hard limestone was present from 40 to 45 feet below the mud-line, followed by medium dense brown fine sand with a trace of silt (SP-SM) to the termination depth of the boring at about 57 feet below the mud-line.

Boring B-1 (PSI) and the ERI results correlate at Bent 6. In addition, this anomaly can be considered indicative of Karst conditions and potential weathering/ solutioning of the limestone. Boring B-2 was also performed at Bent 6, on the opposite side of the bridge (eastbound lane). This boring indicated somewhat similar soils to Boring B-1, however, there was no evidence of the stiff silt layer at 10 to 19 feet below the mud-line.

The borings conducted by Williams in the 1994 study indicated a soil stratigraphy that was quite dissimilar to the borings conducted at Bent 6 by PSI. These borings generally indicate a surficial layer of sands to silty sands or clayey soils, followed by very hard limestone to the full depth of the borings. There were a few minor variations in the subsurface soils, such as a thin layer of clay (CH) material in boring B-1 at a depth of 47 to 58 feet below the ground surface; a very loose shelly fine sand layer from 77 to 84 feet below the mud-line at boring B-2; and a possible void from 69 to 71 feet below the ground surface at boring B-3. The medium dense fine sand with a trace of silt soil was not encountered in the SPT borings conducted by Williams.

Encountering highly dissimilar soils in a relatively short distance indicates that this area potentially has localized karst features. The Anclote River area is known for variable subsurface conditions and karst features. The subsurface is characterized by a sand layer overlying shallow limestone. There is a lack of clay layering in this area and this condition can promote localized subsidence and raveling of the surficial soils into the karst limestone. Review of the ERI results indicates that the surficial karst solution features, or surficial relic sinkhole features, may be more prevalent near the center of the bridge. There also appears to be an apparent shelf, as indicated on ERI transects T3 and T4. Review of ERI transects T3, T4 and T5 indicate the possibility of a solution zone near to and below the bridge footprint that may be located in a southwest orientation. However, it should be noted that the bascule bridge footing and the piles may be providing interference of the ERI data and therefore additional geotechnical exploration is warranted to verify subsurface conditions.

The Williams report indicates that there has been settlement and rotation of the bents and/or bascule pier. There are a number of potential causes for this, both structurally and geotechnically; however, from a geotechnical standpoint, the causes may be due to subsidence of the piles due to 1) active solutioning of the limestone, or 2) insufficient pile bearing both axially and laterally, or a combination of both. Another consideration is the age of the timber piles supporting the bascule pier, which are more than 85 years old. The timber piles could be in poor condition due to fatigue, rot or some other form of deterioration.

HP 14x73 crutch bent piles were installed in 1996. The 1996 plans indicate crutch bents at Bent 6 and Bent 7, and pier stabilizers for the bascule. The lengths of the crutch bent piles varied dramatically from tip elevations of about -30 to -200 feet. These lengths were taken from old facsimile correspondence between Williams and DSA.

There was a minimum tip elevation of -35 feet indicated on the plans; therefore, one of the piles did not achieve the minimum tip elevation in accordance with the plans. The piles were also supposedly preformed to an elevation of -27 feet, and the preformed hole was supposed to be grouted. The HP crutch bent piles were also planned to be jacketed using an epoxy mix from elevation -4 to +4 feet, at the splash zone of the piles. The 2007 Bridge Inspection Report, prepared by Volkert & Associates, Inc., states that the "jackets are in good condition with no washouts or exposed base pile".

3.1.8 Crash Data

Crash data was obtained from Pinellas County for the five-year period from 2005 to 2009. A summary of crashes occurring at six intersections, five within the project limits and one east of the project, are provided in **Table 3-2**. The location of these intersections is shown on **Figure 3-2**. A total of nine crashes occurred between 2005 and 2009. The highest number of crashes (three) occurred at the intersection of Spring Boulevard and Pampas Avenue within this time period.

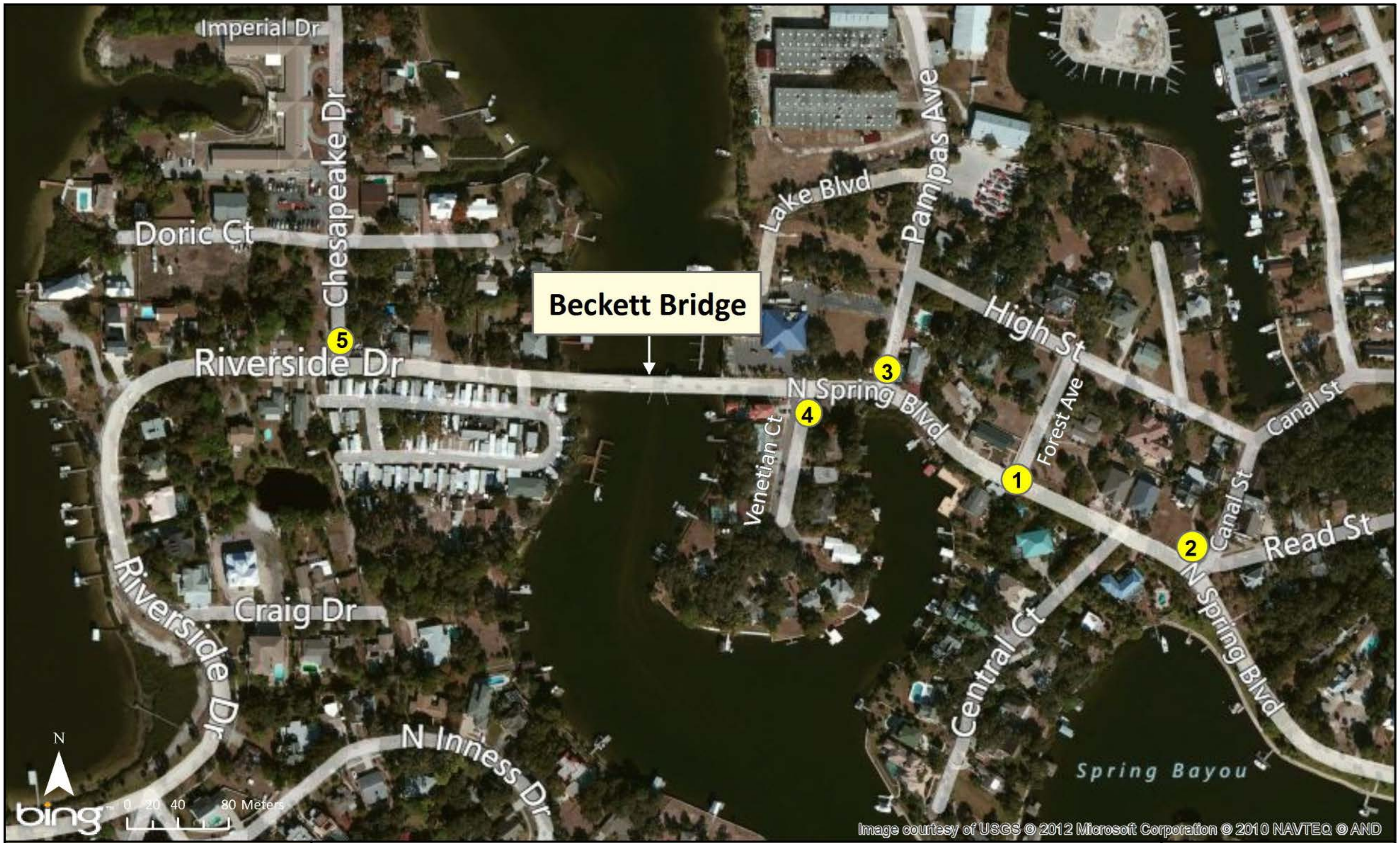


Figure 3-2 – Location of Crash Data Nodes

Table 3-2 – Intersection Crash Summary (2005 – 2009)

Intersections	Node	Year/Number of Crashes Year/Number of Crashes						Intersection Crash Rate Intersection Crash Rate	
		2005	2006	2007	2008	2009	Total	Project Crash Rate (Crashes/MEV)	Statewide Crash Rate (Crashes/MEV)
Spring Boulevard/ Forest Avenue	**1**					1	**1**	0.071	0.338
Spring Boulevard/ Canal Street	**2**				1		**1**	0.071	
Spring Boulevard/ Pampas Avenue	**3**	2		1			**3**	0.213	
Spring Boulevard/ Venetian Court	**4**				1		**1**	0.071	
Riverside Drive/ Chesapeake Drive	**5**			1	2		**3**	0.213	
Total **Total**		2 **2**	0 **0**	2 **2**	4 **4**	1 **1**	9 **9**		

Source: Pinellas County.

Table 3-3 shows the crash frequency by type of crash, crash frequency by severity, and comparison of the corridor crash rate with the statewide average for similar roadways. Of the nine crashes, one involved rear-end collisions, one was classified as a side swipe, and one involved collision with a fixed object (sign). The remaining four were classified as types other than those described above. Review of the accident reports indicate that these accidents involved a bicyclist losing control of a bicycle, a motorcyclist losing control of a motorcycle, and a driver falling asleep at the wheel and running off the road. The average crash rate for the Riverside Drive/Spring Boulevard corridor in the vicinity of the Beckett Bridge was 2.669. This crash rate is less than the statewide average of 3.243 for similar facilities.

3.1.9 Intersections and Signalization

There are no signalized intersections within the project limits. Four local roads intersect Riverside Drive/Spring Boulevard within the project limits. Chesapeake Drive intersects Riverside Drive west of the bridge. Venetian Court, Pampas Avenue and Forest Drive intersect Spring Boulevard east of the bridge.

Table 3-3 – Corridor Crash Summary (2005 – 2009)

Corridor			Frequency by Crash Type									Frequency by Crash Severity			Corridor Crash Rates	
Description	Functional Class	Length (Miles)		Total	Angle[1]	Over Turned	Rear End	Side Swipe	Head On	Collision with Other Object	All Other[2]	Fatality	Injury	Property Damage	Project Crash Rate (crashes/MVMT)	Statewide Average Rate[3] (crashes/MVMT)
Riverside Drive/Spring Boulevard	Urban Collector	0.24	5-Year	9	0	0	3	1	0	1	4	0	1	8	2.669	3.243
			Average	1.8	0.0	0.0	0.6	0.2	0.0	0.2	0.8	0.0	0.2	1.6		

Source: Pinellas County Traffic Records 2005 – 2009
[1] Includes left-turn and right-turn type crashes
[2] Includes all other crash types for which specific crash type is not listed
[3] Statewide average crash rate based on the five-year data from 2005 to 2009
MVMT = million vehicle miles traveled

3.1.10 Lighting

Existing lighting consists of standard cobra head luminaires mounted on steel poles or wood utility poles. West of the bridge, light fixtures are located on the south side of the roadway. East of the bridge, lighting is provided on the north side of the roadway. One steel light pole is attached to the bridge just west of the bascule span.

3.1.11 Utilities

Knology Broadband of Florida, Bright House Networks, Progress Energy Florida, Verizon, and the City of Tarpon Springs operate utilities within the project area. Knology Broadband has aerial coaxial cables entering the project area along Spring Boulevard on the east side of the bridge and along Riverside Drive on the west side of the bridge. These Knology cables are co-located on Progress Energy utility poles. Spurs of the aerial coaxial cables extend along Chesapeake Drive from Doric Court to the Bayshore Cove Mobile Park, and along Forest Avenue from North Spring Boulevard to High Street. In addition, a Knology broadband underground coaxial cable is located adjacent to the Tarpon Springs Yacht Club along the north side of Spring Boulevard.

City of Tarpon Springs wastewater force mains are located along Riverside Drive. A six inch force main is located on the south side of the bridge and a 12 inch force main is located on the north side of the bridge; however, these mains are located outside of the bridge fender system**.** A pump station is located on the north side of Riverside Drive at Chesapeake Drive. No other City utilities occur within the project limits.

3.2 EXISTING BRIDGE

3.2.1 Bridge Repair History

The Beckett Bridge was first constructed in 1924. It featured timber approach spans, a concrete bascule pier and steel draw span. All original foundations consisted of timber piling. Beckett Bridge connected east and west Tarpon Springs, carrying travelers over Whitcomb Bayou. Prior to construction of the bridge, the only available route for travel to the eastern side of Tarpon Springs from the west was Meres Boulevard or Whitcomb Boulevard, both located south of Whitcomb Bayou. The Beckett Bridge created a shorter travel route to both the eastern residential areas and the newly constructed Sunset Hills Country Club.

In 1955, the County deemed the Beckett Bridge unsafe and determined repairs to the original timber approach spans would not be feasible. Local newspaper articles indicate that a contract was let in 1956 to reconstruct the bridge. The reconstruction of the approach spans was completed in 1956 and retained the original concrete bascule pier, steel draw span and machinery. The remainder of the bridge was reconstructed with a concrete superstructure, supported on concrete bent caps, founded on concrete piles. Plans for the 1955 – 1956 reconstruction have not been located. The USCG has no record of a request for a bridge permit for these changes.

By 1995 differential settlement of the structure was evident. The settlement resulted in misalignment of the steel draw span, causing it to rub against the adjacent fixed concrete approach structure. Uneven wear on the machinery was noticeable. The County let a contract for a major rehabilitation of the bridge in 1996. The rehabilitation included the addition of steel crutch bents to stabilize the settlement, repair of the steel draw span and the concrete approach spans, refurbishment of the machinery, replacement of the electrical system, and construction of a new control house. Rehabilitation did not include bridge widening.

In 1997, the main machinery drive shafts failed during testing of the draw span subsequent to the 1996 repairs described above. The failure was attributed to bridge tender error when operating the bridge. Repairs to correct this problem were completed in December 1997. Subsequent to these repairs, wear on the machinery system due to the inherent misalignment of the draw span continued to develop. In 2011, the bridge became inoperable due to continued deterioration and misalignment, including development of an offset in the curb line between the bascule span and approach span. To correct this, another contract was let for additional bridge repairs that included modification of the curb and deck joints to compensate for misalignment, replacement of the span lock mechanisms, installation of a centering device, replacement of a pinion shaft and pinion bearing, and repair of the rack gears. Cleaning and painting of corroded structural steel was also performed.

3.2.2 Structure Type/Span Arrangement

The existing bridge is a 358'-6" long low-level bridge consisting of ten spans, including a 40'-3 ¾" long bascule span over Whitcomb Bayou. Horizontally, the bridge is aligned normal to the navigation channel within the bayou. Vertically, the bridge profile features a crest centered approximately at the navigation channel. The approach span superstructure consists of a reinforced concrete deck supported by five AASHTO type beams. The sidewalk deck is cantilevered beyond the exterior beams. The superstructure is supported by pile bents consisting of reinforced concrete caps and driven prestressed concrete piles.

The bascule portion of the bridge consists of a steel single-leaf rolling lift span with a length of 31'-3" from centerline roll to leaf tip. The bascule span superstructure consists of a steel open grid deck supported by a framework of steel stringers, floorbeams and two main girders. The sidewalks on the bascule span cantilever outboard of the main girders and are supported with brackets. The leaf is balanced by a concrete counterweight at the tail of the leaf to reduce the power requirements needed to raise the bridge. A reinforced concrete bascule pier supports the bascule leaf at the center of roll. The tip of the leaf is supported by a pile bent when the bridge is in the lowered position. A control house, located at the northeast portion of the bascule span, contains the electrical equipment needed to operate the bridge.

The bascule leaf is a Scherzer rolling-lift type. The leaf and counterweight pivot about an axis that also moves horizontally as it rotates on curved tread plates attached to each bascule girder and supported on flat tracks located on the bascule pier. The leaf is driven by an electric motor coupled to bridge mounted drive machinery consisting of open spur gears. A pinion located at the center of roll of each bascule girder engages a horizontal flat rack, supported on the bascule pier, to actuate span motion. Vehicular traffic is controlled by traffic gates and traffic signals located on the bridge approach spans. Additionally, a barrier gate located on the west approach spans provides a physical deterrent to inhibit vehicles from approaching the deck opening when the span is in the open position.

The bridge intersects the navigation channel at a 90^{o} angle. Waterborne vessels are guided between the bascule piers by a fender system consisting of timber rub rails attached to driven timber piles. Navigation lights mounted to the fender system and the bascule leaf provides a warning indication. The channel has a minimum horizontal width of 25 feet between faces of fenders. When the bascule leaf is in the closed position there is approximately six feet of vertical clearance at the face of the east fender. When the bridge opens, the leaf rolls away from the channel and rotates to a 49 degree angle. The angle of opening is limited by physical constraints present in the geometric configuration of the counterweight, bascule pier, and approach span. It is not known if these limitations are the result of original construction or subsequent reconstruction and/or repair. However, in this position the bridge provides unlimited vertical clearance only between the west fender and the tip of the span of approximately 14 feet. The rest of the channel is obstructed by the bascule span.

3.2.3 Current Condition and Year of Construction

General Condition: The description of the overall condition of the existing bridge is based on the FDOT Bridge Management System *Inspection/CID (Comprehensive Inventory Data) Reports* including Special-Other Bridge Report dated June 27, 2013, Special Movable Inspection Report dated July 31, 2012, and Regular NBI with Movable dated July 28, 2011. The bridge was constructed in 1924 and currently has a Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. The Health Index is 88.44.

The 2011, 2012 and 2013 Inspection Reports are provided in **Appendix D.** Pictures of bridge elements, including bridge machinery and electrical systems, which illustrate their current condition are included in the 2011 Addendum and 2012 Addendum.

The Sufficiency Rating is a method of evaluating highway bridge data by calculating factors to obtain a numeric value, which is indicative of bridge sufficiency to remain in service. The sufficiency rating includes the following applicable primary factors:

1. Structural Adequacy and Safety including:
    a. Superstructure Condition
    b. Substructure Condition
    c. Load Carrying Capacity
2. Serviceability and Functional Obsolescence including:
    a. Deck Condition
    b. Overall Structural Condition
    c. Roadway Geometry
    d. Traffic Volume
3. Essentiality for Public Use including:
    a. Traffic Volume

b. Detour Length

c. Probability of Bridge Closure

The overall condition of the bridge is consistent with the age and severe exposure conditions. The movable span of the bridge has been in service for 88 years. At the time of construction it was customary to design a bridge with an anticipated service life of 50 years. Although the bridge operates infrequently, functional and operational deficiencies have developed despite efforts to correct these deficiencies. There have been recurring misalignment issues at the joints of the approach spans, as well as at the joint between the bascule leaf and bascule rest pier. These misalignments have led to lack of continuity of the curb line and rubbing of the bascule leaf railing on the railing at the bascule leaf pier. The discontinuity of the curb has reportedly led to several tire punctures. Periodic attempts have been made to correct and/or arrest these alignment issues.

The most recent Bridge Inspection Report (November 2011) indicates that the overall condition rating of the deck is *Good*, the superstructure is considered *Satisfactory*, and the substructure is considered *Satisfactory*. The overall performance rating is *Good* but the bridge is classified as *Functionally Obsolete*. The bridge has reached a threshold at which deficiencies and deterioration are expected to accelerate. Specifically, conditions of concern include:

Misalignment and Settlement: While some remedial measures in the form of crutch bents and helper piles have been installed in an attempt to mitigate the long term settlement and associated misalignment of the structure, evidence of continued problems remains. Specifically, the bascule span continues to trend towards one side and the deck joints and curbs exhibit misalignment. It appears unlikely that correction of one deficiency or symptom would provide full resolution. A comprehensive rehabilitation would be required to correct the leaf misalignment and secure it from further abnormal movement. The corrective measures implemented in 2011 are expected to only provide a short term solution. In addition to the effects of settlement, the curved tread plates and flat track plates exhibit problems that contribute to the bascule span's overall misalignment issues.

Bascule Drive System: The condition of the drive system (i.e., machinery) is consistent with the age and misalignment of the structure. In general, the machinery, including the rack and pinion teeth, pinion shafts, and bascule track and treads exhibits advanced wear and deterioration. The wear has advanced to the point where it is expected to accelerate. With worn gears there is more clearance (backlash) between meshing teeth. As the backlash increases, the wear to the teeth accelerates. In addition, the bascule tracks and treads are not properly aligned. This has resulted in uneven wear to these components and may be a contributing factor to the variations in load on the main rack and pinions. During the 2011 repairs, deficiencies in the design of the drive machinery were also identified. The current pinion shafts do not meet current design requirements established by AASHTO.

Span Locks: The forward span lock assemblies at the tip end of the bascule leaf were replaced in 2011 and are in good working condition.

Load Capacity: The bridge load capacity was determined in 1987. According to the load rating, the structure should be posted at or below the following: Single Unit Truck – 12 tons and Combination Trucks – 20 tons. The bridge is actually posted at both approaches as follows: Single Unit Truck – 12 Tons, Combination Truck – 15 tons, and Truck and Trailer – 15 tons.

Fender System: The 2011 bridge inspection report notes that marine borer activity is evident on several of the fender piles and lower wales. It is likely that this activity will cause the piles and wales to deteriorate near the waterline. Affected piles will need to be replaced.

Safety Considerations: There are several factors that contribute to the functional obsolescence of the existing bridge. The concrete post and beam bridge railings are substandard, as they do not meet current standards for roadside safety in terms of both geometry and impact resistance. Railings for new bridges are required to meet specific crash testing and geometric requirements outlined in *National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedure for the Safety Performance Evaluation of Highway Features* which has been adopted by AASHTO and FDOT. The 9-inch curbs along the edge of travel lanes are generally considered a safety concern due to the propensity to launch errant vehicles. The approach guardrails, guardrail end treatments and transitions do not meet current design standards.

Wave Vulnerability: The existing bridge is low and susceptible to waves from a coastal storm event. According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D.*

Max Sheppard and William Miller Jr., September 2003, the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation and the existing bridge low member elevations are below the storm surge elevation.

It is anticipated that wave heights at the bridge during a coastal storm event would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves and the presence of topographical features, including numerous adjacent residential buildings and trees that reduce wind velocities at the surface of the water. Although the waves are not expected to be large, the existing bridge contains details that make it susceptible to damage from waves. Specifically, the beams introduce multiple vertical surfaces exposed to the waves that can yield large wave forces even when the waves are not large. The presence of diaphragms at each end of the spans creates conditions that can trap air and magnify vertical forces that act to lift the span. Because the simple-span superstructure is not anchored to the substructure, there are no lateral restraints to prevent the waves from pushing the superstructure off of the substructure. The pile bent substructures have limited capacity to resist lateral wave forces.

The existing Beckett Bridge is important for evacuation during a storm event. Although it is not considered a designated emergency evacuation route, it is considered an extension of Tarpon Avenue, which is a designated emergency evacuation route. Wave vulnerability during a storm event could impact the reliability of the existing bridge for evacuation.

3.2.4 Typical Section

The existing bridge typical section consists of one 10-foot wide through lane in each direction and 2'-2" sidewalks on both sides of the roadway. The sidewalks are level with the roadway surface and are separated from the travel lanes by 9-inch high by 9-inch wide curbs. Concrete post and beam railings 2'-8" high are located at the back of the sidewalk. Separate bicycle lanes are not provided; both bicyclist and pedestrians share the sidewalk. The overall existing bridge width is 28 feet (see **Figure 3-3**).

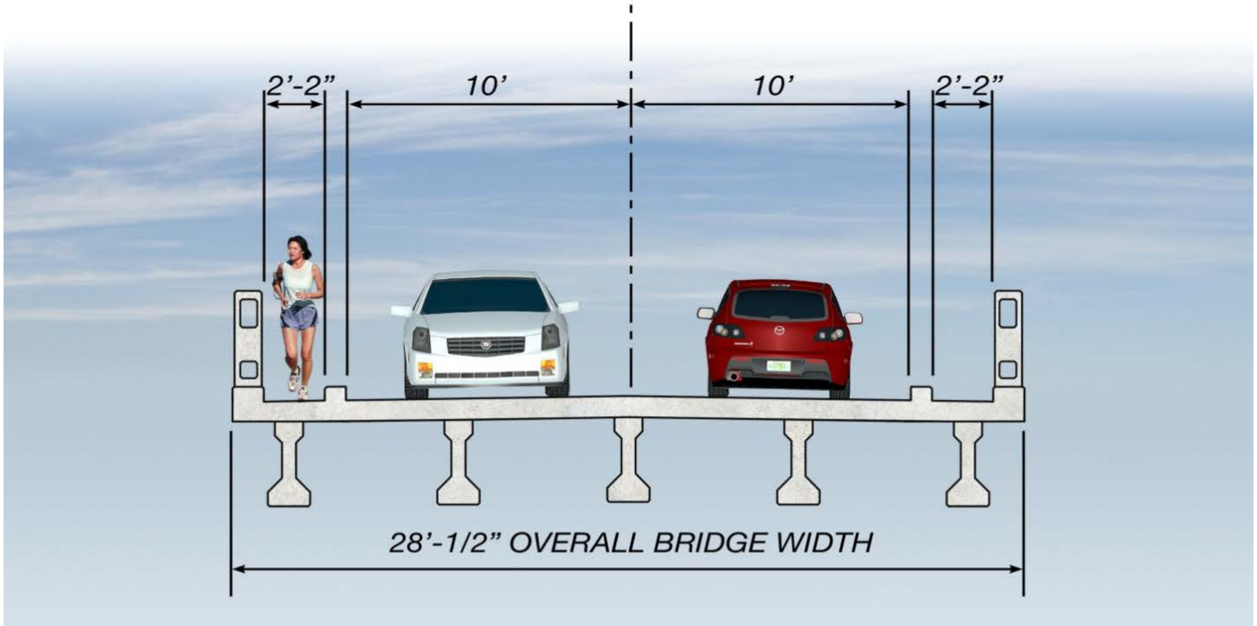


Figure 3-3 – Existing Bridge Typical Section

3.2.5 Horizontal and Vertical Alignment

The bridge is aligned horizontally at a 90^{o} angle to the channel. Vertical curve information for the bridge is not known with certainty. The 1923 permit sketches for the original bridge indicate a +1.29% grade west of the bridge, a level section 100 feet long over the channel (offset to the west from the centerline of the channel), and a -0.71% grade east of the bridge. No information is available from the 1955 reconstruction to indicate if the approach grades were modified at that time. Survey information along the bridge is also inconclusive. The survey indicates a level section across the channel, but the approaches exhibit a varying grade. Some of this may be due to past settlement. However, a best fit vertical curve created to match the surveyed profile appears to meet current minimum design standards for stopping distance and headlight distance for the 35 mph design speed.

3.2.6 Bridge Openings

Pinellas County owns and operates the Beckett Bridge. The US Coast Guard regulations state that the bridge will open on demand with two hours advance notice. Pinellas County maintains records of bridge opening requests. The number of openings for each month in 2009 through 2012 are provided in **Table 3-4**.

Table 3-4 – Number of Bridge Openings 2009 – 2012

Month	2009	2010	2011	2012
January	1	1	1	2
February	1		2	
March	4	1	1	2
April	1	5	2	2
May		1	7	2
June	1	2	2	
July		2	1	4
August		2	1	
September	1	2		
October		2	1**	
November				1
December	1*	3	1	1*
TOTAL	**10**	**21**	**18**	**14**

* Opened for Holiday Boat Parade, Dec 12, 2009 from 7:00 – 9:30 pm and Dec 7, 2012
** Test Opening after Repairs

The bridge opened ten times in 2009, 21 times in 2010, 18 times in 2011 and 14 times in 2012. The highest number of openings occurred in March 2009 and July 2012 (four), April 2010 (five) and May 2011 (seven).

3.2.7 Channel Data

The existing bascule bridge crosses Whitcomb Bayou approximately perpendicular to the channel. Waterborne vessels are guided between the bascule piers by a fender system consisting of timber rub rails attached to driven timber piles. Navigation lights mounted to the fender system and the bascule leaf provides a warning indication. The channel has a minimum horizontal width of 25 feet between faces of fenders. When the bascule leaf is in the closed position there is approximately six feet of vertical clearance at the face of the east fender for the entire width of the channel. When the bridge opens, the leaf rolls away from the channel and rotates to a 49 degree angle. In this open position the bridge provides unlimited vertical only between the west fender and the tip of the span of approximately 14 feet. The remaining 11 feet of the channel is obstructed by the raised bascule span.

Bascule Leaf in Full Open Position – Unlimited Clearance Restricted

3.2.8 Ship Impact Data

The bridge, which crosses Whitcomb Bayou, is not required to be designed to resist vessel impact. The low member vertical clearance is six feet with the bascule span in the closed position. There is no evidence that the existing vertical clearances, in the restricted open and in the closed position, are insufficient for current marine usage, or that the type and number of vessels using the bayou will change dramatically in the future. There are no commercial marinas present in Whitcomb Bayou.

3.3 ENVIRONMENTAL CHARACTERISTICS

3.3.1 Existing and Future Land Use

Existing land use was determined by a field review of the project corridor and review of Existing Land Use maps (July 2007) published in the City of Tarpon Springs Comprehensive Plan. Land use in the area is predominantly residential. Bayshore Mobile Home Park (MHP) is located on the southwest corner of the bridge immediately adjacent to Riverside Drive. The Tarpon

Springs Yacht Club is located on the northeast side of the bridge. Two assisted living facilities, Serenity on the Bayou and Tarpon Bayou Center are located on Chesapeake Drive, just north of Riverside Drive. Stamas Yacht Repair and Restoration is located on Pampas Drive, north of Spring Boulevard. Existing land uses are shown in **Figure 3-4**.

No notable changes in future land use in the vicinity of the project are shown on the 2025 Future Land Use Map (Tarpon Springs Comprehensive Plan). The predominant land use in the vicinity will remain low to medium density residential. The area surrounding the Beckett Bridge is largely built out; accordingly, land for potential new development is limited. Future land uses as identified in the 2025 Comprehensive Plan are shown on **Figure 3-5**.

3.3.2 Community Resources/Emergency Services

Community resources, including those providing emergency services located within approximately 1.5 miles of the project include two fire stations, one police station, one hospital, five religious institutions, and five schools. In addition, the Pinellas County Health Department operates a health center within the City of Tarpon Springs, located approximately 1.2 miles from the Beckett Bridge. The location of these resources and services are provided in **Table 3-5** and on **Figure 3-6**.

The western boundary of the local Tarpon Springs Historic District is located just east of the project at Canal Street. The District, created in 1990, comprises a total land area of approximately 700 acres. The Tarpon Springs Heritage Museum is located in Craig Park south of the project on Whitcomb Bayou. Three City of Tarpon Springs parks, Rotary Park, Sissler Field and Craig Park occur in the project vicinity. Additional information about these cultural resources is provided in Section 3.4 of this report.

Figure 3-4 – City of Tarpon Springs Existing Land Use

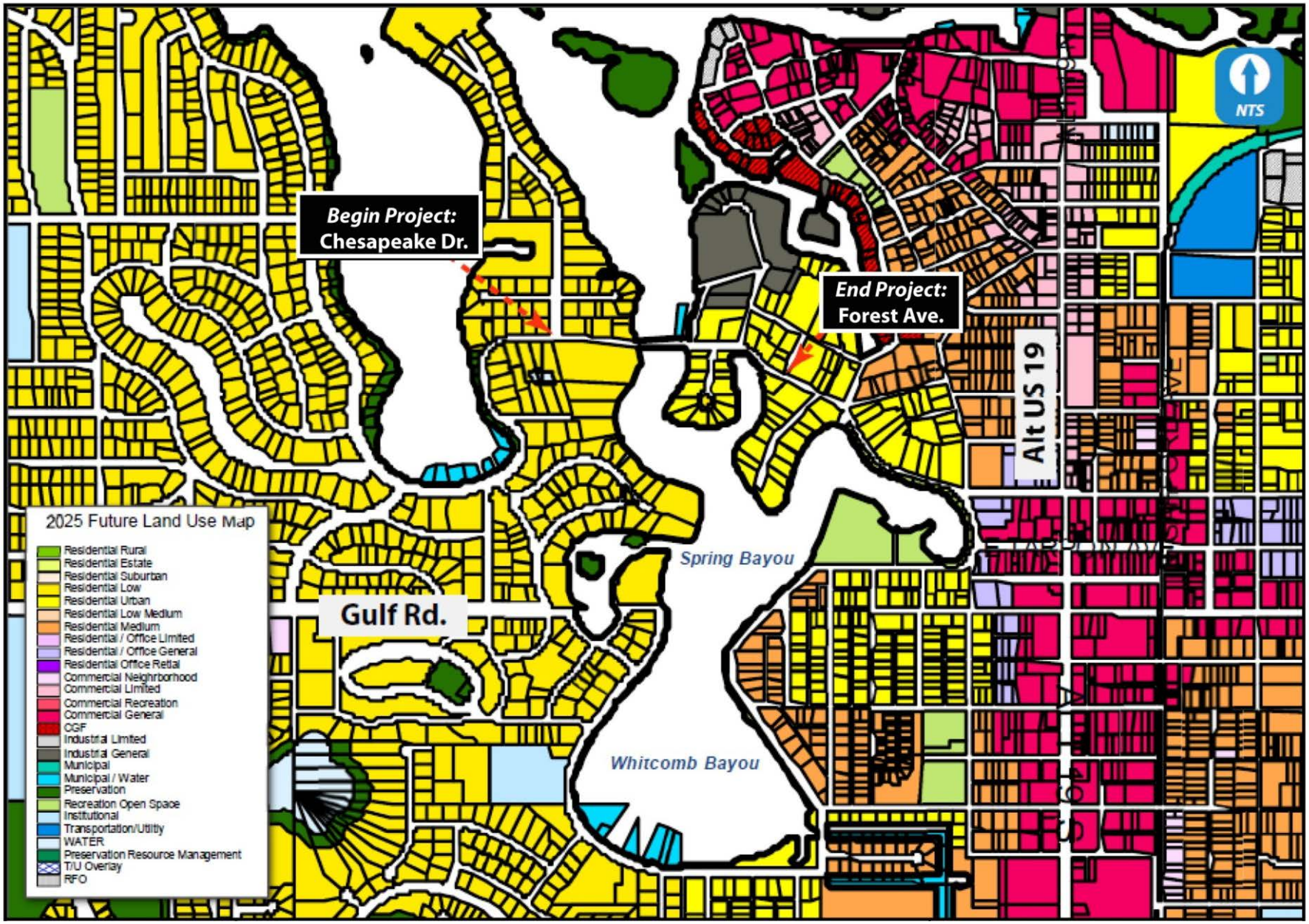


Figure 3-5 – City of Tarpon Springs Future Land Use

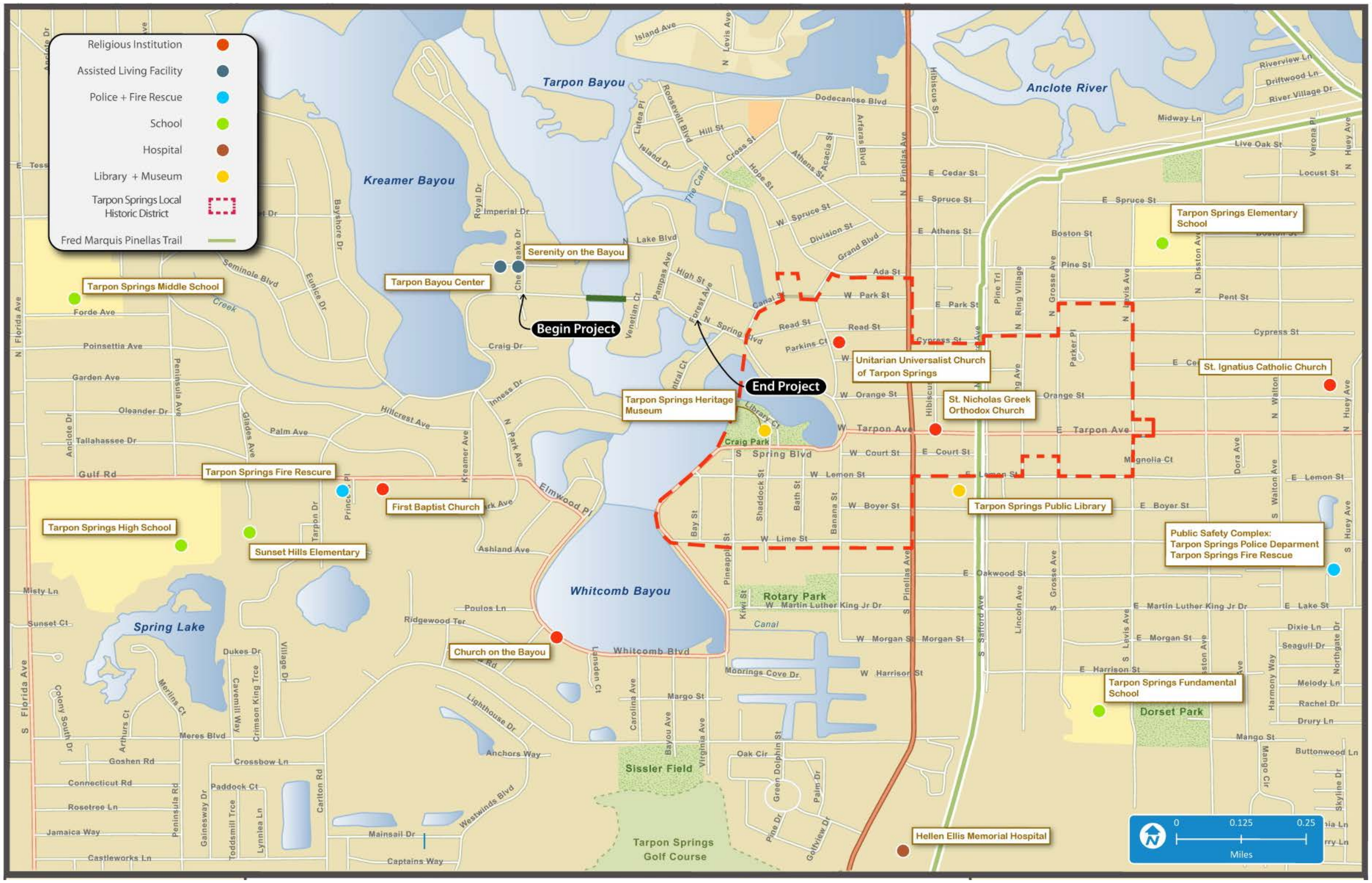


Figure 3-6 – Community Resources/Emergency Services

Table 3-5 – Location of Community Resources

Fire Department		Distance from Beckett Bridge (approximate)
Tarpon Springs Fire Rescue[1]	444 Huey Avenue South Tarpon Springs, FL 34689	1.3 miles
Tarpon Springs Fire Rescue #70	1025 Gulf Road Tarpon Springs, FL 34689	0.6 mile
Law Enforcement		
Tarpon Springs Police Department[1]	444 Huey Avenue South Tarpon Springs, FL 34689	1.3 miles
Hospitals		
Helen Ellis Memorial Hospital	1395 South Pinellas Avenue Tarpon Springs, FL 34689	1.2 miles
Religious Organizations		
St. Ignatius Catholic Church	715 E. Orange Street Tarpon Springs, FL 34689	1.3 miles
St. Nicholas Greek Orthodox Church	36 North Pinellas Avenue (Alt US 19) Tarpon Springs, FL 34689	0.6 mile
Unitarian Universal Church of Tarpon Springs	230 Grand Boulevard Tarpon Springs, FL 34689	0.4 mile
First Baptist Church	1021 Gulf Road Tarpon Springs, FL 34689	0.5 mile
Church on the Bayou	409 Whitcomb Boulevard Tarpon Springs, FL 34689	0.7 mile
Schools		
Tarpon Springs High School	1411 Gulf Road Tarpon Springs, FL 34689	0.8 mile
Tarpon Springs Middle School	501 North Florida Avenue Tarpon Springs, FL 34689	0.9 mile
Tarpon Springs Elementary School	555 E. Pine Street Tarpon Springs, FL 34689	1 mile
Sunset Hills Elementary School	1347 Gulf Road Tarpon Springs, FL 34689	0.8 mile
Tarpon Springs Fundamental School	400 E. Harrison Street Tarpon Springs, FL 34689	1.2 miles

1 Tarpon Springs Police Department and Tarpon Springs Fire Rescue Share the Public Safety Facility.

3.3.3 Wetlands

In February 2012, environmental scientists familiar with Florida wetland communities conducted a field review of the project study area. The purpose of the review was to verify and/or refine preliminary wetland boundaries and classification codes established through in-office literature reviews and photo-interpretation.

In June 2012, environmental scientists familiar with seagrass beds conducted a field review to verify the presence/non-presence of seagrass beds within the project study area. During field investigations, each wetland within the project study area was visually inspected. Attention was given to identifying plant species composition for each wetland and adjacent upland habitats.

Exotic plant infestations and any other disturbances, such as soil subsidence, canals, power lines, etc. were noted.

Based on field data and in-house reviews, one surface water was identified within the project study area. This tidally-influenced, estuarine surface water is known as Whitcomb Bayou. Two wetland habitat types are included within the Whitcomb Bayou boundaries of the project study area. A detailed description of Whitcomb Bayou and the wetland habitat types are presented below, which includes the Florida Land Use, Cover and Forms Classification System (FLUCFCS) and U.S. Fish and Wildlife Service (FWS) wetland classifications, listings of dominant vegetation, bordering habitat types, size, connections to other wetlands, and observed wildlife utilization. The Land Use/Vegetative Cover Type Map (**Figure 3-7**) shows the land use/habitat types and approximate boundary of Whitcomb Bayou within the project study area. A Wetland Evaluation/Essential Fish Habitat (EFH) Technical Memorandum was prepared for this project and is published separately. Additional information can be found in this document.

Figure 3-7 – Land Use/Vegetative Cover

<u>Surface Water (Whitcomb Bayou)</u>
FLUCFCS: 540 (Bays and Estuaries)
FWS: E2UB3 (Estuarine, Intertidal, Unconsolidated Bottom, Mud)

Bays and estuaries are tidally influenced inlets or large bodies of water that extend from the ocean into the land mass of Florida. Within the project study area, this category includes 10.38 acres of Whitcomb Bayou. Whitcomb Bayou is part of the Anclote River Bayou complex. The Anclote River Bayou complex is a Class III Outstanding Florida Water in the Pinellas County Aquatic Preserve. Within the project area, the west and east shorelines of the bayou are hardened with vertical seawalls.

Bottom sediments within the project study area consist of unconsolidated mud. According to the Florida Fish and Wildlife Conservation Commission (FWC) (2010), the nearest documented seagrass beds are located approximately 200 feet north of the project study area. However, no seagrass or attached macro-algae were observed within the project study area during the June 2012 field review. No seagrass blades or macro algae branchlets were present within the rack line in or adjacent to the project study area.

During the field review, a number of wildlife species were observed utilizing Whitcomb Bayou within and adjacent to the project study area such as mullet (*Mugil* spp.) and sheepshead (*Archosargus probatocephalus*). Two osprey (*Pandion haliaetus*) nests were observed on the same utility pole on the east end of Beckett Bridge on the south side of North Spring Boulevard. At the time of the field review, the nest was occupied by a foraging osprey. Gulls (*Larus* spp.), pigeons (*Columba livia*), royal terns (*Sterna maxima*), and a great egret (*Ardea alba*) were observed outside of the project study area during the review.

<u>Mangrove Swamps</u>
FLUCFCS: 612
FWS: E2SS3 (Estuarine, Intertidal, Scrub-Shrub, Broad-Leaved Evergreen)

Mangrove swamps are typically coastal hardwood swamps where red mangrove (*Rhizophora mangle*) and/or black mangroves (*Avicennia germinans*) are pure or predominant. White mangroves (*Laguncularia racemosa*) are also typically found within these swamps. Within the project study area, mangrove stands are dominated by black mangrove, white mangrove, red mangrove, saltweed (*Philoxerus vermicularis*), and marsh elder (*Iva frutescens*). Mangroves were observed on the west end of Beckett Bridge, north and south of the existing roadway. In addition, mangroves and associated species were observed along Whitcomb Bayou on the south side of North Spring Boulevard. The mangroves in this area are trimmed and maintained. Mangrove swamps comprise 0.12 acre of the total project study area.

Oyster Bars
FLUCFCS: 654
FWS: E2RF2 (Estuarine, Intertidal, Reef, Mollusk)

Barnacles (*Balanus* sp.) and oysters (*Crassostrea virginica*) were observed attached to the bridge pilings, seawall face, and pieces of debris on the bottom of the bayou. An accumulation of oysters was observed under the east and west ends of Beckett Bridge. Oyster bars comprise 0.17 acre of the total project study area.

Mitigation through Chapter 373.4137, Florida Statute (F.S.) (i.e., Senate Bill, 1986) is not available for this project because FDOT is not the applicant. A review of the available data from Florida Department of Environmental Protection (FDEP) and the water management districts indicates that the proposed project is not located within the service area of any permitted mitigation banks. For the reasons listed above, any unavoidable wetland impacts will have to be mitigated (if required) by creating, restoring, enhancing, or preserving wetlands on-site or off-site within the same drainage basin if there are no mitigation opportunities at the project site.

3.3.4 Water Quality

A Water Quality Impact Evaluation (WQIE) was prepared for this project in accordance with Part 2, Chapter 20 of the *FDOT PD&E Manual*. A copy of the WQIE is included in Appendix E. Whitcomb Bayou is located with the Pinellas County Aquatic Preserve, an Outstanding Florida Waters (OFW) according to the FDEP.

Whitcomb and Spring Bayous are embayments of the lower Anclote River and are included in the Anclote River Bayou complex watershed (EPA WBID 1440A) and the flows into the tidal segment of the Anclote River (EPA WBID 1440). These watersheds have been identified to be impaired for dissolved oxygen, nutrients, coliform and mercury in fish. During the field review, Whitcomb Bayou was mostly clear with a light sheen on the surface. Water quality in the Whitcomb Bayou (part of the Anclote River Watershed basin) is monitored and recorded by the Pinellas County Department of Environmental Management (PCDEM) Water Resources Department. A general review of the data from sampling station 01-05, which is located south of Beckett Bridge near Whitcomb Boulevard between West Lake Street and Manatee Lane, indicates that salinity concentrations in the Whitcomb Bayou tend to average in the lower to mid-20 parts per thousand.

3.3.5 Wildlife and Habitat

The project study area was evaluated for potential occurrences of federal and state listed protected plant and animal species in accordance with Section 7 of the Endangered Species Act of 1973, as amended, and Chapters 5B-40 and 68A-27 of the Florida Administrative Code (F.A.C.). The evaluation included coordination with the FWS and the Florida Natural Areas Inventory (FNAI). The evaluation also included literature searches and field reviews to identify the potential occurrence of listed species and any designated critical habitat located within the project study area. An Endangered Species Biological Assessment (ESBA) has been prepared for this project in accordance with Part 2, Chapter 27 of the *FDOT PD&E Manual*. The ESBA is published separately for this project and includes more detailed information concerning wildlife and habitat.

The evaluation included coordination with the FWS, the National Marine Fisheries Service (NMFS), and the FWC through the FDOT's ETDM process. Verbal correspondence with FWC via a phone conversation was also conducted during this evaluation regarding potential impacts to the Florida manatee. Additionally, information was obtained from the FNAI. The evaluation also included literature searches and field reviews to identify the potential occurrence of listed species and any designated critical habitat located within the project study area.

Ten federal and/or state listed plant species and thirty-four federal and/or state listed animal species occur or have been historically documented in Pinellas County. Listed species with a potential to occur within the project study area were determined based on the habitat requirements of each species, presence of their preferred habitat within the project study area, their geographic range, and documented occurrences of the species within the vicinity of the project study area. Based on this analysis, one state listed plant species and twenty-one federally and/or state listed animal species have a potential to occur within the project study area. Each species with a potential to occur within the project study area is described below

3.3.5.1 Federal Listed Species

Fauna

Mammals

The **West Indian manatee** (*Trichechus manatus*) is listed as endangered by the FWS. The manatee is an herbivorous marine mammal found statewide in coastal or estuarine waters, rivers, and (occasionally) lakes, but is most common in waters of peninsular Florida. Sheltered coves are important for feeding, resting, and rearing of young. No manatees were observed during the field review of the project study area. However, the project study area is located in a FWS Consultation Area for the West Indian manatee. Based on the U.S. Army Corps of Engineers (USACE) 2011 Manatee Key, Whitcomb Bayou is designated as an Important Manatee Area (IMA) where increased densities of manatees occur due to the proximity of warm water discharges, freshwater discharges, natural springs and other habitat features that are attractive to manatees. Within this IMA, dredging is not allowed to occur between November 15 and March 31.

Birds

The **piping plover** (*Charadrius melodus*) is listed as threatened by the FWS. The piping plover utilizes sandy beaches for foraging and nesting, but also feeds in tidal mud and sand flats. According to FNAI, no individuals have been documented within one mile of the project study area. Even though foraging habitat is available within the project study area, no piping plovers were observed during the field review. However, the project study area is located in a FWS Consultation Area for the piping plover. Within the project study area, minimal impacts to wetland habitat utilized by the piping plover may occur as a result of construction activities along the shorelines of Whitcomb Bayou.

The **wood stork** (*Mycteria americana*) is listed as endangered by the FWS. This wading bird species is opportunistic and utilizes various habitats, including forested wetlands, freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures, and ditches. However, a specialized feeding technique commonly referred to as "groping" limits the wood stork to feeding in shallow water. Based on information provided by the FWS and FNAI, the project study area is located within the 15-mile core foraging area of eight active wood stork rookeries.

Reptiles

The **American alligator** (*Alligator mississippiensis*) is listed as threatened by the FWS and a species of special concern by the FWC. The FWS classifies this species as threatened because of its similar appearance to the threatened American crocodile (*Crocodylus acutus*). The American alligator is an opportunistic feeder and can be found in both freshwater and brackish environments, but their preferred habitat is freshwater lakes, slow moving rivers, and associated wetlands. According to FNAI, no alligators have been documented within one mile of the project study area and none were observed during the field review of the project study area.

The **green turtle** (*Chelonia mydas*) is listed as endangered by the FWS. This sea turtle occurs in estuarine and marine coastal and oceanic waters. Nesting occurs on coastal sand beaches, often near the dune line. Large juveniles and adults feed on seagrasses and algae. Hatchlings use offshore floating sargassum mats and juveniles frequent coastal bays, inlets, lagoons, and offshore worm reefs. According to FNAI, no green turtles have been documented within one mile of the project study area and none were observed during the field review.

The **eastern indigo snake** (*Drymarchon corais couperi*) is listed as threatened by the FWS. The eastern indigo snake can be found in a variety of habitats including swamps, wet prairies, xeric pinelands, and scrub areas. The eastern indigo snake commonly utilizes gopher tortoise burrows for shelter to escape hot or cold ambient temperatures within its range. According to FNAI, no eastern indigo snakes have been documented within one mile of the project study area and none were observed during the field review.

Fish

The **Gulf sturgeon** (*Acipenser oxyrinchus desotoi*) is listed as threatened by the FWS. The Gulf sturgeon is typically found in the Gulf of Mexico and associated near-shore marine, estuarine, and riverine habitat. According to FNAI, no individuals have been documented within one mile of the project study area and no individuals were observed during the field review of the project study area.

3.3.5.2 State Listed Species

Fauna

Wading birds including the **limpkin** (*Aramus guarauna*), **little blue heron** (*Egretta caerula*), **snowy egret** (*Egretta thula*), **tricolored heron** (*Egretta tricolor*), and **white ibis** (*Eudcimus albus*) have been documented within Pinellas County, but none have been documented within one mile of the project study area. All of these species are listed as a species of special concern by the FWC. While each species is distinct, wading birds are discussed collectively since they occupy similar habitats and generally have similar feeding patterns (i.e., waders). The populations of these species have been impacted by the destruction of wetlands for development and by the drainage of wetlands for flood control and agriculture. None of these listed wading birds were observed within the project study area during the field review and no wading bird rookeries are documented within one mile of the project study area.

The **snowy plover** (*Charadrius alexandrinus*) is listed as threatened by the FWC. The snowy plover utilizes dry, sandy beaches for foraging and nesting, but also feeds on tidal mud and sand flats along inlets and creeks. Even though foraging habitat is available within the project study area, no snowy plovers were observed during the field review and none have been documented within one mile of the project study area.

The **reddish egret** (*Egretta rufescens*) is listed as a species of special concern by the FWC. This wading bird species is almost exclusively found along the coast foraging in shallow saltwater habitats and marine tidal flats with sparse vegetation. FNAI reports indicate that the reddish egret has been documented in Pinellas County and habitat is present within the project study area. However, no individuals were observed during the field review and none have been documented within one mile of the project study area.

The **southeastern American kestrel** (*Falco sparverius paulus*) is listed as threatened by the FWC. This species typically nests in tree cavities that were excavated by woodpeckers. Kestrels prefer open habitats for foraging, such as pine savannas, pine flatwoods, farmlands, suburban golf courses and residential areas which provide enough cover to support small terrestrial prey animals. Some suitable foraging habitat is available within the project study area, but nesting habitat is minimal due to the lack of large, dead nesting trees. Based on information from FNAI, the southeastern American kestrel has been documented within Pinellas County, but no individuals have been documented within one mile of the project study area. No kestrels were observed during the field review.

The **Florida sandhill crane** (*Grus canadensis pratensis*) is listed as threatened by the FWC. The sandhill crane is associated with shallow fresh water areas, pasture and open woods habitats. Habitats such as wet and dry prairies, marshes, and marshy lake margins are optimum for the sandhill crane. According to FNAI, no sandhill cranes have been documented within one mile of the project study area and none were observed during the field review.

The **American oystercatcher** (*Haematopus palliates*) is listed as a species of special concern by the FWC. This shorebird requires large areas of beach, sandbar, mud flat, and shellfish beds for foraging. Sparsely vegetated, sandy areas are generally used for nesting, but they will also use beach wrack and marsh grass. According to FNAI reports, the project study area is within the geographic range of the American oystercatcher and suitable habitat is present. However, no individuals have been documented by FNAI within one mile of the project study area and no individuals were observed during the field review.

The **brown pelican** (*Pelecanus occidentalis*) is listed as a species of special concern by the FWC. The brown pelican's preferred foraging habitat is primarily coastal estuarine waters and can be frequently found resting on near-shore sandbars. This species tends to nest in trees on small coastal islands, but some ground nesting has been documented. Based on information from FNAI, the brown pelican has been documented within one mile of the project study area; however, none were observed during the field review of the project study area.

The **roseate spoonbill** (*Platalea niger*) is listed as a species of special concern by the FWC. This species is typically found foraging along tidal mudflats and coastal beaches and roosting in mangrove swamps. However, roseate spoonbills are occasionally found in forested freshwater swamps and herbaceous freshwater marshes. Based on information from FNAI, the roseate spoonbill has not been documented within one mile of the project study area and none were observed during the field review

The **black skimmer** (*Rynchops niger*) is listed as a species of special concern by the FWC. This species typically forages in coastal and inland waters, including beaches, bays, estuaries, tidal creeks, large lakes, phosphate pits, and flooded agricultural fields. Nests are primarily found on sandy beaches, small coastal islands, and dredge spoil islands. According to FNAI, the black skimmer has been documented in Pinellas County, but not within one mile of the project study area. No individuals were observed during the field review of the project study area.

The **least tern** (*Sterna antillarum*) is listed as threatened by the FWC. The preferred nesting habitat for this species is sparsely vegetated coastal beaches above the high tide line. The least tern forages in near-shore open water habitats by diving into the water after prey items. Based on information received from FNAI, the least tern has been documented within Pinellas County, but not within one mile of the project study area and no individuals were observed during the field review.

Flora

A review of state-listed plants that have been documented within Pinellas County and their potential habitats was performed prior to the field visit. One state-listed plant species with habitat available within the project study area is described below.

The **golden leather fern** (*Acrostichum aureum*) is listed as threatened by the Florida Department of Agriculture and Consumer Services (FDA). This species is a member of the fern (*Pteridaceae*) family and is typically found in tropical hardwood hammocks, as well as fresh and brackish water marshes. While limited suitable habitat for this species is available within the project study area, no leather ferns were observed during the field review. In addition, FNAI does not have any recorded documentations of this species within one mile of the project study area.

Other Species of Concern

Although the **bald eagle** (*Haliaeetus leucephalus*) is no longer state-or federally-listed, it is still federally-protected by the Bald and Golden Eagle Protection Act in accordance with 16 United States Code (U.S.C.) 668. It is also state-protected by Chapter 68A-16.002, F.A.C., and the FWC Bald Eagle Management Plan (2008). The bald eagle typically uses riparian habitat associated with coastal areas, lake shorelines, and river banks for foraging. The nests are generally located near bodies of water that provide a dependable food source. According to FWC's online bald eagle nest locator, there are no active bald eagle nests documented within one mile of the project study area. No bald eagles or nests were observed within the project study area during the field review.

During the field reviews, two **osprey** nests were observed on the east side of Beckett Bridge on the south side of North Spring Boulevard. Both nests were supported by the same utility pole and may be used by the same osprey. An osprey was present within one nest at the time of the February 2012 field inspection and empty oyster shells and fish remains were visible on the ground directly below the nest.

The osprey is state-listed as a species of special concern in Monroe County only. However, it is still federally-protected by the U.S. Migratory Bird Treaty Act (16 U.S.C. 703-712) and state protected by Chapter 68A of the F.A.C. Authorization is required from the FWC to take any osprey nest while federal permits are only required for the taking of "active" nests. "Inactive" nests may normally be taken and may be determined as inactive by the absence of any egg or dependent (i.e., flightless) young in the nest. While nesting typically occurs in December and may extend into late February, the nest may remain active throughout the summer months. Requests from the FWC for removal of active nests are only issued if the nest presents a safety hazard for the birds or humans. Active nest removal permits are issued with less frequency on a case-by-case basis.

Critical Habitat and Consultation Areas

The project study area was also evaluated for the potential occurrence of Critical Habitat as defined by 17 Code of Federal Regulations (CFR) 35.1532, but no designated Critical Habitat was identified within the project study area.

The project study area is located within a designated FWS consultation area and IMA for the West Indian manatee. The project study area is located within a designated FWS consultation area for the piping plover. Potential impacts to piping plover habitat will be coordinated with the FWS, FWC, and the Southwest Florida Water Management District (SWFWMD) during the design and permitting phases of this project.

The project study area is located within a designated FWS consultation area for the Florida scrub jay (*Aphelocoma coeruluscens*). Based on a review of available sources referenced in Section 2.0 of this technical memorandum and field reviews, no scrub jay habitat is available within the project study area and no populations have been reported or observed. Therefore, no further scrub jay consultation with FWS should be required for this project.

3.3.6 Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Panel 19 of Map Number 12103C00196 (September 2003), the Beckett Bridge and immediate vicinity are located within the 100 year floodplain in designated Zone AE. The Base Flood Elevation established for Minnetta Bayou/Spring Bayou is elevation 10 feet which is associated with coastal tidal surge conditions. Detailed information about floodplains within the project area is also discussed in the *Locations Hydraulic Report* published separately for this project.

3.3.7 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act required each regional Fishery Management Council to amend their existing fishery management plans to identify and describe EFH for each species under management. EFH is defined by the Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Whitcomb Bayou is within the Gulf of Mexico Fishery Management Council's (GMFMC) area of jurisdiction, which extends from the coasts of Texas, Louisiana, Mississippi, Alabama, and west Florida to Key West. GMFMC's limits of jurisdiction also extend seaward to the limit of the Exclusive Economic Zone (200 nautical miles from the baseline of the territorial sea.

The GMFMC separates EFH into estuarine and marine components. For the estuarine category, EFH includes estuarine emergent wetlands (saltmarsh and brackish marsh), mangrove wetlands, submerged aquatic vegetation (seagrass), algal flats, mud, sand, shell, and rock substrates, and estuarine water column. The marine category includes the water column, vegetated bottoms, non-vegetated bottoms, live bottoms, coral reefs, geologic features, and Continental shelf features (GMFMC, 2010).

The GMFMC manages 55 species for the Gulf of Mexico area. Of these 55 species, the GMFMC has identified and described EFH for 26 representative managed species. Species accounts of each of the 26 representative managed species were reviewed to assess the potential occurrence of these species within the project study area during any stage of their life cycle. Table 4 lists each of these species and its potential to occur in the project limits. Of the 26 representative fish, shrimp, and crab species listed by the GMFMC, one is considered to have a high potential to occur within the project limits, the gray snapper (*Lutjanus griseus*). The remaining 25 representative species and the coral complex are considered to have a low to no potential to occur within the project limits.

