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865707	NE 59th Avenue	Pelican Canal
865708	Bayview Drive	Longboat Inlet
865709	NE 55th Street	Landings Inlet West
865710	Bayview Drive	Landings Inlet South
865712	Castle Harbor Isle	Toulon Waterway
865713	NE 41st Street	Toulon Waterway
865720	Old Dixie Highway	S. Fork Middle River
865721	NE 15th Avenue	S. Fork Middle River
865727	NE 1st Street	Stranahan Lake
865728	SE 8th Avenue	Himmarshee Canal
865729	East Las Olas Blvd.	Himmarshee Canal
865731	South Gordon Road	Las Olas Canal
865732	Coconut Isle Drive	Grande Canal
865733	Hendricks Isle Drive	Las Olas Canal
865738	SE 23rd Avenue	Rio Del Mar
865739	SE 23rd Avenue	Rio Castilla Canal
865740	NE 23rd Avenue	Rio Aragon Canal
865741	NE 23rd Avenue	Rio Toledo Canal
865742	NE 23rd Avenue	Rio Giraldo Canal
865743	NE 26th Terrace	Rio De Sota
865745	Solar Plaza Drive	Rio Canal
865746	Solar Plaza Drive	Rio Placid Canal
865748	SW 11th Avenue	N. Fork New River
865752	SW 7th Street	Tarpon River
865758	SE 9th Avenue	Tarpon River
865759	SE 9th Street	Tarpon River
865760	SE 7th Street	Rio Cordova
865761	SE 8th Street	Rio Cordova
865762	SE 9th Street	Rio Cordova
865763	SE 10th Street	Rio Cordova
865764	SE 11th Street	Rio Cordova
865765	SE 13th Street	Cerro Gordo River
865770	Laguna Terrace	Diane River
865771	West Lake Drive	Estelle River
865772	West Lake Drive	Diane River
865773	West Lake Drive	Lucille River
865774	West Lake Drive	Mercedes River
865775	South Ocean Drive	Marion River
865776	SE 2nd Court	Himmarshee Canal
865777	NE 18th Avenue	Cypress Creek Canal C-14
865781	Access Road	Mills Pond Canal
865782	SE 25th Avenue	Rio Idlewild Canal
865783	Harborage Isle Drive	New River Sound
865789	SE 15th Avenue	Marcheta River
865790	SE 15th Avenue	Carlotta River

EXECUTIVE SUMMARY

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements, above and below water level, and was led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding documentation of deficiencies.

A bridge inspection report was prepared for each bridge inspected. This report documented existing deficiencies and included a discussion of substandard geometric elements and any identified safety hazards. Conditions were compared to previous inspection reports prepared as part of the FDOT Local Government Bridge Inspection program, supplied to TranSystems by the City. Short term and long term recommendations for work at each bridge were made based on noted conditions and TranSystems' long history of experience with similar bridges. Long term recommendations have been grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

Future deterioration and long term recommendations were based on several factors, including the age of the bridge, the condition of the bridge components, whether the bridge was load restricted or not, and TranSystems' significant experience with inspection and repair of the types of bridges within the City's inventory.

Short term recommendations, intended to be performed in the next two years, address either structural deficiencies, safety concerns, or may cause long term work to be pushed back, have been identified, along with costs. Short term work is needed at thirteen of the 46 bridges in this study. Many of these work items can be accomplished using City forces or contracted maintenance forces to address safety hazards, like uneven sidewalks, and minor maintenance activities, like removing significant vegetation, that could cause much more significant problems if not addressed. Outside of the use of City forces or contracted maintenance forces, for which the cost has not been identified, it is anticipated that the total cost of these short term repairs is $86,000.

Anticipated costs associated with the long term recommendations for each bridge during each five year period, including design, construction, CEI and administration and a contingency amount, have been estimated. Costs have been estimated assuming that some grouping of similar work or nearby bridges will be done when contracting the work, in order to take advantage of the efficiencies associated with doing so. The total cost to complete the long term recommendations is $35,136,360. All costs have been estimated in 2014 dollars. Following is a summary of the long term anticipated costs, broken out into each five year work period, with a list of the bridges that are included within that period:

LONG TERM ANTICIPATED COSTS								
0-5 YEARS		6-10 YEARS		11-15 YEARS		16-20 YEARS		NO WORK REQ'D
$ 4,066,600		$ 432,050		$ 9.253,040		$ 21,384,670		
REPAIR	REPLACE	REPAIR	REPLACE	REPAIR	REPLACE	REPAIR	REPLACE	
865709	865732	865707	none	864025	865708	865776	865712	865743
865710	865775	865720		865709	865727	865781	865713	865758
865731		865777		865710	865765		865760	865759
865733				865721	865761		865761	865783
865745				865728			865762	865789
865746				865738			865763	865790
				865739			865764	
				865740			865770	
				865741			865772	
				865742			865773	
				865748			865774	
				865752				
				865782				

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding documentation of deficiencies. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

A bridge inspection report was prepared for each bridge inspected. This report included all deficiencies noted during the inspection, organized by bridge component. Photographs were included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report included discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed in the next two years, and focus on conditions that may require action before the long term recommendations could be implemented, or might reduce the chance that significant repairs would be required in the long term. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation

or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

Upon completion of the individual inspection reports, a summary report was prepared to discuss the overall condition of the City's 46 bridges and prioritize the recommendations from each bridge inspection.

AVAILABLE INFORMATION AND FIELD INSPECTION PROCESS

Available Information

Previous inspection reports prepared by others as part of the FDOT Local Government Bridge Inspection program, dated between 2009 and 2013, were provided by the City for use in preparing for the bridge inspections. These reports included basic information regarding current load posting for each bridge, which was used evaluate each bridge's load carrying capacity and factor that into recommendations.

Additionally, the City provided construction bids for recent bridge replacements, for use in estimating bridge replacement costs.

Above Water Structural Inspection

The above water portions of the bridges were inspected by TranSystems bridge inspectors between May 5 and June 11, 2014. Work for the above water portions of the bridges included a review of all bridge structural elements, noting structural features of the bridge that do not meet current design criteria. The deck and associated elements, including the joint system, traffic barriers and approach slabs, were inspected and signs of distress located and measured, such as cracks, spalls, settlement, and impact damage. Superstructure elements were examined for any deficiencies, particularly impact damage, or deterioration caused by the elements and lack of proper maintenance. Impact damage and section loss were documented, including broken reinforcing steel bars, prestressing strands or cracked welds. The ends of cracks on steel elements were marked to track any future growth that may occur. Substructure elements above the water line were examined for cracks and spalls on pile caps, spalls on prestressed or reinforced concrete piles, and any damage which may be occurring to the substructure units or slope protection due to joint leakage, as evidenced by water staining and erosion. Abutments, piers, bents, and wingwalls were inspected for evidence of vertical, lateral, or rotational movement. Bearing seats were inspected for cracking, spalling and accumulation of debris which accelerates deterioration. Slope protection was examined for signs of slope washout and settlement, paying close attention to open joints between the slope protection and other elements.

Prestressed and reinforced concrete elements were examined for early evidence of corrosion of prestress tendons and/or mild steel reinforcing. Questionable areas were hammer sounded to determine if delamination has occurred. Special attention was given to impact damaged beams and elements that showed any signs of overload. Losses to reinforcing steel and section loss due to spalling were recorded. Bearing areas were examined for spalling and other distress due to bearing restraint, inadequate support, and thermal movements. Cracking in the flexure areas (midspan for simply supported beams and slabs) was documented with particular attention given to the presence

of efflorescence or rust staining which indicate moisture penetration and possible future delamination. Hammer sounding was used to determine the extent of deterioration.

Inspections included looking for signs of displacement such as misalignment of curbs and railings, separation at construction joints, and unusual cracking (not in expected flexural or shear areas).

Steel elements were reviewed over their entire visible lengths, and particular attention given to areas susceptible to corrosion and fatigue. Welded steel beams, built-up from rolled steel or steel plate sections, are susceptible to fatigue cracking at the termination of cover plates and connection plates including diaphragms and stiffeners. These details were examined to detect the presence of visible cracks, particularly those members where out of plane bending could be occurring, such as at stiffeners, connection plates which are not rigidly connected to the flanges, skewed bridges, etc.

Inspection of bulkheads and seawalls outside the limits of the bridge width was not included in the field inspection, except as needed to report on the bridge condition and ensure that recommendations would ensure slope and bridge stability at the abutments.

All parts of the bridges were visually inspected without the need for lane closures.

Movable Bridge Mechanical and Electrical Inspection

In addition to the above water structural inspection, SW 11th Avenue swing bridge (865748) was inspected by TranSystems Florida-registered mechanical and electrical engineer inspectors. The mechanical and electrical inspectors interviewed maintenance and operations personnel to obtain information regarding the current operation of the bridge and to determine if any abnormal conditions exist.

Work included a hands on inspection of all mechanical and electrical components, including the span drive system, span control system, span support system, traffic control equipment, auxiliary drive system, navigational aids, and other components. Each component was observed during operation for evidence of unusual conditions. The mechanical and electrical systems were observed for proper sequence of operation and safety interlocks. In addition, an assessment as to the current level of maintenance and housekeeping was made during the inspection, to include observations on component obsolescence. Maintenance is critical to the proper function of the movable bridge. Inspectors checked for proper maintenance including lubrication, cleanliness and paint deterioration of the mechanical components. All lube fittings were checked to ensure they are in place and receiving adequate lubrication. Evidence of over-lubrication of components such as couplings that frequently have damaged seals as a result of improper lubrication techniques were checked.

Underwater Structural Inspection

Inspection of substructure elements below the waterline, including bridge bulkheads, were performed by Marlin Engineering, Inc. using a four person team, three individuals to meet OSHA and ADCI commercial diving standards, with an additional individual to attend to requested video of the underwater inspection.

Inspectors noted all deficiencies found with locations and measurements, including but not limited to heavy scaling of older concrete piles, corrosion and section loss to steel piles, especially at the water line, loss of backfill from behind bulkheads due to open joints, piles fractured during pile

driving, older repairs to piles (such as pile jackets), and deterioration of pile jackets, slope protection failure due to poor maintenance or ineffective control of drainage, and vertical cracks and spalls in piles in the splash zone due to expansion of corroded reinforcing or prestressing steel.

Inspection of bulkheads and seawalls outside the limits of the bridge width was not included in the field inspection, except as needed to report on the bridge condition and ensure that recommendations would ensure slope and bridge stability at the abutments.

Individual Bridge Inspection Reports

Bridge inspection reports were prepared for each bridge. Each report included all deficiencies noted during the inspection, organized by bridge component. Photographs were used to supplement and support noted conditions, as well as clarify conditions and locations.

In addition to documentation of deficiencies, each report included discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could take place. Long term recommendations were grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focused on anticipated remaining life and the need for rehabilitation or replacement. Remaining life is not easily quantifiable; engineering judgment and experience were used to provide sound reasoning for recommendations and the timeframe anticipated.

Opinions of probable costs were provided for both short term and long term recommendations. Costs included engineering, construction and construction management, as would be anticipated based on the recommendation made, using City and FDOT cost history information as a basis, as modified by engineer's experience and judgment with actual projects and for the smaller bridges that comprise the City's inventory.

FACTORS AFFECTING DECISION-MAKING

While there is no formula available to quantify when a bridge should be repaired or replaced, there are several factors that engineers use to evaluate the prudence of making repairs or replacing a bridge, including age, locations of deterioration, load carrying capacity, structure type/material and the condition of neighborhood bridges. Usually it is not just one of these factors, but a combination of them, that can make replacement of a bridge the prudent solution over making repairs.

Age

Older bridges are generally accepted to have a 50 year design life, based on the AASHO or AASHTO design specifications in place at the time, as well taking into consideration common construction practices of past eras and common materials used. Current design codes are accepted to produce bridges with 75 to 100 year design life.

In the case of the City's older bridges, which are predominantly of concrete construction, the concrete mixes were more permeable than current mixes, such that the chlorides from salt water or brackish water can, over time, penetrate the concrete and promote corrosion of the internal

reinforcing steel. Once the corrosion process has initiated, it is not possible to reverse it and it is very difficult to stop it, particularly when chlorides permeate the entire concrete component. The concrete substructure elements of the City's bridges are likely contaminated with chlorides, which is why there are cracks, delaminations and spalls on the piles, seawalls and abutments.

The City's bridges are close to the water, such that the beams and deck of many of the bridges are within only a few feet of the water and subjected to repeated windblown salt spray that can eventually cause the corrosion process to occur. The primary barrier for this is the thickness of the concrete on top of the internal steel, commonly known as the concrete cover. New bridges have concrete cover that ranges from 2 in. minimum for beams to 4 or 4½ in. for substructure units in water. Older bridges generally don't have more than 2 in. cover over steel in the beams and deck, and frequently it is on the order of 1 to 1½ in. thick. Given lesser concrete cover and the more permeable concretes used at the time of construction, it would be expected that the City's bridges have the deterioration noted during field work.

The oldest bridges in the City's inventory, all built prior to the 1950s and 74 years or older, are the 1923 Old Dixie Highway bridge over the South Fork of the Middle River (865720), the 1925 SW 11th Avenue swing bridge over the North Fork of the New River (865748), the 1925 Coconut Isle Drive bridge over Grande Canal (865732), the 1929 SW 7th Street bridge over Tarpon River (865752), the 1930 East Las Olas Boulevard bridge over Himmarshee Canal (865729), and the 1940 NE 1st Street bridge over Stranahan Lake (865727).

Of the remaining bridges, thirteen were constructed in the 1950s, eleven in the 1960s, eleven in the 1970s, one in the 1980s, one in the 1990s, and three were constructed after 2000.

Locations of Deterioration

Deterioration present on concrete and steel bridges can be repaired in conventional ways, but the locations where the deterioration exists can make performing repairs difficult once the areas have significant deterioration. For example, abutments with concrete panels behind them to retain the fill are very difficult to replace without demolishing the approach slabs above, since just removing the panels will likely result in the fill collapsing into the channel since temporary support is not feasible.

Load-Carrying Capacity

Older bridges were designed using lighter loads than current bridges. For very old bridges, the design load may be less than today's Florida legal loads, which are the basis for determining the needs to post bridges with load restrictions. In that case, the structures may not have the ability to be strengthened, and any deterioration to them could cause significant reduction in the allowable truck load limits.

Structure Type/Material

The type of structure and the materials used play a role in the durability and ability to strengthen and repair. For example, prestressed concrete slab unit bridges close to the water are extremely difficult to provide long term repairs for concrete spalls and exposed prestressing strands, because making repairs creates focal points at the edges where reinforcing steel penetrates sound concrete and the corrosion inducing chloride ions concentrate at those locations. This causes additional

spalls that require repair. Using a cathodic protection system to prevent this behavior, while practical on substructure elements, is not feasible for slab unit bridges because it cannot reliably be installed on the vertical faces of the adjacent slab units due to lack of access. This compromises the system, making it useless.

Condition of Similar Bridges

For the City's bridges, there are many groups of bridges within neighborhoods that were constructed in the same era using the same types of construction materials and methods and are of similar type, size, configuration, and proximity to the waterline. Examples of these neighborhood groups are the bridges in the Seven Isles neighborhood, north of Las Olas Boulevard on and around NE 23rd Avenue (865738 thru 865739), the neighborhood north of SE 17th Street Causeway on the east side of the Intracoastal Waterway (865770 thru 865774), and the neighborhood south of the New River off Cordova Road (865760 through 865764).

For the purposes of this study, conditions found at some bridges in a particular neighborhood were considered to be likely to occur at others within the 20 year study period. At these groups of bridges, anticipated work and long term recommendations are very similar for all bridges, since they behave similarly and will have similar deterioration.

REPAIR OR REPLACEMENT DECISION-MAKING

The goal of the decision-making process is to provide the prudent solution for each bridge, considering its age, current and expected future condition, structure type and material, load-carrying capacity and the condition of similar bridges. All bridges were initially evaluated individually based on specific conditions found during the field inspection, using engineering judgment and experience to anticipate over what period of time further deterioration would occur. Once the individual evaluations were complete, groups of bridges were evaluated and conditions compared to gain a better understanding of what the deterioration of other bridges would look like, given that all of the City's bridges are close to the water and most were constructed prior to 1975 and are more than 40 years old.

While the age of a bridge is an indicator that a bridge may be a candidate for replacement, there is no direct correlation between age and making the decision to replace a bridge. The durability of a concrete bridge is dependent upon the quality of construction and the durability of the concrete. Concrete strength and permeability are highly dependent upon the concrete mix, and use of different materials over the years have produced very different results. This can be seen in the overall conditions of similar bridges, like SE 7th Street over Rio Cordova, which is rated in fair condition, and SE 11th Street over Rio Cordova, which is in good condition. Both bridges were constructed in 1972 in the same neighborhood, likely as part of the same development and probably by the same contractor. They are both low to the water, yet one bridge has deteriorated more than the other. It is not possible to pinpoint the reasons for the difference without significant testing of concrete, which is not part of the scope of this project and is not cost effective, as it is just as likely that the concrete mix was slightly different, the reinforcing steel in the slab units was placed in the formwork differently, or the location of one bridge makes it more susceptible to windblown salt spray.

Recommendations considered the difficulty of making good quality repairs with long lifespan. If repairs were not expected to last long enough to get through the 20 year study period, other alternatives were considered and recommended. Temporary repairs that will require re-repair during the study period were not considered, since they will require constant repetitive maintenance until the bridge is replaced. In some circumstances, difficult elements to repair due to configuration, particularly for older bridges in the City's inventory, ultimately resulted in recommendations for replacement based on prudence from the cost-effectiveness and maintenance of traffic perspectives.

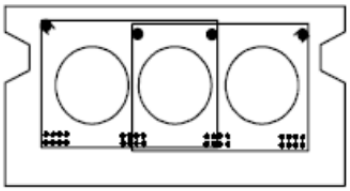
Concrete repairs were not recommended for bridges with significant spalls and cracks that indicate the internal reinforcing steel has significant corrosion, as it is very difficult to make good repairs that will last more than 5-8 years, unless the work was generally done in conjunction with cathodic protection.

If only part of an older bridge is in poor condition, with the remainder of the bridge in satisfactory or better condition, the cost to make repairs to address the poor condition may not be cost-effective if the remaining life of the bridge is less than what the repair would be expected to provide. This decision was made on a case-by-case basis and is discussed within each of the individual bridge inspection reports attached in an appendix. This is most common for the substructure elements. Bridges more than 50 years old with significant deterioration to the concrete substructure elements are recommended for replacement at some point during the next 20 years, using engineering judgment and expertise to project when deterioration may become critical or start to significantly affect the ability of the bridge to carry traffic without major posting efforts.

Groups of the City's bridges are very similar in terms of bridge type, configuration and age, particularly where bridges are located within a specific community, for example the Harbor Isle or Landings neighborhoods. Additionally, the bridges are, almost without exception, reinforced or prestressed concrete structures. Elements of this type in close proximity to the salt or brackish water present throughout the canals in the City will absorb the chlorides in the water and eventually promote corrosion of the internal steel, causing cracks, delaminations and spalls. The sections that follow address some of the very common bridge types and problems encountered, in order to provide additional information regarding reasons for the long term recommendations that have been made.

Prestressed Concrete Slab Units

Of the 46 bridges inspected as part of this study, 25 of them are of prestressed concrete slab unit construction. For this type of bridge, three or four foot wide slab units are manufactured using standard forms. Prestressing strands are run through the formwork prior to pouring concrete. After the concrete is poured and hardens, the strands are tensioned to improve the structural capacity of the concrete units. The earliest example of this bridge type in the City's inventory is the 1959 NE 18th Avenue bridge over Cypress Creek Canal C-14. All of the City's bridges included in this study constructed after 1964 are of this construction type.

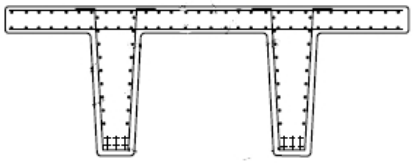


All of the City's bridges are close to the waterline, with less than 9 ft. clearance from the underside of the superstructure to the mean high water line. It is highly likely that the concrete is saturated with chlorides. For bridges of this type, where cracks and spalls already exist, making concrete spall repairs to areas where concrete is delaminated will address the primary anodic site (where the corrosion is greatest), but it will also create an anodic ring around the repair, because adjacent secondary anodic locations (areas with less corrosion present) become primary locations, which will eventually cause further concrete deterioration. For low lying coastal bridges on state roads, the FDOT State Materials Office Corrosion Research Laboratory personnel recommend replacement of the bridge once widespread deterioration is found, since the different repair methods they have attempted for such bridges have not stopped or significantly slowed the rate of deterioration. Making concrete repairs without installation of cathodic protection systems are generally considered to be non-cost effective. A discussion of cathodic protection types is provided in a later section of this report.

For this bridge type, cathodic protection is not considered a feasible long-term solution, because the slab units are independent and cathodic protection systems must be continuous on all faces of an element. For slab units, it is not possible to protect the sides of adjacent slab units due to lack of access, or the tops of the units. Additionally, cathodic protection systems depend upon electrical continuity between reinforcing steel, and it is common that prestressing strands are not electrically continuous with the mild reinforcing steel in the slab. Bars that do not have electrical continuity with the rest of the internal reinforcing steel will not be protected by the cathodic protection system. For cathodic protection systems requiring a gunite or grouted overlay, constructing such a system on the slab undersides is difficult and past experience is that it is unlikely that such repairs will be of a quality to ensure long term encapsulation of the protection mesh and the efficacy of the system would be significantly reduced. The weight of the added material would also be a concern to the bridge's load carrying capacity.

For these reasons, when prestressed concrete slab units were found to have moderate to significant cracks and spalls, they were generally recommended for replacement in the later years of the study.

Reinforced Concrete Double T-Beams



Nine reinforced concrete T-beam bridges were evaluated as part of this study. Reinforced concrete double T-beams have thin webs and top flanges, and are fabricated off-site using common forms into which reinforcing steel cages are constructed prior to the concrete being poured. The City's bridges of this type were constructed between 1952 and 1958. These beam types commonly have less concrete between the exterior surface and the reinforcing steel, otherwise known as concrete cover, and are prone to corrosion when close to water due to chloride contamination and infiltration through load-induced cracking. Double T-beams are prone to the same limitations regarding repairs as prestressed concrete slab units, but have the additional problem that they tend to have less load carrying capacity. Once corrosion has started on the reinforcing steel and repeated repairs are needed, section loss to the internal reinforcing steel is very difficult to replace, for the main reason that there is often not enough development length available to splice in new bars and there isn't the space available to do so. There are no cost-effective ways to strengthen T-beam bridges.

For these reasons, and given that all of the double T-beam bridges are over 50 years old with cracks and spalls to superstructure and substructure, all double T-beam bridges are recommended to be replaced during the 20 year study period.

Reinforced Concrete Abutments

The abutments at all bridges are of reinforced concrete construction. At most of the bridges, the abutments are in line with the adjacent seawalls and have piles that support panels that hold in the fill material under the roadway. All of these elements are subjected to repeated wet-dry cycles and chloride intrusion that cause deterioration through either the chlorides contaminating the concrete over time, or more directly through cracks in the concrete. Both of these conditions cause corrosion of the internal reinforcing steel. The piles and panels of the abutments are in fair condition,

with cracks and spalls with exposed reinforcing steel present. Over time, the rate of deterioration will increase, with the reinforcing steel losing section and the concrete spalls become larger and more numerous.

The piles and panels of the abutment restrain the fill behind it. Because of the proximity to the water and the difficulty associated with placing good quality repairs that will last, repairs are likely to only last a short period and not provide long term value. Long term repairs for this type of condition will impact traffic, since the work is in the roadway and at least one lane of traffic must be maintained at many of the City's bridges due to the road being the single point of access to an island. The long term work to the bridge would include removing the approach slab and fill in order to replace the panels, which is not cost-effective if the abutment piles and caps, or the superstructure itself, are not expected to last more than the 20 years or so expected of significant repairs. For a bridge with an older superstructure that has deterioration, replacement of the entire bridge is usually recommended. The five year work period to which work to replace a bridge in this situation is recommended to occur is based on judgment to estimate when cracks and spalls will worsen to the extent that the bridge's load carrying capacity is significantly affected.

ANTICIPATED REPAIRS

Seventeen of the City's bridges are recommended for replacement in the next 20 years, and there are six for which no significant work is recommended during the study period. For the remaining 23 bridges, various repairs are anticipated. Following is a discussion of various repairs, along with a list of which bridges that work has been recommended.

Concrete Repairs

Spall repairs and crack sealing are conventional, very common repairs. When done as part of a design project, concrete repairs should be identified and addressed through the use of plan notes or technical special provisions to dictate the methods of repair and the requirements of materials. These requirements may vary based on whether the repaired areas are on horizontal, vertical or overhead surfaces. All deteriorated concrete should be removed and the limits of repair squared off, followed by cleaning and preparing the exposed substrate and reinforcing steel in accordance with the requirements of the manufacturer and the design engineer. It is recommended that the FDOT be consulted to ensure the very latest in materials and procedures are incorporated to provide the longest lasting repairs possible.

Crack sealing and injection are covered in the FDOT Standard Specifications for Road and Bridge Construction, Section 411[1]. There are two general categories of materials for crack injection: sealants that provide a structural bond to the concrete on either side of a cracked section to restore structural integrity, and those that do not. For general shrinkage cracks and cracks in the concrete in the tension area of a beam or other element, the non-structural material may be adequate. For beams with shear and flexural cracking that by analysis are not due to overstress in the concrete, the structural sealant may be the preferred material.

[1] FDOT construction specifications can be found at the following website: http://www.dot.state.fl.us/specificationsoffice/Implemented/SpecBooks/default.shtm

Bridges with minor spalls and non-structural cracks without signs of corrosion bleed out were recommended for concrete repairs. A rough cost for repairs to bridges with little to no specific deterioration at this time was also included, as they will deteriorate and are likely to require some repair during the 20 year study period.

Bridges recommended for concrete repairs: 864025, 865707, 865709, 865710, 865720, 865721, 865728, 865729, 865738, 865739, 865740, 865741, 865742, 865745, 865748, 865746,865752, 865776 and 865781.

Steel Painting

Steel coatings have a useful life of 15-20 years in aggressive coastal environments. It is likely that re-coating of the steel will be required during the study period. The only bridges recommended for painting are 865748, SW 11th Avenue truss swing bridge and 865752, SW 7th Street over Tarpon River. The swing bridge was repainted during a 2010 rehabilitation and may not require full cleaning and painting. However, a paint specialist should be consulted in order to sample the paint and recommend the best option for cleaning the surface and applying a new coating, using the latest FDOT-approved coating systems for maximum longevity. The SW 7th Street bridge will require the bearings to be cleaned of corrosion and painted during work to replace the concrete encapsulating the existing steel beams.

Surface preparation is the most important factor in getting a good, long-lasting coating. In coastal environments, care is required to ensure that cleaned areas are coated within a short timeframe in order to keep oxidation, salt and contaminants from affecting the bond of the paint to the substrate.

Bridges recommended for steel painting: 865748 and 865752.

Pile Jackets

Pile jackets are required when the existing concrete cover has spalled off due to corrosion of the internal reinforcing steel or prestressing strands, or when there are wide cracks in the piles with corrosion bleed out indicating that delaminations and spalls are imminent and that the steel may be deteriorating. It is desirable that loose and deeply cracked concrete be removed and new concrete jackets be placed prior to the steel losing significant cross section and new steel must be spliced into place. When the jacket is intended to protect an existing pile with adequate load carrying capacity, a non-structural jacket may be installed. If the pile is deteriorated to the point that its load-carrying capacity is compromised, structural jackets may be required.

Non-structural jackets in coastal environments are recommended to include zinc anodes to provide a level of passive cathodic protection. Common types current being installed on FDOT bridges include prefabricated two piece fiberglass jackets with zinc anodes attached to them, which are installed by removing all loose concrete, installing the fiberglass jackets as a form, then pouring repair concrete into the formwork to complete the jacket. Including supplemental reinforcing steel to account for losses on existing reinforcing steel may be required. This type of installation has no need for maintenance and is expected to have a service life of 20 to 25 years.

Structural jackets are designed with reinforcing steel and are typically longer than non-structural jackets, because they must be detailed to allow for extra length needed to ensure that the jacket steel is fully developed to take the necessary loads. It is not anticipated that structural jackets will

be needed, since the jackets on the existing piles do not appear to be structural in nature. However, as the bridges deteriorate, it may be necessary to install structural jackets at piles where there are broken prestressing strands or reinforcing steel bars that are corroded through.

Bridges recommended for pile jackets: 865709, 865710, 865720, 865721, 865728, 865729, 865733, 865738, 865739, 865740, 865741, 865742, 865776 and 865777.

Cathodic Protection / Metalizing

Making concrete spall repairs to areas where concrete is delaminated on abutments and intermediate bent caps will address the primary anodic site (where the corrosion is greatest), but it will also create an anodic ring around the repair, because adjacent secondary anodic locations (areas with less corrosion present) become primary locations, which will eventually cause further concrete deterioration. Per discussion with staff from the FDOT State Materials Office Corrosion Research Laboratory, further repairs to those areas will be likely within a few years. Because of these factors, only making concrete repairs to these areas at select bridges is not considered to be a satisfactory repair option and concrete repairs in conjunction with installation of cathodic protection (CP) systems have been investigated.

The efficacy of a CP system is dependent on the concrete elements not being saturated with chlorides. It is expected that the concrete on the sides and bottom of the caps will require removal and replacement, to ensure that the chloride saturated concrete is removed. Testing will be required to confirm the chloride concentration at the depth of the reinforcing steel, and at what depth the concentration is small enough that the corrosion reaction does not initiate.

Bridges recommended for cathodic protection: 865731, 865733, 865738, 865739, 865740, 865741, 865742, 865745, 865746 and 865782.

Cathodic Protection Using Zinc Metalizing

Zinc metalizing CP systems consist of a zinc spray applied to the surface of the concrete and connected directly to the reinforcing steel. The zinc serves as a galvanic (sacrificial) anode that corrodes instead of the reinforcing steel. The main drawback is that zinc spray is sacrificial and has a finite lifespan, which is reasonable given the age of the bridges being protected.

Impressed Current Cathodic Protection

Impressed current CP systems include installation of a power supply and titanium mesh or titanium ribbons that cause the mesh/ribbons to act as the anode, drawing ions from the internal prestressing strands and mild reinforcing steel. An externally powered system has the ability to provide a large range of currents and must be tuned appropriately for the installation.

For a titanium mesh system, it is commonly attached to the faces of the element and encapsulated in a hand-applied or spray-applied (gunite) mesh. For a titanium ribbon system, numerous sawcut grooves about ¾ in. deep, which would then be filled with a non-shrink cementitious grout.

Impressed current CP systems require an electrical tap from an adjacent power pole, run through underground conduit to a controller device that is tuned to provide the appropriate current in the titanium elements on the bridges. Protection should be provided for these elements using lockable

NEMA 4X stainless steel cabinets, fenced enclosures and guardrail, depending on the location of the installation.

CONSTRUCTABILITY ISSUES

Specific recommendations made for each bridge have attempted to take into account the challenges associated with construction. In many cases, bridges will need to be replaced on the same alignment as the existing, requiring careful consideration of phased construction in order to ensure accessibility by residents who have no detour route available.

Historical Bridges

In order to be eligible for the National Register of Historic Places (NRHP), a bridge must be at least 50 years old. Bridges are eligible if they are significant and they meet one or more of the following NRHP criteria for evaluation[2]:

- Criterion A - association with an event or pattern of events that made an important contribution to the historical and physical development of a region.
- Criterion B - historic association with the lives of persons significant in the past. This criterion generally has not been commonly applied to bridges, as the works of noted engineers and builders are usually more appropriately represented under Criterion C.
- Criterion C - embodies distinctive characteristics of a type, period, or method of construction; they are the work of a master; they possess high artistic value; or they contribute to a historic district and appear as they did when the district achieved its significance. This criterion is the most broadly applicable for bridges. The criterion affords recognition of the evolution of bridge types and important design or fabrication variations within those bridge types over time. It also facilitates recognition of the development of new bridge types or designs that go on to have a significant effect on bridge or highway design in the state or nation. Under this criterion, significant bridges are represented by early examples or those with innovative details and that have influenced the general acceptance of an important type or design. Significant bridges may also represent an engineering advance within a long-lived technology, like design variations or new ways to fabricate beams. Bridge building technology is significant when it is first introduced, proves its viability, and then goes on to become a commonly-used standard design.
- Criterion D - properties that yield important information in prehistory or history. The criterion is generally used to evaluate archeological resources and is not typically applied to bridges.

As discussed previously in this report, the bridges evaluated during this study have construction dates ranging from 1923 to 2013. By the end of the 20 year study period, 41 of the 46 bridges will be more than 50 years old. This scope of this study did not include thorough research of which of the City's bridges may be recognized as historic and require greater consideration of repair or rehabilitation options than other bridges. Greater consideration for rehabilitation of select bridges may be needed if they are classified as historic by the State Historic Preservation Officer.

[2] The NRHP criteria for evaluation are listed in the Code of Federal Regulations 36 CFR 60.4.

Bridges that receive that are considered historic may still require replacement if they are in poor condition or if remaining in place is intolerable due to safety considerations, like a documented accident history due to the bridge's geometry. Work to repair the bridge is unlikely to affect the historic nature of a bridge, but replacement of the bridge will likely require consultations with historians, the local historical society, and the state historic preservation officer, as well as a study to evaluate no build, rehabilitation and replacement options in order to satisfy federal Section 106 of the National Historic Preservation Act of 1966, the US Department of Transportation Act of 1966, and the National Environmental Policy Act of 1969.

Maintenance of Traffic

Many of the City's bridges are the only means of access to island neighborhoods, so careful phasing of work and maintenance of traffic is of paramount importance. Many of the bridges are narrow, but show no signs of being inadequate for the use, so recommendations to replace have assumed minimal bridge width increases to ensure the bridge is within the City's right of way and that no adjacent properties will be infringed upon. The challenge associated with that is that the existing bridges, most of which serve two lane, two way traffic, must maintain two way traffic on a single lane while a new bridge is constructed immediately adjacent. Depending upon the length of the bridge, temporary signals may be required in order to safely maintain traffic during the work, since temporary barriers and the existing vertical geometry would significantly reduce sight distances for vehicles in both directions.

Design engineers will need to carefully consider traffic control, including providing safe access to pedestrians and bicyclists for any construction activities that may occur.

Utilities

Most of the City's bridges carry utility pipes attached to the deck underside at one or both fascias. Construction activities, whether repairs to the beams, caps or piles, or full bridge replacement, will need to pay attention to these pipes and ensure that they are properly supported and protected throughout construction. For bridge replacements, all avenues should be researched to determine if the utilities can be relocated off of the bridges, although doing so may be difficult due to narrow right of way and deep seawalls. During full bridge replacements, phasing of work must consider how utility service will be maintained throughout construction.

At many bridges, there are overhead utilities crossing just outside of the bridge fascias, parallel to the bridge. These utility lines must be considered during phased construction, to ensure that cranes and other construction equipment can be safely operated. A few bridges have utilities that pass directly over the bridge. An example of this is the bridge carrying Coconut Isle Drive over Grande Canal (865732). Utility agencies will need to be contacted and those lines relocated in order to perform bridge replacement activities.

SHORT TERM RECOMMENDATIONS

Short term recommendations are intended to address structural and safety issues and do not address improving substandard geometry or fixing cosmetic problems. The intent is that these

recommendations address major problems requiring action within the next 2 years, such that it may eliminate or push back the need for long term work.

The costs to perform these repairs have been estimated based on FDOT unit cost history and experience using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for short term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

Many of the items identified are maintenance items that do not require engineering design or construction inspection, but can be addressed by on-call contracts the City currently has for bridge maintenance. In those cases, costs have been provided for construction only, and do not include broken down costs for design, CEI/Admin or contingency. Work that requires the need for engineering professionals has been broken out with costs for all subcategories.

The following pages list the recommended short term work included in each individual bridge inspection report. Further discussion of individual bridge conditions and reasoning for the short term recommendations are provided in those reports, which are included in an appendix to this summary report.

Bridge No.	Facility Carried	Feature Intersected	Recommendation	Costs				
				Design	Construction	CEI/ Admin	Contingency	Total
865721	NE 15th Avenue	S. Fork Middle River	Remove vegetation from around bridge. Address uneven sidewalks.	work can be performed as maintenance by City-contracted forces				
865731	South Gordon Road	Las Olas Canal	Repair handrail. Repair spalls and delaminations on beams. Address north approach slab movement.	$ 15,000.00	$ 25,000.00	$ 5,000.00	$ 5,000.00	$ 50,000.00
865733	Hendricks Isle Drive	Las Olas Canal	Repair spalls and delaminations on beams.		$ 25,000.00			$ 25,000.00
865741	NE 23rd Avenue	Rio Toledo Canal	Repair aluminum handrail at left railing.		$ 3,000.00			$ 3,000.00
865746	Solar Plaza Drive	Rio Placid Canal	Metalize exposed steel on prestressed slab.		$ 3,000.00			$ 3,000.00
865748	SW 11th Avenue	North Fork New River	Seal holes and penetrations in electrical conduits and cabinets. Clean sidewalk joints and reseal with hot pour sealant.	work can be performed as maintenance by City-contracted forces				
865758	SE 9th Avenue	Tarpon River	Address uneven sidewalks.	work can be performed as maintenance by City-contracted forces				
865759	SE 9th Street	Tarpon River	Remove tree growing at west abutment. Address uneven sidewalks.	work can be performed as maintenance by City-contracted forces				
865762	SE 9th Street	Rio Cordova	Address uneven sidewalk at northwest corner.	work can be performed as maintenance by City-contracted forces				
865763	SE 10th Street	Rio Cordova	Address uneven sidewalk at west and east ends of north sidewalk.	work can be performed as maintenance by City-contracted forces				
865776	SE 2nd Court	Himmarshee Canal	Address uneven sidewalk at the northwest approach.	work can be performed as maintenance by City-contracted forces				
865777	NE 18th Avenue	Cypress Creek Canal	Remove tree roots at abutments. Address uneven sidewalk at southeast approach.	work can be performed as maintenance by City-contracted forces				
865782	SE 25th Avenue	Rio Idlewild Canal	Repair slab and concrete arches.		$ 5,000.00			$ 5,000.00
			SHORT TERM RECOMMENDATIONS - TOTAL COST	**$ 15,000.00**	**$ 61,000.00**	**$ 5,000.00**	**$ 5,000.00**	**$ 86,000.00**

LONG TERM RECOMMENDATIONS

Of the 46 bridges evaluated during this study, 17 have been recommended for replacement during the 20 year study period; two in the 0-5 year period, zero in the 6-10 year period, four in the 11-15 year period, and 11 in the 16-20 year period. The remaining 29 bridges are estimated to remain serviceable through the study period, although there will be additional bridges that require major work after the 20 year study period, when all but three of them will have been in service for over 60 years.

Recommendations that do not suggest replacing the bridge, but rather recommend certain repairs during a five year period, have been made based on TranSystems' experience with inspecting and repairing bridges, and what work has a proven track record of success and what does not.

Six of the bridges are not anticipated to require anything more than routine maintenance through the study period.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history and experience using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

It is recommended that work be grouped by type or by adjacent bridges in order to gain cost savings. Savings can be gained in the design, construction and CEI/administrative phases of the work due to similar engineering challenges involved in the phasing and design of repairs or design of replacement bridges. The costs provided assume that this will occur, particularly where repairs are needed or bridge replacements are warranted for bridges in a similar neighborhood, for example:

- Bridges 865709 and 865710 in the Landings neighborhood – concrete repairs
- Bridges 865738 through 865742 carrying roads in the Seven Isles neighborhood – concrete repairs
- Bridges 865745 and 865746 carrying Solar Plaza Drive – concrete repairs
- Bridges 865760 through 865764 east of Cordova Road – bridge replacements
- Bridges 865770 through 865774 in the Harbor Isle neighborhood – bridge replacements

The following pages list the recommended long term work included in each individual bridge inspection report. Further discussion of individual bridge conditions and reasoning for long term recommendations are provided in those reports, which are included in an appendix to this summary report.

Work Period (years)	Bridge No.	Facility Carried	Feature Intersected	Recommendation	Costs				
					Design	Construction	CEI/ Admin	Contingency	Total
0-5	865732	Coconut Isle Drive	Grande Canal	Replace bridge.	$ 105,000.00	$ 700,000.00	$ 140,000.00	$ 140,000.00	$ 1,085,000.00
0-5	865775	South Ocean Drive	Marion River	Replace bridge.	$ 201,600.00	$ 1,344,000.00	$ 268,800.00	$ 268,800.00	$ 2,083,200.00
0-5	865709	NE 55th Street	Landings Inlet West	Replace bulkhead walls and slope protection. Repair railings. Repair spalls on caps.	$ 12,000.00	$ 130,000.00	$ 26,000.00	$ 26,000.00	$ 194,000.00
0-5	865710	Bayview Drive	Landings Inlet South	Replace bulkhead walls and slope protection. Repair railings. Repair spalls on caps.	$ 12,000.00	$ 130,000.00	$ 26,000.00	$ 26,000.00	$ 194,000.00
0-5	865731	South Gordon Road	Las Olas Canal	Install metalizing at abutment and caps.	$ 15,000.00	$ 65,000.00	$ 13,000.00	$ 13,000.00	$ 106,000.00
0-5	865733	Hendricks Isle Drive	Las Olas Canal	Install metalizing at abutment and caps. Install jackets at bent piles.	$ 40,000.00	$ 150,000.00	$ 30,000.00	$ 30,000.00	$ 250,000.00
0-5	865745	Solar Plaza Drive	Rio Canal	Install metalizing at abutment and caps. Make concrete repairs.	$ 10,000.00	$ 48,000.00	$ 9,600.00	$ 9,600.00	$ 77,200.00
0-5	865746	Solar Plaza Drive	Rio Placid Canal	Install metalizing at abutment and caps. Make concrete repairs.	$ 10,000.00	$ 48,000.00	$ 9,600.00	$ 9,600.00	$ 77,200.00
0-5				**TOTAL COST**	**$ 405,600.00**	**$ 2,615,000.00**	**$ 523,000.00**	**$ 523,000.00**	**$ 4,066,600.00**
6-10	865707	NE 59th Avenue	Pelican Canal	Make concrete repairs.	$ 4,050.00	$ 27,000.00	$ 5,400.00	$ 5,400.00	$ 41,850.00
6-10	865720	Old Dixie Highway	S. Fork Middle River	Install pile jackets. Make concrete repairs. Replace bulkheads at each quadrant	$ 40,000.00	$ 158,000.00	$ 31,600.00	$ 31,600.00	$ 261,200.00
6-10	865777	NE 18th Avenue	Cypress Creek Canal C-14	Replace pile jackets.	$ 10,000.00	$ 85,000.00	$ 17,000.00	$ 17,000.00	$ 129,000.00
6-10				**TOTAL COST**	**$ 54,050.00**	**$ 270,000.00**	**$ 54,000.00**	**$ 54,000.00**	**$ 432,050.00**
11-15	864025	Riverland Road	Branch South N New River	Make concrete repairs.	$ 4,000.00	$ 22,000.00	$ 4,400.00	$ 4,400.00	$ 34,800.00
11-15	865708	Bayview Drive	Longboat Inlet	Replace bridge.	$ 60,000.00	$ 400,000.00	$ 80,000.00	$ 80,000.00	$ 620,000.00
11-15	865709	NE 55th Street	Landings Inlet West	Install jackets on piles. Perform concrete repairs.	$ 7,000.00	$ 71,000.00	$ 14,200.00	$ 14,200.00	$ 106,400.00
11-15	865710	Bayview Drive	Landings Inlet South	Install jackets on piles. Perform concrete repairs.	$ 7,000.00	$ 71,000.00	$ 14,200.00	$ 14,200.00	$ 106,400.00
11-15	865721	NE 15th Avenue	S. Fork Middle River	Install pile jackets. Make concrete repairs.	$ 40,000.00	$ 73,000.00	$ 14,600.00	$ 14,600.00	$ 142,200.00
11-15	865727	NE 1st Street	Stranahan Lake	Replace bridge.	$ 81,000.00	$ 540,000.00	$ 108,000.00	$ 108,000.00	$ 837,000.00
11-15	865728	SE 8th Avenue	Himmarshee Canal	Install pile jackets. Make concrete repairs. Replace bulkheads at each quadrant	$ 40,000.00	$ 302,000.00	$ 60,400.00	$ 60,400.00	$ 462,800.00
11-15	865729	East Las Olas Blvd.	Himmarshee Canal	Install pile jackets. Make concrete repairs.	$ 15,000.00	$ 89,000.00	$ 17,800.00	$ 17,800.00	$ 139,600.00

Work Period (years)	Bridge No.	Facility Carried	Feature Intersected	Recommendation	Costs				
					Design	Construction	CEI/ Admin	Contingency	Total
11-15	865738	SE 23rd Avenue	Rio Del Mar	Install metalizing at abutment and caps. Install jackets at bent piles. Repair abutment backwalls and retaining walls. Repair beams.	$ 40,000.00	$ 122,000.00	$ 24,400.00	$ 24,400.00	$ 210,800.00
11-15	865739	SE 23rd Avenue	Rio Castilla Canal	Install metalizing at abutment and caps. Install jackets at bent piles. Repair abutment backwalls and retaining walls. Repair beams.	$ 40,000.00	$ 122,000.00	$ 24,400.00	$ 24,400.00	$ 210,800.00
11-15	865740	NE 23rd Avenue	Rio Aragon Canal	Install metalizing at abutment and caps. Install jackets at bent piles. Repair abutment backwalls and retaining walls. Repair beams.	$ 40,000.00	$ 122,000.00	$ 24,400.00	$ 24,400.00	$ 210,800.00
11-15	865741	NE 23rd Avenue	Rio Toledo Canal	Install metalizing at abutment and caps. Install jackets at bent piles. Repair abutment backwalls and retaining walls. Repair beams.	$ 40,000.00	$ 122,000.00	$ 24,400.00	$ 24,400.00	$ 210,800.00
11-15	865742	NE 23rd Avenue	Rio Giraldo Canal	Install metalizing at abutment and caps. Install jackets at bent piles. Repair abutment backwalls and retaining walls. Repair beams.	$ 40,000.00	$ 122,000.00	$ 24,400.00	$ 24,400.00	$ 210,800.00
11-15	865748	SW 11th Avenue Swing Bridge	N. Fork New River	Replace timber sidewalk planks. Clean and paint bridge Perform concrete repairs. Perform in-depth mechanical maintenance.	$ 65,000.00	$ 345,000.00	$ 69,000.00	$ 69,000.00	$ 548,000.00
11-15	865752	SW 7th Street	Tarpon River	Replace concrete encasement over steel beams. Replace concrete deck and barriers. Clean and paint bearings. Make concrete repairs to substructure.	$ 60,000.00	$ 205,000.00	$ 41,000.00	$ 41,000.00	$ 347,000.00
11-15	865765	SE 13th Street	Cerro Gordo River	Replace bridge.	$ 283,920.00	$ 1,892,800.00	$ 378,560.00	$ 378,560.00	$ 2,933,840.00
11-15	865771	West Lake Drive	Estelle River	Replace bridge.	$ 181,800.00	$ 1,212,000.00	$ 242,400.00	$ 242,400.00	$ 1,878,600.00
11-15	865782	SE 25th Avenue	Rio Idlewild Canal	Install metalizing at abutment and bent caps.	$ 10,000.00	$ 48,000.00	$ 9,600.00	$ 9,600.00	$ 77,200.00
11-15				**TOTAL COST**	**$ 1,050,720.00**	**$ 5,858,800.00**	**$ 1,171,760.00**	**$ 1,171,760.00**	**$ 9,253,040.00**
16-20	865712	Castle Harbor Isle	Toulon Waterway	Replace bridge.	$ 83,160.00	$ 554,400.00	$ 110,880.00	$ 110,880.00	$ 859,320.00
16-20	865713	NE 41st Street	Toulon Waterway	Replace bridge.	$ 83,160.00	$ 554,400.00	$ 110,880.00	$ 110,880.00	$ 859,320.00
16-20	865760	SE 7th Street	Rio Cordova	Replace bridge.	$ 205,200.00	$ 1,368,000.00	$ 273,600.00	$ 273,600.00	$ 2,120,400.00
16-20	865761	SE 8th Street	Rio Cordova	Replace bridge.	$ 205,200.00	$ 1,368,000.00	$ 273,600.00	$ 273,600.00	$ 2,120,400.00
16-20	865762	SE 9th Street	Rio Cordova	Replace bridge.	$ 196,560.00	$ 1,310,400.00	$ 262,080.00	$ 262,080.00	$ 2,031,120.00

Work Period (years)	Bridge No.	Facility Carried	Feature Intersected	Recommendation	Costs				
					Design	Construction	CEI/ Admin	Contingency	Total
16-20	865763	SE 10th Street	Rio Cordova	Replace bridge.	$ 209,520.00	$ 1,396,800.00	$ 279,360.00	$ 279,360.00	$ 2,165,040.00
16-20	865764	SE 11th Street	Rio Cordova	Replace bridge.	$ 203,040.00	$ 1,353,600.00	$ 270,720.00	$ 270,720.00	$ 2,098,080.00
16-20	865770	Laguna Terrace	Diane River	Replace bridge.	$ 181,800.00	$ 1,212,000.00	$ 242,400.00	$ 242,400.00	$ 1,878,600.00
16-20	865772	West Lake Drive	Diane River	Replace bridge.	$ 181,800.00	$ 1,212,000.00	$ 242,400.00	$ 242,400.00	$ 1,878,600.00
16-20	865773	West Lake Drive	Lucille River	Replace bridge.	$ 295,200.00	$ 1,968,000.00	$ 393,600.00	$ 393,600.00	$ 3,050,400.00
16-20	865774	West Lake Drive	Mercedes River	Replace bridge.	$ 195,187.50	$ 1,301,250.00	$ 260,250.00	$ 260,250.00	$ 2,016,937.50
16-20	865776	SE 2nd Court	Himmarshee Canal	Install pile jackets. Make concrete repairs.	$ 20,000.00	$ 188,000.00	$ 37,600.00	$ 37,600.00	$ 283,200.00
16-20	865781	Access Road	Mills Pond Canal	Make concrete repairs.	$ 2,250.00	$ 15,000.00	$ 3,000.00	$ 3,000.00	$ 23,250.00
16-20				**TOTAL COST**	**$ 2,062,077.50**	**$ 13,801,850.00**	**$ 2,760,370.00**	**$ 2,760,370.00**	**$ 21,384,667.50**
				LONG TERM RECOMMENDATIONS - GRAND TOTAL (0-20 YEARS)	**$ 3,572,447.50**	**$ 22,545,650.00**	**$ 4,509,130.00**	**$ 4,509,130.00**	**$ 35,136,357.50**

BRIDGE INSPECTION REPORT

Bridge Number: 864025 **Bridge Name:** Riverland Road over Branch South of North New River

Topside Inspection Complete: 5/21/2014

Underwater Inspection Complete: 5/19/2014

Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville – Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 28.9 ft. long, single span, prestressed concrete slab bridge was constructed in 1964. The bridge has a roadway width of 27.9 ft. and carries two lanes of traffic on an urban collector roadway in a residential neighborhood. There are 4.5 ft. wide sidewalks on each side. The bridge is classified as Functionally Obsolete but is not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an August 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 25 and 30 tons for SU and C trucks, respectively.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the condition of the prestressed concrete slabs. The conditions are generally unchanged from the 2013 inspection report conducted as part of

the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Sidewalks

- The northwest approach sidewalk has a 1 ft. 6 in. x 1 ft. 6 in. asphalt patch with minor settlement at Abutment 1. See Condition Photo 1.
- The south sidewalk has an accumulation of dirt and debris.

Railings/Barriers

- The south bridge railing exhibits a 6 in. x 4 in. x ½ in. spall with exposed corroded steel in the north face at the west end. This condition was not previously noted. See Condition Photo 2.
- The south bridge rail has up to five 8 in. x 5 in. x ½ in. spalls with exposed and painted steel in the north face of the bottom rail.
- Post 5 of the south bridge rail has a 5 in. x 2 in. x ½ in. spall with exposed and painted steel in the southwest corner.
- The north bridge rail has an 8 in. x 5 in. x ½ in. spall with exposed and painted steel in the south face of the bottom rail.
- The above spalls are due to lack of concrete cover.

Utilities

- There is one 2 in. fiberglass utility attached to the north bridge rail.
- There is one 8 in. ductile iron utility attached to south bridge rail.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- There is graffiti on the underside of the slab units. See Condition Photo 3.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Piles

- The southwest corner of Pile 2-4 has a 2 ft. x 4 in. delamination starting at the high watermark. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.
- Several of the piles have up to 3 ft. long x $^{1}/_{64}$ in. wide vertical cracks in random locations. See Underwater Inspection Report Photo 2.
- There is graffiti on the piles.

Abutments

- The abutment caps have up to 2 ft. 10 in. x $^{1}/_{32}$ in. wide vertical cracks in random locations.
- There is graffiti on both abutment caps. See Condition Photo 4.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- A tree is growing in the south channel adjacent to the southeast retaining wall. See Condition Photo 5 and Underwater Inspection Report Photo 3.
- The end of the southwest retaining wall has up to a 6 in. x 6 in. 2 ft. deep washout behind the bulkhead cap. See Condition Photo 6.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Retaining Walls

- The southwest retaining wall to backwall joint is open up to 2 ft. x 4 in. x 4 in., exposing corroded steel. Active fill leakage is evident; as a result, the earth slope above the southwest retaining wall joint has a washout as noted in the channel section. See Condition Photo 7 and Underwater Inspection Report Photo 4.
- The retaining walls to backwall joints are randomly open up to 1 in. wide with no active fill leakage noted during this inspection.
- The northwest backwall to wingwall transition has a delamination 1 ft. 6 in. x 10 in. This deficiency was not previously noted. See Underwater Inspection Report Photo 5.
- The backwalls have random diagonal cracks up to $^{1}/_{64}$ in. wide. See Condition Photo 8 and Underwater Inspection Report Photo 6.
- There is graffiti on the retaining walls. See Condition Photo 8.