A Wetland Evaluation/Essential Fish Habitat Technical Memorandum was prepared for this project and is published separately. Additional information can be found in this document.

3.3.8 Contamination

A Contamination Screening Evaluation has been conducted as required by FDOT's PD&E Manual, Part 2, Chapter 22 (revised January 17th, 2008) and in accordance with the FHWA Technical Advisory T 6640.8a (dated October 30th, 1987). The results of this evaluation were published separately in a Contamination Screening Evaluation Report (CSER). Refer to this report for additional information.

Consistent with the guidance provided by FDOT and FHWA, and based on environmental records searches, land use surveys, field surveys and other screening methodologies cited within the PD&E manual, eight potential contamination sites were identified within the vicinity of the project corridor. The location of these sites is shown on **Figure 3-8** and described in **Table 3-6**. Of the eight sites, six were identified as "No" contamination risk, one was identified as "Low" contamination risk, and one was identified as "Medium" contamination risk. Accordingly, no further evaluation of these sites is recommended during the design phase of the project unless changes are made to the project design that could potentially change the location or alignment of the bridge.

Figure 3-8 – Potentially Contaminated Sites

Table 3-6 – Potentially Contaminated Sites within the Project Limits

Map ID	Site Name	Site Address	Risk Rating
01	Stamas Yacht, Inc.	300 Pampas Ave.	Medium
02	Ericson Marine	435 Roosevelt Blvd.	No
03	N/A	Roosevelt Blvd. and Canal St.	No
04	N/A	200 High St.	No
05	Beckett Bridge (fender system)	Riverside Dr.	Low
06	City of Tarpon Springs Sewage Pumping Station (1 of 2)	Doric Ct.	No
07	City of Tarpon Springs Sewage Pumping Station (2 of 2)	Riverside Dr. and Chesapeake Dr.	No
08	Tarpon Springs Yacht Club	350 N Spring Blvd.	No

The "Low" risk site corresponds to the piles of the fender system immediately adjacent to the Beckett Bridge which could contain creosote and/or arsenic as preservatives. Should some or all of these piles require removal or disturbance during the construction period, they should be evaluated beforehand to verify the presence or absence of these substances. If these substances are present, precautions should be taken by the contractor to help prevent the leaching of creosote into the waterway or the generation of arsenic-containing dust.

The "Medium" risk site (i.e., the Stamas facility) presents a contamination potential based on current and historical environmental records, however, it is not anticipated that this facility will be impacted as part of the current project design. Should project design elements change such that implementation would require FDOT to acquire, engage or otherwise alter this property, it is recommended that further assessment be conducted.

3.4 CULTURAL RESOURCES

3.4.1 Historic and Archaeological Sites

A *Cultural Resource Assessment Survey (CRAS)* was conducted for this study. The results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013. The concurrence letter is included in Appendix F. The objective of this survey was to identify cultural resources within or adjacent to the Area of Potential Effect (APE) and assess their eligibility for listing in the NRHP according to the criteria set forth in 36 CFR Section 60.4.

This assessment was designed and implemented to comply with Section 106 of the *National Historic Preservation Act of 1966* (NHPA) (Public Law 89-655, as amended), as implemented by 36 CFR 800 (*Protection of Historic Properties*, effective January 2001); Chapter 267, F.S.; Section 4(f) of the *Department of Transportation Act of 1966* (DOT Act), as amended (49 U.S.C. 303); and the minimum field methods, data analysis, and reporting standards embodied in the Florida Department of Historic Resources (FDHR) *Historic Preservation Compliance Review Program* (November 1990), *Cultural Resource Management Standards and Operational Manual* (February 2003), and Chapter 1A-46 (*Archaeological and Historical Report Standards and Guidelines*), F.A.C. In addition, this report was prepared in conformity with standards set forth in Part 2, Chapter 12 (*Archaeological and Historic Resources*) FDOT *Project Development and Environment Manual* (revised, January 1999).

All work conforms to professional guidelines set forth in the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* [48 Federal Register (FR) 44716, as amended and annotated]. Principal investigators meet the minimum qualifications for archaeology, history, architecture, architectural history, or historic architecture contained in 36 CFR 61 (*Procedures for Approved State and Local Historic Preservation Programs*, Professional Qualifications Standards). Archaeological investigations were conducted under the direction of James Pepe, M.A., RPA. Historic resource investigations were conducted under the direction of Amy Groover Streelman, M.H.P.

The APE was determined by evaluating the improvements that may be implemented as part of the bridge construction. The improvements under consideration may range from rehabilitation of the existing bridge to the construction of a 28 foot high fixed bridge. The determination also considered the surrounding character of the area and the existing facilities found throughout the corridor. Additionally, a detour would be required for removal of the existing bridge, rehabilitation or replacement alternatives. The proposed detour plan was considered when determining the limits of the APE. The proposed APE for historic and archaeological resources is shown on **Figures 3-9 and 3-10**. The APE was reviewed and approved by FHWA and State Historic Preservation Officer (SHPO) by letter dated March 27, 2012, which is included in **Appendix F**.

Figure 3-9 – Proposed Historic Resources Area of Potential Effect (APE)

Figure 3-10 – Proposed Archaeological Resources Area of Potential Effect (APE)

The APE for historic resources includes any historic properties adjacent to the current roadway and any new proposed right of way acquisitions beginning at Chesapeake Drive and ending at Forest Avenue. This APE provides appropriate coverage for the alternatives related directly to Beckett Bridge PD&E project. In regard to the mid-level fixed bridge alternative that is being studied, the APE includes properties along the riverfront that can physically be seen from a from a reasonable distance in order to address any viewshed/visual effects. This APE extends two to four parcels on either side of the current bridge location on both sides of the bayou.

The goal of this cultural resource survey was to locate and document evidence of historic or prehistoric occupation or use within the APE (archaeological or historic sites, historic structures, or archaeological occurrences [isolated artifact finds]), and to evaluate these for their potential eligibility for listing on the NRHP. The research strategy was composed of background investigation, a historical document search, and field survey. The background investigation involved a perusal of relevant archaeological literature, producing a summary of previous archaeological work undertaken near the project area.

This survey resulted in the identification of 16 newly recorded historic resources within the APE including one bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, 8PI2069) (**Table 3-7**). One of these newly recorded historic resources, Beckett Bridge (8PI12017), was determined to be eligible for listing in the NRHP by FHWA and SHPO. The remaining resources (8PI12043-8PI12055, 8PI12068, 8PI12069) are considered ineligible for listing in the NRHP as individual historic resources or as contributing resources to a historic district.

Determination of Eligibility (DOE) forms were prepared for the Beckett Bridge (8P112017) and submitted to the FHWA in August 2012. The purpose of this early coordination, prior to submitting the CRAS, was to obtain early input from FHWA and the SHPO on the potential eligibility of the bridge for the NRHP. The DOE concluded that the Beckett Bridge was eligible for listing in the NRHP. Both FHWA and SHPO concurred with this determination in September and October 2012, respectively. The Letter from FDOT to FHWA dated August 24, 2012 which includes FHWA and SHPO concurrence is included in Appendix F.

Table 3-7 – Historic Resources Identified within the Project APE

FMSF #	Site Name / Address	Style	Const. Date	National Register Status
8PI12017	Beckett Bridge Riverside Drive/Spring Boulevard	Bascule Bridge	1924	Determined Eligible
8PI12069	435 Doric Court	Masonry Vernacular	c. 1947	Ineligible
8PI12068	425 Doric Court	Frame Vernacular	c. 1954	Ineligible
8PI12043	438 Riverside Drive	Craftsman	c. 1925	Ineligible
8PI12044	434 Riverside Drive	Frame Vernacular	c. 1929	Ineligible
8PI12045	412 Riverside Drive	Masonry Vernacular	c. 1946	Ineligible
8PI12046	403 Riverside Drive	Mission	c. 1949	Ineligible
8PI12047	438 Craig Drive	Frame Vernacular	c. 1940	Ineligible
8PI12048	Tarpon Springs Yacht Club/350 North Spring Boulevard	Masonry Vernacular	1954	Ineligible
8PI12049	6 Venetian Court	Ranch	c. 1952	Ineligible
8PI12050	8 Venetian Court	Ranch	c. 1954	Ineligible
8PI12051	12 Venetian Court	Masonry Vernacular	c. 1953	Ineligible
8PI12052	101 Pampas Avenue	Masonry Vernacular	c. 1954	Ineligible
8PI12053	330 North Spring Avenue	Masonry Vernacular	c. 1956	Ineligible
8PI12054	302 North Spring Boulevard	Masonry Vernacular	c. 1950	Ineligible
8PI12055	301 North Spring Boulevard	Frame Vernacular	c. 1953	Ineligible

No archaeological sites were newly identified within or adjacent to the project corridor during the current survey and no previously recorded archaeological sites were located within the archaeological APE.

In addition to the CRAS, a Cultural Resource Reconnaissance Survey was performed to provide preliminary cultural resource information for a proposed detour route of Beckett Bridge outside the established APE. One previously recorded historic resource was identified that is NRHP-listed and six previously recorded historic resources were identified that are considered individually eligible for inclusion in the NRHP. These resources were evaluated in the Historic Resources Survey of Tarpon Springs, conducted in July 2009 by Janus Research for the City of Tarpon Springs. Some of these resources are located in the Beckett Bridge proposed detour route.

These seven previously identified resources include the NRHP-listed Tarpon Springs Historic District (8PI1712), the Edward Newton Knapp House (8PI238), the William T. Fleming House (8PI1617), the George Clemson House (8PI1619), the George Clemson Auxiliary (8PI1620), the Marshall H. Alworth House (8PI1621) and the Bigelow Cottage (8PI1625). The six individually eligible buildings are part of the National Register-listed Tarpon Springs Historic District (8PI1712). Only one new property along this route was identified as potentially NRHP–eligible during the reconnaissance survey and is located at 115 North Park Avenue.

3.4.1.1 8PI12017 (Beckett Bridge)

The Beckett Bridge is located in Township 27 South, Range 15 East, and Sections 11 and 12 of [U.S. Geological Survey (USGS) Quadrangle Tarpon Springs 1973, Photorevised 1987], in Pinellas County, Florida. The bridge is a steel, single-leaf, under-deck counterweight, Scherzer rolling-lift (bascule) bridge, approximately 360 feet long and about 28 feet wide. It carries Riverside Drive/North Spring Boulevard over Whitcomb Bayou in Tarpon Springs, Florida.

The existing typical section of the bridge consists of two 10-foot wide travel lanes and 2’2” sidewalks and concrete railing on both sides. Nine approach spans and one main span are present. The main bridge span is a steel structure with an open steel grid deck. Railings flank the bridge approaches and the bascule span; these are simple concrete rails with concrete posts on the approach spans and steel rails and posts on the main span. Concrete piers support the prestressed concrete girder spans of this bridge. A galvanized pipe staircase with handrails leads to the bridge substructure from a utilitarian bridge tender’s station that consists of a simple one-story rectangular building with a steel shed roof and Plexiglas windows. This structure is located on the north side of the bridge.

Beckett Bridge was originally built in 1924 and called the Chilito Street Bridge until it was renamed in 1948 for Edward H. Beckett to honor him for his 34 years of service as a County Commissioner (Freedman 1948). The original bridge was of wood construction with a concrete pier and a steel drawbridge span. The bridge was the shortest way of connecting east and west Tarpon Springs. In 1956, the Beckett Bridge was almost entirely reconstructed after Pinellas County decided repairs to the original wooden structure would be wasteful (Twitty 1955). The new structure utilized the original steel bascule, draw, and machinery for operation, but the wooden approach spans were replaced with new concrete spans, spanning 350 feet (n.a. 1956). The 1956 plans have not been located.

Since the major alterations to the bridge in 1956, the Beckett Bridge underwent repairs again in 1996. The rehabilitation repairs included the addition of steel crutch bents to stabilize settlement, repair of the steel draw span as well as the concrete approach spans, refurbishment of the machinery, replacement of the electrical system, and construction of the tender station. The tender station is a non-historic alteration because it was built after the historic period in 1996; it is considered a non-contributing element to the historic bridge. The traffic and barrier gates were also added during the 1996 repairs.

In 1997, the main machinery drive shafts failed during testing of the draw span subsequent to the 1996 repairs. Repairs were completed in December 1997. Recent repairs in 2011 were performed to correct issues with the operating machinery and the movable bridge span.

The Beckett Bridge remains one of seven pre-1965 single-leaf bascule bridges in Florida. It is considered eligible for listing in the National Register under Criterion A for its contributions to the patterns of development and transportation in the State, as well as Criterion C for its distinct engineering.

3.4.2 Recreation Areas/Potential Section 4(f) Properties

Section 4(f) lands include publicly owned parks, recreation areas, wildlife and waterfowl refuges; properties that represent multiple public land use holdings; and historical and archaeological sites (regardless of ownership). Section 4(f) of the DOT Act [Title 49, U.S.C., Section 1653(f)] was enacted to encourage preservation of Section 4(f) lands.

Potential Section 4(f) resources identified during the ETDM screening process include historical or archaeological sites located within the project corridor and the Pinellas County Aquatic Preserve (OFWs). The Beckett Bridge is considered eligible for listing in the NRHP (See Section 3.4.1 Historic and Archaeological Sites).

The ETDM metadata also identifies areas of statewide greenways critical and low priority linkages, low priority paddling trails, and high and low priority multi-use trails that could be associated with the proposed project. These FDEP designations contain all of the largest areas of ecological and natural resource landscapes and the linkages necessary to link them together in a statewide system. There are no existing FDEP, County or Regional officially designated, marked or signed greenways or trails within, along or perpendicular to the project study limits.

However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located approximately 0.7 mile east of the Bridge. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2025 LRTP, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. (The locations of these trails are shown on Figure 2-4.) The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

An unmarked paddling trail beginning at Craig Park, south of the bridge is identified in the “Guide to Pinellas County Blueways,” published by the Pinellas County Planning Department in April 2010. (A map from this guide for trails in northern Pinellas County is provided in Figure 2-5.) The unmarked trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico.

4.0 DESIGN CRITERIA

4.1 BRIDGE

4.1.1 Channel Clearance Requirements

The proposed bridge will provide horizontal and vertical navigation clearances that are, at a minimum, equal to those of the existing bridge. The existing horizontal clearance is approximately 25 feet between fenders. The vertical clearance for the existing movable span in the closed position is approximately 6 feet. The maximum vertical clearance for the movable bridge in the fixed position which avoids impacts to adjacent right-of-way is 7.5 feet. Discussions with the USCG indicated that a bridge with at least 6 feet of vertical clearance would be permittable.

A waterway survey of waterfront property owners on Whitcomb Bayou was conducted to determine the number and types of boats that would need to pass under the bridge to reach deeper water. The results showed that six sailboats requiring 14-38 feet of vertical clearance were owned by waterfront property owners in the Bayou. Based on this information and discussions with the USCG, a fixed bridge alternative was developed which provided the maximum vertical clearance practical to provide access to these vessels. The maximum vertical clearance that could be obtained without impacting the intersections at the western and eastern limits of the project (Riverside Drive with Chesapeake Drive and Forest Avenue) was determined to be 28 feet.

In summary, these clearances used to develop alternatives include:

1. 25 ft. horizontal between fenders.
2. 28 ft. vertical clearance above mean high water (MHW) between fenders for a fixed span.
3. 7.8 ft. vertical clearance above MHW between fenders for a movable span bridge with the movable span in the closed position.
4. Unrestricted vertical clearance in the channel for a movable span in the open position.

4.1.2 Design Method

Replacement Bridge

The replacement bridge will be designed for a 75 year service life. Concrete may include additives as well as having additional cover over reinforcing steel for increased corrosion protection.

Substructure Elements

Substructure elements, including precast and cast-in-place concrete piles, footings, caps, and columns will be designed for dead load, live load, wind load, etc. in accordance the Load and Resistance Factor (LRFD) method.

Superstructure Elements

Superstructure elements, including prestressed and cast-in-place deck slab, beams, and barrier rails will be designed for dead load, live load, and crash resistance in accordance with the LRFD method.

Bascule Span Superstructure

Structural steel (main girders, floor beams, stringers, bracing, etc.) for the bascule span superstructure will be designed for dead load, live load, and wind load in accordance with the LRFD method.

Bascule Span Electrical and Mechanical

The bascule span machinery and electrical control system will be designed in accordance with the LRFD method. The design will be based on 3,000 (open and close) operation cycles over the proposed 75-yr service life.

4.1.3 Design Loads and Load Factors

Live Load

HL-93 Design Vehicular Live Loading, including design truck or design tandem and design lane load, per *AASHTO LRFD Bridge Design Specifications, 6th Edition – 2012,* Section 3.6, shall be used. The load results from the HL-93 Design Vehicular Live Loading envelopes the load results for all LRFD Design Live Loads. The movable span shall also be designed for HL-93 Design Vehicular Live Loading when the span locks are not engaged for a Strength II Load Combinations, per *FDOT Structures Design Guidelines*, Section 8.4.

Wind Loads

Section 2.4 of the *FDOT Structures Design Guidelines* shall be used to determine the wind on structure loads for the bridge design. A Basic Wind Speed (V) of 130 mph as per Table 2.4.1-2 shall be used.

Wave Loads

In accordance with the *FDOT Structures Design Guidelines*, Section 2.5, the level of importance classification for the proposed bridge is recommended to be "Critical." This recommendation is based on a combination of factors including projected traffic volumes, route impacts on local residents and businesses, and use of this facility as an evacuation and emergency response route. This classification requires that the replacement bridge be designed to resist wave forces at the Extreme Event Limit State with a performance level of "Repairable Damage." Using thisdesign criteria, the bridge would be designed to survive a 100-year storm event but may experience some damage that would require minimal repair before bridge is returned to service. The use of "Sacrificial Spans" that would require replacement after a 100-year storm event is not recommended.

According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D. Max Sheppard and William Miller Jr., September 2003*, the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation. Portions of the superstructure will be below the wave crest elevation. Accordingly, wave forces need to be considered in the design of the bridge. However, it is anticipated that wave heights and corresponding force at the bridge would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves. Furthermore, the presence of topographical features, including numerous adjacent residential buildings and trees, reduce wind velocities at the surface of the water with lower corresponding wave heights.

As the superstructure for the movable bridge alternative will be below the storm surge elevation, it will be subject to waves and thus will be required to be designed to resist the design wave loads. Accordingly, the movable bridge alternative may require wave force-mitigation measures such as a shallow slab type superstructure. The superstructure for the fixed bridge alternatives is anticipated to be above the maximum wave crests and thus it will not be necessary to design these spans for the wave loads.

During final design, a Coastal Engineer will be required to perform a wave analysis to determine the anticipated wave heights and corresponding wave design loads. A Level I Analysis per *AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms* will yield conservative design wave loads.

Seismic Loads

The superstructure spans will be supported on elastomeric bearings. Therefore, the bridge will be categorized as "exempt" for seismic loads per *FDOT Structures Design Guidelines* Section 2.3. The minimum bearing support dimensions only need to be satisfied as required by *AASHTO Bridge Design Guidelines*, Section 4.7.4.4 for seismic adequacy.

Vehicular Collision Loads

Traffic railing (barriers) on the fixed spans will be in accordance with NCHRP Report 350 Performance Level TL-4 (AASHTO Level PL-2), including crash testing. Traffic railing on the movable span may be constructed of structural steel, and if so, will be designed as an equivalent to a crash tested TL-4 railing, including similar geometry and strength.

4.1.4 Movable Span Operation Requirements

The movable span will be a single-leaf bascule. The movable span drive machinery may be either an electro-mechanical or hydraulic system.

Time of Operation

The normal operating cycle from fully closed to fully opened, or fully open to fully closed, will be a maximum of 60 seconds. The 60 seconds will include a zero to ten second acceleration period and a zero to five second period deceleration, creep speed and seating. This operating cycle will apply for wind loads defined in AASHTO.

Redundancy

Primary span drive components including motors, brakes, reducers, driver machinery, pump/motor groups, hydraulic cylinders, and valving will be designed for redundancy such that one component or system can be removed from service for repair or replacement without disabling the bridge for opening under maximum constant velocity torque wind loads per

AASHTO.

Service Duty

The design life for reducers, bearings and other similar mechanical components will be 50 years. The design life for cylinder seals, hydraulic pumps, and other hydraulic seals will be 20 years.

Electrical Service

Electrical service will be 480 volts 3 phase, "wye" for motor loads.

Bridge Control System

Bridge control and operation will be by way of a relay logic with bypass capability.

4.1.5 Environmental Classification

The following environmental classifications apply:

- Superstructure: Corrosive (Extremely Aggressive)
- Substructure: Corrosive (Extremely Aggressive)
- Location: Coastal (Saltwater)

4.2 ROADWAY

Roadway design criteria are summarized in Table 4-1 below. Conceptual plans have been developed using the current editions of the documents listed below. If the project proceeds to the Design phase, the editions current at that time will be used for final design of the proposed improvements.

4.2.1 Vertical Clearance over Roadways

The minimum vertical clearance used to develop alternatives for the bridge structure overpasses is 14.5 feet from the bottom of the structure member to the crown (or high point) of the roadway travel way underpass. This clearance height is consistent with AASHTO required minimum criteria.

Table 4-1 – Roadway Design Criteria

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Traffic Volumes [Annual Average Daily Traffic (AADT)] **Design Year**	9,700 2038	*9,700 vehicles per day (vpd)*	Design Traffic Technical Memorandum (URS, April 2012 prepared for this PD&E Study)
Functional Classification: Riverside Drive/ N Spring Blvd	**Rural** Collector	**Urban** Collector	City of Tarpon Springs and Pinellas County Comprehensive Plans
Design Speed Collector Roadway	20 & 30 miles per hour (mph) (Posted)	**35** mph* (Greenbook) >30 mph** (AASHTO) 35-50 mph*** (FDOT) ***Use 35 mph****	*Greenbook, Table 3-1 ** AASHTO, Chapter 6 ***FDOT PPM, Table 1.9.1
Design Vehicle Single Unit Truck (SU) 8' wide x 30' long Conventional School Bus (S-Bus36) 8' wide x 35.8' long Recreational Vehicle (MH/B) 8' wide x 53' long per AASHTO and Greenbook.	N/A	SU* (Greenbook) SU-30,SU-40, S-BUS36, MH-B** (AASHTO) WB-62 FL*** (FDOT) ***Use SU, S-BUS36, MH-B design vehicles*****	*Greenbook, Table 3-2 **AASHTO, Table 2-1b ***FDOT PPM, Sec. 1.12
Minimum Width of Travel Lane	10 ft.	11 ft.* (Greenbook) 10-12 ft** (AASHTO) 11 ft.*** (FDOT) ***Use 11 ft.****	*Greenbook, Table 3-7 **AASHTO, Chapter 6 ***FDOT PPM, Table 2.1.1
Bicycle Lane	N/A	4.0 ft.* (Greenbook) Varies (2ft. min.) ** (AASHTO) 4.0 ft.*** (FDOT) ***Use 4 ft.****	*Greenbook, Ch. 3, sec. C.10.b **AASHTO, Chapter 2 (Pg. 2-81) ***FDOT PPM, Table 2.1.2
Sidewalk	4-5 ft.	4 ft.* Min. (Greenbook) 5 ft. ** (AASHTO) (ADA) 5 ft. (On Bridge)*** (FDOT) ***Use 5 ft. min. sidewalk******	*Greenbook, Ch. 3, Sec. C.7.d. **AASHTO, Chapter 6 ***FDOT PPM, Figure 2.0.4
Shared Use Path (S.U.P.)	N/A	10 ft. (2-way only)* (Greenbook) N/A ** (AASHTO) 6 ft. (1-way),10 ft.(2-way)*** FDOT ***N/A******	*Greenbook, Ch. 9, sec. C.2 **AASHTO Bicycle Handbook ***FDOT PPM, Sec. 8.6.2
Shoulder Width (Outside)	No Shoulder	8' * (Greenbook) 8' ** (AASHTO) 16" (raised sidewalk), 8' min. long bridge*** (FDOT) ***N/A****	*Greenbook, Table 3-8 **AASHTO, Exhibit 6-5. Ch. 6 ***FDOT PPM, Fig. 2.03, 2.04

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Shoulder Width (Inside) Distance from travel lane to longitudinal barrier. For FDOT Plans Preparation Manual (PPM) and Greenbook, median shoulder only applies to multi-lane highways.	None	6' * (Greenbook) 4' ** (AASHTO) 2'-6" with raised median / 6' flush shoulder*** (FDOT) ***N/A***	*Greenbook, Table 3-9 **AASHTO, Chapter 6, ***FDOT PPM, Fig. 2.0.4
Breakdown Vehicle Width on Travel Lane This is the width of the travel lane that can be used to accommodate a "break down" situation for a narrow shoulder.	N/A	[1' to 4'] encroachment onto travel lane is allowed for a narrow shoulder** (AASHTO) ***N/A***	**AASHTO, Chapter 4, "Width of Shoulders" Section 4.4.2
Cross Slope	Not Available	1.5% to 4%* (Greenbook) 1.5% to 3%** (AASHTO) 2% from crown*** (FDOT) ***Use 2% Cross Slope****	*Greenbook, Chapter 3, C.7.B.2 **AASHTO, Chapter 6, pg. 6-13 ***FDOT PPM, Figure 2.1.1
Roadside Slopes Anything steeper than 1:3 will need to be shielded per all references.	Not Available	1:4 or flatter* (Greenbook) 1:3 or flatter** (AASHTO) 1:2, not flatter than 1:6*** (FDOT) ***N/A****	*Greenbook, Ch. 3, sec. C.7.f.2 **AASHTO, Ch. 4, pg. 6-13 ***FDOT PPM, Table 2.1.1
Clear Zone Based on Design Speed.	N/A	10' (Rural), 4' (Urban)* (Greenbook) 14' (Rural), 1.5' back of face of curb (Urban)** 18' (Rural), 4' (Urban but not < 2.5')***(FDOT)) ***Use 4'****	*Greenbook, Table 3-12 **AASHTO Roadside Guideline Chapter 3 and Chapter 10 ***FDOT PPM, Chapter 4
Border Width Based on Design Speed.	Not Available	N/A * (Greenbook) 8 ft.** (AASHTO) 33' Rural, 12' Urban, 10' w/bike lane*** (FDOT) ***Use 8 ft.*****	*Greenbook, N/A **AASHTO, Chapter 8 ***FDOT PPM, Table 2.5.1, 2.5.2
Drop-Off Hazard For Vehicles and Cyclists on Road	N/A	Hazard when less than 22 ft. from traveled way, steeper than 1:3 slope and 6 ft. or greater drop.*** (FDOT) ***Identify Hazards less than 22'/ steeper than 1/3 > 6' drop ******	***FDOT PPM 2012, Section 4.2.2

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Drop-Off Hazard For Pedestrians on Sidewalk	N/A	Case I: When Drop-off is > 10" and within 2 ft. of Back-of-Sidewalk. Case II: When Total Drop-off is > 60" and slope steeper than 1:2 and begins within 2 ft. of Back-of-Sidewalk *** (FDOT) ***Identify Hazards that meet Case I or II****	***FDOT PPM 2012 Figure 8.8.1
Maximum Grade Based on Design Speed of 35 mph.	1.3 % max.	9% * (Greenbook) 9% ** (AASHTO) 9% *** (FDOT PPM) 5% **** (ADA) ***Use 5% maximum grade******	*Greenbook, Table 3-4 **AASHTO, Exhibit 6-8 ***FDOT PPM, Tables 2.6.1 ****ADA
Minimum Grade	0.2 % min.	0.3%* (Greenbook) 0.3%** (AASHTO) 0.3 %*** (FDOT) ***Maintain 0.3% minimum grade****	*Greenbook Chapter 6, C.5.b **AASHTO Chapter 6, Pg 3-119 ***FDOT PPM, Table 2.6.4
Maximum change in grade w/out using vertical curve Based on Design Speed of 35 mph.	N/A	0.9%* (Greenbook) N/A ** (AASHTO) 0.9%*** (FDOT) ***Use 0.9%****	*Greenbook, Table 3-5 **N/A (AASHTO) ***FDOT PPM, Table 2.6.2
Minimum Length of Crest Vertical Curve Based on K-value. Based on Design Speed of 35 mph.	360' existing	K=47 but not L < 105* (Greenbook) K=29** (AASHTO) K=47 but not L < 105*** (FDOT) ***Use k=47 for minimum length******	*Greenbook, Table 3-6 **AASHTO, Table 3-34 ***FDOT PPM, Table 2.8.5
Minimum Length of Sag Vertical Curve Based on K-value. Based on Design Speed of 35 mph.	N/A	K=49 but not L < 105* (Greenbook) K=49** (AASHTO) K=49*** (FDOT) ***Use k=49 for minimum length******	*Greenbook, Table 3-6 **AASHTO, Table 3-36 ***FDOT PPM, Table 2.8.6
Maximum Degree of Curvature Without Superelevation Based on Normal Cross Slope = -0.02. Based on Design Speed of 35 mph.	4 existing Curves: 28° - 1st curve 28° - 2nd curve 34° - 3rd curve 38° - 4th curve	N/A* (Greenbook) R=510'** (AASHTO) 5°*** (FDOT) ***Maintain existing degree of curvature*****	*Greenbook, N/A **AASHTO, Table 3-13 ***FDOT PPM, Table 2.8.4

Control / Design Element	Existing Roadway Elements	Minimum Design Controls & Standards	Documentation & References
Minimum Length of Horizontal Curve Based on Design Speed.	4 existing Curves: 14.84' – 1st curve 15.36' - 2nd curve 130' - 3rd curve 52.29' - 4th curve	N/A* (Greenbook) 500'** (AASHTO) 525' but not < 400'*** (FDOT) ***Maintain existing length of curve***	*Greenbook, N/A **AASHTO, Ch. 3 Sec 3.3.13 ***FDOT PPM, Table 2.8.2a
Maximum Deflection without a Horizontal Curve Based on Design Speed of 35 mph.	N/A	2° *** (FDOT) ***Use 2 degrees****	***FDOT PPM, Table 2.8.1a
Traffic Control Through Work Zones (Minimum Regulatory Speed) FDOT states that the Regulatory Speed should never be below the minimum statutory speed for this facility. See "Design Speed". AASHTO follows Manual on Uniform Traffic Control Devices (MUTCD) criteria.		20 mph & 30 mph Posted*** (FDOT) Existing Roadway Regulatory Speeds**** (MUTCD) ***Use 20 mph & 30 mph posted speeds****	***FDOT Design Standards, Index 600 ****MUTCD, Chapter 6C
Traffic Control Through Work Zones (Clear Zone Width for Work Zones)		14' or 4' behind face of curb and gutter *** *(FDOT)* ***Use 14' or 4' behind face of curb and gutter****	***FDOT Design Standards, Index 600
Traffic Control Through Work Zones (Minimum Radii for Normal Cross Slope) Based on Design Speed.		610' *** (FDOT) ***Use 610'****	***FDOT Design Standards, Index 600
Traffic Control Through Work Zones (Minimum Lane Widths)		10' *** (FDOT) ***Use 10'****	***FDOT Design Standards, Index 600

References:
2013 FDOT Plans Preparation Manual
2013 FDOT Design Standards
2011 AASHTO "A Policy on Geometric Design of Highways and Streets"
2011 FDOT "Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways" (Green Book)
2011 AASHTO Roadside Design Guide
2009 Manual on Traffic Control Devices
Note: The latest adopted versions of all references will be used in final design.

5.0 TRAFFIC

A *Design Traffic Technical Memorandum* was prepared in accordance with the FDOT *Design Traffic Handbook (Topic No. 525-030-120)*). Detailed information concerning the methodology employed for this traffic study can be found in this report, published separately from the PER. Traffic for the following years was analyzed:

- Existing Year 2012
- Opening Year 2018
- Design Year 2038

The Study area encompassed Riverside Drive/North Spring Boulevard including the Beckett Bridge from Chesapeake Drive, across Whitcomb Bayou to Forest Avenue, Alternate US 19, Florida Avenue, Meres Boulevard, Gulf Road, Whitcomb Boulevard, East Tarpon Drive and Tarpon Avenue.

5.1 EXISTING TRAFFIC CONDITIONS

Traffic counts were conducted in January and February of 2012 at key locations in the study area. Pinellas County provided 72-hour directional volume counts on Meres Boulevard, Whitcomb Drive, East Tarpon Drive, and Spring Boulevard. URS conducted 72-hour directional volume counts on Riverside Drive just east and west of the Beckett Bridge, as well as intersection turning movement counts from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. (including bicycles and pedestrians) at the following locations:

- Alternate US 19 at Tarpon Avenue, and
- Alternate US 19 at Meres Boulevard.

Additionally, traffic counts along Alternate US 19 and Florida Avenue were obtained from FDOT Florida Traffic Online for the latest available year (2010). The traffic count data is documented in the *Design Traffic Technical Memorandum*, published separately. The existing (2012) AADT volumes are illustrated in **Figure 5-1**. The segment of Alternate US 19 located north of Tarpon Avenue is posted with a speed limit of 45 mph. All other roadways in the study area have a posted speed limit of 30 mph. It should also be noted that the Beckett Bridge is currently load-posted to a maximum weight limit of 15 tons, which prohibits certain trucks and buses from using the bridge.

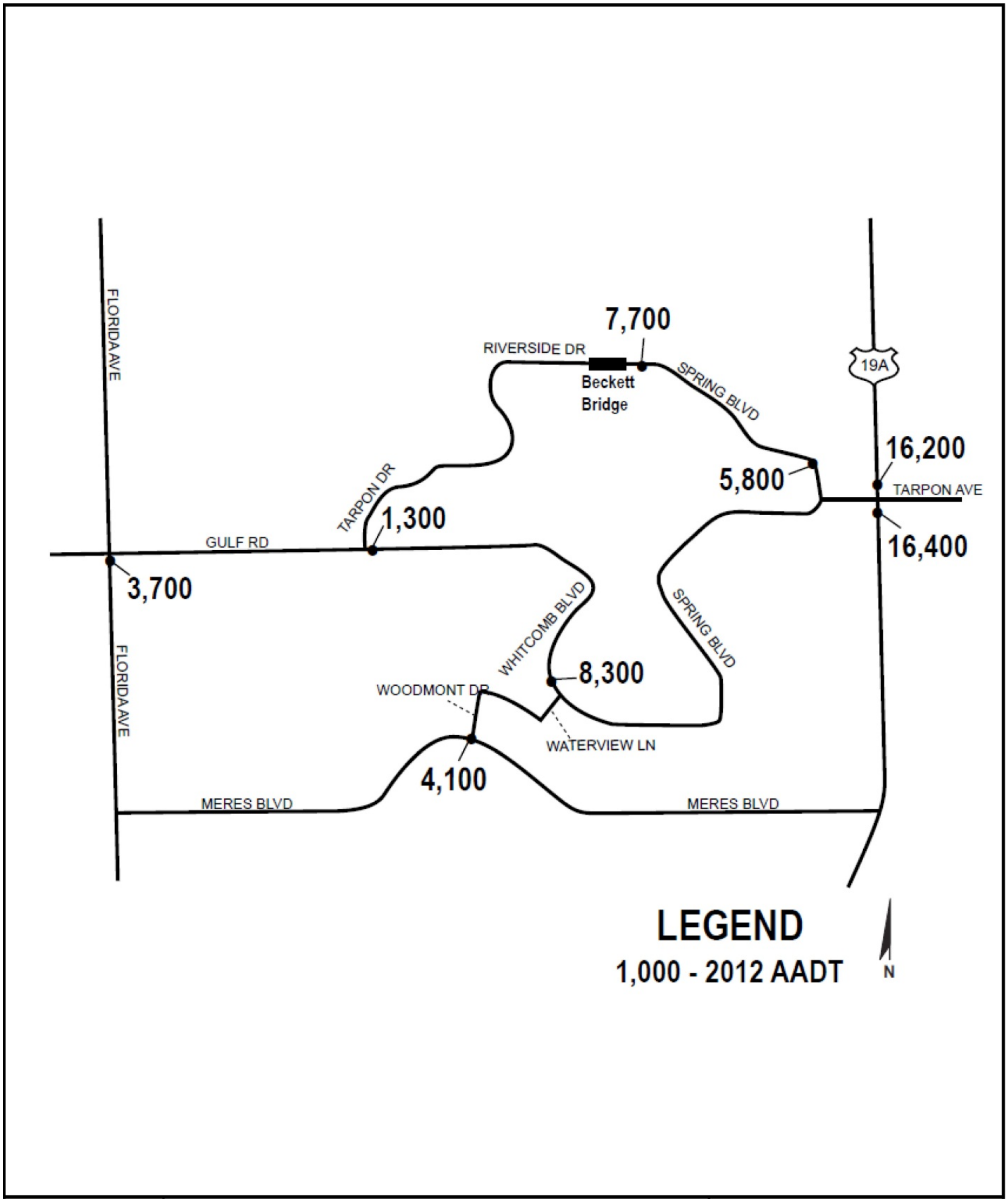


Figure 5-1 – Existing (2012) AADT Volumes

5.1.1 Existing Traffic Volumes

Twenty-four hour counts were averaged for a three-day period and multiplied by the appropriate weekly seasonal adjustment factor to obtain the AADT volumes. Since the latest available data on Alternate US 19 and Florida Avenue was based on 2010 AADT information from FDOT, these counts were adjusted to the year 2012 based on historical traffic growth in the area. The existing (2012) AADT volumes are illustrated in **Figure 5-1**.

To obtain the existing peak hour directional traffic, the AADT volumes were multiplied by the appropriate K and D factors. The K-factor utilized is based upon consultation with the FDOT District Seven Office, where a K-factor of 9.0 percent for Alternate US 19 and 9.5 percent for other collector roadways was determined to be acceptable. The D-factor utilized is based upon an evaluation of the existing directional traffic volumes in the study area, which ranges between 55.2 percent and 63.8 percent. For consistency, these factors were used for both the existing and future traffic volumes. Existing (2012) peak hour directional volumes and intersection peak hour volumes (turning movement volumes) are provided in **Figure 5-2** and **Figure 5-3**, respectively.

5.1.2 Existing Conditions Traffic Operations Analysis

Intersection traffic operations for existing conditions within the study area were determined by inputting the peak hour traffic volumes into the latest version of the *Highway Capacity Software* (HCS+), which is based upon fundamental principles found in the Transportation Research Board's *Highway Capacity Manual*.

Table 5-1 summarizes the existing intersection delay and level of service (LOS) results based on the analysis for the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. Currently, Alternate US 19 at Meres Boulevard operates at LOS C overall in both the a.m. and p.m. peak hours, while Alternate US 19 at Tarpon Avenue operates at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. The northbound approach at the Alternate US 19 at Tarpon Avenue intersection currently operates at LOS E during the p.m. peak hour.

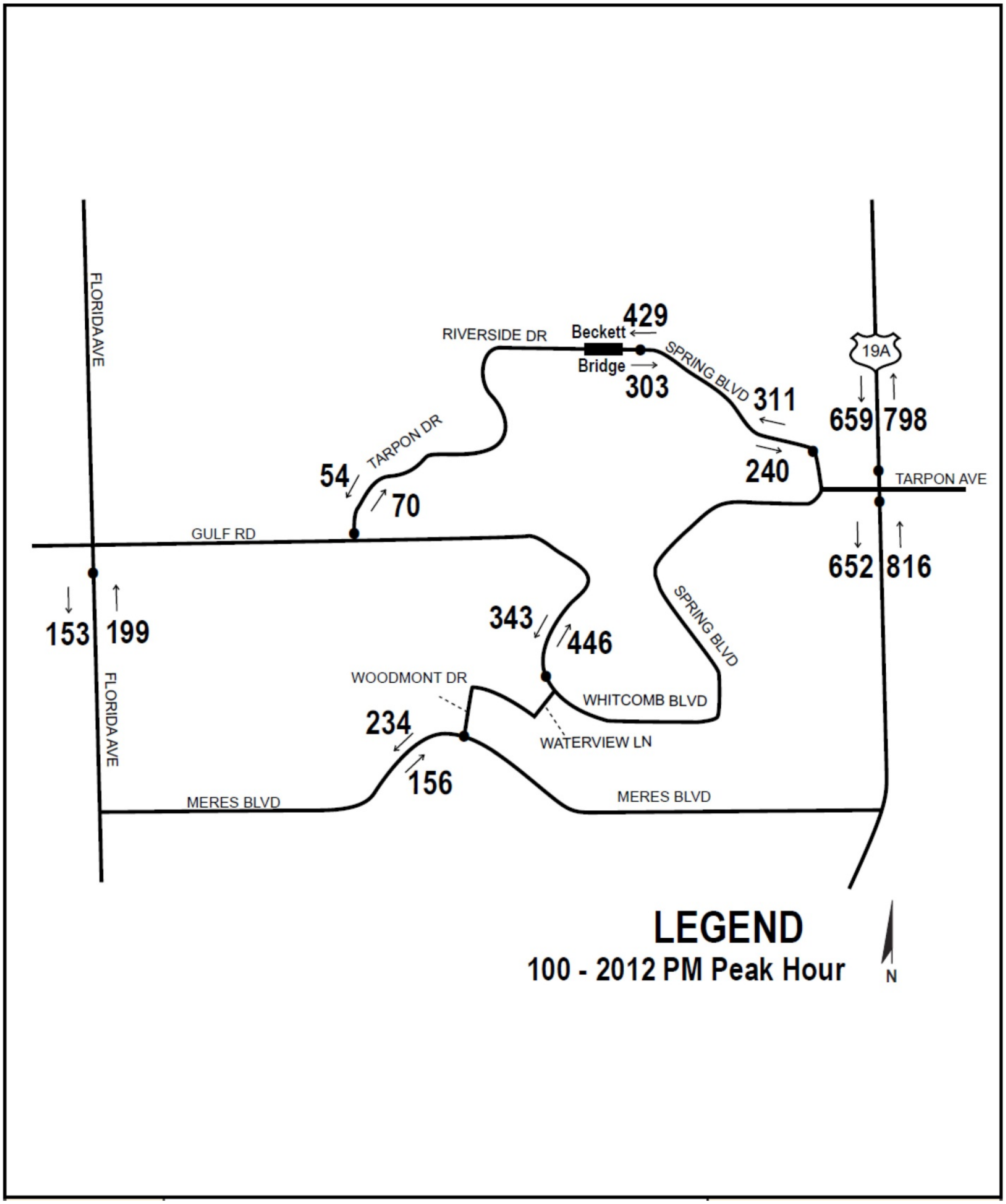


Figure 5-2 – Existing (2012) Peak Hour Directional Volumes

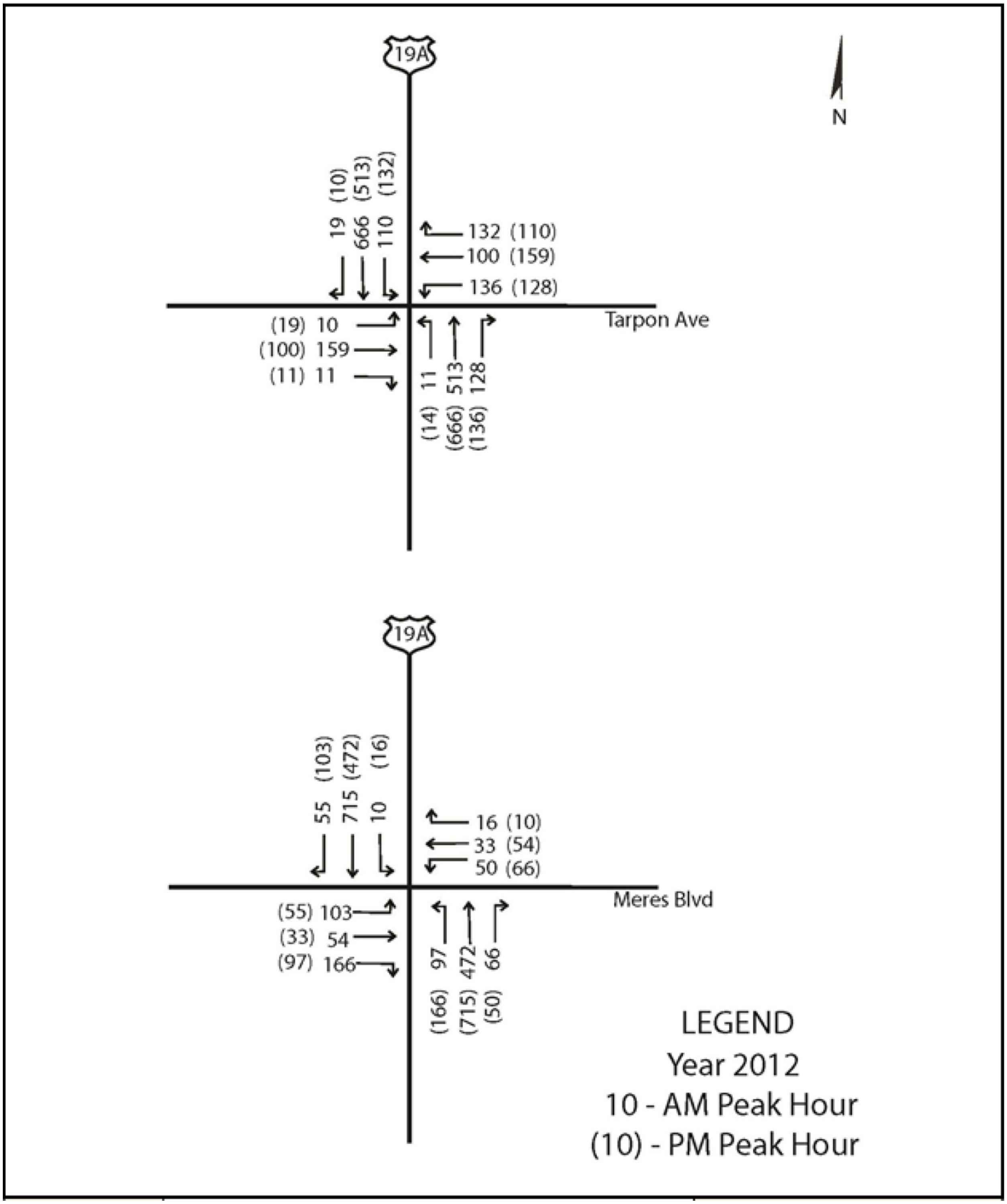


Figure 5-3 – Existing (2012) Intersection Peak Hour Volumes (Intersection Turning Movements)

Table 5-1 – Existing (2012) Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume AM	Approach Traffic Volume PM	A.M. Peak Hour Delay (in sec/veh)	A.M. Peak Hour LOS	P.M. Peak Hour Delay (in sec/veh)	P.M. Peak Hour LOS
Alternate US 19 at Meres Boulevard	Northbound	635	931	28.4	C	27.7	C
	Southbound	780	591	30.3	C	18.4	B
	Eastbound	323	185	27.1	C	33.6	C
	Westbound	99	130	39.0	D	46.6	D
			Overall	**29.6**	**C**	**26.6**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	652	816	25.9	C	55.7	E
	Southbound	795	655	21.7	C	22.5	C
	Eastbound	180	130	44.1	D	48.5	D
	Westbound	368	397	30.3	C	34.4	C
			Overall	**26.9**	**C**	**40.1**	**D**

5.1.3 Existing Conditions Arterial Analysis

An arterial analysis was conducted using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is currently operating over capacity (LOS E). It should be noted that Alternate US 19 has been designated by Pinellas County as a constrained roadway. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-2** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-2 – Existing (2012) Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS: Volume	Peak Hour Directional Traffic Volumes and LOS: LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	311	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	429	C
Tarpon Drive (North of Gulf Road)	2U	630	70	B
Florida Avenue (South of Gulf Road)	2U	630	199	B
Meres Boulevard (West of Woodmont Drive)	2U	630	234	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	446	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	816	E
Alternate US 19 (North of Tarpon Avenue)	2U	880	798	C

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

5.2 OPENING YEAR AND DESIGN YEAR ANALYSIS

5.2.1 Traffic Forecasting Methodology

Two scenarios were used to develop the traffic projections for the Opening Year (2018) and Design Year (2038). **Scenario 1** assumes that a two-lane bridge (the Beckett Bridge) connects Riverside Drive with Spring Boulevard across Whitcomb Bayou. This scenario is intended to illustrate the traffic conditions for the following PD&E alternatives:

- No-Build (Maintain Existing Bridge)
- Rehabilitation of the Existing Bridge
- Replacement with a New Movable Bridge
- Replacement with a New Fixed Bridge

Scenario 2 assumes that there is no bridge connection across Whitcomb Bayou. This scenario is intended to illustrate the traffic conditions for the following PD&E alternatives:

- No-Build with Removal of the Existing Bridge

Methodology to develop future traffic projections for both scenarios is described in detail in the *Design Traffic Technical Memorandum*. The redistribution of traffic under Scenario 2 was determined from a comparison of the Tampa Bay Regional Planning Model (TBRPM), Version 7.1 with and without the Beckett Bridge. The redistribution of Beckett Bridge traffic under Scenario 2 is illustrated in **Figure 5-4**. As discussed previously, the Beckett Bridge is currently load-posted to a maximum weight limit of 15 tons, which prohibits certain trucks and buses from using the bridge. The actual truck/heavy vehicle percentage is less than one percent. If any of the proposed bridge rehabilitation or replacement alternatives are selected, this load restriction will no longer be applicable to the bridge. Accordingly, a peak hour heavy vehicle percentage of two percent was assumed in the analysis to provide a conservative estimate for future scenarios.

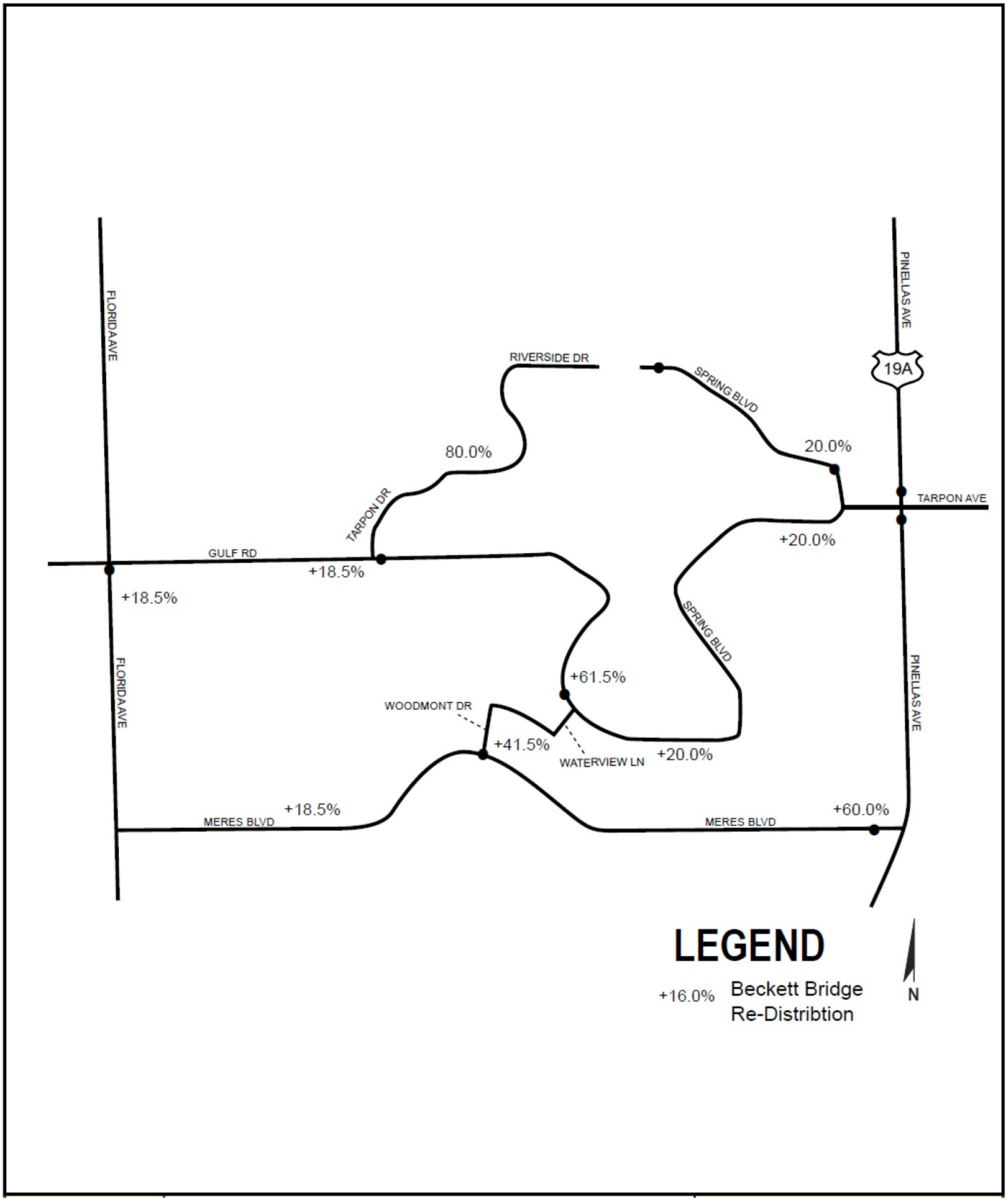


Figure 5-4 – Redistribution of Beckett Bridge Traffic

5.2.2 Opening Year (2018) and Design Year (2038) AADT Volumes

Daily traffic projections were based on applying a growth rate of 1.03 percent per year to the existing (2012) AADT volumes. Projections were based on increases from 2012 to the 2018 Opening Year (for 6 years) and from 2012 to the 2038 Design Year (for 26 years). For Scenario 2, the AADT volumes were reallocated based on the redistribution of traffic provided on **Figure 5-4**. Opening Year (2018) and Design Year (2038) AADT volumes under both scenarios are illustrated on **Figures 5-5 through 5-8**.

5.2.3 Opening Year (2018) and Design Year (2038) Peak Hour Volumes

Directional peak hour traffic projections were derived by applying the K and D factors to the Opening Year (2018) and Design Year (2038) AADT volumes. Opening Year (2018) and Design Year (2038) directional peak hour volumes under both scenarios are illustrated on **Figures 5-9 through 5-12**.

The peak hour traffic projections at the intersections of Alternate US 19 at Tarpon Avenue and Alternate US 19 at Meres Boulevard were developed by applying a 1.03 percent growth rate annually to the existing (2012) counts. Opening Year (2018) and Design Year (2038) intersection peak hour volumes under both scenarios are illustrated on **Figures 5-13 through 5-16**.

5.2.4 Opening Year (2018) Intersection Analysis

The Opening Year (2018) traffic conditions were analyzed under both scenarios using the Transportation Research Board's *Highway Capacity Manual* (HCM) and HCS+ for the two study area intersections.

Scenario 1 – Bridge Remains

Table 5-3 summarizes the intersection delay and LOS results based on the Opening Year (2018) analysis with the Beckett Bridge (Scenario 1) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue.