Guardrails

- The northeast guardrail is improperly terminated at the structure.
- The west end of the northeast pedestrian safety pipe rail is not secured to the final guardrail post.
- The anchor bolts of the southwest approach guardrail transition protrude towards traffic creating a snagging condition.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines, with the majority of deficiencies being in the substructure elements. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, particularly where water intrusion into waterline cracks and spalls with exposed steel exist. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in very good condition and have no visible spalls or cracks. The latest available load rating analysis indicates that load posting is not required, but the bridge is load posted.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

A detour is available to residents on either side of the bridge; however, the detour is about 2.8 miles via Davie Boulevard and Fairmont Avenue to the west.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally over the bridge at the south fascia, in close proximity to the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 5,500 vehicles per day, and the road is posted for 35 mph, so it is possible to perform repairs on the deck with simple flagging operations to close half of the bridge at a time. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or

future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge for the next 20 years is described in the following section, Long Term.

LONG TERM

Deficiencies which may require repairs in the future include spalls and delaminations, as well as small cracks in substructure elements and retaining walls. The structure is in good condition and only small concrete repairs are anticipated. The cost to do the work is estimated at $20,000, to be done 10-15 years from now.

Long Term Recommendation(s): **Make concrete repairs.**			Cost
Design [1]			$ 4,000.00
Construction			$ 22,000.00
Bridge Construction [2]	$	20,000.00	
Maintenance of Traffic [3]	$	2,000.00	
Construction Inspection and Administration [4]			$ 4,400.00
Contingency [5]			$ 4,400.00
		TOTAL COST	$ 34,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Miscellaneous concrete repairs: $20,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

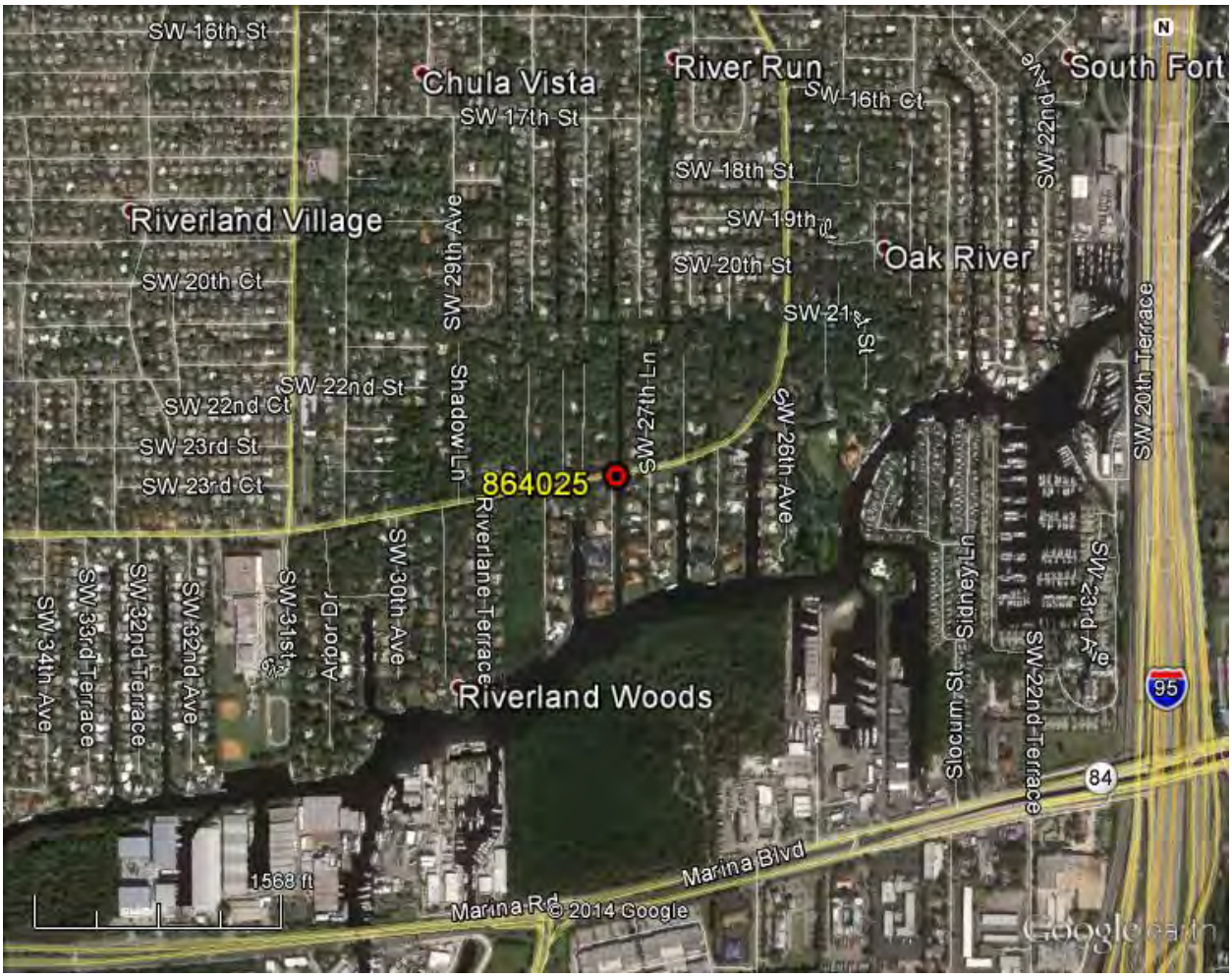
Utilities Mounted at South Fascia

GENERAL PHOTOS OF BRIDGE

Channel Looking North

Channel Looking South

LOCATION MAP



CONDITION PHOTOS

Photo 1 – The northwest approach sidewalk exhibits settlement.

Photo 2 – The north side of the south railing exhibits spalls with exposed steel.

CONDITION PHOTOS

Photo 3 – The deck underside exhibits graffiti.

Photo 4 – Abutment 2 exhibits graffiti.

CONDITION PHOTOS

Photo 5 – A tree is growing in the southeast corner.

Photo 6 – The southwest retaining wall exhibits a washout behind the bulkhead cap.

CONDITION PHOTOS

Photo 7 – The southwest retaining wall is open and exposes corroded steel.

Photo 8 – The southwest backwall exhibits diagonal cracks and graffiti.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **864025** Date: **19-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 864025 UW Inspection Date: 5/19/2014

Bridge Name: N/A

Road Name/Number: Riverland Road

Feature Intersected: Branch South N New River

Location: 1.4 miles East of SR 7.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	3.2 ft. Low Tide.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	2 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Heavy oyster growth		290 Channel
Water Temp.:	81°		475 R/Concrete Walls
Weather:	83° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Stinging Hydroids, Sharp oyster shells

Critical Deficiency Notes: None

Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead.	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Rego, Alexis - Bridge Insepector / Diver (CBI # 409).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

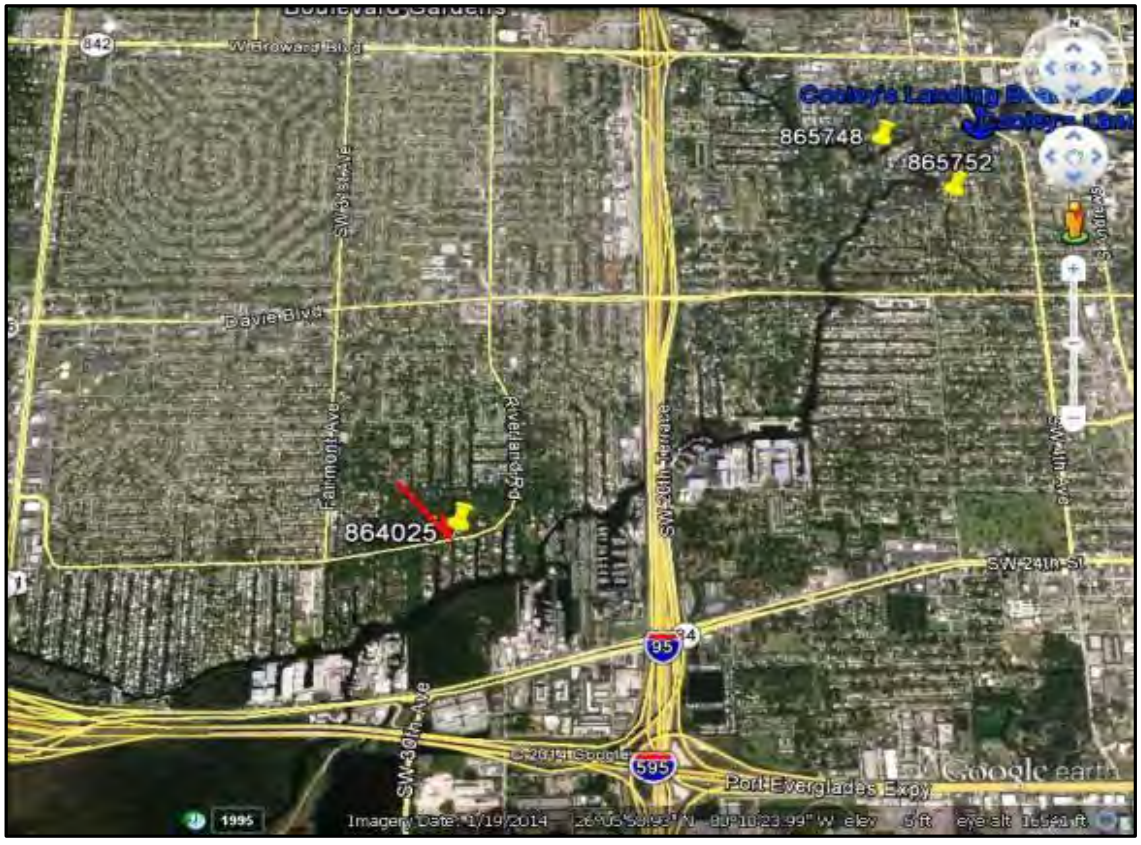
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

2/18/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **864025** Date: **19-May-14**

A: LOCATION MAP



Description: 1.4 miles East of SR 7

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **14 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 24" below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **1**
_Pile 2-4, SW corner delamination 24" x 4", starting at the high watermark. **UW Photo 01. NEW**

CS-1: **13**
_Random piles have up to 36" x 1/64", vertical cracks in random locations. **UW Photo 02. NO CHANGE**

INCIDENTAL:
_There is graffiti on the Piles. **NO CHANGE**

290 Channel **1 ea.**

CS-1: **1**
_Tree growing in the South channel adjacent to the SE retaining wall. **UW Photo 03. NO CHANGE**

475 R/Concrete Walls **147 lf.**

Note:
_This Element represents the abutment backwalls and the retaining walls at the four corners of the structure.

CS-3: **3**
_The SE retaining wall to backwall joint is open up to 24" x 4" x 4", exposing corroded rebars. Active fill leakage is evident; as a result, the earth slope above the SW retaining wall joint has a 24" x 24" x 6', washout. **UW Photo 04. NO CHANGE.**
_The NW backwall transition to wingwall has a delamination 18" x 10". **UW Photo 05. NEW**

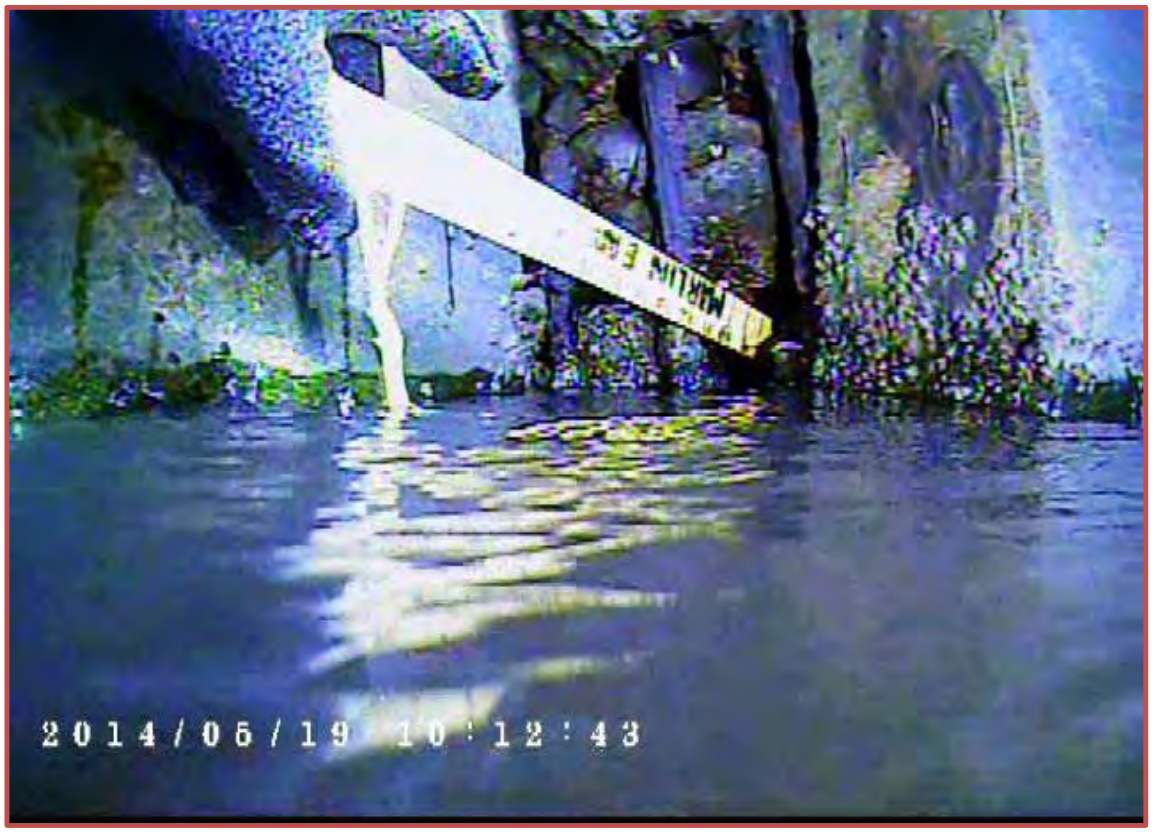
CS-1: **144**
_The retaining walls to backwall joints are open up to 1" wide. No backfill leakage was observed during this inspection cycle. **DECREASE.**
_The backwalls have random diagonal cracks up to 1/64" wide. **UW Photo 06. NO CHANGE.**

INCIDENTAL:
_There is graffiti on the retaining walls. **NO CHANGE.**

F: PHOTO SECTION

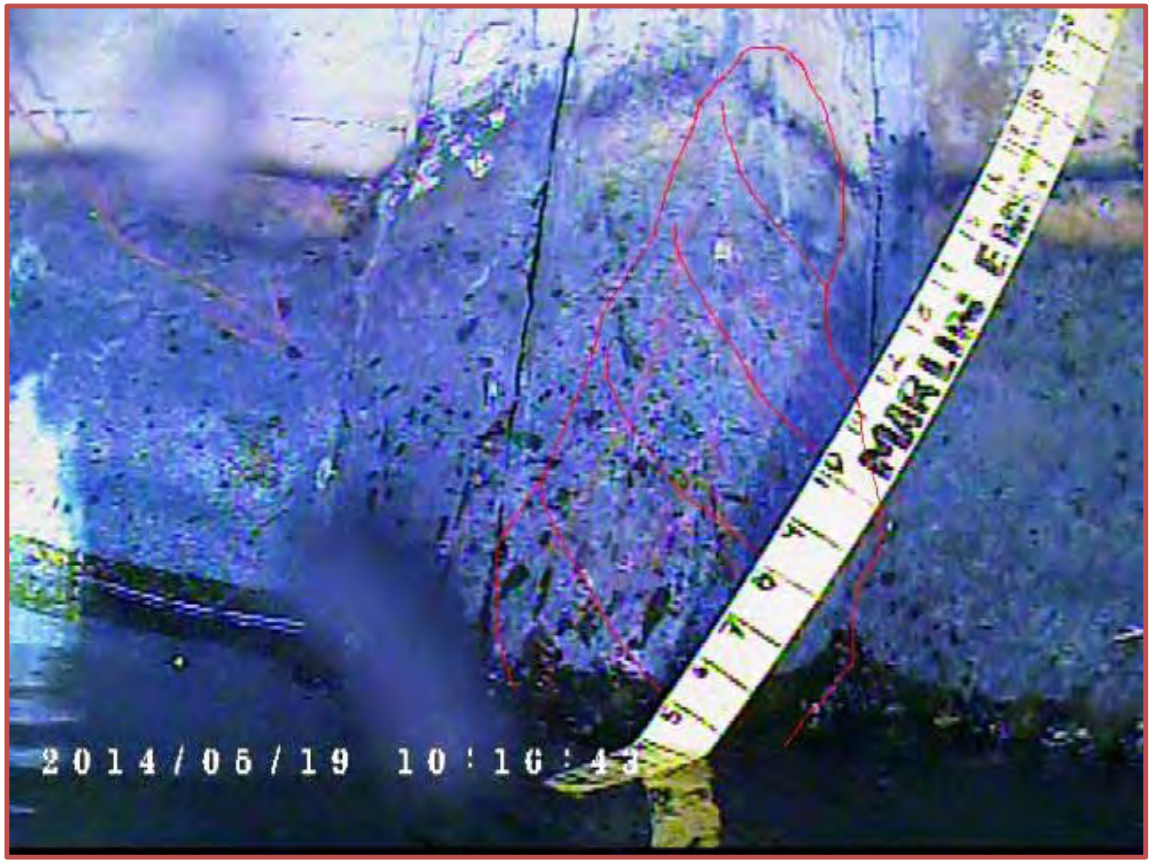
Description: Top: Pile 2-4, SW corner delamination, starting at the high watermark. **UW Photo 01.**
Bottom: Several of the Piles have up to 36" x 1/64" vertical cracks. **UW Photo 02.**

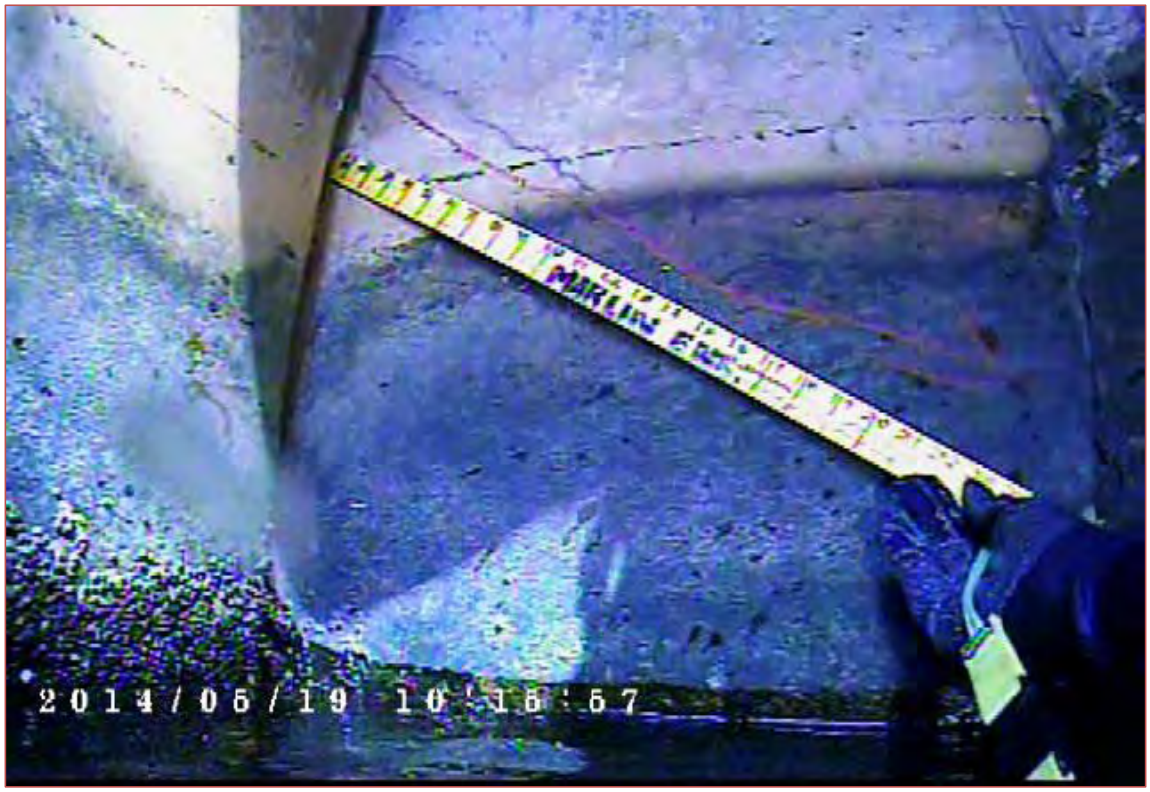
F: PHOTO SECTION



Description: Top: Tree growing in the South channel adjacent to SE retaining wall. **UW Photo 03.**
Bottom: SE retaining wall to backwall joint is open, exposing rebars. **UW Photo 04.**

F: PHOTO SECTION





Description: Top: NW backwall transition to wingwall has a delamination. **UW Photo 05.**
Bottom: The backwalls have random diagonal cracks up to 1/64" wide. **UW Photo 06.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch as needed Pile 2-4.

475 R/Concrete Walls

_Seal the open joint at the SW retaining wall as needed.
_Remove all unsound concrete and patch at the NW transition between the backwall and wingwall.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.3	13.4
1.5	13.8	13.8
2	12.9	12.8

Notes: Measurements were taken from the top of the concrete rail.
Waterline on the left: 10.9 ft. and right: 10.7 ft. at mid-channel.
Maximum Channel depth: 3.2 ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865707 **Bridge Name:** NE 59th Street over Pelican Canal

Topside Inspection Complete: 5/16/2014
Underwater Inspection Complete: 5/20/2014

Report Date: 7/25/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 22.3 ft. long, single span, reinforced concrete slab bridge with double T-beams supporting the sidewalks was constructed in 1957. The bridge has a roadway width of 24.2 ft. and carries two lanes of traffic in a residential neighborhood. There are 5.6 ft. wide sidewalks on each side. The bridge is neither Functionally Obsolete nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a June 1998 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the condition of the reinforced concrete slab and the tops of the sidewalk double T-beams. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has ¼ in. wide transverse cracks over the expansion joints. See Condition Photo 1.
- The asphalt overlay has 26 ft. long x $^{1}/_{8}$ in. wide longitudinal cracks. See Condition Photo 2.
- The sidewalks have minor cracks and the south sidewalk has five exposed utility hangers up to 3 in. diameter.

Railings/Barriers

- The timber portions of the bridge rails have typical weather splits up to ¼ in. wide. See Condition Photo 3.

Utilities

- There is one 6 in. diameter ductile iron utility in the bay under each sidewalk along both sides of the structure.
- There is one 2 in. diameter PVC utility pipe in the bay under the south sidewalk.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Slab

- Various slab conditions were repaired. See Condition Photo 4 for a general view of the deck underside.
- The poured keyways between the double tee beams and the slab units have delaminations up to 1 ft. 6 in. x 1 ft. 6 in. randomly throughout.

Reinforced Concrete Tee Beams

- The north fascia at the east end over Abutment 2 exhibits a 9 in. x 7 in. x 6 in. spall. See Condition Photo 5.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have minor vertical cracks.
- Abutment 1 cap has heavy efflorescence beneath Slab Unit 1-1.
- The haunches at the end of the caps have minor cracking up to $^{1}/_{32}$ in. wide.

Reinforced Concrete Piles

- Several of the piles have minor edge scrapes up to 5 in. x 4 in. x ½ in.
- Pile 2-1 is a built-up pile in the top 4 ft. This built-up section is spalled/delaminated up to 3 in. deep with exposed rebar, 3/8 in. section remaining, in all four faces. This deficiency has increased in severity since the previous inspection. See Underwater Inspection Report Photo 1.
- The southwest corner of Pile 2-4 has an 11 in. x 4 in. x ½ in. spall at and below the high watermark. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- The southwest corner of Pile 2-8 has a 1 ft. 2 in. x 4 in. x 1 in. spall at and below the high watermark. Previously noted as two vertical cracks. See Condition Photo 6.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel has heavy oyster growth along the channel bottom.

MISCELLANEOUS ELEMENTS

Approach Slabs

- The southeast approach sidewalk has two diagonal cracks up to $^{1}/_{32}$ in. wide at the bridge transition. See Condition Photo 7.
- The northeast approach sidewalk has a 3 ft. x 4 in. x 1 in. spall along the wingwall. See Condition Photo 8.
- The northwest approach sidewalk has a 4 ft. x 4 in. x 1 in. spall along the wingwall.
- The southeast sidewalk has a 5 ft. long x 2 ft. 3 in. wide x 4 in. deep area of undermining.
- The northeast approach sidewalk has an area of undermining up to 10 ft. long x 4 in. x up to 5 ft. of penetration. See Condition Photo 9.

Bulkheads/Retaining Walls

- The Abutment 2 backwall has a 5 ft. x 1 ft. x 3 in. spall/delamination with exposed steel in the northeast corner behind Pile 2-8. Previously noted as a 4 ft. x 1 ft. x 3 in. spall. See Condition Photo 10 and Underwater Inspection Report Photo 3.
- The northeast wingwall has two delaminations up to 3 ft. x 2 ft. 6 in., east of the 3rd pile from the west.
- The first joint west of Pile 1-8 has a 1 ft. 2 in. x 11 in. delamination 3 ft. below the cap.
- The west retaining wall north of Piles 1-3 and 1-7 has delaminations with corrosion staining up to 4 ft. x 11 in.
- The west retaining wall between Piles 1-2 and 1-3 has a vertical crack, full panel height x 1/32 in. wide extending up to 1 ft. 3 in. into the marine growth. This condition was not previously noted.
- In the east retaining wall north of Piles 2-4, 2-5 and 2-8 there are spalls/delaminations and cracking up to 1/32 in. wide with corrosion bleedout up to 4 ft. 3 in. x 1 ft. x 3 in.
- The east retaining wall between Piles 2-4, 2-5 and 2-8 has a 5 ft. x 1 ft. 8 in. delamination with associated cracks, extending up to 11 in. into the marine growth. This condition was not previously noted.
- The south face of the southwest retaining wall exhibits spalls and delaminations with exposed steel up to 4 ft. long x 4 ft. high at various locations. This condition was not previously noted. See Condition Photo 11.
- The southwest retaining wall has a spalled/delaminated area 3 ft. x 2 ft. 7 in. x 2 in. with exposed rebars with up to 75% section loss, starting at the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 4.
- Several wingwall piles have minor edge spalls up to 5 in. x 4 in. x ½ in.
- There are open joints between sheet pile units up to 1 ¼ in. which are allowing fill leakage to occur, causing depressions in the shoulders and contributing to the undermining of the approach sidewalks and west approach slab. See Underwater Inspection Report Photo 5.
- The concrete sheet piles and caps have minor vertical cracks up to 3 ft. long x $^{1}/_{32}$ in. wide.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is generally in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the worst conditions present on the abutment piles and backwalls. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete is very likely to have chloride contamination to the extent that the internal reinforcing steel is corroding. The act of making repairs helps to extend the bridge's lifespan, but it does not address the root condition that is causing the spalls and delaminations. Concrete repairs to bridges like this one are likely to last 5-8 years.

The reinforced concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no notable spalls or cracks. The latest available load rating for the bridge does not indicate that posting is required. Given the good condition of these slab units, the bridge is expected to remain in service for the next 20 years, with work being performed only to the substructure elements and the bulkheads/retaining walls.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge via Federal Highway from the west and Bayview Drive from the east.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally over the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 600 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The primary load carrying member of the bridge, the reinforced concrete slab, is in good condition and can be expected to continue to perform for the next 20 years without repairs. The tee beams supporting the sidewalks may need some spall repairs eventually.

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

Because the slab units rest on abutments that are integral with the retaining walls, deterioration of the retaining walls can compromise the structural integrity of the bridge. It is very difficult to replace the abutments without replacing the superstructure, so the prudent course of action is to repair them until such time as replacement is the only option. Based on this, in 5-10 years, spall repairs should be completed to the spalls in the bulkheads/retaining walls. Because the spall repair patches are unlikely to last through the rest of the study period, it is recommended that the process be repeated 16-20 years from now. Minor spall repairs to the concrete tee beams which support the sidewalks are likely to be required during that work.

Long Term Recommendation(s): **Make concrete repairs.**			Cost	
Design [1]			$	4,000.00
Construction			$	27,000.00
Bridge Construction [2]	$	25,000.00		
Maintenance of Traffic [3]	$	2,000.00		
Construction Inspection and Administration [4]			$	5,400.00
Contingency [5]			$	5,400.00
		TOTAL COST	$	41,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Concrete repairs: $25,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

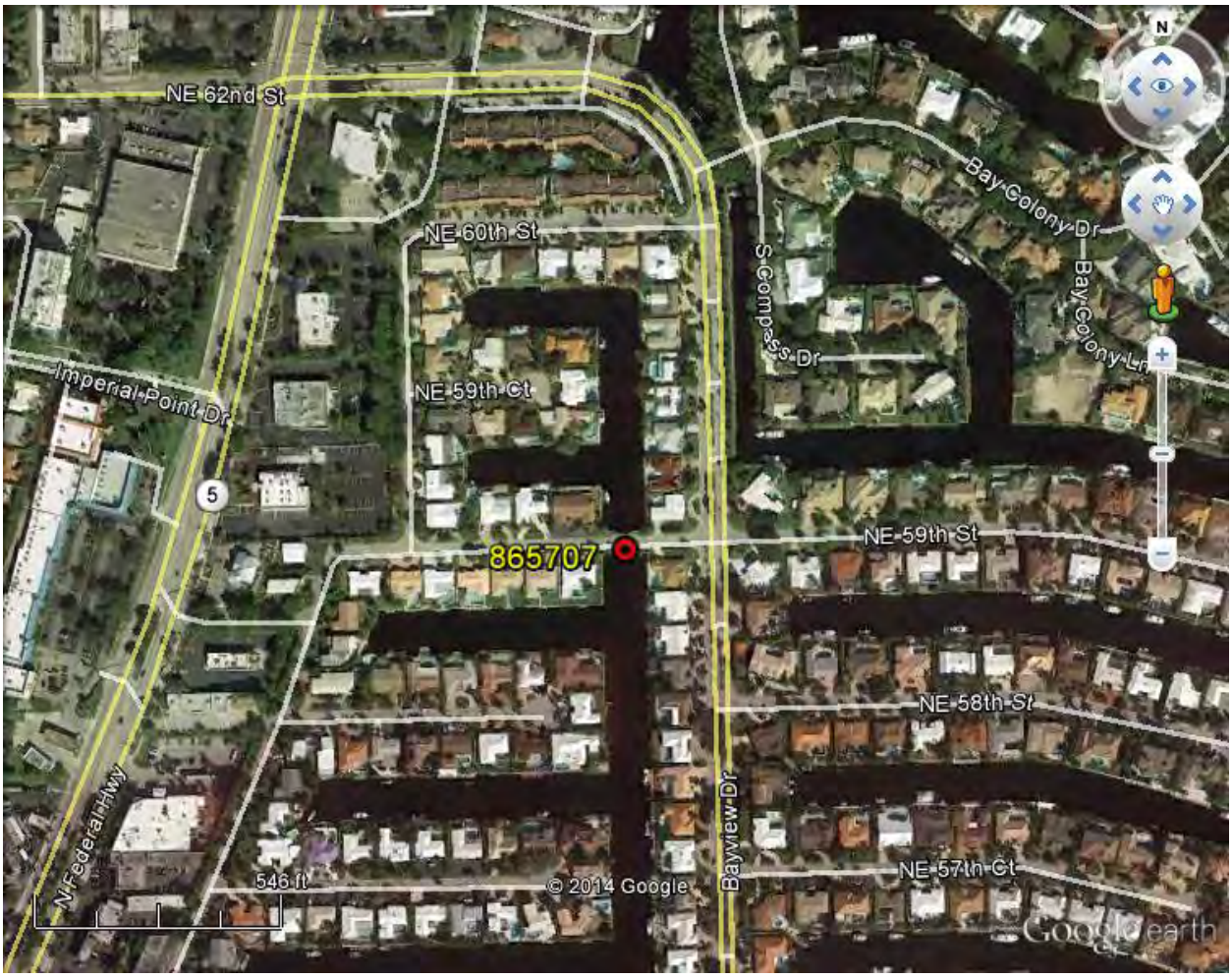
Utilities Mounted under South Sidewalk

Channel Looking South

GENERAL PHOTOS OF BRIDGE

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Abutment 1 joint seal transverse crack.

Photo 2 – Westbound deck top longitudinal cracks.

CONDITION PHOTOS

Photo 3 – Timber rail splitting.

Photo 4 – Deck underside general view of repairs.

CONDITION PHOTOS

Photo 5 – The east end of the north fascia exhibits a spall over Abutment 2.

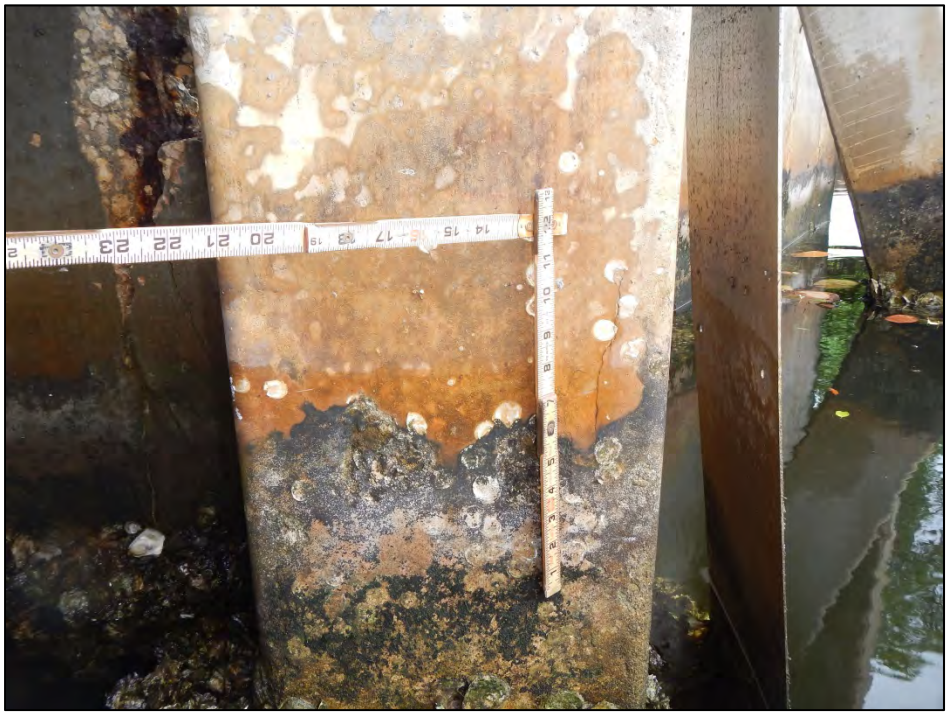


Photo 6 – The southwest corner of Pile 2-8 exhibits a vertical crack.

CONDITION PHOTOS

Photo 7 – The southeast approach sidewalk exhibits diagonal cracks.

Photo 8 – The northeast approach sidewalk exhibits a spall.

CONDITION PHOTOS

Photo 9 – The northeast approach sidewalk has an area of undermining.

Photo 10 – The south end of the Abutment 2 backwall exhibits a spall/delamination.

CONDITION PHOTOS

Photo 11 – The south face of the southwest retaining wall exhibits a spall/delamination.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865707** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865707 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: NE 59th STREET.

Feature Intersected: PELICAN CANAL.

Location: 0.1 mile West of BAYVIEW DR.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6.8 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera
Water Type:	Salt water		Inspection Tools, U/W Lights
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Heavy oyster growth		290 Channel
Water Temp.:	80°		475 R/Concrete Walls
Weather:	83° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Stinging Hydroids, Sharp oyster shells

Critical Deficiency Notes: None

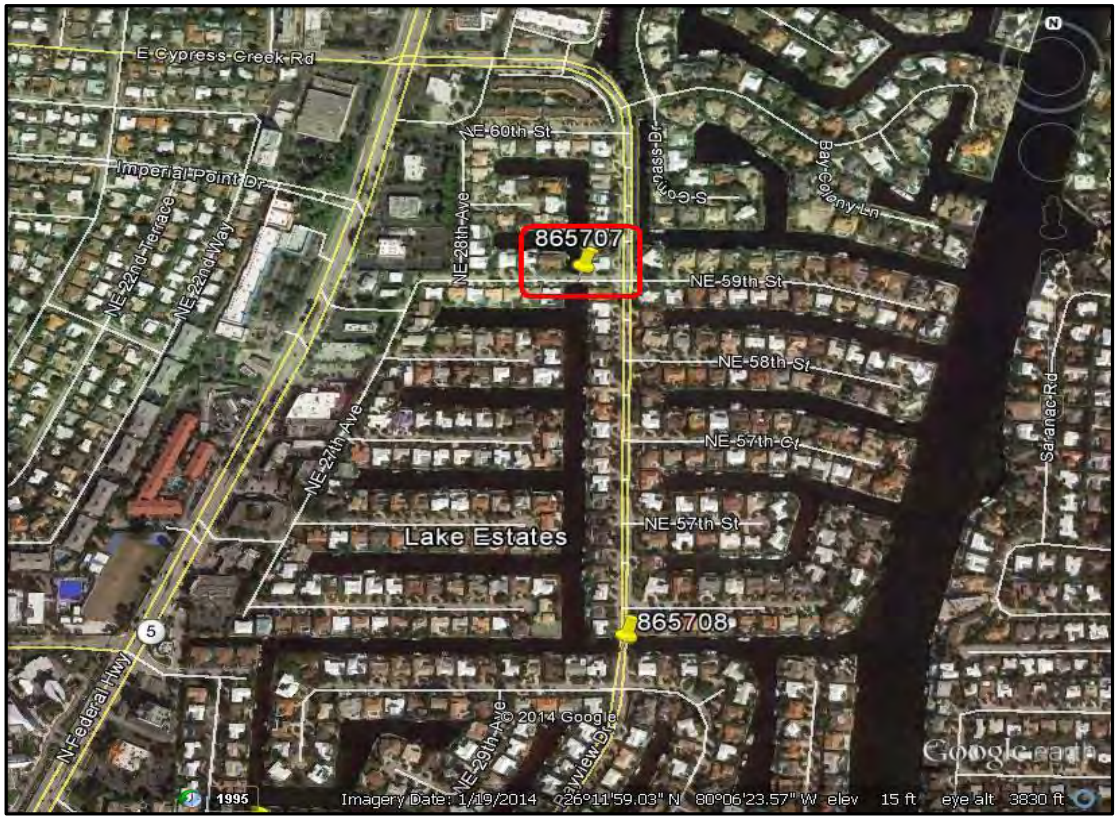
Personnel / Title / Number	Initials
Hayes, Steven - Bridge Inspector / Diver (CBI # 438). Lead.	SH
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	7/18/14

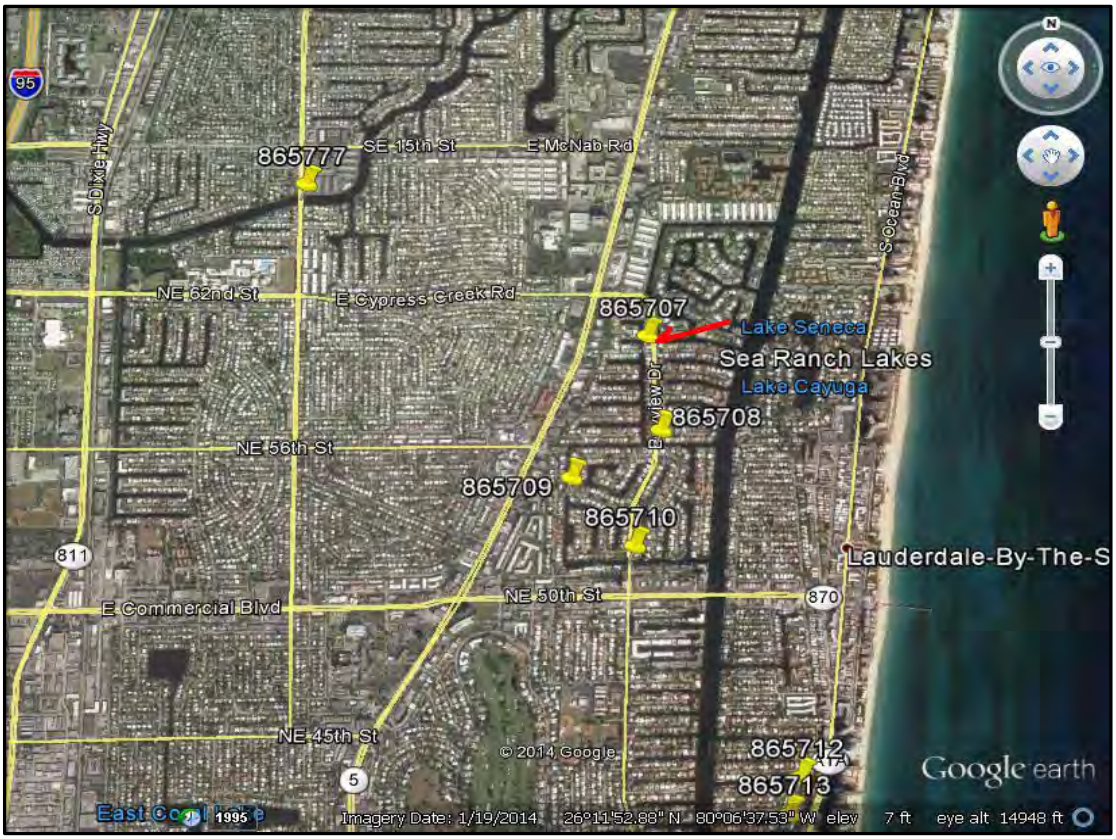
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865707** Date: **20-May-14**

A: LOCATION MAP





Description: 0.1 mile West of BAYVIEW DR.

E: ELEMENT NOTES

Notes:

_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
<u>204 P/S Concrete Column</u>	**16 ea.**

Note:

_Only the sixteen load bearing piles were included in the total quantity. Refer to Element 475 R/Concrete Walls for comments on the retaining wall piles.

_Piles were inspected from the cap down by underwater inspectors during this inspection cycle.

_The Piles are covered heavy marine growth starting 40in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-4: **1**

_Pile 2-1 is a built-up Pile in the top 4'. This built-up section is spalled/delaminated up to 3" deep, with exposed rebar (3/8" section remaining) in all four faces. **UW Photo 01. INCREASE.**

CS-2: **2**

_Pile 2-4, SW corner spall 11" x 4" x 1/2", at and below the high watermark. **UW Photo 02. NEW.**

_Pile 2-8, SW corner spall 14" x 4" x 1", at and below the high watermark. **INCREASE.**

CS-1: **13**

_Several of the Piling have minor edge scrapes up to 5" x 4" x 1/2". **NO CHANGE.**

<u>290 Channel</u>	**1 ea.**

CS-1: **1**

_The channel has heavy oyster growth along the channel bottom.

<u>475 R/Concrete Walls</u>	**234 lf.**

Note:

_Total quantity includes retaining walls and the wingwalls at the four corners of the bridge.

_Abutment backwalls and retaining walls were inspected from the cap down by underwater inspectors during this inspection cycle.

_The Abutment backwalls and retaining walls are covered heavy marine growth starting 40" below the caps. Several areas were cleaned during this inspection cycle.

CS-3: **22**

_At the first joint West of Pile 1-8, delamination 14" x 11", 36" below the cap. **NO CHANGE.**

_Abutment 2 backwall adjacent to the NE transition retaining walls has a spall/delamination 5' x 12" x 3", with exposed rebar. **UW Photo 03. INCREASE.**

_Northeast wingwall has (2) delamination up to 36" x 30", East of the 3rd Pile from the West. **NO CHANGE.**

_West retaining wall between Piles 1-2 and 1-3 has a vertical crack, full panel height x 1/32", extending up to 15" into the marine growth. **NEW.**

E: ELEMENT NOTES

475 R/Concrete Walls

CS-3 (continuation):

_West retaining wall between Piles 1-3 and 1-7 has delaminated areas up to 30" x 13", extending up to 16" into the marine growth. **INCREASE.**

_East retaining wall between Piles 2-2 and 2-3 there is a delamination 5' x 20", with associated cracks, extending up to 11" into the marine growth. **NEW.**

_East retaining wall between Piles 2-4, 2-5 and 2-8 there are spall/delamination up to 51" x 12" x 3", with associated cracks up to 1/32" wide and corrosion bleed-out. **INCREASE.**

_SW retaining wall has a spalled/delaminated area 36" x 31" x 2", with exposed rebars up to 75% section loss, starting at the cap. **UW Photo 04. NEW.**

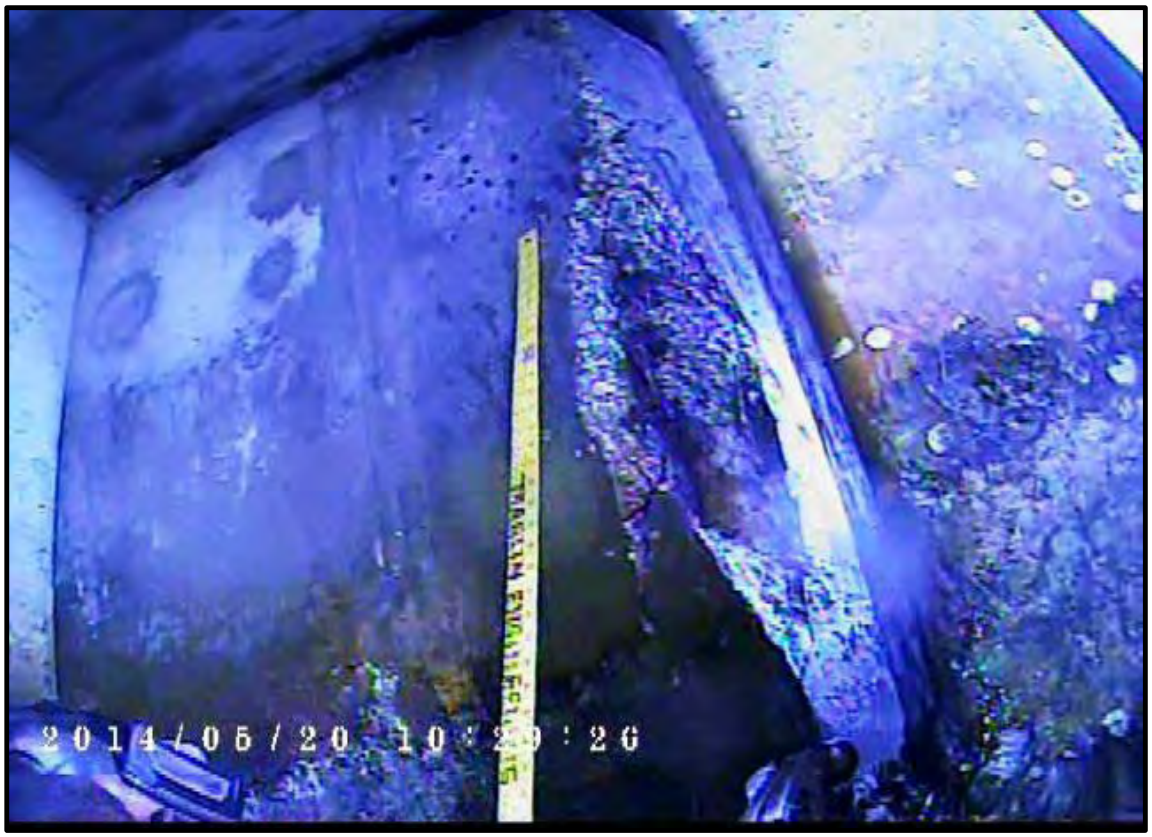
CS-1: **212**

_There are open joints between sheet piles up to 1-1/4", which are allowing backfill leakage to occur. **UW Photo 05. NO CHANGE.**

F: PHOTO SECTION

Description: Top: Pile 2-1, the built-up section is spalled/delaminated. **UW Photo 01.**
Bottom: Pile 2-4, SW corner spall, at and below the high watermark. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Abutment 2 backwall adjacent to the NE transition spall/delamination. **UW Photo 03.**
Bottom: SW retaining wall, spalled/delaminated area. **UW Photo 04.**

F: PHOTO SECTION

Description: Open joints between sheet piles up to 1-1/4", with backfill leakage. **UW Photo 05.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Repair Pile 2-1 built-up section.

475 R/Concrete Walls

_Remove all unsound concrete and patch long both Abutment backwalls and retaining walls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	17.4	17.5
1.5	20.0	19.8
2	18.3	17.7

Notes: Measurements were taken from the bottom of the concrete rail.
Waterline on the left: 13.2ft. and right: 13.2 ft. at mid-channel.
Maximum Channel depth: 6.8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865708 **Bridge Name:** Bayview Drive over Longboat Inlet

Topside Inspection Complete: 5/16/2014

Underwater Inspection Complete: 5/20/2014

Report Date: 6/16/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos –Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF PROFESSIONAL ENGINEER

6/16/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 20 ft. long, single span, reinforced concrete slab bridge was constructed in 1962. The 42 ft. wide bridge has a roadway width of 28.3 ft. and carries two lanes of traffic, as well as two 2.9 ft. wide sidewalks separated from the roadway by a raised curb, in a residential neighborhood. The bridge is classified as both Functionally Obsolete and Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 24 tons. The rating is controlled by the concrete slab.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced in the inspection findings that follow, are included as an Addendum.

DECK

The deck is the portion of the bridge that consists of concrete slabs. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall poor condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to 1/4in. wide transverse cracking over the joint seal. See Condition Photo 1.
- There are up to 1/16in. wide intermittent longitudinal cracks in the asphalt over the slab unit joints. See Condition Photo 2. This is an indication that independent movement of the slab units is occurring.
- The south end of the east curb and the north end of the west curb have 20 in. x 9 in. x 2-1/2 in. spalls with exposed rebar caused by vehicle impact. See Condition Photo 3.
- The northwest and southwest corners have drop-offs up to 2 in. high where the bridge sidewalks end, creating a trip hazard. This condition was not previously noted. See Condition Photo 4.

Railings/Barriers

- The west bridge rail has three post connections to the concrete parapet. Posts 1 and 2 each are missing two of the four anchor bolt nuts. Post 3 is missing all of the anchor bolt nuts, leaving the rail unsecured and loose. It appears that an attempt was made to secure the post using anchors and washers drilled adjacent to the post, but it does not appear to working effectively. See Condition Photos 5 through 7.
- The south end of the west railing exhibits a 10 in. x 4 in. x 2 in. spall with exposed steel. This condition was not previously noted. See Condition Photo 8.
- The east rail has sustained impact damage between Posts 1 and 2. This has deformed the bottom rail and has pulled out all four anchor bolts for Post 1 from the concrete parapet. It appears that an attempt was made to secure the post using anchors and washers drilled adjacent to the post, but it does not appear to working effectively. See Condition Photo 9.
- The south end of the east railing below Post 1 exhibits a 1 ft. 5 in. x 8 in. x 2 in. spall. This condition was not previously noted. See Condition Photo 10.
- The east parapet has a 1 ft. x 7 in. delaminated area at Post 3. See Condition Photo 11.

Expansion Joints

- No expansion joints are present.

Utilities

- There is a 12in. water pipe on each side of the deck.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Precast Concrete Slab

- The undersides of the slab units have numerous areas of spall repairs. See Condition Photo 12.

Bearings

- The slab units sit directly on the abutment; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both ends of the Abutment 1 cap have 1/16 in. wide vertical and horizontal cracks. See Condition Photo 13.
- Both abutment backwalls have delaminations up to 1 ft. x 1 ft. and cracking up to 1/16 in. wide with corrosion bleed out. See Underwater Inspection Report Photo 4.

Prestressed Concrete Piles

- All sixteen piles have a 3 ft. high band of deterioration from the cap down. This deterioration generally consists of vertical cracks up to ¼ in. wide outlining delaminations in the corners of the piles with heavy corrosion bleed out. See Condition Photos 14 and 15 and Underwater Inspection Report Photo 1.
- Piles 2-4 and 2-8 have spalls with exposed rebar that has up to 20% section loss. See Condition Photo 15 and Underwater Inspection Report Photos 2 and 3.

Retaining Walls

- The northeast retaining wall cap has a 4 ft. long x 1/16 in. wide horizontal crack adjacent to the Abutment 2 cap.
- The southeast retaining wall cap has a 3 ft. 6 in. x 9 in. x 3½ in. spall with exposed steel with 100% section loss along the bottom edge. See Condition Photo 16 and Underwater Inspection Report Photo 5.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel has heavy oyster growth along the bottom.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Roadway

- The north and south approach roadway transitions exhibit transverse cracks up to 26 ft. long x 1/4in. wide. This condition was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in poor to fair condition based on National Bridge Inspection Standards and FDOT guidelines. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements are very likely to have chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles, abutment backwalls and slab units. Making repairs helps to extend the bridge's lifespan by limiting the deterioration of the reinforcing steel, but it does not address the root condition that is causing the deterioration. Concrete repairs to bridges like this one are likely to last only 5 years.

Long term repairs to prestressed slab unit bridges that are over 50 years old have been proven to FDOT to be ineffective. The FDOT State Materials Office usually recommends that bridges of this type that are this close to the water be replaced, rather than instituting a long term repair program. Cathodic protection of these concrete elements is not feasible or and highly unlikely to provide satisfactory results.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

The bridge is posted for 24 tons, but the 1995 load rating indicates that posting is not necessary. The load rating details were not available for review, but it is questionable whether this rating represents the current conditions at the bridge, as the rating is almost 20 years old. A new rating analysis should be performed, to include the condition of the existing elements.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalks are less than the 5 ft. required to meet the Americans with Disabilities Act, and the bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available to properties at both ends of the bridge, from NE 62nd Street at the north side and NE 55th Street at the south side. Closing the bridge to perform work is a viable option.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep

the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs, estimated to be required every 5 years, or improve load carrying capacity.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to address temporary support or relocation of the utilities. Bridge construction could be done to the eastern portion first, so that the existing bridge would provide support for the existing utility lines while new lines were constructed on the east side, with the west portion of the bridge constructed after utility service is cut over to those new lines. It is unclear if all of the utilities are active, or if any have been abandoned in place. A determination of the need for each utility should be made early in any design process so that the most cost effective and time effective construction sequence is determined.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 18,000 vehicles per day, and the road is posted for 35 mph. The bridge has a roadway width of 28 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. Maintaining a space for pedestrians to cross will make it likely that only a single lane would be available for two way traffic. However, detour routes exist for residents at each end of the bridge, so it is recommended that the road be closed at each approach to the bridge and all work done during a bridge closure in order to minimize construction time.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge is currently 52 years old. There are no feasible and prudent ways to protect low-lying prestressed concrete slab bridges that are chloride-contaminated. It is anticipated that replacement of the bridge will be required 11-15 years from now. No repairs are recommended for the years prior to the bridge being replaced.

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 11-15 years from now.

LONG TERM

Replacement of the bridge is recommended 11-15 years from now based on the existing condition and our experience with similar bridges.

There are adequate detour routes available to perform the work with the bridge closed to vehicle traffic. Utility service can be maintained throughout construction by constructing the portion of the bridge where the utilities are not present, then cutting service to new utility lines mounted on that new portion prior to demolishing and reconstructing the rest of the bridge.

The length of a new bridge is anticipated to be the same as the existing bridge. The bridge width has been assumed to be 50 ft., about 8 ft. wider than the existing bridge, to accommodate wider sidewalks meeting ADA requirements and railings that meet current design specifications. This appears reasonable because the roadway narrows at the bridge; however, if the available right-of-way is problematic, the width of a new bridge should be revisited.

The cost to replace the bridge has been estimated based on FDOT bridge type unit costs, and is based on 2014 dollars. The costs for construction, design, construction inspection, with a factored contingency, have been broken out below for budgeting purposes.

Long Term Recommendation(s): **Replace bridge.**		Cost
Design [1]		$ 75,000.00
Construction		$ 400,000.00
Bridge Construction [2]	$ 325,000.00	
Maintenance of Traffic [3]	$ 25,000.00	
Utilities [4]	$ 50,000.00	
Construction Inspection and Administration [5]		$ 80,000.00
Contingency [6]		$ 80,000.00
TOTAL COST		$ 635,000.00

(1) Design costs estimated $75,000 new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Curb, Sidewalk and Bridge Railing

Utilities Mounted at East Fascia

GENERAL PHOTOS OF BRIDGE

Channel Looking East

Channel Looking West

LOCATION MAP

CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal transverse crack.

Photo 2 – Deck top longitudinal cracks over joints between slab units.

CONDITION PHOTOS

Photo 3 – East curb south end spall with exposed steel.

Photo 4 – Southwest corner bridge sidewalk has a drop-off at the end, creating a trip hazard.

CONDITION PHOTOS

Photo 5 – West railing Post 1-2L exhibits 2 of 4 anchor bolt nuts missing.

Photo 6 – West railing Post 1-2L is missing 2 of 4 anchor bolt nuts.

CONDITION PHOTOS

Photo 7 – West railing Post 3 not secured to rail. Note attempt to secure post.

Photo 8 – West railing has a spall with exposed steel at the south end.

CONDITION PHOTOS

Photo 9 – East railing Post 1 has an improper repair.

Photo 10 – East railing has a spall with exposed steel at the south end.

CONDITION PHOTOS

Photo 11 – East railing has a delamination at the north end.

Photo 12 – Typical repaired areas at deck underside and abutment cap.

CONDITION PHOTOS

Photo 13 – Abutment 1 cap has a horizontal crack at the east end.

Photo 14 – Pile 1-8 exhibits a vertical crack.

CONDITION PHOTOS

Photo 15 – Pile 2-4 exhibits a spall with corroded exposed steel.

Photo 16 – Southeast wingwall cap exhibits a spall with exposed steel.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865708** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865708 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: Bayview Drive

Feature Intersected: Longboat Inlet

Location: 164 ft North of NE 55th Place

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	3.1 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Heavy oyster growth		215 R/Concrete Abutment
Water Temp.:	80°		475 R/Concrete Walls
Weather:	83° Sunny		290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Stinging Hydroids, Sharp oyster shells

Critical Deficiency Notes: None

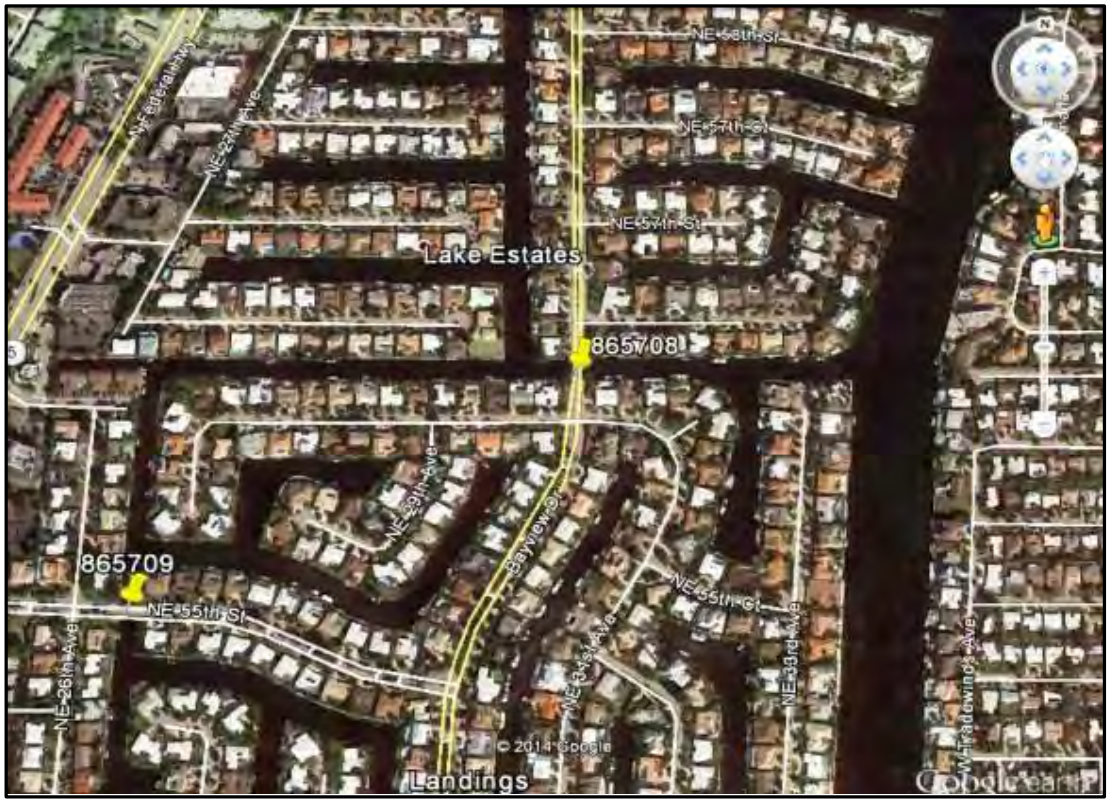
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

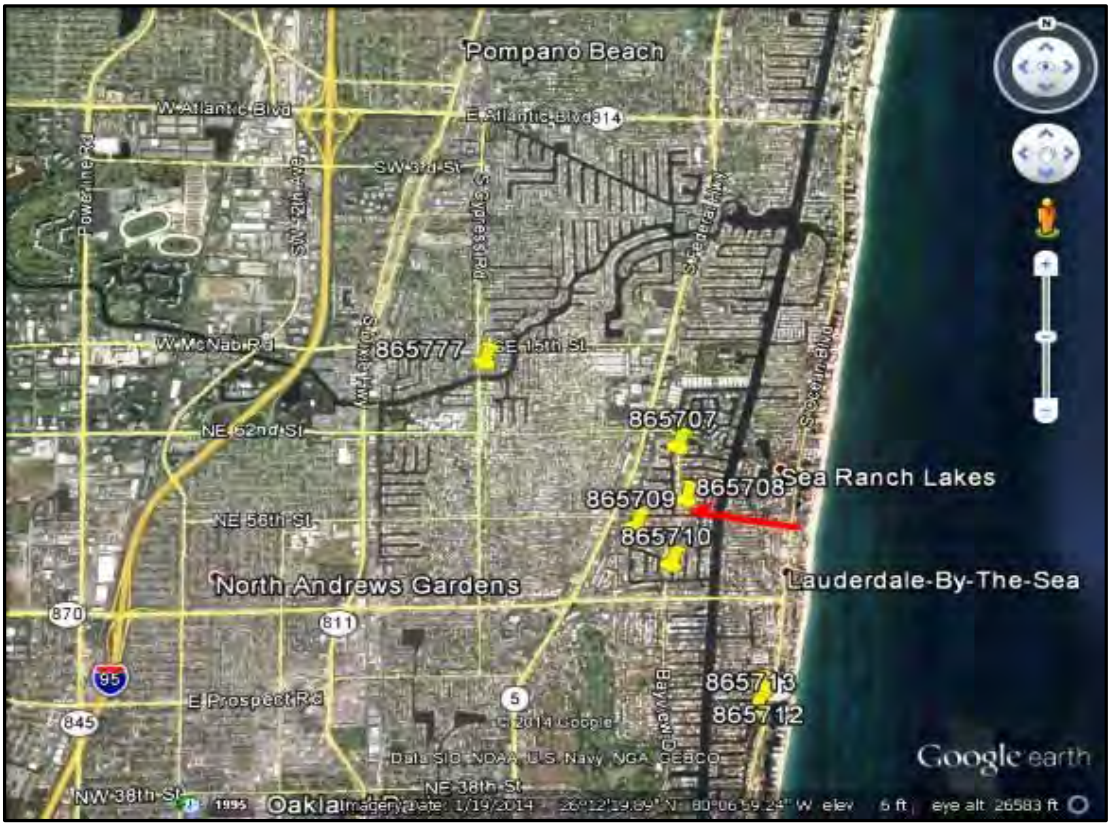
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/20/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865708** Date: **20-May-14**

A: LOCATION MAP





Description: Bayview Drive, 164 ft North of NE 55th Place.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**16 ea.**
CS-4:	**16**

_All sixteen piles have a 3' high band of deterioration from the cap down. These deterioration generally consists of vertical cracks up to 1/4" wide, outlining spalls/delaminations in the corners of the piles with heavy corrosion bleed-out. **INCREASE**
_Pile 1-2, typical cracking on piles. **UW Photo 01.**
_Pile 2-4, spall/delamination with exposed rebar. **UW Photo 02.**
_Pile 2-8, spall/delamination with exposed rebar. **UW Photo 03.**

215 R/Concrete Abutment	**85 lf.**
CS-3:	**85**

_Both abutment backwalls exhibit random areas of hollow sound and cracking up to 1/32" wide with areas of corrosion bleed-out. **UW Photo 04. INCREASE**

475 R/Concrete Walls	**39 lf.**
CS-2:	**5**

_NE retaining wall cap has a horizontal crack 4' L x 1/16", adjacent to the cap. **NO CHANGE**

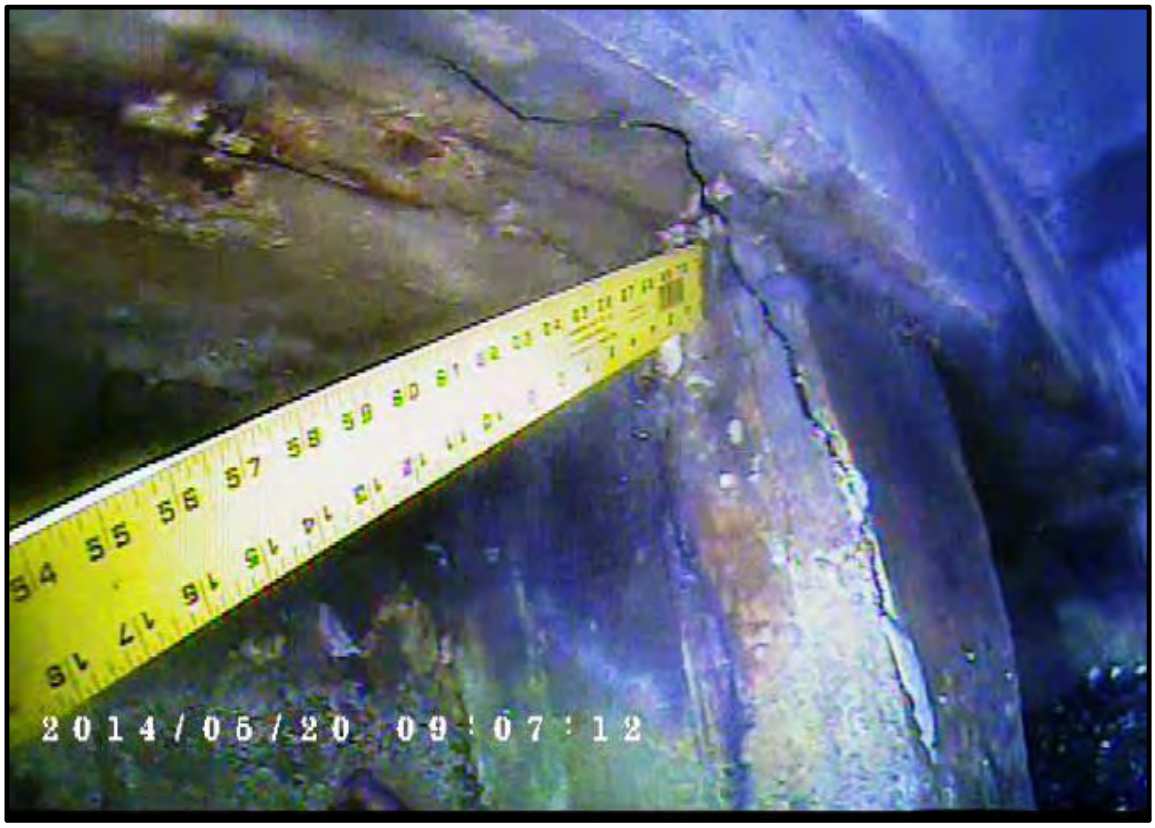
CS-3:	**5lf.**

_SE retaining wall cap has a spall 42" x 9" x 3-1/2", with (1) exposed rebar 100% section loss.
UW Photo 05. INCREASE
_Both backwalls have delaminations up to 12" x 12", and cracking up to 1/16"W with corrosion bleed-out.
NO CHANGE

290 Channel	**1 ea.**

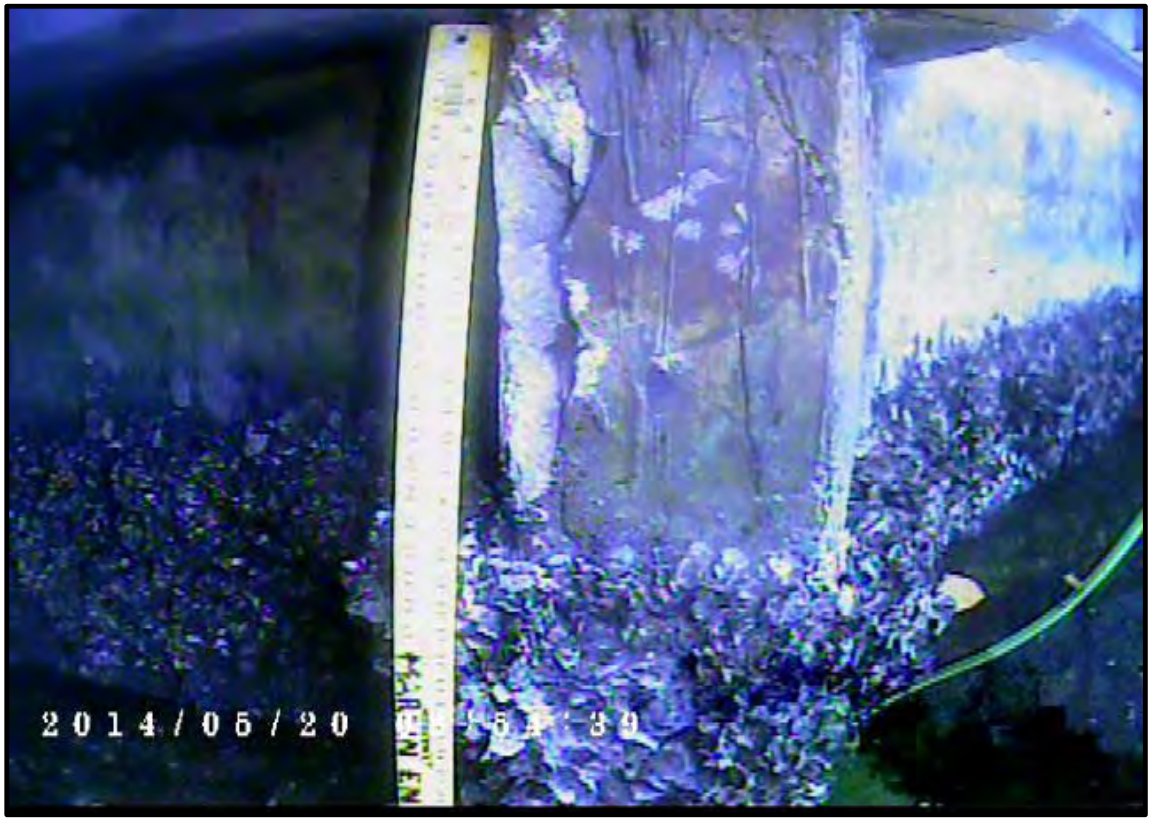
Note: The channel has heavy oyster growth along the channel bottom.

F: PHOTO SECTION



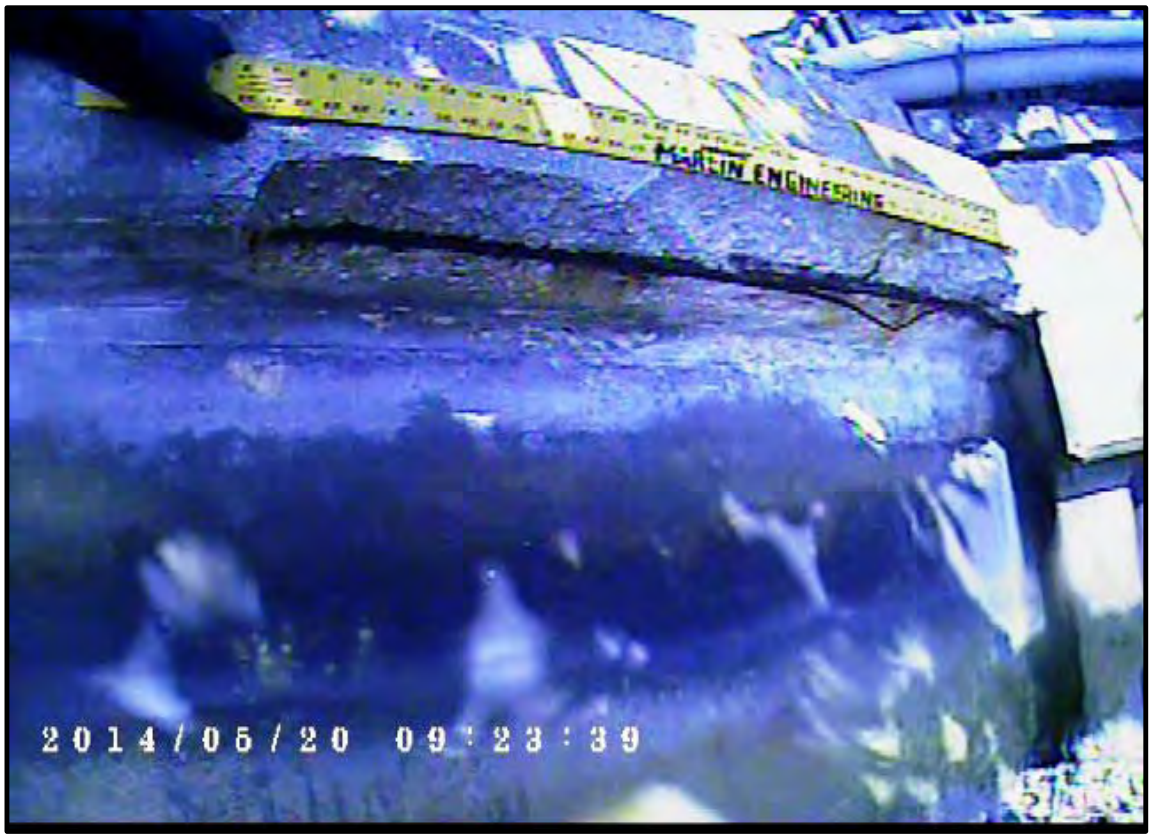
Description: Top: Pile 1-2, typical cracking on piles. **UW Photo 01.**
Bottom: Pile 2-4, spall/delamination with exposed rebar. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Pile 2-8, spall/delamination with exposed rebar. **UW Photo 03.**
Bottom: Abutment backwalls have random areas of cracking with CBO. **UW Photo 04.**

F: PHOTO SECTION



Description: SE retaining wall cap, spall with exposed rebar 100% section loss. **UW Photo 05.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch as needed all the Piles.

215 R/Concrete Abutment

_Remove all unsound concrete and patch as needed both abutment backwalls.

475 R/Concrete Walls

_Repair the spall at the SE retaining wall cap and delaminations at both backwalls as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.1	9.2
1.5	11.1	8.9
2	9.0	9.8

Notes: Measurements were taken from the bottom of the concrete rail.
Waterline on the left: 8 ft. and right: 8 ft. at mid-channel.
Maximum Channel depth: 3.1 ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865709 **Bridge Name:** NE 55th Street over Landings Inlet West

Topside Inspection Complete: 5/16/2014
Underwater Inspection Complete: 5/15/2014

Report Date: 7/25/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 58.7 ft. long, three-span, reinforced concrete slab bridge was constructed in 1962. The bridge has a roadway width of 28.3 ft. and carries two lanes of traffic in a residential neighborhood. There are 3.1 ft. wide sidewalks on each side. The bridge is neither Functionally Obsolete nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a February 2003 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting, but is currently posted at 20 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the condition of the reinforced concrete slabs. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The bridge surfacing is up to ¾ in. lower than the approach slab surfaces.
- The asphalt surfacing over both abutment expansion joints has up to 4 ft. long x 4 in. wide x 3 in. deep transverse cracks. This condition has increased in severity since previously noted. See Condition Photo 1.
- There are $^{1}/_{8}$ in. wide longitudinal cracks in the asphalt surfacing over the edges of the poured keyways between the slab units. See Condition Photo 2.
- The asphalt has disintegrated in areas in both travel lanes over Bents 2 and 3 exposing the tops of the slab units up to 7 ft. x 3 ft. See Condition Photo 3.
- The south curb at Abutment 1 has a 1 ft. 8 in. x 6 in. x 2 ¼ in. spall with exposed steel. See Condition Photo 4.
- The sidewalks have minor map cracking up to $^{1}/_{64}$ in. wide.

Pourable Joint Seals

- The sidewalk joint sealant has deteriorated and the joint is partially filled with dirt and debris.

Railings/Barriers

- The north curb at Abutment 4 has a 1 ft. 1in. x 8 in. x 2 in. spall with exposed steel at the east end. The curbs also have other areas of minor edge spalling due to impact.
- The attachment at Post 2-2 Right is missing the northeast washer, Post 2-3 Right is missing the southeast bolt and Post 3-2 Right is missing the northwest nut. See Condition Photo 5.
- There are delaminations in the concrete parapets at Posts 2-2 Right, 2-3 Right, 3-1 Right, 3-2 Right and 2-1 Left. Typically, these delaminations are up to 1 ft. 5 in. x 4 in., except at Post 2-3 Right, where it is 1 ft. 8 in. x 10 in. See Condition Photo 6.
- At Post 2-2 Right, there is a 1 ft. x 5 in. x 2 in. spall in the north face which has partially exposed the anchor bolt for the post. See Condition Photo 7.
- Post 2-2 Left exhibits impact damage. This condition was not previously noted. See Condition Photo 8.

Utilities

- There is one 6 in. diameter ductile iron utility pipe along the north side of the structure.
- There is one 16 in. diameter ductile iron utility pipe along the south side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE	
CODE	**DESCRIPTION**
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Precast Concrete Slab

- The undersides of the slab units have minor edge spalls throughout.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

End Bents

- End Bent 1 cap exhibits several up to 2 ft. x 1 ft. 6 in. x 2 in. spalls with exposed steel below Slab Units 1-5 to 1-7. This condition has increased in severity – the spall was previously below Slab Units 1-6 to 1-7. See Condition Photo 9.
- End Bent 1 exhibits 6 in. x 6 in. and 6 in. x 3 in. delaminations below Slab Unit 1-8.
- End Bent 1 exhibits 8 in. x 3 in. delamination below the joint between Slab Units 1-10 and 1-11. See Condition Photo 10 for a general view of End Bent 1 cap.
- End Bent 4 exhibits a 1 ft. x 1 ft. x 2 in. spall with exposed rebar below joint between Slab Units 3-7 and 3-8. See Condition Photo 11.
- End Bent 4 exhibits a 1 ft. 4 in. x 6 in. delamination at north end of the cap.
- The south end of End Bent 1 cap is undermined 4 in. x 1 ft. x up to 2 ft. back under. See Condition Photo 12.
- The cap at End Bent 1 exhibits spalls at the following locations:
    - 6 in. x 3 in. x 1 in. spall, below joint of Slab Units 1-2 and 1-3.
    - 4 ft. x 10 in. x 2 in. spall below Slab Unit 1-5.
    - 11 in. x 8 in. x 2 in. spall below Slab Unit 1-6.
    - 10 in. x 8 in. x 3 in. spall at north end of cap.
- The abutment caps have random $^{1}/_{64}$ in. wide vertical cracks throughout.

Intermediate Bents

- The bent caps have random $^{1}/_{64}$ in. wide vertical cracks throughout.
- The corners of all piles have minor construction-related edge spalls up to ¾ in. deep.
- The west face of Bent 2 cap below Slab Unit 1-11, has a 2 ft. x 8 in. x 2 in. spall with exposed steel. See Condition Photo 13.
- The east face of Bent 2 cap below Slab Units 2-3 and 2-4 joint, has an 8 in. x 4 in. delamination.
- The southeast corner of Pile 2-1, 9 ft. below cap, has a 1 ft. 2 in. x 4 in. delamination with corrosion staining.
- The southwest corner of Pile 2-1, 9 ft. below cap, has a 1 ft. 3 in. x ¾ in. spall.
- The northwest corner of Pile 2-1 has a 2 ft. x 6 in. x 1 in. spall/delamination starting 9 ft. below the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- The west face of Pile 2-1 and 2-2 exhibits 6 in. x 4 in. x ¼ in. spalls with exposed steel. See Condition Photo 14.
- The northwest corner of Pile 2-2 has a delamination 1 ft. 3 in. x 5 in. and the southeast corner has 2 vertical cracks up to 9 in. x 1/64 in.
- Piles 2-2, 2-3, 2-5, at the northeast and southwest corners, adjacent to the cap, exhibit up to 6 in. x 3 in. delaminations.
- The northwest and southwest corners of Pile 2-3, 9 ft. below the cap, have up 3 ft. 2 in. x 10 in. delamination with corrosion bleedout. See Underwater Inspection Report Photo 4.
- All corners of Pile 2-4, adjacent to cap, have up to a 1 ft. x 6 in. x 2 in. spall/delaminations. See Condition Photo 15.

- The southwest corner of Pile 2-4, 9 ft. below cap, has a 3 ft. 4 in. x 4 in. delamination with corrosion bleedout starting 9 ft. below the cap.
- Pile 2-5, on all faces, 6 ft. to 9 ft. below cap, there is a 4 ft. x 2 ft. area of spalls and delaminations with one (1) exposed strand with up to 50% section loss and corrosion staining. This condition has increased in severity since the 2011 inspection. See Condition Photo 16 and Underwater Inspection Report Photo 1.
- Pile 2-6, in the southwest and northwest corners 9 ft. below cap, has up to 2 ft. x 5 in. delaminations. The northwest corner was not previously noted.
- Pile 2-6, at the north, south and east faces, 9 ft. below cap, have multiple vertical cracks with corrosion staining up to 2 ft. long x $^{1}/_{32}$ in. wide. Cracks in the north face were not previously noted.
- The west face of Bent 3 cap below the joint at Slab Units 2-8 and 2-9, has a 2 ft. 6 in. x 8 in. x 2 in. spall/delamination. See Condition Photo 17.
- The east face of Pile 2-7 has a 1 ft. x 1/32 in. wide vertical crack with corrosion bleedout, starting 9 ft. below the cap. This deficiency was not previously noted.
- Bent 3 cap, west face below Slab Unit 2-10, has an 8 in. x 4 in. x 1 in. spall.
- Pile 3-1, northeast corner, adjacent to cap, 9 in. x 8 in. x 2 in. spall. See Condition Photo 18.
- Pile 3-2, southeast corner, adjacent to cap, 9 in. x 8 in. x 2 in. spall/delamination. See Condition Photo 19.
- The northwest corner of Pile 3-3, 8 ft. below the cap, has a 5 ft. x 8 in. x 3 in. spall with an exposed prestressed cable with 100% section loss. Also, in the northeast corner, 9 ft. below the cap, there is a 2 ft. x 8 in. delamination with corrosion staining.
- The southwest corner of Pile 3-4 has two (2) vertical cracks up to 4 ft. x 1/16 in. wide with corrosion bleedout, at and below the high waterline.
- Pile 3-6, southeast and northwest corners, adjacent to cap, there are up to 8 in. x 8 in. x 1 ½ in. spall/delaminations with exposed steel. See Condition Photo 20.
- Pile 3-6, northwest corner, 9 ft. below cap, 1 ft. x 8 in. delamination with corrosion staining.
- The south face of Pile 3-6 has two (2) vertical cracks up to 7 in. x 1/64 in. wide, with corrosion bleedout.
- Pile 3-7, northeast, northwest and southeast corners, adjacent to cap, up to 8 in. x 4 in. x 1 in. spall/delamination.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific deficiencies noted.

MISCELLANEOUS ELEMENTS

Approach Slabs

- There is a 2 ft. long x 1 in. high x more than 3 ft. deep under area of undermining at the north side of the east approach slab at Abutment 4 and the sidewalk. See Condition Photo 21.
- The longitudinal joints between the approach slab and the northeast and northwest approach sidewalks are not sealed. See Condition Photo 22 and 23.

Slope Protection

- Sections of the concrete slope pavement throughout the northwest slope are displaced, undermined, missing and have up to 6 in. of settlement. See Condition Photo 24.
- Several sections under Span 3 have settled up to 5 in. and exhibit a hollow sound. See Condition Photo 25.
- The undermining and settlement of the west slope pavement is apparently due to fill loss through the sheet pile joints of the seawall.
- The joints in the concrete slope pavement are not sealed.
- The northeast radius area is overgrown with vegetation.

Walls

- There is light pitting and corrosion of the steel sheet pile walls.
- The west and east bulkhead caps have an up to 40 ft. x 10 in. x 3 in. spall/delaminations with exposed steel below the bridge. Previously noted as 35 ft. long. See Condition Photo 26 and Underwater Inspection Report Photo 5.
- The bulkhead piles, caps and sheet piles have up to $^{1}/_{16}$ in. wide vertical and horizontal cracks, some with corrosion bleedout.
- The sheet piling of the bulkheads have heavy scale damage. See Underwater Inspection Report Photo 6.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

The bridge is one of three in this neighborhood, constructed between 1957 and 1962, exhibiting similar type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and pile bent caps in the worst condition. At this and the other bridges in the neighborhood, the abutments and intermediate bents have cracks, spalls and delaminations. The piles and caps will require repairs in the next 20 years, as cracked elements and elements with corrosion bleedout turn into spalls. Concrete elements at the waterline, continuously subjected to wet-dry conditions likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The reinforced concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no notable spalls or cracks. The latest available load ratings for the bridges do not indicate that any of them require posting, however posting signs

are present at this bridge and Bridge No. 865710. Given the good condition of these slab units, and the restricted passage of heavy vehicles by posting signs, the bridge is expected to remain in service for the next 20 years, with work being performed only to the substructure elements.

The railings have deterioration to the concrete pedestals and the attachments of the metal railings to them. The concrete pedestals should be repaired and the anchor bolts fixed to ensure the railing is acting as intended, or the railings should be replaced and upgraded to meet current standards.

There are problems with the bulkheads/retaining walls, as evidenced by settled slope pavement panels and exposed, corroded reinforcing steel and significant cracks on the piles, wall panels and caps. Work to fix the failing slope pavement should be combined with the replacement of the walls. The slope protection appears soon to fail completely, so this work is required in the next five years.

The bridge is posted for 20 tons, but posting is not required by analysis.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge via Federal Highway from the west and Bayview Drive from the east.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 5,000 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The work required at the bridge is split into two groups of work. Between years 0-5, the bulkhead walls require replacement and the slope protection be replaced. During this work, the railings require repairs and the spalls on the intermediate bent caps should be repaired using conventional concrete repair methods, or metalizing the spalls.

Between years 11-15, it is expected that pile jackets will be required for the intermediate bents, as well as miscellaneous concrete repairs.

Long Term Recommendation(s): 0-5 YEARS **Replace bulkhead walls and slope protection.** **Repair railings.** **Repair spalls on caps.**			Cost	
Design [1]			$	12,000.00
Construction			$	130,000.00
Bridge Construction [2]	$	125,000.00		
Maintenance of Traffic [3]	$	5,000.00		
Construction Inspection and Administration [4]			$	26,000.00
Contingency [5]			$	26,000.00
		TOTAL COST	$	194,000.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Bulkhead and Slope Protection Replacement: $50,000/side (2 total); Railing repairs: $10,000; Intermediate cap repairs: $15,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

Long Term Recommendation(s): 11-15 YEARS **Install jackets on piles.** **Perform concrete repairs.**			Cost	
Design [1]			$	7,000.00
Construction			$	71,000.00
Bridge Construction [2]	$	66,000.00		
Maintenance of Traffic [3]	$	5,000.00		
Construction Inspection and Administration [4]			$	14,200.00
Contingency [5]			$	14,200.00
		TOTAL COST	$	106,400.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $4,000 per pile (14 piles total); Concrete repairs: $10,000

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

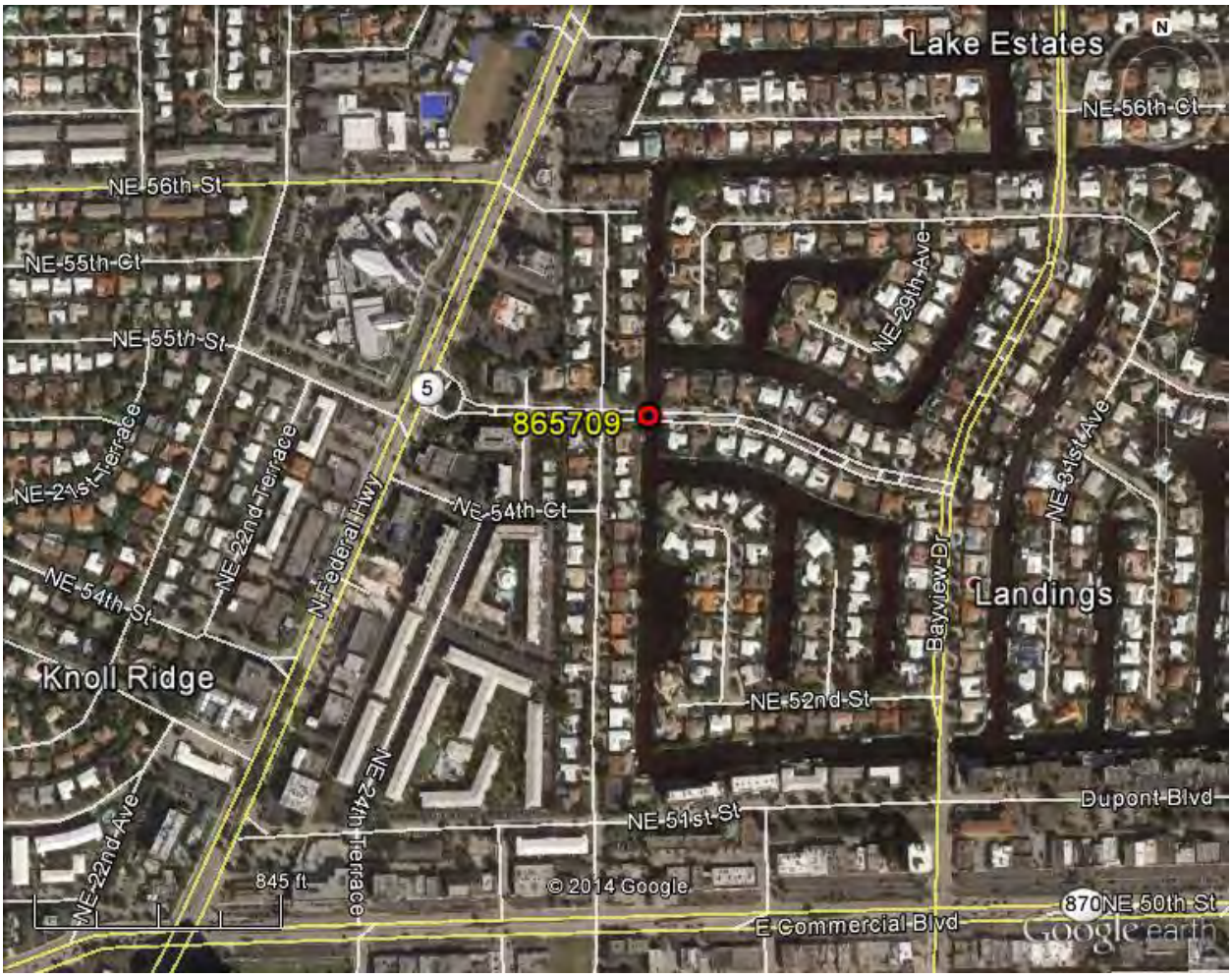
Utilities Mounted at South Fascia

GENERAL PHOTOS OF BRIDGE

Channel Looking North

Channel Looking South

LOCATION MAP



CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal transverse crack.

Photo 2 – Deck top longitudinal cracks.

CONDITION PHOTOS

Photo 3 – Disintegrated asphalt over Bent 2.

Photo 4 – The south curb over End Bent 1 exhibits a spall.

CONDITION PHOTOS

Photo 5 – Post 3-2 Right is missing an anchor bolt nut.

Photo 6 – Delamination at Post 2-3 Right.

CONDITION PHOTOS

Photo 7 – Spall with exposed steel below Post 2-2 Right.

Photo 8 – Post 2-2 Left exhibits impact damage.

CONDITION PHOTOS

Photo 9 – End Bent 1 cap exhibits spalls between Slab Units 1-5 and 1-7.

Photo 10 – End Bent 1 cap general view.

CONDITION PHOTOS

Photo 11 – End Bent 4 cap exhibits a spall between Slab Units 3-7 and 3-8.

Photo 12 – The south end of End Bent 1 cap is undermining.

CONDITION PHOTOS

Photo 13 – The south end of Bent 2 cap exhibits a spall with exposed steel.

Photo 14 – The west face of Pile 2-2 exhibits a popout.

CONDITION PHOTOS

Photo 15 – Pile 2-4 adjacent to the cap exhibits spalls/delaminations.

Photo 16 – The southeast and southwest corners of Pile 2-5 exhibit spalls/delaminations.

CONDITION PHOTOS

Photo 17 – Bent 3 cap exhibits a spall between Slab Units 2-8 and 2-9.

Photo 18 – The northeast corner of Pile 3-1 exhibits a spall.

CONDITION PHOTOS

Photo 19 – The southeast corner of Pile 3-2 exhibits a spall.

Photo 20 – The southeast corner of Pile 3-6 exhibits a spall.

CONDITION PHOTOS

Photo 21 – Northeast corner approach slab undermining.

Photo 22 – Northwest approach slab between the sidewalk is not sealed.

CONDITION PHOTOS

Photo 23 – Northeast approach slab between the sidewalk is not sealed.

Photo 24 – Northwest slope protection displacement.

CONDITION PHOTOS

Photo 25 – Slope protection under Span 3 settlement.

Photo 26 – West bulkhead cap at End Bent 1 exhibits a spall/delamination with exposed steel.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865709** Date: **15-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865709 UW Inspection Date: 5/15/2014

Bridge Name: N/A

Road Name/Number: NE 55th STREET.

Feature Intersected: LANDINGS INLET WEST.

Location: 0.2 miles East of US-1.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		393 Bulkhead Seawall Any Mater
Water Temp.:	81°		290 Channel,
Weather:	80° Raining		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

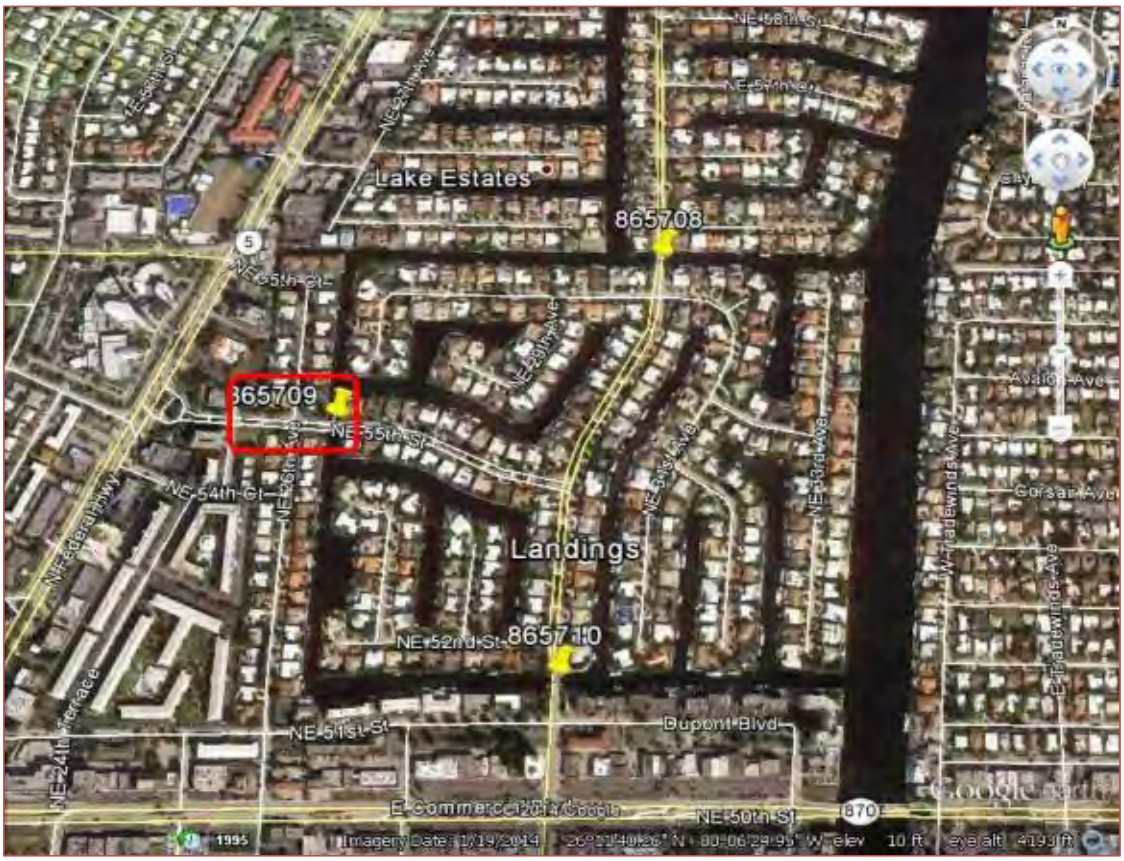
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

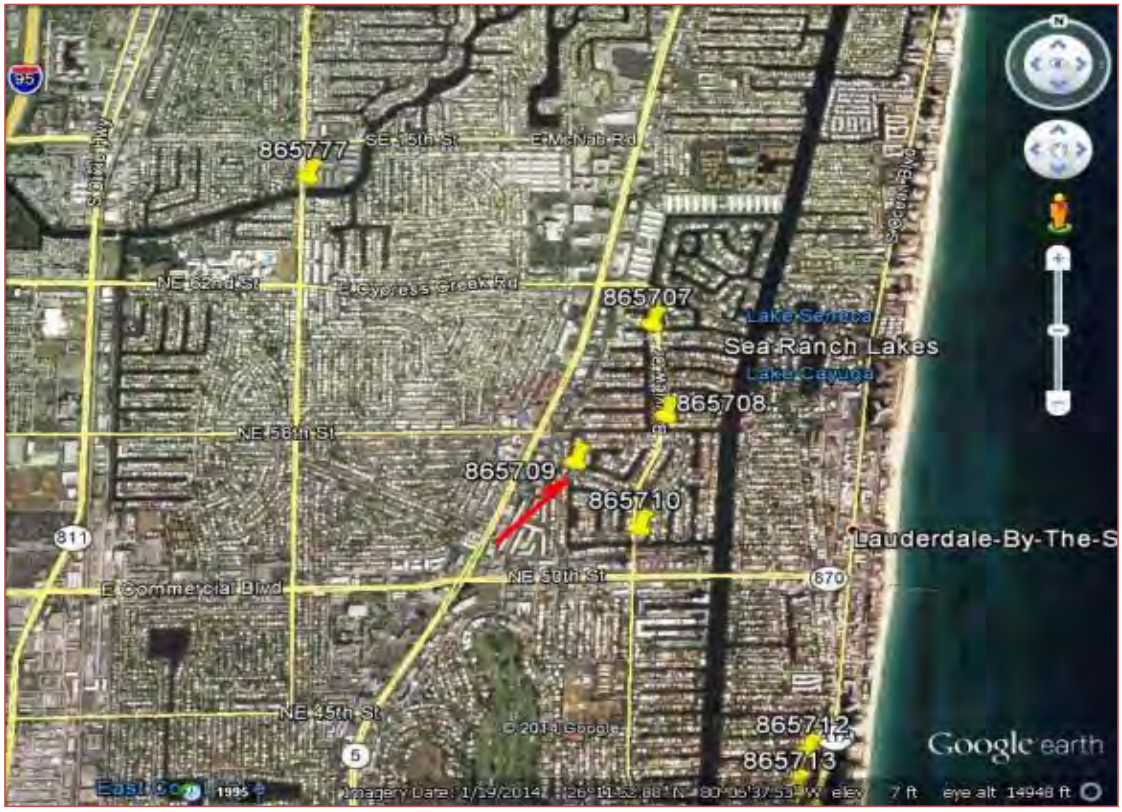
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/18/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865709** Date: **15-May-14**

A: LOCATION MAP





Description: 0.2 miles East of US-1.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 10'. below the caps. Several piles were cleaned at random locations during this inspection cycle.
_All Piles have minor construction-related edge spalls up to 3/4" Deep.

CS-4: **2**
_Pie 2-5, all faces have spall/delamination up to 48" x 4", with (1) exposed pre-stressed strand with up to 50% section loss. starting 9' below the Bent cap. **UW Photo 01. INCREASE.**
_Pile 3-3, NW corner has a spall/delamination starting at the cap and extending 14" into the marine growth with (1) exposed pre-stressed strand up to 100% section loss. Also NE corner has a delamination 24" x 8", with corrosion bleed-out, starting 9' below the cap. **UW Photo 02. INCREASE.**

CS-3: **2**
_Pile 2-1, SE corner delamination 14" x 4", with corrosion bleed-out, starting 9' below the cap. **NO CHANGE.**
_Pile 2-1, SW corner spall 12" x 3" x 3/4", starting 9' below the cap. **NO CHANGE.**
_Pile 2-1, NW corner spall/delamination 24" x 6" x 1", starting 9' below the cap. **UW Photo 03. NEW.**
_Pile 2-2, NW corner delamination 15" x 5", starting 9' below the cap. **NEW**
_Pile 2-2, SE corner (2) vertical cracks up to 9" x 1/64". **NEW**
_Pile 2-3, NW and SW corners delaminations up to 38" x 10", with CBO. **UW Photo 04. NEW.**
_Pile 2-4, SW corner delamination 42" x 10", with CBO, starting 9' below the cap. **INCREASE.**
_Pile 2-6, SW and NW corners delaminations up to 24" x 5", starting 9' below the cap. **INCREASE.**
_Pile 2-6, North, South and East faces multiple cracks up to 24" x 1/32", with CBO, starting 9' below the cap. **INCREASE.**
_Pile 2-7, East face vertical crack up to 12" x 1/32", with CBO, at and below the high waterline. **NEW.**
_Pile 3-4, SW corner (2) vertical cracks 48" x 1/16", with CBO, at and below the high waterline. **NEW.**
_Pile 3-6, NW corner delamination 36" x 10", with CBO. **NO CHANGE.**
_Pile 3-6, South face (2) vertical cracks up to 7" x 1/64", with CBO. **NEW.**

393 Bulkhead Seawall Any Material **243 ft.**

Note:
_The submerged steel sheet pile walls in front of the concrete seawalls were evaluated under this Element and appear to be a repair for the original seawall.

CS-2: **243**
_There is light pitting and corrosion of the steel sheet pile walls. **NO CHANGE.**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

E: ELEMENT NOTES

Element	Quantity
475 R/Concrete Walls	**123 lf.**

Note:
_The concrete bulkheads (Seawalls) were evaluated under this Element.

CS-3: **123**

_The West and East bulkhead caps have spall/delaminations up to 40' L x 10" H x 3" D, with exposed rebars and associated cracks up to 1/8" W, with corrosion bleed-out. **UW Photo 05. INCREASE.**

_The bulkhead piles and sheet piles have vertical cracks up to 1/16" W, with CBO. **NO CHANGE.**

_The sheet piling of the bulkheads have heavy scale damage up to 1/8" D. **UW Photo 06. NO CHANGE**

_Many of the sheet pile joints are not sealed and appear to be leaking fill material which is contributing to the falling slope pavement as noted under Element 394 R/Concrete Abutment Slope Protection. No backfill leakage was observer during this inspection cycle**. DECREASE.**

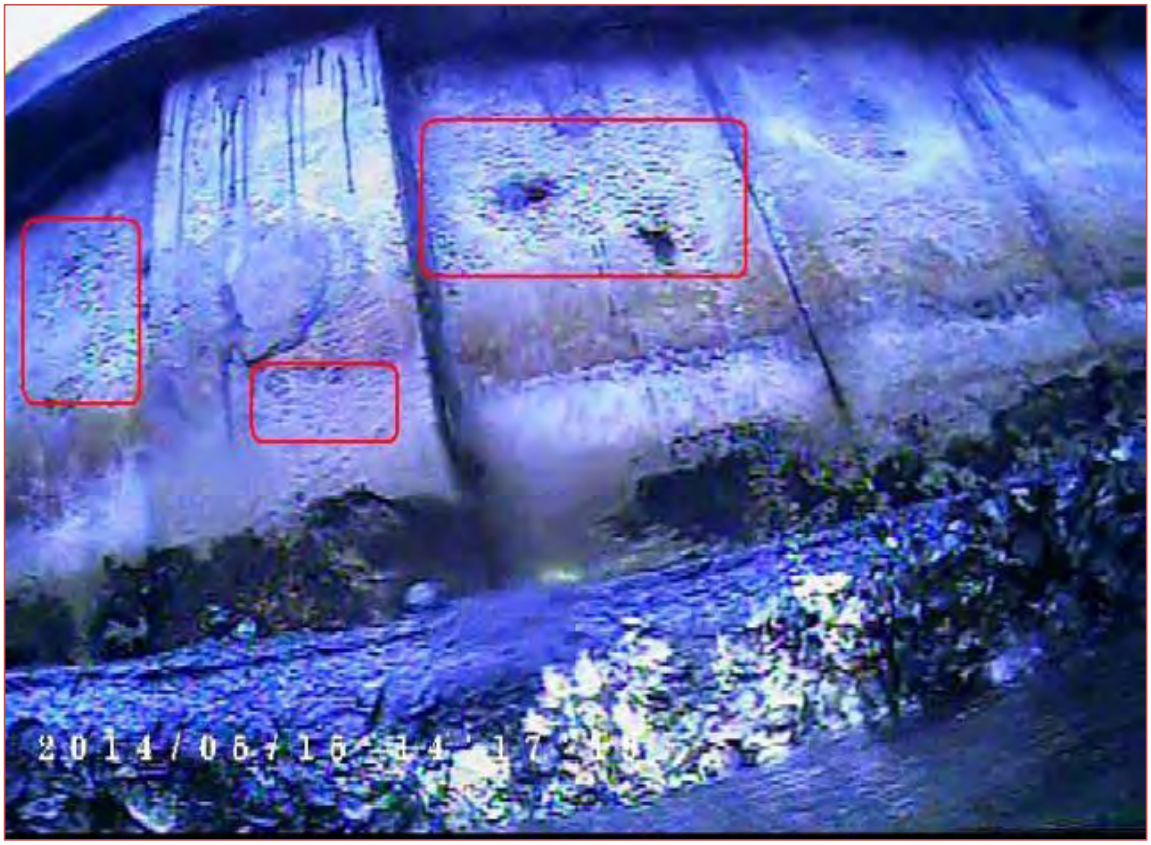
F: PHOTO SECTION

Description: Top: Pie 2-5, All faces spall/delamination, exposed pre-stressed strand. **UW Photo 01.**
Bottom: Pile 3-3, NW corner spall/delamination starting at the cap. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Pile 2-1, NW corner spall/delamination, starting 9' below the cap. **UW Photo 03.**
Bottom: Pile 2-3, NW and SW corner delaminations, with CBO. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: West and East bulkhead caps spall/delaminations, with rebars. **UW Photo 05.**
Bottom: Bulkhead panels have heavy scale damage up to 1/8" D. **UW Photo 06.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove unsound concrete and patch and seal the cracks as needed on the following Piles: 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 3-3 and 3-4.