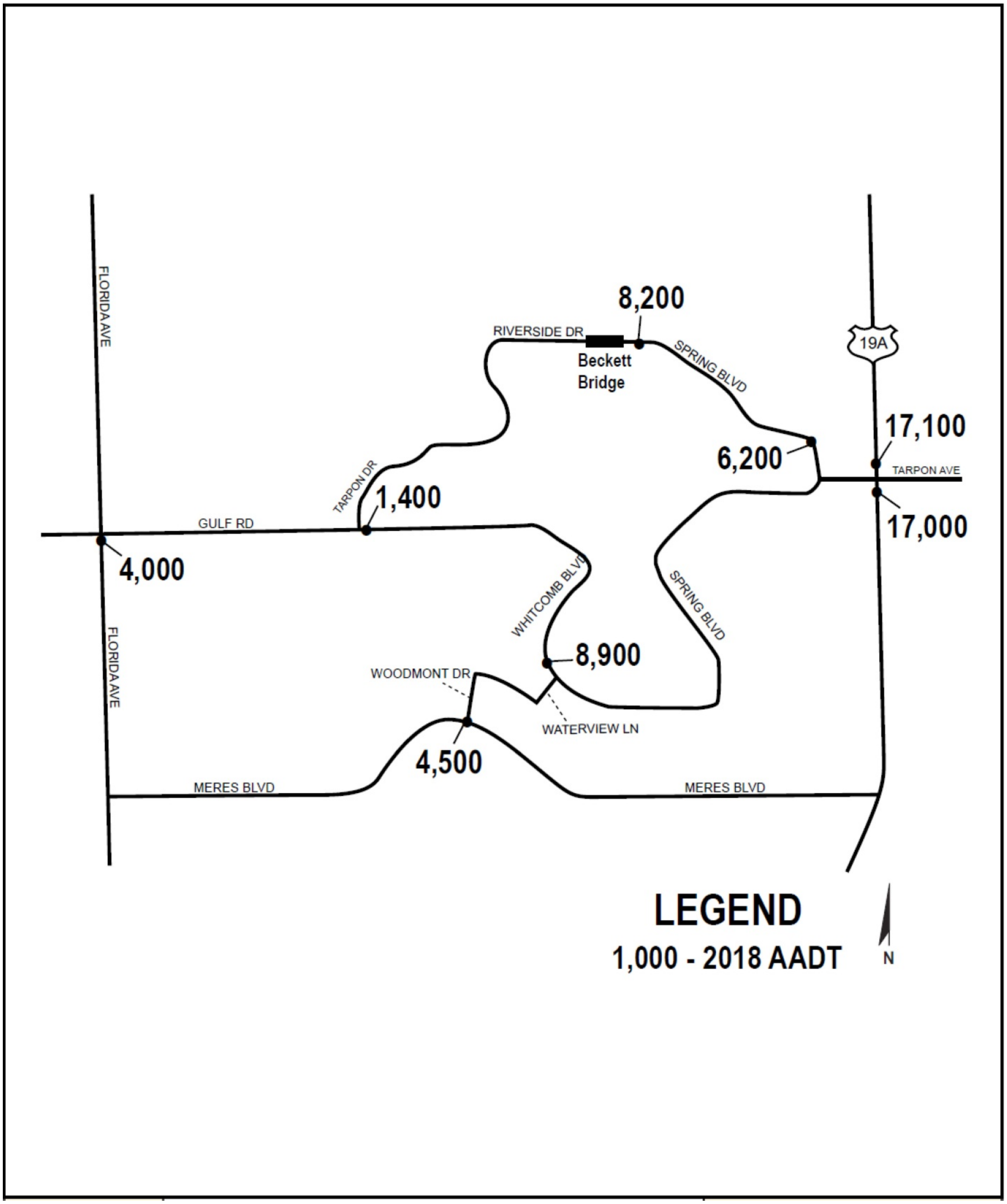


Figure 5-5 – Opening Year (2018) AADT Volumes – Scenario 1

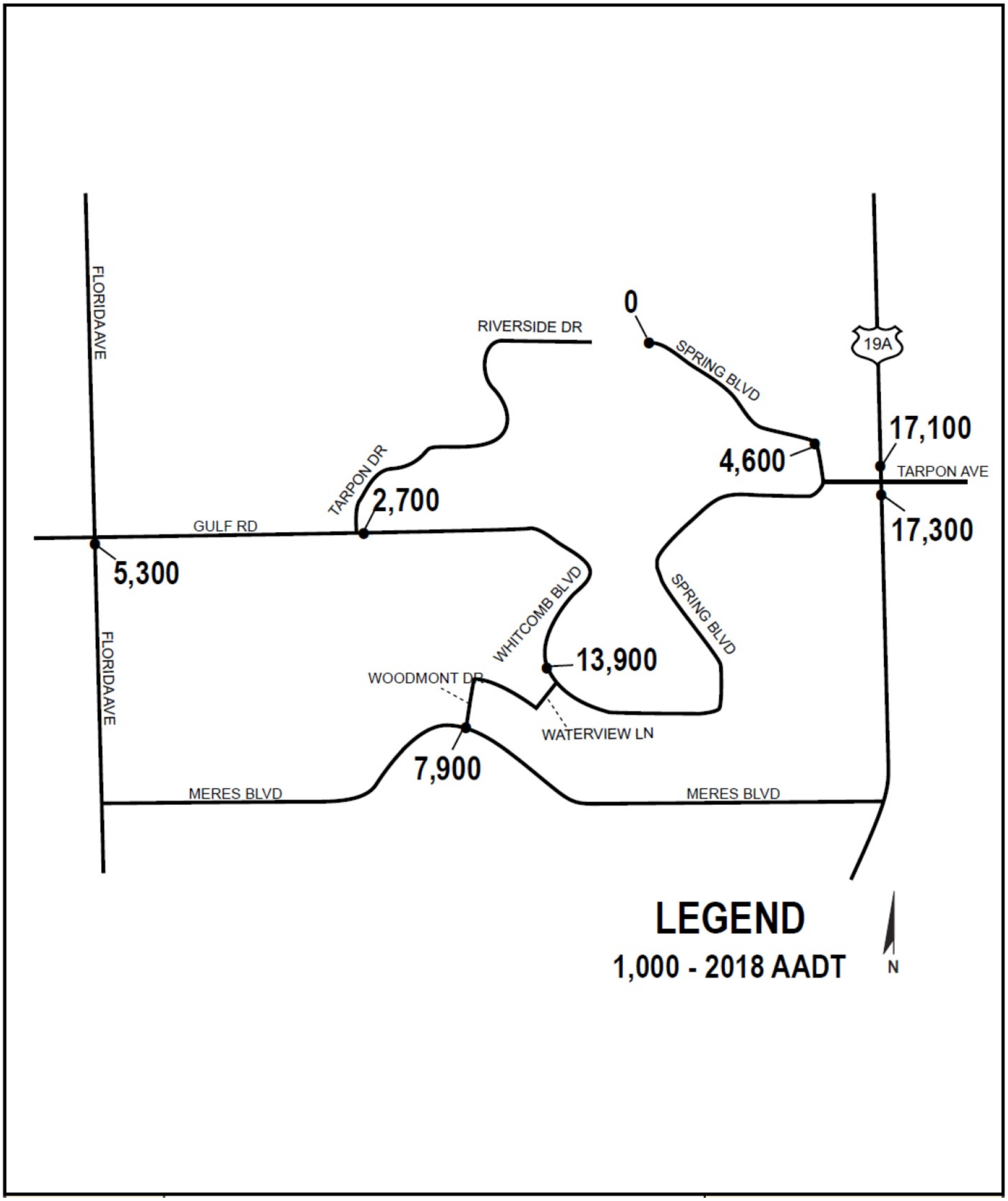


Figure 5-6 – Opening Year (2018) AADT Volumes – Scenario 2

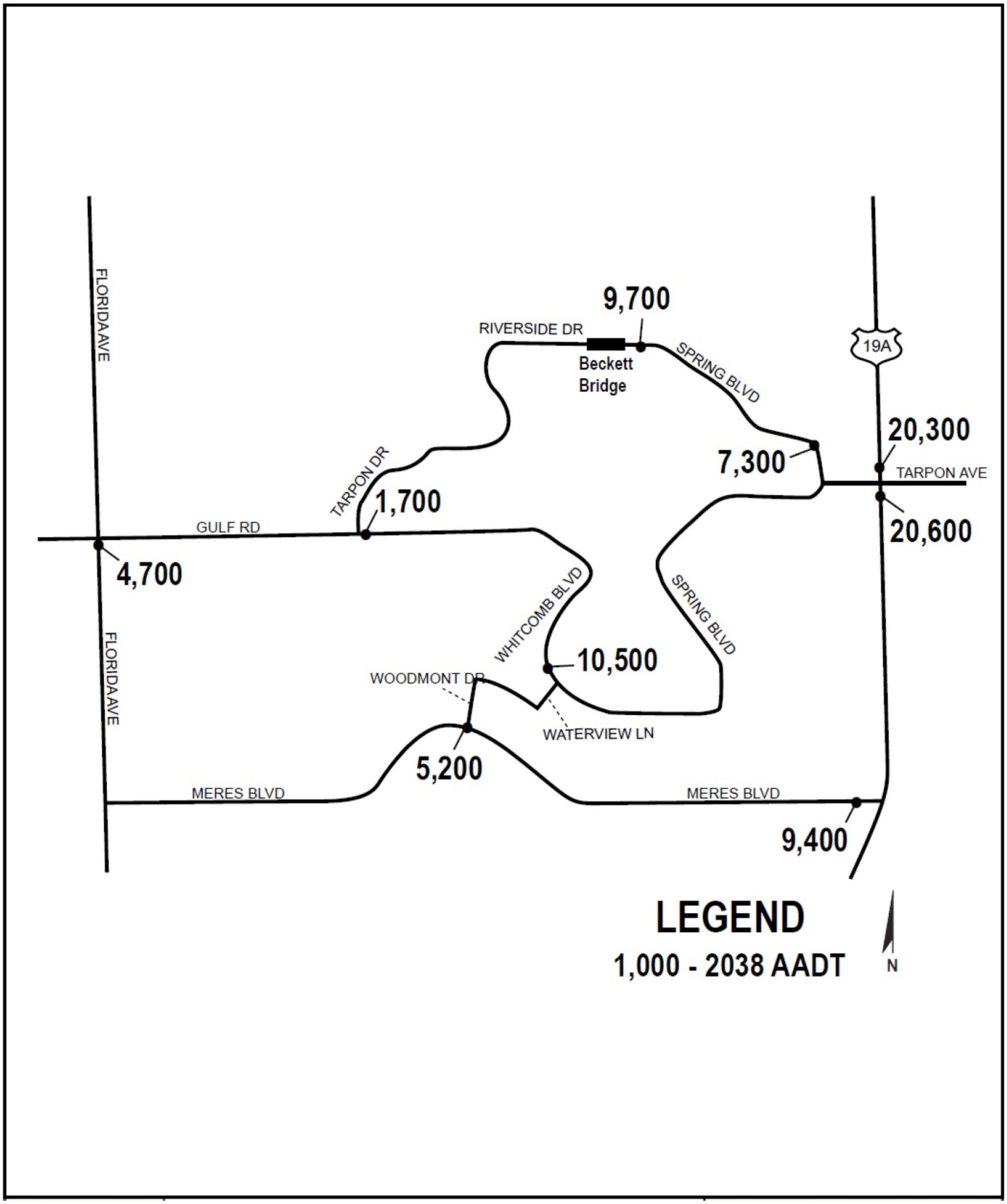


Figure 5-7 – Design Year (2038) AADT Volumes – Scenario 1

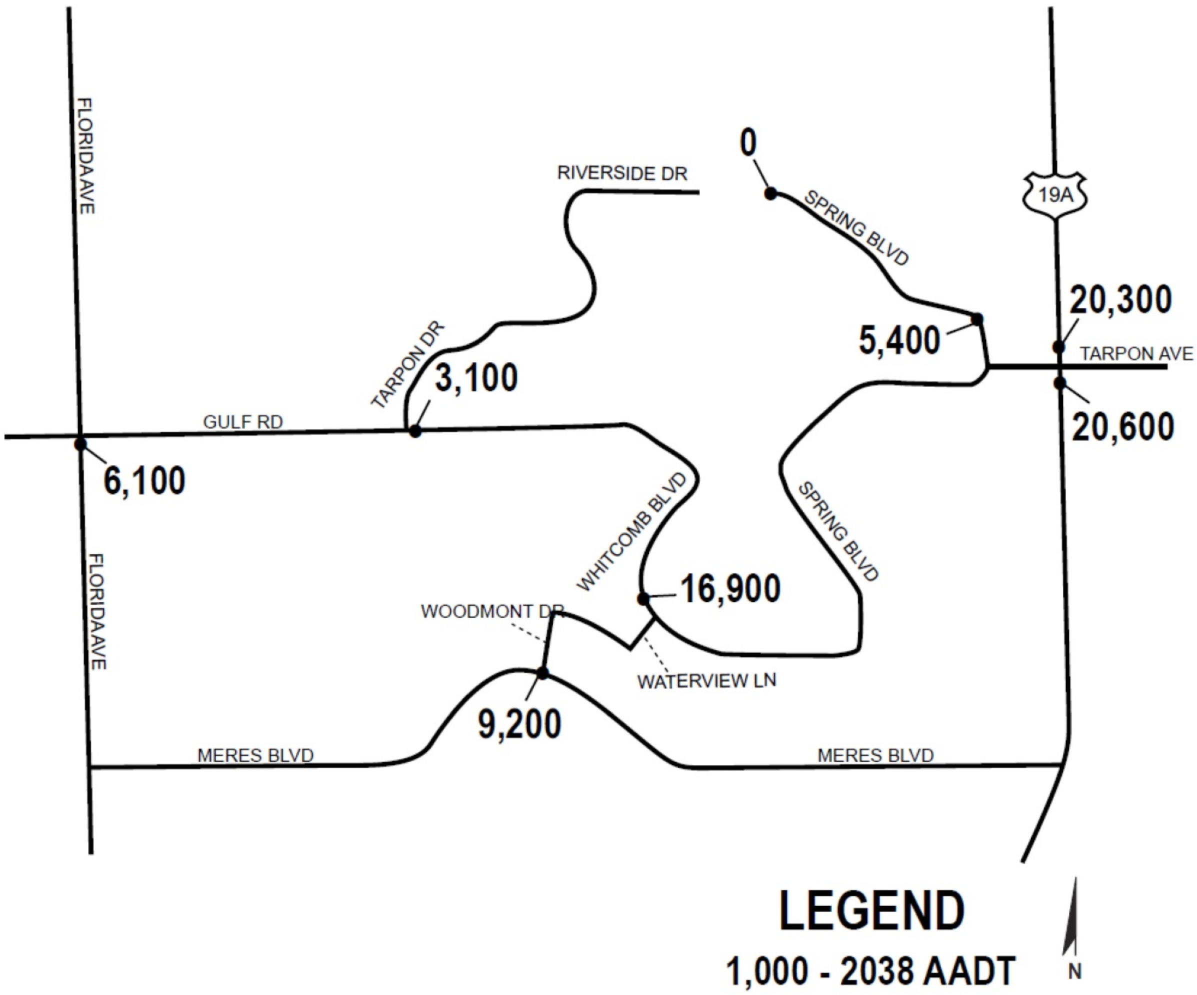


Figure 5-8 – Design Year (2038) AADT Volumes – Scenario 2

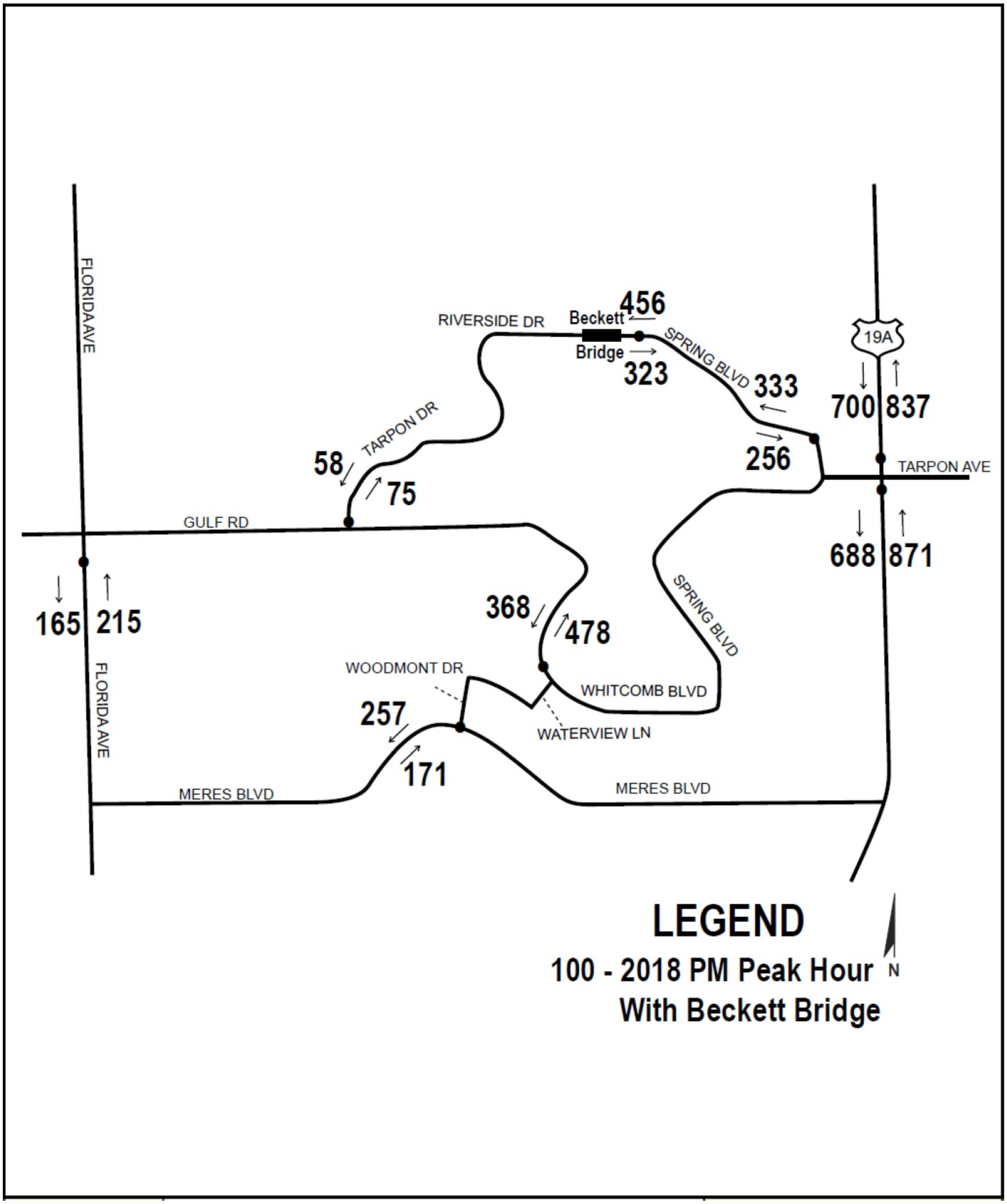


Figure 5-9 – Opening Year (2018) Peak Hour Directional Volumes – Scenario 1

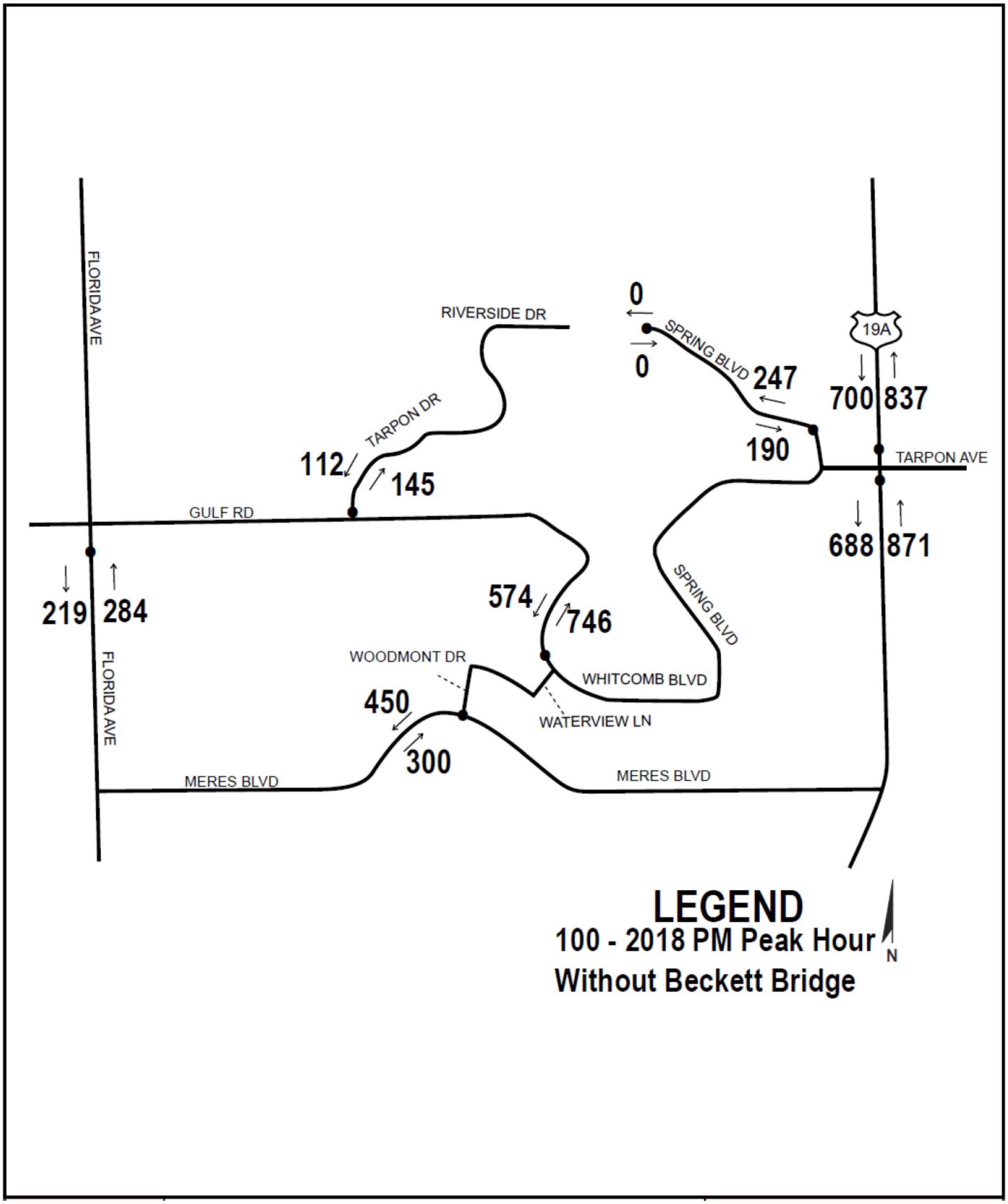


Figure 5-10 – Opening Year (2018) Peak Hour Directional Volumes – Scenario 2

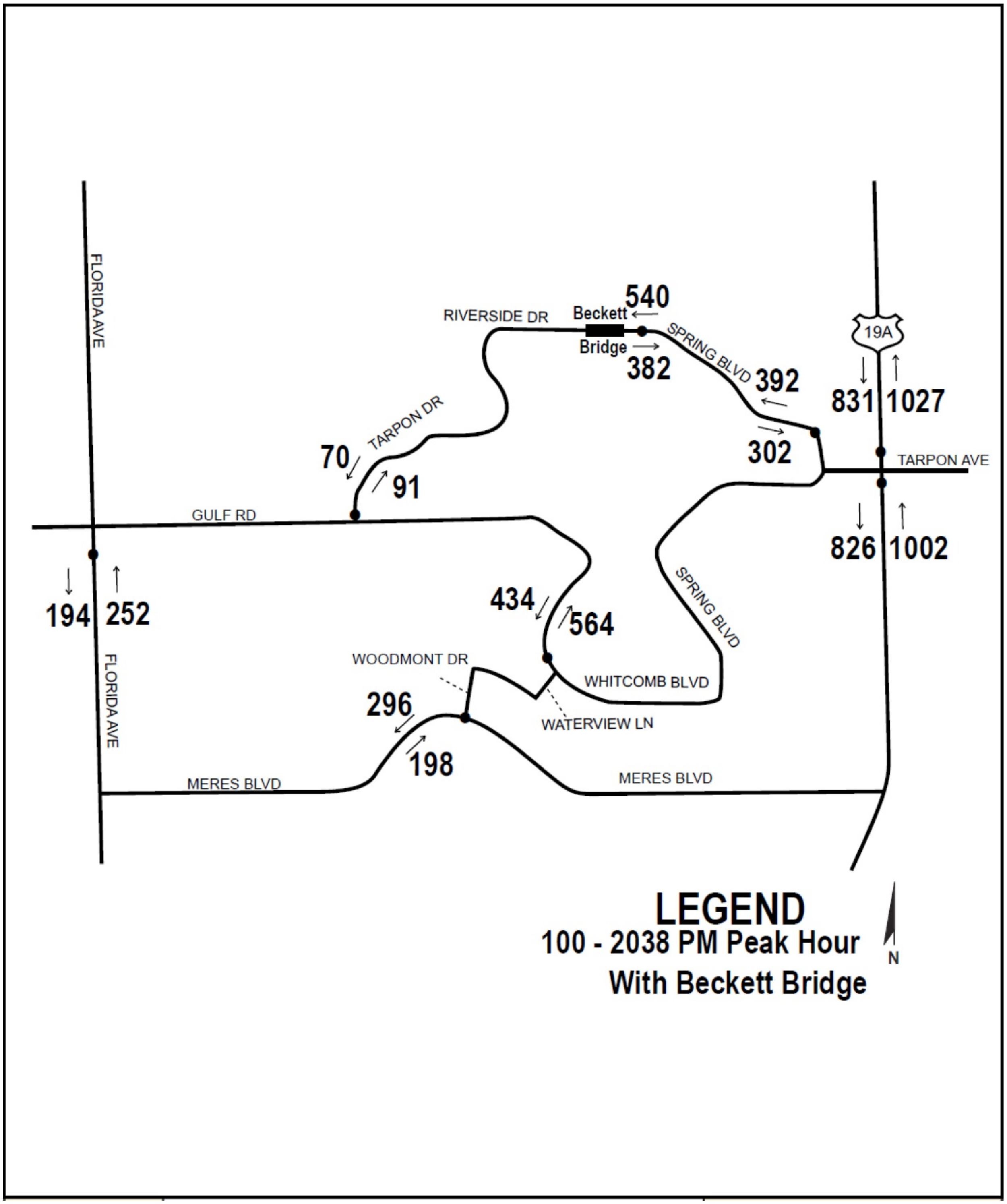


Figure 5-11 – Design Year (2038) Peak Hour Directional Volumes – Scenario 1

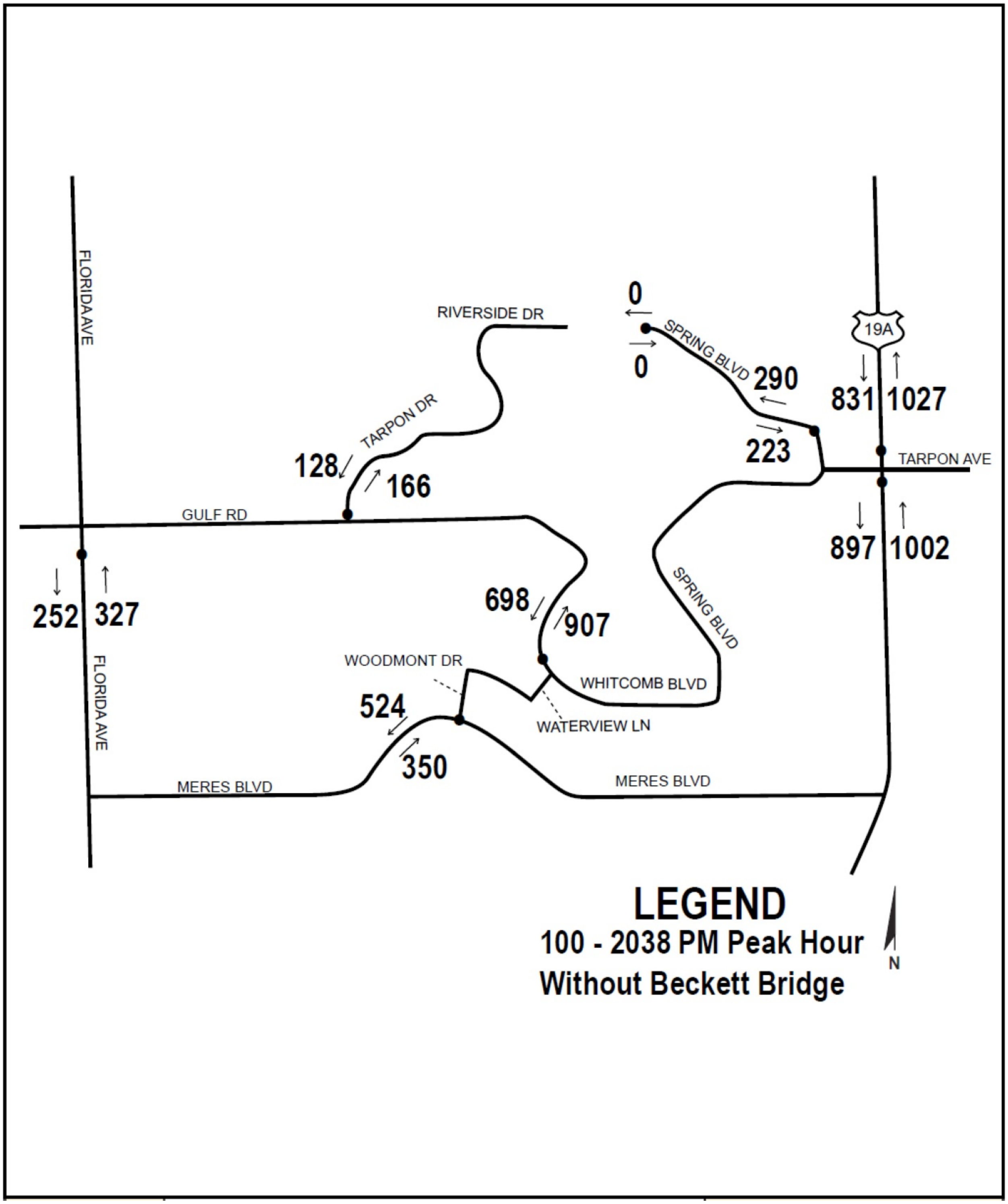


Figure 5-12 – Design Year (2038) Peak Hour Directional Volumes – Scenario 2

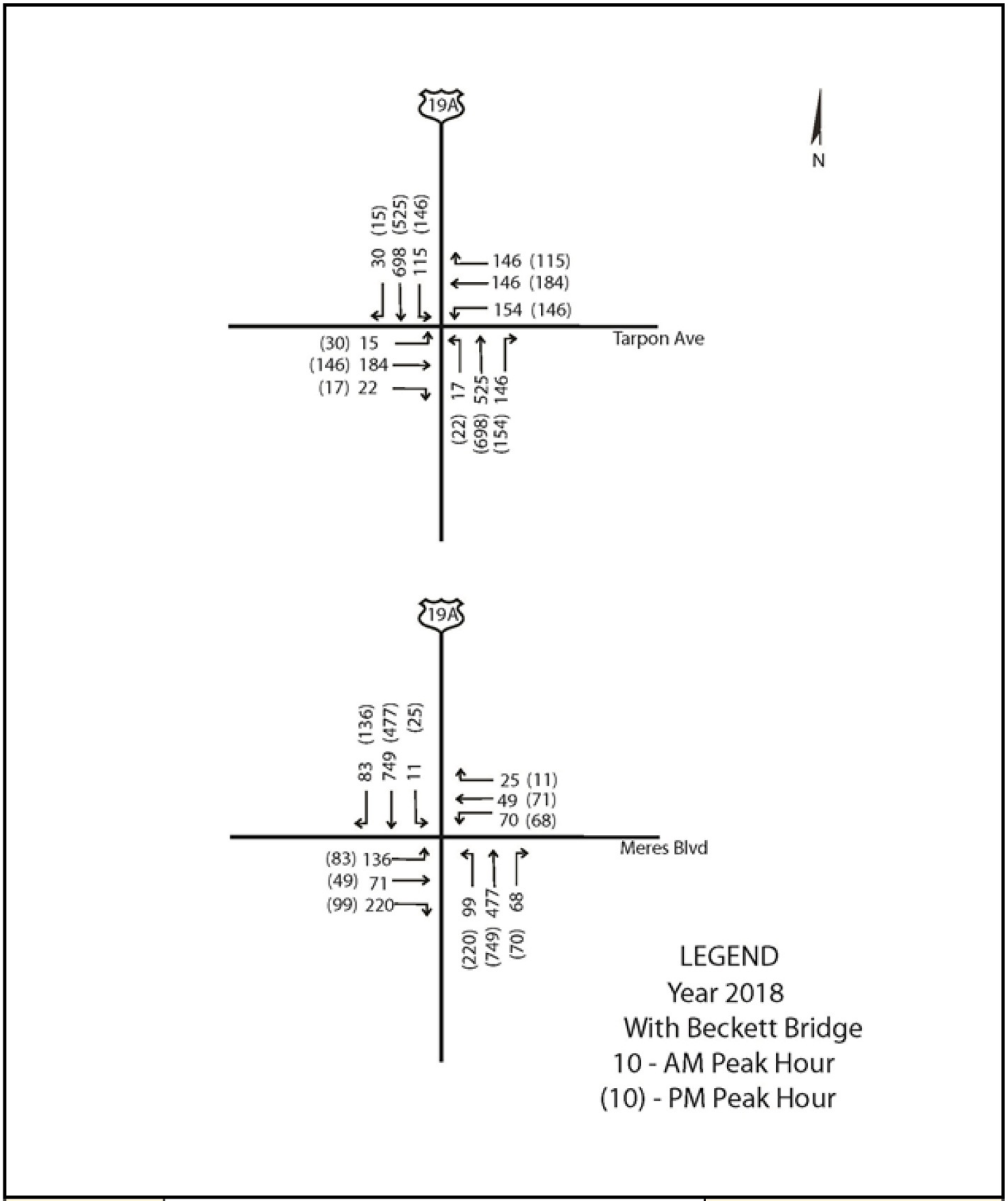


Figure 5-13 – Opening Year (2018) Intersection Peak Hour Volumes – Scenario 1

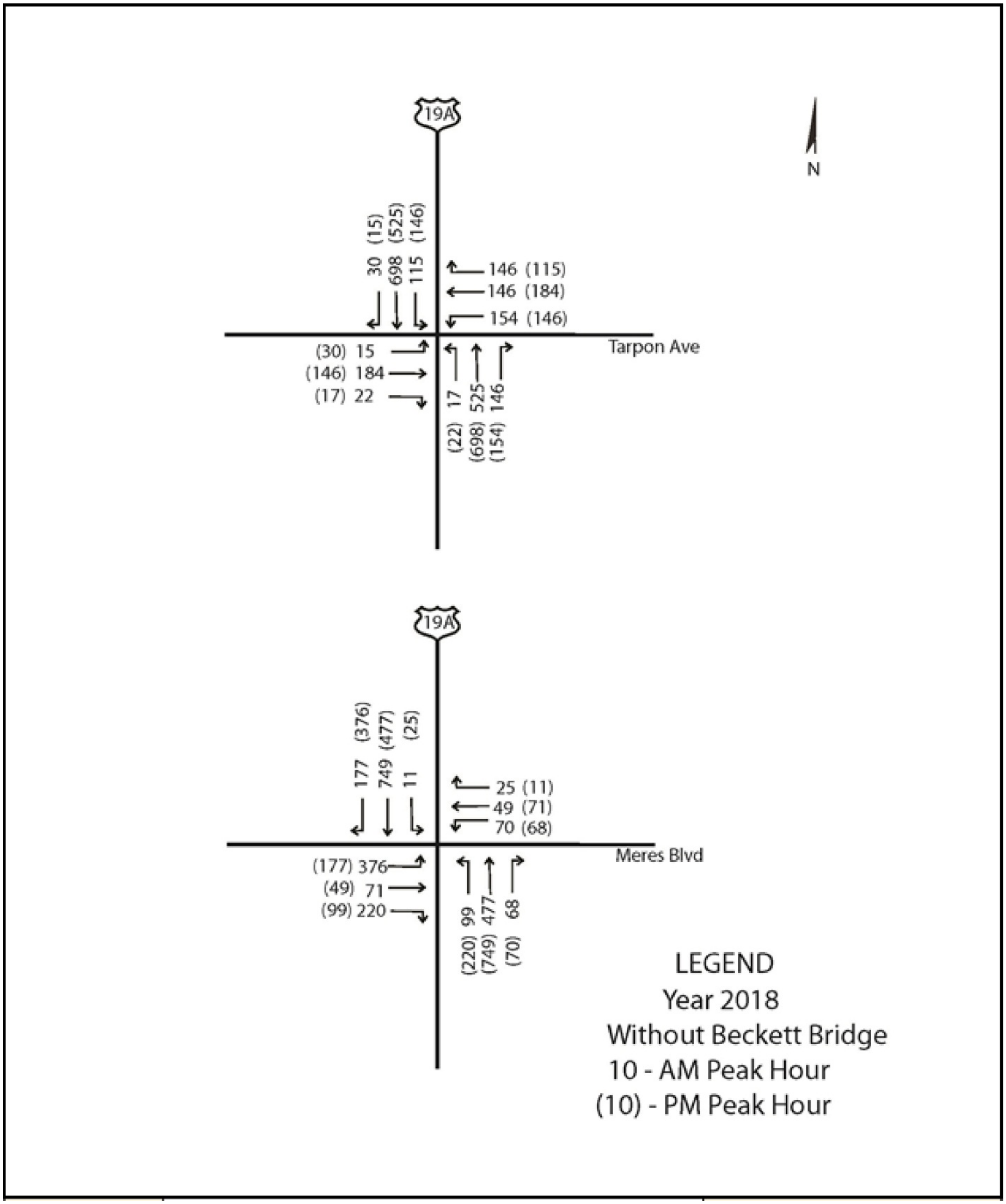


Figure 5-14 – Opening Year (2018) Intersection Peak Hour Volumes – Scenario 2

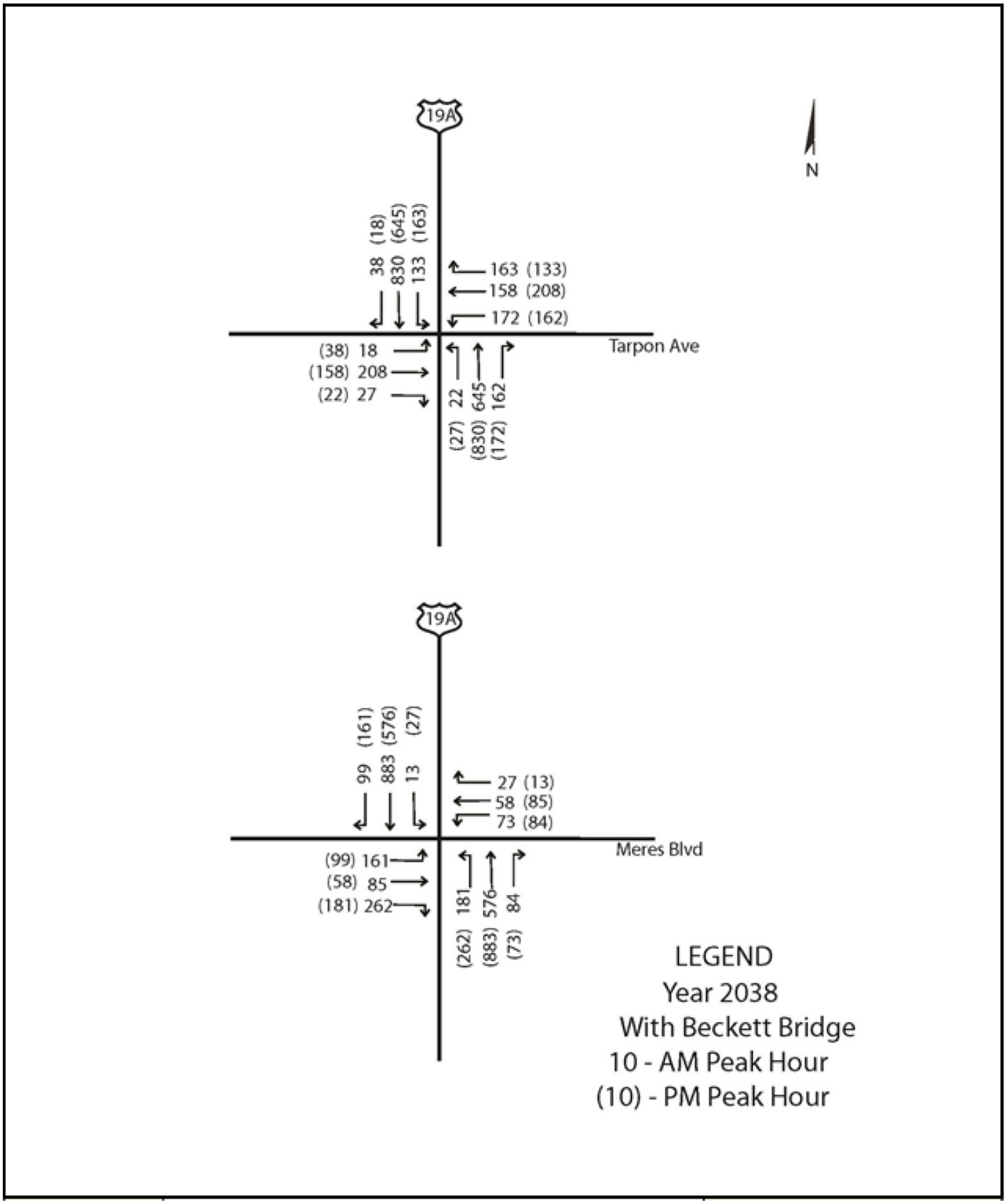


Figure 5-15 – Design Year (2038) Intersection Peak Hour Volumes – Scenario 1

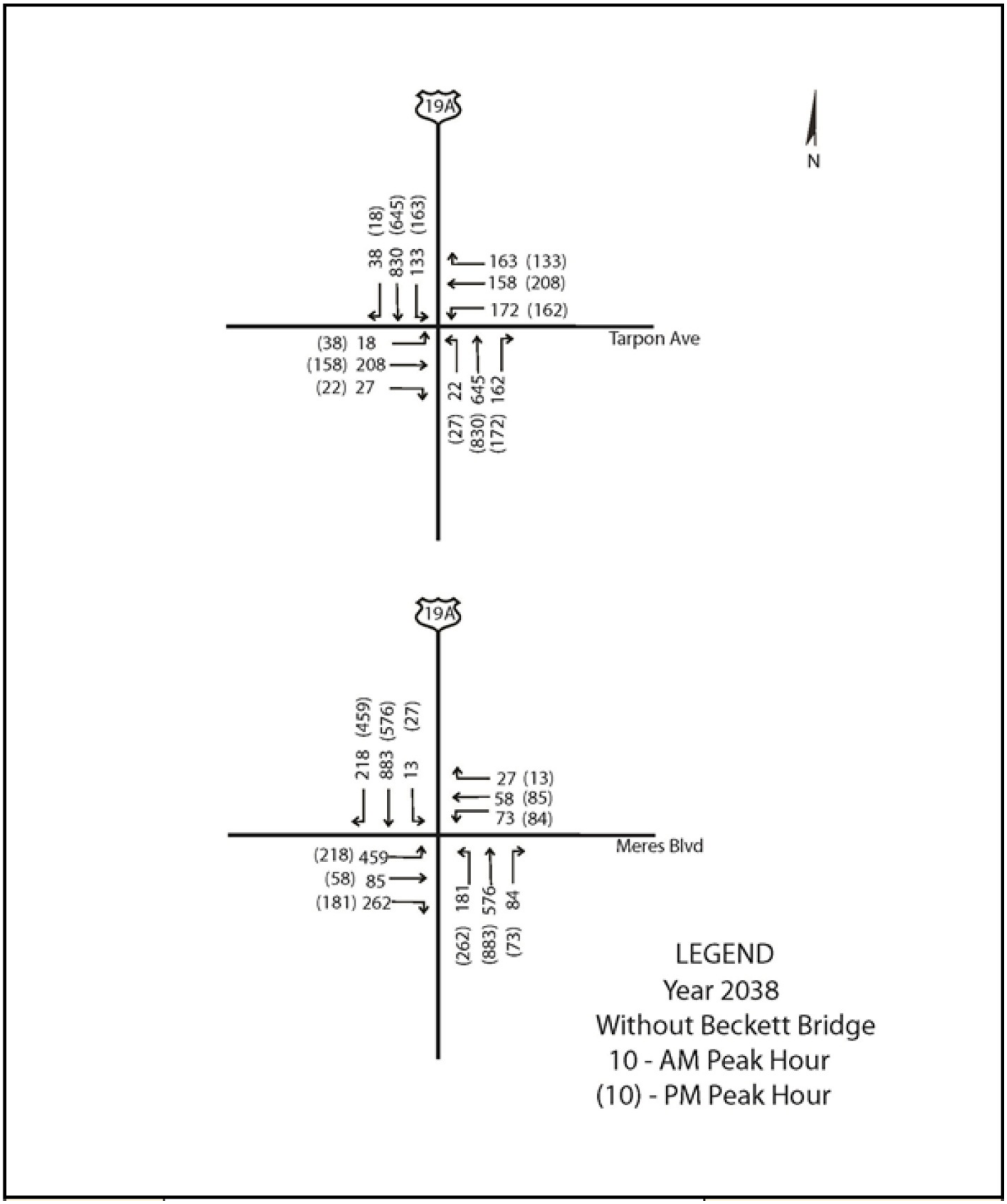


Figure 5-16 – Design Year (2038) Intersection Peak Hour Volumes – Scenario 2

Table 5-3 – Opening Year (2018) Signalized Intersection Peak Hour Level of Service – Scenario 1

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	18.4	B	31.8	C
	Southbound	843	638	22.2	C	18.4	B
	Eastbound	427	231	35.8	D	34.0	C
	Westbound	144	150	51.4	D	46.9	D
			Overall	**25.9**	**C**	**29.0**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	688	874	20.1	C	59.9	E
	Southbound	843	686	18.3	B	23.2	C
	Eastbound	221	193	47.4	D	53.1	D
	Westbound	446	445	39.2	D	36.6	D
			Overall	**26.1**	**C**	**43.1**	**D**

In 2018, with the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS C overall during both the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the existing (2012) conditions analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour.

Scenario 2 – Bridge Removed

Table 5-4 summarizes the intersection delay and LOS results based on the Opening Year (2018) analysis without the Beckett Bridge (Scenario 2) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2018, without the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS C overall in the a.m. peak and the p.m. peak hour. The intersection of Alternate US 19 at Tarpon Avenue is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. During the p.m. peak hour, the northbound approach of Alternate US 19 at Tarpon Avenue is anticipated to continue to operate at LOS E. It should be noted that in Scenario 2, the same level of traffic is projected to utilize the Alternate US 19 at Tarpon Avenue intersection after the redistribution around Whitcomb Bayou.

Table 5-4 – Opening Year (2018) Signalized Intersection Peak Hour Level of Service – Scenario 2

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	19.4	B	27.6	C
	Southbound	937	878	22.4	C	17.3	B
	Eastbound	667	325	53.7	D	38.6	D
	Westbound	144	150	49.5	D	49.6	D
			Overall	**32.0**	**C**	**26.7**	**C**
Alternate US 19 at Tarpon Avenue	Northbound	688	874	20.1	C	59.9	E
	Southbound	843	686	18.3	B	23.2	C
	Eastbound	221	193	47.4	D	53.1	D
	Westbound	446	445	39.2	D	36.6	D
			Overall	**26.1**	**C**	**43.1**	**D**

5.2.5 Opening Year (2018) Arterial Analysis

An arterial analysis was conducted for the Opening Year (2018) under both scenarios using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.*

Scenario 1 – Bridge Remains

An arterial analysis was conducted for the Opening Year (2018) with the Beckett Bridge (Scenario 1) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-5** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-5 – Opening Year (2018) Arterial Level of Service – Scenario 1

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	333	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	456	C
Tarpon Drive (North of Gulf Road)	2U	630	75	B
Florida Avenue (South of Gulf Road)	2U	630	215	B
Meres Boulevard (West of Woodmont Drive)	2U	630	257	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	478	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

Scenario 2 – Bridge Removed

An arterial analysis was conducted for the Opening Year (2018) without the Beckett Bridge (Scenario 2) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the direct removal of the bridge. Additionally, without the bridge, the redistribution of traffic is projected to degrade the operations on Whitcomb Boulevard to LOS F. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-6** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-6 – Opening Year (2018) Arterial Level of Service – Scenario 2

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	145	B
Florida Avenue (South of Gulf Road)	2U	630	284	B
Meres Boulevard (West of Woodmont Drive)	2U	630	450	C
Whitcomb Boulevard (South of Poulos Lane)	2U	630	746	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

5.2.6 Design Year (2038) Intersection Analysis

The Design Year (2038) traffic conditions were analyzed under both scenarios using the Transportation Research Board's HCM and HCS+ for the two study area intersections.

Scenario 1 - Bridge Remains

Table 5-7 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis with the Beckett Bridge (Scenario 1) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, with the bridge, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS D overall during the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the Opening Year (2018) analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour. Additionally, the northbound approach is projected to operate at LOS E in the a.m. peak hour.

Table 5-7 – Design Year (2038) Signalized Intersection Peak Hour Level of Service – Scenario 1

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	45.6	D
	Southbound	995	764	23.9	C	18.0	B
	Eastbound	508	338	49.1	D	39.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	**49.3**	**D**	**36.9**	**D**
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	**31.1**	**C**	**52.3**	**D**

Scenario 2 – Bridge Removed

Table 5-8 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis without the Beckett Bridge (Scenario 2) at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, without the bridge, operations at the intersection of Alternate US 19 at Meres Boulevard are projected to deteriorate to LOS E overall in the a.m. peak hour and LOS D in the p.m. peak hour. Additionally, the northbound approach is anticipated to operate at LOS E and the eastbound approach is anticipated to deteriorate to LOS F in the a.m. peak hour.

The intersection of Alternate US 19 at Tarpon Avenue is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. During the p.m. peak hour, the northbound approach of Alternate US 19 at Tarpon Avenue is anticipated to continue to operate at LOS E. It should be noted that in Scenario 2, the same level of traffic is projected to utilize the Alternate US 19 at Tarpon Avenue intersection after the redistribution without the bridge.

5.2.7 Design Year (2038) Arterial Analysis

An arterial analysis was conducted for the Design Year (2038) under both scenarios using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.*

Table 5-8 – Design Year (2038) Signalized Intersection Peak Hour Level of Service – Scenario 2

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	43.9	D
	Southbound	1114	1062	22.6	C	18.8	B
	Eastbound	806	457	163.5	F	43.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	79.5	E	35.2	D
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	31.1	C	52.3	D

Scenario 1 – Bridge Remains

An arterial analysis was conducted for the Design Year (2038) with the Beckett Bridge (Scenario 1) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-9** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Scenario 2 – Bridge Removed

An arterial analysis was conducted for the Design Year (2038) without the Beckett Bridge (Scenario 2) using the capacities provided in the *2009 FDOT Quality/LOS Generalized Tables.* Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the removal of the bridge.

Table 5-9 – Design Year (2038) Arterial Level of Service – Scenario 1

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	392	C
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	540	C
Tarpon Drive (North of Gulf Road)	2U	630	91	B
Florida Avenue (South of Gulf Road)	2U	630	252	B
Meres Boulevard (West of Woodmont Drive)	2U	630	296	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	564	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS.

Additionally, without the bridge, the redistribution of traffic is projected to degrade the operations on Whitcomb Boulevard to LOS F. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 5-10** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 5-10 – Design Year (2038) Arterial Level of Service – Scenario 2

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	290	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	166	B
Florida Avenue (South of Gulf Road)	2U	630	327	B
Meres Boulevard (West of Woodmont Drive)	2U	630	524	C
Whitcomb Boulevard (South of Poulos Lane)	2U	630	907	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS D.

5.3 DETOUR ANALYSIS

5.3.1 Proposed Detour Route Alternatives

In order to evaluate potential traffic impacts to the surrounding study area roadways during the period of rehabilitation or replacement of the existing bridge structure, several detour options were explored. Construction for bridge rehabilitation or replacement is anticipated to occur for six to 24 months, depending on the extent of the improvements. **Figure 5-17** illustrates the proposed detour route alternatives, which include the following:

1. Whitcomb Boulevard - traffic diverted using Whitcomb Boulevard/South Spring Boulevard around Whitcomb Bayou - a distance of approximately 2.5 miles.

2. Meres Boulevard - traffic diverted using Meres Boulevard from Alternate US 19 to Florida Avenue

3. Klosterman Road-Carlton Road-Curlew Road - traffic diverted from Alternate US 19 using Klosterman Road, Carlton Road, and Curlew Road to Florida Avenue

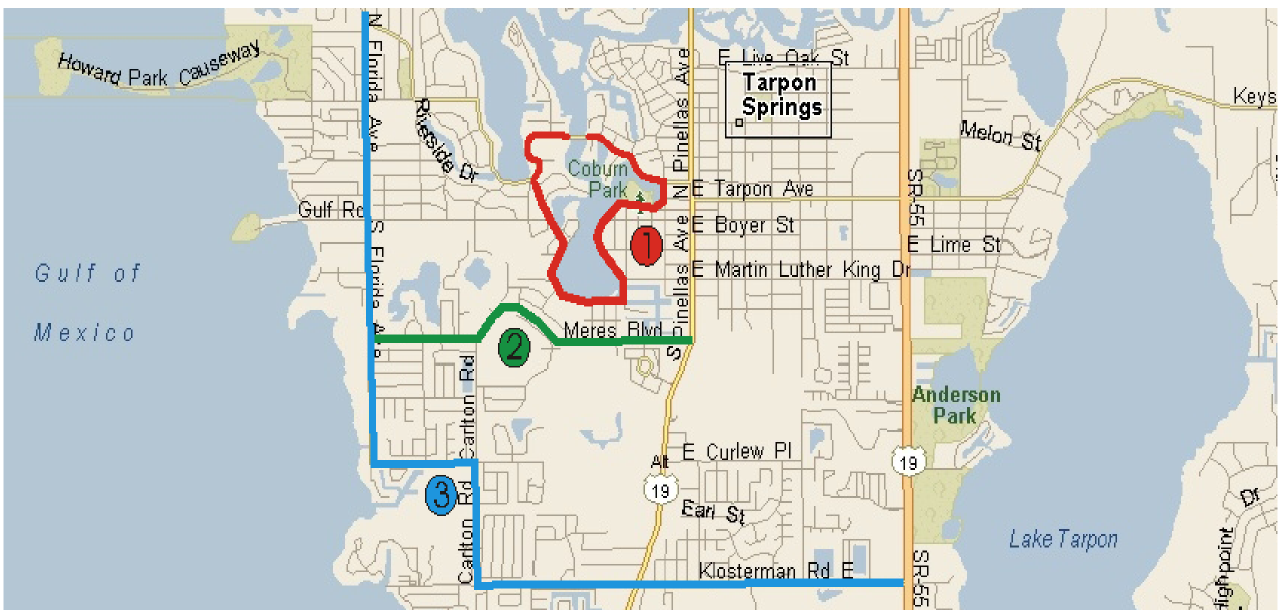


Figure 5-17 – Proposed Detour Route Alternatives

It should be noted that a comparison of the TBRPM origin/destination traffic patterns with and without the Beckett Bridge showed that none of the existing or future traffic traveling across the bridge would redistribute using the Klosterman Road-Carlton Road-Curlew Road alternative. In addition, this route is the longest and most circuitous of the alternatives, at approximately 2.75 miles in length. For these reasons, this alternative was eliminated from further consideration.

Results of the analysis indicate that in the event of closure of the Beckett Bridge, reassigning traffic to Whitcomb Boulevard would increase congestion on this roadway to failing levels of service (LOS F). Conversely, if the traffic was rerouted via Meres Boulevard, then the study area roadways are anticipated to continue to operate at acceptable levels of service with the additional traffic. Detour route LOS analyses are summarized below in **Tables 5-11 through 5-14**.

Table 5-11 – Whitcomb Boulevard Detour Route Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	427	C
Florida Avenue (South of Gulf Road)	2U	630	215	B
Meres Boulevard (West of Woodmont Drive)	2U	630	257	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	830	F
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

Table 5-12 – Whitcomb Boulevard Detour Route
Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Tarpon Avenue	Northbound	705	902	53.5	D	91.0	F
	Southbound	984	800	97.1	F	60.3	E
	Eastbound	505	387	85.5	F	146.9	F
	Westbound	472	577	24.9	C	27.2	C
			Overall	**70.3**	**E**	**76.2**	**E**

Table 5-13 – Meres Boulevard Detour Route Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	247	B
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	N/A	N/A
Tarpon Drive (North of Gulf Road)	2U	630	427	C
Florida Avenue (South of Gulf Road)	2U	630	567	C
Meres Boulevard (West of Woodmont Drive)	2U	630	609	D
Whitcomb Boulevard (South of Poulos Lane)	2U	630	478	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	871	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	837	D

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
[1] Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
[2] LOS Standard for all study area roadways is LOS D.

Table 5-14 – Meres Boulevard Detour Route Signalized Intersection Peak Hour Level of Service

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	644	1039	19.4	B	27.6	C
	Southbound	937	878	22.4	C	17.3	B
	Eastbound	667	325	53.7	D	38.6	D
	Westbound	144	150	49.5	D	49.6	D
			Overall	**32.0**	**C**	**26.7**	**C**

Based on these results, it is recommended that the detour route for the project occur along Meres Boulevard. Detour signage, including the use of Intelligent Transportation Systems (ITS), specifically electronic message panels, should be placed well in advance of the route location along Florida Avenue and Alternate US 19 (at a minimum). Additional electronic signage may also be needed at key locations throughout the neighborhood surrounding the Beckett Bridge and should provide (if at all possible) real-time information regarding potential delays on the route.

It should be noted that portions of Alternate US 19 operate at LOS F under either scenario, as well as the detour alternatives, in both the Opening Year (2018) and Design Year (2038). However, this corridor has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the project.

6.0 ALTERNATIVES CONSIDERED

6.1 CORRIDOR ANALYSIS

Beckett Bridge was originally constructed in 1924. Since that time, the existing two-lane bridge has provided an important link to areas west and north of the Bayou to downtown Tarpon Springs. The bridge is also located on a popular route for access to Fred Howard Park, a Pinellas County park located approximately 3.1 miles west on the Gulf of Mexico. Riverside Drive/North Spring Boulevard is an extension of Tarpon Avenue, which is a designated evacuation route. Beckett Bridge provides access to major north/south arterials including Alternate US 19 and US 19 for coastal residents during hurricane evacuation. The bridge also provides access for emergency vehicles, including police, ambulance and fire. The AADT volume is currently 7,700. In the design year (2038), the AADT is predicted to increase to 9,700.

Areas to the east and west of the bridge are densely developed. Therefore, other corridors for construction of a new bridge would result in substantial impacts to adjacent properties. In addition, construction of a new bridge on a new corridor would result in more impacts to the natural environment. If a replacement bridge is selected as the Preferred Alternative, construction along the existing corridor will best serve the purpose and need of the project and result in fewer impacts than a bridge constructed within a new corridor.

6.2 TRANSPORTATION SYSTEM MANAGEMENT MULTI-MODAL IMPROVEMENTS

Transportation System Management (TSM) multi-modal improvements are strategies for reduction of existing and potential future congestion. Typically TSM improvements include traffic signal and intersection improvements, transit improvements and changes in access management. These improvements are designed to improve efficiency without costly infrastructure improvements.

The purpose of this project is to establish a preferred alternative to remove, repair or replace a deteriorating existing bridge. Improving efficiency within the project corridor is not the objective of the proposed improvements considered for this project. There are no signalized intersections within the project limits. Accordingly, it was determined that TSM improvements are not feasible to address the project need.

6.3 No-Build Alternatives

Two No-Build Alternatives were considered, No-Build and No-Build with Removal of the Existing Bridge.

6.3.1 No-Build

The No-Build Alternative includes only routine maintenance performed as needed to keep the bridge open to traffic until safety issues, such as reduced capacity due to ongoing deterioration, would require it to be closed. Repair or replacement could be considered at a later date. The No-Build Alternative does not include modification or improvements to the existing bridge or approach roadway. Existing geometric and other deficiencies, including substandard lane width and curbs would remain. No changes to the existing horizontal and vertical navigational clearances would occur.

There are a number of components of the bridge that are in an advanced state of deterioration that are not likely to be economically corrected by routine maintenance or in-kind repair. Estimating the remaining service life of these components is more subjective than quantitative analysis. However, given the age of the bridge and the extent of the deficiencies, without major rehabilitation the existing bridge is estimated to have no more than 10 years of remaining service. The No-Build Alternative was retained as a viable alternative throughout the duration of the PD&E study, though it is not the Preferred Alternative. The Preferred Alternative is described in Section 7.0 of this document.

6.3.2 No-Build with Removal of the Existing Bridge

This alternative is the same as the No-Build Alternative described above, except that the bridge would be demolished when it is no longer safe for traffic. No plans for future rehabilitation would be considered and a replacement bridge would not be constructed.

6.4 Rehabilitation Alternative

The existing bridge service life can be extended with extensive repairs and modifications, implementation of measures that slow the rate of concrete and structural steel deterioration, replacement of severely deteriorated structural elements, replacement of worn, deteriorated, and outdated electrical and mechanical systems and replacement of substandard bridge railings. However, even after major rehabilitation, due to its age and condition, it is anticipated that the bridge will require significant ongoing maintenance and periodic additional major repairs with corresponding disruptions to traffic. Rehabilitation to restore structural capacity, bring the bridge rails up to current safety standards, and mitigate future settlement would involve replacement of the bascule leaf (the steel draw span), the operating system (electrical and mechanical), and construction of crutch bents at each approach bent. These improvements, in conjunction with continued maintenance and periodic repair and/or rehabilitation, could extend the service life of the bridge 25 to 30 years (from 2013). It is not practical to extend the life of the bridge indefinitely.

Generally, if proposed improvements include substantial modification to the superstructure or substructure, the USCG is likely to require that the navigational clearances be improved to meet current USCG guide clearances for the affected waterway. However, there are no USCG guide clearances for the channel over which the Beckett Bridge is constructed. Accordingly, it is anticipated that the USCG will permit the proposed improvements described below for the Rehabilitation Alternative provided the proposed clearances are at least the same as the existing clearances. No changes in the navigational clearances are proposed. Replacement of the fender system would require a USCG permit.

The proposed Rehabilitation Alternative would include the following work and would extend the service life of the bridge a maximum of 25-30 years:

- Replace the sand-cement riprap at the abutments.
- Replace substandard approach guardrails.
- Remove all existing pile jackets and install new cathodic protection jackets on all concrete bent piles as well as steel bascule pier helper piles.
- Repair deteriorated concrete of the pile bent caps, bascule pier and rest pier, and provide cathodic protection in the form of zinc spray metalizing.
- Install crutch bents at Bents 2, 3, 4, 5, 8, 9, 10.
- Replace substandard concrete bridge railings with new traffic railings meeting crash testing requirements of NCHRP 350 (i.e. FDOT Standard Index 422 – 42" Vertical Face Traffic Railing).
- Hydro-blast the deteriorated concrete deck surface and install a new concrete overlay.

- Replace the expansion joints.
- Repair deteriorated concrete of the deck underside, beams and diaphragms, and provide cathodic protection in the form of zinc spray metalizing.
- Rehabilitate the control house including roof, windows and door or replace the control house.
- Replace the bascule leaf including counterweight, open steel and concrete filled grid deck.
- Replace the bascule span main drive machinery as well as the span locks and live load shoes.
- Replace the bascule span electrical system.
- Replace the bascule span traffic gates.
- Replace the bascule span barrier gate.
- Replace the fender system.

6.5 BRIDGE REPLACEMENT ALTERNATIVES

Two bridge types were considered for replacement alternatives:

1. A new, two lane, movable span bridge (with 7.8 feet of vertical clearance)
2. A new, two lane, mid-level fixed span bridge (with 28 feet of vertical clearance)

All build alternatives would be constructed on approximately the same alignment as the existing bridge to minimize environmental impacts and impacts to adjacent properties. An analysis of future LOS needs indicates that a two lane bridge will provide sufficient capacity in the design year. (This analysis is presented in Section 5 of this report.) No additional travel lanes are proposed. Conceptual plans for all replacement alternatives are included in Appendix G.

In general, the existing bridge would be demolished prior to construction of a replacement bridge. Accordingly, a detour would be required for all or part of the construction duration. The worst case detour, approximately 2.6 miles long, would be required for someone traveling from Bayshore Mobile Home Park (MHP), located immediately west of the bridge, to the Yacht Club located on the east shoreline of the channel. Analyses of other potential detour routes for traffic using the bridge are discussed in Section 5.3 of this report. (Note: The traffic patterns for the No-Build with Removal of the Existing Bridge Alternative, after the bridge is removed, are likely to be similar to traffic patterns during the construction detour.) Demolition includes disposal of removed material in accordance with applicable state and federal regulations. Specific disposal requirements, such as identification and handling of hazardous materials, recycling, or artificial reef placement will be addressed in the design phase.

The navigational channel at the bridge site is not federally maintained. The USCG has not established guide clearances for movable or fixed bridges at this channel crossing. It is anticipated that a movable bridge providing at least the same horizontal and vertical clearances as the existing bridge would be permitted. The maximum vertical clearance that avoids impacts to the intersections of Riverside Drive with Chesapeake Drive and Forest Avenue at the project limits is 28 feet (at the fenders) for the fixed span alternatives. When the bridge is in the closed position, the maximum vertical clearance over the channel for the movable bridge alternative that would avoid impacts to the driveways to the Bayshore MHP on the west, and the Yacht Club on the east is 7.8 feet at the fenders.

Aesthetics for the proposed bridge will be based on Level Two criteria in accordance with the *FDOT Plans Preparation Manual.* This emphasizes full integration of efficiency, economy and elegance in all bridge components and the structure as a whole with consideration given to structural systems that are inherently more appealing. The project cost estimates include 10% of the construction costs for aesthetic enhancements.

Constraints affecting construction access and methods at the bridge site include the following:

- Shallow water depths
- Narrow channel at the bridge crossing
- Location of Tarpon Springs Yacht Club and Bayshore MHP docks immediately adjacent to the bridge
- Highly developed adjacent lands with limited areas for construction staging.

Construction methods to reduce the duration of detours and the corresponding disruptions to the traveling public were investigated. Typical means of reducing detour durations include offline construction and phased construction. Offline construction, where a new bridge alignment is shifted away from an existing bridge so that traffic can be maintained on the existing bridge while the new bridge is constructed, is not practical for this site due to limited right-of-way, adjacent properties, and adjacent wetlands.

Phased construction involves construction of one side of a new bridge while maintaining traffic on a portion of the old bridge. Phased construction is not viable for the Beckett Bridge replacement for two reasons. First, it would require a slight offset of the existing alignment, or a temporary bridge, which would result in additional impacts to adjacent properties and to wetlands. Secondly, the existing bridge's bascule span is a two girder structural system which is not conducive to removal of part of the bridge. Given the above conditions and since the bridge replacement alternatives were developed with the goal of limiting impacts and right-of-way acquisition, neither offline nor phased construction were considered further.

Accelerated Bridge Construction (ABC) is another means of reducing detour durations and construction impacts. ABC utilizes a combination of construction means and technologies to increase the speed of construction, with particular emphasis on reducing the duration of on-site construction. Implementing ABC technology could reduce the required detour time by maximizing off-site prefabrication and taking advantage of partial construction of the proposed bridge while the existing bridge is still in service. Once the existing bridge was removed, the remaining portion of the bridge would be constructed. Pre-cast components would be transported to the site and erected until the bridge was complete. Reduced construction time would be realized by minimizing the amount of conventional cast-in-place concrete which typically requires a curing period to gain its required strength. Accordingly, costs and detour times developed for replacement alternatives assumed that ABC methods are proposed to be employed for all build alternatives.

6.5.1 Replacement with a Movable Bridge

The proposed movable span will provide 7.8 feet of vertical clearance at the fenders (in the closed position) and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. Unlimited vertical clearance will be provided in the open position for the width of the channel between the fenders. (Vertical clearance is measured at the lowest point of clearance within the navigation channel. The low point is generally located at one or both sides of the channel, directly above the fender system that marks the channel limits.)

The maximum proposed grade is five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore MHP, the Tarpon Springs Yacht Club and Venetian Court to allow connection of these driveways with minimal re-grading. Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues.

The proposed roadway profile would be approximately two feet higher than the existing roadway at the west end of the bridge (Begin Bridge Station 135+95 as shown on concept plans), and approximately four feet higher at east end of the bridge ("End Bridge" Station 139+55). The proposed improvements can be constructed within the existing right-of-way. Purchase of additional right-of-way is not required.

Based on meetings with Southwest Florida Water Management District (SWFWMD) staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required. If treatment of stormwater is required by the Southwest Florida Water Management District, it is anticipated that compensatory, offsite treatment will be acceptable. Accordingly, acquisition of additional right-of-way is not anticipated to address water quality concerns.

Bridge Description

The total length of the proposed movable span bridge is 360 feet. The bridge includes a 123-foot long east approach, 152-foot long west approach, and an 85-foot long bascule span. A continuous superstructure is proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure may consist of bents or piers supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

A single-leaf bascule span is proposed. The proposed configuration is similar to that of the existing bridge. The bascule leaf rotates about a horizontal axis located on one side of the channel to provide unlimited vertical clearance over the channel with the leaf in the fully open position. The bascule leaf will consist of steel main girders, floor beams, stringers, and a solid surface deck. The counterweight will be located inside the bascule pier and consist of concrete with steel ballast blocks for balancing the leaf. The bascule pier, approximately 56 feet by 40 feet will be supported by prestressed concrete piles or drilled shafts and feature concrete pier walls to enclose the machinery and counterweight. The rest pier, which supports the tip of the bascule span when in the fully closed position, will be similar to the other bents or piers.

The new movable bridge will feature traffic control safety devices that are required for movable bridges. These elements include traffic signals and traffic warning gates on both approaches and a resistance barrier gate on the rest pier side of the bascule span. The bridge will also feature a fender system equipped with standard navigation lights and clearance signs.

Proposed Movable Bridge Typical Section

The proposed bridge typical section for the Movable Bridge Alternative has a total out-to-out width of 47.2 feet as shown in **Figure 6-1**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, 6 feet wide, are proposed on both sides of the bridge.

Proposed Roadway Sections

The proposed roadway section for the Movable Bridge Alternative west of the bridge consists of two 10-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Because of the limited right-of-way, a six-foot wide sidewalk is proposed only on the north side of the roadway. No sidewalks are proposed on the south side of the roadway, adjacent to the Bayshore MHP. East of the bridge, the roadway section consists of two 11-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Six-foot wide sidewalks are proposed on both sides of the roadway. **Figures 6-2 and 6-3** illustrate the proposed roadway sections for the west and east sides of the bridge, respectively.

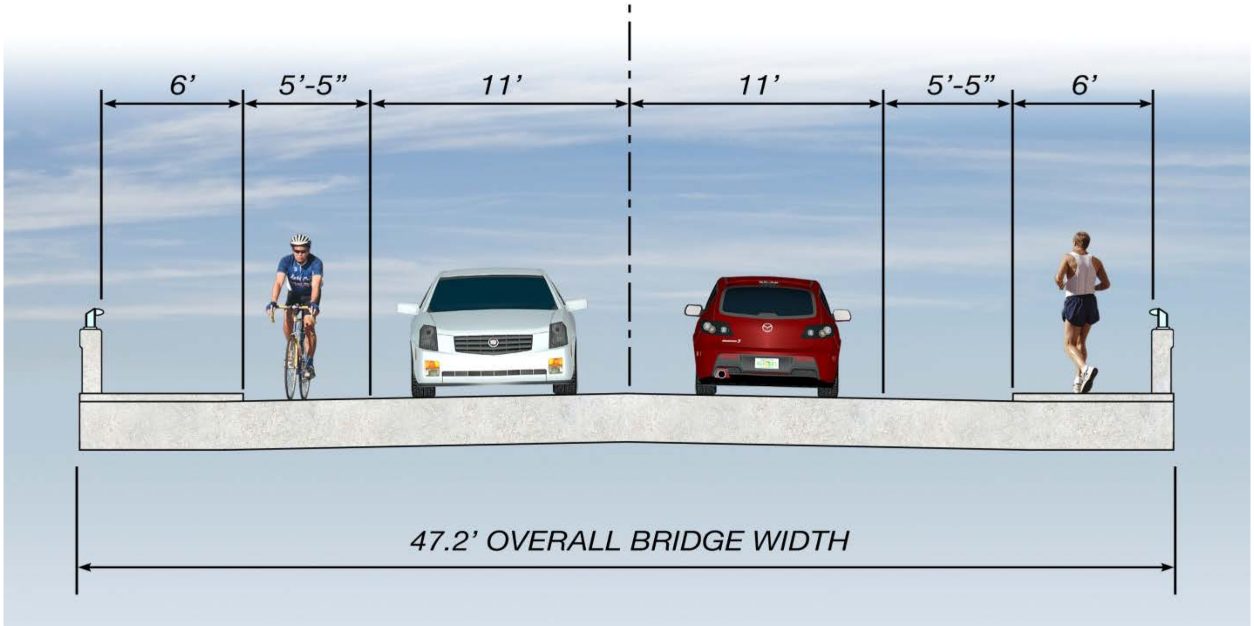


Figure 6-1 – Proposed Movable Bridge Typical Section

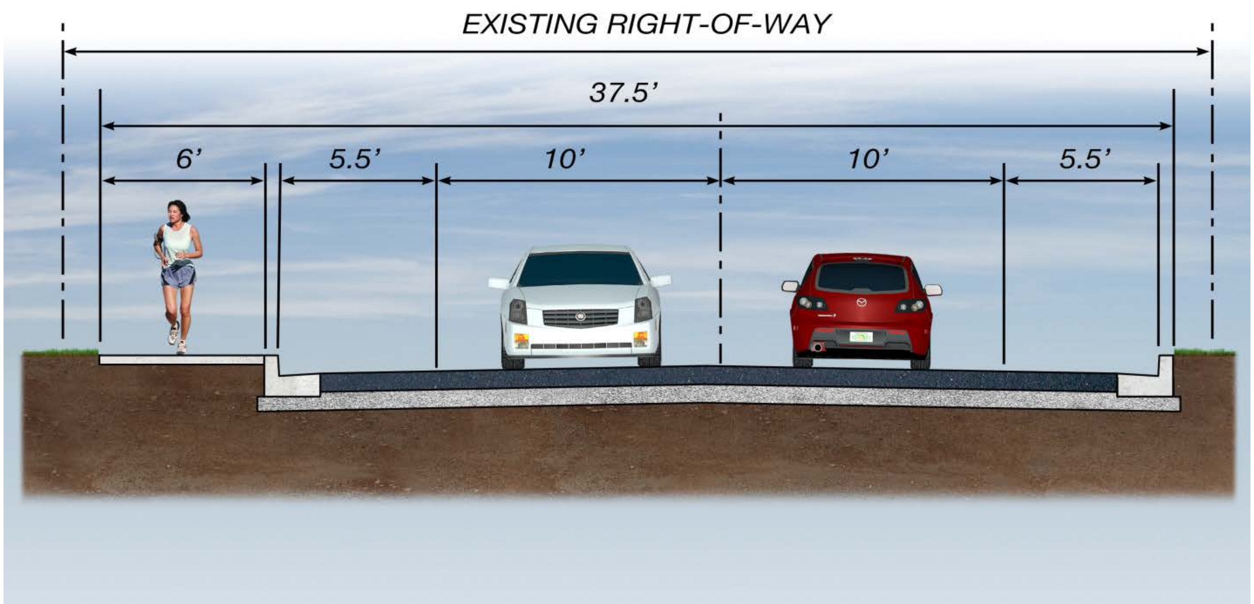


Figure 6-2 – Proposed Roadway Section West of Proposed Movable Bridge

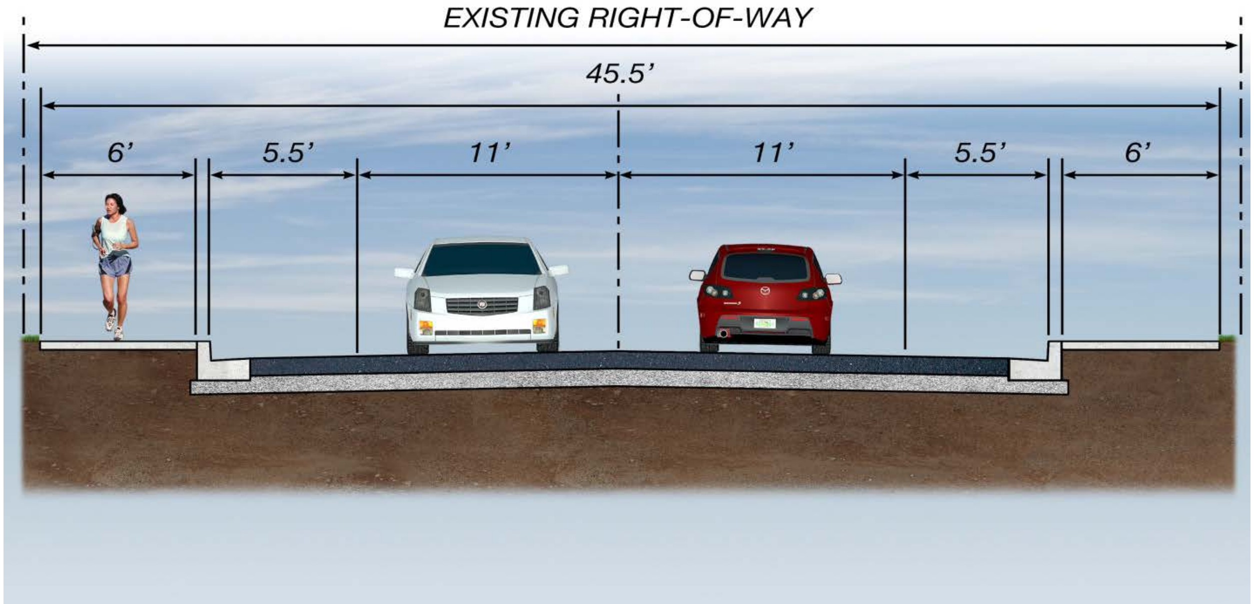


Figure 6-3 – Proposed Roadway Section East of Proposed Movable Bridge

6.5.2 Replacement with a Fixed Bridge

Two options, A and B, were developed for the fixed bridge alternative. Both options provide approximately 28 feet of vertical clearance over Whitcomb Bayou and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. The proposed maximum grade is 5%. The total length of the proposed fixed span bridge is 720 feet.

Both fixed bridge options require acquisition of additional right-of-way. Although the proposed roadway typical sections were developed to tie into the existing roadway right-of-way once the bridge structure returns to existing grade, impacts from gravity walls required to contain the fill for the much steeper slope of these alternatives block access to existing properties. Construction of new access roads is required to maintain access to the Bayshore MHP on the west side and to Venetian Court east of the bridge. The two fixed bridge options differ in the properties that are impacted to maintain access. Option A impacts the residential parcels on the north side of Riverside Drive. Option B impacts the Bayshore MHP on the south side of the roadway. More detail about the impacts of each option is provided later in this section.

The proposed bridge typical section for the fixed bridge alternative options has an out to out width of 39.6 feet. It consists of two, 11-foot travel lanes, 4.5-foot shoulders (which can be used as undesignated bicycle lanes) on both sides and a 6-foot sidewalk on the north side of the bridge. To minimize impacts to property owners, a sidewalk is not proposed on the south side of the bridge. (See **Figure 6-4**.) Shoulder widths for the fixed bridge alternative are limited to 4.5 feet to avoid additional right-of-way impacts.

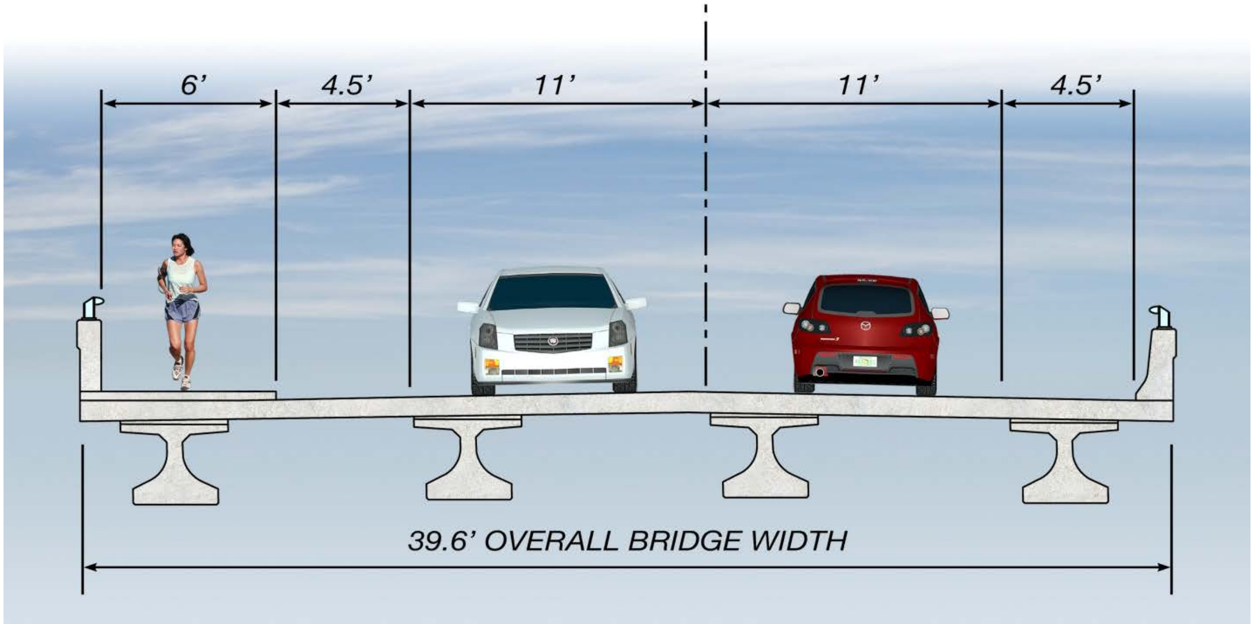


Figure 6-4 – Proposed Fixed Bridge Typical Section

The proposed roadway section west of the bridge consists of two, ten-foot wide travel lanes, a 5.5-foot wide shoulder, a six-foot wide sidewalk on the north side of the bridge, and a 5.5-foot wide shoulder on the south side of the bridge. Because of limited right-of-way, a sidewalk is not proposed on the south side of the bridge. Although the roadway section is 37 feet wide, the total width of the proposed section, including bridge railings in areas where the roadway is constructed on a raised embankment between retaining walls, is 39.6 feet. This section can be constructed in the approximately 40 feet of existing right-of-way.

East of the bridge, the proposed roadway section provides two, 11-foot wide travel lanes, a 5.5-foot wide shoulder and six-foot wide sidewalk on the north side of the bridge. A sidewalk is not proposed on the south side of the bridge to minimize impacts to adjacent property owners. Although the roadway section is 39 feet wide, the total width of the proposed section, including bridge railings in areas where the roadway is constructed on a raised embankment between retaining walls, is 41.6 feet. This section on embankment will require acquisition of some right-of-way on the north side of the road between Pampas Avenue and Forest Avenue, where the right-of-way narrows. **Figures 6-5 and 6-6** illustrate the proposed roadway sections for the fixed bridge alternatives.

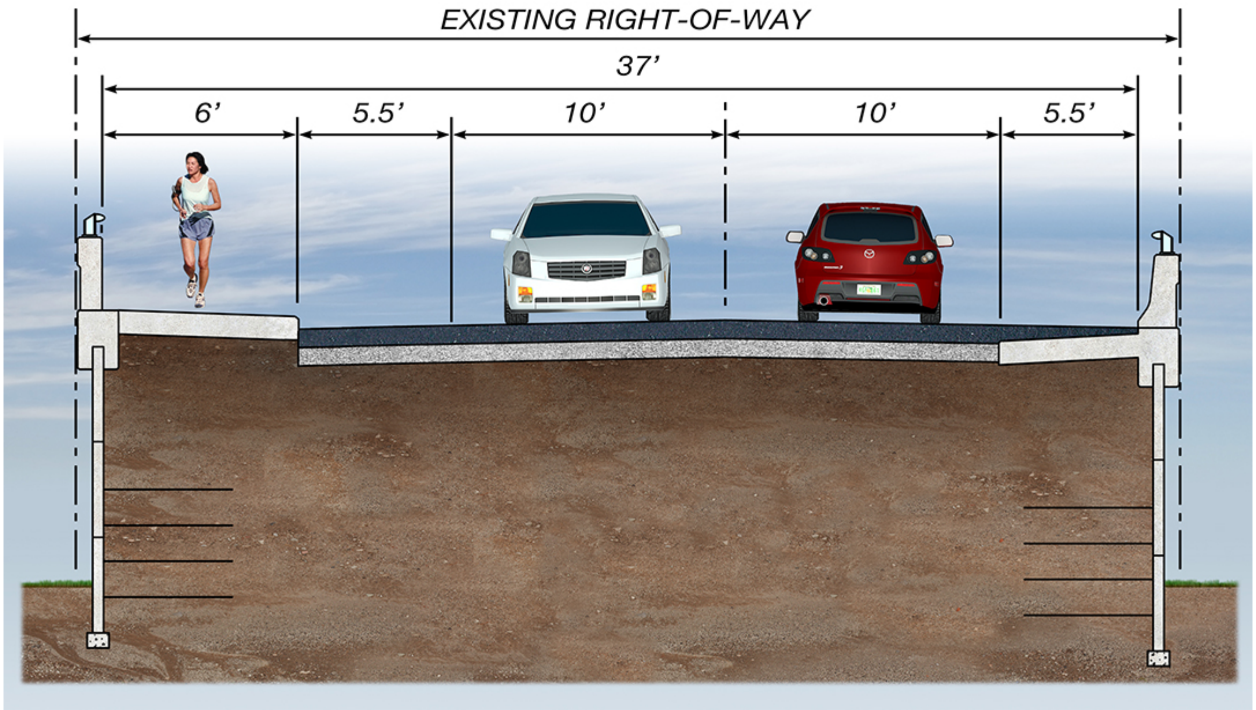


Figure 6-5 – Proposed Roadway Section West of Proposed Fixed Bridge

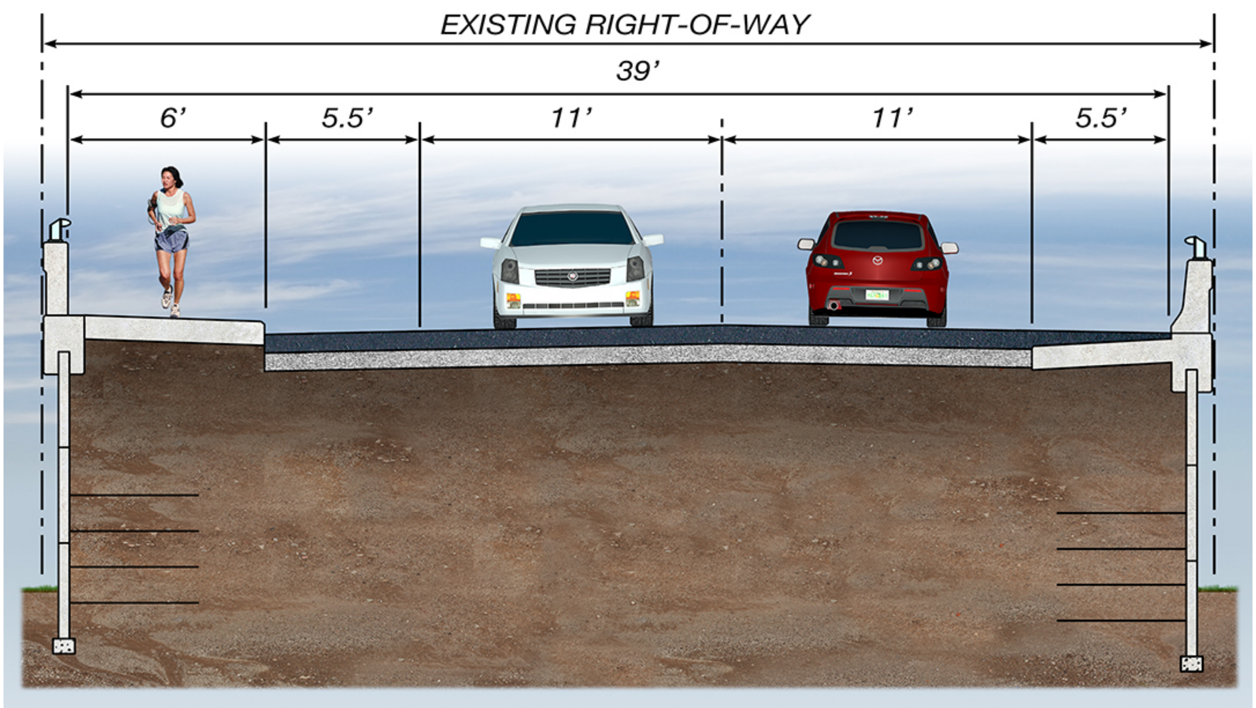


Figure 6-6 – Proposed Roadway Section East of Proposed Fixed Bridge

Fixed Bridge Alternative – Option A

The superstructure will may consist of prestressed concrete girder (Florida I-Beams) construction with a concrete deck. To span the access road to the Bayshore MHP, waterway, navigation channel and new Venetian Court extension, it is likely that the span lengths will vary slightly. The bridge may consist of nine spans, each approximately 80 feet long. Continuous superstructure units with a limited number of joints could be proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the bridge could consist of piers and/or bents supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps. The total length of the proposed fixed span bridge is 720 feet.

The roadway profile at the intersection of Chesapeake Drive and Riverside Drive will be only about one to two feet above existing grade. A proprietary retaining wall system, such as Mechanically Stabilized Earth (MSE) walls, will be required on both sides of the roadway from Chesapeake Drive to station 134+42, where the bridge begins. The wall will begin just east of Chesapeake Drive on the north side of Riverside Drive and extend approximately 360 feet east.

On the south side of the roadway, the wall will begin just west of Chesapeake Drive and extend approximately 420 feet east. The height of the wall will increase to approximately 19 feet above existing ground, just west of the entrance driveway to the Bayshore MHP.

East of the proposed bridge, an MSE wall will extend approximately 340 feet on the north side and about 400 feet on the south side. The wall will end west of Forest Avenue where the approach roadway will return to the existing grade. The proposed retaining wall will block access to Riverside Drive for five single family residences west of the bridge, on the north side of the roadway. A new access road for the Bayshore MHP will be constructed north of Riverside Drive. The access road will connect with Chesapeake Drive and extend east through the parcels immediately adjacent to the north side of the roadway. The access road will then turn south and extend under the proposed bridge to connect to the Bayshore MHP driveway.

The minimum vertical clearance at the MHP driveway will be 14’6”. The five single family residences impacted are expected to require relocation.

On the east side of the bridge, the proposed bridge will eliminate access to Riverside Drive from

Venetian Court and Pampas Avenue. An extension of Venetian Court will be constructed from Pampas Avenue through the vacant lot adjacent to the Tarpon Springs Yacht Club, extend under the proposed bridge, and tie into the existing Venetian Court. A minimum vertical clearance of 14'6" is provided at Venetian Court.

Direct access to Riverside Drive for the single family residence on the corner of Pampas Avenue and Riverside Drive will be eliminated by the proposed retaining wall. Access from this location and from Venetian Court to Riverside Drive can be accomplished by traveling north on Pampas Avenue, turning east on High Street and south on Forest Avenue. The single family residence driveway located at approximately Station 145+20 will be modified (raised) to provide direct access to Riverside Drive. Vehicular access to private docks located south of Riverside Drive in the area between Station 144+00 and 145+20 will be blocked by the proposed retaining wall.

Fixed Bridge Alternative – Option B

The total length of the proposed fixed span bridge, Option B, is approximately 720 feet. The superstructure may consist of prestressed concrete girder (Florida I-Beams) construction with a concrete deck. To span the waterway, navigation channel and new Venetian Court extension, the span lengths will vary slightly. The bridge may consist of nine spans, each approximately 80 feet long. The last span on the east end of the bridge could include a skewed abutment to reduce the span length. The end bridge location could be moved further east, extending the bridge to provide a perpendicular abutment in final design. Continuous superstructure units with a limited number of joints are proposed to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the bridge could consist of piers and/or bents supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

The roadway is raised about one to two feet above existing grade at Chesapeake Drive. A retaining wall on both sides of the roadway will extend approximately 429 feet east, and vary in height from 1- 22 feet. The height of the wall will be approximately 22 feet at the location of the existing entrance driveway to the Bayshore MHP. East of the proposed bridge, along the north side of the road, the retaining wall will extend from the end of the bridge approximately 340 feet, to west of Forest Avenue where the approach roadway will return to the existing grade. East of the proposed bridge, along the south side of the road, the retaining wall will extend from the end of the bridge approximately 400 feet. The wall will be approximately 21 feet high at the east end of the bridge.

The proposed retaining wall will block access to Riverside Drive for five single family residences west of the bridge, immediately north of the roadway. An access road will be constructed through the impacted parcels to provide access to Chesapeake Drive for the two waterfront parcels in this area. It is anticipated that three relocations on the north side of the road will be required. The driveway entrance to Bayshore MHP will be eliminated. Construction of a new entrance and exit for the MHP at Chesapeake Drive will impact approximately seven mobile home lots on the west end of the development.

As in Alternative A above, the proposed fixed bridge will eliminate the access to Riverside Drive from Venetian Court and Pampas Avenue. An extension of Venetian Court will be constructed from Pampas Avenue through the vacant lot adjacent to the Tarpon Springs Yacht Club, and extend under the proposed bridge with a minimum vertical clearance of 14'6". Although the proposed connector for this option minimizes impacts to the Tarpon Springs Yacht Club property, the connector will extend through the vacant residential lot just east of the Venetian Court intersection south of Riverside Drive and connect to Venetian Court.

Direct access to Riverside Drive for the single family residence on the corner of Pampas Avenue and Riverside Drive will be eliminated by the proposed retaining wall. Access from this location and Venetian Court to Riverside Drive can be accomplished by traveling north on Pampas Avenue, turning east on High Street and south on Forest Avenue. The single family residence driveway at approximately station 145+20 will be modified (raised) to provide direct access to Riverside Drive. Vehicular access will be blocked to docks located south of Riverside Drive in this area.

6.6 PROJECT COSTS

Cost estimates were prepared for the no-build and build alternatives (**Table 6-1**). In addition, demolition costs were estimated which apply to both the No-Build and No-Build with Removal of the Existing Bridge Alternatives. All estimates were based on the following:

- FDOT Structures Design Guidelines, Chapter 9-Bridge Development Report (BDR) Cost Estimating

- Historical Unit Prices for Similar Projects
- Conceptual Quantities

Table 6-1 – Estimated Construction Costs

	No Build (Removal of Existing Bridge)	Rehabilitation (25-30 Year)	New Low-Level Bascule Bridge	New Fixed Bridge Option A	New Fixed Bridge Option B
Construction	$475 K (Demolition)	$4.85 M	$7.92 M	$6.25 M	$6.25 M
Mobilization	$48 K (10%)	$0.39 M (8%)	$0.792 M (10%)	$0.63 M (10%)	$0.63 M (10%)
Maintenance of Traffic	$48 K (10%)	$0.48 M (8%)	$0.792 M (10%)	$0.62 M (10%)	$0.62 M (10%)
Aesthetic Enhancements	N/A	N/A	$0.792 M (10%) (10%)	$0.62 M (10%)	$0.62 M (10%)
Contingency	$143 K (30%)	$1.46 M (30%)	$1.58 M (20%)	$0.94 M (15%)	$0.94 M (15%)
Construction Total	**$714 K**	**$7.18 M**	**$11.87 M**	**$9.06 M**	**$9.06 M**
Design	$71 K (10%)	$1.08 M (15%)	$1.78 (15%)	$0.91 M (10%)	$0.91 M (10%)
CEI	$71 K (10%)	$1.06 M (15%)	$1.78 (15%)	$0.91 M (10%)	$0.91 M (10%)
Post Design	N/A	0.14 M (2%)	$0.36 M (3%)	$0.18 M (2%)	$0.18 M (2%)
Right-of-Way	N/A	N/A	N/A	$4.0M	$2.9 M
Project Total	**$0.9 M**	**$9.5 M**	**$15.8 M**	**$15.1 M**	**$14.0 M**

Construction cost estimates are based on the baseline structure described for each alternative. Contingencies are added to each alternative in accordance with engineering judgment and experience. Contingencies account for miscellaneous items that are not quantifiable at the conceptual design stage. For all alternatives a percentage of the basic construction costs were calculated to account for mobilization, maintenance of traffic, contingencies, design and construction engineering and inspection (CEI). Mobilization costs were estimated as 10% of construction for all alternatives except the Rehabilitation Alternative which was estimated at 8% due to the work requiring less material than replacement. Maintenance of traffic costs were estimated as 10% of construction for all alternatives.

For this project, 30% contingency was assumed for the Rehabilitation Alternative as is typical within the industry for work of that nature. Rehabilitation is typically more prone to scope expansion as the project develops and therefore the percent contingency is higher than for build alternatives. A 15% contingency was assumed for the fixed bridge alternatives, assuming accelerated construction methods. A 20% contingency was assumed for the movable bridge alternative due to the more complex nature of movable bridge design and construction. Design and CEI costs were each estimated to be 10% of construction for two alternatives – no build with permanent removal of the bridge and replacement with a fixed bridge. CEI costs are estimated to be 15% of construction for rehabilitation or replacement with a movable bridge. All estimates need to be adjusted for inflation based upon the schedule of implementation. It is recommended that construction cost estimates be adjusted to the midpoint of construction when programming funds. Detailed cost estimates are provided in Appendix H.

Cost estimates for bridge replacement assume Level Two Aesthetics, as defined in the *FDOT PPM* (Section 26.9.4, January 1, 2013 edition). An additional 10% of the construction costs have been included to account for aesthetic enhancements. Aesthetic enhancements may include concrete surface finishes, decorative railings, light poles, light fixtures, landscaping and/or hardscaping features.

6.6.1 Right-of-Way Costs

Right-of-way costs for potential right-of-way takes of property impacted by the proposed fixed bridge alternatives were estimated using the “Just Market Value”, the “Assessed Value” and the “Sales Comparison Value” determined by the Pinellas County Property Appraiser. The area impacted was multiplied by the estimated square foot value to obtain a “Right-of-Way Value.” The “Right-of-Way Value” was then multiplied by factors of 2.5 and 3.0 to account for potentially negotiated higher price, administrative costs and other unknowns to estimate a low to high range of potential costs. A summary of the results is presented in **Table 6-2**.

Table 6-2 – Right-of-Way Cost Estimates

Fixed Bridge Alternative	Total Row Required (square feet)	Raw ROW Cost ($ millions)	Row Cost x 2.5 ($ millions)	ROW Cost x 3.0 ($ millions)
Option A	86,620	1.35	3.4	4.1
Option B	80,856	0.96	2.4	2.9

The estimated cost multiplied by a factor of 3.0 was used in the Life Cycle Cost Analysis and shown in the Alternatives Evaluation Matrix. Additional information about the methodology used to estimate the costs is included in Appendix H.

6.6.2 Life Cycle Cost Analysis

A life cycle cost comparison was performed in accordance with the FDOT Manual *Life-Cycle Cost Analysis for Transportation Projects* to more completely evaluate and compare the costs for replacement vs. repair/rehabilitation. The costs used for the analysis came from several sources. The costs for the replacement bridges are as summarized above. Estimated costs for right-of-way and relocation are included. Operating and maintenance costs for the existing bridges were derived from data provided by the County and from similar projects. The timeline for rehabilitation assumes that the project starts with design in 2016 and is completed in 2020. The timeline for replacement is similar, assuming that construction is completed in 2020. Rehabilitation is assumed to provide a bridge that remains in service for an additional 25 years (from 2013) before being replaced.

Life-cycle costs were generated for the following four bridge rehabilitation and/or replacement scenarios. The detailed estimates are provided in Appendix H.

- Rehabilitate the bridge in 2020 then replace it with a new movable bridge in 2038 (25 years from 2013),
- Rehabilitate the bridge in 2020 then replace it with a new mid-level fixed bridge in 2038 (25 years from 2013),
- Replace the bridge in 2020 with a new movable bridge,
- Replace the bridge in 2020 with a new mid-level fixed bridge.

Life-cycle costs were computed on the basis of present worth. For each of the alternatives, a period of 107 years was used in the analysis for consistency. Replacement bridge alternatives are assumed to have a service life of 75 years. Cost expenditures beyond this period have a negligible effect on the cost comparison. At the recommendations of FDOT, District 7 Structures and FDOT, Central Office, Structures, a discount rate of 5% was used in the analysis. The effect of inflation and the cost of future construction are accounted for in the discount rate. As recommended by FDOT, discount rates of 4% and 6% were used to test the sensitivity of the analysis. In addition, the estimated life of a rehabilitated bridge was tested by running the scenarios assuming a 20 year remaining service life and a 30 year service life, in addition to the baseline estimate of 25 years. The results of the life cycle cost comparison are presented in **Table 6-3**.

Table 6-3 – Results of Life Cycle Cost Comparison of Rehabilitation and Replacement Alternatives

Rehabilitation Service Life (years)	Discount Rate (percent)	Alternative					
		Rehabilitate / Replace with Movable Bridge	Rehabilitate / Replace with Fixed Bridge		Replace with Movable Bridge	Replace with Fixed Bridge	
			Opt. A	Opt. B		Opt. A	Opt. B
		Present Value ($Millions)					
20	4	17.6	16.7	16.2	14.8	13.0	12.2
20	5	15.3	14.7	14.3	13.3	11.8	11.1
20	6	13.5	13.0	12.6	12.2	10.9	10.2
25	4	16.4	15.7	15.3	14.8	13.0	12.2
25	**5**	**14.2**	**13.6**	**13.2**	**13.3**	**11.8**	**11.1**
25	6	12.4	11.9	11.7	12.2	10.9	10.2
30	4	15.3	14.6	14.3	14.8	13.0	12.2
30	5	13.0	12.6	12.4	13.3	11.8	11.1
30	6	11.3	11.0	10.8	12.2	10.9	10.2

Each row in the table represents a comparison of alternatives in terms of life-cycle costs. Values in different rows cannot be compared. For most scenarios considered, it is more economical to replace the bridge now than to repair/rehabilitate the bridge now and replace the bridge at a later date. However, at discount rates of 5%, and 6%, assuming that the remaining service life of the existing bridge is 30 years, it is more economical to repair/rehabilitate the movable bridge now and replace the bridge later than it is to replace the movable bridge now. Given that the life cycle cost analysis for this project is sensitive to the discount rate used (i.e., the lowest cost alternative varies depending on the discount rate) and rehabilitation service life, the costs can be considered relatively equal within the tolerances of the analysis. Furthermore, only direct (capital) costs were considered in the analysis; indirect (non-capital) costs such as user delay and accident costs were not included in the analysis. These costs are difficult to accurately quantify and are considered somewhat subjective. In all alternatives, indirect costs support the decision to replace the bridge now. Costs associated with user delays and accidents are anticipated to decrease with improvements in the facility (e.g., improved roadway geometry that decreases accidents.)

6.7 EVALUATION OF ALTERNATIVES

An Evaluation Matrix was developed (**Table 6-4**) to facilitate comparison of alternatives. Evaluation Criteria for operational and engineering issues, right-of-way impacts, environmental impacts, parks and recreation impacts, costs and construction time were considered for each alternative. The relative impact for each criterion is stated in the evaluation matrix. Advantages and disadvantages of each alternative are discussed below.

No-Build Alternative

The expected service life of the existing bridge is approximated at ten years or less. The advantages and disadvantages of this alternative are discussed below.

Advantages

- No adverse impacts to historic structures, recreational areas, wetlands and wildlife
- No noise or visual impacts.
- No changes in access to local streets.

Table 6-4 – Evaluation Matrix

Impact Evaluation Criteria	No Build	No Build/Remove Bridge	Rehabilitation	New Low-Level Movable Bridge	New Mid-Level Fixed Bridge Option A	New Mid-Level Fixed Bridge Option B
Roadway/Bridge Issues						
Width of Vehicular Travel Lanes	10 feet	N/A	10 feet	11 feet	11 feet	11 feet
Shoulders	None	N/A	None	5.5 feet	4.5 feet	4.5 feet
Sidewalks	2'2"	N/A	2'2"	6 feet– Both Sides	6 feet – One Side Only	6 feet – One Side Only
Meets Current Design/Safety Standards	No	N/A	No	Yes	Yes	Yes
Structural Deficiencies Corrected	No	N/A	Yes	Yes	Yes	Yes
Vertical/Horizontal Channel Clearance	6 feet/25 feet	N/A	6 feet/25 feet	7.8 feet/25 feet	28 feet/25 feet	28 feet/25 feet
Bridge Openings	No Change	N/A	No Change	Minimal to No Change	None	None
Right of Way Issues						
Overall Bridge Width	28 feet	N/A	28 feet	47.2 feet	39.6 feet	39.6 feet
Right-of-Way Required	None	None	None	None	2 acres	2 acres
Relocations	None	None	None	None	5 Residences	3 Residences, 7 Mobile Homes
Other Impacts	None	None	None	None	Yacht Club Parking Driveways on South Side, East of Bridge	Yacht Club Parking Driveways on South Side, East of Bridge
Environmental Impacts						
Impacts to Historic Bridge	None	High	High	High	High	High
Wetlands	None	Low	Low	0.03 acre	0.02 acre	0.02 acre
Wildlife	None	Low	Low	Low	Low	Low
Parks/Recreation	None	None	None	None	None	None
Visual Impacts	None	None	Low	Low	High	High
Noise Impacts (Permanent)	None	None	None	Low	Low	Low
Costs						
Total Project Costs[1]	N/A	$0.9 M (Demolition)	$9.5 M	$15.8 M	$15.0 M (ROW Costs= $4.0 M)	$13.9 M (ROW Costs=$2.9 M)
Construction Impacts						
Detour Duration	N/A	Permanent	6 months	12 months	24 months	24 months
Total Construction Time	N/A	N/A	12 months	24 months	24 months	24 months
Anticipated Service Life (2010)	10 years or less	10 years or less	25-30 years	75 years	75 years	75 years

[1] Costs include demolition, roadway and bridge construction, mobilization, maintenance of traffic, aesthetic enhancements, engineering design, construction engineering inspection (CEI) and contingency.

- Minor impacts to traffic as a result of on-going maintenance are anticipated.

Disadvantages

- Existing geometric deficiencies would not be corrected (e.g. narrow sidewalks).
- Structural and electrical deficiencies would not be corrected.
- Substantial continuing bridge maintenance would be required.
- Maintenance repairs could further disfigure the historic resource.
- Expected service life would be relatively short (about 10 years).
- Existing horizontal and vertical clearances will not be improved.

No-Build with Removal of Existing Bridge

Advantages and disadvantages of this alternative are the same as those stated for the No-Build Alternative above while the bridge is still serviceable. Additional advantages and disadvantages resulting from eventual permanent removal of the bridge include the following.

Advantages

- Any perceived visual impacts of the existing bridge will be eliminated.
- Noise impacts will be reduced to properties adjacent to the existing bridge.
- Maintenance costs associated with the existing bridge will be eliminated.
- Restriction of the navigation channel will be eliminated.

Disadvantages

- Removal of the NRHP Eligible bridge may result in an adverse impact.
- A crucial link to the Pinellas Trail east of the bridge will be eliminated for the proposed Howard Park Trail.
- Traffic on Whitcomb Drive and Meres Blvd. will increase during peak hours.
- Travelers coming from outlying areas will have a longer travel route to the recreational areas west of the bridge.
- An alternate route will not be available during local special local events
- A local emergency evacuation route from areas west of the bridge will be eliminated.

Rehabilitation Alternative

The existing service life of the bridge, if the repairs described for this alternative are made, is estimated to be 25-30 years. The extensive structural deterioration would need to be corrected by replacing portions of the superstructure and substructure. Some costly improvements that improve safety, but do not extend the service life of the existing bridge, may be required if federal funding is obtained. The return on the investment of funds for these improvements will be relatively short-lived.

Advantages

- Mechanical and electrical systems will be updated.
- Structural deficiencies will be corrected.
- No adverse impacts to recreational areas.
- Minimal to no impacts to wetlands and wildlife.
- No changes in access to local streets.
- A complete detour of only about six months is required for construction, which is less than the detour required for construction of a replacement bridge.

Disadvantages

- Replacement of the bascule leaf from the NRHP eligible bridge may result in an adverse impact.
- Installation of additional crutch bents and pile jackets would alter the appearance of the bridge and further diminish its appearance.
- Temporary noise impacts could occur during construction.
- No changes to the existing geometry of the bridge will occur.
- The substandard sidewalks would remain.
- The substandard shoulder width would remain.
- The bridge will continue to require openings to allow vessels to pass through the channel
- A six month detour will be required during construction

- Rehabilitation will only extend the service life of the existing bridge approximately 25-30 years.

Replacement with a Low-Level Movable Bridge

The anticipated service life of a new movable bridge is about 75 years. Advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an "undesignated" bicycle lane.
- Six-foot wide sidewalks will be provided on both sides of the bridge.
- The replacement bridge can be constructed within existing right-of-way.
- No impacts to existing intersections with Riverside Drive/Spring Boulevard will occur.
- No impacts to driveways within the project corridor will occur.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Construction and life-cycle costs for a movable bridge are higher than for a fixed bridge.
- Operation and maintenance costs are higher for a movable bridge than for a fixed bridge.
- The bridge will continue to require openings to allow vessels to pass through the channel.
- A complete detour will be required for about one year for construction.
- Minor impacts to wetlands will occur (about 0.03 acre).

Replacement with a Mid-Level Fixed Bridge – Option A

The anticipated service life of the new bridge is about 75 years. The advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an “undesignated” bicycle lane.
- Bridge openings that disrupt vehicular traffic will be eliminated.
- Initial and long term maintenance costs will be reduced.
- Construction cost is less than cost of a new movable bridge.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Boats requiring more than 28 feet of vertical clearance will not be able to navigate through the channel.
- Sidewalks will only be provided on the north side of the bridge.
- Substantial visual impacts to the surrounding area will result from construction of the higher bridge.
- A complete detour will be required for approximately two years during construction.
- Five residential relocations will be required.
- The existing intersections of Pampas Avenue and Venetian Court with Riverside Drive/Spring Boulevard will be eliminated.
- Construction of a connector road to re-establish the connections of Pampas Avenue and Venetian Court to Riverside Drive/Spring Boulevard will impact Tarpon Springs Yacht Club property
- Private docks on the south side of Riverside Drive, between Pampas Avenue and Forest Avenue will be inaccessible from the roadway due to retaining wall construction.

Replacement with a Mid-Level Fixed Bridge – Option B

The anticipated service life of the new bridge is about 75 years. The advantages and disadvantages of this alternative are discussed below.

Advantages

- Structural, mechanical, electrical and geometric deficiencies will be corrected.
- Shoulders will provide an "undesignated" bicycle lane.
- Bridge openings that disrupt vehicular traffic will be eliminated.
- Initial and long term maintenance costs will be reduced.
- Construction cost is less than cost of a new movable bridge.

Disadvantages

- Replacement of the NRHP-eligible bridge may result in an adverse impact.
- Boats requiring more than 28 feet of vertical clearance will not be able to navigate through the channel.
- Sidewalks will only be provided on the north side of the bridge.
- Substantial visual impacts to the surrounding area will result from construction of the higher bridge with retaining walls.
- A complete detour will be required for approximately two years during construction.
- Three residential relocations will be required.
- The existing intersections of Pampas Avenue and Venetian Court with Riverside Drive/Spring Boulevard will be eliminated.
- Construction of a connector road to re-establish the connections of Pampas Avenue and Venetian Court to Riverside Drive/Spring Boulevard will impact Tarpon Springs Yacht Club property and a vacant residential property on south of Riverside Drive.
- Private docks on the south side of Riverside Drive, between Pampas Avenue and Forest Avenue will be inaccessible from the roadway due to retaining wall construction.

6.8 Additional Rehabilitation Alternatives Evaluated After the Alternatives Public Meeting at the Request of the State Historic Preservation Officer

The Alternatives discussed in Sections 6.3 through 6.7 (with minor variations of the typical sections) were presented at an Alternatives Public Meeting on January 23, 2013. Based on potential social and environmental impacts and input from the community, No-build with

Removal of the Existing Bridge and Replacement of the Existing Bridge with a New Fixed Bridge were eliminated from further consideration. The majority of written comments received from the public after the Alternatives Public Meeting supported the "Rehabilitation" and/or "Replacement with a New Movable Bridge" alternative. Many members of the community also expressed support for improvements to the existing pedestrian facilities.

The Beckett Bridge remains one of seven, pre-1965 single-leaf bascule roadway bridges in Florida. It has been determined to be eligible for listing in the NRHP under Criterion A for its contributions to the patterns of development and transportation in the State, and under Criterion C for its distinct engineering. A Cultural Resource Committee (CRC) was established as part of the ongoing PD&E Study. Two meetings have been held to date. The first Meeting was held on October 29, 2012 and the second was held on March 13, 2013. At the second meeting, representatives of the SHPO stated that the SHPO strongly supported rehabilitation of the existing bridge in lieu of constructing a replacement bridge.

The Rehabilitation alternative, as presented to the Public at the January 23, 2013 Alternatives Public Meeting, described in Section 6.7 above, and presented to the CRC does not include widening the existing bridge. The CRC recognized that widening the sidewalks on the existing bridge, which are only 2'2" wide, was warranted to provide a safe facility and acknowledged input from the community on this issue. Accordingly, the CRC requested that the project team develop and evaluate a second rehabilitation alternative which included widening the existing sidewalks. Accordingly, the project engineers developed another alternative which will be referred to as the "Rehabilitation with Widening" Alternative in this document.

The results of the evaluation of the Rehabilitation with Widening alternative was presented to SHPO, FHWA, and FDOT staff on June 11, 2013 in Tallahassee. SHPO concurred that this alternative did not promote preservation of the existing bridge and requested evaluation of an additional rehabilitation alternative that did not require widening, but that provided a single wider sidewalk on one side of the existing bridge. Accordingly, this alternative was evaluated. The following sections summarize the evaluation of these two additional alternatives.

6.8.1 Evaluation of the Rehabilitation with Widening Alternative

Development of a Minimum Acceptable Typical Section for Rehabilitation

The first step in development of the Rehabilitation with Widening alternative was to establish the *minimum acceptable typical section*. Pinellas County, in coordination with FDOT District 7 staff, determined that widening the existing bridge would require compliance with the Florida Green Book to bring the bridge up to acceptable minimum current safety standards. Accordingly, a minimum acceptable typical section was developed based on these criteria. This typical section consists of two 11-foot travel lanes, one in each direction, 3-foot wide shoulders on both sides and 5.5 foot wide sidewalks on both sides of the bridge. The total width of the bridge would be 42 feet. The total width of the existing bridge is only 28 feet.

Description of Required Improvements to the Bascule Span and Approach Spans Required to Construct the "Rehabilitation with Widening" Alternative

Detailed engineering analysis indicates that the additional weight of the wider roadway (which provides the minimum acceptable typical section with shoulders, described above) and the proposed sidewalks cannot be accommodated by the existing bascule span or bascule pier.

Major modifications would be required to the existing bascule span, bascule pier and approach spans to accommodate the additional load and wider typical section. These include:

- The existing 28 foot wide steel bascule leaf will be replaced with a 42 foot wide bascule leaf.
- The bascule pier (the structure that supports the leaf) will be replaced to accommodate the wider bascule leaf and larger counterweight.
- The approach spans will be widened by adding two new prestressed concrete beams, one along each side of the bridge, to support the wider bridge deck.
- The existing bridge railing will be replaced with a light-weight steel, crash tested railing.

Other Structural Improvements include the following:

- The existing pile bents will be replaced.
- The bridge abutments will be replaced.
- The Control House will be relocated 7 feet to the north.

- Cathodic protection will be required in the remaining existing concrete elements of the bridge.

Conclusion

Rehabilitation of the existing bridge will require that the bridge meet current minimum safety standards. Widening of the bridge to provide shoulders and wider sidewalks will result in substantial alteration to look of the bridge and will require substantial modification to the existing bascule piers. The final structure will no longer resemble the original historic bridge. Replacement with a new movable bridge, of similar design, which is consistent with and compliments the local environment, is recommended.

6.8.2 Evaluation of Rehabilitation Alternative which Provides a Single Code Compliant Sidewalk without Widening, or with Minimal Widening of the Existing Bridge

At the June 11, 2013 meeting in Tallahassee, attended by URS, Pinellas County, FDOT, FHWA, and SHPO, representatives from SHPO requested consideration of an additional concept that would modify the existing bridge cross section to accommodate a single, code compliant, sidewalk, rather than two sidewalks has had been previously proposed. This section summarizes URS's technical evaluation of concepts with a sidewalk on one side only.

Reconfiguration of the Existing Bridge without Widening

The most desirable concept from a historic preservation perspective would be to avoid widening of the bridge and simply rework the arrangement of lanes and sidewalk(s) within the width of the existing bridge (28'-0½"). A modified section of the narrowest practical width would include minimum shoulders, a traffic railing (barrier) on the south side, two travel lanes, a sidewalk on a raised curb on the north side, and a traffic railing at the back of sidewalk. Assuming that design exceptions are granted for lane width (to allow two 10-foot wide lanes rather than the 11-foot minimum) and shoulder width (to allow a 2.5-foot shoulder adjacent to a traffic railing and a 1.5-foot shoulder adjacent to the curb rather than the 3-foot minimum required) the minimum clear roadway width for this configuration is 24 feet. With a minimum 5.5 foot wide sidewalk and two traffic railings (1.5' on the south side adjacent to traffic and 1'-1" at the back of sidewalk on the north side) the minimum bridge width that would accommodate this section is 32'-1", which is 4'-0½" wider that the existing bridge. Therefore, the existing bridge width is not sufficient to support two lanes and a single sidewalk without widening.

Reconfiguration of the Existing Bridge with Minimal Widening

The next most desirable concept from a historic preservation perspective would be one that limits bridge widening and associated impacts such that the existing bascule pier foundations can be saved. As discussed in the June 11 meeting, if the bridge is widened, the new bridge section must meet minimum standards. The minimum width of a bridge featuring a single sidewalk under this scenario would include 3-foot wide shoulders, a traffic railing on the south side (1.5'), two 11-foot wide travel lanes, a 5.5-foot wide sidewalk on a raised curb on the north side, and a traffic railing at the back of sidewalk (1'-1") on the north side. The clear roadway with of this section is 28 feet and the overall width of is 36'-1". To accommodate this section the bridge would need to be widened by 8'-0½".

The technical issues associated with widening the bridge by 8'-0½" were examined. The evaluation included calculating live load distribution factors (as an indicator of the increase in live load on a main girder due to widening) and approximating dead and live load changes associated with the proposed modifications. The analysis also included determining approximate span balance conditions and corresponding density of the counterweight needed to balance the bridge. The following summarizes the technical challenges disclosed in this investigation:

- As with any solution, the current live load (HL-93) is approximately 32% heavier than the original design load (HS-15 assumed based on year of construction).
- Live load distribution factor for the main girders of the bascule span would increase by 117%.
- The net of the above is an increased live load on the main girders that is 2.8 times the original design load.
- The movable span dead load (weight) would increase by approximately 49%.
- The density of the counterweight would need to be increased to approximately 360 per cubic foot (pcf) to properly balance the bascule span (note that the AASHTO recommended maximum density for counterweight concrete is 280 pcf).

Based on this evaluation it is our conclusion that widening the bridge to include a single sidewalk that meets current design criteria is not technically feasible unless the bascule pier is replaced as well. The increased dead load and live loads are beyond what the existing foundations can handle without extensive strengthening. The physical size of the existing bascule pier footing precludes increasing the size of the counterweight and the density required of the existing size counterweight is well in excess of that recommended by AASHTO.

6.9 CONCLUSION

The existing bridge width is not sufficient to support two lanes and a single sidewalk without widening. In comparison to the widening concepts originally developed with two sidewalks (presented in Sections 6.x – 6.x of this report), a single sidewalk concept does not offer any significant improvements or reductions in impacts to the scope of bridge rehabilitation. Both require complete replacement of the bascule span and bascule piers.

6.10 SELECTION OF A RECOMMENDED ALTERNATIVE

As a result of public input, local government coordination, state and federal agency coordination, project costs, and a detailed comparative analysis of viable alternatives, Replacement of the Existing Bridge with a new Movable Bridge was selected as the Recommended Alternative.

By email, dated 08/03/13, SHPO concurred that replacing the existing bridge with a new movable bridge is preferable to rehabilitation of the existing bridge (based in part on the evaluation discussed in Section 6.8 above). In addition, FHWA concurred that replacement of the existing bridge with a new movable bridge rather than a fixed bridge was consistent with FHWA 23 CFR 650H. FHWA 23 CFR 650H Se 650.890 Movable Bridges states *"A fixed bridge shall be selected wherever practicable. If there are social, economic, environmental or engineering reasons which favor the selection of a movable bridge, a cost benefit analysis to support the need for the movable bridge shall he prepared as a part of the preliminary plans."*

7.0 RECOMMENDED CONCEPT

7.1 TYPICAL SECTION

The proposed bridge typical section for the Recommended Alternative – Replacement with a Low-Level Movable Bridge, has a total out-to-out width of 47.2 feet as shown in **Figure 7-1**. The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks, six feet wide, are proposed on both sides of the bridge.

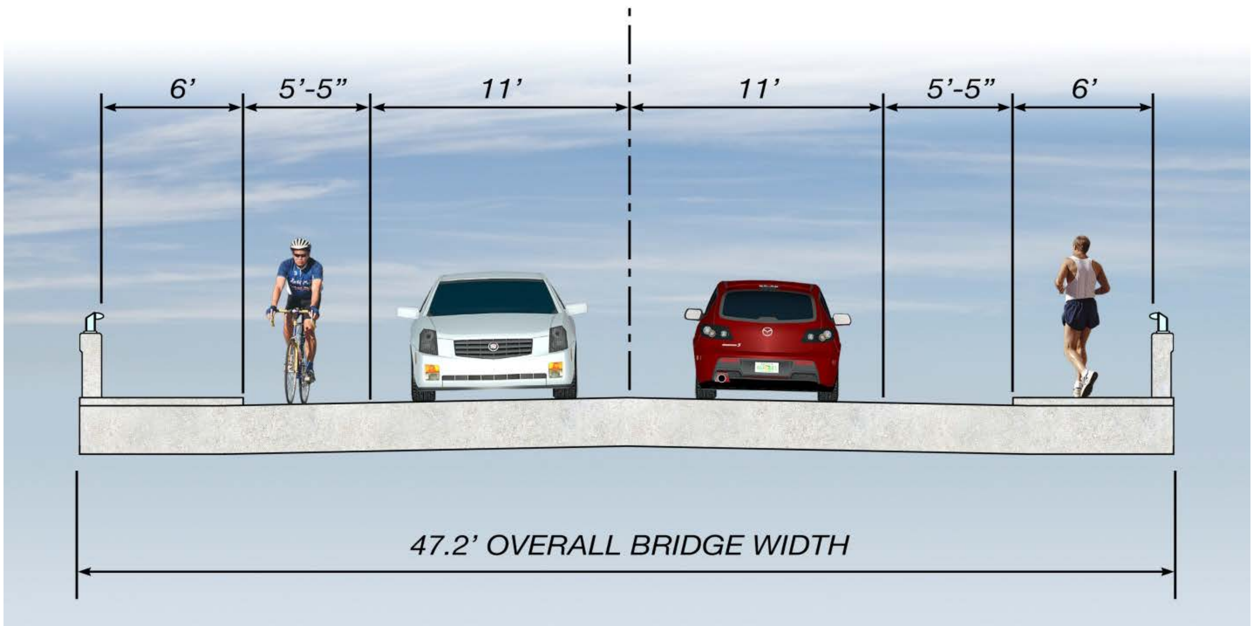


Figure 7-1 – Proposed Bridge Typical Section – Recommended Alternative

The proposed roadway section west of the bridge consists of two 10-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Because of the limited right-of-way, a six-foot wide sidewalk is proposed only on the north side of the roadway. No sidewalks are proposed on the south side of the roadway, adjacent to the Bayshore Mobile Home Park.

East of the bridge, the roadway section consists of two 11-foot wide through lanes, one in each direction, and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Six-foot wide sidewalks are proposed on both sides of the roadway. **Figures 7-2 and 7-3** illustrate the proposed roadway sections for the west and east sides of the bridge, respectively.