475 R/Concrete Walls

_Remove unsound concrete and patch along the West and East bulkhead caps.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	4.0	2.4
2	19.4	19.7
2.5	20.5	21.2
3	19.4	18.4
4	2.5	2.2

Notes: Measurements were taken from the top of the concrete deck edge.
Waterline on the left: 14.4 ft. and right: 13.5 ft. at mid-channel.
Maximum Channel depth: 7.7 ft.
Right side has a water pipe adjacent to the deck.

BRIDGE INSPECTION REPORT

Bridge Number: 865710 **Bridge Name:** Bayview Drive over Landings Inlet South

Topside Inspection Complete: 5/16/2014

Underwater Inspection Complete: 5/10/2014

Report Date: 7/25/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 58.4 ft. long, three span, reinforced concrete slab bridge was constructed in 1962. The bridge has a roadway width of 28.1 ft. and carries two lanes of traffic in a residential neighborhood. There are 3 ft. wide sidewalks on each side. The bridge is classified as Functionally Obsolete but not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a January 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting for Single Unit trucks at 32 tons. The bridge is currently posted for a gross weight limit of 22 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the condition of the reinforced concrete slabs. The conditions are generally unchanged from the 2012 inspection report conducted as part of

the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has up to ½ in. wide transverse cracks over the expansion joints in the travel lanes. The cracks in the shoulders are open up to 3 in. wide and upheaving up to 1 in. high with vegetation. See Condition Photo 1.
- The deck top over Span 3 exhibits an up to 10 ft. long x $^{1}/_{8}$ in. wide longitudinal crack. This condition was not previously noted. See Condition Photo 2.
- There is rooted vegetation growing between the undersides of the slab units and the tops of the Bent 2 caps, intermittently throughout.
- The left curb in Span 1 has a 7 in. x 6 in. x ½ in. spall with exposed steel 6 ft. south of Bent 2. See Condition Photo 3.
- The right curb in Span 1 has a 10 in. x 9 in. x 2 in. spall with exposed steel in the south end. See Condition Photo 4.
- The left sidewalk in Span 2 has a 7 in. x 5 in. x 1½ in. spall with an exposed pickup point.
- There is light vegetation and debris buildup along the curbs and sidewalks.

Expansion Joints

- No expansion joints are visible.

Railings/Barriers

- The patched areas in the concrete parapets at the handrail posts have minor shrinkage cracking.
- Posts 1-1 right, 2-1 right and 1-3 left are missing anchor bolts.
- The concrete parapet has two spalls with exposed steel up to 1 ft. 2 in. x 5 in. x 1 in., one at the base of Post 1-2 left and one at the base of Post 2-2 right. See Condition Photo 5.
- The concrete parapet, below Post 1-3 right, has a 2 ft. 3 in. x 8 in. x 2 in. spall with exposed anchors. This condition has increased in severity – the spall was previously noted as 1ft. x 8in. x 2in. See Condition Photo 6.
- The concrete parapet, below Post 3-2 right, has a 1 ft. x 8 in. x 2 in. spall with exposed anchors.

Utilities

- There is a 4 in. gas line supported by cap extensions on the west side of the structure.
- There is a 12 in. water line on concrete cradles and a 3 in. PVC conduit supported by the utility slab on the east side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Slab

- The underside edges of the slab units have minor spalls up to 6 in. x 2 in. x ½ in.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

End Bents

- End Bent 1 cap has an 8 in. x 6 in. x 1 in. spall with exposed steel under Slab Unit 1-7. See Condition Photo 7.
- One pile at the east end of End Bent 1 is exposed. This was not previously noted.
- End Bent 4 cap has an up to 6 ft. x 1 ft. x 2 in. spall and delamination under Slab Units 3-3 and 3-4. See Condition Photo 8.
- End Bent 4 cap has a 4 ft. x 8 in. x 1 in. spalled/delaminated repair under Slab Unit 3-9.

Intermediate Bents

- The fourteen intermediate bent piles have been jacketed with a 1 ft. 8 in. x 2 ft. 1 in. concrete jacket from cap to groundline. The jacket size has changed due to repairs. The bottom 6 in. of each jacket is irregular.
- There is minor vegetation growth between the caps and the east and west ends of Slab Units at Bents 2 and 3. See Condition Photo 9.
- Pile Jacket 1-1 at the northeast corner 4 ft. above the water mark exhibits a 7 in. long x 7 in. wide cutout. See Condition Photo 10.
- Pile Jacket 2-5 has a void/washout with exposed steel, up to 100% section loss, in the west face at the groundline.
- Pile Jacket 2-6 has up to 2 in. deep area of soft concrete in the east and south faces, 24in. above the groundline. The concrete in the lower 2 ft. in all four faces has voids/washouts with six pieces of exposed vertical steel having light corrosion. The original pile is exposed in areas. See Underwater Inspection Report Photo 1.
- Pile Jacket 2-7 has a 10 in. x 10 in. x 1 in. void/washout with exposed steel having up to 100% section loss in the lower 2 ft. of the northwest corner. See Underwater Inspection Report Photo 2.
- The south face of Pile Jacket 3-4 exhibits a 2 ft. 1 in. x 10 in. x 2 in. spall with exposed steel. This condition has increased in severity – the spall was previously noted as 2 ft. x 8 in. x 1 in. See Condition Photo 11 and Underwater Inspection Report Photo 3.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall satisfactory condition. The conditions are unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

Approach Slabs

- The south and north approach slabs exhibit up to 15 ft. long x $^{1}/_{8}$ in. wide longitudinal cracks. This condition was not previously noted. See Condition Photo 12.

Slope Protection

- The joints between many of the panels of the concrete slope pavement are not sealed. See Condition Photo 13.
- Random slope pavement panels have settled up to 2 in., primarily in the radius areas. See Condition Photo 14.
- The concrete slope pavement has up to 1½ in. separations from End Bent 1 cap and has settled up to 3 in. at the east and exposing one pile. See Condition Photo 15.
- The slope pavement at the northwest and northeast corners at End Bent 4 cap has separations up to 1 in. and the panels at several locations sound hollow when tapped with a hammer.
- The End Bent 1 slope protection exhibits graffiti. This condition was not previously noted. See Condition Photo 16.
- The southeast corner adjacent to the utility pipe exhibits a washout area of 5 ft. long x 4 in. wide x 6 in. deep. This condition was not previously noted. See Condition Photo 17.

Bulkheads/Retaining Walls

- The steel sheet piles for the submerged wall in front of both bulkheads have light pitting and moderate corrosion.
- Both concrete bulkhead walls exhibit scaling up to 1/8 in. deep and have areas of corrosion bleedout at random locations. See Underwater Inspection Report Photo 4. These conditions were not previously noted.
- The bulkhead caps in the top end areas outside of the bridge have cracking up to $^{1}/_{16}$ in. wide with spotty corrosion staining. See Condition Photo 18.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

The bridge is one of three in this neighborhood, constructed between 1957 and 1962, exhibiting similar type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and pile bent caps in the worst condition. At this and the other bridges in the neighborhood, the abutments and intermediate bents have cracks, spalls and delaminations. The piles and caps will require repairs in the next 20 years, as cracked elements and elements with corrosion bleedout turn into spalls. Concrete elements at the waterline, continuously subjected to wet-dry conditions likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The reinforced concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no notable spalls or cracks. The latest available load ratings for the bridges do not indicate that any of them require posting, however posting signs are present at this bridge and Bridge No. 865709. Given the good condition of these slab units, and the restricted passage of heavy vehicles by posting signs, the bridge is expected to remain in service for the next 20 years, with work being performed only to the substructure elements.

The railings have deterioration to the concrete pedestals and the attachments of the metal railings to them. The concrete pedestals should be repaired and the anchor bolts fixed to ensure the railing is acting as intended, or the railings should be replaced and upgraded to meet current standards.

There are problems with the bulkheads/retaining walls, as evidenced by settled slope pavement panels and exposed, corroded reinforcing steel and significant cracks on the piles, wall panels and caps. Work to fix the failing slope pavement should be combined with the replacement of the walls. The slope protection is in better condition than the slope protection at Bridge no. 865709, which is failing, but the root cause of the deterioration is the same and action will be required within the study period. The work for both bridges should be done at the same time, to minimize design and mobilization costs.

The bridge requires posting for Single Unit trucks at 32 tons, but the bridge is posted for 22 tons.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalks are only 3 ft. wide and do not meet the 5 ft. width needed to satisfy current ADA criteria.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge via Commercial Boulevard from the south and NE 55th Street from the north.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 5,000 vehicles per day, and the road is posted for 30 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The work required at the bridge is split into two groups of work. Between years 0-5, the bulkhead walls require replacement and the slope protection be replaced. During this work, the railings require repairs and the spalls on the intermediate bent caps should be repaired using conventional concrete repair methods, or metalizing the spalls.

Between years 11-15, it is expected that pile jackets will be required for the intermediate bents, as well as miscellaneous concrete repairs.

Long Term Recommendation(s): 0-5 YEARS **Replace bulkhead walls and slope protection.** **Repair railings.** **Repair spalls on caps.**			Cost	
Design [1]			$	12,000.00
Construction			$	130,000.00
Bridge Construction [2]	$	125,000.00		
Maintenance of Traffic [3]	$	5,000.00		
Construction Inspection and Administration [4]			$	26,000.00
Contingency [5]			$	26,000.00
		TOTAL COST	$	194,000.00

[1] Design work by same engineer for multiple bridges to be let as single contract.

[2] Bulkhead and Slope Protection Replacement: $50,000/side (2 total); Railing repairs: $10,000; Intermediate cap repairs: $15,000.

[3] Daily closures for equipment and material access. Work done from water, under traffic.

[4] Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

[5] Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

Long Term Recommendation(s): 11-15 YEARS **Install jackets on piles.** **Perform concrete repairs.**			Cost	
Design [1]			$	7,000.00
Construction			$	71,000.00
Bridge Construction [2]	$	66,000.00		
Maintenance of Traffic [3]	$	5,000.00		
Construction Inspection and Administration [4]			$	14,200.00
Contingency [5]			$	14,200.00
		TOTAL COST	$	106,400.00

[1] Design work by same engineer for multiple bridges to be let as single contract.

[2] Jackets: $4,000 per pile (14 piles total); Concrete repairs: $10,000

[3] Daily closures for equipment and material access. Work done from water, under traffic.

[4] Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

[5] Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

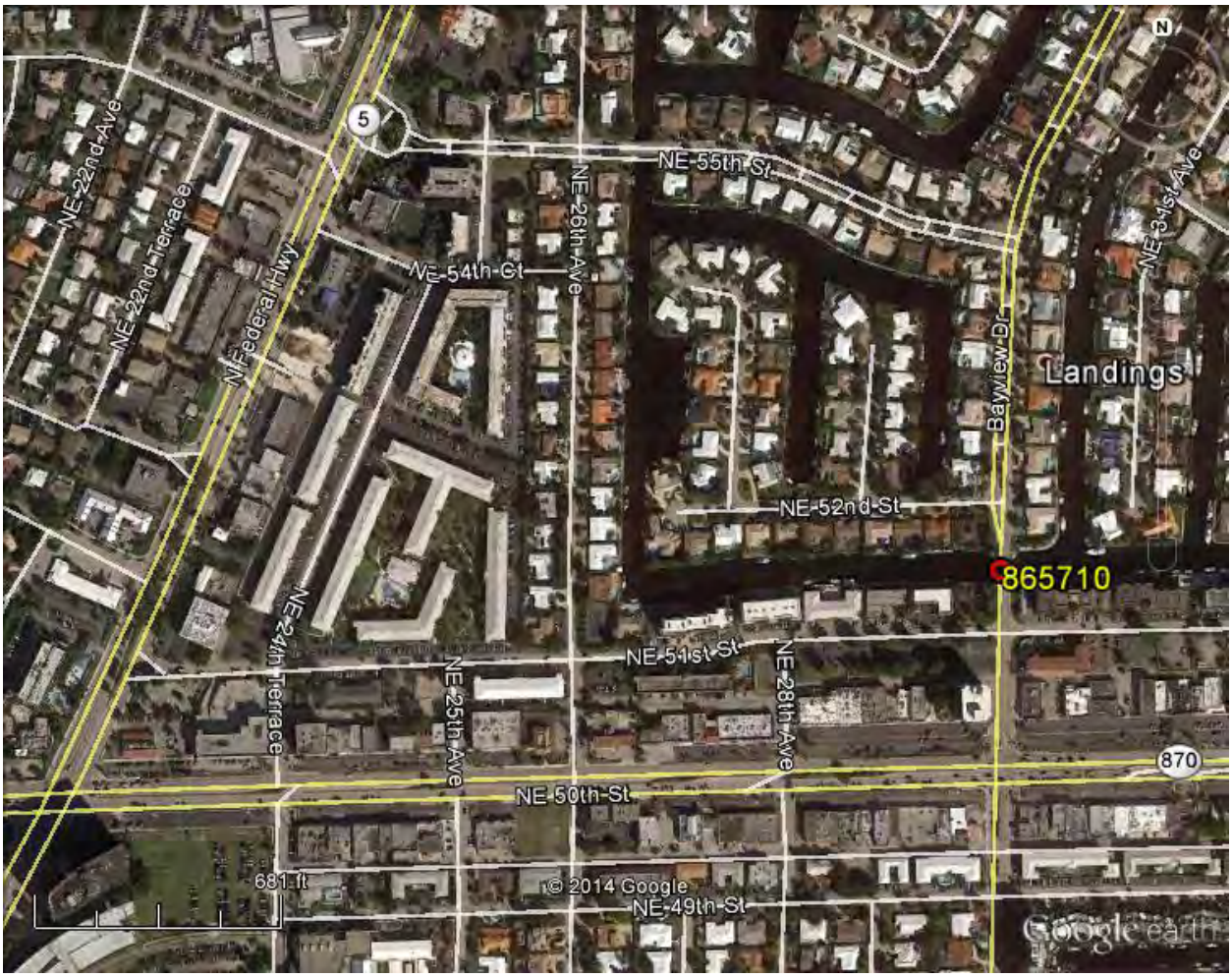
Utilities Mounted at East Fascia

GENERAL PHOTOS OF BRIDGE

Channel Looking East

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal transverse crack.

Photo 2 – Deck top longitudinal crack over Span 3.

CONDITION PHOTOS

Photo 3 – The left curb over Span 1 has a spall with exposed steel.

Photo 4 – The right curb over Span 1 has a spall with exposed steel.

CONDITION PHOTOS

Photo 5 – The concrete parapet below Post 1-2 exhibits a spall with exposed steel.

Photo 6 – The concrete parapet below Post 1-3 right exhibits a spall with exposed anchors.

CONDITION PHOTOS

Photo 7 – Abutment 1 cap has a spall under Slab Unit 1-7.

Photo 8 – Abutment 4 cap exhibits a spall under Slab Units 3-3 and 3-4.

CONDITION PHOTOS

Photo 9 – There is minor vegetation growth between the caps and the Slab Units at the east end of Bent 2.

Photo 10 – The northeast corner of Pile Jacket 1-1 exhibits a spall.

CONDITION PHOTOS

Photo 11 – The south face of Pile 3-4 exhibits a spall with exposed steel.

Photo 12 – The north approach slab exhibits a longitudinal crack.

CONDITION PHOTOS

Photo 13 – Concrete panels are not sealed below Slab Unit 1-10.

Photo 14 – The southwest slope protection exhibits settlement.

CONDITION PHOTOS

Photo 15 – The End Bent 1 cap has separated from the slope protection.

Photo 16 – The End Bent 1 slope protection exhibits graffiti.

CONDITION PHOTOS

Photo 17 – The southeast corner exhibits a washout area.

Photo 18 – The End Bent 1 bulkhead cap exhibits cracking.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865710** Date: **10-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865710 UW Inspection Date: 5/10/2014

Bridge Name: N/A

Road Name/Number: BAYVIEW DRIVE

Feature Intersected: LANDINGS INLET SOUTH

Location: 0.1MI NORTH of COMMERCIAL BLV.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.2 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	Moderate		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	82°		393 Bulkhead Seawall Any Material
Weather:	86° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

Soria, Miguel, Professional Engineer (P.E. # 49359)

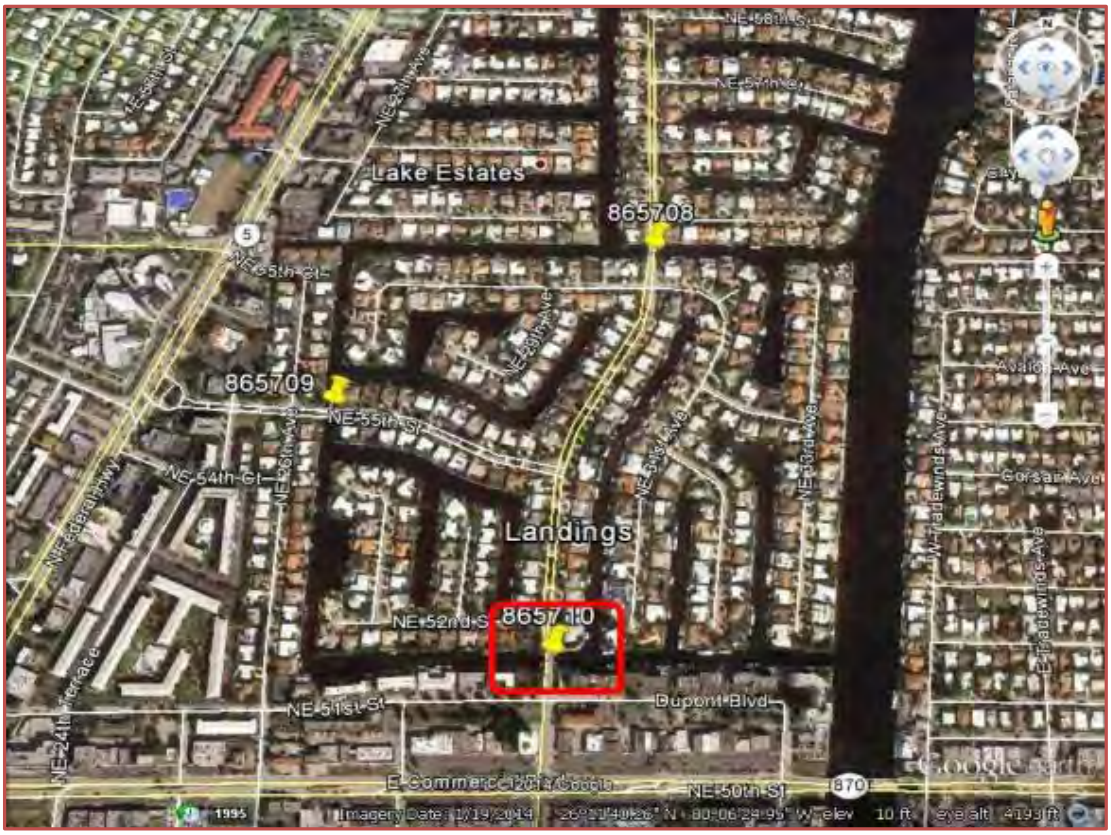
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

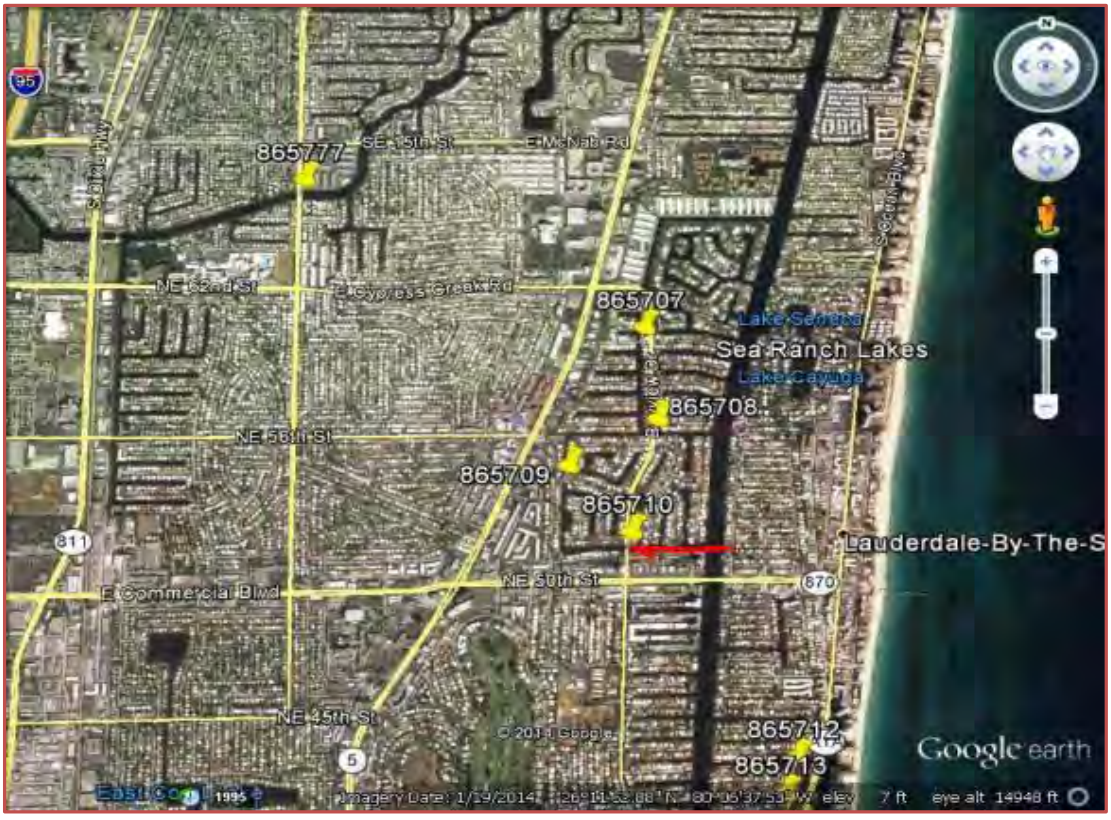
5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865710** Date: **10-May-14**

A: LOCATION MAP





Description: 0.1MI NORTH of COMMERCIAL BLV.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**15 ea.**

Note:
_The one Pile exposed at the East end of Abutment 1 is included in the quantity.
_Fourteen intermediate Bent Piles have been jacketed and are placed in **CS-3** due to unknown deficiencie prior to being jacketed. Refer to Element 298 Pile Jacket Bare for related comments.

298 Pile Jacket Bare	**14 ea.**

Note:
_All intermediate Bent Piles have jacketed with a 25" x 20", concrete jacket from cap to groundline. The jacket size has changed due to repairs.
_The bottom 6" of the jackets are irregular.
_Several Pile Jackets were cleaned at random locations.

CS-3:
_Pile Jacket 2-5, West face at the groundline has a void/washout with exposed rebar and up to 100% section loss. **NO CHANGE.**
_Pile Jacket 2-6, East and South faces, 24" above at the groundline has up to 2" deep area of soft concre The concrete in the lower 24" on all four faces has voids/washouts with (6) pieces of exposed vertical rebar with light corrosion also the original pile is exposed in areas. **UW Photo 01. NO CHANGE.**
_Pile Jacket 2-7, Northwest corner has a void/washout 10" x 10" x 1", with exposed rebar up to 100% section loss in the lower 24". **UW Photo 02. NO CHANGE.**
_Pile Jacket 3-4, South face has a spall 24" x 8" x 1", with (2) exposed rebars, up to 80% section loss. **UW Photo 03. NO CHANGE.**

393 Bulkhead Seawall Any Material	**210 ft.**

Note: The submerged steel sheet pile wall in front of both bulkheads was evaluated under this Element.

CS-2:
The steel sheet piles have light pitting and moderate corrosion. **NO CHANGE.**

290 Channel	**1 ea.**

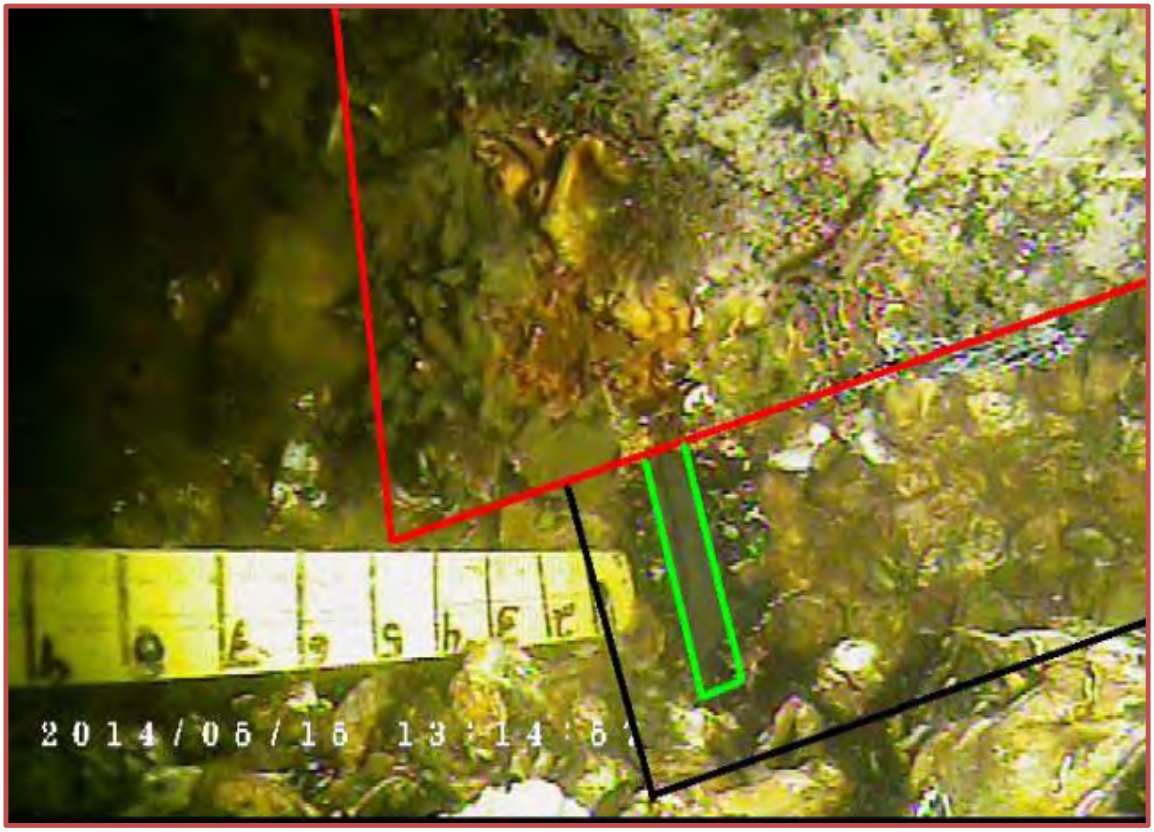
_No deficiency noted during this inspection cycle.

475 R/Concrete Walls	**220 lf.**

Note: The concrete bulkheads (seawalls) were evaluated under this Element.

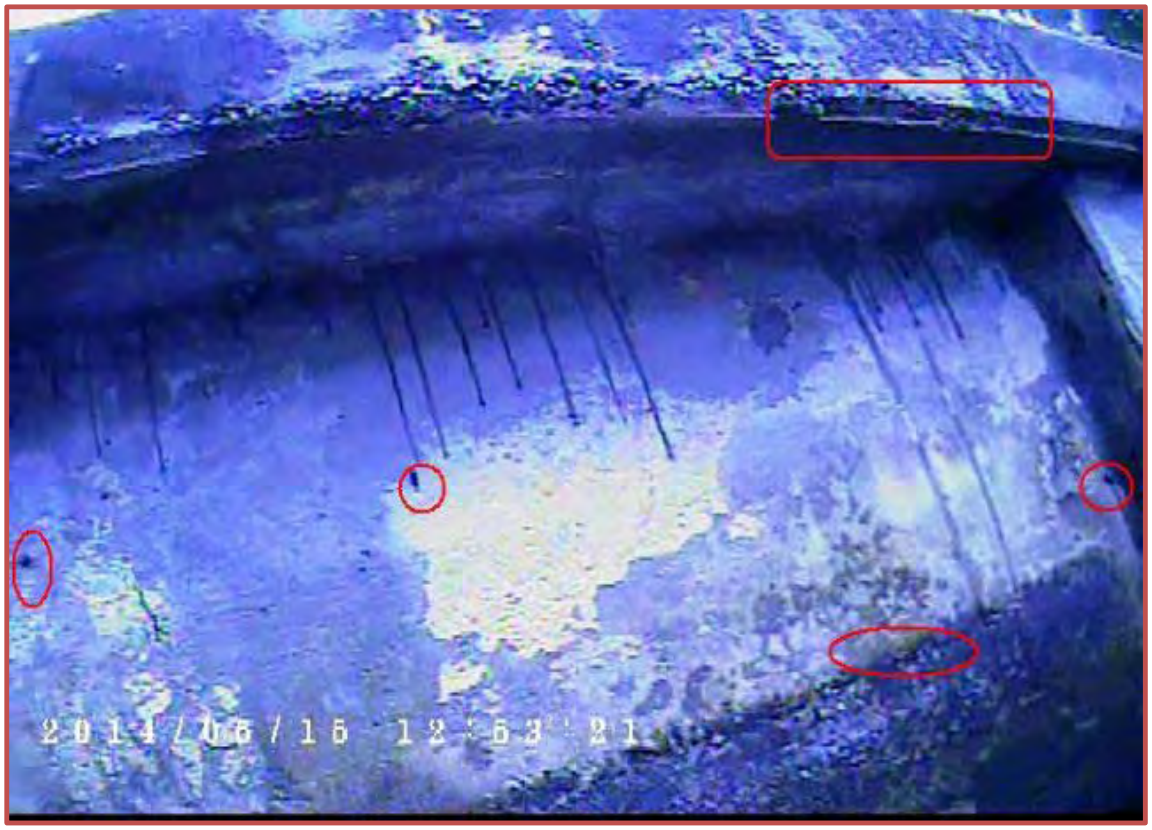
CS-3:
_The South and North seawalls exhibit spotty areas of corrosion bleed-out at random locations. **UW Photo 04. NEW.**
_The bulkhead caps in the areas outside of the bridge have cracking up to 1/16" wide, with spotty corrosion bleed-out. **NO CHANGE.**
_The South and North seawalls exhibit scaling up to 1/8" deep. **NEW.**

F: PHOTO SECTION



Description: Top: Pile Jacket 2-6, East and South faces, void with exposed rebars. **UW Photo 01.**
Bottom: Pile Jacket 2-7, NW corner, void/washout with exposed pile. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Pile Jacket 3-4, South face, spall, with exposed rebars. **UW Photo 03.**
Bottom: South and North seawalls spotty areas of corrosion bleed-out. **UW Photo 04.**

H: RECOMMENDED REPAIRS

298 Pile Jacket Bare

_Repair the spall on Pile Jackets 3-4.

475 R/Concrete Walls

_Remove all unsound concrete and patch and epoxy inject the cracks as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	19.6	19.0
1.5	21.2	20.0
2	20.0	18.7

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 14 ft. and right: 13 ft. at mid-channel.
Maximum Channel depth: 7.2 ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865712 **Bridge Name:** Castle Harbor Isle over Toulon Waterway

Topside Inspection Complete: 5/19/2014

Underwater Inspection Complete: 5/20/2014

Report Date: 7/21/2014

Inspection Personnel / Title / Number	**Initials**
Gutierrez, Carlos –Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/21/14

Prepared for:	**Prepared by:**
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 40.2 ft. long, two span, T-beam bridge was constructed in 1956. The bridge has a roadway width of 21.1 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only access to residences west of the bridge. There is a 1.9 ft. and 1 ft. wide sidewalk at the north and south sides, respectively. The bridge is classified as Functionally Obsolete but is not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a January 1999 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 20 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based upon the condition of the double T-beams, since the riding surface is the top flange of the beams. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Railings/Barriers

- The diagonal striping on the northwest and southeast object markers is oriented incorrectly. See Condition Photo 1.

Expansion Joints

- The joints are deteriorated and are filled with dirt and debris. See Condition Photo 2.
- There are random edge spalls up to 1 ft. x 3 in. x ½ in. along the westbound Abutment 1 expansion joints. This condition has increased in severity – the spalls were previously noted as up to 3 in. x 3 in. x ½ in. See Condition Photo 3.

Utilities

- There is one 2 in. diameter PVC pipe attached to the right overhang in both spans and the west face of Abutment 1 cap.
- There are two 6 in. diameter ductile iron utility pipes in Bays 1 and 5 of both spans.
- The utility under Beams 1-1 and 2-1 is heavily corroded with areas of 100% section loss. See Underwater Inspection Report Photo 4.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Double T-Beams

- The underside of the right overhang is delaminating intermittently along the entire length. See Condition Photo 4.
- The flange undersides of the double T-beams have random shallow delaminated areas ranging from 4 in. x 4 in. to 1 ft. 6 in. x 1 ft. 6 in.
- The undersides of the poured keyways have delaminations up to 1 ft. x 8 in. throughout both spans.

- The south and north underside overhangs exhibit intermittent delaminations with efflorescent bleedout along the entire length of the repaired length. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.
- All the Bays have intermittent delaminated areas up to 3 ft. 4 in. x 2 ft. 10 in. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- The flange undersides of the double T-beams have random shallow delaminated areas ranging from 4 ft. x 1 ft. 6 in. to 4 in. x 4 in. along the repairs. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- Beam 2-1 left leg has a 2 ft. x 8 in. delamination at Bent 2.
- Beam 2-1 right leg has a 1 ft. 6 in. x 10 in. delaminated patch at Abutment 3.
- The riding surface has numerous multi-directional cracks up to 20 ft. long x $^{1}/_{32}$ in. wide and moderate abrasive wear. See Condition Photo 5.
- The tops of Beams 1-1, 1-3, 2-1, and 2-3 each have two 3 in. diameter x 1 ½ in. deep unpatched pickup points.
- There is no roadway striping provided for this structure.

Bearings

- The beams sit directly on the abutments; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has an 8 in. x 5 in. x 2 in. spall/delamination in the top edge under Bay 1-4.
- Abutment 1 cap has a 1 ft. 6 in. x 6 in. x 1 ½ in. spall/delamination with exposed rebar in the bottom edge between Piles 1-4 and 1-5.
- Both Abutment caps exhibit horizontal cracks up to 1/64 in. at random locations along the repaired areas. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- Abutment 1 under Beam 1-1 has a spall 8 in. x 5 in. x 1 in. with corrosion bleedout.

Intermediate Bents

- The underside of Bent 2 cap at the North end has spall/void 10 in. x 3 in. x 1 in. with associated cracks up to 1/64 in. with corrosion bleedout along the edge of the concrete repair. See Underwater Inspection Report Photo 7.
- The Bent 2 cap, bottom west edge, between Piles 2-2 and 2-3 has a crack up to 4 ft. x 1/16 in. with corrosion bleedout. See Underwater Inspection Report Photo 8.
- Bent 3 both faces exhibit horizontal and vertical cracking up to 1/64 in. with corrosion bleedout along the repaired areas. This deficiency was not previously noted.
- Piles 2-1, 2-3, 2-4, 2-5, 2-6 and 3-6 have cracking up to 1/64 in. wide with corrosion bleedout. See Underwater Inspection Report Photo 5.
- The gunite repairs on the piling extend approximately 2 ft. 4 in. below the top of the marine growth and have several cracks up to 1 ft. 2 in. long x $^{1}/_{64}$ in. wide.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approaches

- No guardrail has been provided for the structure. See Inventory Photos.

- The undersides of the beams have several longitudinal cracks along the flanges and flexure cracks up to $^{1}/_{32}$ in. wide.
- The east and west approach roadways exhibit up to 10 ft. long x $^{1}/_{8}$ in. wide longitudinal cracks with evidence of settlement. This condition was not previously noted. See Condition Photo 6.
- The bridge does not have sidewalk transitions in any of the four corners and also exhibits differences in elevation up to 1 ft. This condition was not previously noted. See Condition Photo 7.

Walls

- This element represents both abutment backwalls and the four wingwalls back to the angle breaks.
- All four approach shoulders, at the bridge deck transition, have areas of erosion up to 4 ft. x 2 ft. x 8 in. See Condition Photo 8.
- The transition joints at the wingwalls and backwalls are open up to 2 in. with minor backfill leakage underwater. See Underwater Inspection Report Photo 9.
- Above water cracking up to 2 ft. x $^{1}/_{32}$ in. and extends a maximum of 4 in. into the marine growth with no corrosion stains.
- The Abutment 2 backwall, northeast end, has a delamination 2 ft. x 1 ft. 8 in. This deficiency was not previously noted. See Underwater Inspection Report Photo 10.
- The Abutment 2 backwall, southeast end, has a delamination 2 ft. x 1 ft. with associated cracks up to 1/8 in. wide and corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 11.
- The center pile at the southeast wingwall has a horizontal crack 1 ft. 6 in. x 1/16 in. This deficiency was not previously noted. See Underwater Inspection Report Photo 12.
- The southeast wingwall has a hollow sounding area 2 ft. 4 in. x 2 ft. at and below the high watermark. This deficiency was not previously noted. See Underwater Inspection Report Photo 13.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of two similar bridges in this neighborhood – the bridge numbers are 865712 and 865713. The bridges were constructed in 1956 and are of the same type and configuration with similar conditions present, so conditions found at both bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair condition based on National Bridge Inspection Standards and FDOT guidelines, with the beams and abutments having cracks, delaminations and spalls. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent

locations. It is particularly difficult to strengthen reinforced concrete double T-beams cost effectively, because of the thin concrete webs and difficulty with properly splicing in additional reinforcement without completely demolishing parts of the beam.

The latest available load rating for the bridge indicates that it does not require posting, but it is currently signed for a gross limit of 20 tons.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalks on the bridge are less than 2 ft. wide on each side, less than the current 5 ft. width needed to meet ADA requirements. The sidewalks terminate at the end of the bridge.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences west of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 500 vehicles per day, and the road is posted for 25 mph. The bridge requires replacement in the long term, not repairs, but any repair work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use. The work to replace the bridge would require phased construction over half the bridge at a time in order to maintain traffic. The bridge has a roadway width of 21 ft. It will be difficult to maintain a dedicated space for

pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridge in the community as much as possible, because the bridges are almost identical in design, the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

The bridge is 58 years old. The T-beams have numerous cracks, spalls and delaminations. The spalls can be patched, but given the age of the bridge, the cost to repair the beams, and the frequency of needed patching, will only increase with time. The cost effective decision is to allow the bridge to deteriorate, including the abutments which exhibit cracks and delaminations, then replace the entire bridge when required. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The bridge is recommended to be replaced in 16-20 years.

The new bridge should provide for at least one 5 ft. sidewalk, so it has been assumed that a new bridge would maintain the existing lane width, but provide for one 5 ft. sidewalk, an increase of about 5 ft. from the existing bridge. The length has been estimated to remain the same as the existing bridge.

Long Term Recommendation(s): **Replace bridge.**			Cost	
Design [1]			$	83,160.00
Construction			$	554,400.00
Bridge Construction [2]	$	423,150.00		
Maintenance of Traffic [3]	$	43,750.00		
Utilities [4]	$	87,500.00		
Construction Inspection and Administration [5]			$	110,880.00
Contingency [6]			$	110,880.00
		TOTAL COST	$	859,320.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

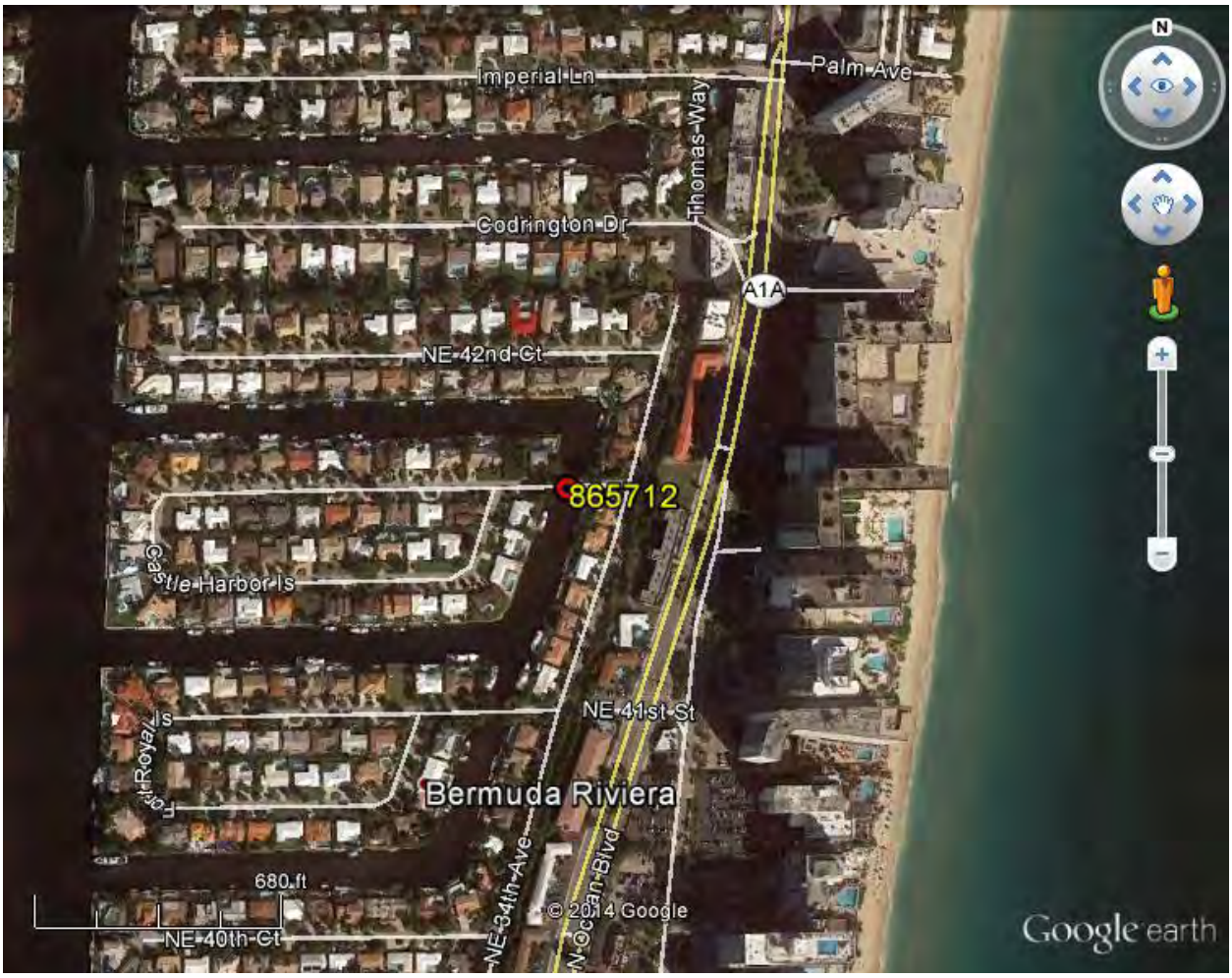
Utilities Running on South Side

GENERAL PHOTOS OF BRIDGE

Channel Looking South

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – The diagonal warning sign stripes are oriented incorrectly.

Photo 2 – Abutment1 joint seal is deteriorated.

CONDITION PHOTOS

Photo 3 – The center lane over End Bent 1 exhibits a spall.

Photo 4 – The south fascia over Span 2 exhibits a long crack and delamination.

CONDITION PHOTOS

Photo 5 – The deck top exhibits multi-directional cracks.

Photo 6 – The east approach roadway exhibits longitudinal cracks.

CONDITION PHOTOS

Photo 7 – The northwest corner is missing the sidewalk transition.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865712** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865712 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: CASTLE HARBOR ISLE.

Feature Intersected: TOULON WATERWAY.

Location: 0.1MI WEST of NE 34th AVENUE.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Conc Col, 215 R/Concrete Abut.
Bottom:	Muck		290 Channel, 110 R/Concrete Open Girder
Water Temp.:	81°		234 R/Conc Cap, 475 R/Concrete Walls
Weather:	82° Sunny		
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number	Initials
Hayes, Steven - Bridge Inspector / Diver (CBI # 438). Lead.	
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368).	
Padrino Reinaldo - Bridge Inspector / Diver (CBI # 242).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/22/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865712** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865712 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: CASTLE HARBOR ISLE.

Feature Intersected: TOULON WATERWAY.

Location: 0.1MI WEST of NE 34th AVENUE.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
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Weather:	82° Sunny		
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Critical Deficiency Notes: None

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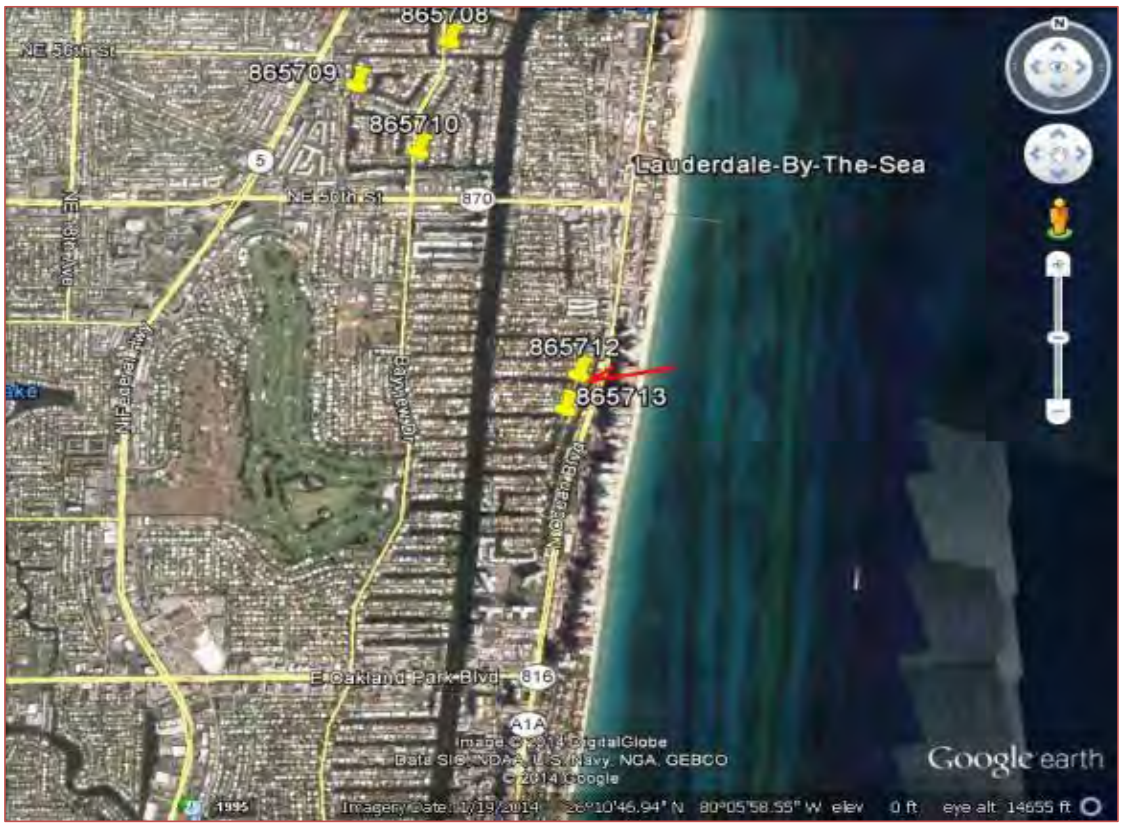
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/22/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865712** Date: **20-May-14**

A: LOCATION MAP



Description: 0.1MI WEST of NE 34th AVENUE.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
110 R/Concrete Open Girder.	**121 lf.**

Notes:
_The concrete open girders were inspected by underwater inspectors during this inspection cycle.
_The traffic rides directly on top of the double tee beams.

CS-3:
_South and North underside overhangs exhibit intermittently delamination with efflorescent bleed-out along the entire repaired length. **UW Photo 01. NEW.**
_All the Bays have intermittently delaminated areas up to 40" x 34". **UW photo 02. NEW.**
_The underside of the poured keyways have delaminations up to 12" x 8", throughout both spans. **NO CHANGE.**
_The flange undersides of the double tee beams have random shallow delaminated areas ranging from 48" x 18" to 4" x 4". Along the repairs. **UW Photo 03. NEW.**

INCIDENTAL:
_The utility under Beams 1-1 and 2-1 is heavily corroded with areas of up to 100% section loss. exposing the wire. **UW Photo 04. NO CHANGE.**

Corrective action taken.
_The concrete open girders lower flange were repaired during this inspection cycle.
_South and North underside overhangs were repaired during this inspection cycle.

205 R/Concrete Column	**18 ea.**

Notes:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 24in. below the caps. Several piles were cleaned at random locations during this inspection cycle.
_Previously documented as 204 P/S Concrete Column by the Previous Underwater Inspectors.

CS-3: **6**
_Piles 2-1, 2-3, 2-4, 2-5, 2-6, and 3-6 have cracking up to 1/64" wide, with some corrosion bleed-out. starting at the cap. **UW Photo 05. (photo taken at Pile 3-6) NO CHANGE.**

CS-2: **12**
_The Gunite repairs on the piling extend approximately 28", below the top of the marine growth and have several cracks up to 14" long x 1/64" wide. **NO CHANGE.**

E: ELEMENT NOTES

215 R/Concrete Abutment **52 lf.**

Notes:
_The Abutment caps were inspected by underwater inspectors during this inspection cycle.

CS-1: **52**
_Both Abutment caps exhibit horizontal cracks up to 1/64", at random location along the repaired areas. **UW Photo 06. NEW.**
_Abutment 1 under beam 1-1 has a spall 8" x 5" x 1", with corrosion bleed-out. **NEW.**

Corrective action taken.
_Both Abutment caps have been repaired during the last inspection cycle.

234 R/Concrete cap **26 lf.**

Notes:
_The Bent caps were inspected by underwater inspectors during this inspection cycle.

CS-3:
_The underside of Bent 2 cap at the North end has a spall/void 10" x 3" x 1", with associated cracks up to 1/64", corrosion bleed-out (previously a piece of exposed and corroded rebar with 10% section loss) along the edge of the concrete repair. **UW Photo 07. NO CHANGE.**
_Bent 2 cap, bottom West edge between Piles 2-2 and 2-3 has a crack up to 48" x 1/16", with corrosion bleed-out. **UW Photo 08 . NEW.**
_Bent 3 both face exhibit horizontal and vertical cracking up to 1/64", with corrosion bleed-out along the repaired areas. **NEW.**

290 Channel **1 ea.**

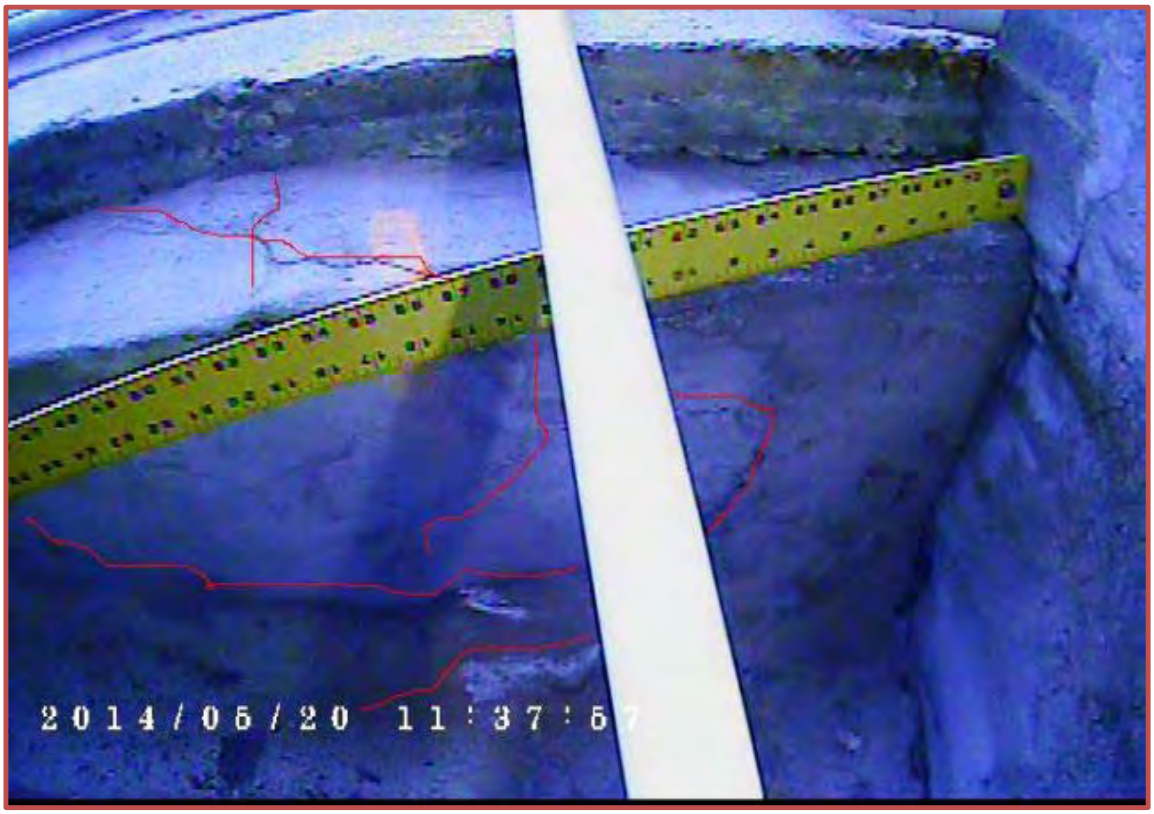
_No drift debris was observer during this inspection cycle.