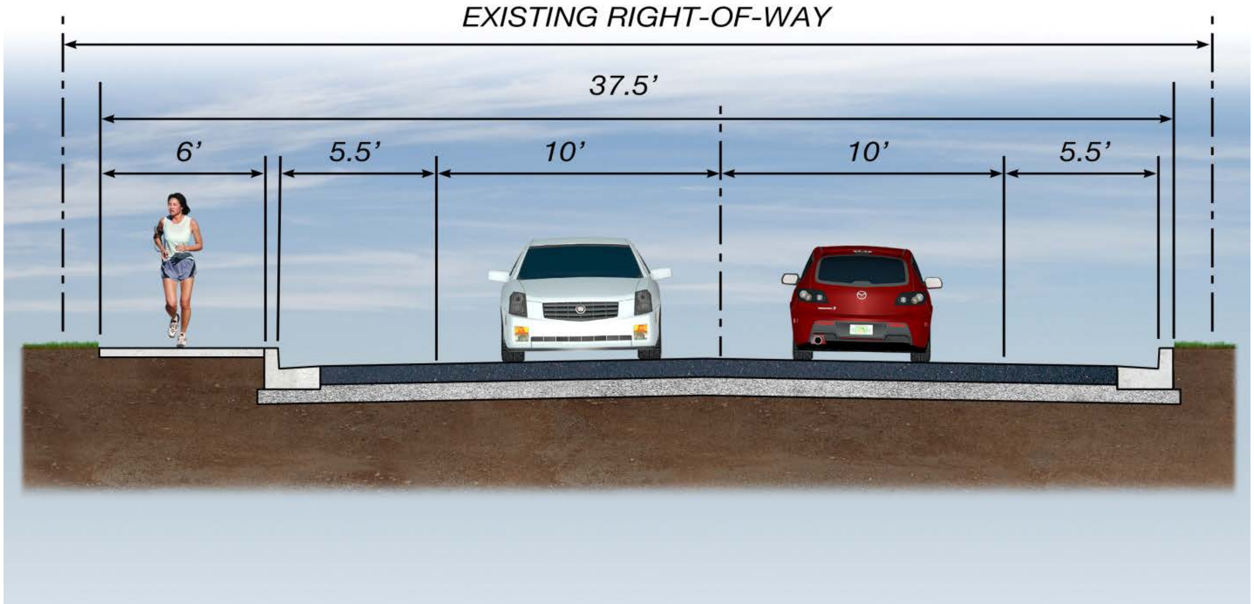


Figure 7-2 – Proposed Roadway Section West of Proposed Movable Bridge

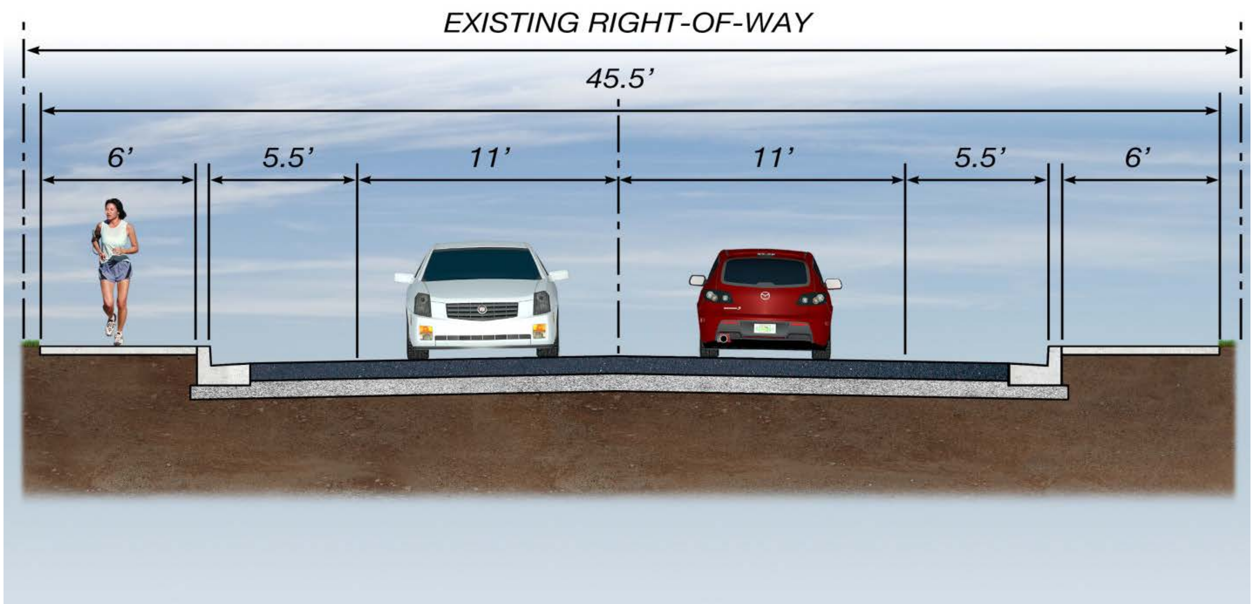


Figure 7-3 – Proposed Roadway Section East of Proposed Movable Bridge

7.2 INTERSECTION CONCEPTS AND SIGNAL ANALYSIS

There are no signalized intersections within the project limits. No changes to the intersections of Chesapeake Drive, Venetian Court or Forest Avenue are proposed.

7.3 DESIGN TRAFFIC VOLUMES

A Design Traffic Technical Memorandum was prepared in accordance with the FDOT Design Traffic Handbook (Topic No. 525-030-120)). Detailed information concerning the methodology employed for this traffic study can be found in this report, published separately from the PER.

Design Year (2038) AADT Volumes

Daily traffic projections were based on applying a growth rate of 1.03 percent per year to the existing (2012) AADT volumes. Projections were based on increases from 2012 to the 2038 Design Year (for 26 years). Design Year (2038) AADT volumes are illustrated on **Figure 7-4**.

Design Year (2038) Peak Hour Volumes

Directional peak hour traffic projections were derived by applying the K and D factors to the Design Year (2038) AADT volumes. Design Year (2038) directional peak hour volumes under both scenarios are illustrated on **Figure 7-5.**

The peak hour traffic projections at the intersections of Alternate US 19 at Tarpon Avenue and Alternate US 19 at Meres Boulevard were developed by applying a 1.03 percent growth rate annually to the existing (2012) counts. Design Year (2038) intersection peak hour volumes under both scenarios are illustrated on **Figure 7-6**.

Design Year (2038) Intersection Analysis

The Design Year (2038) traffic conditions for the Recommended Alternative were analyzed using the Transportation Research Board's HCM and HCS+ for the two study area intersections.

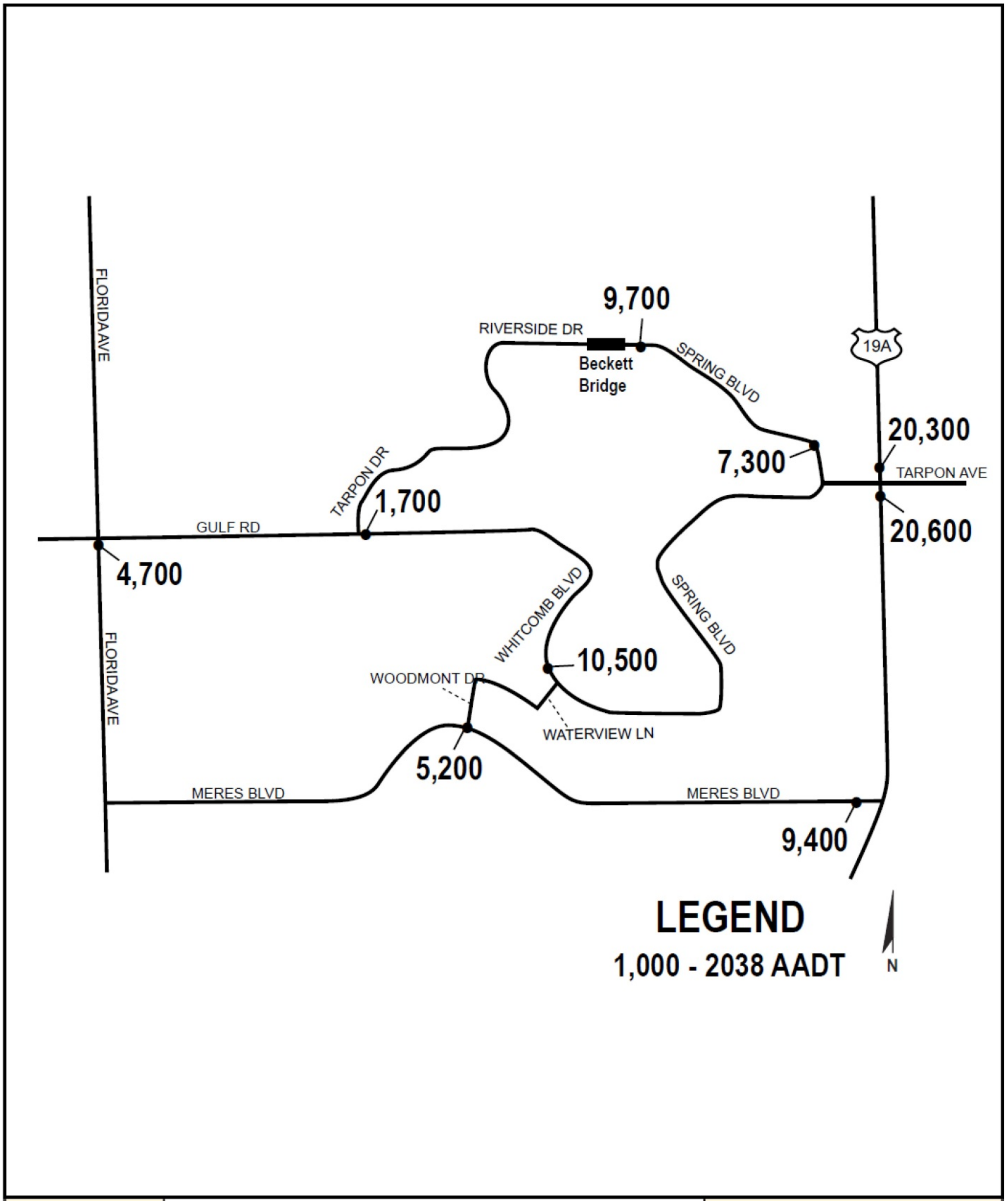


Figure 7-4 – Design Year (2038) AADT Volumes

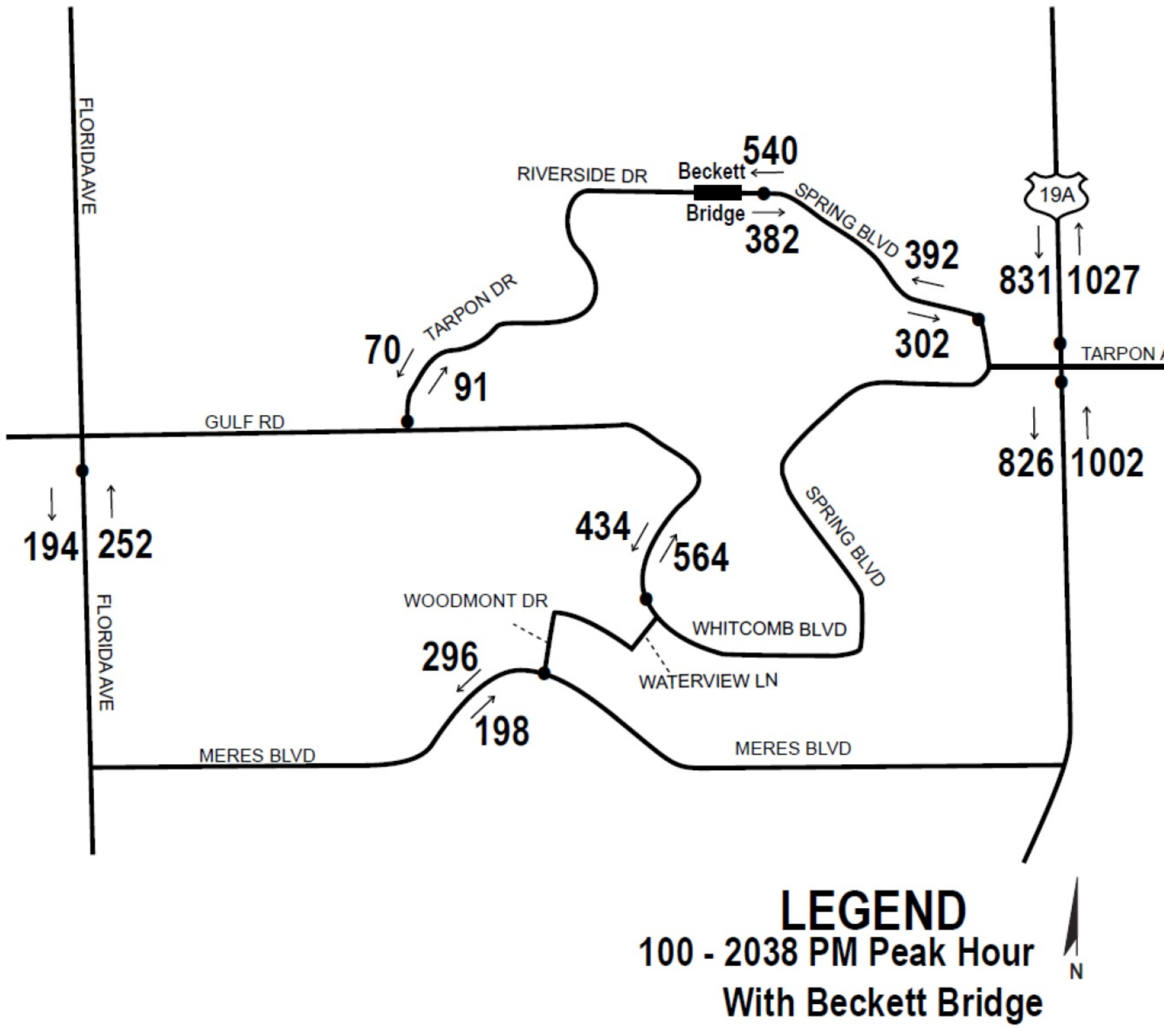


Figure 7-5 – Design Year (2038) Intersection Peak Hour Volumes

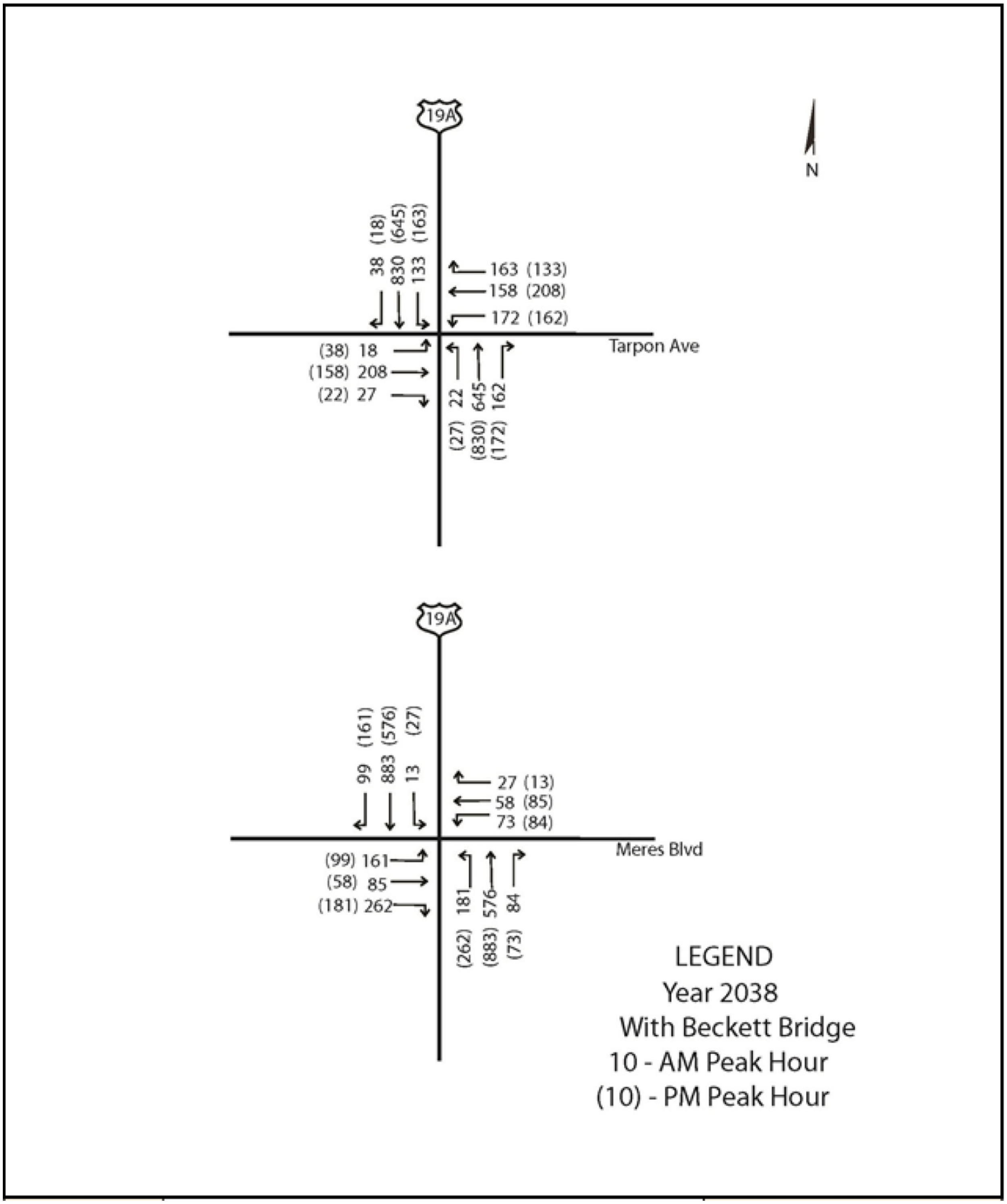


Figure 7-6 – Design Year (2038) Intersection Peak Hour Volumes

Table 7-1 summarizes the intersection delay and LOS results based on the Design Year (2038) analysis at the signalized intersections along Alternate US 19 at Meres Boulevard and at Tarpon Avenue. In 2038, the intersection of Alternate US 19 at Meres Boulevard is projected to operate at LOS D overall during the a.m. and p.m. peak hours. The Alternate US 19 at Tarpon Avenue intersection is projected to operate at LOS C in the a.m. peak hour and LOS D during the p.m. peak hour. Consistent with the Opening Year (2018) analysis, the northbound approach for the Alternate US 19 at Tarpon Avenue intersection continues to operate at LOS E during the p.m. peak hour. Additionally, the northbound approach is projected to operate at LOS E in the a.m. peak hour.

Table 7-1 – Design Year (2038) Signalized Intersection Peak Hour Level of Service Recommended Alternative

Intersection	Approach	Approach Traffic Volume		A.M. Peak Hour		P.M. Peak Hour	
		AM	PM	Delay (in sec/veh)	LOS	Delay (in sec/veh)	LOS
Alternate US 19 at Meres Boulevard	Northbound	841	1218	78.4	E	45.6	D
	Southbound	995	764	23.9	C	18.0	B
	Eastbound	508	338	49.1	D	39.7	D
	Westbound	158	182	53.4	D	51.6	D
			Overall	**49.3**	**D**	**36.9**	**D**
Alternate US 19 at Tarpon Avenue	Northbound	829	1029	24.1	C	68.9	E
	Southbound	1001	826	25.3	C	39.9	D
	Eastbound	253	218	48.0	D	54.7	D
	Westbound	493	503	45.9	D	38.2	D
			Overall	**31.1**	**C**	**52.3**	**D**

Design Year (2038) Arterial Analysis

An arterial analysis was conducted for the Design Year (2038) using the capacities provided in the 2009 FDOT Quality/LOS Generalized Tables. An arterial analysis was conducted for the Design Year (2038) using the capacities provided in the 2009 FDOT Quality/LOS Generalized Tables. Results show that Alternate US 19 is projected to continue to deteriorate to LOS F. As previously noted, Alternate US 19 has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a result of the bridge improvements. All of the other roadways in the study area operate at an acceptable LOS (LOS C or better). **Table 7-2** shows the results based on the generalized table capacities using urban, state and non-state roadway classifications.

Table 7-2 – Design Year (2038) Arterial Level of Service

Segment	Existing No. Lanes	Peak Hour Directional Capacity[1]	Peak Hour Directional Traffic Volumes and LOS	
			Volume	LOS[2]
Spring Boulevard (North of Tarpon Avenue)	2U	630	392	C
Riverside Drive/Spring Boulevard (at the Beckett Bridge)	2U	630	540	C
Tarpon Drive (North of Gulf Road)	2U	630	91	B
Florida Avenue (South of Gulf Road)	2U	630	252	B
Meres Boulevard (West of Woodmont Drive)	2U	630	296	B
Whitcomb Boulevard (South of Poulos Lane)	2U	630	564	C
Alternate US 19 (South of Tarpon Avenue)	2D	660	1002	F
Alternate US 19 (North of Tarpon Avenue)	2U	880	1027	F

Source: 2009 FDOT Quality/LOS Handbook Generalized Tables, Table 7.
1 Adjustments made for Non-State Roadway designation and inclusion/exclusion of turn-lanes, where applicable.
2 LOS Standard for all study area roadways is LOS.

7.4 Right-of-Way Needs and Relocations

The proposed bridge replacement and associated roadway improvements will be constructed within the County's right-of-way. Construction of the proposed bridge will not require acquisition of any additional right-of-way and will not result in the relocation of any residences or businesses.

7.5 Cost Estimates

The cost estimate for the Recommended Alternative is provided in **Table 7-3**. The estimates were based on the following:

- FDOT Structures Design Guidelines, Chapter 9-Bridge Development Report (BDR) Cost Estimating
- Historical Unit Prices for Similar Projects
- Conceptual Quantities

Table 7-3 – Estimated Construction Costs

	Recommended Alternative Low-Level Movable Bridge
Construction	$7.92 M
Mobilization	$0.792 M (10%)
Maintenance of Traffic	$0.792 M (10%)
Aesthetic Enhancements	$0.792 M (10%)
Contingency	$1.58 M (20%)
Construction Total	**$11.87 M**
Design	$1.78 (15%)
CEI	$1.78 (15%)
Post Design	$0.36 M (3%)
Right-of-Way	N/A
Project Total	**$15.8 M**

Construction cost estimates are based on the baseline structure. Contingencies were added in accordance with engineering judgment and experience. Contingencies account for miscellaneous items that are not quantifiable at the conceptual design stage. A percentage of the basic construction costs were calculated to account for mobilization, maintenance of traffic, contingencies, design and construction engineering and inspection (CEI). Mobilization costs were estimated as 10% of construction. Maintenance of traffic costs were estimated as 10% of construction. A 20% contingency was assumed for the Recommended Alternative, a replacement movable bridge, assuming ABC methods. This percentage was applied due to the complex nature of movable bridge design and construction.

Design and CEI costs were each estimated to be 15% of construction costs. All estimates need to be adjusted for inflation based upon the schedule of implementation. It is recommended that construction cost estimates be adjusted to the midpoint of construction when programming funds. Detailed cost estimates are provided in **Appendix H**.

Cost estimates for the Recommended Alternative assume Level Two Aesthetics, as defined in the *FDOT PPM* (Section 26.9.4, January 1, 2012 edition). An additional 10% of the construction costs have been included to account for aesthetic enhancements. Aesthetic enhancements may include concrete surface finishes, decorative railings, light poles, light fixtures, architectural features of the control house, landscaping and/or hardscaping features. An "Aesthetic Committee", which will include members of the community and local governments, will address the aesthetics of the bridge design during the Design Phase of the project.

7.6 PEDESTRIAN AND BICYCLE FACILITIES

The proposed replacement bridge will provide six foot wide sidewalks and 5.5 foot wide shoulders on both sides of the bridge. The shoulders will function as undesignated bicycle lanes for experienced cyclists. These facilities will be continued on the approach roadways east of the existing bridge. West of the proposed bridge, the six foot sidewalk on the south side will be eliminated because of right of way constraints. Construction of a sidewalk in this area would require acquisition of property from the Bayshore Mobile Home Park. It is anticipated that if the existing mobile home park is redeveloped in the future, sidewalks could be added. These improvements will provide safer bicycle and pedestrian facilities on the bridge and approach roadways. The proposed sidewalk approaching the western terminus of the bridge will be tapered to transition to the narrower roadway section. Signs will be installed which clearly indicate that the sidewalk will end.

No officially designated County or regional pedestrian or bicycle trails cross the Beckett Bridge. However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

7.7 UTILITY IMPACTS

Knology Broadband of Florida, Bright House Networks, Progress Energy Florida, Verizon, and the City of Tarpon Springs operate utilities within the project area. Knology Broadband has aerial coaxial cables entering the project area along Spring Boulevard on the east side of the bridge and along Riverside Drive on the west side of the bridge. These Knology cables are co-located on Progress Energy utility poles. Spurs of the aerial coaxial cables extend along Chesapeake Drive from Doric Court to the Bayshore Cove Mobile Park, and along Forest Avenue from North Spring Boulevard to High Street. In addition, a Knology broadband underground coaxial cable is located adjacent to the Tarpon Springs Yacht Club along the north side of Spring Boulevard.

City of Tarpon Springs wastewater force mains are located along Riverside Drive. A six inch force main is located on the south side of the bridge and a 12 inch force main is located on the north side of the bridge; however, these mains are located outside of the bridge fender system. A pump station is located on the north side of Riverside Drive at Chesapeake Drive. No other City utilities occur within the project limits.

Utilities will be located more precisely during the Design phase of the project and coordination with utility owners will continue. Depending on the location and depth of the utilities, construction of the proposed project may require adjustment of some of these facilities. Since no construction will occur outside of existing right-of-way, relocation or adjustment of most utilities located outside the existing County right-of-way is not anticipated. Cost for relocation or adjustment of activities is not included in the cost estimates prepared for the project since most are anticipated to be incurred by the utility owner. It is not anticipated that the proposed project will impact the existing City of Tarpon Springs Force Main.

7.8 TEMPORARY TRAFFIC CONTROL PLAN

Construction of a replacement bridge will require approximately 18 months of work at the project site. Initial work will be performed while the route remains open to traffic. During this period of approximately four months, work will be performed at the site that may require disruptions to traffic, including lane closures and short-term, off peak hour, road and/or sidewalk closures. These disruptions will be necessary to move equipment and materials to and from the site and to perform demolition and construction activities outside of the travel way.

Following this initial work phase, the majority of the demolition and construction work will be performed during a full detour of approximately 12 months. **Figure 7-7** illustrates the proposed detour route alternatives which were evaluated during the PD&E Study. Details of this evaluation are provided in Section 5.0 of this report. The alternative detour routes include the following:

- Whitcomb Boulevard - traffic diverted using Whitcomb Boulevard/South Spring Boulevard around Whitcomb Bayou - a distance of approximately 2.5 miles.
- Meres Boulevard - traffic diverted using Meres Boulevard from Alternate US 19 to Florida Avenue
- Klosterman Road-Carlton Road-Curlew Road - traffic diverted from Alternate US 19 using Klosterman Road, Carlton Road, and Curlew Road to Florida Avenue.

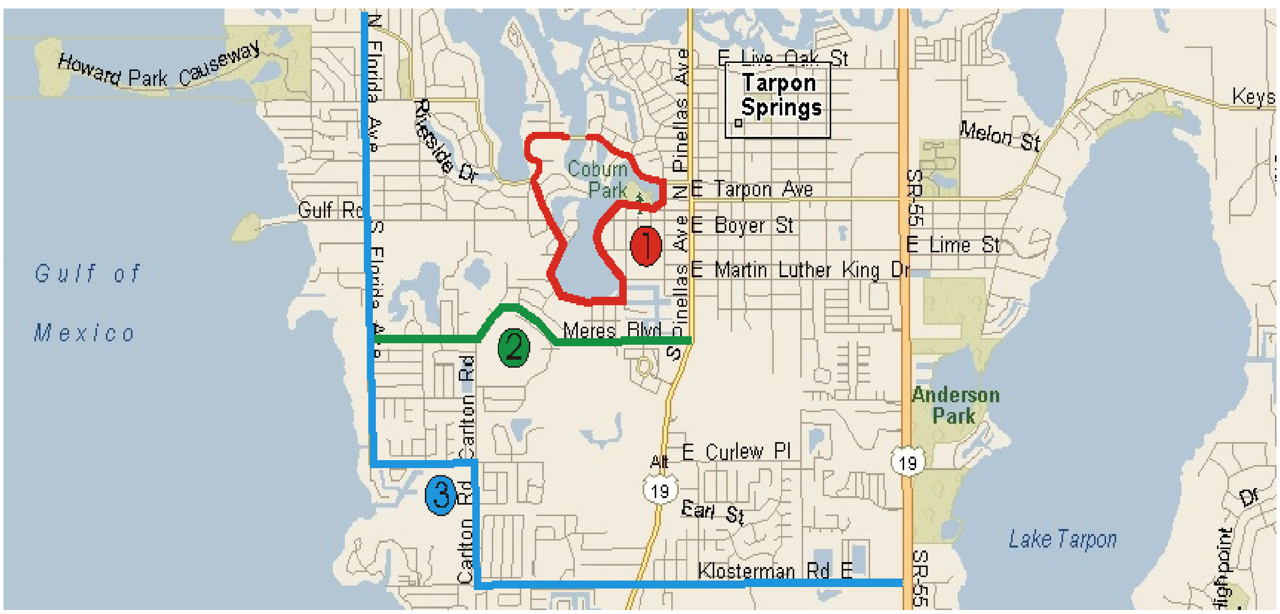


Figure 7-7 – Detour Routes

Upon completion of the detour period the new bridge and roadway will be reopened to traffic. However, construction activities, including commissioning and testing of the movable span will still be required. During this period of approximately two months some single lane closures and/or short-term, off-peak hour closures may be required to test the operation of the new movable span, deliver materials and perform work outside of the travel way.

Throughout construction, barge mounted construction equipment, delivery barges, and supporting tugs and skiffs may occupy part of the waterway. Operations in the water will be coordinated with the USCG. Temporary restrictions to navigation will be required to perform the construction work. Such work will be conducted in accordance with the requirements established by the USCG and published via a Notice to Mariners.

It should be noted that a comparison of the TBRPM origin/destination traffic patterns with and without the Beckett Bridge showed that none of the existing or future traffic traveling across the bridge would redistribute using the Klosterman Road-Carlton Road-Curlew Road alternative. In addition, this route is the longest and most circuitous of the alternatives, at approximately 2.75 miles in length. For these reasons, this alternative was eliminated from further consideration.

Results of the analysis indicate that in the event of closure of the Beckett Bridge, reassigning traffic to Whitcomb Boulevard would increase congestion on this roadway to failing levels of service (LOS F). Conversely, if the traffic was rerouted via Meres Boulevard, then the study area roadways are anticipated to continue to operate at acceptable levels of service with the additional traffic.

Based on these results, it is recommended that the detour route for the project occur along Meres Boulevard. Detour signage, including the use of Intelligent Transportation Systems (ITS), specifically electronic message panels, should be placed well in advance of the route location along Florida Avenue and Alternate US 19 (at a minimum). Additional electronic signage may also be needed at key locations throughout the neighborhood surrounding the Beckett Bridge and should provide (if at all possible) real-time information regarding potential delays on the route.

It should be noted that portions of Alternate US 19 operate at LOS F under either scenario, as well as the detour alternatives, in both the Opening Year (2018) and Design Year (2038). However, this corridor has been designated by Pinellas County as a constrained roadway, and the failing level of service can be attributed to additional land use in the area and not as a direct result of the project.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signs will be used as appropriate to provide notice of detours, lane closures and other pertinent information to the traveling public. The local news media will be notified in advance of detour lane closings and other construction-related activities, which could excessively inconvenience the community.

7.9 DRAINAGE

The existing drainage system within the project limits is predominantly sheet flow along the Riverside Drive roadway to Whitcomb Bayou/Spring Bayou which outfalls to the Anclote River. The existing Beckett Bridge discharges directly to the Whitcomb Bayou/ Spring Bayou via scuppers and at the bridge approaches. Currently no existing stormwater management facilities are located within or adjacent to the project limits.

Based on meetings with Southwest Florida Water Management District (SWFWMD) staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required.

Conceptual drainage proposed for the Recommended Alternative will include the installation of scuppers for bridge deck drainage as well as a curb and gutter drainage system along the roadway east and west of the bridge. The roadway currently has no stormwater management system in place, so the proposed curb and gutter drainage system may help lessen reported flooding along portions of the roadway. The proposed system will convey collected stormwater runoff from the roadway to the tidal Whitcomb Bayou in the vicinity of the bridge.

During the Design phase, the proposed drainage system for this project will be designed in accordance with the FDOT and Pinellas County drainage standards and procedures to carry stormwater runoff away from the roadway. If water quality treatment is required by the SWFWMD, the possibility of providing compensatory off-site treatment will be further explored (during the Design phase). Other treatment options, including stormwater ponds along the corridor, are limited. All discharge piping that leads to Whitcomb Bayou will be equipped with approved Manatee Exclusion Devices, as described in a February 2011 information circular developed by the Florida Fish and Wildlife Conservation Commission. Preliminary drainage calculations for the proposed improvements are included as **Appendix I**.

7.10 BRIDGE ANALYSIS

The proposed replacement bridge is a low-level bridge with a movable span over the navigation channel. The total length of the proposed new bridge is 360 feet. The bridge includes a 123-foot long east approach, 152-foot long west approach, and an 85-foot long bascule span.

The maximum proposed grades on either end of the bridge are five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore MHP, the Tarpon Springs Yacht Club and Venetian Court to allow connection of these driveways with minimal re-grading. Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest and Pampas Avenues.

A continuous superstructure, from abutment to movable span, is proposed for the approach spans to reduce future deck joint maintenance and provide for a smoother ride. The substructure for the prestressed slab unit spans are bents or piers supported on prestressed concrete piles or drilled shafts and featuring reinforced concrete caps.

A single-leaf rolling-lift bascule span, with an underdeck counterweight (deck girder configuration with the girders and counterweight located below the deck), is proposed for the movable span. The proposed configuration is similar to that of the existing bridge. The bascule leaf rotates about a horizontal axis located on one side of the channel and rolls back on a track as it opens to provide unlimited vertical clearance over the channel with the leaf in the fully open position. The proposed movable span will provide 7.8 feet of vertical clearance at the fenders (in the closed position) and 25 feet of horizontal clearance between fenders for vessels traveling on the waterway. (Vertical clearance is measured at the lowest point of clearance within the navigation channel. The low point is located at the side of the channel closest to the bascule pier, directly above the fender system that marks the channel limits.) The bascule leaf will consist of steel main girders, floor beams, stringers, and a solid surface deck. The counterweight will consist of concrete with steel ballast blocks for balancing the leaf. The bascule pier will be supported by prestressed concrete piles or drilled shafts and feature concrete pier walls to enclose the machinery and counterweight. The rest pier, which supports the tip of the bascule span when in the fully closed position, will be similar to the other bents or piers.

The new movable bridge will feature traffic control safety devices that are required for movable bridges. These elements include traffic signals and traffic warning gates on both approaches and a resistance barrier gate on the rest pier side of the bascule span. The bridge will also feature a fender system equipped with standard navigation lights and clearance signs.

The bridge, which crosses Whitcomb Bayou, is not required to be designed to resist vessel impact. The low member vertical clearance of the proposed bridge is less than eight feet with the bascule span in the closed position. There is no evidence that the existing vertical clearances of the fixed approach span and movable span (6-feet) are not sufficient for current marine usage, or that the type and number of vessels using the bayou will change dramatically in the future. There are no commercial marinas present in Whitcomb Bayou.

Wave Vulnerability: According to the *Final Report, Design Storm Surge Hydrographs for the Florida Coast, D. Max Sheppard and William Miller Jr., September 2003,* the 100-yr Storm Surge Elevation for the Anclote River is approximately 11.5 feet. The storm surge elevation at the bridge is anticipated to be similar to this elevation. It is anticipated that wave heights at the bridge during a coastal storm event would not be substantial because of the lack of a significant fetch needed to develop wind-driven waves. In addition, the presence of topographical features, including numerous adjacent residential buildings and trees reduce wind velocities at the surface of the water. The Beckett Bridge is important for evacuation during a storm event. Although it is not considered a designated emergency evacuation route, it is considered an extension of Tarpon Avenue, which is a designated emergency evacuation route. The proposed bridge, while non-critical, and therefore not required to be designed for wave forces, should be designed with consideration for reducing the potential effects of wave action.

7.11 NAVIGATION

The existing bridge crosses a narrow channel of Whitcomb Bayou. The bridge provides approximately six feet of vertical clearance at the fenders, and approximately 25 feet of horizontal clearance between the fenders. A USCG bridge permit will be required for construction of the proposed replacement single-leaf movable bridge. The USCG is a cooperating agency for this project. Coordination concerning navigational issues has been ongoing throughout the PD&E Study.

The proposed replacement bridge will be constructed on approximately the same alignment as the existing bridge and provide approximately 7.8 feet of vertical clearance in the closed position at the fenders, slightly more than the existing bridge. In the open position, unlimited clearance will be provided between the fenders. This is an improvement to the existing condition since the bascule leaf currently does not open fully and unlimited clearance is not provided for the entire width of the channel. The proposed horizontal clearance is the same as the existing bridge, 25 feet. Construction of the replacement bridge will not adversely impact navigation in the channel.

7.12 ENVIRONMENTAL IMPACTS

Detailed studies and evaluations were conducted to determine the potential for adverse impacts associated with construction of the proposed improvements to the Beckett Bridge. Baseline data, evaluation criteria and the results of these studies are contained in the project files and published separately in the following reports or technical memoranda: Air Quality Technical Memorandum, NESHAP Asbestos and Protective Coatings Survey Report, Contamination Screening Evaluation Technical memorandum, Noise Study Report, Biological Assessment Technical Memorandum, Wetland Evaluation/Essential Fish Habitat Technical Memorandum, Cultural Resources Assessment Survey Report, Section 106 Determination of Availability, Section 106 Case Study Report, Programmatic Section 4(f) Document.

It is anticipated that environmental impacts associate with the Recommended Alternative will be minimal, except for adverse impacts to the historic bridge. The following summarizes anticipated impacts associated with the Recommended Alternative. The Type II Categorical Exclusion Determination Form, published separately, provided a detailed analysis of potential impacts and addresses agency comments and concerns expressed in the ETDM Program Summary Report.

7.12.1 Social and Economic Impacts

Land Use: Land use patterns are established in the vicinity of the project and not expected to change substantially over the next few years. The proposed improvements will not require acquisition of additional right-of-way. Replacement of the functionally obsolete bridge in the same location with a similar movable bridge will have minimal impact on land use in the area. The proposed project will not adversely impact the cohesion of the communities in the vicinity of the bridge.

Community Resources: Community services, including those providing emergency services located within approximately 1.5 miles of the project include two fire stations, one police station, one hospital, five religious institutions, and five schools. In addition, the Pinellas County Health Department operates a health center within the City of Tarpon Springs, located approximately 1.2 miles from the Beckett Bridge.

Replacement of the existing bridge will have a positive impact on access to community resources. The existing bridge is currently load posted. School busses and large emergency vehicles are prohibited from crossing the bridge. Six public schools are located within three miles of the Beckett Bridge. According to the Route and Safety Auditor for the Pinellas County School Board, if the bridge were rehabilitated or replaced, school bus traffic would be re-routed to travel along Spring Boulevard/Riverside Drive and cross the Beckett Bridge. Approximately 15 to 20 school busses per day could potentially use the bridge. The detour results in additional costs for busses that service schools in the vicinity of the project. The proposed replacement bridge would result in a cost savings for operation of school busses in the community.

Traffic will be detoured during construction of a replacement bridge, if selected as Preferred Alternative. Two detour routes are proposed, the longest is approximately 2.75 miles. Emergency response times could be affected for some areas in the immediate vicinity of the bridge while the detour is in effect

7.12.2 Impacts to Cultural Resources

Section 4(f): Marked and unmarked paddle trails are identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. One unmarked trail begins in Spring Bayou at Craig Park, just south of the Beckett Bridge. The trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico. Access to navigational opportunities will be maintained to the greatest extent possible during construction. No impacts to this unmarked trail will result by replacement of the Beckett Bridge with the proposed new movable bridge.

Whitcomb Bayou is located within the Pinellas County Aquatic Preserve. The proposed project will be constructed within the existing Pinellas County transportation right-of-way which is designated for transportation. An Environmental Resource Permit, a USCG bridge permit and a Section 10/Section 404 permit will be required from the USACOE. Compliance with all requirements and conditions of these permits will ensure that potential impacts to water quality, fish and wildlife are avoided or minimized. The proposed project will not cause any proximity impacts that would permanently impair or diminish the Pinellas County Aquatic Preserve resources' attributes which qualify the preserve for protection under the provisions of Section 4(f).

The existing historic bridge was determined to be eligible for listing in the National Register of Historic Places (NRHP). Since the bridge will be demolished, a Programmatic Section 4(f) Evaluation was prepared to evaluate avoidance alternatives and minimization of impacts. Mitigation to offset the impacts to this resource are outlined in the Evaluation and in the Memorandum of Agreement (MOA) among SHPO, FHWA, FDOT and Pinellas County. The conclusion of Programmatic Section 4(f) Evaluation is that the provisions of Section 4(f) and 36 CFR Part 8—will be fully satisfied.

Historic and Archaeological Sites: A CRAS was conducted for this study. The results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013. No archaeological sites were newly identified within, or adjacent to, the project corridor during the current survey. No previously recorded archaeological sites were located within the archaeological APE.

This survey resulted in the identification of 16 newly recorded historic resources within the APE including one bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, 8PI2069). One of these newly recorded historic resources, Beckett Bridge (8PI12017), was determined to be eligible for listing in the NRHP by FHWA and SHPO. The remaining resources (8PI12043-

8PI12055, 8PI12068, 8PI12069) are considered ineligible for listing in the NRHP as individual historic resources or as contributing resources to a historic district.

A Cultural Resource Committee (CRC) was established to address Section 106 issues and conduct good faith consultation with affected parties. After consideration of a detailed evaluation of rehabilitation alternatives described in Section 6 of this document, SHPO stated that ample evidence had been provided to support that a new movable bridge would be preferable to rehabilitation.

A Section 106 Case Study Report was prepared to document the impacts to the historic resource. A Section 106 MOA among SHPO, FHWA, FDOT and Pinellas County which specifies conditions required to mitigate for the adverse impacts resulting from demolition of the existing bridge was prepared. This MOA is included in the Programmatic 4(f) Evaluation and in Appendix J of this document.

This MOA requires the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. In addition, the following mitigation measures are included:

The replacement bridge will be a single-leaf, rolling lift bridge type of similar design and scale. However, other aesthetic elements of the bridge will be determined by an aesthetics committee that will be assembled during the Design phase. This committee will include representatives of the community and local governments, including the Tarpon Springs Historical Society.

- Pinellas County will ensure representative, significant engineering elements from the Beckett Bridge will be identified and salvaged. These elements may be incorporated into the design of the new bridge. The reuse of these historic elements will be determined by Pinellas County in coordination with the aesthetics committee and will not require consultation with FDOT, FHWA or SHPO. If during construction it is determined that the existing bridge elements are not salvageable for reuse into the design of the new bridge, Pinellas County will salvage a few intact elements for display in a location identified by Pinellas County and within the vicinity of the new bridge.

- Pinellas County will ensure that the existing historic bridge plaque will be removed and stored in an area protected from human and natural damage until it can be incorporated into the new control house that will be constructed as part of the new bridge. The bridge plaque will be placed on the new control house so that it is visible to pedestrians.

- Pinellas County will ensure that information regarding the Beckett Bridge, which is suitable for inclusion in a "public-facing website for project information and educational purposes" and/or suitable for use on a mobile device, such as "What Was There" or "Next Exit History", is developed. This information will provide a historic account of the bridge to educate the public on its history.

7.12.3 Impacts to Natural Resources

Wetlands: The proposed project will impact approximately 0.01 acre of mangrove swamp and 0.02 acre of oyster bars. No seagrass beds will be impacted. The wetlands within the project study area impacted by the proposed improvements were assessed using the Uniform Mitigation Assessment Methodology (UMAM) per Chapter 62-345, FAC. Based on meetings with regulatory agencies, it is anticipated that mitigation for these impacts will not be required. However, if mitigation is required by one of the reviewing agencies, "in-kind" mitigation at the project site may not be a feasible option due to the limited ROW and surrounding developments. Therefore, an "out-of-kind" mitigation option, such as water quality improvements, may be requested during the design and permitting phases of this project. Any proposed mitigation will be coordinated with the NMFS, FWS, and the SWFWMD during the Design phase.

Water Quality: A Water Quality Impact Evaluation (WQIE) was conducted in accordance with the FDOT PD&E Manual. The WQIE checklist is included in **Appendix E**. The project is located within the Pinellas County Aquatic Preserve which is an Outstanding Florida Water. Based on meetings with SWFWMD staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required.

The County will implement appropriate best management practices during construction to prevent water quality violations. An Environmental Resource Permit will be required for construction of the proposed project. The contractor will comply with all permit requirements and conditions related to water quality. Because the proposed new bridge does not provide any additional capacity, it is not anticipated that this project will have a substantial impact on water quality.

Floodplains: In accordance with the requirements set forth in 23 CFR 650A, the project corridor was evaluated to determine the effects, if any, of the proposed alternatives on the hydrology and hydraulics of the area.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Panel 19 of Map Number 12103C00196 (September 2003), the Beckett Bridge and immediate vicinity are located within the 100 year floodplain in designated Zone AE. The Base Flood Elevation established for Minnetta Bayou/ Spring Bayou is elevation 10 feet which is associated with coastal tidal surge conditions.

The proposed replacement bridge will be constructed in approximately the same location as the existing bridge to minimize impacts. There are no existing or proposed cross drains within the project limits. The proposed structure (replacement bridge) will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. Within the project corridor, the improvements to the existing Riverside Drive and Beckett Bridge represent transverse encroachments on the floodplain. This encroachment should remain at existing levels. As a result, the project will not affect existing flood heights or floodplain limits.

Cut and fill activities required as part of the roadway improvements are not expected to significantly impact the fauna, flora, and open space environments along the corridor. The project will not result in substantial adverse environmental impacts. The proposed project will not significantly change the risks or damages associated with roadway flooding. There will not be significant change in the potential for interruption or termination of emergency services or emergency evacuation routes. Therefore it has been determined that this encroachment is not significant.

The encroachments for the bridge will mainly involve modifications at the approaches to the bridges as well as incidental encroachments due to bridge modification or replacement activities, where applicable. Since the existing flood zones are associated with coastal surge, compensation for the floodplain impacts is not anticipated to be required by the regulatory agencies.

Coastal Zone Consistency: According to the ETDM Program Screening Tool Track Clearinghouse Projects Report for this project, the State of Florida has determined that this project is consistent with the Florida Coastal Zone Management Plan (FCMP). The State's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting process in accordance with Section 373.428, Florida Statutes.

Wildlife and Habitat: Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC). Project biologists made a finding of "no effect" for the southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. The FWC, by letter dated April 22, 2013 concurred with these determinations and supported the protected species commitments identified in the report which include the following:

1. Compliance with the USFWS "Standard Protection Protocols for the Eastern Indigo Snake" and paragraph E of the U.S. Army Corps of Engineers Eastern Indigo Snake Programmatic Key.
2. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.
3. Submission of a blasting plan (if blasting occurs), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.
4. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

5. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

6. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

By letter dated June 12, 2013, the USFWS concurred with the Biological Assessment's determination that the project may affect, but is not likely to adversely affect the piping plover, is not likely to adversely affect the wood stork or eastern indigo snake, and will have no effect on federally listed plants. The USFWS further noted that there is no appropriate habitat for the piping plover, no suitable foraging habitat for the woodstork. In addition the Service states that no undisturbed upland habitat near the project that might support the eastern indigo snake or listed plants. Accordingly, the USFWS will not require implementation of the "Standard Construction Measures for the Eastern Indigo Snake".

USFW also stated that they will not be able to make an impact determination for the Florida manatee, gulf sturgeon or sea turtles until more specific information is available concerning construction. The timing and duration of construction, as well as construction methods, will determine the appropriate conditions to safeguard manatees and other aquatic species. Accordingly, Pinellas County has committed to continued coordination with the USFWS during the Design phase concerning potential impacts to these species.

Because of the constrained project location, it is not anticipated that blasting will be employed for demolition of the existing bridge. However, if blasting is proposed, the selected contractor will be required to submit a blasting plan which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.

The project study area is located within a designated FWS consultation area for the Florida scrub jay (*Aphelocoma coeruluscens*). Based on a review of available and field reviews, no scrub jay habitat is available within the project study area and no populations have been reported or observed. Therefore, no further scrub jay consultation with USFWS should be required for this project.

Essential Fish Habitat: Construction of the proposed project will not result in the loss of open water area designated as EFH. However, approximately 0.02 acre of oyster beds and 001 acre of mangroves will be impacted. Impacts to oyster beds will likely be temporary; live oysters can be relocated prior to construction and oysters may recolonize the area following construction. If required by conditions of the environmental permits or the USCG Bridge Permit, all permanent and temporary loss of these habitats will be mitigated. Accordingly, no populations of any of the 26 representative fish, shrimp, and crab species and the coral complex listed by the GMFMC are expected to be adversely affected by the proposed project.

By email dated, April 15, 2013, the NMFS stated that the essential fish habitat effect determinations presented in the Wetland Evaluation/Essential Fish Habitat technical memorandum appear to accurately reflect potential impacts to NMFS trust resources for the proposed bridge replacement. Given the relatively low quantity of impacts to fish habitats estimated for all the alternatives, NMFS also stated that they would be generally more inclined to accept appropriate off-site (but within the same drainage basin) "in-kind" mitigation, rather than "out-of-kind" mitigation for unavoidable project impacts. NMFS also requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed.

7.12.4 Physical Impacts

Noise: A noise study analysis was performed for this project following FDOT procedures that comply with Title 23 Code of Federal Regulations (CFR), Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. The evaluation used methodologies established by the FDOT and documented in the PD&E Manual, Part 2, Chapter 17 (May 2011). The prediction of traffic noise levels, with and without the proposed improvements (replacement of the Beckett Bridge), was performed using the FHWA's Traffic Noise Model (TNM-Version 2.5).

Twenty-seven noise sensitive sites, including 26 residential sites and one meeting room (Tarpon Springs Yacht Club) were identified. The existing (2012) traffic noise levels are predicted to range from 54.6 to 63.2 decibels on the "A" weighted scale (dB(A)), which are traffic noise levels that would not approach, meet, or exceed the Noise Abatement Criteria (NAC) at any of the evaluated noise sensitive sites. In the future without the proposed improvements (no-build), traffic noise levels were predicted to range from 55.8 to 64.4 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. In the future with the proposed improvements (build), traffic noise levels were predicted to range from 56.9 to 64.7 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. Additionally, when compared to the existing condition, traffic noise levels with the improvements are not predicted to increase more than 2.8 dB(A). As such, the project would not substantially increase traffic noise (i.e., an increase in traffic noise of 15 dB(A) or more).

Since future traffic noise levels with the proposed improvements are not predicted to approach, meet, or exceed the NAC at any of the noise sensitive sites or substantially increase, noise abatement measures were not considered. However, Pinellas County commits to review the project for any changes in land use during the Design Phase of the project to ensure that all noise sensitive sites that received a building permit prior to the project's Date of Public Knowledge (i.e., the date the environmental documentation is approved) have been evaluated. No construction or posted building permits were observed within the project limits during a land use survey that was performed on November 13, 2012.

Construction of the proposed project would result in temporary construction-related noise and vibration. It is anticipated that the application of the *FDOT Standard Specifications for Road and Bridge Construction* will minimize or eliminate this noise and/or vibration. Should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the Contractor, will investigate additional methods of controlling these impacts.

Land uses such as residential, offices, and parks are considered incompatible with highway noise levels exceeding the NAC. In order to reduce the possibility of new noise-related impacts, noise level contours were developed for the future improved roadway facility (see Section 6 of this NSR). These noise contours delineate the distance from the improved roadway's edge-of-travel lane to where 56, 66, and 71 dB(A) (the FDOT's NAC for Activity Categories A, B/C, and E, respectively) is expected to occur in the year 2038 with the proposed improvements. Local officials will be provided a copy of the Final NSR to promote compatibility between land development in the area and the project should it be selected as the Preferred Alternative and completed.

Air Quality: The US Environmental Protection Agency does not anticipate any negative air quality impacts relating specifically to the project. Pinellas County is currently designated to be an attainment area for all of the National Ambient Air Quality Standards (NAAQS). Accordingly, the transportation conformity requirements of the Clean Air Act are not applicable to the project. The proposed replacement two-lane bridge is not a capacity improvement.

The project alternatives were subjected to the FDOT's screening model, CO Florida 2004 (Version 2.0.5, which employs United States Environmental Protection Agency (USEPA)-developed software (MOBILE6 and CAL3QHC). This model is a carbon monoxide (CO) screening model that makes various conservative worst-case assumptions related to site conditions, meteorology, and traffic. The results of the screening analysis indicate that the greatest one- and eight-hour CO concentrations would be 6.1 and 3.7 ppm, respectively - levels that would not meet or exceed the NAAQS for this pollutant. Accordingly, the project "passes" the screening model. An Air Quality Technical Memorandum documenting the air quality screening analysis was prepared for this project and is available at the County offices.

Construction: Construction activities for the proposed improvements will have air, noise, water quality, traffic flow, and visual impacts for those residents and travelers within the immediate vicinity of the project. The air quality impact will be temporary and will primarily be in the form of emissions from diesel powered construction equipment and dust from demolition activities, embankment and haul road areas. Air pollution associated with the creation of airborne particles will likely be effectively controlled through the use of watering or the application of calcium chloride in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* as directed by the County Project Manager.

Noise and vibration impacts will be from the heavy equipment movement and construction activities, such as demolition, pile driving and vibratory compaction of embankments. Noise control measures will likely include those contained in FDOT's *Standard Specifications for Road and Bridge Construction*.

Water quality impacts resulting from erosion and sedimentation will likely be controlled in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* and through the use of Best Management Practices. Stormwater pollution prevention measures will likely be developed per FDOT standards and in accordance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signs will be used as appropriate to provide notice of detours, lane closures and other pertinent information to the traveling public. The local news media will be notified in advance of detour lane closings and other construction-related activities, which could excessively inconvenience the community.

A sign providing the name, address, and a contact telephone number will be displayed on-site to assist the public in obtaining immediate answers to questions and logging complaints about project activity. In general, the objective of the maintenance of traffic plan for the project will be to detour traffic away from the construction zone. No temporary roads or temporary bridges will be required.

Construction of the roadway may require minor excavation of unsuitable material (muck). Construction of the roadway will require placement of embankments, and use of materials such as lime rock, asphaltic concrete, and Portland cement concrete. Although not anticipated, if demucking is required, it will likely be performed in accordance with Section 120 of the FDOT *Standard Specifications for Road and Bridge Construction*. The removal of structures and debris will be in accordance with local and State regulatory agencies permitting this operation. The contractor is responsible for methods of controlling pollution on haul roads (if used), in borrow pits, other materials pits, and areas used for disposal of waste materials from the project. Temporary erosion control features, as specified in the FDOT's *Standard Specifications for Road and Bridge Construction*, Section 104, will likely consist of temporary grassing, sodding, mulching, sandbagging, hay bales, slope drains, sediment basins, sediment checks, artificial coverings, and berms.

Contamination: A Contamination Screening Evaluation Report (CSER) was prepared as part of the Beckett Bridge Pinellas County Study as required by FDOT's PD&E Manual, Part 2, Chapter 22 (revised January 17th, 2008) and in accordance with the Federal Highway Administration (FHWA) Technical Advisory T 6640.8a (dated October 30th, 1987). Consistent with this guidance and based on environmental records searches, land use surveys, field surveys and other screening methodologies cited within the PD&E manual, eight potential contamination sites were identified within the vicinity of the project corridor. Of the eight sites, six were identified as "No" contamination risk, one was identified as "Low" contamination risk, and one was identified as “Medium” contamination risk.

The “Low” risk site corresponds to the wooden structures (i.e., piles) immediately adjacent to the Beckett Bridge which could contain creosote and/or arsenic as preservatives. Should some or all of these piles require removal or disturbance during the construction period, they should be evaluated beforehand to verify the presence or absence of these substances. If these substances are present, precautions should be taken by the contractor to help prevent the leaching of creosote into the waterway or the generation of arsenic-containing dust.

The “Medium” risk site, Stamas Yacht, Inc., presents a contamination potential based on current and historical environmental records, however, the site is located a substantial distance from the existing Riverside Drive right-of-way and will not be impacted as part of the current project design. Accordingly, no further evaluation of these sites is recommended during the Design phase of the project unless changes are made to the project design that could potentially change the location or alignment of the bridge.

An asbestos survey of the Beckett Bridge structure was conducted as part of the PD&E Study. The purpose of this survey was to identify and sample suspect asbestos-containing materials (ACM) and heavy metals based protective coatings to provide information regarding the identity, location, condition and approximate quantities of these materials so that proper remediation and disposal methods can be evaluated.

The survey was conducted on April 29, 2012 by an Asbestos Hazard Emergency Response Act (AHERA) accredited inspector in general accordance with the sampling protocols established in Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) 763. Thirteen bulk samples were collected from four homogeneous areas of suspect ACM. No Asbestos Containing Materials were identified as a result of the survey. Three painted surfaces, suspected of containing heavy metal based paints, were observed during the survey and sampled. None of the sample results indicated that the paints were Lead Based Paint (LBP).

7.13 AESTHETICS AND LANDSCAPING

A Section 106 Memorandum of Agreement (MOA) was signed by the County, FDOT, FHWA and SHPO, which outlines mitigation and conditions required to offset the impacts of removing the historic Beckett Bridge. SHPO has requested that the design of the replacement bridge, in terms of engineering, be similar to the existing bridge. Accordingly, the MOA requires that the design consist of a single-leaf, rolling-lift bridge to preserve the character of the area. In addition, the MOA specifies that some elements of the existing bridge may be incorporated into the new bridge, or displayed in a location within the vicinity of the bridge. (The MOA is published separately for this project and is included in Appendix J.)

SHPO has agreed; however, that decisions regarding the specifics of the design, in terms of aesthetic elements, will be determined during the Design phase by an “Aesthetics Committee”. The committee will include members of the community, Tarpon Springs Historical Society and local government. The County has proposed a budget of ten percent of the construction cost for aesthetics for the replacement bridge.

8.0 SUMMARY OF PERMITS AND NAVIGATION

8.1 PERMITS

The ETDM screening process, Advanced Notification process and subsequent agency coordination provided opportunities for preliminary coordination with regulatory and commenting agencies during the PD&E study. EPA, USFWS, FDEP and USACE provided comments concerning the proposed project during the PD&E study. A meeting with SWFWMD was held to discuss preliminary drainage plans and requirements.

The USACE and the SWFWMD regulate impacts to wetlands and surface waters within the project study area. Other agencies, including the USFWS, NMFS, EPA and FWC, review and comment on environmental permit applications. In addition, the FDEP manages the use of sovereign submerged, state-owned lands and regulating stormwater discharges from construction sites. The USCG will require a Bridge Permit for the replacement bridge.

The following permits are anticipated to be required for construction of the Recommended Alternative.

- **US Coast Guard** – A Bridge Permit will be required. The proposed replacement bascule bridge will provide approximately 7.8 feet of vertical clearance at the fenders and a minimum of 25 feet of horizontal clearance between the fenders. There are no USCG bridge clearance guidelines for this waterway. The proposed design and navigation clearances have been coordinated with the USCG throughout the study.

- **Southwest Florida Water Management District (SWFWMD)** – Based on a meeting with SWFWMD staff, on November 13, 2012, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required. The meeting notes are included at the end of this section.

- **US Army Corps of Engineers** – It is anticipated that the project will qualify for a Nationwide Permit, or a combination of Nationwide Permits (Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act).

Chapter 253 Florida Statute states that authorization is required from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on, or over state-owned, sovereign submerged lands (state lands). The public; to maintain traditional uses, such as navigation and fishing; to provide maximum protection of all state lands; and to ensure that all private uses of state lands will generate revenue as just compensation for that privilege. The existing bridge is located within a Sovereign Submerged Lands Easement granted by the Board to the Pinellas County Board of County Commissioners on February 1, 1996. This easement authorized repairs of the existing FDEP, Division of State Lands has been delegated by the Board to manage the use of State Lands for the good of the bridge. It is likely that construction of a new bridge will require modification of this easement. This authorization will be obtained during the ERP permitting process.