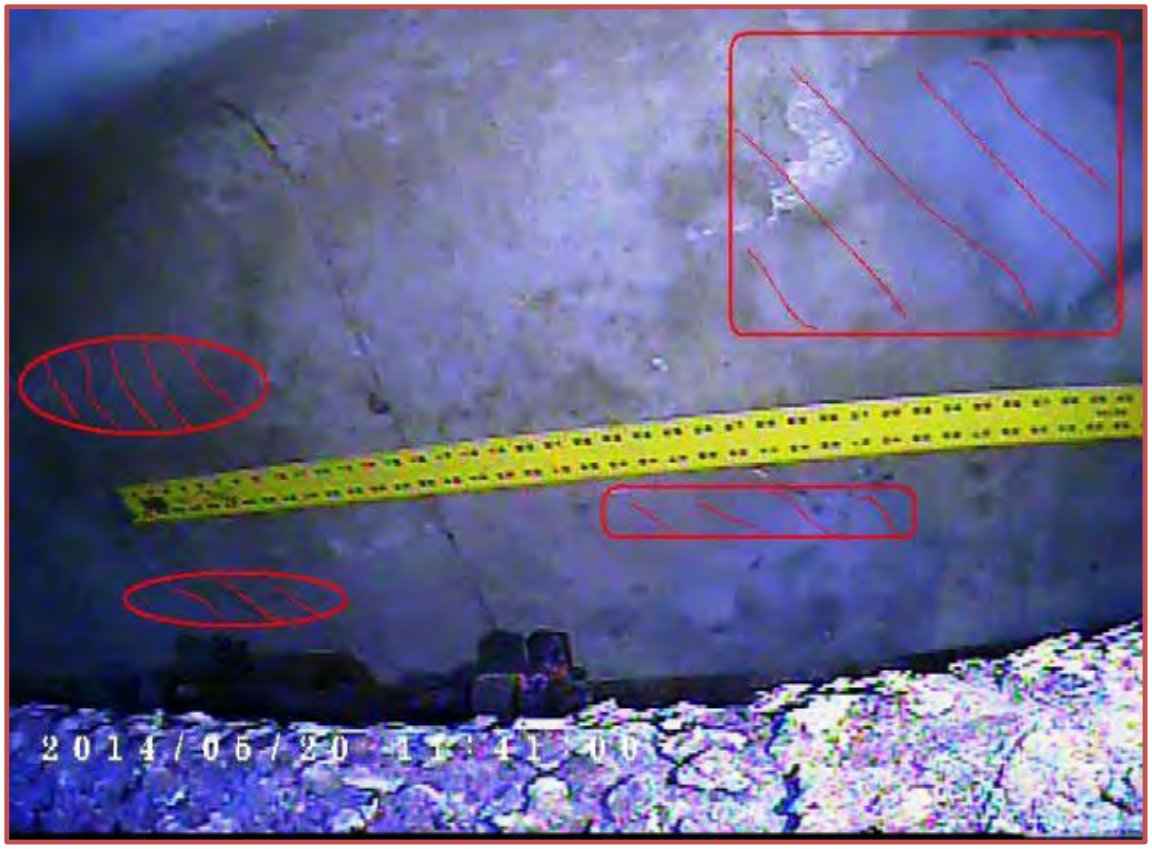
475 R/Concrete walls **124 lf.**

Notes:
_This Element represents both Abutment backwalls and the four wingwalls back to the angle breaks and the Piles along the walls.

CS-3:
_All the transition joints to the wingwalls and backwalls are open up to 2", with minor active backfill leakage underwater. **UW Photo 09. NO CHANGE.**
_Above water cracking up to 24" x 1/32", extends up to of 4", into the marine growth. **NO CHANGE**
_Abutment 2 backwall Northeast end has a delamination 24" x 20". **UW Photo 10. NEW.**
_Abutment 2 backwall Southeast end has a delamination 24" x 12", with associated cracks up to 1/8", and corrosion bleed out. **UW Photo 11. NEW.**
_SE wingwall center Pile has a horizontal crack 18" x 1/16". **UW Photo 12. NEW.**
_SE wingwall has an hollow sounding area 28" x 24", at and below the high watermark. **UW Photo 13. NEW.**

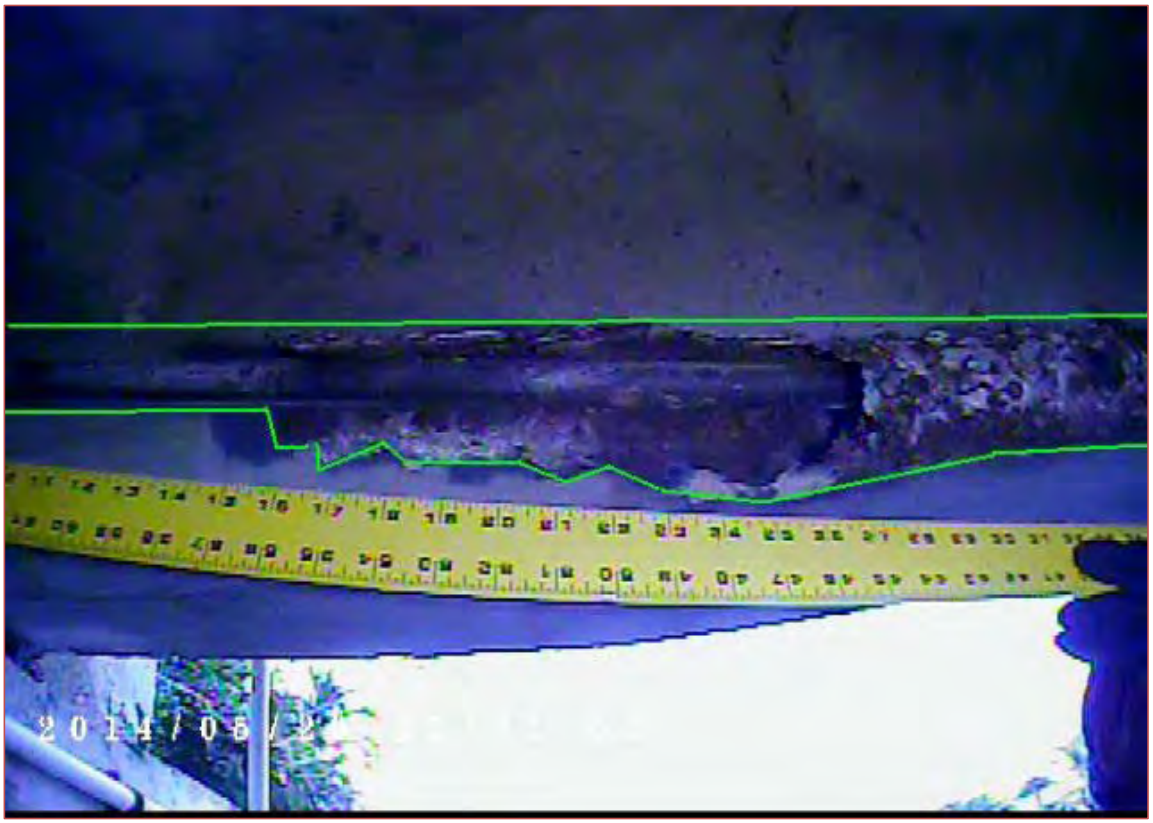
F: PHOTO SECTION





Description: Top: S and N overhangs exhibit delaminations with efflorescence. **UW Photo 01.**
Bottom: All the Bays have intermittently delaminated areas up to 40" x 34". **UW Photo 02.**

F: PHOTO SECTION

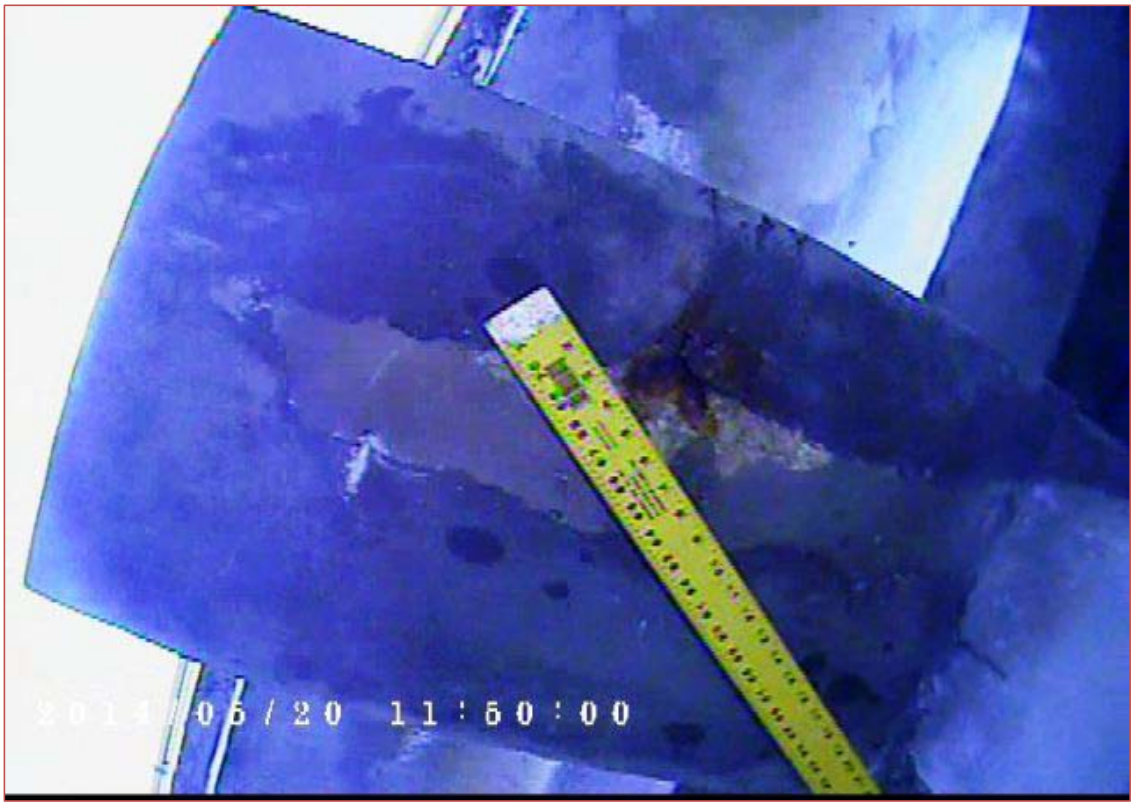


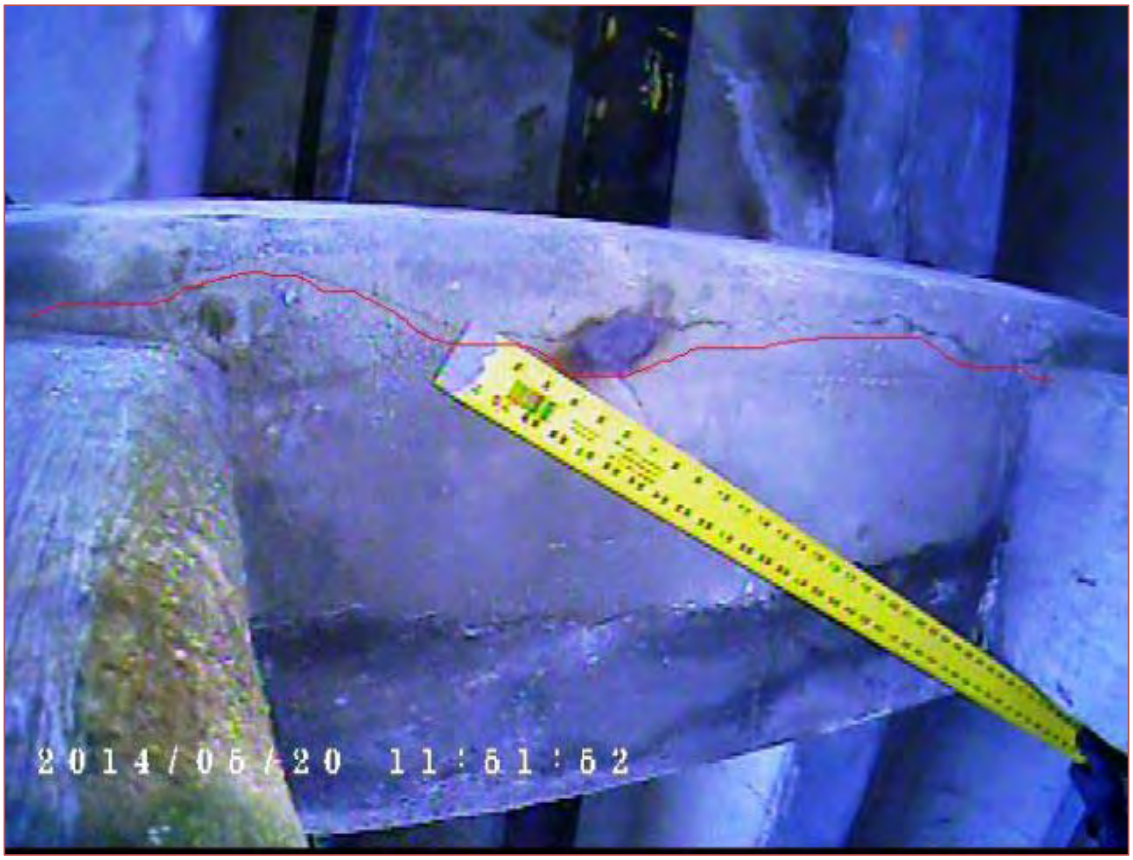
Description: Top: Flange undersides of double tee beams have shallow delamination. **UW Photo 03.**
Bottom: Utility under Beams 1-1 and 2-1 is heavily corroded, exposed wires. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Piles have cracking up to 1/64", with minor CBO. **UW Photo 05.**
Bottom: Both Abutment caps, horizontal cracks along the repaired areas. **UW Photo 06.**

F: PHOTO SECTION



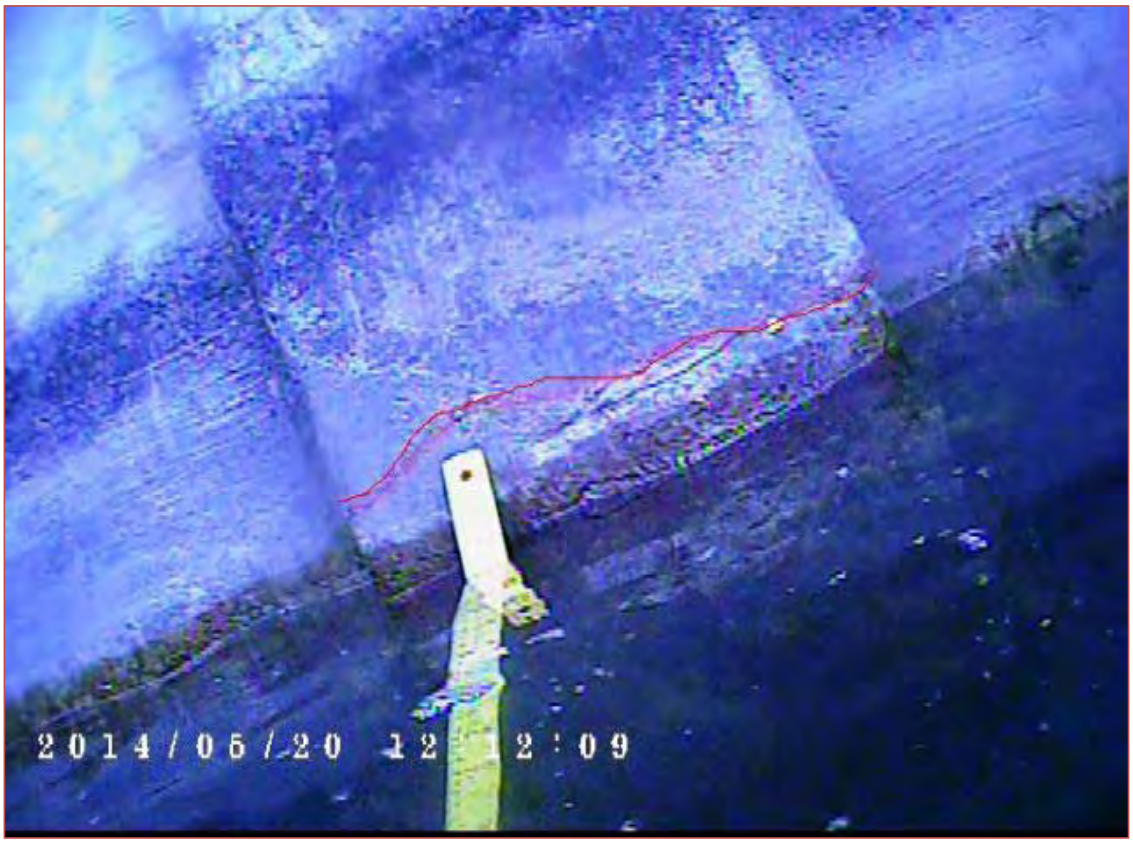


Description: Top: Bent 2 cap underside, North end, spall/void, with associated cracks. **UW Photo 07.**
Bottom: Bent 2 cap, bottom West edge, crack with corrosion bleed-out. **UW Photo 08.**

F: PHOTO SECTION

Description: Top: Transition joints to wingwalls & backwalls are open, backfill leakage. **UW Photo 09.**
Bottom: Abutment 2 backwall NE end, delamination. **UW Photo 10.**

F: PHOTO SECTION



Description: Top: Abutment 2 backwall SE end, delamination with associated cracks. **UW Photo 11.**
Bottom: SE wingwall center Pile has a horizontal crack. **UW Photo 12.**

F: PHOTO SECTION

Description: SE wingwall, hollow sounding area, at and below the high watermark. **UW Photo 13.**

H: RECOMMENDED REPAIRS

110 R/Concrete Open Girder.

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed.

234 R/Concrete cap

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed.

475 R/Concrete walls

_Remove all unsound concrete and patch and epoxy inject all the cracks as needed at Abutment 2 NE and SE ends, also seal all four transition joints to wingwalls and backwalls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.4	11.4
2	14.0	13.1
3	11.1	10.1

Notes: Measurements were taken from the top of the concrete barrier post.
Waterline on the left: 8.1 ft. and right: 7.7 ft. at mid-channel.
Maximum Channel depth: 5.9 ft. (low tide)

BRIDGE INSPECTION REPORT

Bridge Number: 865713 **Bridge Name:** NE 41st Street over Toulon Waterway

Topside Inspection Complete: 5/19/2014

Underwater Inspection Complete: 5/20/2014

Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 40.2 ft. long, two span, tee beam bridge was constructed in 1956. The bridge has a roadway width of 21 ft. and carries two lanes of traffic in a residential neighborhood. There are 1 ft. and 3 ft. wide sidewalks at the north and south sides, respectively. The bridge is the only access to residences west of the bridge. The bridge is classified as Functionally Obsolete but is not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a January 1999 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 20 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the condition of the double T-beams, since the riding surface is the top flanges of the beams. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Railings/Barriers

- Post 1-1 left, lower north face has a 1 ft. 5 in. x 9 in. x 1 in. spall/delamination. See Condition Photo 1.
- The horizontal rails along both sides have minor horizontal cracks up to $^{1}/_{64}$ in. wide.

Expansion Joints

- The joints are deteriorated and are filled with dirt and debris. See Condition Photo 2.

Utilities

- There is one 1 in. diameter PVC utility attached to both overhangs and Abutment 1 cap.
- There are two 6 in. diameter ductile iron pipes in Bays 1 and 5 of both spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Double T-Beams

- Typically, the beams have $^{1}/_{32}$ in. wide vertical/diagonal cracks at random locations in the legs. Previously noted as 1/64 in. wide.
- At many locations, the beams have intermittent longitudinal cracks from $^{1}/_{64}$ in. to $^{1}/_{32}$ in. wide, which run along the outer edges of the beam flanges. At many locations along the cracks, the concrete is delaminating. See Condition Photo 3 and Underwater Inspection Report Photo 1.
- The undersides of the top flanges of the beams have numerous delaminated areas throughout ranging in size up to 4 ft. in diameter with exposed rebars. See Underwater Inspection Report Photos 2 and 3.
- In many instances, past repairs were made to the delaminated areas in the beam flanges by applying grout without fully removing the unsound concrete areas. See Underwater Inspection Report Photo 4.
- The closure pour between Beams 1-1 and 1-2 is voided, honeycombed and unsound at many locations. At several areas, exposed and corroded rebar is visible. See Underwater Inspection Report Photo 6.
- The cast-in-place overhangs have $^{1}/_{32}$ in. wide cracking with associated delaminated areas up to 1 ft. x 1 ft. throughout their lengths. See Condition Photo 4.
- The riding surface has several longitudinal and transverse cracks up to $^{1}/_{32}$ in. wide and has minor scale damage. See Condition Photo 5.
- Beam 2-3, bottom edge, has a 1 ft. 1 in. x 9 in. x 1 in. spall/delamination with exposed rebar. See Underwater Inspection Report Photo 5.
- The top of Beam 2-3 has a 3 in. diameter x 1 ½ in. deep unpatched pickup point, 2 ft. from the Abutment 3 joint. See Condition Photo 6.
- There is no roadway striping over the structure.

Bearings

- The beams sit directly on the abutments; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has 1 ft. 6 in. long x $^{1}/_{64}$ in. wide horizontal cracks near the bottom edge, between Piles 1-1 and 1-2 and between Piles 1-4 and 1-5 with spotty corrosion areas. Previously noted without spotty corrosion areas. See Underwater Inspection Report Photo 12.
- Abutment 2 cap has horizontal cracks up to 1/16 in. wide, near the bottom flange between Piles 3-4 and 3-5 with spotty corrosion areas. See Underwater Inspection Report Photo 13.

Reinforced Concrete Piles

- Eight of the eighteen piles have signs of corrosion related cracking or staining above water.
- There is minor vertical and horizontal cracking in the gunite coating from the cap bottom to the barnacle line.
- The east face of Pile 1-1, starting at the cap, exhibits cracking up to 1/16 in. wide, with corrosion bleedout and sounds hollow. This deficiency was not previously noted.
- The northeast corner of Pile 1-4 has a spall 2 ft. x 6 in. x 2 in. with one exposed rebar and associated cracking with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 8.
- The southeast corner of Pile 1-5 has a spall 10 in. x 4 in. x 1 in. with one exposed rebar and associated cracking with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 9.
- The east face of Pile 1-6 has cracking up to 1/16 in. wide with corrosion bleedout and sounds hollow when hit with a hammer. This deficiency was not previously noted. See Underwater Inspection Report Photo 10.
- All faces of Piles 2-1, 2-2 and 2-5 have cracking up to 1/16 in. wide with corrosion bleedout and sounds hollow when hit with a hammer. This deficiency was not previously noted. See Underwater Inspection Report Photo 11.

Reinforced Concrete Caps

- Bent 2 cap bottom face has a 1 ft. x $^{1}/_{32}$ in. wide horizontal crack with corrosion staining between Piles 2-5 and 2-6. See Underwater Inspection Report Photo 14.
- Bent 2 cap has a 1 ft. long x $^{1}/_{64}$ in. wide horizontal crack in the top edge of the west face, south of Beam 1-3.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition with no deficiencies noted. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approaches

- No guardrail has been provided for the structure.
- The diagonal striping on the northwest and southeast object markers is angled in the wrong direction. See Condition Photo 2.

Walls

- The retaining walls and abutment backwalls have up to 1/32 in. wide cracks with corrosion bleedout throughout. See Underwater Inspection Report Photos 15 and 16.
- There are several spalls/delaminations up to 1 ft. 3 in. x 3 in. x 1 in. intermittently along the retaining wall caps, with exposed rebars and associated cracks up to 1/16 in. wide. See Underwater Inspection Report Photo 17.
- The transition joints between the northwest, southwest and northeast retaining walls and the backwalls have re-opened up to 1 ½ in. wide and have minor backfill leakage. See Underwater Inspection Report Photo 18.
- The southeast retaining wall, center pile, has separated from the wall leaving a space up to 1/8 in. wide, starting from the cap and extending to the ground line. See Underwater Inspection Report Photo 19.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of two similar bridges in this neighborhood – the bridge numbers are 865712 and 865713. The bridges were constructed in 1956 and are of the same type and configuration with similar conditions present, so conditions found at both bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair condition based on National Bridge Inspection Standards and FDOT guidelines, with the beams and abutments having cracks, delaminations and spalls. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen reinforced concrete double T-beams cost effectively, because of the thin concrete webs and difficulty with properly splicing in additional reinforcement without completely demolishing parts of the beam.

The latest available load rating for the bridge indicates that it does not require posting, but it is currently signed for a gross limit of 20 tons.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalks on the bridge are less than 2 ft. wide on each side, less than the current 5 ft. width needed to meet ADA requirements. The sidewalks terminate at the end of the bridge.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences west of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 500 vehicles per day, and the road is posted for 25 mph. The bridge requires replacement in the long term, not repairs, but any repair work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use. The work to replace the bridge would require phased construction over half the bridge at a time in order to maintain traffic. The bridge has a roadway width of 21 ft. It will be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridge in the community as much as possible, because the bridges are almost identical in design, the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

The bridge is 58 years old. The T-beams have numerous cracks, spalls and delaminations. The spalls can be patched, but given the age of the bridge, the cost to repair the beams, and the frequency of needed patching, will only increase with time. The cost effective decision is to allow the bridge to deteriorate, including the abutments which exhibit cracks and delaminations, then replace the entire bridge when required. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The bridge is recommended to be replaced in 16-20 years.

The new bridge should provide for at least one 5 ft. sidewalk, so it has been assumed that a new bridge would maintain the existing lane width, but provide for one 5 ft. sidewalk, an increase of about 5 ft. from the existing bridge. The length has been estimated to remain the same as the existing bridge.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 83,160.00
Construction			$ 554,400.00
Bridge Construction [2]	$	423,150.00	
Maintenance of Traffic [3]	$	43,750.00	
Utilities [4]	$	87,500.00	
Construction Inspection and Administration [5]			$ 110,880.00
Contingency [6]			$ 110,880.00
		TOTAL COST	$ 859,320.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

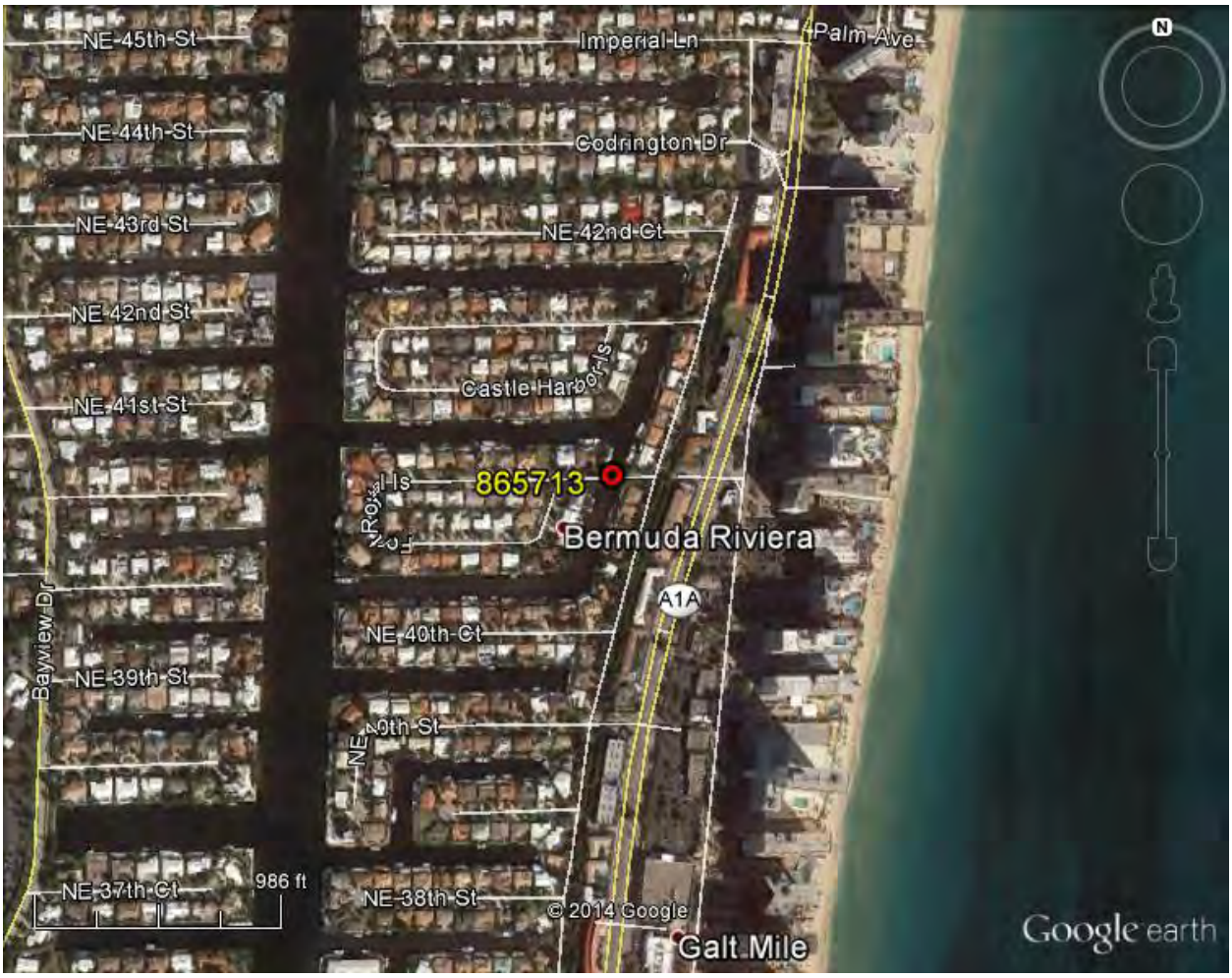
Channel Looking North

Channel Looking South

GENERAL PHOTOS OF BRIDGE

Utilities Mounted under Span 1.

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Post 1-1 left exhibits a spall/delamination.

Photo 2 – The End Bent 1 joint seal is deteriorated.

CONDITION PHOTOS

Photo 3 – Beam 1-1 exhibits longitudinal cracks.

Photo 4 – The right overhang exhibits cracking with delaminations.

CONDITION PHOTOS

Photo 5 – The deck top over Span 2 exhibits longitudinal cracks.

Photo 6 – The deck top exhibits an unpatched pick up point.

CONDITION PHOTOS

Photo 7 – The northwest corner object marker diagonal striping is oriented incorrectly.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865713** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865713 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: NE 41st STREET.

Feature Intersected: TOULON WATERWAY.

Location: 0.1MI WEST of NE 34th AVENUE.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.2 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Concrete Col, 215 R/Concrete Abut.
Bottom:	Muck		290 Channel, 110 R/Concrete Open Girder
Water Temp.:	81°		234 R/Conc Cap, 475 R/Concrete Walls
Weather:	82° Sunny		
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number	Initials
Hayes, Steven - Bridge Inspector / Diver (CBI # 438). Lead.	
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368).	
Padrino Reinaldo - Bridge Inspector / Diver (CBI # 242).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865713** Date: **20-May-14**

A: LOCATION MAP

Description: 0.1MI WEST of NE 34th AVENUE.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
110 R/Concrete Open Girder.	**121 lf.**

Notes:
_The concrete open girders were inspected by underwater inspectors during this inspection cycle.
_The traffic rides directly on top of the double tee beams.

CS-3: **121**

_Typically, the Beams have up to 1/32" wide, vertical/horizontal/diagonal cracks at random locations along the legs. **INCREASE.**

_At many locations, the Beams have intermittent longitudinal cracks up to 1/32" wide, which run along the outer edges of the Beam flanges. The cracks, have hollow sounding. **UW Photo 01. NO CHANGE.**

_The underside of the top flanges of the Beams have numerous spall/delaminated areas throughout, ranging in size up to 4' diameter with exposed rebars. **UW Photos 02 and 03. INCREASE.**

_In many instances, past repairs were made to the delaminated areas in the Beam bottom flanges by applying grout without fully removing the unsound concrete areas. The repair location exhibit horizontal cracks up to 1/16" wide. **UW Photo 04. INCREASE.**

_Beam 2-3, bottom edge spall/delamination 13" x 9" x 1", with exposed rebar. **UW Photo 05. NEW.**

_The closure pour between Beam 1-1 and 1-2 is voided, honeycombed and unsound at many locations. At several areas, exposed and corroded rebar are visible. **UW Photo 06. INCREASE.**

_The cast-in-place overhangs have up to 1/32" wide cracking with delaminated areas up to 12"x 12", throughout the overhangs length. **NO CHANGE.**

_The top of Beam 2-3, has a 3" x 1-1/2" deep un-patched pick-up point, 2' from a Abutment 3 joint. **NO CHANGE.**

205 R/Concrete Column	**18 ea.**

CS-3: **8**

_Eight of the eighteen Piles exhibit cracking up to 1/16" wide, with corrosion bleed-out and related hollow sound. **INCREASE.**

_Pile 1-1, East face exhibit cracking up to 1/16" wide, with corrosion bleed-out and hollow sound, starting from the cap. **UW Photo 07. NEW.**

_Pile 1-4, NE corner has a spall 24" x 6" x 2", with (1) exposed rebar and associated cracking with corrosion bleed-out, starting at the cap. **UW Photo 08. NEW.**

_Pile 1-5, SE corner has a spall 10" x 4" x 1", with (1) exposed rebar and associated cracking with corrosion bleed-out, starting at the cap. **UW Photo 09. NEW.**

_Pile 1-6, East face cracking up to 1/16" wide, with corrosion bleed-out and hollow sound, starting at the cap. **UW Photo 10. NEW.**

_Pile 2-1, all faces cracking up to 1/16" wide, with corrosion bleed-out and hollow sound, starting at the cap. **UW Photo 11. NEW.**

_Pile 2-2, all faces cracking up to 1/16" wide, with corrosion bleed-out and hollow sound, starting at the cap. **NEW.**

_Pile 2-5, all faces cracking up to 1/16" wide, with corrosion bleed-out and hollow sound, starting at the cap. **NEW.**

E: ELEMENT NOTES

215 R/Concrete Abutment **52 lf.**

Notes: The Abutment caps were inspected by underwater inspectors during this inspection cycle.

CS-3: **52**

_Abutment 1 cap exhibit horizontal cracks up to 1/64", near the bottom edge between Piles 1-1 and 1-2 and Piles 1-4 and 1-5, with spotty corrosion areas. **UW Photo 12. INCREASE.**

_Abutment 2 cap exhibit horizontal cracks up to 1/16", near the bottom edge between Piles 3-4 and 3-5 with spotty corrosion areas. **UW Photo 13** .**NEW.**

234 R/Concrete cap **26 lf.**

Notes: The Bent caps were inspected by underwater inspectors during this inspection cycle.

CS-3: **26**

_Bent 2 cap bottom face between Piles 2-5 and 2-6 has a horizontal crack 12" x 1/32" wide, with corrosion bleed-out. **UW Photo 14. NO CHANGE.**

_Bent 2 South of Beam 1-3, West top face, has a horizontal crack 12" x 1/64" wide. **NO CHANGE.**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete walls **124 lf.**

Notes:

_This Element represents both Abutment backwalls and the four wingwalls back to the angle breaks and the Piles along the walls.

CS-3: **124**

_The Abutment backwalls have up to 1/32" wide, cracks with corrosion bleed-out throughout and hollow sounding areas. **UW Photo 15. INCREASE.**

_The retaining walls have up to 1/32" wide, cracks with corrosion bleed-out throughout and hollow sounding areas. **UW Photo 16. INCREASE.**

_There are several spall/delamination 15" x 3" x 1", intermittently along the retaining wingwalls caps, with exposed rebars and associated cracks up to 1/16" wide. **UW Photo 17. INCREASE.**

_The NW transition joint has reopen at the repaired underwater location up to 1-1/2" wide. No backfill leakage was observer during this inspection cycle. **UW Photo 18. INCREASE.**

_The NE transition joint has reopen at the repaired underwater location up to 1-1/2" wide, with active backfill leakage occurring during this inspection cycle. **NEW.**

_The SE retaining wall, center Pile has separated from the wall leaving a space up to 1/8" wide, starting from the cap and extending to the ground-line. **UW Photo 19. NEW.**

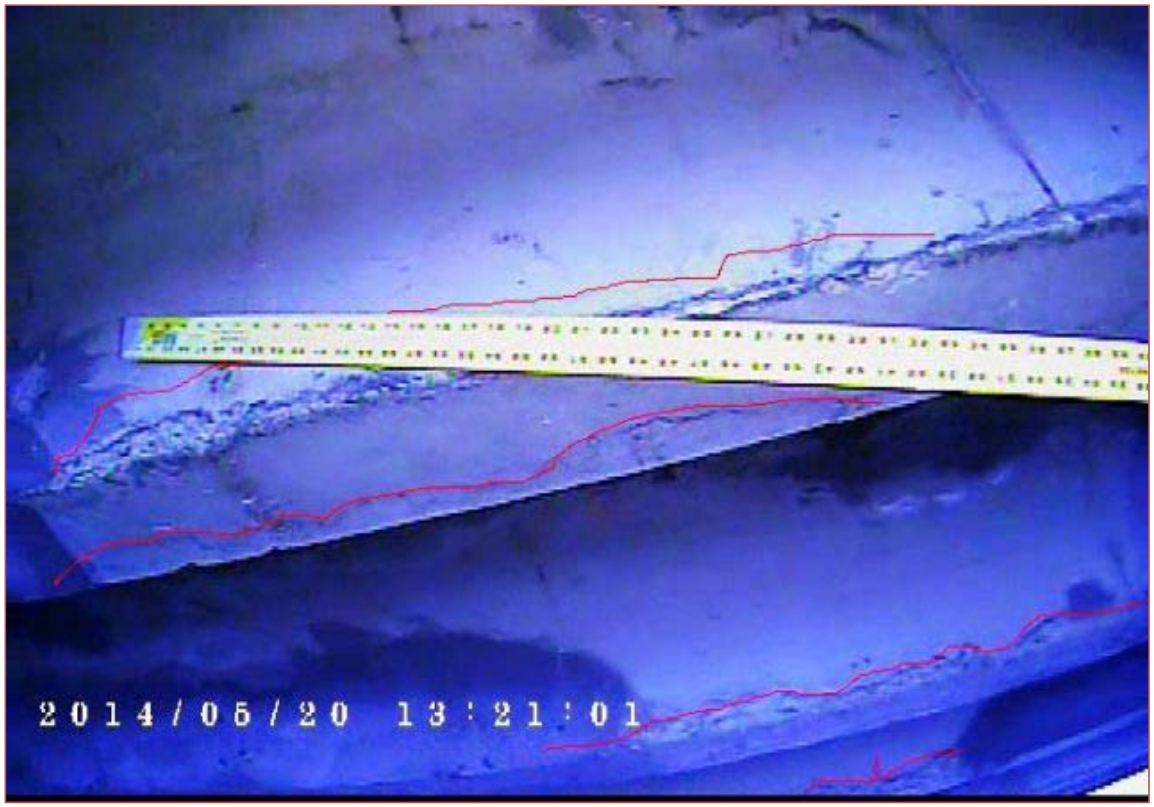
Corrective action taken.

_The transition joints from the retaining walls to the backwalls were repaired during the last inspection cycle.

F: PHOTO SECTION

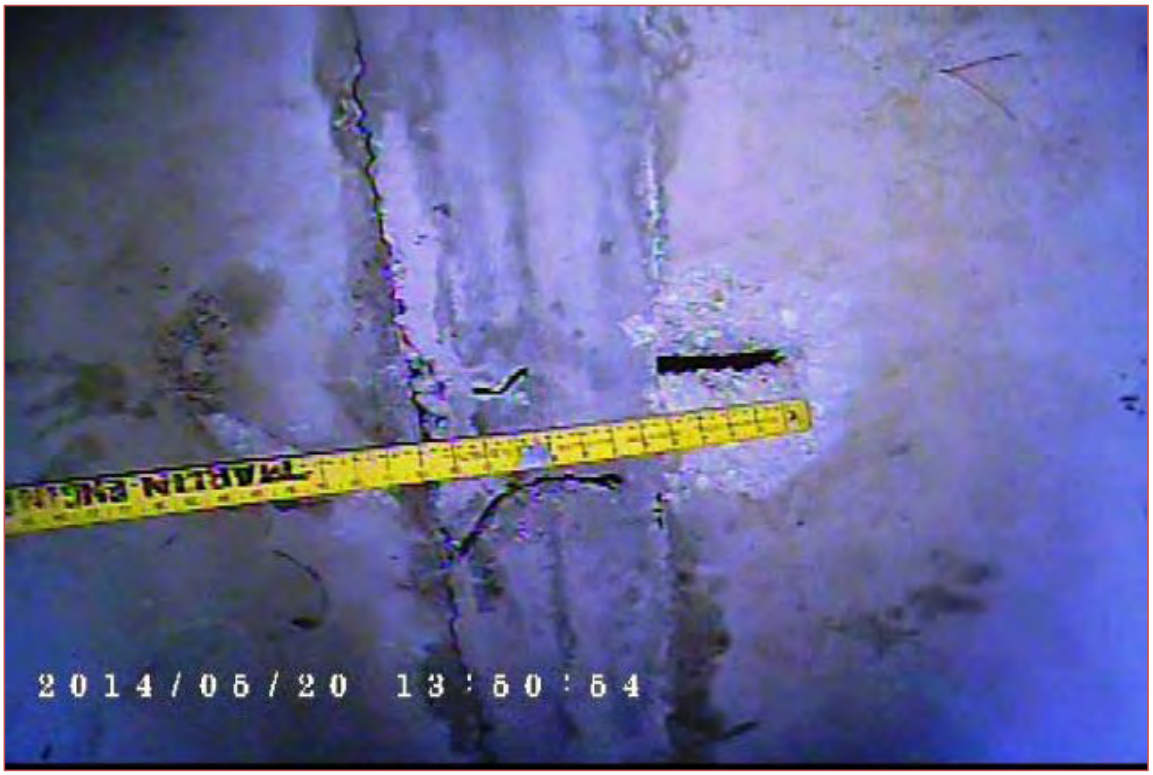
Description: Top: Outer edges of the Beam flanges, horizontal cracks. **UW Photo 01.**
Bottom: Underside of the top flanges of the beams, spall/delaminati0ns. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Underside of the top flanges of the beams, spall/delamination. **UW Photo 03.**
Bottom: Delaminated areas along the beams bottom flanges. **UW Photo 04.**

F: PHOTO SECTION

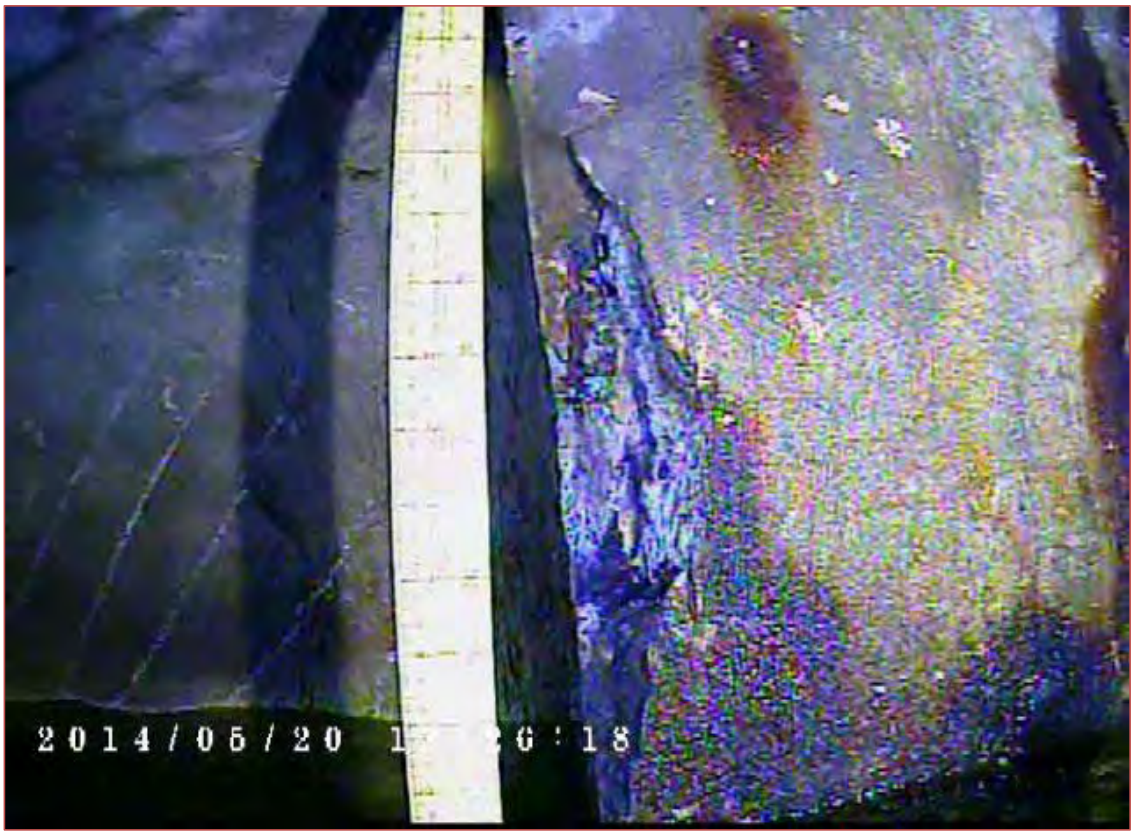


Description: Top: Beam 2-3, bottom edge spall/delamination with exposed rebar. **UW Photo 05.**
Bottom: Closure pour between Beam 1-1 and 1-2, unsound with rebar. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: Pile 1-1, East face exhibits cracking with corrosion bleed-out. **UW Photo 07.**
Bottom: Pile 1-4, NE corner spall, with exposed rebar and cracking. **UW Photo 08.**

F: PHOTO SECTION



Description: Top: Pile 1-5, SE corner, spall, with exposed rebar and cracking. **UW Photo 09.**
Bottom: Pile 1-6, East face cracking with corrosion bleed-out. **UW Photo 10.**

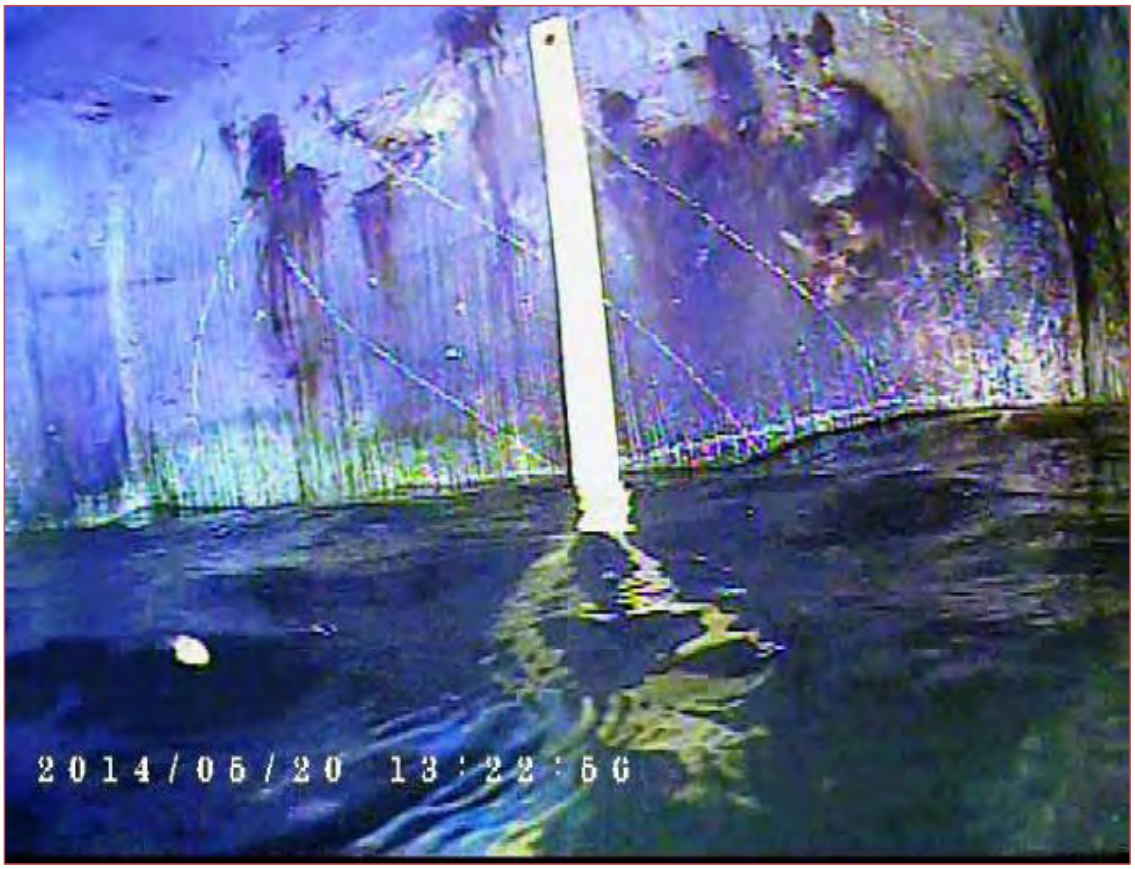
F: PHOTO SECTION

Description: Top: Pile 2-1, cracking with corrosion bleed-out and hollow sound. **UW Photo 11.**
Bottom: Abutment 1 cap horizontal cracks, near the bottom edge. **UW Photo 12.**

F: PHOTO SECTION

Description: Top: Abutment 2 cap horizontal cracks, near the bottom edge. **UW Photo 13.**
Bottom: Bent 2 cap between Piles 2-5 and 2-6, bottom horizontal crack. **UW Photo 14.**

F: PHOTO SECTION



Description: Top: Abutment backwalls, cracks with corrosion bleed-out throughout . **UW Photo 15.**
Bottom: Retaining walls have cracks with corrosion bleed-out throughout. **UW Photo 16.**

F: PHOTO SECTION

Description: Top: Spall/delaminations intermittently along the retaining wingwalls caps. **UW Photo 17.**
Bottom: NW transition joint repair has reopen underwater up to 1-1/2". **UW Photo 18.**

F: PHOTO SECTION

Description: SE retaining wall, center Pile has separated from the wall leaving a space up to 1/8" wide. **UW Photo 19.**

H: RECOMMENDED REPAIRS

110 R/Concrete Open Girder.

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed.

205 R/Concrete Column

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed at the following Piles; 1-1, 1-4, 1-5, 1-6, 2-1, 2-2 and 2-5.

215 R/Concrete Abutment

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed.

234 R/Concrete cap

_Remove all unsound concrete and patch. Also epoxy inject all the cracks as needed.

475 R/Concrete walls

_Remove all unsound concrete and patch and epoxy inject all the cracks as needed at Abutment 1and 2 backwalls.
_Seal all four transition joints to wingwalls and backwalls. Also remove all unsound concrete and patch and epoxy inject all the cracks as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.9	11.8
2	12.1	13.8
3	10.3	10.6

Notes: Measurements were taken from the top of the concrete barrier post.
Waterline on the left: 6.5 ft. and right: 6.6 ft. at mid-channel.
Maximum Channel depth: 7.2 ft. (low tide)

BRIDGE INSPECTION REPORT

Bridge Number: 865720 **Bridge Name:** Old Dixie Highway over South Fork Middle River

Topside Inspection Complete: 5/15/2014
Underwater Inspection Complete: 5/27/2014
Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 82.7 ft. long, three span, reinforced concrete arch-deck bridge was constructed in 1923 and widened using prestressed concrete slabs in 1959. The bridge has a roadway width of 28.4 ft. and carries two lanes of traffic in a residential neighborhood. There is a 4.3 ft. sidewalk on the west side. The bridge is classified as Functionally Obsolete but is not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 1994 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting for SU and C vehicles at 16 and 29 tons, respectively. The bridge is posted for SU and C vehicles at 16 and 28 tons, respectively, for northbound traffic and 16 and 29 tons, respectively, for southbound traffic. The rating is controlled by the concrete arch.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced in the below text, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. Because this bridge does not have a deck, but uses the slab and arch top surfaces for traffic, the overall rating is generally aligned with the rating of the superstructure. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall satisfactory condition, based on the condition of the prestressed concrete slab units and concrete arch. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has transverse cracks up to 3 in. wide over the joints, which are filled with dirt, debris and are heaving. See Condition Photo 1.
- There are longitudinal cracks up to ¼ in. wide in all spans over the slab unit joints and widening joint. See Condition Photo 2.
- The west sidewalk has a 5 ft. long x $^{1}/_{16}$ in. wide transverse crack, 8 in. north of Bent 2. See Condition Photo 3.
- The west sidewalk has a 1 ft. x 6 in. delamination over Bent 3 adjacent to the bridge rail post. See Condition Photo 4.
- The west sidewalk has minor map cracking up to $^{1}/_{64}$ in. wide.
- Both shoulders exhibit debris and vegetation. See Condition Photo 5.

Railings/Barriers

- The bottom left rail between Posts 1-3 and 1-4 has six 6 in. x 4 in. x ½ in. spalls/ delaminations with painted-over steel in the east and west face. This condition has increased in severity. See Condition Photo 6.
- No guardrails have been provided for this structure.
- No reflectors have been provided for this structure.
- No object markers have been provided for this structure.

Expansion Joints

- The sealant in the left sidewalk joints is deteriorated and the joints are filled with dirt and debris. See Condition Photo 7.

Utilities

- There is one 18 in. ductile iron utility pipe and one 8 in. fiberglass wrapped utility pipe attached to the east side of the structure.
- There is one 24 in. ductile iron utility approximately 25 ft. east of the structure that is supported by concrete caps and piles.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slabs and arch; secondary members, bearings, joints, etc., are not included in this rating. See Tables 2 and 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. e. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- Slab Unit 1-6 has a 1 ft. 6 in. x 3 in. x 2 in. spall in the east edge at Abutment 1 and a 4 ft. x 6 in. x 3 in. spall in the east edge, 5 ft. south of Bent 2.

Reinforced Concrete Arch

- The arch exhibits scaling up to $^{1}/_{8}$ in. deep intermittent along the high watermark. See Underwater Inspection Report Photo 01.
- There are two spalls in Span 2 up to 3 ft. x 9 in. x 2 in. with exposed steel in the arch springline, approximately 10 ft. from Footer 2. This condition has increased in severity. See Condition Photo 8.
- There is a 9 ft. long x 1 ft. x 1 in. spall/delamination in the east face of Span 2, extending from the centerline of the arch to 3 ft. from Footer 3. This condition has increased in severity. See Condition Photo 9.
- At the outside faces of the arches, there are diagonal and horizontal cracks up to $^{1}/_{16}$ in. wide on both sides of Piers 2 and 3. See Condition Photo 10.
- There is a longitudinal construction joint approximately ¼ in. wide at the center of each arch span.
- The utility supports and abandoned utilities attached to the east face are heavily corroded with the support in Span 2 having 100% section loss. See Condition Photo 11.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- End Bent 1 at the east side exhibits vegetative growth. See Condition Photo 12.

Reinforced Concrete Piles

- The piles typically exhibit spalls/delaminations with exposed corroded rebar and cracking up to $^{1}/_{8}$ in. wide with corrosion staining. See Condition Photos 13-17.
- Pile 1-1: Northwest and northeast corners have spall/delaminations up to 3 ft. x 11 in. x 2 in., with associated cracks up to $^{1}/_{8}$ in. starting at the cap.
- Pile 1-2: Northwest and northeast corners have spall/delamination up to 3 ft. x 11 in. x 2 in., exposing reinforcing steel with up to 60% section loss and cracks up to $^{1}/_{8}$ in. starting at the cap. See Underwater Inspection Report Photo 02.
- Pile 1-3: Northwest and northeast corners have delaminations up to 3 ft. x 10 in. with associated cracks up to $^{1}/_{8}$ in. wide and corrosion bleed-out, starting at the cap.
- Pile 2-1: All four corners are delaminated up to 3 ft. 4 in. x 10 in. with associated cracks up to $^{1}/_{8}$ in. wide, and corrosion bleed-out, starting at the cap. See Underwater Inspection Report Photo 03.
- Pile 2-2: Northwest, northeast and southwest corners are delaminated up to 3 ft. 4 in. x 10 in. with associated cracks up to $^{1}/_{8}$ in. and corrosion bleed-out, starting at the cap.
- Pile 2-3: All four corners are delaminated up to 3 ft. 4 in. x 10 in. with associated cracks up to $^{1}/_{8}$ in. and corrosion bleed-out, starting at the cap. See Underwater Inspection Report Photo 04.
- Pile 3-1: The northwest corner has a delamination 2 ft. 4 in. x 10 in. with corrosion bleed-out. On the east face there are three vertical cracks up to 1 ft. long x $^{1}/_{32}$ in. wide.
- Pile 3-2: Northeast and southeast corners and the west face have spalls/delaminations up to 2 ft. 4 in. x 2 ft. 5 in. x 2 in. with exposed reinforcing steel with up to 50% section loss and associated cracks up to $^{1}/_{8}$ in. wide, and corrosion bleed-out, starting at the cap. See Underwater Inspection Report Photos 05 and 06.
- Pile 3-3: Southwest and northeast corners have delaminations up to 1 ft. 7 in. x 5 in. with corrosion bleed-out. Also the north face has one vertical crack 7 in. long x $^{1}/_{32}$ in. wide starting at the cap.
- Pile 4-1: northwest and southwest corners have delaminations up to 1 ft. 10 in. x 6 in. with associated cracks up to $^{1}/_{8}$ in. wide and corrosion bleed-out, starting at the cap.
- Pile 4-2: Southwest and southeast corners have spalls/delaminations up to 1 ft. 11 in. x 9 in. x 2 in. with exposed reinforcing steel with up to 50% section loss and associated cracks up to $^{1}/_{16}$ in. wide. See Underwater Inspection Report Photo 07.
- Pile 4-3: Southwest and southeast corners have delaminations up to 2 ft. x 10 in. with corrosion bleed-out, starting at the cap.

Footings

- There are some minor voids in the bottom edge of Footer 2 that run intermittently along the north face with a maximum height of 14 in. and a maximum depth of 10 in.
- Footer 3 has minor voids that are less severe than those in Footer 2.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 5 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 5 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Channel

- The slopes on the east side of both abutments have up to 8 ft. x 3 ft. x 3 ft. deep washed out/undermined areas of the shoulders and of the concrete rip rap bag slope protection and loosening some of the bags.
- There is a chain link fence down in the east side of Abutment 4.
- There are several shopping carts in the west channel under Span 1. See Underwater Inspection Report Photo 08.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Bulkheads

- The piles at the southwest and northwest bulkheads exhibit vertical cracks and spalls/delaminations with exposed steel up to 2 ft. 8 in. x 10 in. x 2 ½ in.
- The end of the southeast bulkhead has a minor spall that has been painted over
- The northwest bulkhead cap has a 7 in. x 4 in. x 1 in. spall in the lower edge.
- The grout in the retaining wall joints is missing.
- Abutment 1 backwall: The southwest end adjacent to the transition to the retaining wall has multiple cracks up to 2 ft. 6 in. long x $^{1}/_{16}$ in. wide starting at the cap. See Underwater Inspection Report Photo 09. This condition was not previously noted.
- Abutment 4 backwall: The northwest end adjacent to the transition to the retaining wall has multiple cracks up to $^{1}/_{16}$ in. wide and corrosion bleed-out, starting at the cap.
- Both piles at the southwest wingwall exhibit delaminations up to 3 ft. 4 in. x 10 in. with associated cracks up to $^{1}/_{8}$ in. wide and corrosion bleed-out, starting at the cap. See Underwater Inspection Report Photo 10.
- Pile 1 at the northwest wingwall has a 2 ft. x 1 ft. x 2 in. spall/delamination with exposed reinforcing steel with up to 50% section loss and associated cracks up to $^{1}/_{32}$ in. wide, on the southwest corner, starting at the cap. See Underwater Inspection Report Photo 11.
- Pile 2 at the northwest wingwall has a 2 ft. x 6 in. delamination with associated cracks up to $^{1}/_{32}$ in. wide and corrosion bleed-out, on the southwest and southeast corners, starting at the cap.
- The grout in the retaining wall joint to backwall transition at all 4 ends is missing.

Approach Roadways

- The northwest approach sidewalk has an area of undermining up to 5 ft. long x 4 in. high x 1 ft. back under. See Condition Photo 18.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The original arch portion of the bridge has several spalls that require repair. The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition with only one specific condition noted on one of the units.

The bridge is posted for load. The latest available load rating for the bridge does not indicate whether the controlling element is the slab units or the arch.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge via NE 4th Avenue or NE 15th Avenue.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge at the east side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 14,500 vehicles per day, and the road is posted for 30 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for pile jackets or concrete repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

Historic Bridge: The bridge dates to 1923 and eligible for inclusion on the National Register of Historic Places. Consultations with historians, the local historical society, and the state historic preservation officer will be required if replacement options are considered. In order to satisfy federal Section 4(f) requirements, a study evaluating no build, rehabilitation and replacement options will need to be performed to confirm that replacement is the only reasonable option.

If the arch shape of the beams is desirable in a replacement bridge, the beams should be designed to include those shapes, rather than providing a purely cosmetic fascia arch, so that additional maintenance costs are not incurred for non-functional components.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in fair to satisfactory condition and is expected to require work to the piles and concrete elements in the next 20 years to ensure they will last the next 20 years without interruption to service.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term work is required to address structural issues at the bridge at this time. Work to extend the life of the bridge is described in Long Term recommendations.

LONG TERM

The piles have spalls, delaminations and cracks with corrosion staining. It is anticipated that the piles will require jackets 6-10 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

The reinforced concrete arch portion of the bridge should be repaired using conventional concrete repair methods.

For all concrete work, surface preparation, to both the sound concrete left in place after loose material is removed and to the exposed reinforcing steel, are key to providing long lasting repairs.

Long Term Recommendation(s): **Install pile jackets.** **Make concrete repairs.** **Replace bulkheads at each quadrant.**			Cost
Design [1]			$ 40,000.00
Construction			$ 158,000.00
Bridge Construction [2]	$	148,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 31,600.00
Contingency [5]			$ 31,600.00
		TOTAL COST	$ 261,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $4,000 per pile (12 piles total); Bulkheads: $20,000/quadrant; Concrete repairs to beams: $20,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

East Elevation

GENERAL PHOTOS OF BRIDGE

North Approach Looking South

North Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Bridge Posting Sign

North Approach Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

West Bridge Railing

East Bridge Railing

GENERAL PHOTOS OF BRIDGE

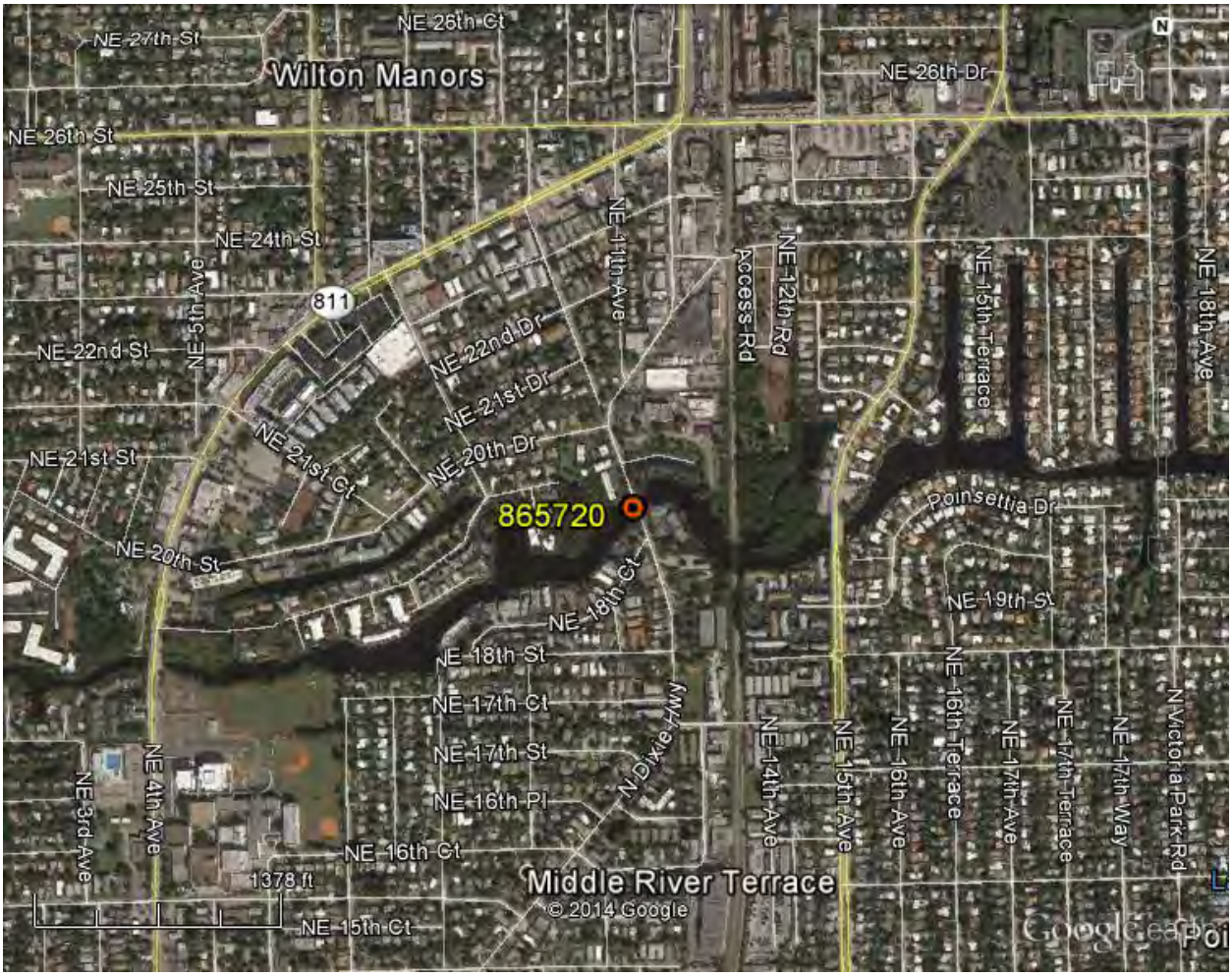
Utilities at East Fascia

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal transverse crack.

Photo 2 – Deck top longitudinal cracks.

CONDITION PHOTOS

Photo 3 – West sidewalk transverse crack.

Photo 4 – West sidewalk delamination over Bent 3.

CONDITION PHOTOS

Photo 5 – East shoulder vegetative growth and debris.

Photo 6 – Left rail between Posts 1-3 and 1-4 exhibits 6 spalls.

CONDITION PHOTOS

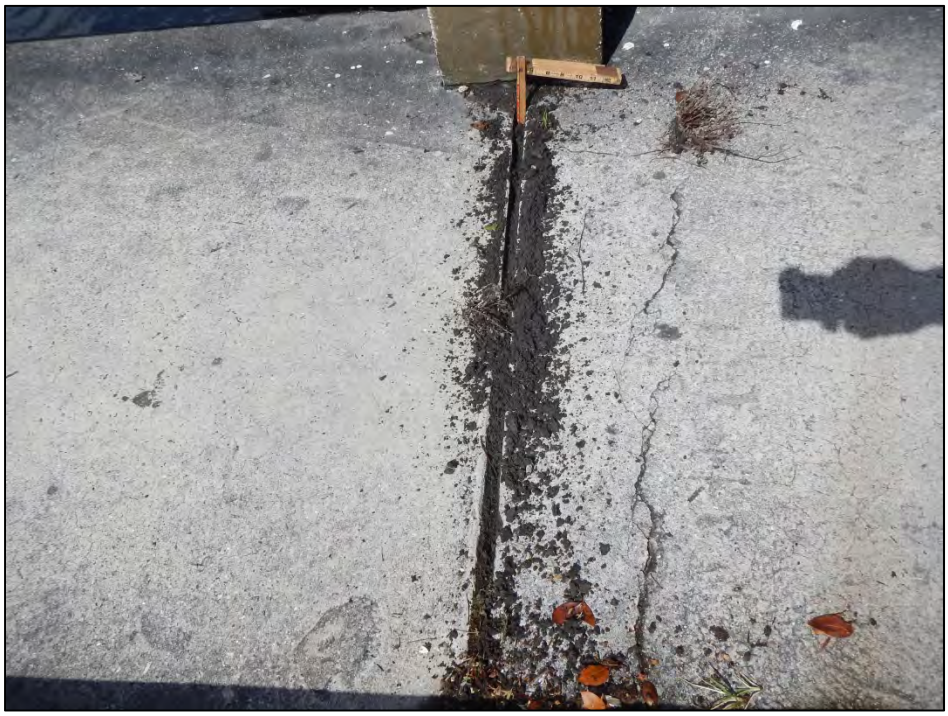


Photo 7 – Joint seal at the west sidewalk is deteriorated and filled with debris.

Photo 8 – Span 2 spall with exposed steel.

CONDITION PHOTOS

Photo 9 – Span 2 east side spall and delamination at mid span.

Photo 10 – West side of Pier 2 of the arch – diagonal and horizontal cracks.

CONDITION PHOTOS

Photo 11 – Utility pipe support at the east side with 100% section loss.

Photo 12 – End Bent 1 at the east side exhibits vegetative growth.

CONDITION PHOTOS

Photo 13 – The north face of Pile 1-3 exhibits vertical cracks with corrosion bleed-out.

Photo 14 – The northwest corner of Pile 1-2 exhibits spalls and delaminations.

CONDITION PHOTOS

Photo 15 – The north face of the northeast corner of Pile 2-3 exhibits a vertical crack with corrosion bleed-out.

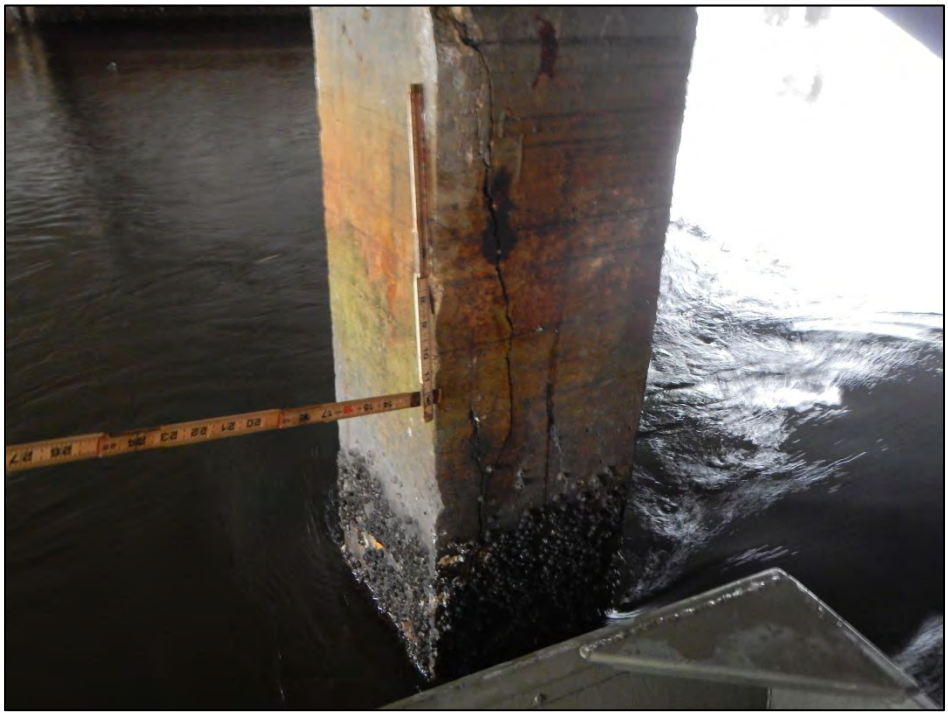


Photo 16 – The southwest and northwest corners of Pile 2-2 exhibit vertical cracks.

CONDITION PHOTOS

Photo 17 – All faces of Pile 3-2 exhibit spalls with associated cracks with corrosion bleed-out.

Photo 18 – Northwest approach sidewalk exhibits undermining.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865720** Date: **27-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865720 UW Inspection Date: 5/27/2014

Bridge Name: N/A

Road Name/Number: OLD DIXIE HWY.

Feature Intersected: SOUTH FORK MIDDLE RIVER.

Location: 0.3MI SOUTH of NE 26th STREET..

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.6 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	144 R/Concrete Arch
Bottom:	Muck.		205 R/Concrete Column
Water Temp.:	81°		220 R/C Sub Pile Cap/Ftg
Weather:	84° Sunny		290 Channel, 475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Stinging Hydroids, Sharp oyster shells

Critical Deficiency Notes: None

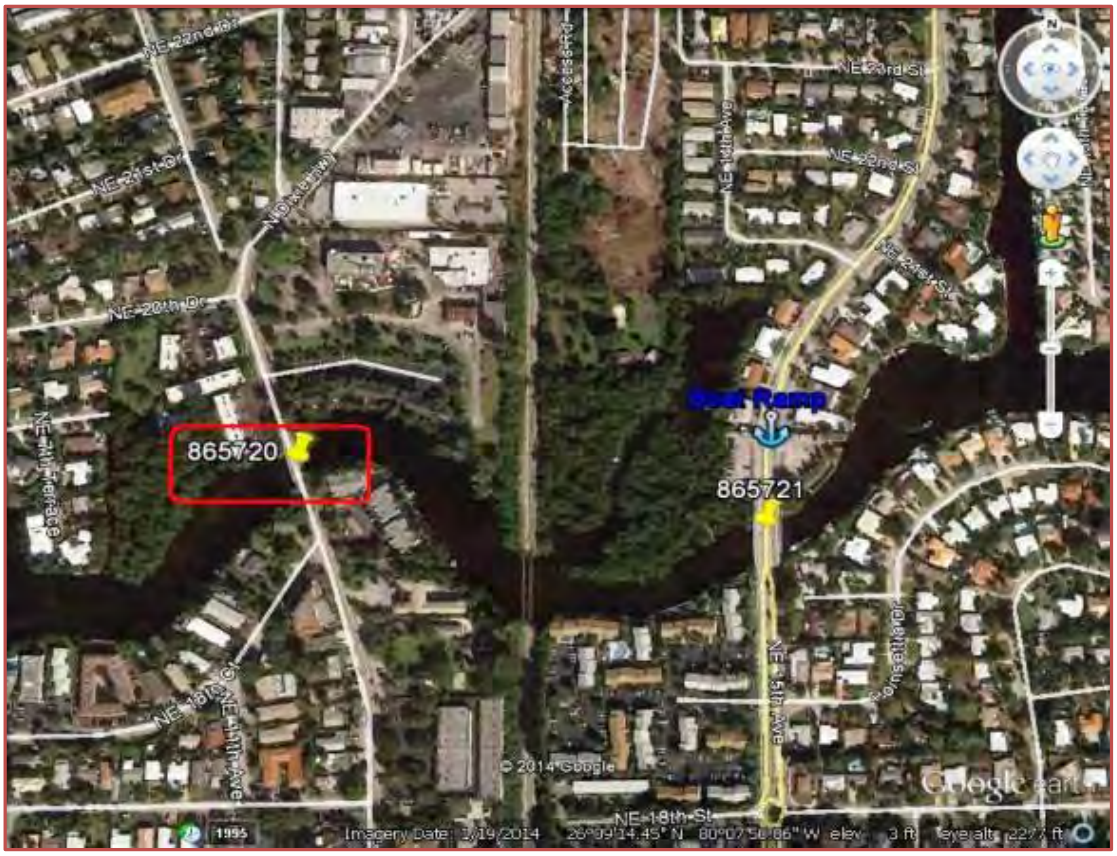
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

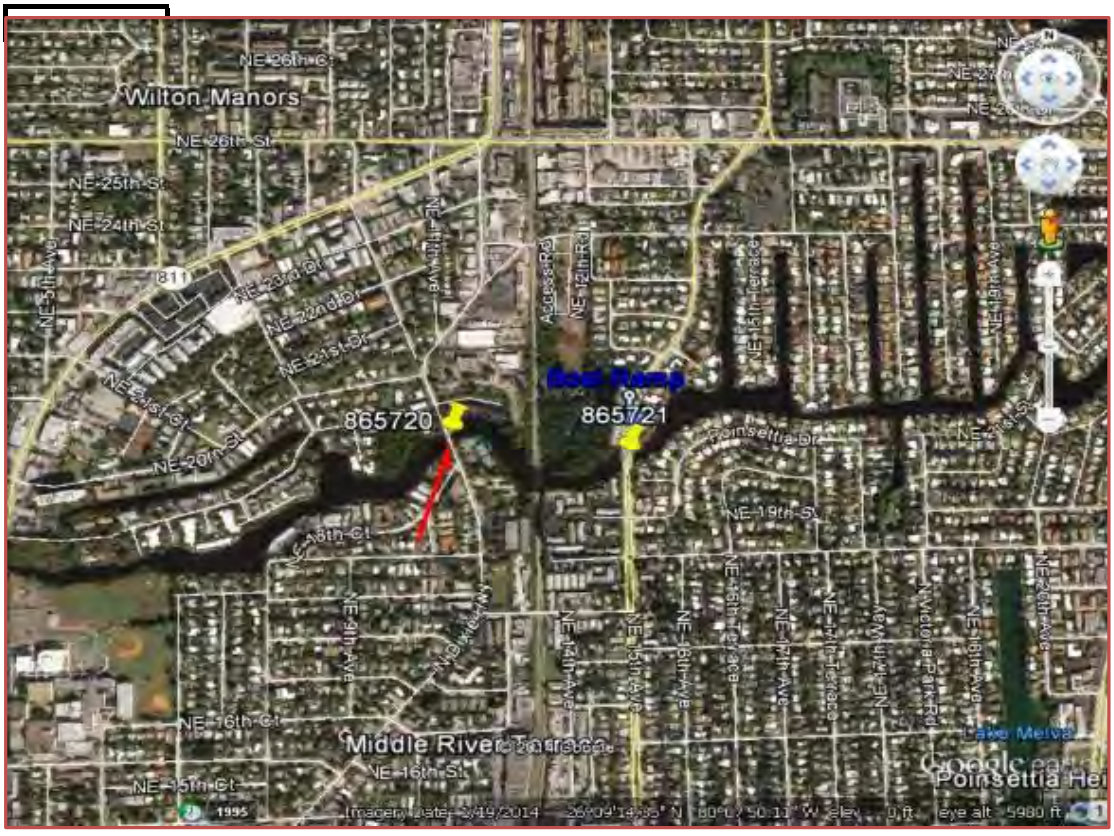
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865720** Date: **27-May-14**

A: LOCATION MAP





Description: 0.3MI SOUTH of NE 26th STREET.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
144 R/Concrete Arch	**25 lf.**

CS-1:
_The arch exhibit scaling up to 1/8" deep intermittent along the high watermark. **UW Photo 01. NEW.**

205 R/Concrete Column	**12 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors during this inspection cycle.
_The Piles are covered heavy marine growth starting 36in. below the caps. Several piles were cleaned at random locations during this inspection cycle.
_Only the load bearing Piles used in the widening section were included in the total quantity. Refer to Element 475 R/Concrete Walls for any comments relating to the wingwall piles.

CS-3: **12**

_Pile 1-1, NW and NE corners have spall/delamination up to 36" x 11" x 2", with associated cracks up to 1/8". Starting at the cap. **INCREASE.**

_Pile 1-2, NW and NE corners have spall/delamination up to 36" x 11" x 2", with exposed rebars up to 60% section loss and associated cracks up to 1/8". Starting at the cap. **UW Photo 02. INCREASE.**

_Pile 1-3, NW and NE corners have delaminations up to 36" x 10", with associated cracks up to 1/8" and corrosion bleed-out, Starting at the cap. **INCREASE.**

_Pile 2-1, all four corners are delaminated up to 40" x 10", with associated cracks up to 1/8", and corrosion bleed-out, Starting at the cap. **UW Photo 03. INCREASE.**

_Pile 2-2, NW, NE and SW corners are delaminated up to 40" x 10", with associated cracks up to 1/8", and corrosion bleed-out, starting at the cap. **INCREASE.**

_Pile 2-3, all four corners are delaminated up to 40" x 10", with associated cracks up to 1/8", and corrosion bleed-out, starting at the cap. **UW Photo 04. INCREASE.**

_Pile 3-1, NW corner has a delamination 28" x 10", with corrosion bleed-out. Also on the East face (3) vertical cracks up to 12" x 1/32". **INCREASE.**

_Pile 3-2, NE and SE corners and West face have spall/delamination up to 30" x 17" x 2", with exposed rebars up to 50% section loss and associated cracks up to 1/8", and corrosion bleed-out, starting at the cap. **UW Photos 05 and 06. INCREASE.**

_Pile 3-3, SW and NE corners have delaminations up to 19" x 5", with corrosion bleed-out. Also the North face has (1) vertical crack 7" x 1/32", Starting at the cap. **INCREASE.**

_Pile 4-1, NW and SW corners have delaminations up to 22" x 6", with associated cracks up to 1/8", and corrosion bleed-out, starting at the cap. **INCREASE.**

_Pile 4-2, SW and SE corners have spall/delamination up to 23" x 9" x 2", with exposed rebar 50% section loss and associated cracks up to 1/16", starting at the cap. **UW Photo 07. INCREASE.**

_Pile 4-3, SW and SE corners have delaminations up to 24" x 10", with corrosion bleed-out, starting at the cap. **INCREASE.**

E: ELEMENT NOTES

220 R/C Sub Pile Cap/Ftg **2 ea.**

Note:
_This Element represents the arch footing. Footer 2 and 3 are 20", below the top of the marine growth.

CS-2: **2**
_There are some minor voids in the bottom edge of Footer 2 that run intermittently along the North face with a maximum height of 14" and a maximum depth of 10". **NO CHANGE.**
_Footer 3 has minor voids that are less severe than those in Footer 2. **NO CHANGE.**

290 Channel **1 ea.**

Note:
_The channel has heavy oyster growth along the channel bottom.

CS-2: **1**
_There are several shopping carts in the West channel under Span 1. **UW Photo 08. NO CHANGE.**

475 R/Concrete Walls **36 lf**

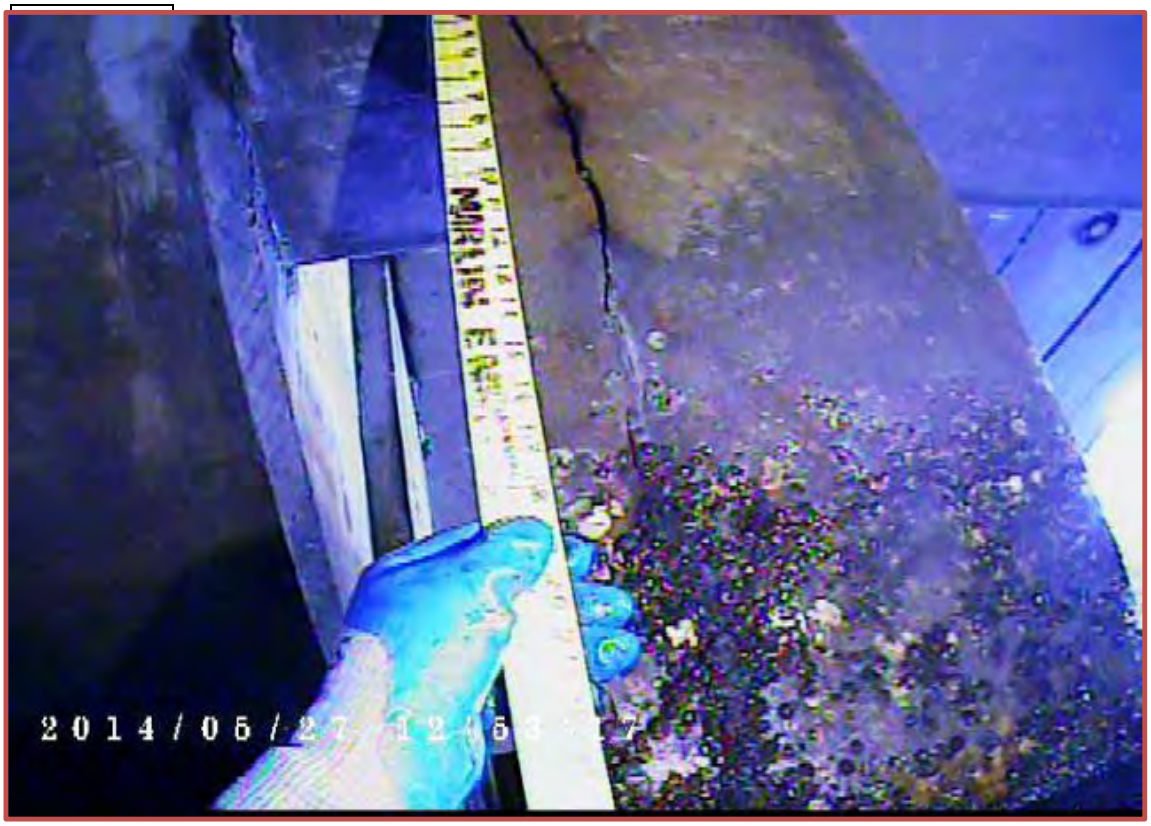
Note:
_Total quantity includes the wingwalls at all four corners including their support Piles.

CS-3:
_Abutment 1 backwall, SW end adjacent to the transition to retaining wall has multiple cracks up to 30" x 1/16", Starting at the cap. **UW Photo 09. NEW.**
_Both Piles on the SW wingwall exhibit delaminations up to 40" x 10", with associated cracks up to 1/8", and corrosion bleed-out, Starting at the cap. **UW Photo 10. INCREASE.**
_Abutment 4 backwall, NW end adjacent to the transition to retaining wall has multiple cracks up to 1/16", and corrosion bleed-out, Starting at the cap**. INCREASE.**
_Pile 1 at the NW wingwall, has a spall/delamination 24" x 12" x 2", with exposed rebar 50% section loss and associated cracks up to 1/32", on the SW corner. Starting at the cap.
UW Photo 11. INCREASE.
_Pile 2 at the NW wingwall, has a delamination 24" x 6", with associated cracks up to 1/32", and corrosion bleed-out, on the SW and SE corners. Starting at the cap. INCREASE.
_The grout in the retaining wall joint to transition backwall at all 4 end is missing. **NO CHANGE.**

F: PHOTO SECTION

Description: Top: Arch exhibits scaling up to 1/8", along the high watermark. **UW Photo 01.**
Bottom: Pile 1-2, NW and NE corners, spall/delamination. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Pile 2-1, all four corners are delaminated, with associated cracks. **UW Photo 03.**
Bottom: Pile 2-3, all four corners are delaminated, with associated cracks. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Pile 3-2, SE corner, spall/delamination, above water. **UW Photo 05.**
Bottom: Pile 3-2, SE corner, spall/delamination, below water. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: Pile 4-2, SW and SE corners, spall/delamination, w/exposed rebar. **UW Photo 07.**
Bottom: Several shopping carts in the West channel under Span 1. **UW Photo 08.**

F: PHOTO SECTION

Description: Top: Abutment 1 backwall, SW transition to retaining wall, multiple cracks. **UW Photo 09.**
Bottom: Piles on the SW wingwall delaminations, with associated cracks. **UW Photo 10.**

F: PHOTO SECTION

Description: Pile 1 at the NW wingwall, has a spall/delamination 24" x 12" x 2", with exposed rebar 50% section loss. **UW Photo 11.**

H: RECOMMENDED REPAIRS

205 R/Concrete Column

_Remove all unsound concrete and patch also seal the cracks as needed on all the Piles.

290 Channel

_Remove the shopping carts on the West side channel.

475 R/Concrete Walls

_Remove all unsound concrete and patch also seal the cracks as needed on all the wingwall Piles.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.3	9.2
2	13.2	11.9
2.5	14.4	14.1
3	11.8	13.6
4	10.0	10.3

Notes: Measurements were taken from the bottom of the concrete rail.
Waterline on the left: 8.8 ft. and right: 9.5 ft. at mid-channel.
Maximum Channel depth: 5.6 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865721 **Bridge Name:** NE 15th Avenue over South Fork Middle River

Topside Inspection Complete: 5/14/2014
Underwater Inspection Complete: 5/19/2014
Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Rego, Alexis – Bridge Inspector/Diver (CBI #409)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 144 ft. long, four span, reinforced concrete tee beam bridge was constructed in and widened using prestressed concrete slab units in 1980. The bridge has a roadway width of 55 ft. and carries two lanes of traffic in a residential neighborhood. The bridge has 4.7 ft. and 4.8 ft. sidewalks on the west and east sides, respectively. The bridge is not classified as Functionally Obsolete or Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting. The details of the load rating were not available, so it is unclear whether the tee beams or slab units control the rating.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced in the below text, are included as an Addendum.

DECK

The deck is the portion of the bridge above the concrete slabs and beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to ½ in. wide transverse cracks over the joint seals with vegetation. This condition has increased in severity. See Condition Photo 1.
- The asphalt overlay has longitudinal cracks up to structure length x ½ in. wide over the slab unit joints. See Condition Photo 2.
- There is a light accumulation of dirt and debris in the shoulder areas. This condition was not previously noted. See Condition Photo 3.

Railings/Barriers

- No deficiencies were noted.

Expansion Joints

- The sidewalk joints are heavily deteriorated. See Condition Photo 4.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units and tee beams; secondary members, bearings, joints, etc., are not included in this rating. See Tables 2 and 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a) Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b) An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c) Loss of prestress force to the extent that calculations show that repair cannot be made. d) Excessive vertical misalignment. e) Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- There is up to 4 in. diameter minor edge spalling in the underside of the slab units at the weep holes. See Condition Photo 5.
- Slab 1-4 exhibits a 9 in. x 6 in. x ½ in. spall. This condition was not previously noted. See Condition Photo 6.

Reinforced Concrete T-Beams

- There is graffiti painted on the beams in Span 1 and 3. The graffiti is only visible from under the structure. This condition was not previously noted. See Condition Photo 7.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a 1 ft. 6 in. x 1 ft. x 2 in. spall under Slab Unit 1-5.
- Abutment 5 cap has a 2 ft. x 10 in. x 3 in. spall under Slab Unit 4-6.

Piles

Bents 2, 3, and 4 consist of four original reinforced concrete piles and three prestressed concrete piles on either side that were installed when the bridge was widened.

- There are edge scrapes up to 6 in. x 5 in. x ½ in. on many of the piles
- Several reinforced concrete piles have cracks with corrosion stains, spalls with exposed rebar and/or delaminations:

Pile	Photo	Location	Deficiency
2-4	UW02	NE corner	3 ft. x 3 in. x 2 in. spall/delamination with exposed rebar - INCREASE
2-4	None	South, West and East faces	Cracks up to 1/8 in. wide with corrosion bleedout
2-5	8	NW and NE corners	2 ft. 6 in. x 10 in. delamination with corrosion staining - INCREASE
2-6	None	NW corner	8 in. x 5 in. delamination
2-7	None	West, East and South faces	2 ft. 6 in. x 1 ft. 6 in. x 2½ in. spall/delamination with exposed rebar
2-7	9	North face	4 vertical cracks with corrosion staining 2 ft. 9 in. long x 1/16 in. wide
3-3	10	North and East faces	Cracks and delaminations up to 2 ft. 4 in. x 8 in.
3-4	UW04	SE corner	2 ft. 4 in. x 11 in. x 2 in. spall/delamination with exposed rebar
3-4	None	SW and NE corners	2 ft. 4 in. x 6 in. delamination with corrosion staining
3-5	None	SW corner	2 ft. 10 in. x 7 in. delamination with corrosion staining - INCREASE
3-5	None	NW corner and East face	Vertical cracks up to 2 ft. 4 in. long x 1/16 in. wide with corrosion staining
3-6	11	SW and SE corners	Spall/delaminations up to 3 ft. 3 in. x 8 in. x 3 in. with exposed steel
3-6	UW05 UW06	SW corner	3 ft. 10 in. x 8 in. x 2 in. spall with exposed steel with section loss
3-7	12	NW and SW corners	2 ft. 5 in. x 1 ft. 6 in. delaminations with corrosion staining
4-4	None	SW and SE corners	2 ft. x 5 in. delaminations with corrosion staining
4-4	UW07	NE corner	2 ft. x 8 in. x 3 in. spall/delamination with exposed steel. This condition was not previously noted.
4-5	None	All 4 faces	Delaminations up to 20 in. long with associated cracks up to 1/16 in. wide with corrosion staining
4-6	13	SE and SW corners	2 ft. 6 in. x 9 in. x 2 in. spall with exposed steel with section loss. This condition was not previously noted.
4-7	None	All 4 faces	Delaminations up to 2 ft. long with associated cracks up to 1/32 in. wide with corrosion staining - INCREASE

Reinforced Concrete Caps

- The caps have up to 10 in. long x less than $^{1}/_{64}$ in. wide vertical cracks, some with efflorescence.
- Bent 3 cap has a 1 ft. 8 in. x 1 ft. x 1 in. spall in the south face at the west widening joint. See Condition Photo 14.
- The south face of Bent 4 cap has a 1 ft. long x $^{1}/_{32}$ in. wide vertical crack, 9 in. west of Beam 3-2.
- There is vegetation is growing on the west end of Bent 2 and Bent 3 caps. See Condition Photo 15.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 5 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 5 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Reinforced Concrete Approach Slab

- Both approach slab/approach roadway transitions have 36 ft. x $^{1}/_{8}$ in. wide transverse cracks. See Condition Photo 16.
- There are tree roots growing between the southeast approach sidewalk and the adjacent curb that have begun to displace portions of the sidewalk, creating a tripping hazard. See Condition Photo 17.
- The base of the southwest approach concrete barrier exhibits 5 up to 4 in. diameter x ¾ in. deep spalls. This condition was not previously noted. See Condition Photo 18.

Reinforced Concrete Wingwalls

- The west face of the southwest wingwall adjacent to End Bent 1 exhibits graffiti. This condition was not previously noted. See Condition Photo 19.

Guardrails

- In general, the guardrail cushion blocks at the northeast and northwest quadrants are heavily deteriorated.
- The 1st guardrail cushion block at the southwest corner and the 2nd, 18th and 19th at the northwest corner are missing. See Condition Photo 20.
- The northwest corner bridge guardrail exhibits impact damage 3ft. north of the approach barrier. This condition was not previously noted. See Condition Photo 21.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete piles from the original portion of the bridge in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The reinforced concrete T-beams and prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition. The bridge is not posted for load.

GEOMETRIC DEFICIENCIES

There are no apparent geometric deficiencies.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge via Old Dixie Highway to the west or via Federal Highway to the east.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Maintenance of Traffic: The bridge average daily traffic is about 14,000 vehicles per day, and the road is posted for 35 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for pile jackets or concrete repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in fair to good condition and is expected to require work to the piles and concrete elements in the next 20 years to ensure they will last the next 20 years without interruption to service.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The vegetation growing from the west ends of the Bents 2 and 3 caps should be cut and the roots treated with an herbicide to kill them in order to avoid deterioration to the fascia beams and cap in the long term. Also, tree roots that are causing the uneven sidewalk at the

southeast approach sidewalk should be cut and the concrete panel replaced to eliminate the tripping hazard. It is assumed that these actions can be completed by City forces, so no cost has been provided.

LONG TERM

The reinforced concrete piles have spalls, delaminations and cracks with corrosion staining and/or exposed corroded reinforcing steel. It is anticipated that the piles will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

The reinforced concrete portions of the bridge – beams, abutments, caps – are likely to require some repairs, which can be done using conventional concrete repair methods.

For all concrete work, surface preparation, to both the sound concrete left in place after loose material is removed and to the exposed reinforcing steel, are key to providing long lasting repairs.

Long Term Recommendation(s): **Install pile jackets.** **Make concrete repairs.**			Cost
Design [1]			$ 40,000.00
Construction			$ 73,000.00
Bridge Construction [2]	$	63,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 14,600.00
Contingency [5]			$ 14,600.00
		TOTAL COST	$ 142,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.
(2) Jackets: $4,000 per pile (12 piles total); Concrete repairs: $15,000.
(3) Daily closures for equipment and material access. Work done from water, under traffic.
(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.
(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

West Elevation

GENERAL PHOTOS OF BRIDGE

North Approach Looking South

North Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

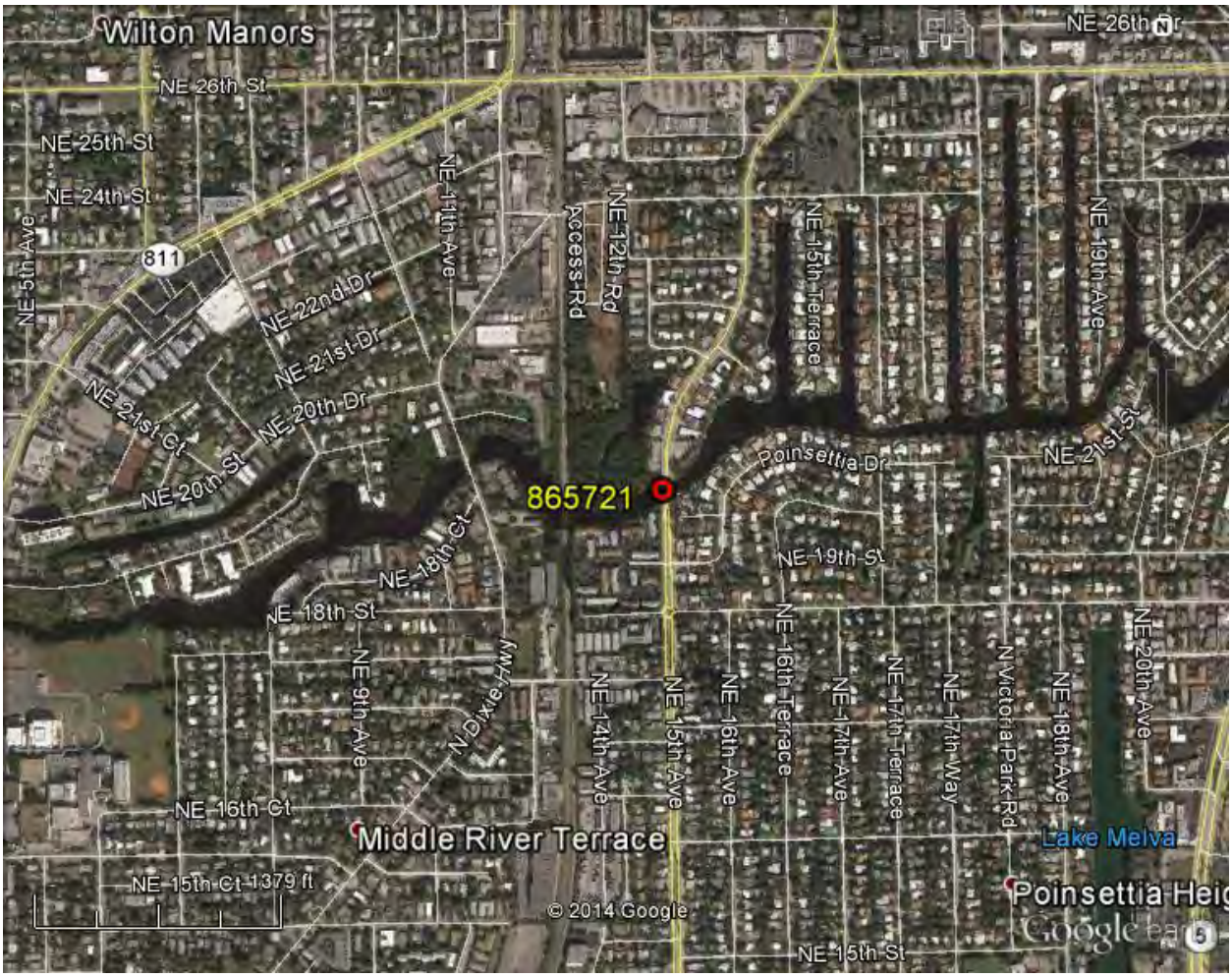
Typical Bridge Railing

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Transverse crack in asphalt over joint at Abutment 2.

Photo 2 – Longitudinal cracks in asphalt over joints between slab units.

CONDITION PHOTOS

Photo 3 – Dirt and Debris in shoulder area.

Photo 4 – Sidewalk joint over Bent 2.

CONDITION PHOTOS

Photo 5 – Spalls near vent holes in Slab 1-2.

Photo 6 – Slab 1-4 exhibits a spall adjacent to slab 1-3.

CONDITION PHOTOS

Photo 7 – Span 3 concrete beams exhibit graffiti.

Photo 8 – Delamination at the northwest corner of Pile 2-5.

CONDITION PHOTOS

Photo 9 – The north face of Pile 2-7 exhibits vertical cracks.

Photo 10 – Cracks and delaminations in the north face of Pile 3-3.

CONDITION PHOTOS

Photo 11 – Spall/delamination with exposed steel at the southwest corner of Pile 3-6.

Photo 12 – The southeast corner of Pile 3-7 exhibits a delamination.

CONDITION PHOTOS

Photo 13 – The southeast corner of Pile 4-6 exhibits a spall with exposed steel.

Photo 14 – The south face of Bent 2 cap exhibits a spall.

CONDITION PHOTOS

Photo 15 – Vegetation at Bent Caps 2 and 3.

Photo 16 – The south approach roadway exhibits a transverse crack.

CONDITION PHOTOS

Photo 17 – Southeast sidewalk concrete panel.

Photo 18 – Southwest approach concrete barrier spalls.

CONDITION PHOTOS

Photo 19 – Graffiti at the west face of the southwest wingwall.

Photo 20 – Southwest guardrail cushion block missing.

CONDITION PHOTOS

Photo 21 – Northwest guardrail impact damage.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865721** Date: **19-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865721 UW Inspection Date: 5/19/2014

Bridge Name: N/A

Road Name/Number: NE 15th AVE.

Feature Intersected: SOUTH FORK MIDDLE RIVER.