40 CFR Part 122 prohibits point source discharges of stormwater to waters of the United States without an NPDES permit. Under the State of Florida's delegated authority to administer the NPDES program, construction sites that will result in greater than one acre of disturbance must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, FAC, or an individual permit issued pursuant to Chapter 62-620, FAC. A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices (i.e. best management practices) that will be used to reduce the potential for pollutant discharges during construction.

8.2 AVOIDANCE, MINIMIZATION AND MITIGATION

During the evaluation of the alternatives and selection of the Recommended Alternative, avoidance and minimization of environmental impacts was a major consideration. Issues of special concern include natural resources (mangroves and other wetlands, wildlife and habitat), socioeconomic impacts (right-of-way acquisition, noise and access to community resources, impacts to navigation and motorists), cultural resource impacts (NRHP eligible site and recreational lands), cost, and construction time frames.

Construction of a new bridge on an alignment north or south of the existing bridge would result in additional wetland impacts and additional right-of-way impacts. The Recommended Alternative consists of construction of a replacement bridge on approximately the same alignment as the existing bridge. Detouring traffic for the duration of construction is proposed. Accordingly, phased construction – which could result in additional impacts – will not be required. Reduction in the width of the typical section was also considered to minimize environmental impacts. Eleven-foot wide travel lanes are proposed, rather than 12-foot wide lanes.

Retaining walls are proposed at the bridge approaches to minimize and avoid right-of-way and wetland impacts. The proposed design will include piers spaced further apart than the existing pile bents. Accordingly, an overall reduction in the footprint of the structure on the bay bottom may result, depending on final design.

8.2.1 Best Management Practices

Construction related impacts to wetlands and water quality will be avoided and minimized to the maximum extent practical through the use of Best Management Practices and erosion control methods found in the latest edition of FDOT's *Standard Specifications for Road and Bridge Construction.* Wetland areas that are not permitted to be impacted will be delineated in the field and staked silt fence will be used to protect these areas. Delineation of wetland areas within the project corridor will be shown on final construction plans.

Construction areas will be contained in turbidity curtains and the project will follow all general and specific regulatory permit conditions regarding turbidity during construction. Final plans will also include a Stormwater Pollution Protection Plan that shows the locations of the turbidity curtains and silt fence.

8.2.2 Protected Species Minimization Measures

A Biological Assessment was prepared for the project and coordinated with the US Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC). Project biologists made a finding of "no effect" for the Southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. The FWC, by letter dated April 22, 2013 concurred with these determinations and supported the protected species commitments identified in the report. The following commitments will minimize potential adverse impacts to protected wildlife species in the project area.

1. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.

2. Submission of a blasting plan (if blasting occurs), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.

3. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

4. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

5. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

By letter dated June 12, 2013, USFWS stated that they will not be able to make an impact determination for the Florida manatee, gulf sturgeon or sea turtles until more specific information is available concerning construction. The timing and duration of construction, as well as construction methods, will determine the appropriate conditions to safeguard manatees and other aquatic species. Accordingly, Pinellas County has committed to continued coordination with the USFWS during the design phase concerning potential impacts to these species.

8.2.3 Mitigation

Wetlands

Mitigation through Chapter 373.4137, F.S. (i.e., Senate Bill, 1986) is not available for this project because FDOT is not the applicant. A review of the available data from FDEP and the water management districts indicates that the proposed project currently is not located within the service area of any permitted mitigation banks. Accordingly, if mitigation is required, unavoidable wetland impacts will have to be mitigated by creating, restoring, enhancing, or preserving wetlands on-site or off-site within the same drainage basin if there are no mitigation opportunities at the project site.

Anticipated wetland impacts to mangroves and oyster beds are minimal. No seagrass beds will be impacted. Utilizing the calculated wetland impact acres and the existing condition UMAM scores, the proposed construction will result in 0.003 to 0.005 units of wetland functional loss. Mitigation is not anticipated to be required by the SWFWMD since the project should qualify for a general permit. It is also anticipated that the project will qualify for a nationwide permit from the USACOE. However, if regulatory policies or preliminary determinations change during the design phase and mitigation is required, "in-kind" mitigation at the project site may not be a feasible option due to the limited ROW and surrounding developments. Therefore, an "out-of-kind" mitigation option, such as water quality improvements, may be requested during the design and permitting phase of this project. Any proposed mitigation will be coordinated with the NMFS, FWS, and the SWFWMD during the design phase.

Historic Resources

Mitigation is required for demolition of the NRHP eligible Beckett Bridge. A Memorandum of Agreement (MOA) among SHPO, FHWA, FDOT and Pinellas County was prepared to address appropriate mitigation of the historic bridge. This MOA includes the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. In addition, the following mitigation measures, recommended by the CRC are included:

- The replacement bridge will be a single-leaf, rolling-lift bridge of similar design. However, other aesthetic elements of the bridge will be determined by an aesthetics committee that will be assembled during the design phase. This committee will include representatives of the community and local governments, including the Tarpon Springs Historical Society.

- Elements of the old bridge will be salvaged and incorporated into the design of the new bridge. The specifics of the design will be determined by the aesthetics committee and community during the design phase.

- There is an existing historic marker or plaque on the current bridge which includes the date the bridge was erected and names of Pinellas County Commissioners at that time. This historic plaque will be incorporated into a new plaque or monument which provides some “bullet history” of the bridge. In lieu of an actual ‘monument”, the new plaque or marker could be attached to the control house so that it could be seen by pedestrians crossing the bridge.

- Information will be prepared which is suitable for the existing “NextExitHistory” and “Whatwashere” Apps. These are free Apps that use gps technology to identify the location of the historic site relative to the App user’s location.

THIS FORM IS INTENDED TO FACILITATE AND GUIDE THE DIALOGUE DURING A PRE-APPLICATION MEETING BY PROVIDING A PARTIAL "PROMPT LIST" OF DISCUSSION SUBJECTS. IT IS NOT A LIST OF REQUIREMENTS FOR SUBMITTAL BY THE APPLICANT.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT RESOURCE REGULATION DIVISION PRE-APPLICATION MEETING NOTES			FILE NUMBER: PA 399655
Date:	11/13/2012		
Time:	10:00 AM		
Project Name:	Beckett Bridge		
Attendees:	Richard Alt, Joe Andress, Julie Brennan, Pinellas County, 727-464-3946, Ann Venables, Robert Johnson, Tony Horrnik jbrennan@co.pinellas.fl.us		
County:	Pinellas	**Sec/Twp/Rge:**	11, 12/27/15
Total Land Acreage:	3.5 acres	**Project Acreage:**	3.5 acres

Prior On-Site/Off-Site Permit Activity:

- Existing drawbridge

Project Overview:

- Upgrade bridge – three scenarios, final design based on public input
- Low level – could qualify for N.G. permit 40D-400.443 – no drainage issues
- Mid level – ERP General permit for new road area

Environmental Discussion: (Wetlands On-Site, Wetlands on Adjacent Properties, Delineation, T&E species, Easements, Drawdown Issues, Setbacks, Justification, Elimination/Reduction, Permanent/Temporary Impacts, Secondary and Cumulative Impacts, Mitigation Options, SHWL, Upland Habitats, Site Visit, etc.)

- Provide the limits of jurisdictional wetlands.
- Surface water/wetlands limits at replacement of bridge will be the existing seawall.
- Provide appropriate mitigation using UMAM for impacts, if applicable.
- Demonstrate elimination and reduction of wetland impacts.
- Maintain minimum 15 foot, average 25 foot wetland conservation area setback or address secondary impacts.
- Add manatee exclusion devices where necessary.

Site Information Discussion: (SHW Levels, Floodplain, Tailwater Conditions, Adjacent Off-Site Contributing Sources, Receiving Waterbody, etc.)

- Existing road.
- WBID 1440A – impaired for nutrients
- OFW
- No floodplain issues (hurricane surge only)

Water Quantity Discussions: (Basin Description, Storm Event, Pre/Post Volume, Pre/Post Discharge, etc.)

- Discharges to an infinite basin (Whitcomb Bayou); attenuation not necessary.

Water Quality Discussions: (Type of Treatment, Technical Characteristics, Non-presumptive Alternatives, etc.)

- Provide water quality treatment for new road.
- In addition, must provide a net environmental improvement.
- Applicant must demonstrate a net improvement for the parameters of concern by performing a pre/post pollutant loading analysis based on existing land use and the proposed land use.
- Will acknowledge compensatory treatment to offset pollutant loads associated with portions of the project area that cannot be physically treated (Venetian Court).

Sovereign Lands Discussion: (Determining Location, Correct Form of Authorization, Content of Application, Assessment of Fees, Coordination with FDEP)
• May have to adjust existing easement due to lane widening. • Title determination for the project will be required.
Operation and Maintenance/Legal Information: (Ownership or Perpetual Control, O&M Entity, O&M Instructions, Homeowner Association Documents, Coastal Zone requirements, etc.)
• The permit must be issued to the county • Provide detailed construction surface water management plan.
Application Type and Fee Required:
• Notice General Construction ERP – Sections A and B of the ERP Application - $250 • General Construction ERP – Sections A, C and E of the ERP Application. • < 10 acres of project area and < 5000 sf of wetland or surface water impacts - $1456.00
Other: (Future Pre-Application Meetings, Fast Track, Submittal Date, Construction Start Date, Required District Permits – WUP, WOD, Well Construction, etc.)
•
Disclaimer: The District ERP pre-application meeting process is a service made available to the public to assist interested parties in preparing for submittal of a permit application. Information shared at pre-application meetings is superseded by the actual permit application submittal. District permit decisions are based upon information submitted during the application process and Rules in effect at the time the application is complete.

9.0 SUMMARY OF PUBLIC INVOLVEMENT

A project specific Public Involvement Program was implemented for this PD&E study. The program identified the key stakeholders and recommended activities to inform and solicit input from the community. Opportunities for community, stakeholder and agency input were provided throughout the duration of the study. A stakeholders' mailing list, which included property owners, local government staff and officials, agency representatives, special interest groups and other interested parties was maintained and updated throughout the study. More detailed information, including copies of all newsletters, handouts, meeting materials and comments received from the public are available in the *Comments and Coordination Report*, published separately.

This section documents public involvement efforts to date. It will be updated in the Final PER.

9.1 PROJECT WEBSITE

A project specific web page was established on the Pinellas County website (pinellascounty.org\beckettbridge.com) at the beginning of the study to provide updated information about the project and upcoming public meetings for the duration of the study. Comments and questions can be forwarded to the project team by email via the contact page on the website. Visitors to the website are also invited to email, write or call the County Project Manager with questions or concerns. The project schedule, newsletters, and meeting exhibits are posted on the website.

9.2 NEWSLETTERS

A newsletter was prepared and mailed with the invitation to the January 23, 2013 Alternatives Public Workshop.

9.3 AGENCY AND LOCAL GOVERNMENT COORDINATION

9.3.1 Efficient Transportation Decision Making (ETDM)/Advanced Notification (AN)

FDOT District Seven initiated the ETDM screening phase of the project. This process initiated early coordination with all Environmental Technical Advisory Team (ETAT) members. The process began with distribution of the Advanced Notification (AN) in October 2010. The *ETDM Programming Screen Summary Report* was published on June 30, 2011. A copy of the AN package and the summary report are included in Appendix A.

9.3.2 Kick-Off Presentation and other Presentations to the Pinellas County Board of County Commissioners (BCC)

A "Kick-Off Presentation" was made to the Pinellas County BCC to introduce the project on March 13, 2012 at a regularly scheduled BCC meeting. Invitations to the meeting were distributed to all federal, state and local government officials; Pinellas County and City of Tarpon Springs staff; and FDOT.

Alternatives proposed to be shown to the public at the January 2013 Alternatives Public Workshop were presented to the BCC on October 30, 2012.

The staff "Recommended Alternative", replacement of the existing movable bridge with a new two lane movable bridge on approximately the same alignment as the existing bridge, was presented to the BCC at their October 22, 2013 meeting. The BCC approved the staff's recommendation to move forward and present the Recommended Alternative to the public at a Public Hearing in February 2014. After consideration of all public input received at the Public Hearing, the BCC agreed to meet at a regularly scheduled BCC meeting on April 15, 2014 to decide whether to confirm their approval of the Recommended Alternative. The invitation to the public hearing included an invitation to the April 15, 2014 BCC meeting.

A presentation was made to the BCC on April 15, 2014 which summarized the results of the February 26, 2014 Public Hearing. The Commission confirmed and ratified their approval of the "Recommended Alternative" to move forward as the "Preferred Alternative", and to be submitted to the Federal Highway Administration for approval.

9.3.3 City of Tarpon Springs Staff Coordination Meeting

Pinellas County hosted a coordination meeting with the Tom Funcheon, City of Tarpon Springs Public Works Director, and Gary Schurman, Engineering Projects Supervisor, on September 13, 2012. Alternatives developed to date were presented and discussed. Strategies to involve the local communities and City officials and staff were also discussed.

9.3.4 Pinellas County Metropolitan Planning Organization (MPO) Meetings

Presentations were made at MPO Board and MPO Advisory Committee meetings between October 15, 2012 and November 14, 2012. This presentation included a discussion of the PD&E Process and the status of the ongoing study. In addition, conceptual designs and anticipated environmental impacts of alternatives that were anticipated to be carried forward to the Alternatives Community Workshop were presented. The meetings were held on the following dates.

- MPO Pedestrian Transportation Advisory Committee Meeting - 10/15/12
- MPO Bicycle Advisory Committee Meeting - 10/22/12
- MPO Technical Coordinating Committee (TCC) - 10/24/12
- MPO Citizens Advisory Committee (CAC) - 10/25/12
- Pinellas County MPO Board - 11/14/12

After the BCC approved the "Recommended Alternative" at their October 22, 2013 meeting, presentations were made to the MPO CAC, TCC and MPO Board. This presentation included information about the "Recommended Alternative" proposed to be presented at the February 2014 public hearing. The meetings were held on the following dates.

- MPO Technical Coordinating Committee (TCC) - 10/23/13
- MPO Citizens Advisory Committee (CAC) - 10/25/13
- Pinellas County MPO Board - 11/13/13

9.3.5 City of Tarpon Springs Commission Presentations

A presentation was made to the City of Tarpon Springs Commission on November 20, 2012, prior to the January 2013 Alternative Workshop. A presentation was also made to the Tarpon Springs City Commission on October 1, 2013 to update them on the status of the project.

9.3.6 Other Stakeholder Groups

Presentations about the alternatives evaluated during the study were made to the following groups.

Tarpon Springs Yacht Club Board Meetings

- October 17, 2012
- December 18, 2013

Tarpon Springs Chamber of Commerce breakfast meeting - November 21, 2012.

Tarpon Springs Rotary Club - January 31, 2012

Tarpon Springs Historical Society – January 16, 2014

A PowerPoint presentation was made about the status of the project and evaluation of alternatives at all meetings. Members of the project team were available to address questions and concerns at all meetings.

9.3.7 Cultural Resource Committee Meetings (CRC)

A number of historic structures are located within the vicinity of the Beckett Bridge project corridor. In addition, the Beckett Bridge was determined to be eligible for listing in the National Register of Historic Places by FHWA and SHPO early in the project. Accordingly, a Cultural Resource Committee (CRC) was assembled to address historic resource issues during the study. Three meetings were held during the course of the study. The first CRC meeting was held on October 29, 2012 at the Tarpon Springs Heritage Museum. Representatives from SHPO, FHWA, FDOT, Tarpon Springs Historic Society, USCG, City of Tarpon Springs and Pinellas County were invited. The purpose of the meeting was to discuss alternatives currently under consideration, the historic significance of the bridge and to provide an opportunity for input into the Section 106 process.

A second CRC meeting was held on March 13, 2013. At this meeting, public comments received at the Alternatives Community Workshop were presented. Discussion also included a review of the rehabilitation and movable bridge alternatives, potential effects to the historic bridge and discussion of possible mitigation/minimization measures. As a result of this meeting, the project team investigated three additional rehabilitation concepts that would provide safer and wider sidewalks.

A third CRC meeting was held on April 24, 2014, after the Public Hearing and subsequent County Commission Meeting. The "Replacement of the Existing Bridge with a New Low-Level Movable Bridge Alternative" was presented as the Recommended Alternative at the February 26, 2014 Public Hearing. At the subsequent County Commission meeting on April 15, 2014, the Commission concurred that the Recommended Alternative could proceed to FHWA as the

Preferred Alternative. The April 24, 2014 CRC meeting included an update on the results of the Public Hearing and Commission meeting, a discussion of the Section 106 process completed to date, a discussion of effects, and a discussion of desired mitigation measures to be included in the Memorandum of Agreement.

9.4 PUBLIC MEETINGS

9.4.1 Alternatives Community Workshop

An Alternatives Community Workshop was held on January 23, 2013 at the Tarpon Springs Yacht Club in Tarpon Springs Florida, located adjacent to the Beckett Bridge. The meeting was well attended; 120 individuals signed in. The purpose of the meeting was to present the alternatives under evaluation, and provide an opportunity for community input. Graphics and informational boards about the alternatives considered were on display and a short video presentation was shown continuously throughout the evening. Project team members and County staff were available to address individual questions and accept comments. Comment forms and the Alternatives Evaluation Matrix were provided to attendees. A court reporter was also available to record public comments.

A total of 71 individuals submitted comments between December 28, 2012 (the date the workshop invitation letter was mailed) and February 28. These comments included those submitted on comment forms, in letters, via email or via the "contact us" page on the website, or verbally provided to the court reporter at the meeting. A summary of comments received, as well as a summary of responses, was provided to all those who submitted comments and posted on the project website. Summary of comments received is provided below.

Summary of Comments

Not all comments included a preference for a specific proposed alternative. Some comments requested alternatives other than those presented. The following summary accounts for comments that did state a preference for an alternative that was presented at the Workshop. Please note that a decision regarding the selection of a "Preferred Alternative" is based on many factors, one of which is community input. **These numbers are not considered "votes."**

No-Build	7
No-Build with Removal of Existing Bridge	2
Rehabilitation	11

Rehabilitation or Movable Bridge	12
New Movable Bridge	32
New Fixed Bridge (Vertical Clearance 28 feet)	4

Preference for Alternatives Other than those Presented

- Construction of a fixed bridge with only seven to eight feet of clearance
- Rehabilitation with widening to provide bicycle lanes and sidewalks
- Rehabilitation with an inoperable movable span
- Rehabilitation with improved sidewalks to accommodate disabled
- Rehabilitation with current weight restrictions enforced
- Consider a tunnel

Many individuals expressed strong opposition to removing the existing bridge permanently.

Many individuals commented on specific concerns. A summary of issues raised follows:

Pedestrian/Bicycle Facilities

- Bicycle lanes and sidewalks are needed on the new bridge.
- The existing sidewalk is not adequate, wider sidewalks are needed.
- Bicycle lanes and sidewalks should be constructed on Riverside Drive approaching the bridge.
- Bicycle lanes and sidewalks are important especially since there is a nationwide emphasis on health and exercise
- Money should not be spent for bicycle lanes or sidewalks on the bridge since there are currently no bicycle lanes and sidewalks on Riverside Drive approaching the bridge.
- Only one sidewalk is needed; there is no need to impact property owners with two sidewalks.
- Bicycle lanes and sidewalks should be added to the bridge if rehabilitated.
- Bicycle lanes are not needed and a sidewalk is needed only on one side
- Sidewalks should accommodate those with disabilities.

- The bridge should be closed to traffic and open only to pedestrians and bicycles.
- The bridge should have one walking lane and one lane for vehicles.

Vertical Clearance

- Limiting clearance will negatively affect waterfront property values by restricting access to deeper water for tall boats.
- Constructing a movable bridge to accommodate all boats is desirable.
- Tarpon Springs is a "water-based" community. There are too many "water – based" events to construct a fixed bridge.
- Whitcomb Bayou serves as a refuge for all boats during storm events. Clearance should not be limited.
- There are not enough boats requiring more than 28 feet of clearance to justify the cost of a new movable bridge or for a fixed bridge higher than 7 or 8 feet.
- Limiting clearance will not affect waterfront property values.
- Constructing a movable bridge to accommodate a few tall boats is not economical.
- The fixed bridge will provide enough vertical clearance since the water depth in the bayou and channel does not allow for large sail-boats.
- Opportunities to relocate existing boats that require the bridge to open at docking facilities on the other side of the bridge should be explored.

Historical Context and Significance

- A new bridge should be similar in design to the existing historic bridge.
- Tarpon Springs is and important heritage tourist attraction and the historic bridge is part of the attraction for tourists.
- The historical character of the bridge should be preserved.
- A fixed bridge will negatively affect the historic character, beauty and aesthetics of the area.
- Construction of a replacement bridge will negatively impact the historic character of the community.
- The Tarpon Springs Historical Society opposed replacement of the historic bridge and supports rehabilitation.

Costs

- Spending additional money to accommodate boats with high masts is not reasonable.
- Spending money on a new bridge is not acceptable.
- Rehabilitation is not a long-term solution.
- A new bridge should be constructed now since construction will cost more in the future.
- A mid-level fixed bridge will save bridge tender costs and allow most boats to pass under.
- Money should not be spent to continually repair the bridge, it should be replaced.
- Costs to buy right-of-way and possible legal challenges if eminent domain is necessary to acquire the right-of- way for the fixed bridge will likely exceed the cost of the movable bridge.
- The bridge will last more than ten years if No-Build is selected.

Flooding and Roadway Repairs

- Riverside Drive and the Bridge cannot function as an effective evacuation route because the bridge approaches flood in storm conditions.
- Potholes should be repaired and flooding issues on Riverside Drive should be addressed before money is spent replacing the bridge.
- Repair or replacement of Riverside Drive is needed between the bridge and Alternate US 19.
- Detour
  - Damage to local roads on the detour route should be repaired after construction is complete.
  - The Moorings Condominium entrance is located on a blind curve on Whitcomb Bayou. A detour will increase traffic to this area and possibly create a dangerous situation. The Moorings representative requested that traffic not be detoured to Whitcomb Boulevard, but should be directed from South Florida Avenue to Meres Boulevard.

Community/Property Impacts

- A new bridge will destroy the uniqueness of the community.
- The fixed bridge options will destroy the ambiance of the community.
- The fixed bridge will impact property and destroy waterfront views.
- The fixed bridge looks like a freeway and is not compatible with the community.
- A new bridge should minimally impact the current residents.
- Impacting property to construct the proposed fixed bridge is not acceptable.
- Retaining walls are intrusive on views of the mobile home park and others.
- The movable bridge is less intrusive on nearby properties.
- The movable bridge maintains the "community" feeling of the area.

Traffic and Evacuation

- The bridge should not be removed since it is important for emergency evacuation.
- The assisted living facilities on Chesapeake Drive rely on the bridge for immediate access for emergency response.
- The bridge is important for moving traffic from the Sunset Hills area into town.
- The fixed bridge will negatively impact traffic patterns for adjoining residents.
- The bridge is important for access to downtown Tarpon Springs.
- More speed bumps should be installed on Riverside Drive.

Other

- The trailer park should be purchased for a city park.

9.4.2 Public Hearing

A Public Hearing was held on February 26, 2014 at the Tarpon Springs Yacht Club. Information about the "Recommended Alternative" and all other alternatives evaluated during the PD&E study was presented. An invitation letter, project fact sheet, public notice and comment form were mailed to approximately 1,200 property owners and other stakeholders three weeks prior to the Public Hearing. One hundred persons signed in at the meeting.

Graphics and informational boards about the alternatives considered were on display prior to and after the formal portion of the Public Hearing. The formal portion of the hearing consisted of an introduction by County staff, a 30 minute video presentation and a formal public comment period. Project team members and County staff were available to address individual questions and accept comments. A Public Hearing Handout which included the Alternatives Evaluation Matrix was provided to attendees. Comment forms were available. A court reporter recorded the formal portion of the Public Hearing and was also available to record public comments on a one-to-one basis during the informal portion of the hearing.

Six individuals spoke at the public hearing. Twenty-two individuals submitted comments during the official Public Hearing comment period. These comments included those submitted on comment forms, in letters, via email or via the "contact us" page on the website, or verbally provided to the court reporter at the meeting. A summary of the comments is provided below.

- 19 – Supported Recommended Alternative
- 1 – Requested a new low-level fixed bridge
- 1 - Requested preservation of existing bridge
- 1 – Requested consideration of a fixed bridge or repair of existing bridge with the elimination of the "drawbridge functionality".

Speakers at Public Hearing:

Five of the six speakers specifically stated that they supported the Recommended Alternative.

One objected and expressed desire for a low-level fixed bridge.

Comment Forms, Letters and Emails Received

Fourteen individuals specifically supported Recommended Alternative.

One individual expanded on comments made at public hearing.

Two individuals (Ms. Cyndi Tarapani and Mr. Robert Faison) objected to the Recommended Alternative.

- Ms. Tarapani requested preservation of the existing bridge

- Mr. Faison requested consideration of a fixed bridge or repair of the existing bridge but eliminate the functionality of the drawbridge.

Four individuals did not specifically state support for the Recommended Alternatives, but stated concerns or raised questions associated with the proposed replacement of the existing bridge.

Summary of Comments and Concerns:

Comments related to the Proposed Detour

- Is it possible to construct a temporary pedestrian bridge or provide a "ferry" for pedestrians during construction?
- Requested a temporary bridge during construction for vehicles and for emergency evacuation
- Suggested that construction techniques exist that could reduce detour time in half
- Requested detour signage that was clear to travelers, provided a specific detour signage plan
- Requested that roadways on the detour routes be repaired prior to closing the bridge

Comments related to the design/looks of the Recommended Alternative

- Requested design similar to existing, but wider with sidewalks and bike lanes as proposed.
- Requested that the new bridge be designed similar to existing historic bridge

Comments Related to Roadway and Drainage

- Spring Boulevard needs to be elevated because it floods during high tides during storms, preventing access to the bridge for evacuation.
- Requested that drainage improvements be made to the approach roadways.

Funding and Cost

- How will the bridge be funded?
- Will my property taxes be raised to pay for the bridge?

Other Comments

- Can future Commissioners change the status of the project since it will take several years to design?
- Boat access to the Bayou is needed for sanctuary during hurricanes.
- The new bridge should be "boat friendly" with bumpers that don't obstruct the slips at the Tarpon Springs Yacht Club.
- A number of individuals expressed support for incorporating parts of the existing bridge into the new bridge.
- The existing speed bumps are not necessary. The speed bumps cause safety problems for two-wheel vehicles. Local police should enforce the speed limits.
- Are there plans to deepen or restore the channel?
- There is an active osprey nest near the site.
- Requested that boat owners be able to operate the movable span remotely to eliminate the need for County staff to open the bridge

Two individuals who own property immediately adjacent to the bridge expressed concerns about how the proposed project could affect their property.

Stephen Katsarelis, owner of the single family residence in the southeast corner of the bridge, across from the Yacht Club supported the recommended alternative but expressed the following concerns:

- Concerned about privacy of his pool and hot tub from the raised bridge
- Concerned about impacts to his privacy fence and hedge
- Concerned about safety – specifically speeding on wider bridge, stated that more effective speed bumps should be considered
- Requested additional information about contaminated sites mentioned in the public hearing presentation

Robert Faison, resident at 408 Riverside Drive, immediately adjacent to the bridge in the northwest quadrant, across from Bayshore Mobile Home Park, objected to the Recommended Alternative. Mr. Faison recommended that the County consider a fixed bridge or repair the existing bridge but eliminate "the draw bridge functionality". He also expressed the following concerns about impacts from the Recommended Alternative:

- Impacts from traffic noise from additional traffic
- Impacts to view
- Safety exiting residential driveway
- Increase in traffic accidents
- Impacts of Construction noise
- Impacts to wood privacy fence
- Impacts to his current access to the sidewalk on Riverside Drive

Ms. Tarapani, president of the Tarpon Springs Preservation Society, requested that the existing bridge be restored.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

TYPE 2 CATEGORICAL EXCLUSION DETERMINATION FORM

1. GENERAL INFORMATION

County:	Pinellas			
Project Name:	Beckett Bridge PD&E Study			
Project Limits:	Chesapeake Drive to Forest Avenue			
Project Numbers:	2161	13040	424385-1-20-01	S129-343-R
	County PID	ETDM	Financial Management	Federal-Aid

2. PROJECT DESCRIPTION AND NEED

a. Project Description

The Beckett Bridge (Bridge No. 15400) carries Riverside Drive over Whitcomb Bayou in the City of Tarpon Springs, Pinellas County, Florida. The Bridge is owned and operated by Pinellas County. The Beckett Bridge is a two lane, single-leaf rolling-lift bascule bridge that was originally constructed in 1924 as a timber bridge with a steel movable span. The fixed timber approach spans were replaced with concrete approach spans in 1956. The bridge currently provides approximately six feet of vertical clearance at the fenders for boats navigating under the bridge, and 25 feet of horizontal clearance between the fenders. The existing typical section consists of one 10-foot wide travel lane in each direction, and 2-foot 2-inch-wide sidewalks separated by a curb on both sides of the bridge (see **Figure 1** – Existing Bridge Typical Section). The overall width of the existing bridge is 28 feet- ½ inch.

Boats moored at waterfront properties south of the bridge along Whitcomb Bayou need to pass under the bridge to reach the Anclote River and eventually the Gulf of Mexico. The bridge opens on demand with two hours' notice. County records indicate that the number of bridge openings varied from 10-20 between 2009 and 2012.

The project consists of replacing the existing low-level movable two-lane bridge with a new two-lane low-level single-leaf, rolling lift bridge of similar design with approximately 7.8 feet of vertical clearance at the fenders. Proposed roadway improvements are limited to the approach roadways. The project limits extend along Riverside Drive from Chesapeake Drive across Whitcomb Bayou to Forest Avenue, a distance of approximately 0.3 miles. Alternatives considered included the No-Build Alternative, No-Build with Permanent Removal of the Bridge, Rehabilitation, Replacement with a mid-level Fixed Bridge (with 28 feet of vertical clearance), and Replacement with a low-level Movable Bridge.

b. Purpose and Need

The purpose of the proposed project is to provide for the safe efficient movement of vehicles within the City of Tarpon Springs and between major arterials, including US 19, downtown Tarpon Springs and destinations to the west of Whitcomb Bayou in Pinellas County. The proposed project will also provide local and regional connectivity across Whitcomb Bayou and provide direct access to a designated county emergency evacuation route (Tarpon Avenue) for about 5,400 local residents and the coastal community.

According to recent (06/27/13) FDOT inspection reports, the existing bridge has an overall Structure Inventory and Appraisal Sufficiency Rating of 44.9 out of 100. The bridge is considered functionally obsolete, based primarily on the substandard clear roadway width of only 20 feet and substandard roadway safety features. The existing typical section consists of one, 10-foot wide travel lane in each direction and 2-foot 2-inch-wide sidewalks separated by a curb on both sides of the bridge. There are no shoulders on the bridge (see **Figure 1** - Existing Bridge Typical Section).

Minimum required lane and shoulder widths prescribed by the American Association of State Highway and Transportation Officials (AASHTO) are not met. The sidewalks on the bridge are narrow and do not meet current accessibility requirements established by the Americans with Disabilities Act (ADA). The bridge railings do not meet current standards for pedestrian safety or geometric and crash testing safety standards for vehicles. Approach guardrail and transitions and end treatments also do not meet current safety standards.

The existing vertical clearance at the fenders is six feet. The tip of the bascule leaf overhangs the fender with the leaf fully raised and does not provide unlimited vertical clearance between the fenders. The existing horizontal clearance between the fenders is 25 feet.

Although the bridge is not considered Structurally Deficient, the bridge has a substandard load carrying capacity requiring weight restrictions. The bridge is currently posted for legal loads limited to 2-ton Single Unit Trucks and 15-ton Combination Trucks. Repairs in 1979 and 1988 included installation of crutch bents due to settlement and lateral stability concerns. Repairs in 2011 were performed to correct issues with the operating machinery and bascule leaf alignment.

The existing bridge has substandard sidewalks (2 feet 2 inches wide) and no shoulders or bicycle lanes. No officially designated county or regional trails cross the Beckett Bridge. However, the Pinellas Trail, a 37-mile long regional trail extending from St. Petersburg to Tarpon Springs, is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies the proposed Howard Park Trail which will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

Based on 2012 traffic counts, the Annual Average Daily Traffic (AADT) is currently 7,700 vehicles. Traffic models predict that the AADT will increase to 8,200 vehicles in 2018 (Opening Year) and to 9,700 vehicles in 2038 (Design Year). Correction of structural deficiencies affecting the load capacity of the existing bridge could result in higher truck traffic in the future.

Six public schools are located within three miles of the Beckett Bridge. However, since the Beckett Bridge is currently load posted for two tons, school busses (which weigh on average 10-15 tons) are not permitted to cross the bridge. Accordingly, an alternate, longer route for school busses is required.

c. Proposed Improvements

The Recommended Alternative is replacement of the existing two-lane bascule Beckett Bridge with a new two-lane single-leaf, rolling lift bridge of similar design. The proposed bridge would provide 7.8 feet of vertical clearance over the navigation channel at the fenders in the closed position. The horizontal clearance between the fenders will be 25 feet. Unlimited vertical clearance will be provided in the open position for the width of the channel between the fenders. The new bridge would be constructed within existing right-of-way, on approximately the same alignment as the existing bridge. The proposed bridge will be approximately 19 feet wider than the existing bridge.

The proposed bridge is likely to qualify for a General Permit from the Southwest Florida Water Management District (SWFWMD) and treatment of stormwater runoff from the bridge would not be required. However, if treatment of stormwater is required, it is anticipated that compensatory, offsite treatment will be acceptable. Accordingly, acquisition of additional right-of-way is not anticipated to address water quality concerns.

The proposed bridge typical section for the low-level Movable Bridge Alternative has a total out-to-out width of 47.2 feet (see **Figure 2** – Proposed Movable Bridge Typical Section). The typical section includes two, 11-foot wide travel lanes with 5.5-foot shoulders that can function as undesignated bicycle lanes. Sidewalks (six feet wide) are proposed on both sides of the bridge.

The maximum proposed grade is five percent, which meets ADA requirements. Roadway reconstruction is limited to the bridge approaches. The approach roadway will return to existing grade at Pampas Avenue on the east side of the bridge. On the west side of the bridge, the approach roadway will return to existing grade just east of Chesapeake Drive. The approach roadway will be close enough to the existing grades at the driveways to the Bayshore Mobile Home Park, the Tarpon Springs Yacht Club and Venetian Court to allow connection of these driveways with minimal re-grading.

Access to residential property driveways along Riverside Drive will still be accessible. Resurfacing (only) is proposed between Forest Avenue and Pampas Avenue. The proposed roadway profile would be approximately two feet higher than the existing roadway at the west end of the bridge, and approximately four feet higher at east end of the bridge.

The proposed roadway section west of the bridge consists of two 10-foot wide through lanes (one in each direction) and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Because of the limited right-of-way, a six-foot wide sidewalk is proposed only on the north side of the roadway. No sidewalks are proposed on the south side of the roadway, adjacent to the Bayshore Mobile Home Park.

East of the bridge, the roadway section consists of two 11-foot wide through lanes (one in each direction) and 5.5-foot wide outside shoulders that can function as undesignated bicycle lanes. Six-foot wide sidewalks are proposed on both sides of the roadway. **Figures 3 and 4** illustrate the proposed roadway sections for the west and east sides of the bridge, respectively.

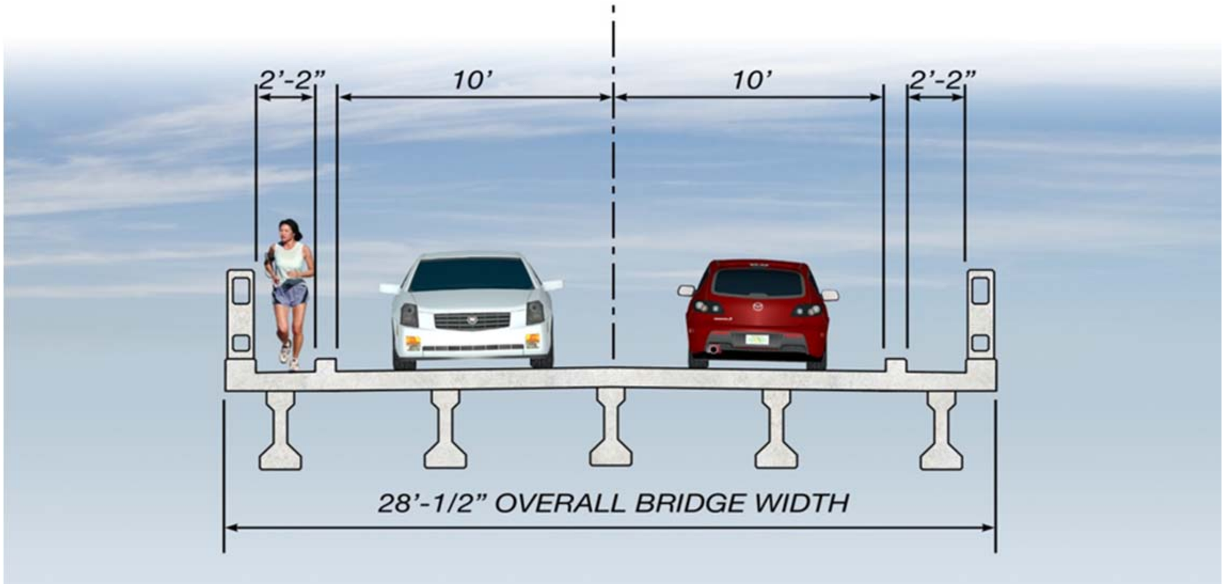


Figure 1. Existing Bridge Typical Section

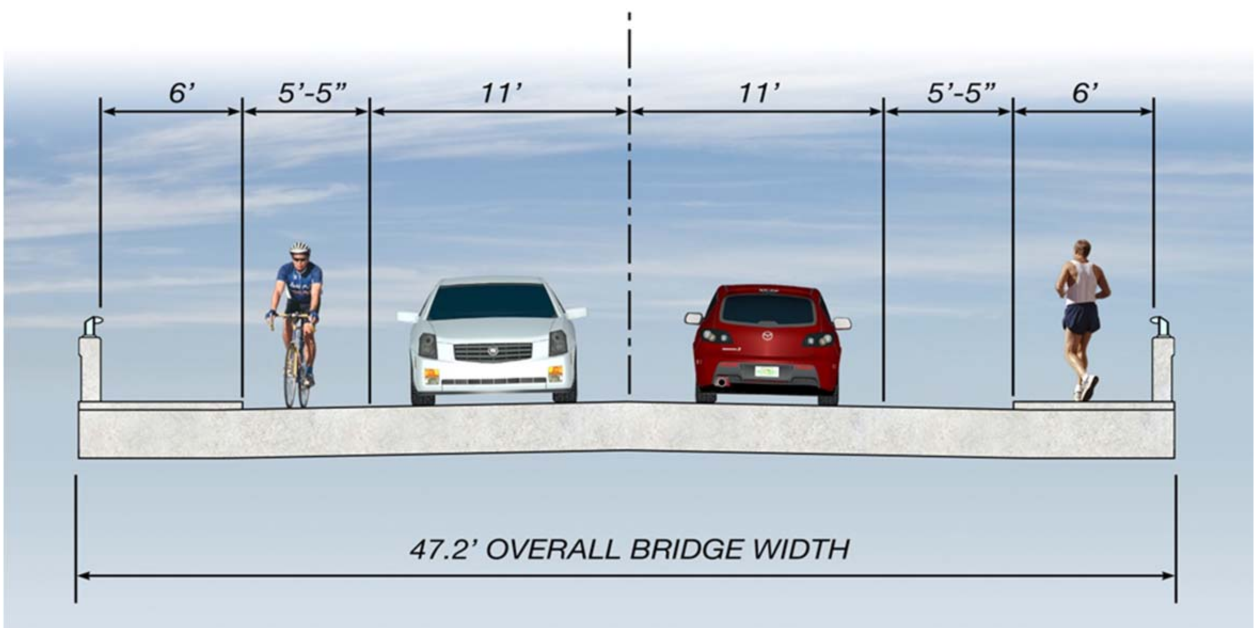


Figure 2. Proposed Movable Bridge Typical Section

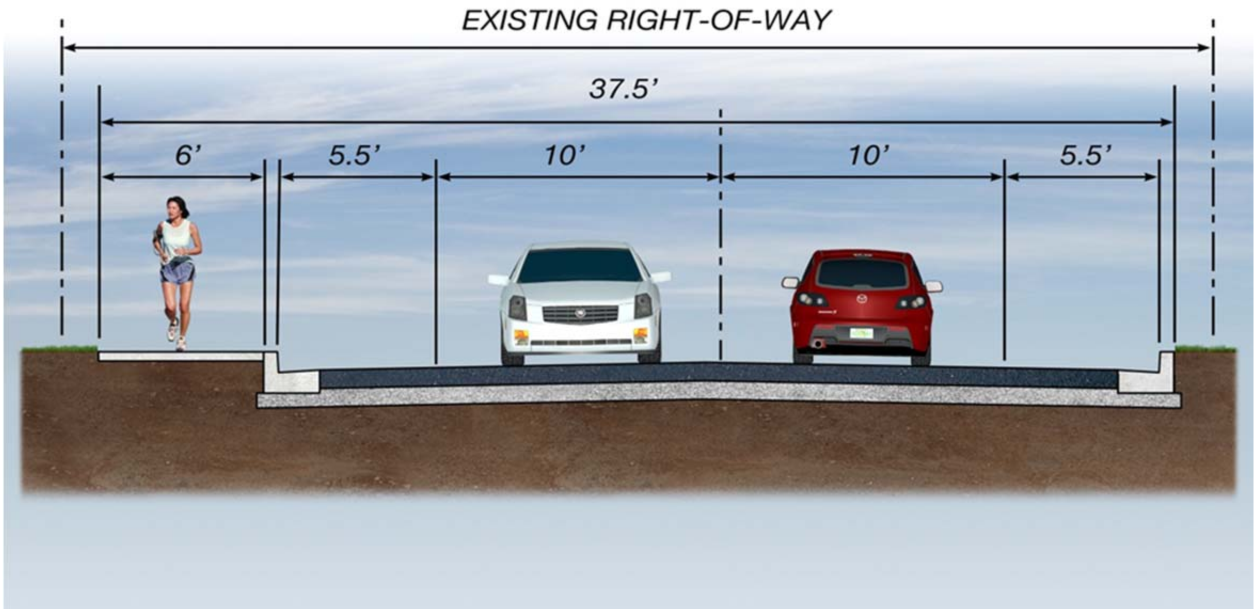


Figure 3. Proposed Roadway Section West of Proposed Movable Bridge

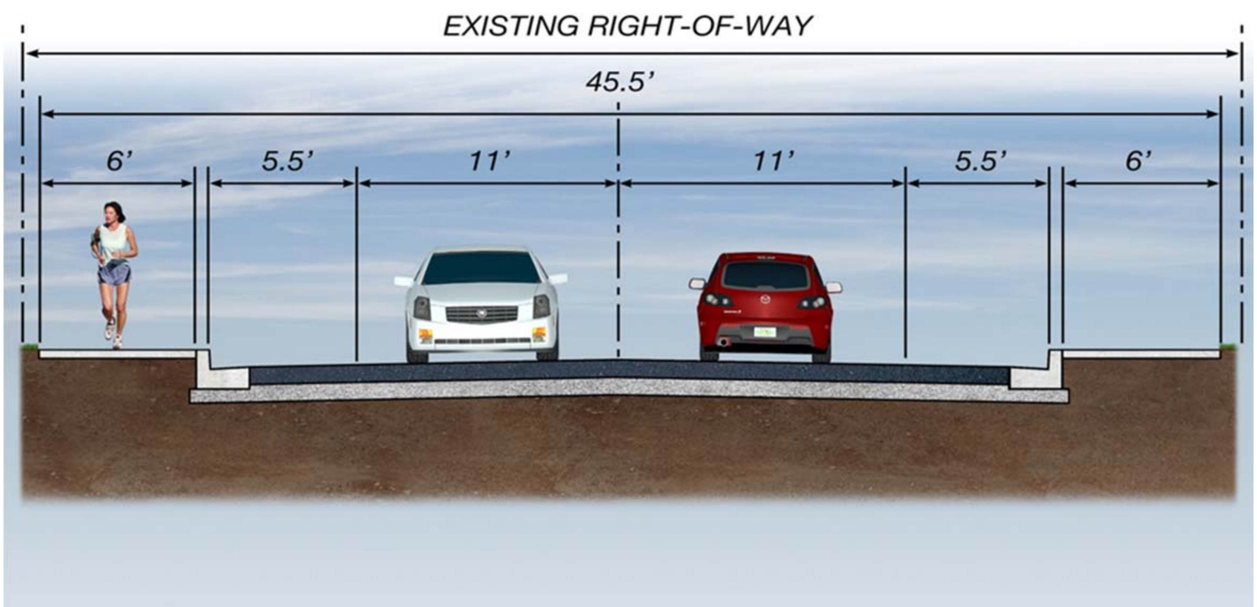


Figure 4. Proposed Roadway Section East of Proposed Movable Bridge

d. Project Planning Consistency

Currently Adopted CFP-LRTP	Based on the Pinellas County Metropolitan Planning Organization (MPO) 2040 Long Range Transportation Plan (LRTP), adopted December 10, 2014, and the Transportation Element of the Pinellas County 2008 Comprehensive Plan, the current lane configuration for the project corridor is expected to remain two-lanes through 2040. Accordingly, replacement of the existing two-lane bridge with a new two-lane bridge is consistent with both plans. Rehabilitation, repair or replacement of the existing bridge is consistent with Goal 3, "*Provide a safe and secure transportation system for all users*" and Objective 3.1, "*Reduce the rate and frequency of fatal and incapacitating crashes for all modes of travel*" of the 2040 LRTP. The MPO added language regarding the replacement of major County bridge structures, including the Beckett, Dunedin Causeway and San Martin Bridges, to the 2040 LRTP. These projects are non-capacity bridge replacement projects. The 2040 LRTP Cost Feasible Plan lists the Beckett Bridge on Table 5-7, which includes "Identified Bridge Replacement Needs". Beckett Bridge is expected to be structurally deficient and eligible for off-system bridge replacement funds prior to the planned construction year. As such, additional grant funding is anticipated for Fiscal Year (FY) 2019, and the Pinellas County MPO Transportation Improvement Program (TIP) was revised to reflect this on October 22, 2015. The pages from the TIP and LRTP are attached in **Appendix A**. This PD&E Study was funded with Federal earmark, local and TCSP grants.
Yes	

PHASE	Currently Approved TIP	Currently Approved STIP	TIP/STIP $	TIP/STIP FY	COMMENTS
PE (Final Design	Y Page 227R (amended 10/22/15)	N/A	$2,800,000	2016-2020	**Local Funds** ("*Penny for Pinellas*") $600,000 – 2016 $600,000 – 2017 $600,000 – 2018 $800,000 – 2019 $200,000 – 2020
R/W	N/A	N/A	N/A	N/A	No right-of-way required
Construction	Y Page 227R (amended 10/22/15)	N/A	$21,000,000	2019-2020	**Local Funds** ("*Penny for Pinellas*") Federal Grant anticipated for 2019. *Beckett Bridge is expected to be structurally deficient and eligible for off-system bridge replacement funds prior to the planned construction year*.

3. CLASS OF ACTION

a. Class of Action:
[X] Type 2 Categorical Exclusion

b. Other Actions:
[X] Section 4(f) Evaluation
[X] Section 106 Consultation
[ ] Endangered Species Biological Assessment

c. Public Involvement:
1. [ ] A public hearing is not required, therefore, approval of this Type 2 Categorical Exclusion constitutes acceptance of the location and design concepts for this project.
2. [X] A public hearing was held on February 26, 2014, and a transcript has been provided as a separate document. Approval of this determination constitutes location and design concept acceptance for this project.
   [ ] An opportunityfor a public hearing was afforded and a certification of opportunity is included. Approval of this determination constitutes acceptance of the location and design concepts for this project.
3. [ ] A public hearing will be held and the public hearing transcript will be provided at a later date. Approval of this determination DOES NOT constitute acceptance of the project's location and design concepts.
   [ ] An opportunityfor a public hearing will be afforded and a certification of opportunitywill be provided at a later date. Approval of this determination DOES NOT constitute acceptance of the project's location and design concepts.

d. Cooperating Agency: [ ] COE [X] USCG [ ] FWS [ ] EPA [ ] NMFS [ ] NONE

4. **REVIEWERS' SIGNATURES**

Tony Hornik, P.E., S.I. Pinellas County Project Manager — 01 / 19 /2016 Date

Robin Rhinesmith, FOOT Environmental Administrator — 01 / 19 /2016 Date

5. FHWA CONCURRENCE

(For) Division Administrator or Designee — 01 / 25 / 2016 Date

6. IMPACT EVALUATION

Impact Determination*

Topical Categories	Sig	NotSig	None	NoInv	Basis for Decision*
A. SOCIAL & ECONOMIC					
1 Land Use Changes	[ ]	[ ]	[X]	[ ]	See Section A.1 (page 11)
2. Community Cohesion	[ ]	[ ]	[X]	[ ]	See Section A.2 (page 11)
3. Relocation Potential	[ ]	[ ]	[X]	[ ]	See Section A.3 (page 11)
4. Community Services	[ ]	[X]	[ ]	[ ]	See Section A.4 (page 11)
5. Nondiscrimination Considerations	[ ]	[ ]	[X]	[ ]	See Section A.5 (page 12)
6. Controversy Potential	[ ]	[X]	[ ]	[ ]	See Section A.6 (page 12)
7. Scenic Highways	[ ]	[ ]	[ ]	[X]	
8. Farmlands	[ ]	[ ]	[ ]	[X]	
B. CULTURAL					
1. Section 4(f)	[ ]	[X]	[ ]	[ ]	See Section B.1 (page 12)
2. Historic Sites/Districts	[ ]	[X]	[ ]	[ ]	See Section B.2 (page 13)
3. Archaeological Sites	[ ]	[ ]	[X]	[ ]	See Section B.3 (page 16)
4. Recreation Areas	[ ]	[ ]	[X]	[ ]	See Section B.4 (page 16)
C. NATURAL					
1. Wetlands	[ ]	[X]	[ ]	[ ]	See Section C.1 (page 17)
2. Aquatic Preserves	[ ]	[X]	[ ]	[ ]	See Section C.2 (page 19)
3. Water Quality	[ ]	[X]	[ ]	[ ]	See Section C.3 (page 19)
4. Outstanding FL Waters	[ ]	[X]	[ ]	[ ]	See Section C.4 (page 20)
5. Wild and Scenic Rivers	[ ]	[ ]	[ ]	[X]	
6. Floodplains	[ ]	[X]	[ ]	[ ]	See Section C.6 (page 21)
7. Coastal Zone Consistency	[ ]	[ ]	[X]	[ ]	See Section C.7 (page 21)
8. Coastal Barrier Resources	[ ]	[ ]	[ ]	[X]	
9. Wildlife and Habitat	[ ]	[X]	[ ]	[ ]	See Section C.9 (page 21)
10. Essential Fish Habitat	[ ]	[X]	[ ]	[ ]	See Section C.10 (page 23)
D. PHYSICAL					
1. Noise	[ ]	[X]	[ ]	[ ]	See Section D.1 (page 24)
2. Air Quality	[ ]	[ ]	[X]	[ ]	See Section D.2 (page 24)
3. Construction	[ ]	[X]	[ ]	[ ]	See Section D.3 (page 25)
4. Contamination	[ ]	[X]	[ ]	[ ]	See Section D.4 (page 26)
5. Aesthetic Effects	[ ]	[X]	[ ]	[ ]	See Section D.5 (page 26)
6. Bicycles and Pedestrians	[ ]	[ ]	[X]	[ ]	See Section D.6 (page 27)
7. Utilities and Railroads	[ ]	[ ]	[X]	[ ]	See Section D.7 (page 28)
8. Navigation	[ ]	[X]	[ ]	[ ]	See Section D.8 (page 29)

a. [ ] FHWA has determined that a USCG Permit IS NOT required in accordance with 23 CFR 650, Subpart H.

b. [X] FHWA has determined that a USCG Permit IS required in accordance with 23 CFR 650, Subpart H.

*** Impact Determination:** Sig = Significant; NotSig = Not significant; None = Issue present, no impact; NoInv = Issue absent, no involvement. Basis of decision is documented in the referenced attachment(s).

E. PERMITS REQUIRED

US Coast Guard – A Bridge Permit will be required.

Southwest Florida Water Management District (SWFWMD) – Based on meetings with SWFWMD staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies for this general permit, water quality treatment of stormwater runoff is not anticipated to be required.

US Army Corps of Engineers – It is anticipated that the project will qualify for a Nationwide Permit or a combination of Nationwide Permits (Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act).

Chapter 253, Florida Statute, states that authorization is required from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on, or over state-owned, sovereign submerged lands (state lands). The Florida Department of Environmental Protection (FDEP), Division of State Lands has been delegated by the Board to manage the use of State Lands for the good of the public; to maintain traditional uses, such as navigation and fishing; to provide maximum protection of all state lands; and to ensure that all private uses of state lands will generate revenue as just compensation for that privilege. The existing bridge is located within a Sovereign Submerged Lands Easement granted by the Board to the Pinellas County Board of County Commissioners on February 1, 1996. This easement authorized repairs of the existing bridge. It is likely that construction of a new bridge will require modification of this easement. This authorization will be obtained during the ERP permitting process.

40 CFR Part 122 prohibits point source discharges of stormwater to waters of the United States without an NPDES permit. Under the State of Florida's delegated authority to administer the NPDES program, construction sites that will result in greater than one acre of disturbance must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, FAC, or an individual permit issued pursuant to Chapter 62-620, FAC. A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices (i.e. best management practices) that will be used to reduce the potential for pollutant discharges during construction. The need for this permit will be determined during the Design Phase of the project.

7. COMMITMENTS AND RECOMMENDATIONS

Pinellas County will comply with the Section 106 Memorandum of Agreement (MOA) developed during the PD&E Study and signed by the FHWA, State Historic Preservation Officer (SHPO), Pinellas County and FDOT. A copy of the MOA is included in **Appendix B** of this document.

To minimize impacts to navigation and to comply with United States Coast Guard (USCG) requirements, the contractor will be required to coordinate any full or partial closures of the channel to marine traffic during construction with the USCG in Miami, Florida (telephone 305.415.6744) at least sixty (60) days prior to the planned closing.

Pinellas County is committed to working with local government officials and community representatives to solicit input for the design of bridge aesthetic elements and landscaping.

An advisory committee will be established during the Design phase of the project, which will include community and local government representatives. This committee is also required by the Section 106 MOA for this project.

As documented in a letter to the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) dated June 17, 2015 (included in **Appendix C**), the County commits to prohibiting blasting for demolition of the existing bridge.

Pinellas County, in coordination with FDOT, intends to request that the NMFS and USFWS reinitiate “informal” consultation for the project’s effects on the listed species during the final Design phase of the project and in conjunction with the project’s permitting process. Consultation will be concluded before the project is advanced to the Construction phase. Pinellas County, in compliance with 23 CFR 771.133 and Section 7 of the Endangered Species Act (Act), agrees not to begin construction on the project, or otherwise make any irreversible or irretrievable commitment of resources that has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative, or reasonable and prudent measures (which would not violate Section 7(a)(2) of the Act), until consultation with NMFS and USFWS is concluded. This constitutes a commitment by Pinellas County of reasonable assurance that the Section 7 consultation can be completed as an informal consultation as the project moves forward and project details and commitments are finalized.

The NMFS requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed. Accordingly, Pinellas County will coordinate potential wetland and essential fish habitat impacts and proposed mitigation with the NMFS during the Design phase of the project.

Pinellas County will comply with the USFWS and Florida Fish and Wildlife Conservation Commission (FWC) approved “Standard Manatee Construction Conditions” during all in-water work/Construction phases of the project. In addition, the County will coordinate with both agencies concerning site-specific manatee protection measures to be implemented during construction.

As requested by the Florida Wildlife Conservation Commission, Pinellas County will coordinate wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and the establishment of a buffer zone around active nesting sites.

Pinellas County will coordinate with FWC for the removal of the osprey nests on a utility pole within the construction area during the Design and Permitting phases of the project.

A full detour is proposed during construction of the proposed replacement bridge. Accordingly, the existing bridge will be closed and no temporary roads or bridges will be constructed.

A.1 LAND USE CHANGES

Existing land use was determined by a field review of the project corridor and review of Existing Land Use maps (July 2007) published in the City of Tarpon Springs Comprehensive Plan. Land use in the area is predominantly residential. Bayshore Mobile Home & RV Park is located on the southwest corner of the bridge immediately adjacent to Riverside Drive. The Tarpon Springs Yacht Club is located on the northeast side of the bridge. Two assisted living facilities, Serenity on the Bayou and Tarpon Bayou Center are located on Chesapeake Drive, just north of Riverside Drive. Stamas Yacht Repair and Restoration is located on Pampas Drive, north of Spring Boulevard.

No notable changes in future land use in the vicinity of the project are shown on the 2025 Future Land Use Map (Tarpon Springs Comprehensive Plan). The predominant land use in the vicinity will remain low to medium density residential. The area surrounding the Beckett Bridge is largely built out; accordingly, land for potential new development is limited.

The Impact Determination is **"None**" for this category.

A.2 COMMUNITY COHESION

The proposed replacement bridge will be constructed on approximately the same alignment as the existing bridge. No additional right-of-way will be required. The proposed bridge will provide approximately 7.8 feet of vertical clearance at the fenders, compared to six feet provided by the existing bridge. Accordingly, the vertical profile of the bridge will vary slightly from the existing; however, the bridge approaches will touch down without impacting driveways or roadway intersections. Accordingly, the proposed project will not adversely impact the cohesion of the communities in the vicinity of the bridge. Accordingly, the Impact Determination is **"None"** for this category.

A.3 RELOCATION POTENTIAL

The proposed bridge replacement will be constructed within the County's right-of-way. Construction of the proposed bridge will not require acquisition of any additional right-of-way and will not result in the relocation of any residences or businesses. Accordingly, the impact determination for this category is **"None"**.

A.4 COMMUNITY SERVICES

Community services, including those providing emergency services located within approximately 1.5 miles of the project include two fire stations, one police station, one hospital, five religious institutions, and five schools. In addition, the Pinellas County Health Department operates a health center within the City of Tarpon Springs, located approximately 1.2 miles from the Beckett Bridge.

Replacement of the existing bridge will have a positive impact on access to community resources. The existing bridge is currently load posted. School busses and large emergency vehicles are prohibited from crossing the bridge. Six public schools are located within three miles of the Beckett Bridge. According to the Route and Safety Auditor for the Pinellas County School Board, if the bridge were rehabilitated or replaced, school bus traffic would be re-routed to travel along Spring Boulevard/Riverside Drive and cross the Beckett Bridge. Approximately 15 to 20 school busses per day could potentially use the bridge. The detour results in additional costs for busses that service schools in the vicinity of the project. The proposed replacement bridge would result in a cost savings for operation of school busses in the community.

Traffic will be detoured during construction of a replacement bridge. Two detour routes are proposed, the longest is approximately 2.75 miles. Emergency response times could be affected for some areas in the immediate vicinity of the bridge while the detour is in effect. Accordingly, the impact determination for this category is **“Not Significant”**.

A.5 NONDISCRIMINATION CONSIDERATIONS

There are no Census Block Groups with a median income of less than $25,000 or with a minority population greater than 40% located within the 100-foot buffer distance. There are no minority communities within the project limits or in the immediate vicinity of the existing bridge. To solicit input from communities potentially affected by the proposed project, property owners located within a minimum of 1,000 feet of the project area were notified and invited to an Alternatives Public Workshop and the Public Hearing. Public outreach during the study included meetings and presentations to local governments and local community organizations. Accordingly, the impact determination for this category is **“None**”.