Location: 0.1MI NORTH of NORTHEAST 18th STREET.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	8 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		205 R/Concrete Column
Water Temp.:	81°		290 Channel
Weather:	82° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

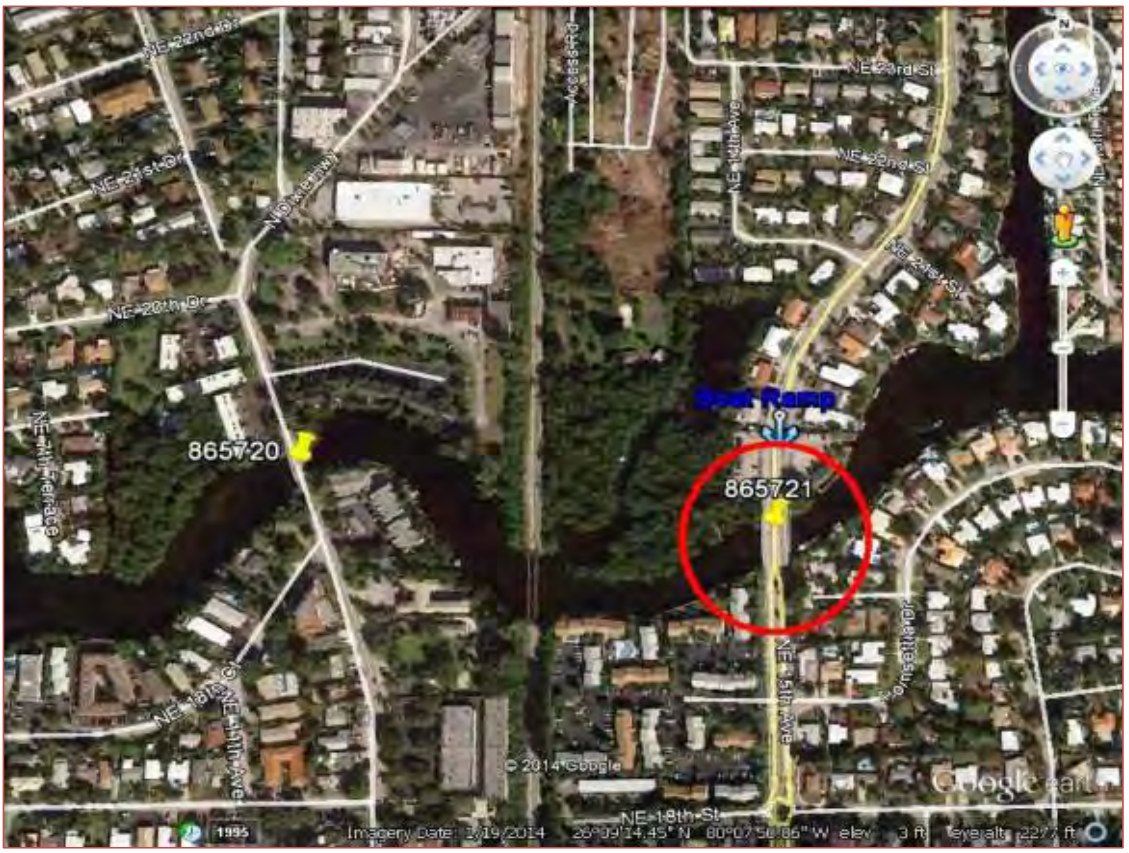
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead.	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Rego, Alexis - Bridge Insepector / Diver (CBI # 409).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

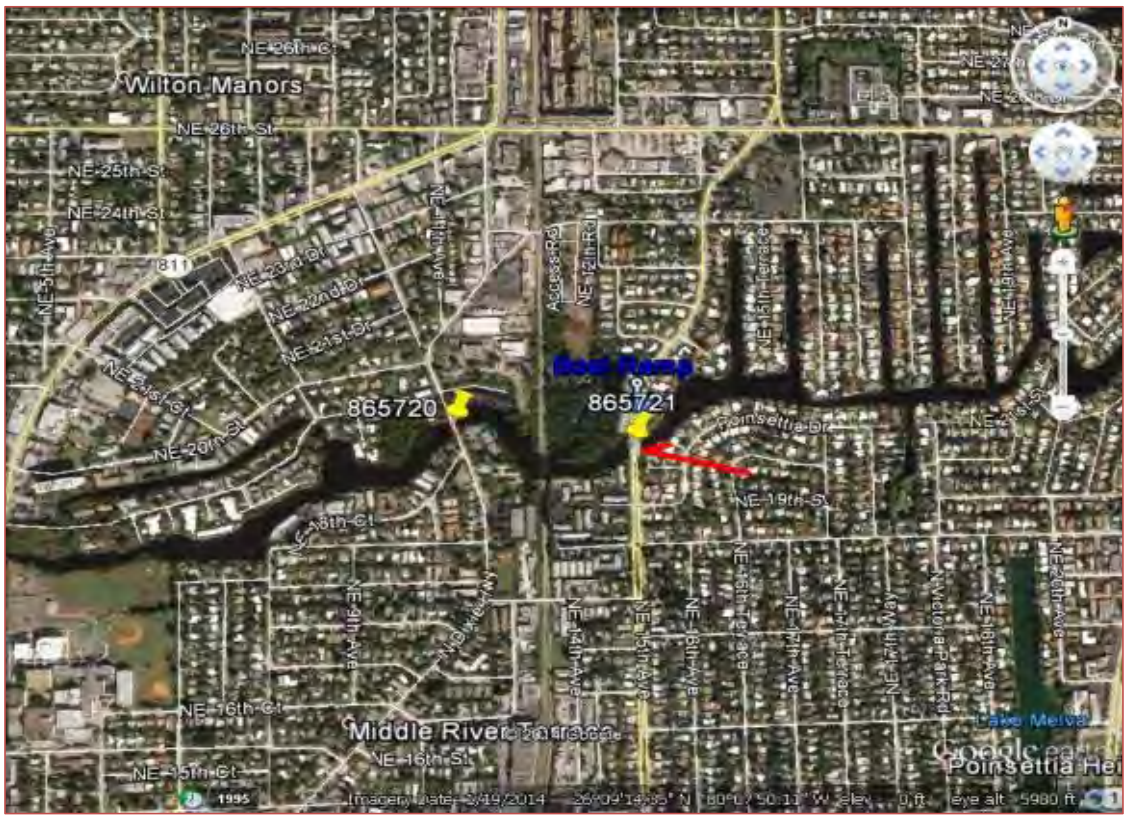
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/22/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865721** Date: **19-May-14**

A: LOCATION MAP





Description: 0.1 MI NORTH of NORTHEAST 18th STREET.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**18 ea.**

Notes:
_This Element represents Piles 1, 2, 3, 8, 9 and 10 in the widened sections at Bents 2, 3 and 4.
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 24" below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **1**
_Pile 3-3, North and East faces have delaminations up to 28" x 8", with associated cracks up to 1/16" wide, starting at the cap. **UW Photo 01. NO CHANGE.**

CS-1: **17**
_There are edge scrapes up to 6" x 5" x 1", on many of the Piles. **NO CHANGE.**
_Pile 4-2, North face has (1) vertical crack 20" x 1/32", starting at the pick up point. **NEW.**

205 R/Concrete Column	**12 ea.**

Note:
_This Element represents Piles 4 through 7 at Bent 2 through 4, which are the original reinforced concrete piles.
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 30" below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **9**
_Pile 2-4, NE corner has a spall/delamination 36" x 3" x 2", with (1) exposed rebar and associated cracks up to 1/16", **UW Photo 02. INCREASE.** Also on the South, West and East face have cracks up to 1/8" wide with corrosion bleed-out, starting at the cap.
_Pile 2-5, NE, NW and SW corners have delamination up to 30" x 10", starting at the cap. **UW Photo 03. INCREASE.**
_Pile 2-6, NW corner has a delamination 8" x 5", starting at the cap. **NEW.**
_Pile 2-7, SW corner and West face has a spall/delamination 30" x 18" x 2-1/2", with (1) exposed rebar. **INCREASE.** Also North face has (2) vertical cracks up to 33" x 1/16". **NO CHANGE.**
_Pile 3-4, SE corner has a spall/delamination 28" x 11" x 2", with (1) exposed rebar. **UW Photo 04. INCREASE.** Also the SW and NE corners have delaminations up to 28" x 6", with corrosion bleed-out, starting at the cap. **NEW.**
_Pile 3-5, SW corner has a delamination 34" x 7", also on the East face and NW corner have vertical cracks up to 28" x 1/16", with corrosion bleed-out. **INCREASE.**
_Pile 3-7, NW and SW corners have delamination up to 28" x 18", with corrosion bleed-out, starting at the cap. **NO CHANGE.**
_Pile 4-5, all faces delaminations up to 20" long with associated cracks up to 1/16" wide, with corrosion bleed-out, starting at the cap. **INCREASE.**

E: ELEMENT NOTES

205 R/Concrete Column (Continuation)

CS-3:

_Pile 4-7, all face have delaminations up to 24" long with associated cracks up to 1/32" wide, with corrosion bleed-out, starting at the cap. **INCREASE.**

CS-4: **3**

_Pile 3-6, SW corner has a spall 46" x 8" x 2", with (1) exposed rebar 75% section loss, starting at the cap. **UW Photos 05 and 06. NEW.**

_Pile 4-4, SW and SE corners have delamination up to 29" x 9", with corrosion bleed-out, also on the NE corner has a spall/delamination 26" x 8" x 3", with (1) exposed rebar 50% section loss associated cracks up to 1/64". **UW Photo 07. NEW.**

_Pile 4-6, SE corner has a spall 30" x 9" x 2", with (1) exposed rebar 50% section loss, starting the cap. **UW Photo 08. INCREASE.** North and West faces have (2) vertical cracks up to 24" x 1/64", with corrosion bleed-out, starting at the cap. **NEW.**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

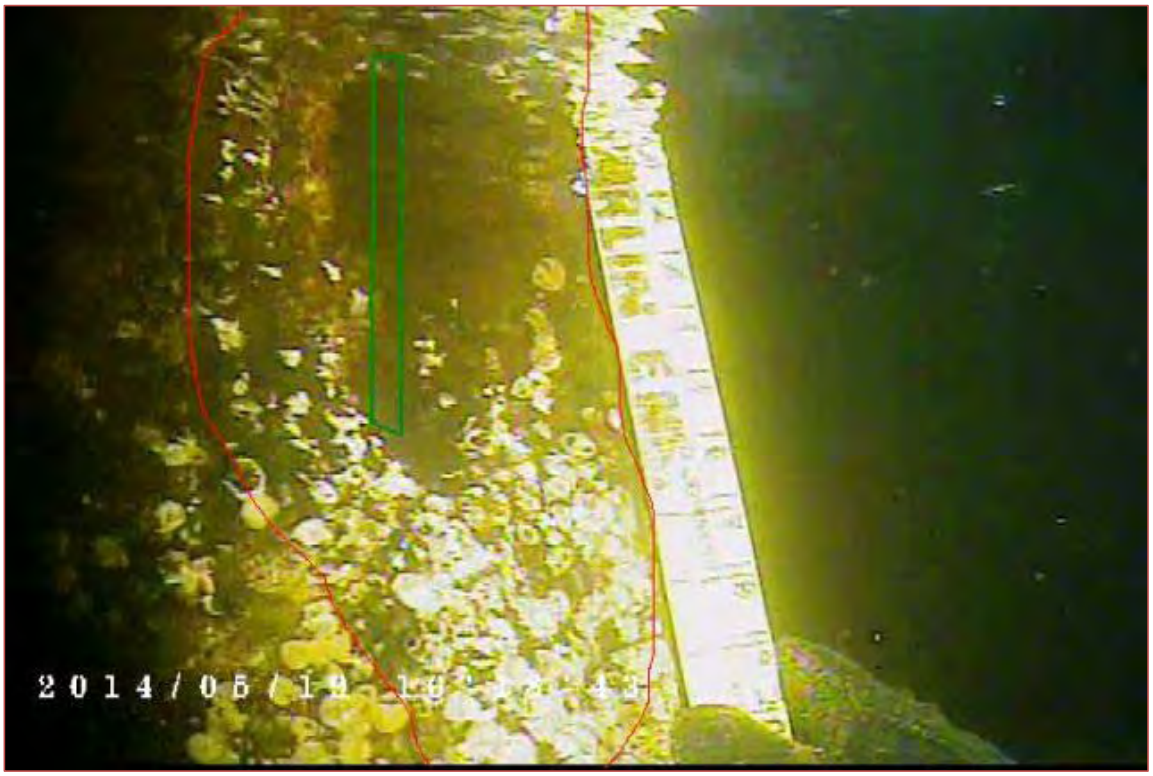
F: PHOTO SECTION

Description: Top: Pile 3-3, North and East faces, delamination with associated cracks. **UW Photo 01.**
Bottom: Pile 2-4, NE corner, spall/delamination, (1) exposed rebar. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Pile 2-5, NE, NW and SW corners delaminations. **UW Photo 03.**
Bottom: Pile 3-4, SE corner, spall/delamination with (1) exposed rebar. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Pile 3-6, SW corner has a spall with (1) exposed rebar. **UW Photo 05.**
Bottom: Pile 3-6, SW corner spall, (1) exposed rebar underwater. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: Pile 4-4, NE corner, spall/delamination with (1) exposed rebar. **UW Photo 07.**
Bottom: Pile 4-6, SE corner has a spall with (1) exposed rebar. **UW Photo 08.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch and epoxy inject all the cracks on Pile 3-3.

205 R/Concrete Column

_Remove all unsound concrete and patch. Also epoxy inject all the cracks at the following Piles: 2-4, 2-5, 2-6, 2-7, 3-4, 3-5, 3-6, 3-7, 4-2, 4-4, 4-5, 4-6 and 4-7.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.0	6.5
2	16.9	16.8
3	17.1	20.5
3.5	17.6	19.3
4	16.3	17.0
5	11.4	13.1

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 11.1 ft. and right: 11.3 ft. at mid-channel.
Maximum Channel depth: 8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865727 **Bridge Name:** NE 1st Street over Stranahan Lake

Topside Inspection Complete: 5/07/2014

Underwater Inspection Complete: 5/07/2014

Report Date: 6/16/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville – Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER
6/16/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 44 ft. long, two span, steel multi-girder beam bridge constructed in 1940. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. The bridge is not classified as either Functionally Obsolete or Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for single unit (SU) vehicles at 34 tons. The steel beams control the rating, but it is unclear what deterioration was accounted for in the analysis, if any.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the deck is a steel open grid. Per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of joints, expansion devices, curbs, sidewalks, parapets, fascias, and bridge rail shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR STEEL DECKS

CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - The steel deck is tightly secured to floor system and showing no corrosion.
7	GOOD - Some connections with minor corrosion. A few cracked welds and/or broken grids.
6	SATISFACTORY - Considerable corrosion with indications of initial section loss. Loose at many locations. Some cracked welds and/or broken grids.
5	FAIR - Heavy corrosion with areas of section loss. Loose at numerous locations. Numerous cracked welds and/or broken grids.
4	POOR - Heavy corrosion resulting in considerable section loss and some holes through deck. Majority of welds cracked and/or grids broken.
3	SERIOUS - This rating will apply if severe or critical signs of structural distress are visible.
2	CRITICAL - Many small holes due to corrosion through the deck.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Open Steel Grid Deck

- The grating has light to moderate surface corrosion throughout.
- At Span 1, two of the secondary bars are bent in the westbound lane between Beams 1-2 and 1-3 within 2 feet of Abutment 1.
- In Span 2, there are two broken/missing secondary transverse bars and one bent longitudinal bar over Beam 2-4 at mid-span. See Condition Photo 1.

- There are two bent transverse bars in Span 2 at Bent 2 near Beam 2-3.
- The right sidewalk in Span 1 has a 10 in. x 6 in. x ½ in. spall/delamination with exposed decking bars along the south edge, 5 ft. from Abutment 1.
- The right sidewalk has a 6 ft. x 6 in. x ½ in. spall/delamination with exposed decking bars along the south edge over Bent 2.
- The right sidewalk also has map cracking up to 1/32 in. wide.
- The underside of the right sidewalk has exposed transverse bars with moderate surface corrosion.

Railings/Barriers

- Both handrails have light surface corrosion at the base of some posts, at some handrail connection points and at both abutments.

Expansion Joints

- No expansion joints are present. A section of the steel grid deck is filled with concrete over Bent 2.

Utilities

- There is a 6 in. diameter ductile iron pipe and a 2 in. diameter galvanized utility pipe supported underneath the deck in Bay 1 of both spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT - no noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - No visible corrosion.
7	GOOD - Minor surface rust without any section loss.
6	SATISFACTORY - Rusting evident but with no initial section loss (minor pitting, scaling, or flaking) in critical areas.
5	FAIR - Initial section loss in critical stress areas. Fatigue or out-of-plane distortion cracks may be present in non- critical area. Hinges may be showing significant corrosion problems.
4	POOR - Significant section loss in critical stress area. Fatigue or out-of-plane distortion cracks may be present in major structural elements. Hinges may be frozen from corrosion. Load carrying capacity of structural members affected.
3	SERIOUS - Severe section loss or cracking in critical stress areas. Significant weakening of primary members evident.
2	CRITICAL - Severe section loss in many areas with holes rusted through at numerous locations. Bridge closure or close monitoring is required.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is - Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Beams

- The beams have heavy corrosion and 1/8 in. deep pitting in the bottom face of the bottom flanges at the bearing areas, mainly in Span 2.
- The end 4 in. of Beam 1-6 over Bent 2 is knife-edged with a 2 in. wide area of 0% remaining section in the bottom right flange.

- Beam 1-7 has corrosion with section loss (80% remaining section) in the bottom flange at Abutment 1.
- Beam 1-8 has corrosion with section loss in the bottom flange with a 5 in. long x 2 in. wide area of 0% section remaining in the left edge over Bent 2.
- Exterior Beams 1 and 8 have areas of corrosion along the bottom face of the bottom flange. See Condition Photo 2.
- Beam 2-1 has areas of corrosion with section loss (80% remaining section) in the bottom flange over Bent 2 and Abutment 3. See Condition Photo 3.
- Beam 2-2 has corrosion with section loss (90% remaining section) in the bottom flange over Bent 2.
- Beams 2-6 and 2-8 have a 5 in. long x 1 in. wide area of 0% section remaining in the bottom flange over Bent 2.
- Several beams have pack rust at the beam/bearing interface over the abutments.
- There is pack rust at the lateral bracing connections to the beams.

Bearings

- The fixed bearings have moderate to heavy corrosion. See Condition Photo 4.
- The shim plate under Beam 1-3 over Bent 2 is loose and can be removed easily. See Condition Photo 5.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE	
CODE	**DESCRIPTION**
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 has intermittent undermining the entire length up to 2 in. high, and 3 ft. 4 in. penetration. No backfill loss was observed during this inspection cycle.
- Abutment 3 has intermittent undermining the entire length with a maximum height of 8 in. and maximum penetration of 9 in.; no backfill leakage was observed.
- Abutment 3 cap has a 5 in. x 5 in. x 1 in. spall below Beam 2-1.
- The joints are open up to 1 in. No backfill leakage was noted this inspection.
- There is graffiti on Abutment 3.

Intermediate Bent

- Bent 2 cap has a 1 ft. 4 in. x 8 in. x 1 in. spall in the east face below Beam 2-1.
- Bent 2 cap has vertical/diagonal cracks up to 1/64 in. wide in isolated areas, primarily over the columns.
- The east face of Bent 2 cap has a full cap height (4 ft.) x 1/64 in. wide vertical crack which extends 2 ft. into the east face of Pile 2-2.
- There is a full cap height (4 ft.) x 1/64 in. wide vertical crack in the Bent 2 cap over Pile 2-3 that is reflective in both faces of the cap.
- The piles are jacketed to approximately 9 ft. below the cap and exposed a maximum of 3 ft. The bottom 4 in. of the jackets are irregular.
- All jackets have vertical and horizontal cracks up to $^{1}/_{64}$ in. wide.
- The cracks in the jackets generally extend up to 1 ft. 4 in. below the marine growth.
- The east face of Jacket 2-1 has a 2 ft. long x $^{1}/_{64}$ in. wide vertical crack which intersects with a crack in the east face of Pier 2 cap. The north face has a 6 in. x 8 in. x 2¾ in. washout in the north face, 5 ft. 3 in. below the cap. See Underwater Inspection Report Photo 1.
- Jacket 2-2, SW corner has a spall/delamination 3 ft. 8 in. x 10 in. x 1-1/2 in., with associated cracks up to 1/8 in. wide, with corrosion bleed-out, all faces, starting at the cap. See Underwater Inspection Report Photo 2.
- Jacket 2-3 NE corner has a spall/delamination 4 ft. x 1 ft. 6 in. x 4 in., with exposed steel up to 75% section loss. Also all faces are delaminated starting at the cap, with associated cracks up to ¼ in. wide and corrosion staining. See Condition Photo 6 and Underwater Inspection Report Photo 3.
- Jacket 2-3 has a 10 in. x 4 in. x 1½ in. void in the west face, 5 ft. below the cap.

Wingwalls

- The southwest wingwall is undermined at the angle break up to 3 ft. x 8 in. x up to 4 ft. of penetration. No backfill loss was observed during this inspection cycle.
- The northeast wingwall has a full length x $^{1}/_{8}$ in. wide horizontal crack, 2 ft. below the top of the wall with a ½" wide outward shift. See Condition Photo 7.
- The northwest wingwall cap has a 10 ft. x 12 in. x 8 in. spall/delamination at the west end.
- There is a 3 ft. diameter area of honeycombing with exposed rebar in the southwest wingwall.
- There is graffiti on the southwest wingwall.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD - Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions observed. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- Abutment 1 has intermittent undermining the entire length up to 2 in. high with 40 in. penetration. No backfill loss was observed. See Underwater Inspection Report Photo 4.

- Abutment 3 has intermittent undermining the entire length up to 8 in. high with 9 in. penetration. No backfill loss was observed.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Roadway

- The southeast approach sidewalk has a 6 ft. 6 in. x 3 ft. 11 in. x 9 in. area that is undermined.
- The southeast approach sidewalk and curb have up to a $^{1}/_{32}$ in. wide diagonal crack , 2 ft. from Abutment 3 and a $^{1}/_{32}$ in. wide transverse crack with a 6 ft. 6 in. x 9 in. area of settlement , 10 ft. from Abutment 3.
- The southwest, northeast and northwest shoulders have heavy vegetation growth.
- The west and east approach roadways have up to 10 ft. long x $^{1}/_{8}$ in. wide transverse and horizontal cracks in the asphalt.
- The west approach roadway/bridge deck transition has a 12 in. x 3 in. x full depth void at Abutment 1 over Bay 1-1. See Condition Photo 8.
- The northwest approach shoulder has an area of erosion up to 8 ft. x 3 ft. x 2 ft.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair condition based on National Bridge Inspection Standards and FDOT guidelines. The bridge beams have areas of corrosion and some losses that may affect the load capacity of the bridge. The abutments do not have significant deterioration, but the intermediate pier piles have been jacketed in the past; those jackets have delaminations and related deterioration.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

The bridge is posted for one of the three Florida legal load types, but the rating is within 1 ton of not being posted. The load rating details were not available for review, but the latest rating was done in 1995 and it is unclear whether it incorporates deterioration noted on the steel beams in 2014. The impact of current losses on the beams on the load rating of the bridge should be determined to determine the course of action for the superstructure. It is possible to add supplemental steel to strengthen the beams if needed.

Because the bridge is more than 70 years old, it is likely that the concrete elements are contaminated with chlorides and significant deterioration requiring repair will occur in the next 5-10 years. Once repairs are required, repairs at five year intervals are likely to be needed for those elements.

The paint on the steel is in fair condition and will likely require re-coating in the next 5-10 years. Provided the section losses on the steel at the time of recoating do not have a significant impact on the load posting of the structure, painting the steel will extend its life 10-15 years. When steel work is being considered, an analysis should be done to determine whether strengthening of the steel beams should be done to improve load carrying capacity.

Consideration should also be given to replacing the grid deck with a solid concrete deck; however, that work will require replacement of the beams and increase the depth of superstructure. This would require work to the approaches to provide adequate transitions to the bridge and require that runoff be accounted for during design. There may also be environmental issues associated with seagrasses in the vicinity, if other conditions are appropriate to promote their existence at this location. At that time, the railings should be upgraded to meet current design requirements.

GEOMETRIC DEFICIENCIES

The bridge not classified as functionally obsolete and it appears that the roadway width is adequate. No sidewalks are present, but the bridge appears to be serving local residents adequately.

The existing bridge railings are substandard when compared to current criteria, including railing height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences on the island. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Repairs to the concrete jackets will require care be taken to ensure proper preparation of the substrate and exposed steel once delaminated concrete has been removed. Depending up on the extent of chloride penetration into the concrete, it may be reasonable to install a cathodic protection system to protect the intermediate bent piles and cap.

Bridge-Mounted Utilities: There are utilities between the two northernmost beams. Any rehabilitation or new construction activities will need to address temporary support or relocation of the utilities. Bridge construction could be done to the southern portion first, so that the existing bridge would provide support for the existing utility lines while new lines were constructed on the south side, with the northern portion of the bridge constructed after utility service is cut over to those new lines.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 24 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. Maintaining a space for pedestrians to cross will make it likely that only a single lane would be available for two way traffic. Temporary traffic signals could be used to control single lane, two traffic use of the bridge, or, since the bridge has only local traffic, it may be possible to post signs indicating a one lane bridge.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge is currently 74 years old. Given the age of the structure and the likelihood that the concrete elements are saturated with chlorides, it is expected that the concrete substructure elements will require increasing repairs in the coming years, with piles requiring jackets and the abutments and the wingwalls/bulkheads requiring spall repairs. The steel elements are likely to require painting and some local repairs.

It is recommended that the bridge be programmed for replacement 11-15 years from now. Because of this recommendation, it is anticipated that no work should be done in the short term to address current deficiencies. However, as biennial inspection reports are provided to the City by the Florida DOT, the need for short term work should be reevaluated by City engineers.

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No work is recommended in the short term, as the bridge has been recommended for replacement 11-15 years from now.

LONG TERM

Replacement of the bridge is recommended 11-15 years from now based on the existing condition and our experience with similar bridges.

No detour route is available, as the bridge is the only means of access for the island to which it provides access. Utility service can be maintained throughout construction by constructing the portion of the bridge where the utilities are not present, then cutting service to new utility lines mounted on that new portion prior to demolishing and reconstructing the rest of the bridge.

The new bridge is anticipated to be the same size as the existing bridge and should include railings that meet current design standards. The cost to replace the bridge has been estimated based on bid tabulations provided by the City for past replacement projects and is based on 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes.

Long Term Recommendation(s): **Replace bridge.**		Cost
Design [1]		$ 81,000.00
Construction		$ 540,000.00
Bridge Construction [2]	$ 438,750.00	
Maintenance of Traffic [3]	$ 33,750.00	
Utilities [4]	$ 67,500.00	
Construction Inspection and Administration [5]		$ 108,000.00
Contingency [6]		$ 108,000.00
	TOTAL COST	$ 837,000.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

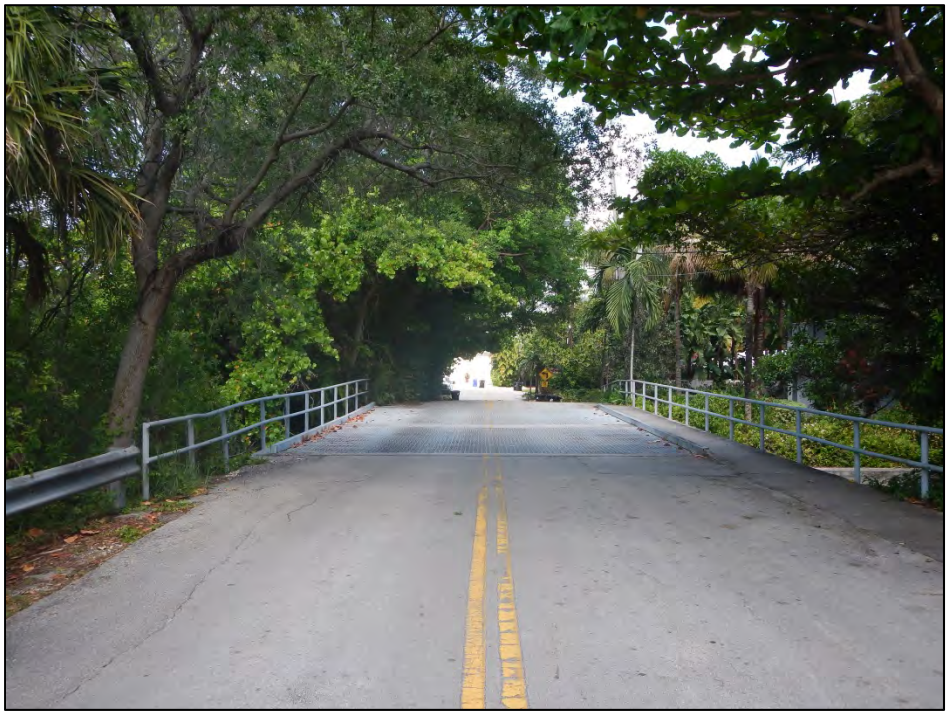
(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation



West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

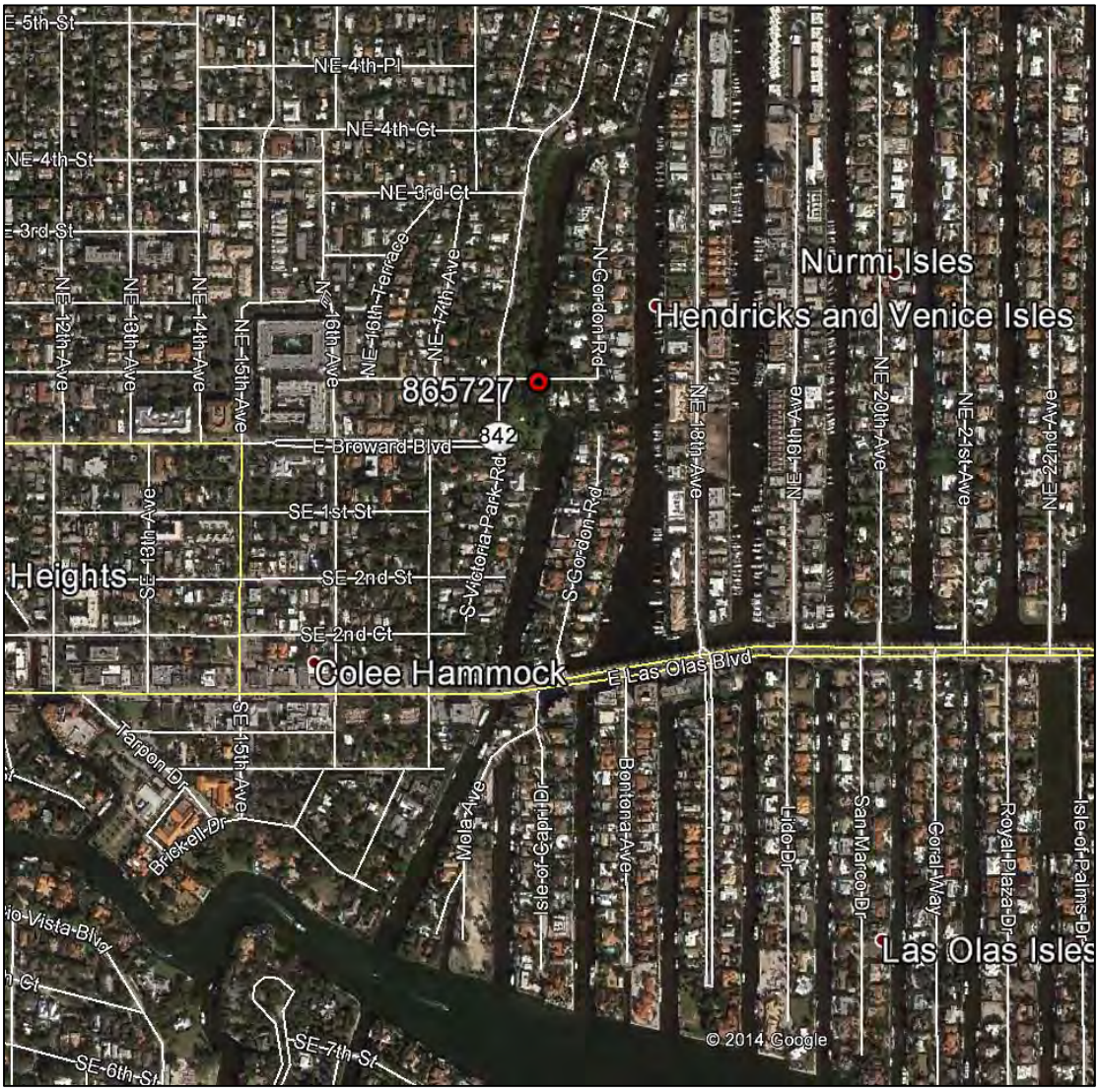
Channel Looking South

GENERAL PHOTOS OF BRIDGE

Channel Looking North

Open Steel Grid Deck

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Damaged and corroded open grid deck.

Photo 2 – Corrosion with section loss in Beam 1-8 at Abutment 1.

CONDITION PHOTOS

Photo 3 – Section loss on Beam 2-1. Note spall in Bent 2 cap.

Photo 4 – Typical corrosion on end bent bearings.

CONDITION PHOTOS

Photo 5 – Loose shim plate at Beam 1-3.

Photo 6 – Spall in Pile Jacket 2-3 with exposed steel.

CONDITION PHOTOS

Photo 7 – Crack in NE wingwall.

Photo 8 – Full depth void in the west approach roadway/bridge deck transition.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865727** Date: **07-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865727 UW Inspection Date: 5/7/2014

Bridge Name: N/A

Road Name/Number: NE 1st Street.

Feature Intersected: STRANAHAN LAKE.

Location: 200 ft East of VICTORIA PK RD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.4 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Concrete Column
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	82°		215 R/Concrete Abutment
Weather:	86° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

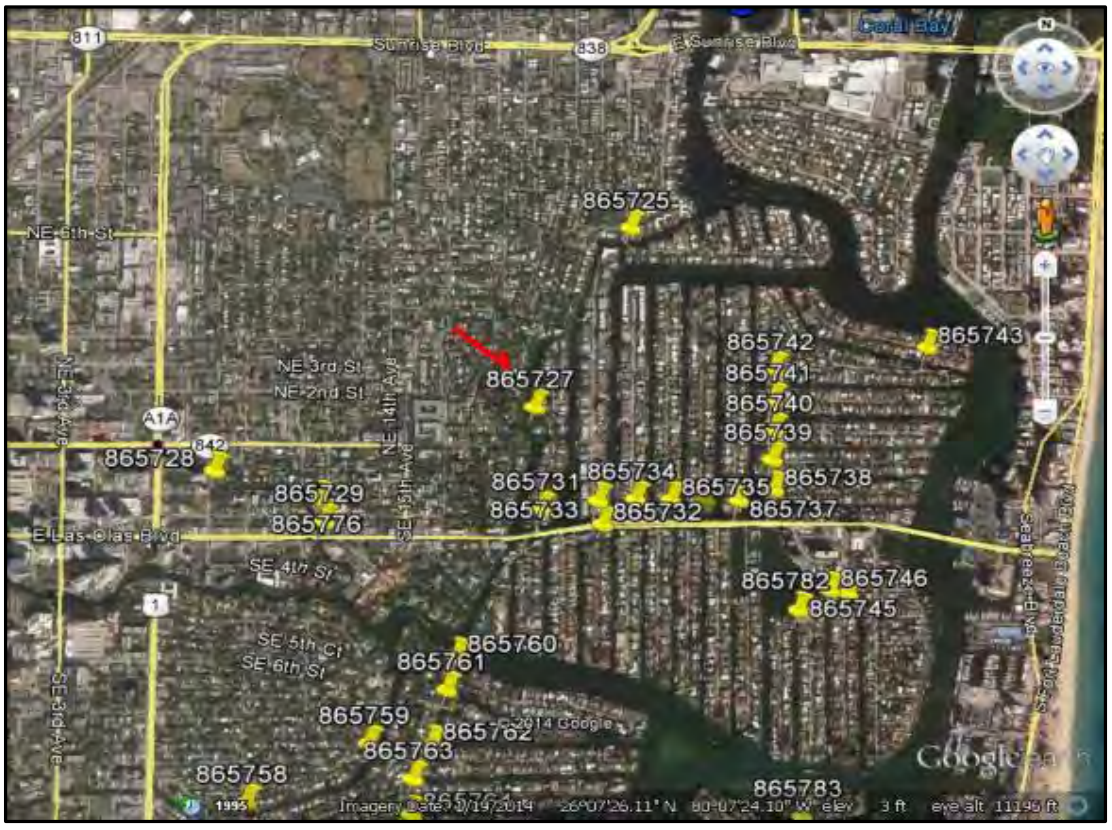
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No. 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 6/20/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865727** Date: **07-May-14**

A: LOCATION MAP



Description: NE 1st Street, 200 ft East of VICTORIA PK RD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
205 R/Concrete Column	**3 ea.**

Note:
_The piles have been jacketed to approximately 9' below the cap and exposed a maximum of 3'. Refer to Element 298 Pile Jacket Bare for related comments

215 R/Concrete Abutment	**48 lf.**
CS-1:	**48**

_The joints are open up to 1" wide. No backfill loss observed during this inspection cycle. Refer to Element 290 Channel for related comments.

298 Pile Jacket Bare	**3 ea.**

Note:
_The Pile Jackets (PJ) start at the cap and extend to approximately 9', below.
_Several jackets were cleaned at random locations.

CS-3: **3**

_The bottom 4" of the jacket are irregular. **NO CHANGE**

_All the jackets have vertical and horizontal cracks up to 1/64", generally extending up to 16", below the marine growth. **NO CHANGE**

_PJ 2-1, East face has a vertical crack 24" x 1/64" which intersects with a crack in the East face of pier 2 cap. **NO CHANGE**

_PJ 2-1, North face, has a washout area 6" x 8" x 2-3/4", 5'-3" below the cap. **UW Photo 01. NO CHANGE**

_PJ 2-2, SW corner has a spall/delamination 44" x 10" x 1-1/2", with associated cracks up to 1/8", with corrosion bleed-out, all faces, starting at the cap. **UW Photo 02. INCREASE**

_PJ 2-3, NE corner has a spall/delamination 48" x 18" x 4", with exposed steel up to 75% section loss. Also all faces are delaminated starting at the cap, with associated cracks up to 1/4" wide. **UW Photo 03. INCREASE**

290 Channel	**1 ea.**
CS-3:	**1**

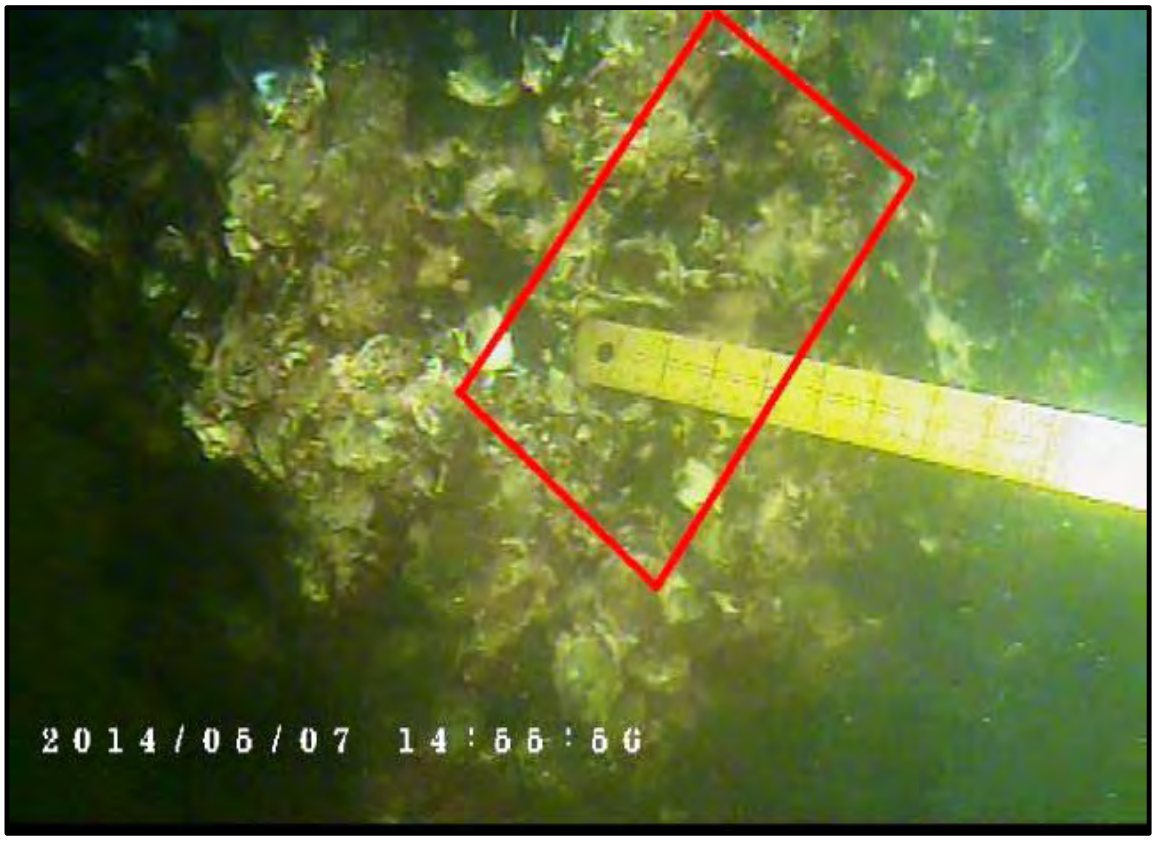
_Abutment 1 has intermittent undermining the entire length up to 2" H, and 40" penetration. No backfill loss was observed during this inspection cycle. **UW Photo 04. INCREASE**

_Abutment 3 has intermittent undermining the entire length up to 8" H, and 9" penetration. No backfill loss was observed during this inspection cycle. **NO CHANGE**

475 R/Concrete Walls	**56 lf.**
INCIDENTAL:	**56**

_The SW wingwall is undermined at the angle break up to 3' x 8" x up to 4' penetration. No backfill loss was observed during this inspection cycle. **NO CHANGE**

F: PHOTO SECTION



Description: Top: Jacket 2-1, North face, has a washout area. **UW Photo 01.**
Bottom: Jacket 2-2, SW corner spall/delamination, with cracks up to 1/8". **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Jacket 2-3, NE corner spall/delamination, with exposed steel. **UW Photo 03.**
Bottom: Abutment 1, intermittent undermining up to 2" H, and 40" D. **UW Photo 04.**

H: RECOMMENDED REPAIRS

298 Pile Jacket Bare

_Remove all unsound concrete and patch as needed Jackets 2-1, 2-2 and 2-3.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.0	11.5
2	16.6	16.4
2.5	17.1	15.1
3	12.4	11.6

Notes: Measurements were taken from the top of steel deck.
Waterline on the left: 9.7 ft. and right: 9.9 ft. at mid-channel.
Maximum Channel depth: 7.4 ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865728 **Bridge Name:** SE 8th Avenue over Himmarshee Canal

Topside Inspection Complete: 5/20/2014

Underwater Inspection Complete: 5/27/2014

Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 44.4 ft. long, three span, reinforced concrete tee beam bridge was constructed in 1953. The bridge has a roadway width of 39 ft. and carries two lanes of traffic. The bridge has 4.8 ft. wide sidewalks on each side. The bridge is not classified as Functionally Obsolete or as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos are included as an Addendum.

DECK

The deck is the portion of the bridge that is above the tee beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Railings/Barriers

- The left barrier has an 8 in. x 3 in. delamination in the bottom west face over Abutment 4. See Condition Photo 1.
- The metal handrails have corrosion spots up to 2 in. in diameter along with areas of the bottom rail being bent. See Condition Photo 2.

Expansion Joints

- The joint sealant in the sidewalks is deteriorated and packed with dirt and debris. See Condition Photo 3.
- The asphalt overlay has transverse cracks up to $^{1}/_{8}$ in. wide over the expansion joints. See Condition Photo 4.

Utilities

- There are four 6 in. diameter ductile iron pipes under the east side of the bridge.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete T-Beams

- Beam 1-5 right over End Bent 1 exhibits a 1 ft. x 9 in. x 2 in. spall with exposed steel. This condition was not previously noted. See Condition Photo 5.
- The beams have isolated areas of honeycombing up to ¾ in. deep.
- Both sidewalks have minor map cracking less than $^{1}/_{64}$ in. wide.
- Random pieces of wood form-boards were left in-place along the beam joints. See Condition Photo 6.

Bearings

- The T-beams sit directly on the abutment; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 4 cap has an 8 in. x 4 in. delamination in the west haunch. See Condition Photo 7.
- Abutment 1 cap has spalls/delaminations up to 1 ft. 4 in. x 8 in. x 1 in. at the following locations:
    - Under the left leg of Beam 2-1.
    - Under the left leg of Beam 3-1.
    - Under the right leg of Beam 5-1. See Condition Photo 8.

Reinforced Concrete Cap

- Bent 3 cap has a 1 ft. x 10 in. x ¾ in. spall in the north face under the right leg of Beam 3-3. See Condition Photo 9.
- Bent 3 cap also has a 10 in. x 4 in. x 2 in. spall under Beam 3-6.

Pile Jackets

- All jackets have a gunite coating.
- The west face of Pile 2-9 has a spot of corrosion bleed-out 3 ft. below the cap. See Underwater Inspection Report Photo 1.
- Several of the jackets have vertical and horizontal cracks up to 1 ft. 4 in. long x $^{1}/_{64}$ in. wide in the gunite. See Underwater Inspection Report Photos 2 and 3.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Bulkheads/Retaining Walls

- The southeast retaining wall cap has a 1 ft. x 8 in. x 3 in. spall with exposed steel in the top south edge at Abutment 1. See Condition Photo 10.

- The first pile of the southeast retaining wall has a 4 ft. x 6 in. delamination with associated vertical cracks up to 3 ft. long x $^{1}/_{64}$ in. wide with corrosion staining. See Condition Photo 11.
- There is an elevation difference of up to ½ in. between panels of the southwest approach sidewalk, over Abutment 1. See Condition Photo 12.
- The northwest approach sidewalk has a 1 ft. diameter remaining timber column, from a removed power pole, that is cut flush with the top of the sidewalk. See Condition Photo 13.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the concrete beam and caps in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The bridge does not require posting for load.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unknown whether the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available; however, avoiding a bridge closure by phasing any work is highly recommended because of the complexity of the detour.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge at the east side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 5,000 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for pile jackets or concrete repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

It is expected that the bridge beams and the bent caps will require work in the next 20 years to ensure they will last the next 20 years without interruption to service. The pile jackets are a spray-applied gunite coating with cracks present. The jackets are likely to require repairs in the next 20 years as well.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term work is required to address structural issues at the bridge at this time. Work to extend the life of the bridge is described in Long Term recommendations.

LONG TERM

The beams and bent caps have spalls and delaminations, and these will only worsen as years pass. It is expected that repairs will be necessary to those elements in the next 11-15 years. The pile repairs are beginning to crack and will eventually spall and delaminate, requiring repairs. For budgeting purposes, it is anticipated that the piles will require new jackets in the next 11-15 years as well.

The bulkheads adjacent to the bridge also show signs of deterioration and are likely to need major work within the next 20 years. For budgeting purposes, it is anticipated that this work would be done with the bridge work 11-15 years from now.

For all concrete work, surface preparation, to both the sound concrete left in place after loose material is removed and to the exposed reinforcing steel, are key to providing long lasting repairs.

Long Term Recommendation(s): **Install pile jackets.** **Make concrete repairs.** **Replace bulkheads at each quadrant.**			Cost
Design [1]			$ 40,000.00
Construction			$ 302,000.00
Bridge Construction [2]	$	292,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 60,400.00
Contingency [5]			$ 60,400.00
		TOTAL COST	$ 462,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $4,000 per pile (48 piles total); Bulkheads: $20,000/quadrant; Concrete repairs to beams: $20,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Plaque

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

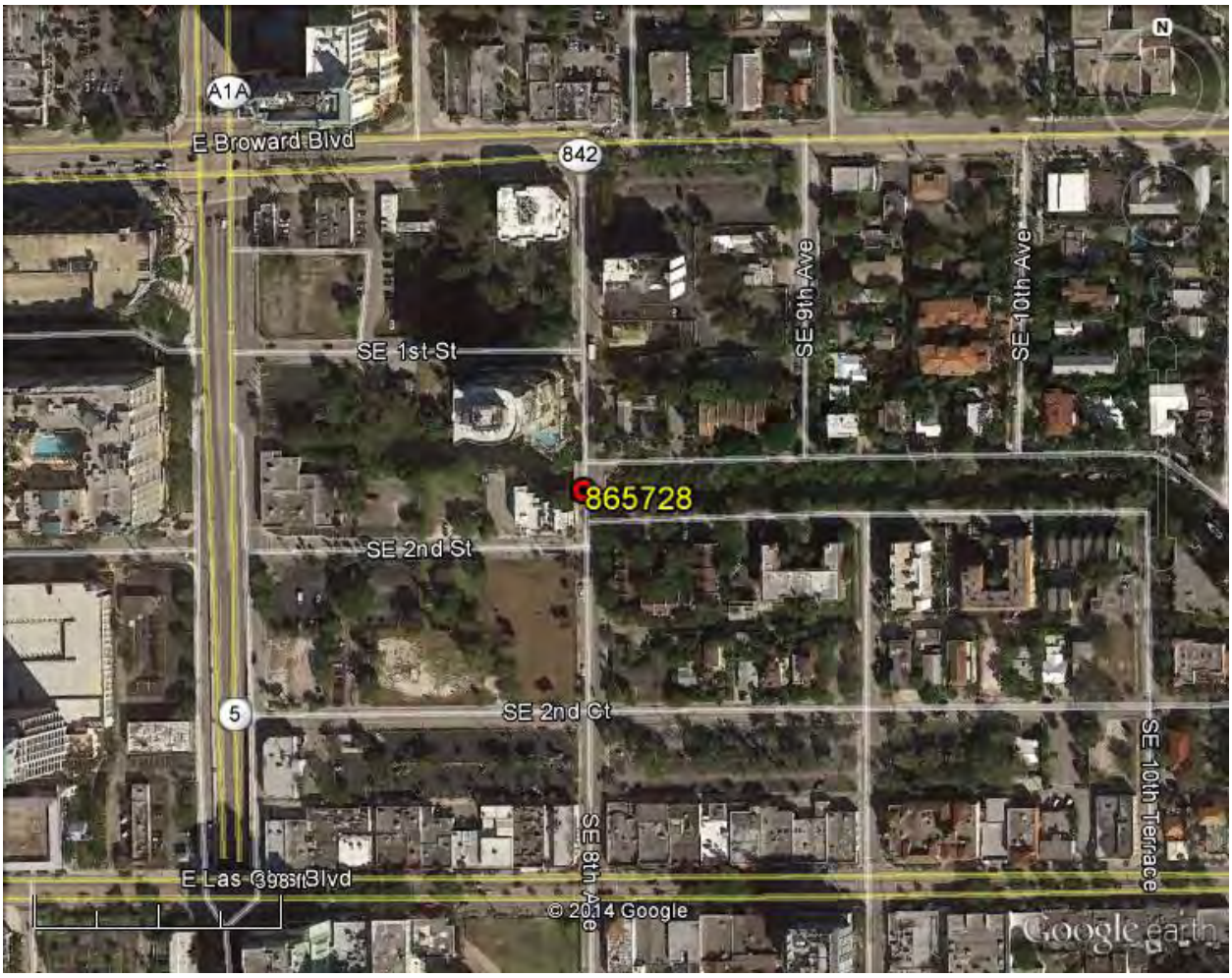
Utilities Mounted under East Side of Bridge

GENERAL PHOTOS OF BRIDGE

Channel Looking East

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – The west face of the left barrier over End Bent 4 exhibits a delamination.

Photo 2 – The east railing at mid span over Span 2 exhibits corrosion.

CONDITION PHOTOS

Photo 3 – The right sidewalk joint seal over End Bent 1 is deteriorated.

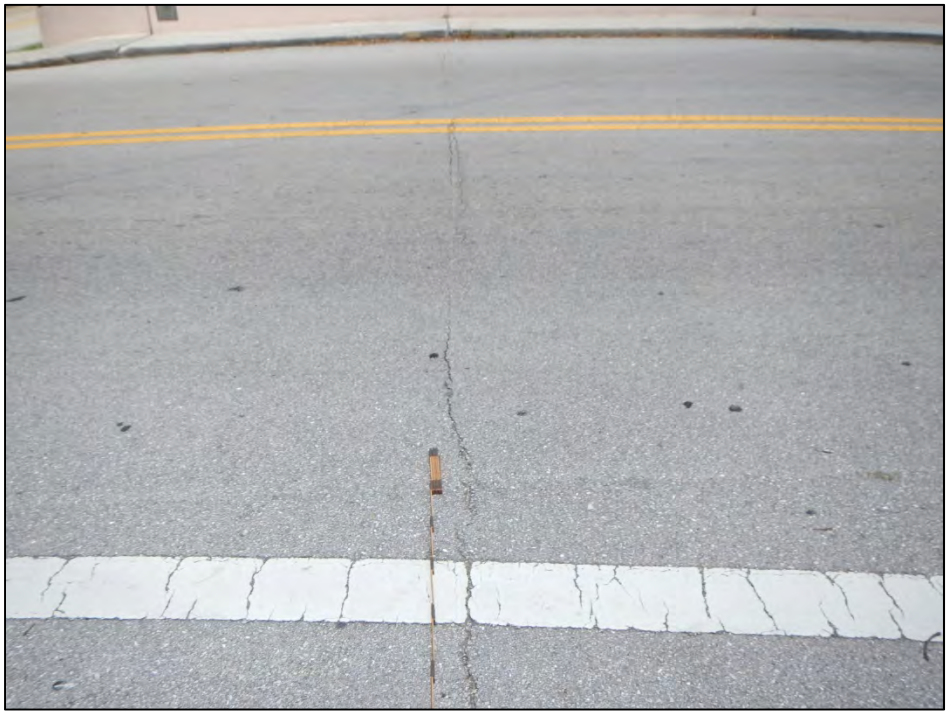


Photo 4 – The deck top exhibits a transverse crack over Bent 3.

CONDITION PHOTOS

Photo 5 – Beam 1-5 right exhibits a spall/delamination with exposed steel.

Photo 6 – Pieces of wood form-boards were left in-place along the beams.

CONDITION PHOTOS

Photo 7 – The west face of Abutment 4 exhibits a delamination.

Photo 8 – Abutment 1 cap below Beam 5-1 exhibits a spall/delamination.

CONDITION PHOTOS

Photo 9 – The north face of Bent 3 cap below Beam 3-3 exhibits a spall.

Photo 10 – The southeast retaining wall cap exhibits a spall at Abutment 1.

CONDITION PHOTOS

Photo 11 – The first pile of the southeast retaining wall exhibits a delamination with corrosion staining.

Photo 12 – The left sidewalk over Abutment 1 exhibits a difference in elevation.

CONDITION PHOTOS

Photo 13 – The northwest approach sidewalk has a 1 ft. diameter timber column.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865728** Date: **27-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865728 UW Inspection Date: 5/27/2014

Bridge Name: N/A

Road Name/Number: SE 8th AVENUE

Feature Intersected: HIMMARSHEE CANAL.

Location: 525ft SOUTH of BROWARD BLVD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	4.8 ft.(low tide)	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Concrete Column
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		475 R/Concrete Walls
Weather:	84° Sunny		290 Channel
Special Crew Hours:	2 hrs. x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

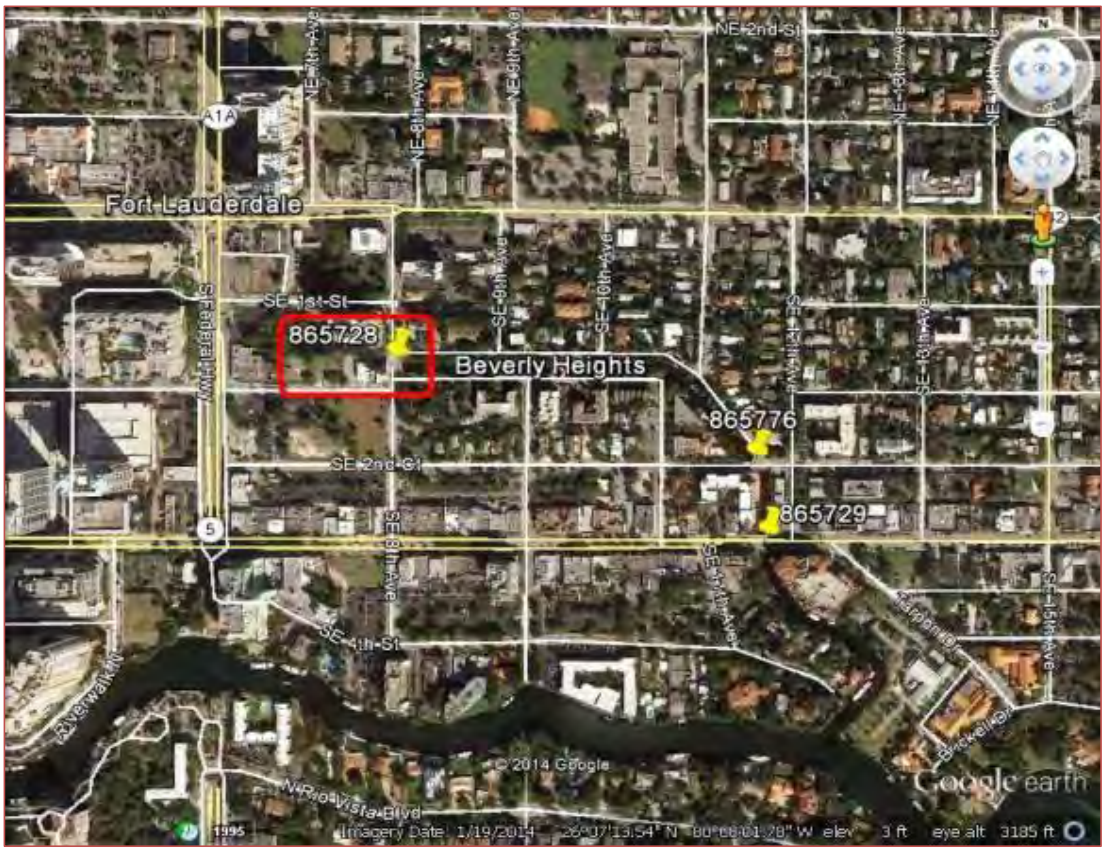
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/22/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865728** Date: **27-May-14**

A: LOCATION MAP



Description: 525ft SOUTH of BROWARD BLVD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
205 R/Concrete Column	**48 ea.**

Notes:
_All the Piles have jackets from the cap down approximately. The piles have been placed in condition State 3 due to unknown conditions prior to being jacked.
_All the columns are exposed up to 12" from the ground-line.