A.6 CONTROVERSY

There are some members of the community, including the Tarpon Springs Historic Preservation Society Board, that have expressed a strong desire to preserve the existing bridge. Accordingly, three rehabilitation alternatives, rather than one, have been considered and evaluated in detail to date. To date the evaluations have indicated that replacement of the existing bridge is not feasible or prudent. Accordingly, the impact determination for this category is **“Not Significant”**.

B.1 SECTION 4(f)

The Efficient Transportation Decision Making (ETDM) metadata and its use in generating what resources are "found" within the Environmental Screening Tool (EST) Geographic Information System (GIS) buffers indicate that there are statewide (typically land based) Ecological Greenways Critical Linkages and Greenways Ecological Priority Linkages that could be associated with the proposed project. These FDEP designations contain all of the largest areas of ecological and natural resource significance and the landscape linkages necessary to link these areas together in one functional statewide network. This data was created as part of the Florida Statewide Greenways Planning Process. The Florida Ecological Greenways Network identifies the opportunities to protect large, intact landscapes important for conserving Florida's biodiversity and ecosystem services.

The ETDM Programming Screen Summary Report stated that a review of the GIS analysis data indicates that the following are located within the 100-foot project buffer:

- Priority 6 and Unknown Description Ecological Greenways Critical Linkages and Prioritization Results
- One Low Greenways Ecological Priority Linkages
- Two High Office of Greenways and Trails (OGT) Multi-Use Trail Priorities
- One Low OGT Multi-Use Trail Priorities
- One Low OGT Paddling Trails Priorities

FDEP noted that further review of GIS data and Google Street View revealed that most of these facilities do not currently exist. A review of the Office of Greenways and Trails (OGT) Map did not identify any existing resources within the project area. There are no FDEP designated Ecological Greenways Critical Linkages and Greenways Ecological Priority Linkages that are officially designated, marked or signed as such either within, along or perpendicular (intersecting) to the project's study limits.

The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies three *future* recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. One of these trails, the proposed Howard Park Trail, will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge. The Bicycle and Pedestrian Planner at Pinellas County stated that there has been no engineering or other evaluation of these planned cost feasible trailways projects. The MPO is anticipating that improved facilities along these existing routes will be constructed as part of future roadway resurfacing or widening projects. Existing sidewalks on the Beckett Bridge are only 2'2" wide and there are no bicycle lanes or shoulders on the bridge. The proposed project will provide improved pedestrian and bicycle facilities on the Beckett Bridge which will enhance recreational opportunities associated with planned future recreational trails.

Marked and unmarked paddle trails are identified in the "Guide to Pinellas County Blueways," published by the Pinellas County Planning Department in April 2010. One unmarked trail begins in Spring Bayou at Craig Park, just south of the Beckett Bridge. The trail continues north through Whitcomb Bayou, passing under the Beckett Bridge continuing to the Anclote River and eventually to the Gulf of Mexico. Access to navigational opportunities will be maintained to the greatest extent possible during construction. No impacts to this unmarked trail will result by replacement of the Beckett Bridge with the proposed new movable bridge.

FHWA noted that Whitcomb Bayou is located within the Pinellas County Aquatic Preserve. The proposed project will be constructed within the existing Pinellas County transportation right-of-way which is designated for transportation. An Environmental Resource Permit, a USCG bridge permit and a Section 10/Section 404 permit will be required from the USACOE. Compliance with all requirements and conditions of these permits will ensure that potential impacts to water quality, fish and wildlife or avoided or minimized. The proposed project will not cause any proximity impacts that would permanently impair or diminish the Pinellas County Aquatic Preserve resources' attributes which qualify the preserve for protection under the provisions of Section 4(f).

FHWA also noted that if the Beckett Bridge is determined to be National Register of Historic Places (NRHP) eligible and the bridge is demolished, a Section 4(f) Determination of Applicability (DOA) will be required. The Beckett Bridge was determined to be eligible for the NRHP. Accordingly, Section 4(f) is applicable to the project.

FHWA concurred with the conclusions and findings of the Draft Programmatic Section 4(f) Evaluation prepared for this project. The Final Programmatic Section 4(f) Evaluation has been submitted and will be approved concurrently with this environmental document.

The impact determination for Section 4(f) resources is "**Not Significant**".

B.2 HISTORIC SITES/DISTRICTS

A review of the GIS analysis data indicates that three Florida Site File (FSF) Historic Standing Structures are located within the 200-foot buffer distance and four additional FSF Historic Standing Structures and the NRHP-listed Tarpon Springs Historic District and E.R. Meres Sponge Packing House are located within the 500-foot buffer distance.

During the ETDM screening process, SHPO, the Miccosukee Tribe, and the FHWA recommended that a Cultural Resource Assessment Survey (CRAS) be conducted to identify and evaluate any resources that may be eligible for listing in the NRHP. The SHPO also noted that the bridge must be documented using historic bridge forms and evaluated by a professional. FHWA noted that it is not clear whether this bridge is eligible for listing in the NRHP.

Determination of Eligibility (DOE) forms were prepared for the Beckett Bridge (8P112017) and submitted to the FHWA in August 2012. The purpose of this coordination, prior to submitting the CRAS, was to obtain early input from FHWA and the SHPO on the potential eligibility of the bridge for the NRHP. The DOE concluded that the Beckett Bridge was eligible for listing in the NRHP. Both FHWA and SHPO concurred with this determination in September and October 2012, respectively. The concurrence letter is included in **Appendix B**. A CRAS was conducted for this study; the results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013, included in **Appendix B**. This survey resulted in the identification of 16 newly recorded historic resources within the Area of Potential Effect (APE) including one bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, 8PI2069). One of these newly recorded historic resources, Beckett Bridge (8PI12017), was determined to be eligible for listing in the NRHP by FHWA and SHPO. The remaining resources (8PI12043-8PI12055, 8PI12068, 8PI12069) are considered ineligible for listing in the NRHP as individual historic resources or as contributing resources to a historic district.

A Cultural Resource Committee (CRC) was established to address Section 106 issues and conduct good faith consultation with affected parties. The rehabilitation alternative originally evaluated and presented at the Alternatives Public Workshop did not propose changing the geometry of the existing bridge. Accordingly, the 2'2" wide sidewalks would remain. Some members of the CRC, including SHPO, recognized the need for improved pedestrian facilities on the bridge. At the request of the CRC and SHPO, two additional rehabilitation alternatives that provided improved pedestrian facilities were evaluated.

One alternative involved widening the bridge to provide wider sidewalks on both sides of the bridge. The second rehabilitation alternative consisted of reconfiguring the existing bridge without widening to provide a wider sidewalk on one side of the bridge. The engineering evaluation determined that both of these alternatives would require removal of the existing bascule leaf and the bascule pier, the only two structural elements of the existing bridge that were part of the original 1924 bridge. A summary of the evaluation of these alternatives is discussed below. Additional details regarding the evaluation are included in the *Draft Preliminary Engineering Report* (PER), prepared for this study.

Rehabilitation with Widening Alternative

Pinellas County, in coordination with FDOT District Seven staff, determined that widening the existing bridge would require compliance with the *Florida Green Book* to bring the bridge up to acceptable minimum current safety standards. Accordingly, a minimum acceptable typical section was developed based on these criteria. This typical section consists of two 11-foot travel lanes, one in each direction, 3-foot wide shoulders on both sides and 5.5 foot wide sidewalks on both sides of the bridge. The total width of the bridge would be 42 feet. The total width of the existing bridge is only 28 feet.

Detailed engineering analysis indicates that the additional weight of the wider roadway and the proposed sidewalks cannot be accommodated by the existing bascule span or bascule pier. Major modifications would be required to the approach spans to accommodate the wider typical section. The existing bascule span and bascule pier would need to be removed and replaced. These modifications would result in substantial alteration to the look of the bridge. The final structure will no longer resemble the original historic bridge.

Rehabilitation Alternative which Provides a Single Code Compliant Sidewalk without Widening, or with Minimal Widening of the Existing Bridge

At the June 11, 2013 meeting in Tallahassee, attended by Pinellas County and its consultants, FDOT, FHWA and SHPO, representatives from the SHPO requested consideration of an additional concept that would modify the existing bridge cross section to accommodate a single, code compliant, sidewalk, rather than two sidewalks that had been previously proposed. This section summarizes the technical evaluation of concepts with a sidewalk on one side only.

Reconfiguration of the Existing Bridge without Widening

The most desirable concept from a historic preservation perspective would be to avoid widening of the bridge and simply rework the arrangement of lanes and sidewalk(s) within the width of the existing bridge (28'-0½"). A modified section of the narrowest practical width would include minimum shoulders, a traffic railing (barrier) on the south side, two travel lanes, a sidewalk on a raised curb on the north side, and a traffic railing at the back of sidewalk. The minimum bridge width that would accommodate this section is 32'-1", 4'-0½" wider than the existing bridge. Therefore, the existing bridge width is not sufficient to support two lanes and a single sidewalk without widening.

Reconfiguration of the Existing Bridge with Minimal Widening

The next most desirable concept from a historic preservation perspective would be one that limits bridge widening and the associated impacts such that the existing bascule pier foundations can be saved. As discussed in the June 11 meeting, if the bridge is widened, the new bridge section must meet minimum standards. The clear roadway with of this minimum section is 28 feet; the overall width of is 36'-1". To accommodate this section the bridge would need to be widened by 8'-0½". The technical issues associated with widening the bridge by 8'-0½"were examined. The evaluation included calculating live load distribution factors (as an indicator of the increase in live load on a main girder due to widening) and approximating dead and live load changes associated with the proposed modifications. The analysis also included determining approximate span balance conditions and corresponding density of the counterweight needed to balance the bridge.

Based on this analysis, it was concluded that widening the bridge to include a single sidewalk that meets current design criteria is not technically feasible unless the bascule pier is replaced as well. The increased dead load and live loads are beyond what the existing foundations can handle without extensive strengthening. The physical size of the existing bascule pier footing precludes increasing the size of the counterweight and the density required of the existing size counterweight is well in excess of that recommended by AASHTO.

Conclusion

The existing bridge width is not sufficient to support two lanes and a single sidewalk without widening. In comparison to the widening concepts originally developed with two sidewalks, a single sidewalk concept does not offer any significant improvements or reductions in impacts to the scope of bridge rehabilitation. Both require complete replacement of the bascule span and bascule piers. The engineering evaluation determined that both of these alternatives would require removal of the existing bascule leaf and the bascule pier, the only two structural elements of the existing bridge that were part of the original 1924 bridge.

After consideration of the detailed evaluation of all rehabilitation alternatives, the SHPO stated that ample evidence had been provided to support that a new movable bridge would be preferable to rehabilitation. Mitigation will be required.

A third CRC meeting was held on April 24, 2014, following confirmation of the Preferred Alternative as the Recommended Alternative by the Pinellas County Commission at the Commission's April 15, 2014 meeting. Minimization and mitigation options were discussed at this meeting. Based on input from CRC members, including SHPO, a MOA among the FHWA, FDOT and SHPO was prepared. A signed copy of this MOA is included in **Appendix B**. This MOA includes the Historic American Engineering Record (HAER) documentation of the bridge, which includes large-format photography, printing historic plans on archival paper, and preparing a written narrative. In addition, the following mitigation measures, recommended by the CRC are included:

- The replacement bridge will be a single-leaf, rolling-lift bridge of similar design. However, other aesthetic elements of the bridge will be determined by an aesthetics committee that will be assembled during the design phase. This committee will include representatives of the community and local governments, including the Tarpon Springs Historical Society.
- Elements of the old bridge will be salvaged and incorporated into the design of the new bridge or displayed in a location in the vicinity of the new bridge. The specifics of the design will be determined by Pinellas County in coordination with the aesthetics committee during the design phase.
- There is an existing historic marker or plaque on the current bridge which includes the date the bridge was erected and names of Pinellas County Commissioners at that time. This historic plaque will be incorporated into the new control house so that it will be visible by pedestrians crossing the bridge.
- Information regarding the Beckett Bridge, which is suitable for inclusion in a "public-facing website for project information and educational purposes" and/or suitable for use on a mobile device, such as "What Was There" or "Next Exit History", is developed. This information will provide a historic account of the bridge to educate the public on its history.

FHWA concurred with the recommendations and findings of the Section 106 Case Study Report on July 17, 2014. SHPO concurred with the report on August 13, 2014. The concurrence letter is included in **Appendix B** of this document. Accordingly, the impact determination for this category is "**Not Significant**".

B.3 ARCHAEOLOGICAL SITES

During the ETDM screening process, SHPO, the Miccosukee Tribe, and the FHWA recommended that a CRAS be conducted to identify and evaluate any resources that may be eligible for listing in the NRHP. The Miccosukee Tribe of Indians of Florida commented that there are no recorded archaeological sites, including burial mounds, reported near this project. The Tribe also recommended that a CRAS be conducted to ascertain if there are any archaeological sites within the project boundaries. The Tribe stated that if no impacts were found, then no further consultation was necessary. No comments were received from the Seminole Tribe of Florida.

A *CRAS* was conducted for this study. The results are documented in the CRAS report, published separately. The recommendations in the CRAS were approved by FHWA on March 13, 2013. SHPO concurred with the findings of the CRAS on April 11, 2013 (**Appendix B**). No archaeological sites were newly identified within or adjacent to the project corridor during the current survey and no previously recorded archaeological sites were located within the archaeological APE. Accordingly, the impact determination for this category is "**None**".

B.4 RECREATION AREAS

The ETDM metadata and its use in generating what resources are "found" within the EST GIS buffers indicate that there are statewide (typically land based) Ecological Greenways Critical Linkages and Greenways Ecological Priority Linkages that could be associated with the proposed project. These FDEP designations contain all of the largest areas of ecological and natural resource significance and the landscape linkages necessary to link these areas together in one functional statewide network. This data was created as part of the Florida Statewide Greenways Planning Process. The Florida Ecological Greenways Network identifies the opportunities to protect large, intact landscapes important for conserving Florida's biodiversity and ecosystem services.

A review of the GIS analysis data indicates that the following are located within the 100-foot project buffer:

- Priority 6 and Unknown Description Ecological Greenways Critical Linkages and Prioritization Results
- One Low Greenways Ecological Priority Linkages
- Two High Office of Greenways and Trails (OGT) Multi-Use Trail Priorities
- One Low OGT Multi-Use Trail Priorities
- One Low OGT Paddling Trails Priorities

FDEP noted that further review of GIS data and Google Street View revealed that most of these facilities do not currently exist. A review of the OGT Map did not identify any existing resources within the project area. There are no FDEP designated Ecological Greenways Critical Linkages and Greenways Ecological Priority Linkages that are officially designated, marked or signed as such either within, along or perpendicular (intersecting) to the project's study limits.

The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies three *future* recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. One of these trails, the proposed Howard Park Trail, will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge. The Bicycle and Pedestrian Planner at Pinellas County stated that there has been no engineering or other evaluation of these planned cost feasible trailways projects.

The MPO is anticipating that improved facilities along these existing routes will be constructed as part of future roadway resurfacing or widening projects. Existing sidewalks on the Beckett Bridge are only 2'2" wide. There are no bicycle lanes or shoulders on the bridge. The proposed project will provide improved pedestrian and bicycle facilities on the Beckett Bridge. This will enhance recreational opportunities associated with planned future recreational trails. Accordingly, the impact determination for this category is "**Not Significant**".

C.1 WETLANDS

A review of the GIS analysis data indicates that the National Wetlands Inventory (NWI) lists 1.5 acres (19.01%) of estuarine wetlands within the 100-foot buffer distance, 3.7 acres (20.7%) of estuarine wetlands within the 200-foot buffer distance, and 10.0 acres (18.21%) of estuarine wetlands within the 500-foot buffer distance. SWFWMD noted that there are wetlands consisting of red mangrove (*Rhizophora mangle*) and black mangrove (*Avicennia germinans*) at the following locations: at the bridge crossing; both upstream and downstream of the bridge crossing on the west shore of the bayou; and on the south side of Riverside Drive within the east approach cross section across from Pampas Avenue. In addition, seagrass beds are present in the Bayou both upstream and downstream of the bridge crossing except in the deepest parts of the Bayou.

The USEPA noted that any studies for this project should focus on identifying the wetland areas and other natural resources (mangroves) to be potentially impacted and what type of additional analysis, if any, will be needed. Additional analyses may be needed such as delineation of wetlands and functional analysis of wetlands to determine their value and function, an evaluation of stormwater pond sites, avoidance and minimization strategies, and mitigation plans to compensate for adverse impacts.

A detailed site review was conducted by project team biologists. Based on collected field data and in-house reviews, one tidally influenced, estuarine surface water known as Whitcomb Bayou occurs within the project area. Two wetland habitat types, mangrove swamps and oyster bars are included within the Whitcomb Bayou boundaries of the project study area. Additional descriptions of wetlands found in the vicinity of the bridge are described below:

Surface Water 1 (Whitcomb Bayou)
FLUCFCS: 540 (Bays and Estuaries)
FWS: E2UB3 (Estuarine, Intertidal, Unconsolidated Bottom, Mud)
Bays and estuaries are tidally influenced inlets or large bodies of water that extend from the ocean into the land mass of Florida. Within the project study area, this category includes 10.38 acres of Whitcomb Bayou.

Whitcomb Bayou is part of the Anclote River Bayou complex. The Anclote River Bayou complex is a Class III Outstanding Florida Water in the Pinellas County Aquatic Preserve. Within the project area, the west and east shorelines of the bayou are hardened with vertical seawalls. Bottom sediments within the project study area consist of unconsolidated mud. According to the Florida Fish and Wildlife Conservation Commission (FWC) (2010), the nearest documented seagrass beds are located approximately 200 feet north of the project study area. However, no seagrass or attached macro-algaes were observed within the project study area during the June 2012 field review. No seagrass blades or macro algae branchlets were present within the rack line in or adjacent to the project study area.

Mangrove Swamps
FLUCFCS: 612
FWS: E2SS3 (Estuarine, Intertidal, Scrub-Shrub, Broad-Leaved Evergreen)
Mangrove swamps are typically coastal hardwood swamps where red mangrove and/or black mangroves are pure or predominant. White mangroves (*Laguncularia racemosa*) are also typically found within these swamps. Within the project study area, mangrove stands are dominated by black mangrove, white mangrove, red mangrove, saltweed (*Philoxerus vermicularis*), and marsh elder (*Iva frutescens*). Mangroves were observed on the west end of Beckett Bridge, north and south of the existing roadway. In addition, mangroves and associated species were observed along Whitcomb Bayou on the south side of North Spring Boulevard. The mangroves in this area are trimmed and maintained. Mangrove swamps comprise 0.12 acre of the total project study area. During the field review, no bird nests or wading birds were observed within the mangrove swamps.

Oyster Bars
FLUCFCS: 654
FWS: E2RF2 (Estuarine, Intertidal, Reef, Mollusk)
Barnacles (*Balanus* sp.) and oysters (*Crassostrea virginica*) were observed in the intertidal zone attached to the bridge pilings, seawall face, and pieces of debris on the bottom of the bayou. A dense accumulation of live oysters was observed under the east and west ends of Beckett Bridge. Oyster bars comprise 0.17 acre of the total project study area.

Most wetland impacts that may occur as a result of construction of any of the three build alternatives are limited to shading as a result of the widened structure. Vegetated wetland habitats were considered to be impacted if located under the drip line of the proposed structure. Bridge piling impacts are unknown at this time since detailed design is not available. However, it is assumed that the removal of old pilings and replacement of new pilings will result in less or similar open water impacts; therefore, fill impacts to open water habitat underneath the drip line are assumed to be *de minimus*.

The proposed project will impact approximately 0.01 acre of Mangrove Swamp and 0.02 acre of Oyster Bars. The wetlands within the project study area impacted by the proposed improvements were assessed using the Uniform Mitigation Assessment Methodology (UMAM) per Chapter 62-345, FAC. The results are provided below.

UMAM Summary for Wetland Impacts and Functional Loss

Proposed Project	FLUCFCS Code	FWS Classification	Delta	Wetland Impacts	
				Impact Acres	Functional Loss[1]
Movable Bridge	612	E2SS3	0.17	0.01	0.002
	654	E2RF2	0.13	0.02	0.001

[1]*Total Functional Loss rounded to the nearest hundredth.*

Based on meetings with SWFWMD staff, it is anticipated that the project will qualify for the 62.330-443 General Permit to the Florida Department of Transportation, Counties, and Municipalities for Minor Bridge Alteration, Placement, Replacement, Removal, Maintenance, and Operation (previously Noticed General Permit 40D-400.443). If the project qualifies, no mitigation will be required since the wetland impacts will be less than 0.5 acre.

If the project does not qualify for this General permit, or if mitigation is required by other agencies, a mitigation plan will be developed during the design phase. Mitigation through Chapter 373.4137, F.S. (i.e., Senate Bill, 1986) is not available for this project because FDOT is not the applicant. A review of the available data from FDEP and the water management districts indicates that the proposed project currently is not located within the service area of any permitted mitigation banks. For the reasons listed above, any unavoidable wetland impacts will have to be mitigated (if required) by creating, restoring, enhancing, or preserving wetlands on-site or off-site within the same drainage basin if there are no mitigation opportunities at the project site.

No seagrass beds will be impacted. If mitigation is required by one of the reviewing agencies, "in-kind" mitigation at the project site may not be a feasible option due to the limited ROW and surrounding developments. Therefore, an "out-of-kind" mitigation option, such as water quality improvements, may be requested during the design and permitting phase of this project. Any proposed mitigation will be coordinated with the NMFS, FWS, and the SWFWMD. Accordingly, the impact determination for this category is "**Not Significant**".

C.2 AQUATIC PRESERVES

A review of the GIS analysis from the EST indicates that the project is located in and adjacent to the Pinellas County Aquatic Preserve which is an Outstanding Florida Water. The County will implement appropriate best management practices during construction to prevent violations to water quality standards. The project will be located within the existing County right-of-way.

An Environmental Resource Permit will be required for construction of the proposed project. Permit requirements and conditions related to water quality will be complied with. Because the proposed new bridge does not provide any additional capacity, it is not anticipated that this project will have a substantial impact on water quality. Accordingly, the impact determination for this category is "**Not Significant**".

C.3 WATER QUALITY

The proposed new movable bridge will be constructed on approximately the same alignment as the existing bridge. The new bridge will only provide two travel lanes, the same as on the existing bridge. No additional capacity will be added. However, the proposed new movable bridge will be wider than the existing to provide travel lanes, shoulders and sidewalks that meet current design standards. There are no shoulders on the existing bridge, and the sidewalks are substandard (only 2'2" wide).

As stated in the ETDM Summary Report, the entire project is located in the Anclote River Bayou Complex (WBID 1440A) watershed which is a major embayment (bayou) of the tidal segment of the Anclote River (WBID 1440). The river, which heads 1.3 miles west of US 41 in Pasco County, discharges to the Gulf of Mexico (WBID8045C) at the Pasco-Pinellas County Line just north of St Joseph's Sound (WBID 8045D). Beckett Bridge carries Riverside Drive over Minetta and Whitcomb Bayous, both of which are included in the Pinellas County Aquatic Preserve and are designated Outstanding Florida Waters (OFWs).

The FDEP Verified List of Impaired Waters, dated May 19, 2009, included information regarding total maximum daily levels (TMDLs) for various constituents in the OFWs located in the vicinity of the project area. The following conclusions related to TMDLs were included in that list:

1. Nutrients: The Anclote River Bayou Complex (WBID 1440A) is impaired for nutrients
2. Dissolved oxygen: The Anclote River Bayou Complex (WBID 1440A) is impaired for dissolved oxygen.
3. Mercury in fish: The Anclote River Tidal watershed (WBID 1440) is impaired for mercury in fish.

Additionally, information from DRASTIC analyses indicates that the surficial aquifer and the Floridan Aquifer within the 100-foot to 500-foot buffers to the project limits have high potentials for contamination. The surficial aquifer is used for landscape irrigation and it contributes flows to canals, ditches and streams in the area. The Stamas Yacht facility, located within 420 feet of the east terminus of the project, may have produced contaminated soils or groundwater plumes within 100-200 feet of the project. Therefore, the FDEP recommended in the ETDM report that an assessment of the areas to be excavated for the project be done to ensure that no pollution from contaminated soils or waters results from project activities.

A Water Quality Impact Evaluation (WQIE) was conducted for this project to comply with the Clean Water Act (surface waters) and the Safe Drinking Water Act (groundwater impacts). The WQIE Checklist is included in the project files.

A Contamination Screening Evaluation Technical Memorandum was prepared for this project. Only one site within the project study area was assigned a "Medium" risk. This site, Stamas Yacht, Inc., presents a contamination potential based on current and historical environmental records; however, it is not anticipated that this facility will be impacted as part of the current project design.

The County will implement appropriate best management practices during construction to prevent water quality violations. An Environmental Resource Permit will be required for construction of the proposed project. The contractor will comply with all permit requirements and conditions related to water quality. Because the proposed new bridge does not provide any additional capacity, it is not anticipated that this project will have a substantial impact on water quality. Accordingly, the impact determination for this category is "**Not Significant**".

C.4 OUTSTANDING FLORIDA WATERS

A review of the GIS analysis from the EST indicates that the project is located in and adjacent to the Pinellas County Aquatic Preserve which is an Outstanding Florida Waters. The project will be located within the existing County right-of-way. The County will implement appropriate best management practices during construction to prevent water quality violations. An Environmental Resource Permit will be required for construction of the proposed project. Permit requirements and conditions related to water quality will be complied with. Because the proposed new bridge does not provide any additional capacity, it is not anticipated that this project will have a substantial impact on water quality. Accordingly, the impact determination for this category is **"Not Significant"**.

C.6 FLOODPLAINS

In accordance with the requirements set forth in 23 CFR 650A, the project corridor was evaluated to determine the effects, if any, of the proposed alternatives on the hydrology and hydraulics of the area. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Panel 19 of Map Number 12103C00196 (September 2003), the Beckett Bridge and immediate vicinity are located within the 100 year floodplain in designated Zone AE. The Base Flood Elevation established for Minnetta Bayou/ Spring Bayou is elevation 10 feet which is associated with coastal tidal surge conditions.

The proposed replacement bridge will be constructed in approximately the same location as the existing bridge to minimize impacts. There are no existing or proposed cross drains within the project limits. The proposed structure (replacement bridge) will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. Within the project corridor, the improvements to the existing Riverside Drive and Beckett Bridge represent transverse encroachments on the floodplain. This encroachment should remain at existing levels. As a result, the project will not affect existing flood heights or floodplain limits.

Cut and fill activities required as part of the roadway improvements are not expected to significantly impact the fauna, flora, and open space environments along the corridor. The project will not result in substantial adverse environmental impacts. The proposed project will not significantly change the risks or damages associated with roadway flooding. There will not be significant change in the potential for interruption or termination of emergency services or emergency evacuation routes. Therefore it has been determined that this encroachment is not significant.

The encroachments for the bridge will mainly involve modifications at the approaches to the bridges as well as incidental encroachments due to bridge modification or replacement activities, where applicable. Since the existing flood zones are associated with coastal surge, compensation for the floodplain impacts is not anticipated to be required by the regulatory agencies. Accordingly, the impact determination for this resource category is "**Not Significant**".

C.7 COASTAL ZONE CONSISTENCY

According to the ETDM EST *Track Clearinghouse Projects Report* for this project, the State of Florida has determined that this project is consistent with the Florida Coastal Zone Management Plan (FCMP). The State's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting process in accordance with Section 373.428, Florida Statutes. Therefore, the impact determination for this category is "**None"**.

C.9 WILDLIFE AND HABITAT

Review of GIS data indicates that the project is located within the Springs Coast Ecosystem Management Area, the West Indian Manatee Consultation Area and Important Manatee Area (IMA); the Consultation Areas for both the scrub jay and piping plover; and the core foraging area for the woodstork. No designated Critical Habitat was identified within the project study area.

A Biological Assessment Technical Memorandum was prepared for the project and coordinated with the USFWS and the FWC. Project biologists made a finding of "no effect" for the Southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. The FWC, by letter dated April 22, 2013 (included in **Appendix C**) concurred with these determinations and supported the protected species commitments identified in the report which include the following:

1. Compliance with the USFWS "Standard Protection Protocols for the Eastern Indigo Snake" and paragraph E of the U.S. Army Corps of Engineers Eastern Indigo Snake Programmatic Key.

2. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.

3. Submission of a blasting plan (if blasting occurs*), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction. [**Note that pending further coordination with NMFS and USFWS, the County commits to prohibiting blasting for demolition of the existing bridge*]

4. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.

5. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.

6. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

By letter dated June 12, 2013 (included in **Appendix C**), the USFWS initially concurred with the Biological Assessment's determination that the project may affect, but is not likely to adversely affect the piping plover, is not likely to adversely affect the wood stork or eastern indigo snake and will have no effect on federally listed plants. The USFWS further noted that there is no appropriate habitat for the piping plover, no suitable foraging habitat for the woodstork, and no undisturbed upland habitat near the project that might support the eastern indigo snake or listed plants. Accordingly, the USFWS will not require implementation of the "Standard Construction Measures for the Eastern Indigo Snake".

USFWS also stated that they will not be able to make an impact determination for the Florida manatee, gulf sturgeon or sea turtles until more specific information is available concerning construction. The timing and duration of construction, as well as construction methods, will determine the appropriate conditions to safeguard manatees and other aquatic species. Accordingly, in a letter to USFWS dated June 17, 2015, Pinellas County provided the following commitment:

> "Pinellas County, in coordination with FDOT, intends to request that the NMFS and USFWS reinitiate "informal" consultation for the project's effects on the listed species during the final Design phase of the project and in conjunction with the project's permitting process. Consultation will be concluded before the project is advanced to the Construction phase. Pinellas County, in compliance with 23 CFR 771.133 and Section 7 of the Endangered Species Act (Act), agrees not to begin construction on the project, or otherwise make any irreversible or irretrievable commitment of resources that has the effect of foreclosing the

formulation or implementation of any reasonable and prudent alternative, or reasonable and prudent measures (which would not violate Section 7(a)(2) of the Act), until consultation with NMFS and USFWS is concluded. This constitutes a commitment by Pinellas County of reasonable assurance, which is to be stipulated in the Commitments and Recommendations Section of the final NEPA document for the project, which is subject to FHWA approval."

Additionally, the County commits to excluding blasting as a means of demolishing the existing bridge. Given these commitments and based on the information available for the current planning phase of the proposed project, USFWS agreed that a 'may affect, but is not likely to adversely affect" determination is currently appropriate for the manatee.

The project study area is located within a designated USFWS consultation area for the Florida scrub jay (*Aphelocoma coeruluscens*). Based on a review of available data and field reviews, no scrub jay habitat is available within the project study area and no populations have been reported or observed. Therefore, no further scrub jay consultation with USFWS should be required for this project.

Based on the Biological Assessment and agency coordination, the impact determination for this category is "**Not Significant**".

C.10 ESSENTIAL FISH HABITAT

The GIS analysis data completed during the ETDM process indicates that two Environmentally Sensitive Shorelines are locate within the 100-foot project buffer. National Marine Fisheries Service (NMFS) staff conducted a site inspection of the project area in November 2010. NMFS staff noted that mangroves occur immediately adjacent to the bridge. In addition, NMFS staff noted that certain estuarine habitats within the project area are designated as Essential Fish Habitat (EFH) and requested that an EFH Assessment be conducted.

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, an EFH evaluation was conducted for the project. The Gulf of Mexico Fishery Management Council (GMFMC) manages 55 species of fish for the Gulf of Mexico area. Of these, the GMFMC has identified and described EFH for 26 representative managed species. Species accounts of each of the 26 representative managed species were reviewed to assess the potential occurrence of these species within the project study area during any stage of their life cycle. Of the 26 representative fish, shrimp, and crab species listed by the GMFMC, only the gray snapper (*Lutjanus griseus*) is considered to have a high potential to occur within the project limits. The remaining 25 representative species and the coral complex are considered to have a low to no potential to occur within the project limits.

Construction of the proposed project will not result in the loss of open water area designated as EFH. However, approximately 0.02 acre of oyster beds and 001 acre of mangroves will be impacted. Impacts to oyster beds will likely be temporary; live oysters can be relocated prior to construction and oysters may recolonize the area following construction. If required by conditions of the environmental permits or the US Coast Guard Bridge Permit, all permanent and temporary loss of these habitats will be mitigated. Accordingly, no populations of any of the 26 representative fish, shrimp, and crab species and the coral complex listed by the GMFMC are expected to be adversely affected by the proposed project.

By email dated, April 15, 2013 (**Appendix C**), the NMFS stated that the essential fish habitat effect determinations presented in the Wetland Evaluation/Essential Fish Habitat technical memorandum appear to accurately reflect potential impacts to NMFS trust resources for the proposed bridge replacement. Given the relatively low quantity of impacts to fish habitats estimated for all the alternatives, NMFS also stated that they would be generally more inclined to accept appropriate off-site (but within the same drainage basin) "in-kind" mitigation, rather than "out-of-kind" mitigation for unavoidable project impacts. NMFS also requested continued coordination at the conclusion of the PD&E Study and during the Design phase when more detailed compensatory mitigation proposals are developed.

Based on further coordination with NMFS in a letter dated June 17, 2015, the County also commits to excluding blasting as a means of demolishing the existing bridge and intends to request that the NMFS reinitiate "informal" consultation for the project's effects on the listed species during the final Design phase and in conjunction with the project's permitting process. Accordingly, based on the conclusions of the Wetland Evaluation Report/Essential Fish Habitat Technical Memorandum, subsequent agency coordination, and commitments to be upheld by Pinellas County throughout the Design and Construction phases of the project, the impact determination for this category is "**Not Significant"**.

D.1 NOISE

A noise study analysis was performed for this project following FDOT procedures that comply with Title 23 Code of Federal Regulations (CFR), Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. The evaluation used methodologies established by the FDOT and documented in the PD&E Manual, Part 2, Chapter 17 (May 2011). The prediction of traffic noise levels, with and without the proposed improvements (replacement of the Beckett Bridge), was performed using the FHWA's Traffic Noise Model (TNM-Version 2.5).

Twenty-seven noise sensitive sites, including 26 residential sites and one meeting room (Tarpon Springs Yacht Club) were identified. The existing (2012) traffic noise levels are predicted to range from 54.6 to 63.2 decibels on the "A" weighted scale (dB(A)), which are traffic noise levels that would not approach, meet, or exceed the Noise Abatement Criteria (NAC) at any of the evaluated noise sensitive sites. In the future without the proposed improvements (no-build), traffic noise levels were predicted to range from 55.8 to 64.4 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. In the future with the proposed improvements (build), traffic noise levels were predicted to range from 56.9 to 64.7 dB(A), which are also levels that would not approach, meet, or exceed the NAC at any of the evaluated sites. Additionally, when compared to the existing condition, traffic noise levels with the improvements are not predicted to increase more than 2.8 dB(A). As such, the project would not substantially increase traffic noise (i.e., an increase in traffic noise of 15 dB(A) or more).

Since future traffic noise levels with the proposed improvements are not predicted to approach, meet, or exceed the NAC at any of the noise sensitive sites or substantially increase, noise abatement measures were not considered. However, Pinellas County commits to review the project for any changes in land use during the Design Phase of the project to ensure that all noise sensitive sites that received a building permit prior to the project's Date of Public Knowledge (i.e., the date the environmental documentation is approved) have been evaluated. No construction or posted building permits were observed within the project limits during a land use survey that was performed on November 13, 2012.

Construction of the proposed project would result in temporary construction-related noise and vibration. It is anticipated that the application of the *FDOT Standard Specifications for Road and Bridge Construction* will minimize or eliminate this noise and/or vibration. Should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the Contractor, will investigate additional methods of controlling these impacts.

Land uses such as residential, offices, and parks are considered incompatible with highway noise levels exceeding the NAC. In order to reduce the possibility of new noise-related impacts, noise level contours were developed for the future improved roadway facility (see Section 6 of this NSR). These noise contours delineate the distance from the improved roadway's edge-of-travel lane to where 56, 66, and 71 dB(A) (the FDOT's NAC for Activity Categories A, B/C, and E, respectively) is expected to occur in the year 2038 with the proposed improvements. Local officials will be provided a copy of the Final NSR to promote compatibility between land development in the area and the project.

Accordingly, the impact determination for this category is "**Minimal**".

D.2 AIR QUALITY

The US Environmental Protection Agency does not anticipate any negative air quality impacts relating specifically to the project. Pinellas County is currently designated to be an attainment area for all of the National Ambient Air Quality Standards (NAAQS). Accordingly, the transportation conformity requirements of the Clean Air Act are not applicable to the project. The proposed replacement two-lane bridge is not a capacity improvement.

The project alternatives were subjected to the FDOT's screening model, CO Florida 2004 (Version 2.0.5, which employs United States Environmental Protection Agency (USEPA)-developed software (MOBILE6 and CAL3QHC). This model is a carbon monoxide (CO) screening model that makes various conservative worst-case assumptions related to site conditions, meteorology, and traffic. The results of the screening analysis indicate that the greatest one- and eight-hour CO concentrations would be 6.1 and 3.7 ppm, respectively - levels that would not meet or exceed the NAAQS for this pollutant. Accordingly, the project "passes" the screening model. An Air Quality Technical Memorandum documenting the air quality screening analysis was prepared for this project and is available at the County offices.

The impact determination for this category is "**Minimal**".

D.3 CONSTRUCTION

Construction activities for the proposed improvements will have air, noise, water quality, traffic flow, and visual impacts for those residents and travelers within the immediate vicinity of the project. The air quality impact will be temporary and will primarily be in the form of emissions from diesel powered construction equipment and dust from embankment and haul road areas. Air pollution associated with the creation of airborne particles will be effectively controlled through the use of watering or the application of calcium chloride in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* as directed by the County Project Manager.

Noise and vibration impacts will be from the heavy equipment movement and construction activities, such as demolition, pile driving and vibratory compaction of embankments. Noise control measures will include those contained in FDOT's *Standard Specifications for Road and Bridge Construction*.

Water quality impacts resulting from erosion and sedimentation will be controlled in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* and through the use of Best Management Practices. Stormwater pollution prevention measures will likely be developed per FDOT standards and in accordance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signs will be used as appropriate to provide notice of detours, lane closures and other pertinent information to the traveling public. The local news media will be notified in advance of detour lane closings and other construction-related activities, which could excessively inconvenience the community.

A sign providing the name, address, and a contact telephone number will be displayed on-site to assist the public in obtaining immediate answers to questions and logging complaints about project activity. In general, the objective of the maintenance of traffic plan for the project will be to detour traffic away from the construction zone. No temporary roads or temporary bridges will be required.

Construction of the roadway may require minor excavation of unsuitable material (muck). Construction of the roadway will require placement of embankments, and use of materials such as lime rock, asphaltic concrete, and Portland cement concrete. Although not anticipated, if demucking is required, it will be performed in accordance with Section 120 of the FDOT *Standard Specifications for Road and Bridge Construction*. The removal of structures and debris will be in accordance with local and State regulatory agencies permitting this operation. The contractor is responsible for methods of controlling pollution on haul roads (if used), in borrow pits, other materials pits, and areas used for disposal of waste materials from the project. Temporary erosion control features, as specified in the FDOT's *Standard Specifications for Road and Bridge Construction*, Section 104, will consist of temporary grassing, sodding, mulching, sandbagging, hay bales, slope drains, sediment basins, sediment checks, artificial coverings, and berms.

In addition to the nonstandard items above/below, the project will be implemented in a manner consistent with the FDOT *Standard Specifications Manual*.

D.4 CONTAMINATED SITES

A Contamination Screening Evaluation Technical Memorandum was prepared as part of the Beckett Bridge Pinellas County Study as required by FDOT's PD&E Manual, Part 2, Chapter 22 (revised January 17th, 2008) and in accordance with the FHWA Technical Advisory T 6640.8a (dated October 30th, 1987). Consistent with this guidance and based on environmental records searches, land use surveys, field surveys and other screening methodologies cited within the PD&E Manual, eight potential contamination sites were identified within the vicinity of the project corridor. Of the eight sites, six were identified as "No" contamination risk, one was identified as "Low" contamination risk, and one was identified as "Medium" contamination risk.

The "Low" risk site corresponds to the wooden structures (i.e., piles) immediately adjacent to the Beckett Bridge which could contain creosote and/or arsenic as preservatives. Should some or all of these piles require removal or disturbance during the construction period, they should be evaluated beforehand to verify the presence or absence of these substances. If these substances are present, precautions should be taken by the contractor to help prevent the leaching of creosote into the waterway or the generation of arsenic-containing dust.

The "Medium" risk site, Stamas Yacht, Inc., presents a contamination potential based on current and historical environmental records, however, the site is located a substantial distance from the existing Riverside Drive right-of-way and will not be impacted as part of the current project design.
Accordingly, no further evaluation of these sites is recommended during the design phase of the project unless changes are made to the project design that could potentially change the location or alignment of the bridge.

An asbestos survey of the Beckett Bridge structure was conducted as part of the PD&E Study. The purpose of this survey was to identify and sample suspect asbestos-containing materials (ACM) and heavy metals based protective coatings to provide information regarding the identity, location, condition and approximate quantities of these materials so that proper remediation and disposal methods can be evaluated.

The survey was conducted on April 29, 2012 by an Asbestos Hazard Emergency Response Act (AHERA) accredited inspector in general accordance with the sampling protocols established in

Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) 763. Thirteen bulk samples were collected from four homogeneous areas of suspect ACM. No Asbestos Containing Materials were identified as a result of the survey.

Three painted surfaces, suspected of containing heavy metal based paints, were observed during the survey and sampled. None of the sample results indicated that the paints were Lead Based Paint (LBP).

Accordingly, the impact determination for this resource category is "**None**".

D.5 AESTHETIC EFFECTS

Computer generated representations were developed which simulated the views from five vantage points within the vicinity of the bridge for both the movable and fixed bridge alternatives. In addition, an animated "drive-through" view of both alternatives was prepared. These computer generated representations were designed to help the community visualize what a replacement bridge might look like. These renderings were shown to the public at the Alternatives Public Workshop, stakeholder presentations, and the Public Hearing.

Perceptions of visual impacts are very subjective and some concerns about impacts to the viewshed have been raised by the community. A preference for a bridge which is compatible with the scale and historic nature of the local community was expressed. Some concerns about potential impacts to waterfront view were raised by waterfront residents adjacent to the bridge. The proposed bridge will be constructed on approximately the same alignment as the existing bridge; however, it is approximately 19 feet wider than the existing bridge.

The vertical profile of the proposed replacement bridge will be similar to the existing bridge, but there will be a slight increase in the vertical clearance over the navigable channel at the fenders. The proposed roadway profile will be approximately two feet higher than the existing roadway at the west end of the replacement bridge. At the east end, the new roadway profile will be about four feet higher than the existing grade. A low gravity wall will change the views from some vantage points.

The County has proposed a budget of ten percent of the construction cost for aesthetics for the replacement bridge. Decisions related to the aesthetics of the bridge will not be made during the PD&E study. An aesthetics committee will be established during the design phase to address bridge aesthetics. Members of the community and local government will be included on the committee.

The impact determination for this resource category is **"Minimal**".

D.6 BICYCLES AND PEDESTRIANS

Screening for potential impacts to "Mobility" includes effects to bicycles and pedestrians. Both FDOT and the Department of Community Affairs stated that improved bicycle and pedestrian facilities on a replacement bridge would enhance mobility.

Narrow sidewalks, approximately 2'2" in width (between the brush curb and the bridge railing), occur on both sides of the existing bridge. The sidewalks on the bridge are set behind a 9-inch wide, 9-inch tall brush curb, but are not separated from the travel lanes by a traffic barrier. Bicycle lanes are not currently provided on the roadway or bridge within the project limits. The existing lanes are a substandard 10-feet wide and there are no shoulders. Bicyclists have been observed using the travel lanes and the narrow sidewalks.

Sidewalks, approximately four to five-foot wide, are present on portions of the approach roadway within the project limits. West of the bridge, sidewalks are continuous on the north side of Riverside drive from the bridge extending west of Chesapeake Drive. No sidewalks occur on the south side of the roadway in this area. East of the bridge, continuous five-foot wide sidewalks are present on the north side of Riverside Drive between Pampas and Forest Avenue. A few sections of discontinuous sidewalk do occur on the south side of the roadway between the bridge and Pampas Avenue, and for a short distance just west of Forest Avenue.

The proposed replacement bridge will provide six foot wide sidewalks and 5.5 feet wide shoulders on both sides of the bridge. The shoulders will function as undesignated bicycle lanes for experienced cyclists. These facilities will be continued on the approach roadways east of the existing bridge. West of the proposed bridge, the six foot sidewalk on the south side will be eliminated because of right of way constraints. Construction of a sidewalk in this area would require acquisition of property from the Bayshore Mobile Home Park. It is anticipated that if the existing mobile home park is redeveloped in the future, sidewalks could be added. These improvements will provide safer bicycle and pedestrian facilities on the bridge and approach roadways. The proposed sidewalk approaching the western terminus of the bridge will be tapered to transition to the narrower roadway section. Signs will be installed which clearly indicate that the sidewalk will end.

No officially designated county or regional pedestrian or bicycle trails cross the Beckett Bridge. However, the Pinellas Trail, a 37 mile long regional trail, extending from St. Petersburg to Tarpon Springs is located just east of the project. The Pinellas County Trailways Plan, included in the Pinellas County MPO 2035 Long Range Transportation Plan, identifies three future recreational bicycle/pedestrian trails that will connect to the Pinellas Trail and continue west. These trails are not currently funded, but are included in the Planned Cost Feasible Trailways Projects. The proposed Howard Park Trail will provide access to Howard Park from the Pinellas Trail via Riverside Drive/North Spring Boulevard, crossing the Beckett Bridge.

The impact determination for this resource category is "**None**".

D.7 UTILITIES AND RAILROADS

No railroads occur in the vicinity of the proposed project.

Knology Broadband of Florida, Bright House Networks, Progress Energy Florida, Verizon, and the City of Tarpon Springs operate utilities within the project area. Knology Broadband has aerial coaxial cables entering the project area along Spring Boulevard on the east side of the bridge and along Riverside Drive on the west side of the bridge. These Knology cables are co-located on Progress Energy utility poles. Spurs of the aerial coaxial cables extend along Chesapeake Drive from Doric Court to the Bayshore Cove Mobile Park, and along Forest Avenue from North Spring Boulevard to High Street. In addition, a Knology broadband underground coaxial cable is located adjacent to the Tarpon Springs Yacht Club along the north side of Spring Boulevard.

City of Tarpon Springs wastewater force mains are located along Riverside Drive. A six inch force main is located on the south side of the bridge and a 12 inch force main is located on the north side of the bridge; however, these mains are located outside of the bridge fender system**.** A pump station is located on the north side of Riverside Drive at Chesapeake Drive. No other City utilities occur within the project limits.

Utilities will be located more precisely during the Design phase of the project and coordination with utility owners will continue. Depending on the location and depth of the utilities, construction of the proposed project may require adjustment of some of these facilities. Since no construction will occur outside of existing right-of-way, relocation or adjustment of most utilities located outside the existing County right-of-way is not anticipated. Cost for relocation or adjustment of activities is not included in the cost estimates prepared for the project and reported in Section 6.0 of the Preliminary Engineering Report prepared for the project, since most are anticipated to be incurred by the utility owner. It is not anticipated that the proposed project will impact the existing City of Tarpon Springs Force Main.

The impact determination for this category is “**Not Significant**”.

D.8 NAVIGATION

The existing bridge crosses a narrow channel of Whitcomb Bayou. The bridge provides approximately six feet of vertical clearance at the fenders, and approximately 25 feet of horizontal clearance between the fenders. A US Coast Guard (USCG) bridge permit will be required for construction of the proposed replacement single-leaf low-level movable bridge. The USCG is a cooperating agency for this project; coordination concerning navigational issues has been ongoing throughout the PD&E Study.

The proposed replacement bridge will be constructed on approximately the same alignment as the existing bridge and provide approximately 7.8 feet of vertical clearance at the fenders, slightly more than the existing bridge. The proposed horizontal clearance is the same as the existing bridge. Construction of the replacement bridge will not adversely impact navigation in the channel.

When the existing bridge opens, the leaf rolls away from the channel and rotates to a 49 degree angle. The angle of opening is limited by physical constraints present in the geometric configuration of the counterweight, bascule pier, and approach span. It is not known if these limitations are the result of original construction or subsequent reconstruction and/or repair. However, in this position the bridge provides unlimited vertical clearance only between the west fender and the tip of the span of approximately 14 feet. The rest of the channel is obstructed by the bascule span. The proposed replacement bridge will provide unlimited clearance for the width of the channel between the fenders, approximately 25 feet. This will improve navigation conditions for vessels passing under the bridge. The channel will remain open to marine vessels during construction.

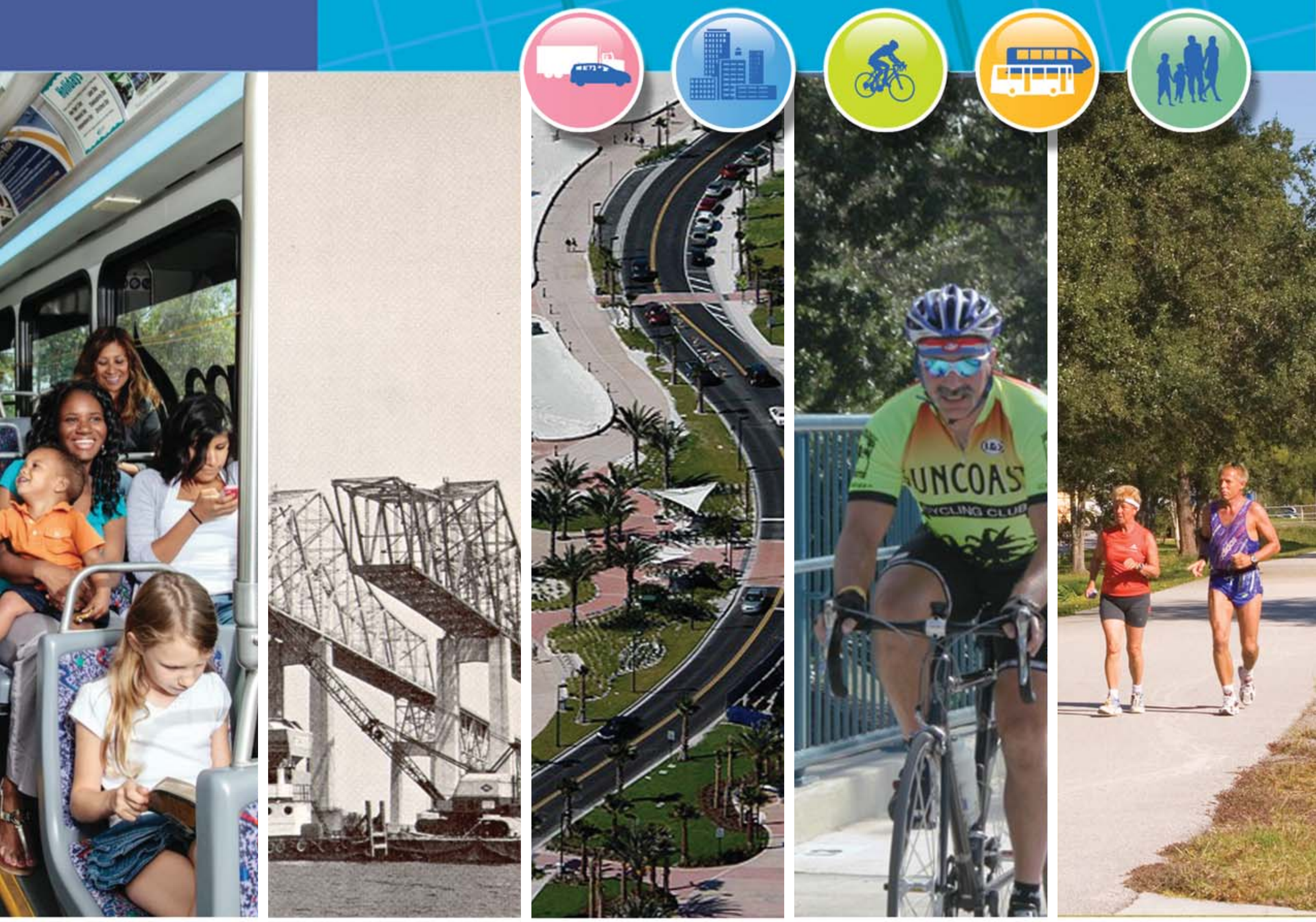
The impact determination for navigation is “**Minimal**”.

APPENDIX A

Planning Consistency Documentation

PINELLAS COUNTY
METROPOLITAN PLANNING ORGANIZATION

2040 Long Range Transportation Plan



DECEMBER 10, 2014

Cost Feasible Plan

The 2040 LRTP earmarks a total of more than $3.4 billion over 20 years for roadway and transit projects. Additional funding in the LRTP for pedestrian and bicycling projects, highway maintenance and resurfacing, management and operations projects and studies, and bridge reconstruction also has been allocated for future preservation and expansion of the multimodal transportation system.

Highway Capacity Projects

As with many financial decisions, the projects selected for inclusion in the Cost Feasible Plan are the result of prioritizing the identified needs and balancing those against the revenue projected to be available. The roadway portion of the LRTP includes significant investment in construction and enhancement of roadways throughout Pinellas County. The major roadway projects included in the Cost Feasible LRTP support economic development, provide for a balanced and multimodal transportation system, and improve the safety of the transportation system, consistent with Goals 1, 2, and 3 of the LRTP.

A total of 28 roadway projects are included in the LRTP—10 State projects and 18 County/municipal projects—as cost feasible. At a total of $1.5 billion, these projects represent capacity increases on nearly 60 miles of roadways and are projected to reduce delay by 10%. In addition to fully funding these 28 projects, partial funding for another 6 projects also is included in the Cost Feasible LRTP as shown in Map 5-6. Additionally, studies are anticipated on roadways such as 22nd Avenue South and 102nd Avenue to determine the type and scope of improvements identified in the LRTP.

Tables 5-8 and 5-9 include a complete listing of projects with anticipated timeframes for completion in the 2040 Cost Feasible Plan. In addition to funding the specific projects listed in these tables, the MPO has determined that $1–$5 million annually can be set aside to fund management and operational improvement projects. As future projects are identified, this source of funding will help address congestion problems without the addition of new lanes to the roadway network.

Maintenance, Operations, and Bridges

As part of the revenue analysis for the LRTP, FDOT maintains a reserve of funding for resurfacing state highways and maintaining state bridges. Appendix B documents the State of Florida’s commitment to maintaining the transportation system.

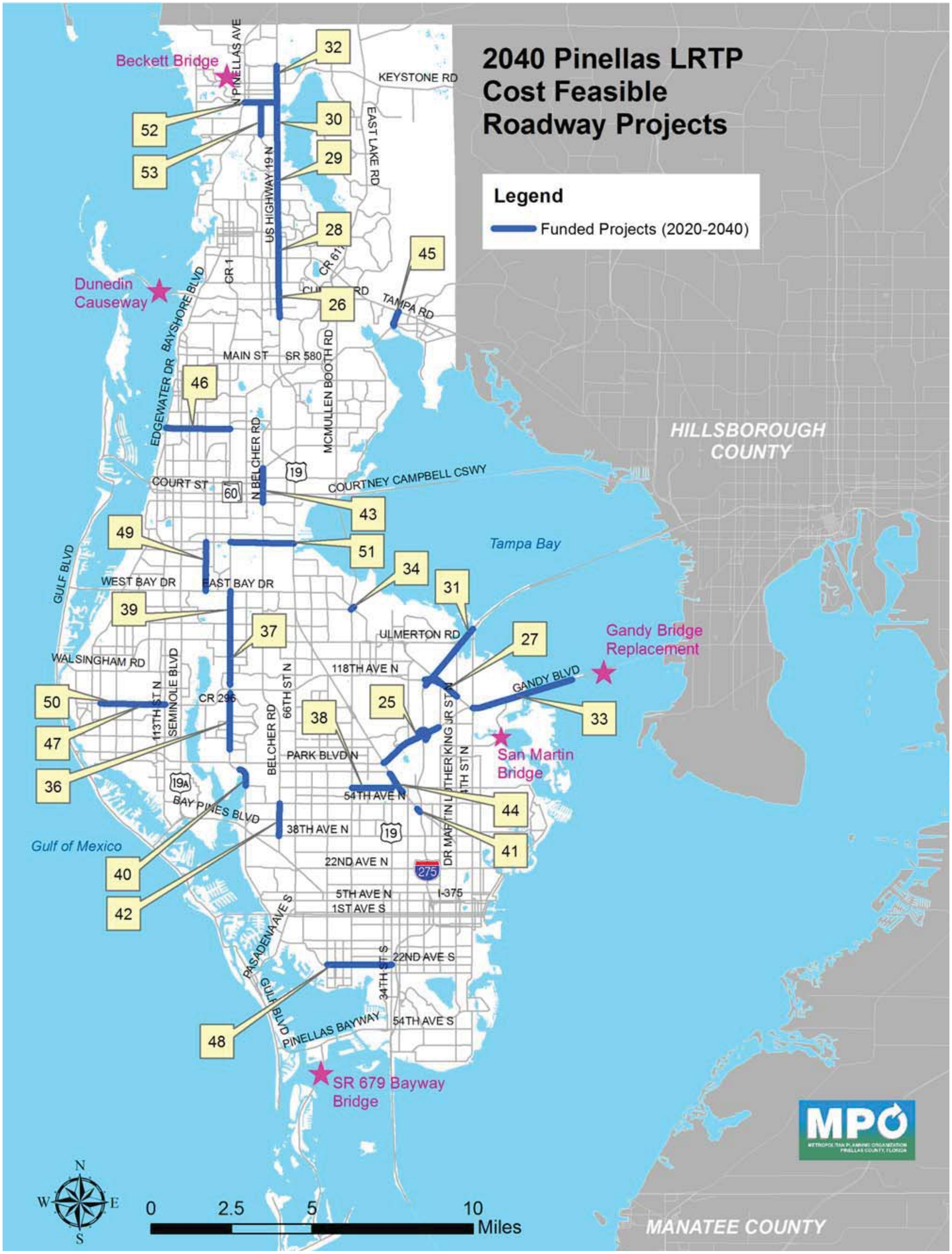
The Pinellas MPO has made a similar commitment through the LRTP. Not allocating all of the available revenues to capacity projects, the LRTP makes available future revenues for addressing major operational and maintenance projects. Revenues such as fuel taxes are applied to maintenance needs, and the 9th Cent Fuel Tax has been dedicated to fund ITS projects. In addition to designated funding for maintenance projects, the MPO has committed to setting aside $1–$5 million annually to fund management and operational improvements. These management and operations projects could include intersection or turn-lane projects as well as future technology projects that will ease congestion. Some proposed corridors where this might occur are listed below.

Table 5-7
Management and Operations and Bridge

Corridors for Management and Operational Improvements	Identified Bridge Replacement Needs
22nd Ave N	Beckett Bridge
54th Ave S	Dunedin Causeway Bridge
East Bay Dr	Gandy Bridge
Alt US 19	San Martin Bridge
East Lake Rd/ McMullen Booth Rd	SR 679 Bayway Bridge
US 19 (SR 55)	
Park Blvd	

Replacement Projects

As a coastal community, bridges provide a critical connection for residents and visitors between the beach communities and the mainland of Pinellas County. As part of the LRTP, the MPO has identified needed replacements for five bridges listed in the above table by 2040. While not identifying timeframes for completion, the MPO has identified initial costs for these replacements. Ultimately, the timing for replacing these bridges will be based on the safety and need for replacement.



Map 5-6: 2040 Cost Feasible Roadway Projects

Transportation Improvement Program (TIP)

Fiscal Years 2015/16 through 2019/20

Pinellas County
Metropolitan Planning Organization (MPO)

Adopted June 10, 2015

Prepared by the MPO for the Pinellas Area Transportation Study

TRANSPORTATION IMPROVEMENT PROGRAM

FISCAL YEARS
2015/16 - 2019/20

Adopted June 10, 2015

Pinellas County
Metropolitan Planning Organization
310 Court Street
Clearwater, FL 33756
Phone: (727) 464-8250
Fax: (727) 464-8212

MPO Web Site: http://www.pinellascounty.org/mpo

This project has been developed in compliance with Title VI of the Civil Rights Act of 1964 and other federal and state nondiscrimination authorities. Neither FDOT nor this project will deny the benefits of, exclude from participation in, or subject anyone to discrimination on the basis of race, color, national origin, age, sex, disability, or family status.

Funding for this report may have been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

PINELLAS COUNTY
METROPOLITAN PLANNING ORGANIZATION

Councilmember Jim Kennedy
Chairman

Commissioner John Morroni
Vice Chairman

Commissioner Joanne "Cookie" Kennedy
Secretary

Councilmember Doreen Hock-DiPolito
Treasurer

Mayor Sandra Bradbury
Commissioner Kevin Piccarreto
Commissioner Julie Ward Bujalski
Commissioner Michael Smith
Councilmember Darden Rice
Commissioner Dave Eggers
Commissioner John Tornga
Commissioner Karen Seel
Commissioner Cliff Merz

Sarah E. Ward
Interim MPO Executive Director

Paul Steinman
FDOT District Seven Secretary (Non-voting Advisor)

PINELLAS COUNTY METROPOLITAN PLANNING ORGANIZATION
TRANSPORTATION IMPROVEMENT PROGRAM
Fiscal Year 2015/16 – 2019/20

TABLE OF CONTENTS

PINELLAS COUNTY METROPOLITAN PLANNING ORGANIZATION
TRANSPORTATION IMPROVEMENT PROGRAM
FISCAL YEARS 2015/2016 THROUGH 2019/2020
ENDORSEMENT

This document was prepared by the Pinellas County Metropolitan Planning Organization (MPO) in cooperation with the Florida Department of Transportation, the Pinellas County Public Works, the Pinellas Suncoast Transit Authority, local airport operators, and the twenty-four incorporated municipalities.

Preparation of this document was financed in part by the United States Department of Transportation under the Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012.

The Pinellas County Metropolitan Planning Organization at its regular meeting of June 10, 2015 endorsed the FY 2015/2016 through FY 2019/2020 Pinellas Area Transportation Study Transportation Improvement Program (TIP), including the Annual Element and supporting documentation, as contained on the pages which follow. This Transportation Improvement Program represents information from the Florida Department of Transportation's State Work Program covering Fiscal Years FY 2015/2016 through FY 2019/2020 together with existing FY 2014/2015 project funding from Pinellas County, and the municipalities and transportation providers within Pinellas County.

Further, it is hereby certified that the planning process of the Pinellas Area Transportation Study is being carried out in conformance with requirements listed under the following provisions: 23 CFR 450.332(b); 23 U.S.C 134; and F.S. 339.175.

This certification determination is being made on the basis of an in-depth review, utilizing a checklist provided by FDOT and covering all aspects of the transportation planning process in this urbanized area.

Jim Kennedy
Pinellas County
Metropolitan Planning Organization

CERTIFICATION STATEMENT

The Pinellas County Metropolitan Planning Organization (MPO), at its regular meeting of June 10, 2015, endorsed its FY 2015/2016 through FY 2019/2020 Pinellas Area Transportation Study Transportation Improvement Program (TIP), including the Annual Element and supporting documentation, as contained on the pages within this document. This document now represents the FY 2015/2016 through FY 2019/2020 adopted Transportation Improvement Program.

Further, it is certified that the planning process of the Pinellas Area Transportation Study is being carried on in conformance with the provisions of 23 CFR 450.334 (b).

This certification determination is being made on the basis of an in-depth review, utilizing a checklist provided by FDOT and covering all aspects of the transportation planning process in this urbanized area.

Jim Kennedy
Pinellas County
Metropolitan Planning Organization

Pinellas County Capital Improvement Program
Project Budget Detail Report

Fund Type: Governmental

	Current Year Estimate 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Function: Transportation												
Activity: Road & Street Facilities												
Project: 001037A Beckett Bridge Replacement												
Fund: 3001 Capital Projects Center: 414100 CIP-Transportation Program: 3031 Bridges-Repair & Improvement												
020.1 Design-Penny	600,000	600,000	600,000	800,000	200,000	0	0	0	0	0	0	2,800,000
020.4 CEI-Grant	0	0	0	800,000	200,000	0	0	0	0	0	0	1,000,000
030.1 Constr-Penny	0	0	0	8,000,000	2,000,000	0	0	0	0	0	0	10,000,000
030.4 Constr-Grant	0	0	0	8,000,000	2,000,000	0	0	0	0	0	0	10,000,000
***Project Total for** : Fund: 3001 Capital Projects Center: 414100 CIP-Transportation Program: 3031 Bridges-Repair & Improvement*	600,000	600,000	600,000	17,600,000	4,400,000	0	0	0	0	0	0	23,800,000
Total for Project: 001037A Beckett Bridge Replacement	600,000	600,000	600,000	17,600,000	4,400,000	0	0	0	0	0	0	23,800,000
Funding Source:												
Penny for Pinellas	600,000	600,000	600,000	8,800,000	2,200,000	0	0	0	0	0	0	12,800,000
Grant - Federal	0	0	0	8,800,000	2,200,000	0	0	0	0	0	0	11,000,000
Funding Total:	600,000	600,000	600,000	17,600,000	4,400,000	0	0	0	0	0	0	23,800,000

Project Description: Design and construction of Beckett Bridge replacement after PD&E is completed. This plan anticipates additional funding (i.e., grant) being available starting in FY19.

Project Classifications:

CIE Elements	Transportation/Transportation Systems
Commission District, At-Large	District 2 - Pat Gerard
Commission District, Single Member	District 4 - Dave Eggers
Location	Tarpon Springs
Originating Department	DEI Public Works
Penny Program	Transportation and Traffic Flow

10/22/15 NOTE: SUBSEQUENT TO THE ORIGINAL PUBLICATION, TASK 020.4 NAME CHANGED FROM DESIGN-GRANT TO CEI-GRANT, AND PROJECT DESCRIPTION REVISED ANTICIPATING ADDITIONAL GRANT FUNDING STARTING IN FY19 RATHER THAN FY16.

Pinellas County Capital Improvement Program
Project Budget Detail Report

Parameters: Project: 001037A Beckett Bridge Replacement Budget Type Code: Planning Fund Type: All

	Current Year Estimate 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Report Total:	600,000	600,000	600,000	17,600,000	4,400,000	0	0	0	0	0	0	23,800,000

APPENDIX B

SHPO and FHWA Concurrence Letters
Section 106 MOA

FLORIDA DEPARTMENT *of* STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Ms. Linda Anderson
US Department of Transportation
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

February 2, 2015

Re: Memorandum of Agreement: Beckett Bridge (FDOT Bridge No. 154000), Pinellas County

Dear Ms. Anderson:

In accordance with the procedures contained in 36 CFR Part 800, this office reviewed and signed four copies of the referenced Memorandum of Agreement. We are returning three of the signed original copies of the Agreement, and retaining one for our files.

If you have any questions concerning these comments, please contact Alyssa McManus by email alyssa.mcmanus@dos.myflorida.com, or at 850.245.6333 or 800.847.7278.

Sincerely

Timothy A Parsons for

Robert F. Bendus, Director
Division of Historical Resources
and State Historic Preservation Officer

Beckett Bridge, FDOT Bridge No. 154000
Over Whitcomb Bayou, City of Tarpon Springs
Pinellas County, Florida

**MEMORANDUM OF AGREEMENT
BETWEEN THE UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION AND THE FLORIDA STATE
HISTORIC PRESERVATION OFFICER
REGARDING THE BECKETT BRIDGE (FDOT BRIDGE NO. 154000)
OVER WHITCOMB BAYOU, CITY OF TARPON SPRINGS
PINELLAS COUNTY, FLORIDA**

WHEREAS, the U.S. Department of Transportation, Federal Highway Administration (FHWA), proposes to provide financial assistance for replacement of Beckett Bridge over Whitcomb Bayou from Chesapeake Drive to Forest Avenue, City of Tarpon Springs, Pinellas County, Florida (Florida Department of Transportation Financial Project Identification Number 424385-1 and Federal Aid Project Number S129-343) (the Project); and,

WHEREAS, the undertaking consists of replacing the existing Beckett Bridge (FDOT Bridge No. 154000) with a new bridge on approximately the existing alignment and will require removal of the existing historic Beckett Bridge; and,

WHEREAS, the FHWA and the Florida State Historic Preservation Officer (SHPO) have determined that the Beckett Bridge (FDOT Bridge No. 154000), recorded in the Florida Master Site File (FMSF) as 8PI12017, is eligible for listing in the National Register of Historic Places (NRHP); and,

WHEREAS, the FHWA has consulted with the Florida SHPO pursuant to 36 CFR Part 800 regulations implementing Section 106 of the National Historic Preservation Act [16 U.S.C. Section 470(f)], and has determined that the proposed project will have an adverse effect on the Beckett Bridge (FDOT Bridge No. 154000) and that the consultation efforts have been documented within the Cultural Resources *Section 106 Effects Consultation Case Study Report for the Beckett Bridge*, hereafter referred to as the Section 106 Report; and,

WHEREAS, the Florida Department of Transportation (FDOT) has participated in the consultation and has been invited to be a signatory to this Memorandum of Agreement (MOA); and,

WHEREAS, Pinellas County has participated in the consultation as the owner of the Beckett Bridge and has been invited to be a signatory to this MOA; and,

WHEREAS, the public has been afforded the opportunity to express their opinion regarding mitigation options, as documented in the Section 106 Report; and,

NOW THEREFORE, FHWA, FDOT, Pinellas County and the Florida SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in consideration of the effects this undertaking will have on the referenced historic property:

STIPULATIONS

FHWA will ensure that the following stipulations are implemented.

I. Design and Construction of the Project

A. Pinellas County will ensure that the new bridge will be constructed on approximately the existing alignment and there will be no changes to the proposed project as identified in the Section 106 Report (June 2014) for the project without consultation with the FHWA and the SHPO, pursuant to Stipulation VII.C.

B. The design of the new bridge will be a single-leaf, rolling lift bridge type of similar design and scale to the historic Beckett Bridge.

C. Pinellas County will create an aesthetics committee consisting of representatives from the adjacent community, City of Tarpon Springs, Tarpon Springs Historical Society, and FHWA, to serve in an advisory capacity regarding appropriate design elements for the replacement bridge that may be addressed during the development of the Project.

D. Should there be any substantive alterations to the project design that could result in adverse effects to historic resources not addressed in this agreement, Pinellas County and FDOT shall notify FHWA, who will notify the SHPO of these alterations and provide the Florida SHPO with an opportunity to review and comment on the alterations.

II. Documentation of the Beckett Bridge

A. Prior to the salvage of the engineering elements and demolition of the bridge, Pinellas County will perform the following documentation of the Beckett Bridge (FDOT Bridge No. 154000; FMSF No. 8PI12017) in accordance with Historic American Engineering Record (HAER) standards;

1. Drawings – Select drawings of the existing bridge plans, as available, scanned and provided in an acceptable digital format (i.e. jpeg files).

2. Photographs – Photographs with large-format negatives of context and views from all sides of the bridge and approaches, roadway and deck views, and noteworthy features and details. All negatives and prints will be processed to meet archival standards. One photograph of a principal elevation shall include a scale.

3. Written Data – Report with narrative description of the bridge, summary of significance, and historical context (primarily derived from the Cultural Resource Assessment Survey).

B. Pinellas County will provide all copies of the documentation completed in accordance with Stipulation II.A to FDOT for review and distribution. FDOT will submit the documentation to the parties as follows:

1. An archival copy to the U.S. Department of Interior, National Park Service Southeast Regional Office for review and approval prior to demolition of the structure, per HAER guidelines; and

2. A non-archival copy and electronic copy to the FDOT; and

3. An electronic digital copy for FHWA; and

4. An archival copy and an electronic digital copy to the Florida SHPO for inclusion in the Florida Archives and the Florida Master Site File (FMSF); and

5. A non-archival copy to the Tarpon Springs Historical Society.

III. Salvage and Reuse of Existing Bridge Elements

A. Pinellas County will ensure representative, significant engineering elements from the Beckett Bridge will be identified and salvaged. These elements may be incorporated into the design of the new bridge, or displayed in accordance with paragraph C of this Section. The reuse of these historic elements will be determined by Pinellas County in coordination with the aesthetics committee and will not require consultation with FDOT, FHWA or SHPO.

B. Pinellas County will ensure that the bridge elements determined important for salvage are removed in a manner that minimizes damage and are stored in an area protected from human and natural damage until elements can be reused on the new bridge, or elsewhere displayed in accordance with paragraph C of this Section.

C. If during construction it is determined that the existing bridge elements are not salvageable for reuse into the design of the new bridge, Pinellas County will salvage a few intact elements for display in a location identified by Pinellas County and within the vicinity of the new bridge.

D. Pinellas County will ensure that the existing historic bridge plaque will be removed and stored in an area protected from human and natural damage until it can be incorporated into the new control house that will be constructed as part of the new bridge. The bridge plaque will be placed on the new control house so that it is visible to pedestrians.

IV. Public Education

Pinellas County will ensure that information regarding the Beckett Bridge, which is suitable for inclusion in a "public-facing website for project information and educational purposes" and/or suitable for use on a mobile device, such as "What Was There" or "Next Exit History", is developed. This information will provide a historic account of the bridge to educate the public on its history.

V. Archeological Monitoring/Discoveries

Pinellas County, in consultation with the FHWA and the Florida SHPO, will ensure efforts to avoid, minimize or mitigate adverse effects to any discoveries of significant archaeological resources inadvertently discovered during the Project are addressed in accordance with 36 CFR 800.13(b). All records resulting from archaeological discoveries shall be handled in accordance with 36 CFR 79; and shall be submitted to the Florida SHPO.

VI. Professional Qualifications

All architectural history work carried out pursuant to this Agreement shall be conducted by, or under the direct supervision of, a person or persons meeting the Secretary of the Interior's Professional Qualifications Standards for Architectural History (48 FR 44738-9); and that all archaeological work carried out pursuant to this Agreement shall be conducted by, or under the direct supervision of, a person or persons meeting the Secretary of the Interior's Professional Qualifications Standards for Archaeology (48 FR 44738-9).

VII. Administrative Stipulations

A. Should any signatory party to this Agreement object in writing to FHWA regarding any action carried out or proposed with respect to the undertaking or implementation of this Agreement, FHWA shall consult with the objecting party to resolve the objection. If after initiating such consultation FHWA determines that the objection cannot be resolved through consultation, FHWA shall forward all documentation relevant to the objection to the Advisory Council on Historic Preservation (ACHP), including FHWA's proposed response to the objection. Within 30 days after receipt of all pertinent documentation, the ACHP shall exercise one of the following options:

1. Provide FHWA with written concurrence of the agency's proposed response to the objection, whereupon FHWA will respond to the objection accordingly;

2. Provide FHWA with recommendations, which the agency will take into account in reaching a final decision regarding its response to the objection; or

3. Notify FHWA that the objection will be referred for comment pursuant to 36 CFR Part 800, and proceed to refer the objection and comment. FHWA shall take the resulting comment into account in accordance with 36 CFR Part 800 and Section 110 (1) of the NHPA.

B. Should the ACHP not exercise one of the above options within 30 days after receipt of all pertinent documentation, FHWA will assume the ACHP's concurrence in its proposed response to the objection, and will respond to the objection accordingly. Any recommendation or comment provided by the ACHP will be understood to pertain only to the subject of the dispute.

C. If the terms of this Agreement have not been implemented by December 31, 2030, this Agreement will be considered null and void. In such event FHWA will so notify the signatories to this MOA, and if they choose to continue with the undertaking, shall reinitiate review of the undertaking in accordance with 36 CFR Part 800.

D. Any signatory party to this MOA may request that it be amended, whereupon the signatory parties will consult in accordance with CFR Part 800.6 to consider such an amendment. All parties must signify their acceptance of the proposed changes to the MOA in writing within 30 days of their receipt. This MOA shall only be amended by a written instrument executed by all the parties. The amendment will be effective on the date of signature of the last party to sign the amendment. When no consensus can be reached, the Agreement will not be amended.

E. The effective date of this MOA will be the date of the last signature. The signatory parties agree this MOA shall continue in full force until it is amended or terminated, as provided is Stipulations VI.D and VI.C, respectively.

Beckett Bridge, FDOT Bridge No. 154000
Over Whitcomb Bayou, City of Tarpon Springs
Pinellas County, Florida

Execution of this MOA by the FHWA, FDOT, Pinellas County, and Florida SHPO, and implementation of its terms, provides evidence that the FHWA has taken into account the effects of the Project on historic properties, and FHWA has satisfied the requirements of Section 106 of the National Historic Preservation Act [16 U.S.C. 470 (f)].

Federal Highway Administration

By: ______________________ Date: 1/15/15
James Christian, P.E.
Division Administrator

Florida State Historic Preservation Officer

By: Robert F. Bendus Date: 1/29/15
Robert F. Bendus
State Historic Preservation Officer

Pinellas County

By: Mark S. Woodard Date: 12/5/14
Mark S. Woodard
~~Interim~~ County Administrator

Florida Department of Transportation

By: ______________________ Date: 01/10/15
Paul J. Steinman, P.E.
District Seven Secretary

L E G A L

Approved as to Form:

By: ______________________
Office of County Attorney

Florida Department of Transportation

RICK SCOTT
GOVERNOR

11201 N. McKinley Drive
Tampa, FL 33612-6456

ANANTH PRASAD, P.E.
SECRETARY

June 9, 2014

Ms. Linda Anderson
Environmental Protection Specialist
Federal Highway Administration
Florida Division
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

RE: Beckett Bridge from Chesapeake Drive to Forest Avenue
PD&E Study Cultural Resource Section 106 Effects Consultation Case Study Report
County Project ID: *PID 2161*
FDOT Financial Project ID: *424385-1-28-01*
Florida DHR Project File Nos: *2012-2526; 2012-4295; and 2013-1021*
Pinellas County, Florida

Dear Ms. Anderson:

Pinellas County, in cooperation with the Florida Department of Transportation (FDOT) District Seven, is conducting a Project Development and Environment (PD&E) Study to evaluate removal, rehabilitation or replacement of the Beckett Bridge over Whitcomb Bayou in Tarpon Springs, Pinellas County, Florida. The limits of the study extend from Chesapeake Drive to Forest Avenue, a distance of about 0.31 miles.

A Cultural Resource Assessment Survey (CRAS) was prepared in February 2013 as part of the study to comply with federal and state regulations. On February 20, 2013, FDOT, on behalf of Pinellas County, coordinated the CRAS with your office and the State Historic Preservation Officer (SHPO). As a result, it was determined that the Beckett Bridge (Bridge No. 154000; FMSF No. 8PI12017) is eligible for listing in the National Register of Historic Places (NRHP) under Criteria A (for local and state development) and C (for engineering). It was constructed in 1924 and although rehabilitated in 1956, it retains its integrity as a Scherzer rolling lift single-leaf bascule bridge. FHWA and SHPO concurred on March 13, 2013 and April 11, 2013, respectively. Therefore, as per 36 CFR Part 800.5, the project must be evaluated to determine if it would have an adverse effect on this significant historic bridge.

The enclosed *Cultural Resource Section 106 Effects Consultation Case Study Report* (June 2014) has been prepared to evaluate effects to the Beckett Bridge. Two bound copies and two CDs with pdf files of the report, as well as one Survey Log Sheet, are enclosed for your review and coordination with the SHPO.

The Criteria of Adverse Effect found in 36 CFR Part 800.5(a)(1) were applied to the Beckett Bridge design project. The Pinellas County Recommended Alternative (replacement with a New Low-level Movable Bridge) will have an *Adverse Effect* on the NRHP-eligible Beckett Bridge as described in the enclosed Case Study Report. Minimization and mitigation options have been discussed with Pinellas County, FDOT, FHWA and SHPO and are described in the enclosed Case Study Report. Preparation of a Memorandum of Agreement (MOA) is underway.

This information is being provided in accordance with the provisions of the National Historic Preservation Act of 1966 (as amended), which are implemented by the procedures contained in 36 CFR, Part 800, as well as the provisions contained in the revised Chapter 267, Florida Statutes (F.S.).

Provided you approve the findings in the enclosed Case Study Report, please coordinate with the SHPO for concurrence. One copy of the report, CD and the Survey Log Sheet are for the SHPO; the other copy of the report and CD are for your files. If you have any questions, please contact me at (813) 975-6456 or at todd.bogner@dot.state.fl.us or Rebecca Spain Schwarz at (813) 281- 8308 or at rebecca.spain-schwarz@atkinsglobal.com.

Sincerely,

Todd L. Bogner
Environmental Specialist III

RR/rss
Enclosure

cc: Phillip Bello (FHWA), Roy Jackson (FDOT CEMO), Robin Rhinesmith (FDOT), Steve Love (FDOT), Tony Horrnik (Pinellas County), David Talhouk (Pinellas County), Ann Venables (URS), Amy Streelman (Janus Research), Rebecca Spain Schwarz (Atkins/FDOT GEC)

The FHWA finds the Cultural Resource Section 106 Effects Consultation Case Study Report provided with this letter to be complete and sufficient and ✓ approves / ___ does not approve the above recommendations and findings.

The FHWA requests the SHPO's opinion on the sufficiency of the Case Study Report provided with the letter and the SHPO's opinion on the recommendations and findings contained in this letter and in the comment block below.

FHWA Comments:

PLEASE ADDRESS COMMENTS/OPINION TO LINDA ANDERSON, FHWA.
P: 850-553-2226. E: linda.anderson@dot.gov.
PLEASE CC: ROBIN RHINESMITH, D7; PHILLIP BELLO, FHWA; AND
ROY JACKSON, FDOT CEMO

/s/ Linda Anderson
James Christian
Division Administrator
Florida Division
Federal Highway Administration

7/17/14
Date

The Florida State Historic Preservation Officer finds the attached Cultural Resource Section 106 Effects Consultation Case Study Report complete and sufficient and concurs with the recommendations and findings provided in this cover letter for SHPO/DHR Project File Number 2014-3051 **.**

SHPO Comments:

/s/
Robert F. Bendus, Director
Division of Historical Resources
and State Historic Preservation Officer

6/13/14
Date

RECEIVED
PLANNING UNIT

2012 OCT 15 AM 7:49

Florida Department of Transportation

11201 N. McKinley Drive Tampa, FL 33612-6456 Phone (813) 975-6000 1-800-226-7220

RICK SCOTT
GOVERNOR

ANANTH PRASAD, P.E.
SECRETARY

RECEIVED
BUREAU OF
HISTORIC PRESERVATION
2012 SEP 19 P 1:51

August 24, 2012

Ms. Linda Anderson
Federal Highway Administration
Florida Division Office
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

RE: Beckett Bridge PD&E Study
Cultural Resource Assessment Survey
Determination of Eligibility for Beckett Bridge (Bridge No. 154000)
County Project ID: *PID 2161*
FDOT Financial Project ID: *424385-1-28-01*
Florida DHR Project File No: *2012-2526*
Pinellas County, Florida

Dear Ms. Anderson:

Pinellas County, in cooperation with the Florida Department of Transportation (FDOT) District Seven, is conducting a Project Development and Environment (PD&E) Study to evaluate removal, rehabilitation or replacement of the Beckett Bridge over Whitcomb Bayou in Tarpon Springs, Pinellas County, Florida. The limits of the study extend from Chesapeake Drive to Forest Avenue, a distance of about 0.31 miles. A Cultural Resources Assessment Survey (CRAS) is being prepared as part of the study to comply with federal and state regulations. In March 2012, FDOT, on behalf of Pinellas County, coordinated the proposed project's area of potential effect (APE) and CRAS methodology with your office and the State Historic Preservation Officer (SHPO).

The CRAS fieldwork has been started but since the Beckett Bridge (Bridge No. 154000) has not previously been recorded in the Florida Master Site File (FMSF) or evaluated for listing on the National Register of Historic Places (NRHP), FDOT is requesting input from your office and SHPO early on concerning its eligibility for listing on the NRHP. For this reason, two copies of the NRHP Determination of Eligibility (DOE) forms are enclosed for preliminary review. After FHWA and SHPO make their eligibility determinations for the bridge, the CRAS will be completed and submitted for review. The CRAS will include a FMSF form (8PI12017) that is currently being prepared for Beckett Bridge, as well as the final DOE with all photos for the FMSF office.

Beckett Bridge was originally constructed in 1924 and carries Riverside Drive/North Spring Boulevard over Whitcomb Bayou in Tarpon Springs, Florida, providing the shortest route connecting the eastern and western sides of Tarpon Springs. The bascule span is a steel single-leaf bottom counterweight Scherzer rolling lift from 1924. The fixed timber approach spans were replaced with concrete approach spans in 1956. Major repairs, which included construction of crutch bents, repair of machinery, replacement of the electrical system and construction of a new control house, were performed in 1996. Additional repairs to the bridge machinery were needed in 1997 and 2011. Despite the rehabilitations and replacement of building materials, the bridge retains its historic integrity and is a rare example of a historic Scherzer rolling lift, single-leaf bascule bridge remaining in the State. Beckett Bridge is therefore considered potentially eligible for listing in the NRHP under Criterion A in the areas of Community Planning and Development and Transportation and under Criterion C in the area of Engineering.

Provided you agree that the Beckett Bridge is NRHP eligible, please submit the enclosed DOE to the SHPO for review and concurrence. We are available to participate in a conference call with your office and SHPO to discuss the NRHP eligibility, if that would help. If you have any questions, or if I may be of further assistance, please contact me at (813) 975-6496 or via e-mail at robin.rhinesmith@dot.state.fl.us, or Rebecca Spain Schwarz at (813) 281-8308 or via e-mail at rebecca.spain-schwarz@atkinsglobal.com.

Sincerely,

RuRhine

Robin Rhinesmith
Environmental Administrator

Enclosures

cc: Theresa Farmer, FDOT
Roy Jackson, FDOT CEMO
Amy Streelman, Janus Research
Tony Horrnik, Pinellas County
David Talhouk, Pinellas County
Ann Venables, EC Driver
Rebecca Spain Schwarz, Atkins

The FHWA finds the attached Determination of Eligibility complete and sufficient and ✓ approves / ___ does not approve the above recommendations and findings.

The FHWA requests the SHPO's opinion on the sufficiency of the attached Determination of Eligibility and the SHPO's opinion on the recommendations and findings contained in this cover letter and in the comment block below.

FHWA Comments:

PLEASE ADDRESS COMMENTS/OPINION TO LINDA ANDERSON, FHWA.
P: 850-553-2226. E: linda.anderson@dot.gov.
PLEASE CC: ROBIN RHINESMITH, FDOT D7; NAHIR DENIZIO, FHWA; AND
ROY JACKSON, FDOT CEMO.

/s/ [signature] 9-17-12
Martin C. Knopp
Division Administrator
Florida Division
Federal Highway Administration
Date

The Florida State Historic Preservation Officer finds the attached Determination of Eligibility complete and sufficient and concurs with the recommendations and findings provided in this cover letter for SHPO/DHR Project File Number 2012-4295.

Alissa M. Slade, Deputy SHPO 10.8.12
for **Robert F. Bendus**
State Historic Preservation Officer
Director, Florida Division of Historical Resources
Date

Florida Department of Transportation

RICK SCOTT
GOVERNOR

11201 N. McKinley Drive, Tampa, FL 33612-6456
Phone (813) 975-6000 1-800-226-7220

ANANTH PRASAD, P.E.
SECRETARY

February 20, 2013

Ms. Linda Anderson
Federal Highway Administration
Florida Division Office
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

RE: Beckett Bridge from Chesapeake Drive to Forest Avenue
PD&E Study Cultural Resource Assessment Survey
County Project ID: *PID 2161*
FDOT Financial Project ID: *424385-1-28-01*
Florida DHR Project File No: *2012-2526*
Pinellas County, Florida

Dear Ms. Anderson:

Pinellas County, in cooperation with the Florida Department of Transportation (FDOT) District Seven, is conducting a Project Development and Environment (PD&E) Study to evaluate removal, rehabilitation or replacement of the Beckett Bridge over Whitcomb Bayou in Tarpon Springs, Pinellas County, Florida. The limits of the study extend from Chesapeake Drive to Forest Avenue, a distance of about 0.31 miles. A Cultural Resource Assessment Survey (CRAS) has been prepared as part of the study to comply with federal and state regulations. In March 2012, FDOT, on behalf of Pinellas County, coordinated the proposed project's area of potential effect (APE) and CRAS methodology with your office and the State Historic Preservation Officer (SHPO) and in August 2012, FDOT, on behalf of Pinellas County, coordinated the National Register of Historic Places (NRHP) Determination of Eligibility (DOE) with your office and SHPO.

This transmittal includes two bound copies of the CRAS dated February 2013; 16 Florida Master Site File (FMSF) forms (8PI12017, 8PI12043-8PI12055, 8PI12068, and 8PI12069); the DOE; a CD containing the FMSF and DOE photos and forms; and a Survey Log Sheet.

No previously recorded or newly recorded archaeological sites were located within the archaeological APE.

The historic resources survey identified 16 newly recorded historic resources within the APE: Beckett Bridge (8PI12017) and 15 buildings (8PI12043-8PI12055, 8PI12068, and 8PI12069). Beckett Bridge (8PI12017) has been determined eligible for listing in the NRHP as an individual historic resource. The Federal Highway Administration (FHWA) concurred that Beckett Bridge is individually eligible for listing in the National Register on September 17, 2012. SHPO also concurred with these findings on October 8, 2012. The 15 structures are considered ineligible for listing in the NRHP.

A historic resources reconnaissance survey was also undertaken in order to address historic resources along a proposed detour route which would be required for removal of the existing bridge, or during construction for the Beckett Bridge. If any of the build or rehabilitation alternatives are selected, it is anticipated that the existing Beckett Bridge route will be closed for approximately six months to two years; therefore, a detour route will be necessary. One NRHP-listed historic district and six previously recorded historic resources that are considered individually eligible for inclusion in the NRHP were identified. The historic resources include the NRHP-listed Tarpon Springs Historic District (8PI1712), the Edward Newton Knapp House (8PI238), the William T. Fleming House (8PI1617), the George Clemson House (8PI1619), the George Clemson Auxiliary (8PI1620), the Marshall H. Alworth House (8PI1621), and the Bigelow Cottage (8PI1625). The six identified significant buildings are part of the 1990 NRHP-listed Tarpon Springs Historic District (8PI1712). As part of the reconnaissance survey, one newly identified resource appears to be individually eligible for the NRHP and is located at 115 North Park Avenue. As agreed in the methodology coordination, a FMSF form was not prepared for this resource.

This information is being provided in accordance with the provisions of the National Historic Preservation Act of 1966 (as amended), which are implemented by the procedures contained in 36 Code of Federal Regulations (CFR), Part 800, as well as the provisions contained in the revised Chapter 267, Florida Statutes (F.S.).

Provided you approve the recommendations and findings in the enclosed cultural resource document, please coordinate with SHPO that Beckett Bridge is NRHP-eligible but the other 15 historic structures are not. One copy of the document is for your files.

If you have any questions, or if I may be of assistance, please contact me at (813)975-6496 or robin.rhinesmith@dot.state.fl.us, or Rebecca Spain Schwarz at (813)281-8308 or rebecca.spain-schwarz@atkinsglobal.com.

Sincerely,

Robin Rhinesmith
Environmental Administrator

Enclosures

cc: Theresa Farmer, FDOT
Roy Jackson, FDOT CEMO
Tony Horrnik, Pinellas County
David Talhouk, Pinellas County
Ann Venables, EC Driver
Amy Streelman, Janus Research
Rebecca Spain Schwarz, Atkins

The FHWA finds the attached Cultural Resource Assessment Survey complete and sufficient and ✓ approves / ___ does not approve the above recommendations and findings.

The FHWA requests the SHPO's opinion on the sufficiency of the attached Cultural Resource Assessment Survey and the SHPO's opinion on the recommendations and findings contained in this cover letter and in the comment block below.

FHWA Comments:

PLEASE ADDRESS COMMENTS / OPINION TO LINDA ANDERSON, FHWA: P: 850-553-2226. E: linda.anderson@dot.gov. PLEASE CC: ROBIN RHINESMITH, FDOT D7; MARIE DENZIO, FHWA; AND ROY JACKSON, FDOT CEMO.

/s/
David Hawk
Acting Division Administrator
Florida Division
Federal Highway Administration

3-13-13
Date

The Florida State Historic Preservation Officer finds the attached Cultural Resource Assessment Survey complete and sufficient and concurs with the recommendations and findings provided in this cover letter for SHPO/DHR Project File Number 2013-1021.

Robert F. Bendus, Director
Division of Historical Resources
and State Historic Preservation Officer

4/11/13
Date

APPENDIX C

Environmental Resource Agency Coordination Letters

Pinellas County
ENGINEERING AND TECHNICAL SUPPORT

June 18, 2015

David Rydene, Fisheries Biologist
National Marine Fisheries Service
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, FL 33701-5005

Dear Mr. Rydene:

RE: Biological Assessment Technical Memorandum
Beckett Bridge Project Development and Environmental Study
from Chesapeake Drive to Forest Avenue
Pinellas County, Florida
Pinellas County Project ID: PID 002161
Financial Project ID: 424385-1-28-01
ETDM No: 13040

Pinellas County, in coordination with the Florida Department of Transportation (FDOT) District Seven and the Federal Highway Administration (FHWA), conducted a Project Development and Environment (PD&E) Study to evaluate alternatives to remove, rehabilitate or replace the existing Beckett Bridge (Bridge No. 154000) in Tarpon Springs, Pinellas County, Florida. Alternatives evaluated during the study would involve impacts to estuarine/inshore wetland and surface waters. A Wetlands Evaluation Report describing potential impacts to designated Essential Fish Habitat was submitted to the National Marine Fisheries Service (NMFS) on March 29, 2013. In an email dated April 15, 2015, you responded with comments regarding appropriate wetland mitigation measures and a request for continued coordination.

The Biological Assessment (BA) prepared for this project was recently provided to you in electronic format. The BA describes existing habitat within the project corridor and discusses potential effects of the proposed bridge replacement to listed species. Since preparation of the BA, a Preferred Alternative has been selected by the County and FDOT. The Preferred Alternative consists of replacement of the existing two-lane bascule Beckett Bridge with a new two-lane single-leaf, rolling lift bridge of similar design. The proposed bridge would provide 7.8 feet of vertical clearance over the navigation channel at the fenders in the closed position. The new bridge would be constructed within

PLEASE ADDRESS REPLY TO:
Pinellas County Engineering and Technical Support
14 S. Fort Harrison Ave. • 6th floor
Clearwater, FL 33756
Main Office: (727) 464-3588
FAX: (727) 464-3595
V/TDD: (727) 464-4062

www.pinellascounty.org

existing right-of-way on approximately the same alignment as the existing bridge; however, the new bridge would be approximately 19 feet wider than the existing bridge.

It is our understanding that detailed construction information is required for you and your staff to analyze the effects of pile driving and other construction activities on protected species. At this time specific construction details, including construction schedule, the number of pilings proposed, pile-driving duration, pile driving methods and the number of hammer strikes per pile are unknown. However, the County will commit to prohibiting blasting for demolition of the existing bridge.

Pinellas County, in coordination with FDOT, intends to request that the Service reinitiate "informal" consultation for the project's effects on the listed species during the final design phase of the project and in conjunction with the project's permitting process. It is understood that the Service's consultation on the project will be concluded before the project is advanced to the construction phase. In this case, Pinellas County, in compliance with 23 CFR 771.133 and Section 7 of the Endangered Species Act, agrees not to begin construction on the project, or otherwise make any irreversible or irretrievable commitment of resources that has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative, or reasonable and prudent measures (which would not violate section 7(a)(2) of the Act), until consultation with the Service is completed. Pinellas County understands that final approval for the project will not be granted by the FHWA until this consultation process is concluded. This constitutes a commitment by the County of reasonable assurance, which is to be stipulated in the Commitment and Recommendations Section of the final NEPA document for the project which is subject to FHWA approval."

The FHWA is evaluating the final Environmental Document, a Type II Categorical Exclusion (CE), which was prepared during the PD&E study. In order to finalize their review and approve the CE, the FHWA has requested that the County and FDOT obtain a response from NMFS regarding the potential effects of the project on listed species under NMFS' jurisdiction.

On behalf of Pinellas County and FDOT, we appreciate your timely review of this information and subsequent response. If you have any questions or need additional information please contact Ann Venables at 813-675-6725 or by email at ann.venables@aecom.com.

Thank you very much for your assistance with this project.

Sincerely

Gregory J. Cutrone

Gregory J. Cutrone, P.E. Supervisor
Civil & Structural Systems Unit

Enclosures

cc w/enclosures: Robin Rhinesmith, FDOT District 7
Ann Venables, URS
Nancy McKibben, Pinellas County
Tony Horrnik, Pinellas County

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

June 24, 2015 F/SER46:DR

Mr. Gregory J. Cutrone
P.E. Supervisor
Civil & Structural Systems Unit
Pinellas County Engineering & Technical Support
14 South Fort Harrison Avenue, 6th Floor
Clearwater, Florida 33756-5105

Ms. Robin Rhinesmith
Environmental Administrator
Florida Department of Transportation District 7
11201 North Malcolm McKinley Drive
Tampa, Florida 33612-6403

Ref.: Pinellas County Project ID PID 002161, Financial Project Number 424385-1-28-01, Pinellas County & the Florida Department of Transportation District 7, Beckett Bridge replacement (from Chesapeake Drive to Forest Avenue), Pinellas County, Florida

Dear Sir and Madam:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the information you have provided regarding the Beckett Bridge replacement PD&E study. This letter responds to your conclusions regarding Endangered Species Act (ESA)-listed species under NMFS's purview and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH). You have requested that NMFS review the Biological Assessment and Wetland Evaluation Report documents and provide support for moving the project forward toward determining a finding under the National Environmental Policy Act. Our comments are provided in accordance with provisions of Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*) and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. NMFS believes that, to the extent practicable at this stage of the project, Pinellas County and the Florida Department of Transportation (FDOT) have addressed NMFS's previous comments in relation to the project.

Pinellas County and FDOT propose the replacement of the existing 2-lane bascule Beckett Bridge with a new 2-lane single-leaf, rolling lift bridge crossing Whitcomb Bayou.

Pinellas County in coordination with FDOT District 7 and the Federal Highway Administration has determined that the project may affect, but is not likely to adversely affect (NLAA) smalltooth sawfish (*Pristis pectinata*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and swimming sea turtles including loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) sea turtles. NMFS cannot provide concurrence or non-concurrence with these NLAA determinations at this time because sufficiently detailed project information is not yet available for NMFS to conduct an analysis as part of the ESA Section 7 consultation. In addition, uncertainty remains regarding how construction impacts to ESA-listed species will be minimized. However, NMFS believes it can provide reasonable assurance that the Section 7 consultation can be completed as an informal consultation as the project moves forward and project details and commitments are finalized.

NMFS has reviewed the information regarding impacts to EFH due to the project. It appears that minor impacts to estuarine mangroves, oyster bars, and other NMFS trust resources comprising EFH may occur based on initial estimates. However, NMFS believes that when appropriate compensatory mitigation is provided for those unavoidable wetland impacts that do occur, the project will not have an adverse impact on EFH.

If you have any questions regarding this letter, please contact me at (727) 824-5379, or by email at David.Rydene@noaa.gov.

Sincerely,

David R

David Rydene, Ph.D.
Fishery Biologist

Pinellas County
ENGINEERING AND TECHNICAL SUPPORT

June 18, 2015

Jay Herrington, Field Supervisor
US Fish and Wildlife Service
North Florida Ecological Services Field Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256-7517

Dear Mr. Herrington:

RE: Biological Assessment Technical Memorandum
Beckett Bridge Project Development and Environmental Study
from Chesapeake Drive to Forest Avenue
Pinellas County, Florida
Pinellas County Project ID: PID 002161
Financial Project ID: 424385-1-28-01
ETDM No: 13040

Pinellas County, in coordination with the Florida Department of Transportation (FDOT) District Seven and the Federal Highway Administration (FHWA), conducted a Project Development and Environment (PD&E) Study to evaluate alternatives to remove, rehabilitate or replace the existing Beckett Bridge (Bridge No. 154000) in Tarpon Springs, Pinellas County, Florida. Alternatives evaluated during the study would involve impacts to estuarine/inshore wetland and surface waters. The Wetlands Evaluation Report and Biological Assessment prepared for the project were coordinated with your staff via letters dated March 29, 2013 (attached).

Your staff provided comments by letter dated June 12, 2013 (attached). The letter stated that without additional information about the selected alternative and construction details, including timing and duration of the proposed work, and whether blasting would be required, the Service could not concur with the "may affect, not likely to adversely affect" determination for the Florida Manatee. Since preparation of the BA, a Preferred Alternative has been selected by the County and FDOT.

The Preferred Alternative consists of replacement of the existing two-lane bascule Beckett Bridge with a new two-lane single-leaf, rolling lift bridge of similar design. The proposed bridge would provide 7.8 feet of vertical clearance over the navigation channel at the fenders in the closed position. The new bridge would be constructed within existing right-of-way on approximately the same alignment as

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V/TDD: (727) 464-4062

www.pinellascounty.org

the existing bridge; however, the new bridge would be approximately 19 feet wider than the existing bridge. At this time specific construction details such as the construction schedule, number of pilings, pile-driving duration, etc. are unknown. However, the County will commit to prohibiting blasting for demolition of the existing bridge.

Pinellas County, in coordination with FDOT, intends to request that the Service reinitiate "informal" consultation for the project's effects on the listed species during the final design phase of the project and in conjunction with the project's permitting process. It is understood that the Service's consultation on the project will be concluded before the project is advanced to the construction phase. In this case, Pinellas County, in compliance with 23 CFR 771.133 and Section 7 of the Endangered Species Act, agrees not to begin construction on the project, or otherwise make any irreversible or irretrievable commitment of resources that has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative, or reasonable and prudent measures (which would not violate section 7(a)(2) of the Act), until consultation with the Service is completed. Pinellas County understands that final approval for the project will not be granted by the FHWA until this consultation process is concluded. This constitutes a commitment by the County of reasonable assurance, which is to be stipulated in the Commitment and Recommendations Section of the final NEPA document for the project which is subject to FHWA approval."

The FHWA is evaluating the final Environmental Document, a Type II Categorical Exclusion (CE), which was prepared during the PD&E study. In order to finalize their review and approve the CE, the FHWA has requested that the County and FDOT obtain a response from USFWS regarding the potential effects of the project on listed species under USFWS jurisdiction.

On behalf of Pinellas County and FDOT, we appreciate your timely review of this information and subsequent response. If you have any questions or need additional information please contact Ann Venables at 813-675-6725 or by email at ann.venables@aecom.com.

Thank you very much for your assistance with this project.

Sincerely,

Gregory J. Cutrone

Gregory J. Cutrone, P.E., Supervisor
Civil & Structural Systems Unit

Enclosures

cc w/enclosures: Robin Rhinesmith, FDOT District 7
Ann Venables, URS
Nancy McKibben, Pinellas County
Tony Horrnik, Pinellas County

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log No. 41910-2013-I-0177

July 9, 2015

Gregory J. Cutrone
Pinellas County Engineering and Technical Support
14S. Fort Harrison Avenue - 6th Floor
Clearwater, Florida 33756
(Attn: Tom Horrnik)

RE: Beckett Bridge from Chesapeake Drive to Forest Avenue
Pinellas County Project ID: PID 002161
FDOT PFN: 424385-1-28-01
Pinellas County, Florida

Dear Mr. Cutrone:

The U.S. Fish and Wildlife Service (Service) has received your letter of June 18, 2015, regarding the project referenced above. Pinellas County (County), in coordination with the Florida Department of Transportation (FDOT) District Seven and the Federal Highway Administration (FHWA), has conducted a Project Development and Environment (PD&E) Study to evaluate the alternatives to remove, rehabilitate, or replace the existing Beckett Bridge, in Tarpon Springs, Pinellas County, Florida. In order to finalize their review and approval of a Type II Categorical Exclusion, the FHWA has requested that the County and FDOT obtain a response from the Service regard the potential effects of the project on listed species that are under Service jurisdiction. The Service provides the following comments in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*).

Previously, in 2013, the Service reviewed the Environmental Assessment and the Wetlands Evaluation Report prepared by URS Corporation for the PD&E Study. In a letter dated June 13, 2013, we stated that we were unable to provide concurrence with listed species effects determinations at the existing stage of project planning, since a project alternative was yet to be selected and construction details were not available. We had particular concerns regarding the West Indian (Florida) manatee (*Trichechus manatus latirostris*). Whitcomb Bayou is designated as an Important Manatee Area in the U.S. Army Corps of Engineers 2013 "Effects Determination Key for the Manatee" and as a result dredging is restricted November 15 through March 31. Manatees use the Anclote River and its associated bayous for calving, mating, foraging, resting, and as travel corridors. Aerial surveys indicate that Whitcomb Bayou receives substantial use by manatees year-round. In our June 13, 2013, letter we did agree with the Biological Assessment's conclusions regarding the piping plover (*Charadrius melodus*), wood stork (*Mycteria americana*), and eastern indigo snake (*Drymarchon corais couperi*). We also cited the National

Marine Fisheries Service as having jurisdiction over listed sea turtle species in the marine environment and over the Gulf sturgeon (*Acipenser oxyrhinchus desotoi*) in estuaries.

Since our 2013 review, a preferred alternative has been selected for the project. The preferred alternative consists of replacement of the existing two-lane bascule bridge with a new two-lane single-leaf, rolling lift bridge of similar design. The new bridge would be constructed within the existing right-of-way and on approximately the same alignment as the existing bridge, but would be 19 feet wider. Specific construction details have yet to be established; however, the County has committed to excluding blasting as a means of demolishing the existing bridge.

Coordination between the Service, the County, and CDOT has established that further consultation under the Act will be required in the project design phase. The County has provided the following commitment:

> "Pinellas County, in coordination with FDOT, intends to request that the Service reinitiate "informal" consultation for the project's effects on the listed species during the final design phase of the project and in conjunction with the project's permitting process. It is understood that the Service's consultation on the project will be concluded before the project is advanced to the construction phase. In this case, Pinellas County in compliance with 23 CFR 771.133 and Section 7 of the Endangered Species Act, agrees not to begin construction on the project, or otherwise make any irreversible or irretrievable commitment of resources that has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative, or reasonable and prudent measures (which would not violate section 7(a)(2) of the Act), until consultation with the Service is completed. Pinellas County understands that final approval for the project will not be granted by the FHWA until this consultation process is concluded. This constitutes a commitment by the County of reasonable assurance, which is to be stipulated in the Commitment and Recommendations Section of the final NEPA document for the project, which is subject to FHWA approval."

Given this commitment and based on the information available for the current planning phase of the proposed project we provide the following review of the project's potential to affect species listed under the ESA.

The March 2013 Biological Assessment concluded 'may affect, not likely to adversely affect' determinations for the manatee, piping plover, wood stork, and eastern indigo snake. For the manatee, in addition to the commitment that no blasting will occur as part of bridge demolition, the County has committed to implement Standard Manatee Conditions for In-water Work during all in-water construction. The County will also coordinate with the Service and the Florida Fish and Wildlife Conservation Commission during the design and permitting phase of the project to determine whether additional site-specific manatee protection measures may be necessary during construction. Based on these commitments and our review of the information available we agree that a 'may affect, but is not likely to adversely affect' determination is currently appropriate for the manatee.

In regard to other listed species, we also agree with the current evaluations of project effects on the piping plover, wood stork, and eastern indigo snake. The project area includes only residential neighborhoods and bridges a portion of the Whitcomb Bayou that is largely bulkheaded with minimal mangrove fringe. No habitat is present to support the piping plover or eastern indigo snake. While the wood stork could utilize the limited mangrove shoreline present, the site does not support foraging habitat. We agree that a determination of 'may affect, but is not likely to adversely affect' is currently appropriate for the piping plover, wood stork, and eastern indigo snake.

This letter this does not represent a biological opinion as described in section 7 of the Act nor a final concurrence with project effects on listed species as determined by the County. New information regarding species presence, changes to and refinement of the proposed project, and potential adverse effects not initially considered may increase the risk of adverse effects to a level at which take is reasonably certain to occur. All additional information available will be evaluated when consultation is reinitiated under the Act.

If you have any questions, please contact Peter Plage at (904) 731-3085. Thank you for considering the effects of your proposal on fish and wildlife, and the ecosystems upon which they depend.

Sincerely,

for Jay B. Herrington
Field Supervisor

cc: FDOT Tampa (Robin Rhinesmith)
AECOM, Tampa (Ann Venables)
FWC, Tallahassee (M. Duncan)

From: Horrnik, Tony
To: Venables, Ann
Cc: Bellhorn, Paul A
Subject: FW: NMFS response to Beckett Bridge Wetland Evaluation/Essential Fish Habitat Technical Memorandum
Date: Wednesday, April 17, 2013 10:32:01 AM

FYI

Tony Horrnik, P.E., S.I.
Division Engineer
DEI - Eng & Tech Support Division
14 St. Ft. Harrison
Clearwater, Fl 33756
Work 727-464-3640
Cell 727- 272-8630
thorrnik@pinellascounty.org
All government correspondence is subject to the public records law.

From: David Rydene - NOAA Federal [mailto:david.rydene@noaa.gov]
Sent: Monday, April 15, 2013 2:14 PM
To: Horrnik, Tony
Subject: NMFS response to Beckett Bridge Wetland Evaluation/Essential Fish Habitat Technical Memorandum

NMFS staff has reviewed the March 2013 Wetlands Evaluation/Essential Fish Habitat Technical Memorandum for the Beckett Bridge (Riverside Drive from Chesapeake Drive to Forest Avenue in Pinellas County, Florida) PD&E Study. The essential fish habitat effect determinations appear to accurately reflect potential impacts to NMFS trust resources for the various bridge removal, rehabilitation, and replacement alternatives under consideration. Given the relatively low quantity of impacts to fish habitats estimated for all the alternatives, the proposed conceptual mitigation plan seems reasonable. In terms of the options laid out in Section 4.3 (Mitigation Alternatives) of the document, NMFS is generally more inclined to accept appropriate off-site (but within the same drainage basin) “in-kind” mitigation, rather than “out-of-kind” mitigation for unavoidable project impacts.

NMFS requests continued coordination as the project moves further along in the process, a bridge alternative is selected, and detailed compensatory mitigation proposals are developed.

--
David Rydene, Ph.D.
Fish Biologist
National Marine Fisheries Service
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, FL 33701
Office (727) 824-5379
Cell (813) 992-5730
Fax (727) 824-5300

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log No. 41910-2013-I-0177

June 12, 2013

Tony Hornik
Engineering and Technical Support Division
Pinellas County Environment and Infrastructure
14 S. Ft. Harrison Drive – 6th Floor
Clearwater, Florida 33756

Dear Mr. Hornik:

The Fish and Wildlife Service (Service) received your two letters dated March 29, 2013, regarding the Beckett Bridge Project Development and Environment Study (PD&E Study). Included were two URS Corporation technical memoranda (reports), "Biological Assessment" and "Wetlands Evaluation/Essential Fish Habitat." You requested that the Service comment on the two reports, and specifically provide our concurrence with listed species effects determinations and proposed conceptual mitigation. We provide the following comments in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*), the Marine Mammal Protection Act of 1972 (MMPA), as amended (16 U.S.C. 1361 *et seq.*).

Beckett Bridge is located on Riverside Drive in Tarpon Springs, Pinellas County, Florida (28.1499N and -82.7651W). It spans Whitcomb Bayou, part of the Anclote River and bayou complex. The PD&E Study, conducted in coordination with the Florida Department of Transportation and the Federal Highway Administration, evaluates alternatives to remove, rehabilitate, or replace the existing bridge. The reports provide a fair representation of listed species, wetlands, and other habitats present that could be impacted by Beckett Bridge project alternatives. Appendix A of the Biological Assessment provides agency comments and concerns over potential project effects from reviews that occurred in 2010. Since a project alternative has not been selected and the details of potential work are not yet established, we find it premature to concur with many conclusions that the reports draw regarding listed species and impact mitigation.

For example, the Biological Assessment report provides effect determinations for federally listed species potentially present in the project area. Determinations include "may affect, not likely to adversely affect" for species including the Florida manatee (*Trichechus manatus latirostris*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and five species of sea turtles. As noted in the Biological Assessment, Whitcomb Bayou is designated an Important Manatee Area (IMA) in the 2013 Corps of Engineers Effect Determination Key for the manatee and dredging is restricted from November 15 through March 31. Florida manatees utilize the Anclote River and associated bayous for calving, mating, foraging, resting and as travel corridors. Aerial surveys by the Florida Fish and Wildlife Conservation Commission (FWC) indicate that Whitcomb Bayou receives substantial use by manatees year-round. In order to reduce the effects of the project on the manatee, Pinellas County has committed to implementing the "Standard Manatee Conditions for In-Water Activities" developed by the Service. Pinellas County has also committed to coordinating with the Service and

FWC to determine additional site-specific manatee protection measures to be implemented during construction. While we are encouraged by both of these commitments, until such time as site specific conditions to address potential impacts are developed and agreed to, we cannot concur with a "may affect, not likely to adversely affect" determination for the manatee. Without knowing construction details, including timing and duration of the proposed work, and whether blasting will be utilized to remove existing bridge structures, appropriate conditions to safeguard manatees and other aquatic species are not determinable.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share federal jurisdiction for Gulf sturgeon and sea turtles under the Act. By agreement, in estuarine environments NMFS has the lead on Gulf sturgeon where the lead federal reviewing agency is the Corps of Engineers, which is likely in this instance. The Service only has responsibility for sea turtles on nesting beaches and the NMFS has jurisdiction for sea turtles in the marine environment. In projects such as this, where any sea turtles would not be nesting, but may be present in the bayou, NOAA has jurisdiction.

We agree with the Biological Assessment's conclusions on piping plover (*Charadrius melodus*), wood stork (*Mycteria americana*), eastern indigo snake (*Drymarchon corais couperi*), and federally listed plants. Appropriate habitat is not present for the piping plover. While the project site is within the core foraging area of several active wood stork colony sites, little or no suitable foraging habitat is present in the project area. As the result of residential development, no undisturbed upland habitat occurs on or near the project site that might support the eastern indigo snake or listed plants. As a result, "Standard Construction Measures for the Eastern Indigo Snake" will not be required.

Based on information provided in the Wetland Evaluation/Essential Fish Habitat report, alternatives being considered may impact up to 0.03 acre of wetland consisting of oyster bars and mangrove swamp; no seagrass beds would be impacted. Bridge pilings may be removed and replaced, but it is assumed that no net impacts to open water would occur. Since impacts are not yet known, mitigation to offset project impacts to wetlands, including essential fish habitat, is as of yet undetermined and could be either on-site or off-site. We encourage avoidance of impacts to wetlands and particularly to mangroves and oyster bars that support foraging and nesting for migratory birds.

We appreciate commitments by Pinellas County to conserve fish and wildlife and your plans to coordinate further with the Service and other agencies during the design and implementation phase of the project. If you have any questions regarding this letter or to further coordinate with the Service regarding this matter, please contact Peter Plage at (904)731-3085.

Sincerely,

for Annie Dziergowski

Dawn Jennings
Acting Field Supervisor

cc:
Terry Gilbert-FFWCC
Brandon Howard- NMFS
Joseph Severson - FDOT

Florida Fish and Wildlife Conservation Commission

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April 22, 2013

Mr. Tony Hornik, Project Manager
Pinellas County Engineering and Technical Support Division
14 S. Ft. Harrison Avenue – 6th Floor
Clearwater, FL 33756
thornik@co.pinellas.fl.us

Re: Beckett Bridge, Pinellas County, Wetlands Evaluation and Biological Assessment (ETDM #13040)

Dear Mr. Hornik:

The Florida Fish and Wildlife Conservation Commission (FWC) staff has reviewed the Wetland Evaluation/Essential Fish Habitat Technical Memorandum (WETM) and the Biological Assessment Technical Memorandum (BATM) for the above-referenced project. These reports were prepared as part of the PD&E Study for the proposed project. We provide the following comments and recommendations for your consideration in accordance with Chapter 379, Florida Statutes (F.S.), and Rule 68A-27, Florida Administrative Code (F.A.C.).

The project involves the potential repair or replacement of the Beckett Bridge over Whitcomb Bayou in Tarpon Springs. The Beckett Bridge is one of the few single-leaf, rolling-lift bascule bridges remaining in Florida. Alternatives under consideration include: no build – maintain existing bridge, no build – remove existing bridge, rehabilitate existing bridge, replace with a moveable bridge, and replace with a fixed bridge. Whitcomb Bayou connects to the Anclote River to the north.

Uplands adjacent to the bridge contain residential and marina development. The shoreline beneath the bridge is seawalled, although there are a few scattered mangroves in the vicinity. Surveys revealed no seagrasses near the bridge, but oysters have colonized the bridge pilings and other hard surfaces in the Bayou.

The WETM evaluated wetland impacts associated with the build alternatives, and found them to be minimal, resulting in only 0.003 to 0.005 units of wetland functional loss. Compensatory mitigation will be offered for all unavoidable wetland impacts during the state and federal permit process.

The BATM evaluated potential project impacts to 25 wildlife species classified under the Endangered Species Act as Federally Endangered (FE) or Threatened (FT), or by the State of Florida as Threatened (ST) or Species of Special Concern (SSC), plus the bald eagle. The bald eagle was delisted by state and federal agencies, but this species remains protected under state rule in Section 68A-16.002, F.A.C. and by the federal Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d).

Listed species were evaluated based on range and potential appropriate habitat or because the project is within a U.S. Fish and Wildlife Service (USFWS) Consultation Area. The following listed species were evaluated in the BATM: Gulf sturgeon (FT), American alligator (FT), Eastern indigo snake (FT), loggerhead sea turtle (FT), green sea turtle (FE), leatherback sea turtle (FE), hawksbill sea turtle (FE), Kemp's ridley sea turtle (FE), Southeastern kestrel (ST), Florida sandhill crane (ST), piping plover (FT), snowy plover (ST), least tern (ST), wood stork (FE), limpkin (SSC), snowy egret (SSC), reddish egret (SSC), little blue heron (SSC), tri-colored heron (SSC), white ibis (SSC), roseate spoonbill (SSC), American oystercatcher (SSC), brown pelican (SSC), black skimmer (SSC), and Florida manatee (FE).

Project biologists made a finding of "no effect" for the Southeastern American kestrel and Florida sandhill crane, and a finding of "not likely to adversely affect" for the wood stork and Eastern indigo snake. For all the other evaluated species, a determination that the project "may affect, but is not likely to adversely affect" these species was concluded in the report. We agree with this determination and support the project commitments for protected species, which include the following:

1. Compliance with the USFWS "Standard Protection Protocols for the Eastern Indigo Snake" and paragraph E of the U.S. Army Corps of Engineers Eastern Indigo Snake Programmatic Key.
2. Compliance with the USFWS and FWC approved "Standard Manatee Construction Conditions" during all in-water construction phases of the project, and coordination with the USFWS and FWC during the design and permitting phases of the project for additional site-specific manatee protection measures to be implemented during construction.
3. Submission of a blasting plan (if blasting occurs), which includes the use of qualified observers and an aerial survey, to USFWS and FWC for review and approval prior to construction.
4. Coordination of wetland impacts with the appropriate resource agencies and propose mitigation to offset any adverse impacts to listed species habitat, if determined to be warranted.
5. If an active bald eagle nest is identified within the 660-foot buffer zone around the construction area, mitigation measures will be implemented to avoid disturbing the species, which may include control of the timing and location of construction activities and establishment of a buffer zone around active nesting sites.
6. Coordination with FWC for the removal of the osprey nests on a utility pole within the construction area during the design and permitting phase of the project.

Thank you for the opportunity to review the WETM and BATM for the Beckett Bridge project in Pinellas County. If you need further assistance, please do not hesitate to contact Jane Chabre either by phone at (850) 410-5367 or at FWCConservationPlanningServices@MyFWC.com. If you have specific technical questions regarding the content of this letter, contact Brian Barnett at (772) 579-9746 or email brian.barnett@MyFWC.com.

Sincerely,

Scott Sanders

Scott Sanders, Director
Office of Conservation Planning Services

ss/bb
ENV 1-13-2
Beckett Bridge Replacement or Repair_17439_042213
cc: Theresa Farmer, FDOT District 7, theresa.farmer@dot.state.fl.us