_No deficiency noted during this inspection cycle.

298 Pile Jacket Bare	**48 ea.**

Notes:
_All the jackets have gunite coating.
_Pile jackets were inspected from the cap down by underwater inspectors.
_The Pile jackets are covered heavy marine growth starting 16in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **1**
_Pile 2-9, West face has a corrosion bleed-out spot, 3' below the cap. **UW photo 01. INCREASE.**

CS:1 **47**
_Several of the jackets have vertical and horizontal cracks up to 16" x 1/64" wide in the gunite.
UW photo 02 and 03 (photo taken Pile 2-5) NO CHANGE.

290 Channel	**1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls	**126 lf.**

Note:
_Abutment backwall were inspected from the cap down by underwater inspectors.

CS-3:
_Both Abutment have intermittent areas of corrosion bleed-out. **UW Photo 04. NEW.**
_Both Abutment have intermittent areas that the gunite cover is falling off. **UW Photo 05. NEW.**

F: PHOTO SECTION

Description: Top: Pile 2-9, West face has a corrosion bleed-out spot, 3' below the cap. **UW Photo 01.**
Bottom: Several of the jackets, horizontal cracks up to 1/64", in the gunite. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Several of the jackets have vertical cracks up to 1/64", in the gunite. **UW Photo 03.**
Bottom: Both Abutment have intermittent areas of corrosion bleed-out. **UW Photo 04.**

F: PHOTO SECTION

Description: Both Abutments have intermittent areas that the gunite cover is falling. **UW Photo 05.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.8	10.0
2	11.3	12.5
2.5	11.9	12.0
3	11.7	11.3
4	10.4	9.5

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 7.7 ft. and right: 7.7 ft. at mid-channel.
Maximum Channel depth: 4.8ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865729 **Bridge Name:** East Las Olas Boulevard over Himmarshee Canal

Topside Inspection Complete: 5/20/2014

Underwater Inspection Complete: 5/27/2014

Report Date: 7/25/2014

Inspection Personnel / Title / Number	**Initials**
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:	**Prepared by:**
City of Fort Lauderdale	TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 99 ft. long, three span, reinforced concrete arch bridge was constructed in 1930 and widened using reinforced concrete T-beams in 1950. The bridge roadway width is 47.7 ft. and carries four lanes of traffic. There are 5.1 ft. sidewalks on each side. The bridge is classified as Functionally Obsolete but not as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 2004 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting. The rating is controlled by the tee beams.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge that is supported by the T-beams and the arches. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The left sidewalk over Span 1 between Railing Posts 1-4 and 1-5 exhibits 4 protruding steel rods. This condition was not previously noted. See Condition Photo 1.
- The deck overlay has a ¼ in. wide longitudinal crack along the construction joints in the outside lanes. See Condition Photo 2.
- There are up to ½ in. wide transverse cracks over the eastbound expansion joints. See Condition Photo 3.
- The scuppers are blocked with dirt and debris.

Expansion Joints

- The sealant in the sidewalk joints is completely deteriorated. See Condition Photo 4.

Utilities

- There is a 1 ft. diameter cast iron utility attached to the deck underside adjacent to Beam 2.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the arch and beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Arch

- The underside of the arch has repaired areas on the northwest and east ends that have minor shrinkage cracks up to $^{1}/_{64}$ in. wide and minor hollow sounding areas up to 1 ft. x 1 ft. in random locations. This condition has increased in severity – the hollow sounding areas were previously noted as up to 4 in. x 4 in. See Condition Photo 5.
- There are up to 4 in. wide and 3 in. deep intermittent voids underwater along the west and east ends of the arch. See Underwater Inspection Report Photo 01.

Reinforced Concrete T-Beams

- No deficiencies were noted.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Piles

- Pile 2-4 has a 2 ft. long x $^{1}/_{16}$ in. wide vertical crack in the northeast corner and a 3 ft. 10 in. x 1 ft. 4 in. delamination in the west face, 2 in. below the cap. INCREASE. See Underwater Inspection Report Photo 02.
- Pile 2-5 and Pile 2-6 at the south and west faces have a pile width x $^{1}/_{64}$ in. horizontal crack 2 ft. below the cap.
- Pile 3-6 southwest corner (previously noted west face) has a 3 ft. x 1 ft. 4 in. delamination with corrosion stains 3 in. below the cap. See Condition Photo 6 and Underwater Inspection Report Photo 03.

Abutments

- There are intermittent voids up to 4 in. x 2 ft. x 3 in.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The asphalt overlay at the approach slabs has longitudinal cracks up to $^{1}/_{8}$ in. wide along the inside edges. See Condition Photo 7.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines, with delaminations and repaired areas present on the arch and cracks present on the piles of the widened section. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The bridge is not posted for load. The latest available load rating for the bridge indicates that the T-beams are the controlling members.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available via SW 2nd Court or Broward Blvd., but either road will require travel through the neighborhood, on roads not configured to accept the volume of vehicles that currently use the bridge. With four lanes carried across the bridge, there is available width to phase construction to work on part of the bridge, if needed.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge at the north side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 20,000 vehicles per day, and the road is posted for 30 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for pile jackets or concrete repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

Historic Bridge: The bridge dates to 1930 and is eligible for inclusion on the National Register of Historic Places. Consultations with historians, the local historical society, and the state historic preservation officer will be required if replacement options are considered. In order to satisfy federal Section 4(f) requirements, a study evaluating no build, rehabilitation and replacement options will need to be performed to confirm that replacement is the only reasonable option. If the arch shape of the beams is desirable in a replacement bridge, the beams should be designed to include those shapes, rather than providing a purely cosmetic fascia arch, so that additional maintenance costs are not incurred for non-functional components.

RECOMMENDATIONS AND PROBABLE COSTS

It is expected that work will be required in the next 20 years, to repair spalled concrete on the arch and on the piles, to ensure they will last the next 20 years without interruption to service.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term work is required to address structural issues at the bridge at this time. Work to extend the life of the bridge is described in Long Term recommendations.

LONG TERM

The reinforced concrete arch has repaired areas that show signs of cracks and hollow areas (indicating poor bond), and repairs will likely be needed 11-15 years from now. These spalls should be repaired using conventional concrete repair methods.

The piles have minor delaminations and cracks present, one location with corrosion staining visible. It is anticipated that the piles will require jackets, and that they should be installed as part of a project to repair the arch spalls, 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

For all concrete work, surface preparation, to both the sound concrete left in place after loose material is removed and to the exposed reinforcing steel, are key to providing long lasting repairs.

Long Term Recommendation(s): **Install pile jackets.** **Make concrete repairs.**			Cost
Design [1]			$ 15,000.00
Construction			$ 89,000.00
Bridge Construction [2]	$	84,000.00	
Maintenance of Traffic [3]	$	5,000.00	
Construction Inspection and Administration [4]			$ 17,800.00
Contingency [5]			$ 17,800.00
		TOTAL COST	$ 139,600.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $4,000 per pile (16 piles total); Concrete repairs to beams: $20,000.

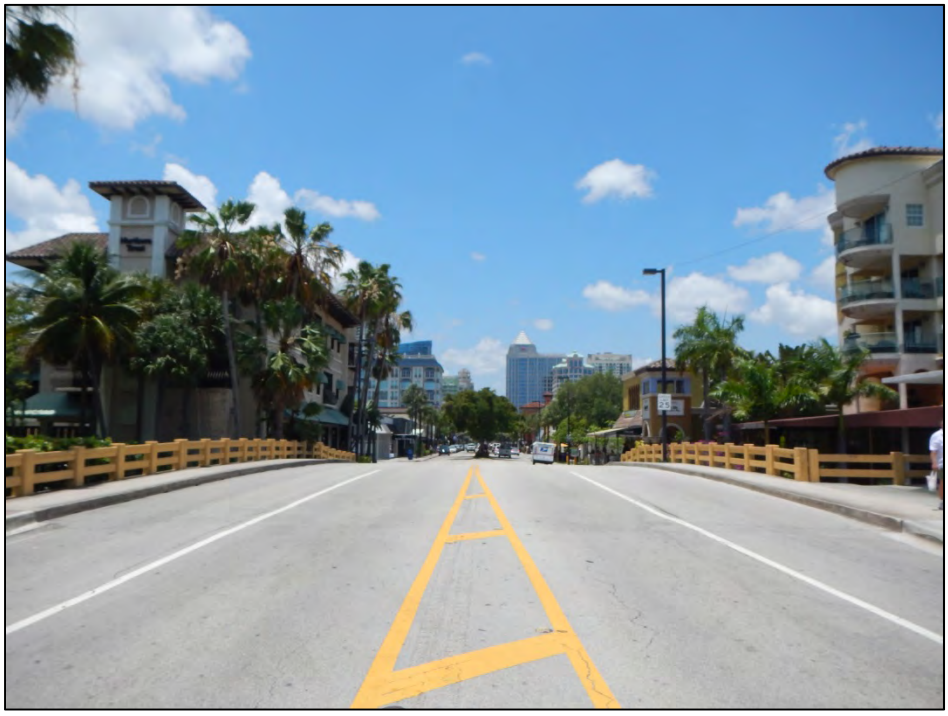
(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation



East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Utility Pipe Mounted under South Side of Bridge

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

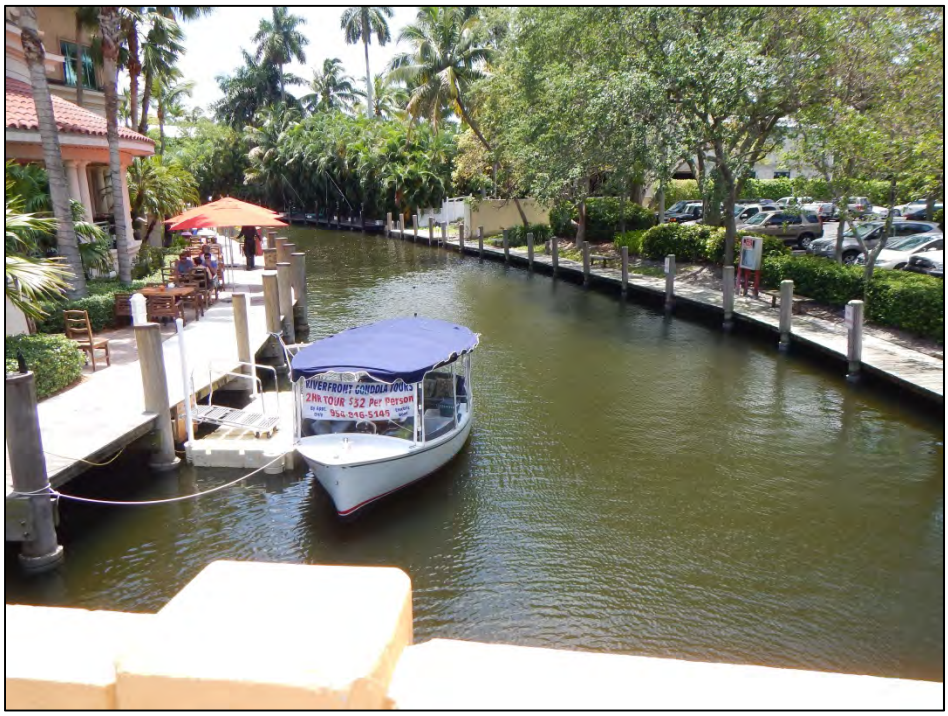
West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

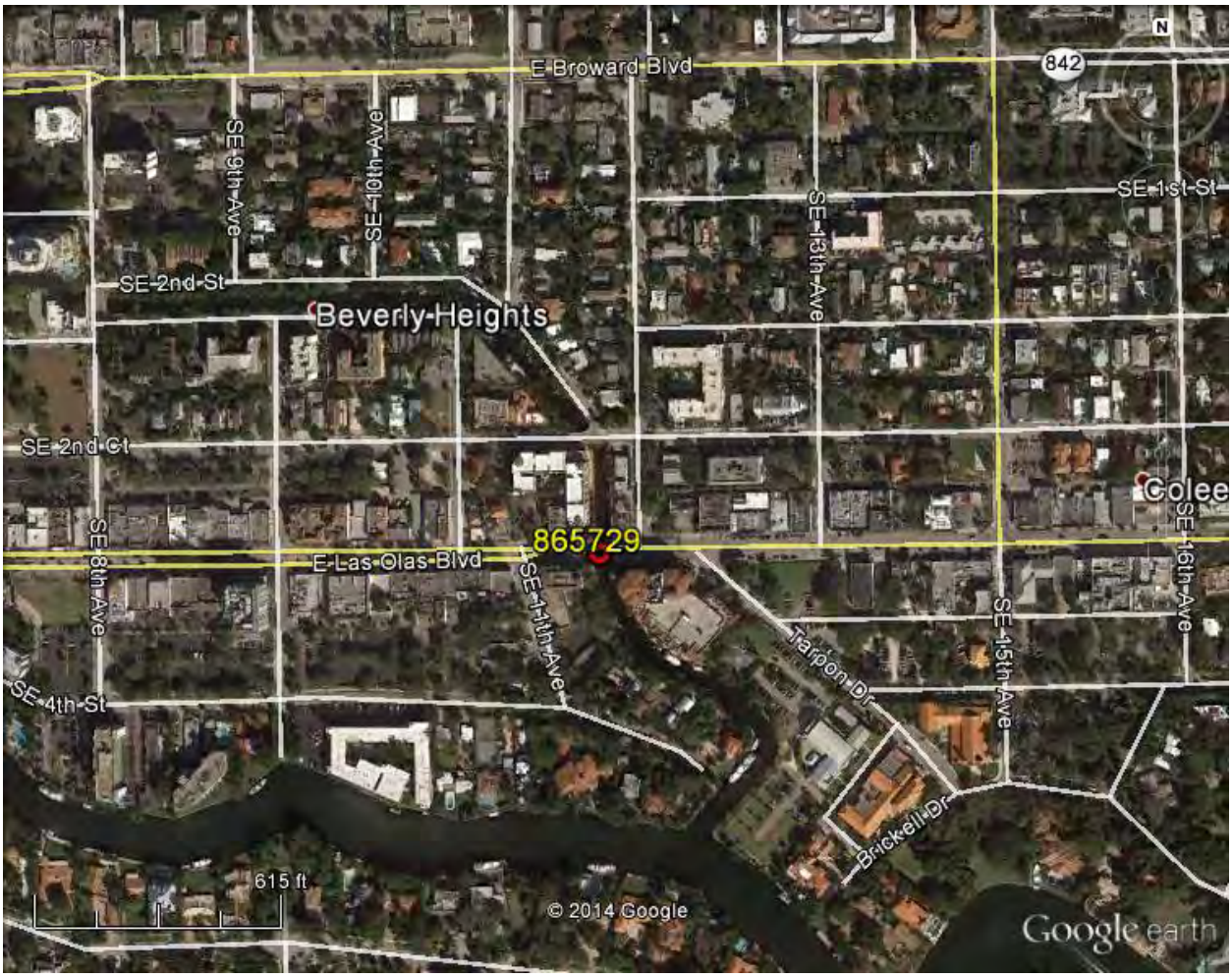
Channel Looking North

GENERAL PHOTOS OF BRIDGE



Channel Looking South

LOCATION MAP



CONDITION PHOTOS

Photo 1 – The left sidewalk between Railing Posts 1-4 and 1-5 exhibits 4 protruding steel rods.

Photo 2 – The deck top exhibits longitudinal cracks.

CONDITION PHOTOS

Photo 3 – The eastbound deck top joint exhibits a transverse crack over Bent 2.

Photo 4 – The right sidewalk joints exhibit deteriorated sealants.

CONDITION PHOTOS

Photo 5 – The northwest end of the arch exhibits shrinkage cracks with hollow sounds.

Photo 6 – The southwest corner of Pile 3-6 exhibits a delamination.

CONDITION PHOTOS

Photo 7 – The south approach slab exhibits longitudinal cracks.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865729** Date: **27-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865729 UW Inspection Date: 5/27/2014

Bridge Name: N/A

Road Name/Number: EAST LAS OLAS BLVD.

Feature Intersected: HIMMARSHEE CANAL.

Location: 0.3MI EAST of US-1.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.7 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	144 R/Concrete Arch
Bottom:	Muck.		204 P/S Concrete Column
Water Temp.:	81°		215 R/Concrete Abutment
Weather:	84° Sunny		290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Stinging Hydroids, Sharp oyster shells

Critical Deficiency Notes: None

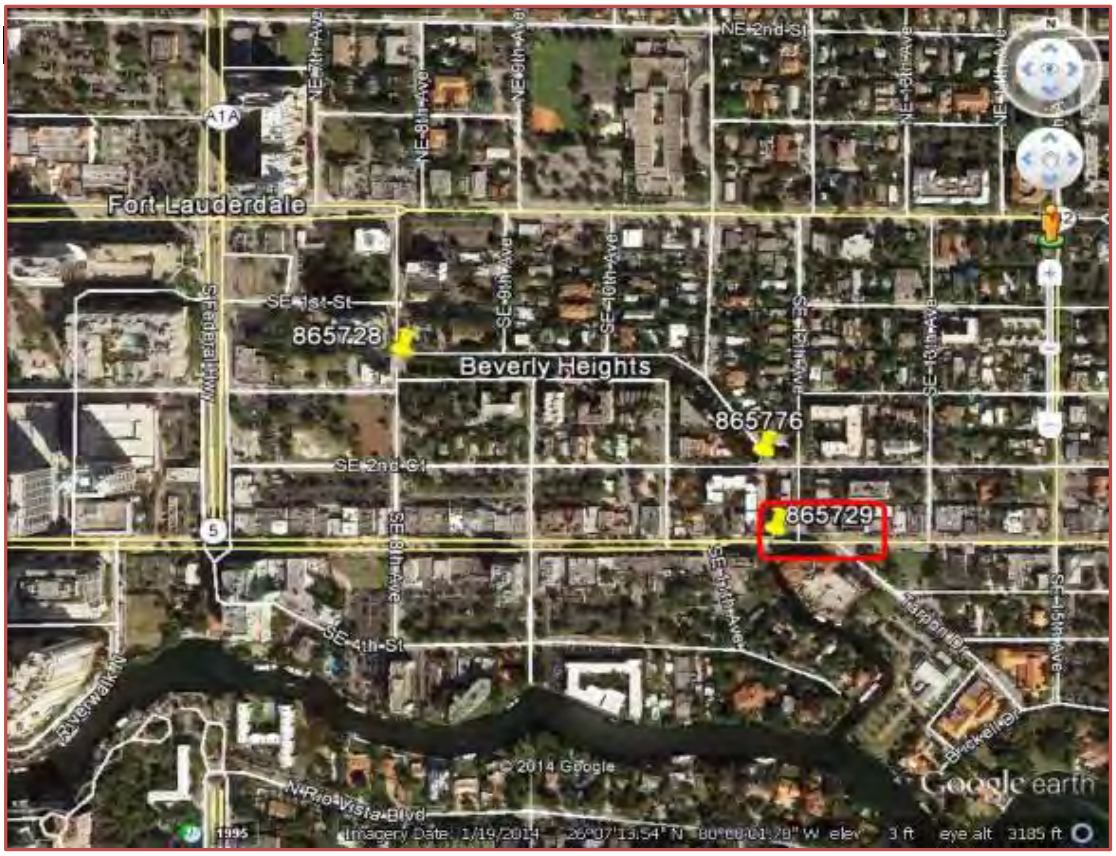
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865729** Date: **27-May-14**

A: LOCATION MAP



Description: 0.3 MI EAST of US-1.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
144 R/Concrete Arch	**25 lf.**
CS-1:	**25**

_There are up to 4" wide and 3" deep intermittent voids underwater along the West and East ends of the arch. **UW Photo 01. NO CHANGE.**

204 P/S Concrete Column	**16 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors during this inspection cycle.
_The Piles are covered heavy marine growth starting 36in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **3**

_Pile 2-4, NW corner has a vertical crack 24" x 1/16", also on the SW corner has a delamination 46" x 16", starting 2' below the cap. **UW Photo 02. INCREASE.**

_Pile 3-6, SW corner has a delamination 36" x 1/16", with corrosion bleed-out, starting 3' below the cap. **UW Photo 03. NO CHANGE.**

_Pile 3-8, SW corner has a spall/delamination 10" x 5" x 1", with exposed steel, 2' below the cap. **UW Photo 04. NEW.**

CS-2: **1**

_Pile 2-5, South and West faces has a horizontal crack, pile width x 1/64", 24" below the cap. **NO CHANGE.**

_Pile 2-6, South and West faces has a horizontal crack, pile width x 1/64", 24" below the cap. **NO CHANGE.**

215 R/Concrete Abutment	**120 lf.**
CS-1:	**120**

_There are intermittent voids up to 24" x 4" x 3". **NO CHANGE.**

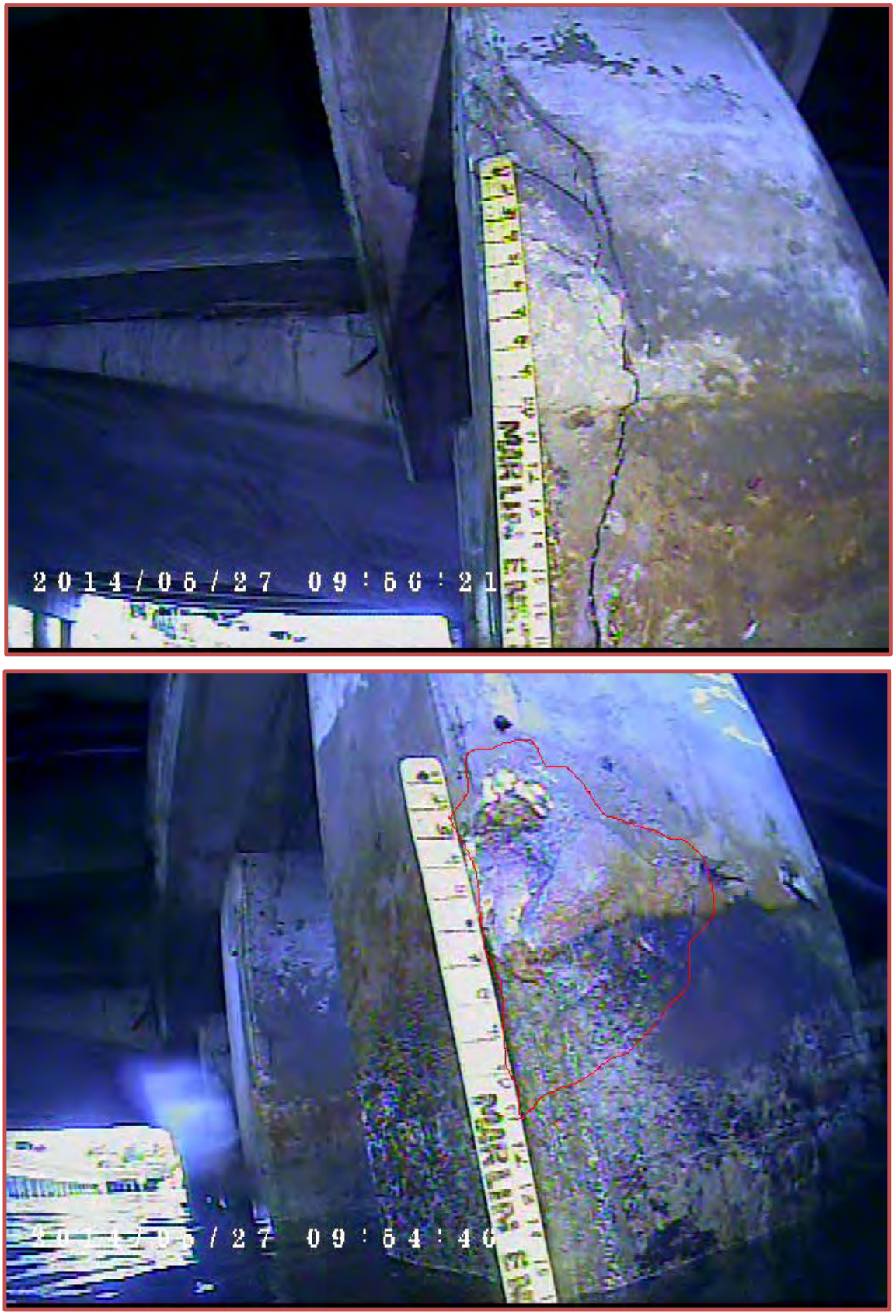
290 Channel	**1 ea.**
CS-1:	**1**

_The channel has heavy oyster growth along the channel bottom.

F: PHOTO SECTION

Description: Top: Intermittent voids underwater along the W and E ends of the arch. **UW Photo 01.**
Bottom: Pile 2-4, NW corner has a vertical crack. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Pile 3-6, SW corner delamination, with corrosion bleed-out. **UW Photo 03.**
Bottom: Pile 3-8, SW corner spall/delamination, with exposed steel. **UW Photo 04.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove unsound concrete, patch, and seal the cracks as needed on Piles 2-4, 2-5, 2-6, 3-6 and 3-8.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	8.6	6.5
2	16.8	14.4
2.5	17.1	17.9
3	14.4	15.2
4	12.4	6.0

Notes: Measurements were taken from the bottom of the concrete rail.
Waterline on the left: 12 ft. and right: 12.2 ft. at mid-channel.
Maximum Channel depth: 5.7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865731 **Bridge Name:** South Gordon Rd over Las Olas Canal

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/07/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is an 85 ft. long, three span, prestressed concrete slab bridge built in 1970. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. There are 5 ft. sidewalks on both sides. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is not visible due to an asphalt overlay.
- There are up to deck width x ¼ in. wide transverse cracks in the asphalt surface over the expansion joints. See Condition Photo 1.
- The asphalt overlay has up to $^{1}/_{8}$ in. wide longitudinal cracks over the slab unit joints. See Condition Photo 2.
- There is vegetation at the curb line. See Condition Photo 2.

Railings/Barriers

- The left parapet wall in Span 1 has a 2 ft. 10 in. x 1 ft. 8 in. x 5 in. delaminated patch in the west face at the second handrail support. See Condition Photo 3.
- The second handrail support for the left parapet wall in Span 1 is fractured. See Condition Photo 4.

Expansion Joints

- The joints are not visible due to an asphalt overlay. The only the portions of the joints that are fully visible are at the right and left sidewalks. The sidewalk joint sealant is deteriorated. See Condition Photo 5.

Utilities

- There is one 6 in. diameter steel utility attached to the outside (west) face of Beam 1.
- There is one 1 ft. diameter cast iron utility, one 1 ft. diameter steel utility, one 4 in. diameter PVC utility and one 4 in. diameter steel utility attached to the deck underside adjacent to the east face of Beam 1.
- There is one 1 ft. diameter cast iron utility, one 1 ft. diameter steel utility and one 6 in. diameter steel utility attached to the deck underside adjacent to the west face of Beam 2.
- There are two 6 in. fiberglass utilities attached to the outside (east) face of Beam 2.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Slab Units

- Slab Unit 3-6 has a 2 ft. x 1 ft. 6 in. x 1 in. spall/delamination with one exposed prestressed strand at Abutment 4. The steel exhibits minor section loss (90% section remaining). See Condition Photo 6.
- Slab Unit 3-7 has a 2 ft. x 1 ft. 6 in. x 1 ¼ in. spall/delamination in the east edge at Abutment 4. See Condition Photo 7.

The sidewalks are supported by tee beams.

- The south end of the east fascia Beam 1-2 at End Bent 1 exhibits a 3 ft. long x 1 ft. wide x 3 in. deep spall with exposed steel. See Condition Photo 8.
- The left and right sidewalks in Span 2 have 3 ft. long x $^{1}/_{64}$ in. wide longitudinal cracks at Bent 2.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- The bottom 8 in. of the caps are underwater at high tide.
- Abutment 1 cap has a cap length x 1 ft. 6 in. delamination with associated cracks up to $^{1}/_{8}$ in. wide along the bottom north edge with several areas of corrosion bleedout. See Condition Photo 9 and Underwater Inspection Report Photo 1.
- Abutment 4 cap has a cap length x 1 ft. 6 in. delamination with associated cracks up to $^{1}/_{8}$ in. wide along the bottom south edge with several areas of corrosion bleedout. See Condition Photo 10 and Underwater Inspection Report Photo 2.

Intermediate Piers

- Bent 2 cap has a cap length x 2 ft. delamination with corrosion bleedout with associated cracks up to $^{1}/_{8}$ in. wide along the bottom south and north edges. See Condition Photo 11 and Underwater Inspection Report Photo 3.
- Bent 3 cap has a cap length x 2 ft. delamination with corrosion bleedout with associated cracks up to $^{1}/_{8}$ in. wide along the bottom south and north edges with isolated areas being full cap height. See Condition Photo 12 and Underwater Inspection Report Photo 4.
- Bent 3 cap has an 8 in. x 5 in. x 3 in. spall with corrosion bleedout with associated cracks up to $^{1}/_{8}$ in. wide in the bottom southeast corner. See Condition Photo 13.
- Bent 3 cap, top southwest corner has a 1 ft. 6 in. x 1 ft. delaminated area.
- The piles have random edge scrapes up to 5 in. x 4 in. x ½ in.
- Pile 3-5, southeast corner, from the cap extending down 5 in. below the marine growth has a 1 ft. 6 in. x 3 in. x 1 ½ in. spall.
- Pile 3-6, southeast corner, from the cap extending down has a 2 ft. 8 in. x 9 in. delamination.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The asphalt overlay over the north and south approach slabs has up to slab length x $^{1}/_{8}$ in. wide transverse cracks.

- The north approach slab moves under car live load when standing at the northeast corner.
- There is a ¼ in. wide crack in the overlay at the roadway transition. See Condition Photo 14.

Retaining Wall

- The southwest and southeast retaining wall caps have full length x 8 in. delaminations with heavy corrosion stains. See Condition Photo 15.
- The southeast retaining wall cap also has a 10 in. x 4 in. x 2 in. void.
- The end of the northeast retaining wall has a void at the transition to the private sector with minor backfill leakage. See Underwater Inspection Report Photo 5.
- The retaining wall joints adjacent to the structure are open up to 1 ¼ in. wide with no fill leakage observed.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutments and intermediate piers in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently, which is why metalizing the caps, a form of cathodic protection, is recommended.

Fortunately, the deterioration to the 40 year old bridge's prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition with only two delaminations noted, one of which had exposed reinforcing steel.

The latest available load rating does not indicate that the bridge requires posting, and no posting signs are present at the bridge. However, the existing rating is 29 years old and should be updated prior to any significant work planned for the bridge, to ensure that any work will not cause restrictions on the bridge and that the bridge's current conditions are reflected in the analysis.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences on the island. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly maintained throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,500 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of Bridge No. 865733, Hendricks Isle Drive over Las Olas Canal, which is located immediately east of this bridge, because much of the work required is similar and there will be mobilization cost savings for a contractor to perform the work at both bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The broken metal handrail support at the left railing should be replaced. Additionally, the spalls on the reinforced concrete tee beam in Span 1, the southernmost span, under the east sidewalk and on the prestressed concrete slab units in Span 3, the northernmost span, should be repaired, with special care taken to ensure the exposed steel is cleaned properly and the concrete surface prepared correctly to ensure a long lasting repair.

The north approach slab was noted to move under traffic loads. This may be due to erosion of the soil under the slab. Investigation into the cause of the movement is needed, with some repairs, possibly grouting any voids under the slab, likely.

Short Term Recommendation(s): **Repair handrail.** **Repair spalls and delaminations on beams.** **Address north approach slab movement.**		Cost
Design [1]		$ 15,000.00
Construction		$ 25,000.00
Bridge Construction [2]	$ 20,000.00	
Maintenance of Traffic [3]	$ 5,000.00	
Construction Inspection and Administration [4]		$ 5,000.00
Contingency [5]		$ 5,000.00
TOTAL COST		$ 50,000.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) $2,000 for handrail work; $8,000 for spall repairs; $10,000 for investigation and repair of approach slab movement.

(3) Daily closures for equipment and material access. Spall repair work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

LONG TERM

The abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in the next 5 years. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

It is expected that the retaining walls adjacent to the south abutment will require work to address similar concrete deterioration. For the purposes of this report, it has been anticipated that this work would be part of a larger project, not bridge based, which would address deterioration to the bulkheads along Las Olas Boulevard.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.**		Cost
Design [1]		$ 15,000.00
Construction		$ 65,000.00
Bridge Construction [2]	$ 60,000.00	
Maintenance of Traffic [3]	$ 5,000.00	
Construction Inspection and Administration [4]		$ 13,000.00
Contingency [5]		$ 13,000.00
TOTAL COST		$ 106,000.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) $3,000 per location for concrete; $12,000 per location for metalizing

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

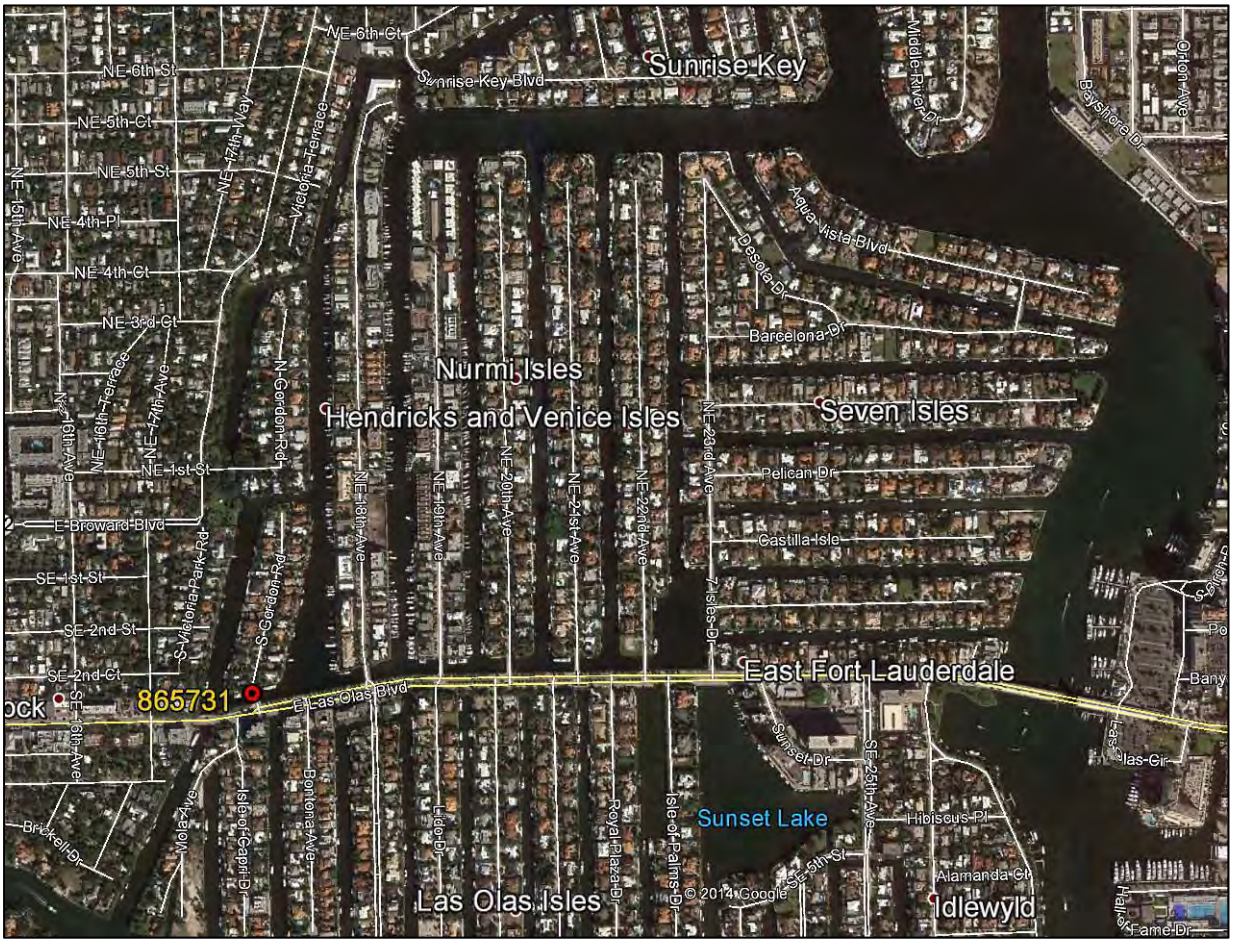
West Channel

East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Transverse cracks in asphalt overlay.

Photo 2 – Longitudinal cracks in asphalt overlay above slab unit joints. Note vegetation at the curb line.

CONDITION PHOTOS

Photo 3 – Delaminated patch in left parapet beneath handrail support.

Photo 4 – Fractured handrail support in Span 1 at the left parapet.

CONDITION PHOTOS

Photo 5 – Deteriorated sidewalk joint.

Photo 6 – Spall/Delamination with exposed prestressing strand in Slab Unit 3-6.

CONDITION PHOTOS

Photo 7 – Spall/Delamination in Slab Unit 3-7 at Abutment 4.

Photo 8 – Spall with exposed steel in the east fascia beam.

CONDITION PHOTOS

Photo 9 – Delamination at Abutment 1 cap.

Photo 10 – Delamination at Abutment 4 cap.

CONDITION PHOTOS

Photo 11 – Delamination in north face of Bent 2 cap.

Photo 12 – Delamination in north face of Bent 3 cap.

CONDITION PHOTOS

Photo 13 – Spall with corrosion bleedout at the southeast corner of Bent 3 cap.

Photo 14 – Crack in asphalt at the roadway transition.

CONDITION PHOTOS

Photo 15 – Delamination at the southwest retaining wall cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865731** Date: **07-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865731 UW Inspection Date: 5/7/2014

Bridge Name: N/A

Road Name/Number: South Gordon Rd.

Feature Intersected: Las Olas Canal.

Location: 50 ft North of East Las Olas Blvd.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	11.6 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	80°		234 R/Concrete Cap, 290 Channel
Weather:	82° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

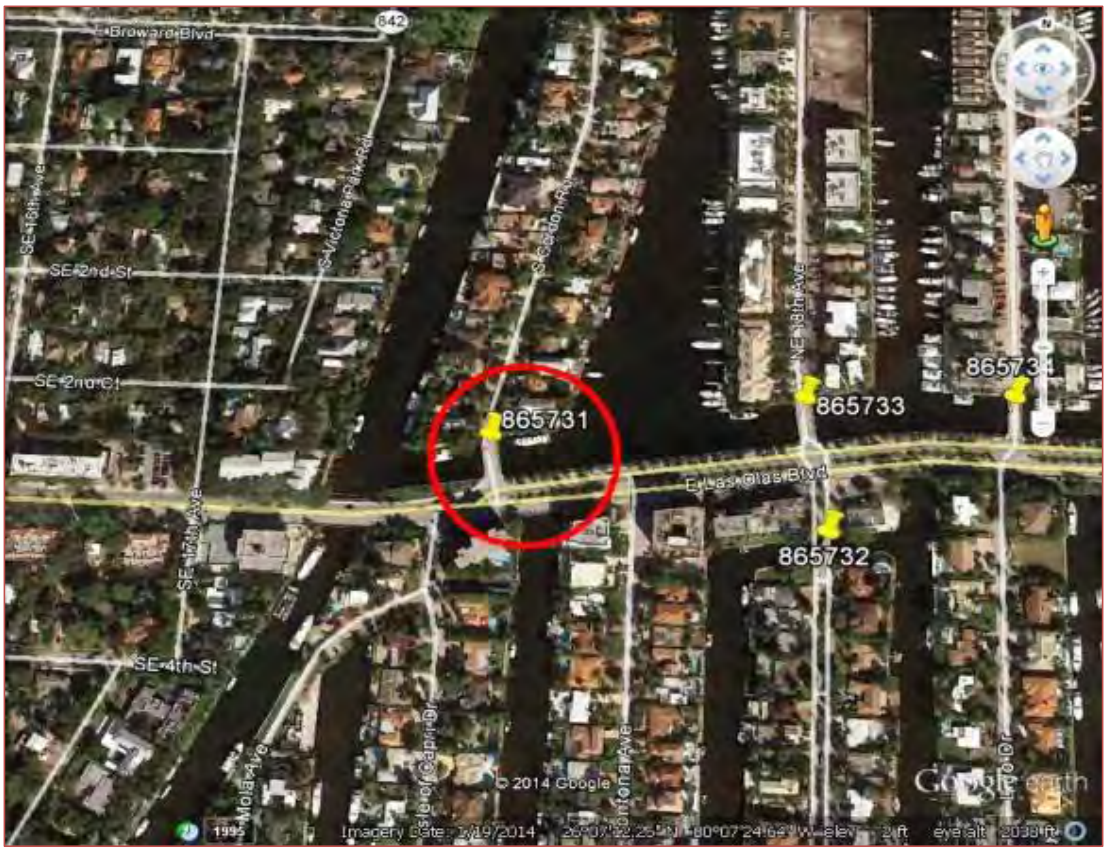
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865731** Date: **07-May-14**

A: LOCATION MAP



Description: 50 ft North of East Las Olas Blvd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**

204 P/S Concrete Column **22 ea.**

Note:
_Piles were inspected from cap down by underwater inspectors.
_The piles are covered heavy marine growth starting 20" below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-1: **22**
_The piles have minor edge scrapes up to 5" x 4" x 1/2". **NO CHANGE**

215 R/Concrete Abutment **72 lf**

Note: The lower 8" of the cap extend into the water during high tide.

CS-3: **72**
_Abutment 1 cap has a full length x 18", delamination along the bottom North edge with associated cracks up to 1/8" wide and several areas of corrosion bleed-out. **UW Photo 01. INCREASE**
_Abutment 4 cap has a full length x 18", delamination along the bottom South edge with associated cracks up to 1/8" wide and several areas of corrosion bleed-out. **UW Photo 02. INCREASE.**

234 R/Concrete Cap **72 lf.**

Note: Bent Caps were inspected from the deck down by underwater inspectors.

CS-3: **72**
_Bent 2 cap has a full length x 15", delamination along the bottom edges with associated cracks up to 1/8" wide and corrosion bleed-out. **UW Photo 03. INCREASE**
_Bent 3 cap has a full length x 15", delamination along the bottom edges with associated cracks up to 1/8" wide and corrosion bleed-out, with isolated areas being full cap height.
UW Photo 04. INCREASE
_Bent 3 cap, bottom SE corner has a spall 8" x 5" x 3", with associated cracks up to 1/8" wide and corrosion bleed-out. **INCREASE**
_Bent 3 cap, top SW corner has a delamination 18" x 12". **NO CHANGE**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **118 lf.**

CS-2: **118**
_The end of the Northeast retaining wall has a void at the transition to the private sector with minor backfill leakage. **UW Photo 05. DECREASE**
_The retaining wall joint adjacent to the structure are open up to 1-1/4" wide, no backfill leakage was observed during this inspection cycle. **DECREASE**

F: PHOTO SECTION

Description: Top: Abutment 1 cap, delamination along the bottom edge. **UW Photo 01.**
Bottom: Abutment 4 cap, delamination along the bottom edge. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Bent 2 cap delamination at the bottom edges w/associated cracks. **UW Photo 03.**
Bottom: Bent 3 cap delamination at the bottom edges w/associated cracks. **UW Photo 04.**

F: PHOTO SECTION

Description: NE retaining wall has a void at the transition to the private sector with minor backfill leakage. **UW Photo 05**

H: RECOMMENDED REPAIRS

215 R/Concrete Abutment

_Remove all unsound concrete and patch as needed at both abutments caps.

234 R/Concrete Caps

_Remove all unsound concrete and patch as needed Bent caps 2 and 3.

475 R/Concrete Walls

_Remove all unsound concrete and patch as needed both abutment backwalls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.1	10.1
2	14.2	15.6
2.5	16.3	17.7
3	14.4	15.6
4	9.8	9.1

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 6.1 ft. and right: 6.1 ft. at mid-channel.
Maximum Channel depth: 11.6 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865732 **Bridge Name:** Coconut Isle Drive over Grande Canal

Topside Inspection Complete: 5/05/2014

Underwater Inspection Complete: 5/05/2014

Report Date: 6/13/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER 6/13/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 46.8 ft. long, single span, reinforced concrete ribbed arch constructed in 1925 by the Luten Bridge Company of York, Pennsylvania (per plaque mounted on bridge railing). The bridge has a roadway width of 20.2 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 2009 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU, C and ST vehicles at 5, 7 and 9 tons, respectively. The details of the load rating were not available, so it is unclear what elements are controlling the rating.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to

easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced in the below text, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay on the deck top has wide spread delaminations and transverse cracks up to ¼ in. wide primarily near centerline at midspan. There is a 1 ft. diameter x ¼ in. wide area of cracked and crumbling asphalt at the south and north ends of the structure with an impending pothole along midspan at centerline. See Condition Photo 1.
- The asphalt overlay has a 17 ft. long x 11 ft. wide deteriorated area with depressions up to ¾ in. and associated map cracking along the left bridge rail starting 14 ft. north of Abutment 1. These depressed areas give the appearance of the bridge deck sagging, but confirming this to be the case was not possible with normal bridge inspection equipment. See Condition Photo 2.
- There is a 4 ft. long x 1 ft. 4 in. wide area of crumbled asphalt with vegetation growth along the left bridge rail over Abutment 1.
- Vegetation is growing along the curbs over the deck top at the southwest corner.
- Ponding water was observed during past inspections from the centerline to the west curb; however, it was not observed during this inspection.
- Heavy trucks were observed crossing the structure during this inspection, likely exceeding the posted weight limit.
- Both approach roadways have up to ½ in. wide cracks and leveling patches at both transitions. At both ends of the bridge, the approach roadway asphalt is below the level of the deck, causing impact loading as vehicles cross the bridge. The elevation difference causing impact loading on the bridge was not previously noted. See Condition Photos 3 and 4.
- There is no roadway striping across the bridge.

Deck Underside

- The west overhang has a 4 ft. long x 1/8 in. wide transverse crack at midspan which was previously sealed with clear epoxy. This condition has increased in severity – reopening of the crack was not previously noted. See Underwater Inspection Report Photo 1.
- The deck underside has a 3 ft. x 1 ft. unsound area along the north edge of a patch at the 2/3 point. The patch is delaminating. This condition has increased in severity – the patch was not delaminating previously.
- There is a 4 ft. x 1 ft. 6 in. unsound area within a patch in the west overhang at the 2/3 point.
- The remaining deck underside patches have unsound areas up to 1 ft. diameter and cracks 1/32 in. wide, some with efflorescence. This condition has increased in severity – the cracks were previously noted as 1/64 in. wide. See Underwater Inspection Report Photo 2.

Railings/Barriers

- The east railing has several cracks up to 1/16 in. wide x 3 ft. long and a spall 3 ft. long x 4 in. high x ½" deep. This condition was not previously noted. See Condition Photos 5 and 6.
- The seventh railing spindle from south at the west railing has three 1 ft. 6 in. high x 1/16 in. wide vertical cracks. This condition was not previously noted. See Condition Photo 7.

Expansion Joints

- No expansion joints are present.

Utilities

- There is a 12 in. cast iron utility pipe and an 8 in. PVC utility pipe attached to the deck underside at the west side of the structure.
- There is a 12 in. cast iron utility pipe and two 8 in. steel utility pipes attached to the deck underside at the east side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Beams

- Both beams have widespread cracking up to 1/32 in. wide with minor corrosion bleed out and heavy efflorescence in the gunite which has been sealed with epoxy in the past; however, the cracks are recurring.
- The beams have widespread repairs with random hollow sounding areas up to 1 ft. diameter.
- Beam 1-1 has a 1 ft. 2 in. x 1 ft. x 1 in. delamination in the east face, 3 ft. north of Abutment 1 with exposed rebar and an associated crack 4 ft. long x 1/64 in. wide with

corrosion bleed out. These conditions were not previously noted. See Underwater Inspection Report Photo 3.

- Beam 1-2 has a 2 ft. 6 in. x 1 ft. 6 in. delamination in the west face, 9 ft. north of Abutment 1. See Underwater Inspection Report Photo 4.

Bearings

- The beams are integral with the abutments; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- The gunite coating over both abutments has 1/32 in. wide cracking. When tapped with a hammer, some areas sounded hollow.
- The southeast corner of Abutment 1 has an undermined area 3 ft. long x 1 ft. 6 in. wide x 5 in. high. No loss of backfill was noted. This condition was not previously noted. See Underwater Inspection Report Photo 5.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is a small tree growing in the joint between Abutment 2 and the northeast bulkhead.
- The joints between the abutments and the bulkheads are open up to 1 in. wide. No loss of backfill was noted. See Underwater Inspection Report Photo 6.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is generally in fair condition based on National Bridge Inspection Standards and FDOT guidelines. This is mostly due to the constant maintenance effort undertaken by City forces to repair damage as it occurs, to keep the bridge open for resident access. The bridge cannot be closed because it is the only means of access for residents and for emergency services.

The low-lying bridge is subjected to tidal influences, which virtually make the arched opening of the beams not visible at high tide. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete is very likely to have chloride contamination to the extent that the internal reinforcing steel is corroding. This is evidenced by repeated spall repairs and delamination of previous repairs and areas adjacent to repairs. The act of making repairs helps to extend the bridge's lifespan, but it does not address the root condition that is causing the spalls and delaminations. Concrete repairs to bridges like this one are likely to last 5-8 years.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

The bridge is posted for a maximum of 9 tons, depending upon the truck configuration. The load rating details were not available for review, but the latest rating was done in 2009 and likely represents the bridge as it appears in 2014. The bridge posting is continually being exceeded because basic services, like garbage pickup, need to cross the bridge on a regular basis. Emergency services are unable to cross the bridge. Our inspectors witnessed a garbage truck crossing the bridge during the field inspection. However, the bridge does not show significant signs of overloading in the form of diagonal shear cracks near the ends or flexural cracks near midspan. Load testing, which involves installation of a series of gauges to measure strains induced by a truck with a known weight and configuration, could be used to determine the actual load capacity of the bridge. However, this will not address the chloride-saturated concrete.

Any work to repair or rehabilitate the bridge should include a new load analysis, or at least a thorough review of the analysis that currently applies to the bridge, to ensure that work will improve the load carrying capacity to a level that allows emergency services and basic services to cross the bridge without exceeding posted levels.

GEOMETRIC DEFICIENCIES

The roadway width, bridge railings and approach roadway transitions are substandard when compared to current design standards. No right of way research was done, but it appears that there is some ability to improve the bridge width, as the approach roadways just off the bridge widen significantly.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the approximately 30 residences on the island. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, only making repairs will not improve the load carrying capacity of the bridge.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at both sides. Any rehabilitation or new construction that would replace the deck will need to address temporary support or relocation of the utilities. Relocation may be difficult given the short length of the bridge and apparent lack of available space to relocate utilities off of paved roadway. Temporary service may need to be installed during construction, with new lines installed under the new bridge to connect to the existing lines off the bridge.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally over the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work. It would be advantageous to relocate the poles from the center of the City's right of way, where poles are located between lanes of opposing traffic, to poles mounted at the shoulder; however it is unclear whether sufficient right of way exists to do so, or whether a utility easement would be possible.

Maintenance of Traffic: The bridge average daily traffic is only about 400 vehicles per day, and the road is posted for 25 mph, so it is possible to perform repairs on the deck with simple flagging operations to close half of the bridge at a time. Replacing the bridge and maintaining traffic will be challenging, since the bridge only has two beams. Temporary supports would be needed in order to do a phased replacement, and only one lane would be available for two way traffic. Temporary signals would likely be required in order to safely maintain traffic during the work, since temporary barriers and the existing vertical geometry would significantly reduce sight distances for vehicles in both directions.

Historic Bridge: The bridge dates to 1925 and eligible for inclusion on the National Register of Historic Places. Consultations with historians, the local historical society, and the state historic preservation officer may be needed as replacement options are considered during preliminary engineering design. In order to satisfy federal Section 4(f) requirements, a study evaluating no build, rehabilitation and replacement options will need to be performed. Alternative uses, like as a pedestrian bridge, are not feasible since the bridge cannot be left in place and access to the island provided at another location. If the arch shape of the beams is desirable in a replacement bridge, the beams should be designed to include those shapes, rather than providing a purely cosmetic fascia arch, so that additional maintenance costs are not incurred for non-functional components.

RECOMMENDATIONS AND PROBABLE COSTS

There are no feasible and prudent ways to strengthen reinforced ribbed arch and T-beam bridges to improve load carrying capacity. Because the bridge is the only way in or out of the community, and emergency vehicles are unable to respond because the bridge is posted, it is recommended that the bridge be replaced in the next five years. No repairs are recommended for the years prior to the bridge being replaced.

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement in the next 0-5 years.

LONG TERM

Replacement of the bridge must be done in phases in order to maintain traffic, since the bridge is the only way into and out of the community. Partial demolition of the bridge will be complex, because the bridge consists of only two beams; removal of half the bridge to construct a new one will make the remaining part unstable. Temporary supports are likely required and will drive up the cost of construction. Additionally, there are five utility pipes on the bridge. It is assumed that these pipes are vital to the island residents. The utility pipes will need to be either relocated from the bridge or temporarily supported during construction.

The bridge length for a new bridge is anticipated to be the same as the existing bridge. The bridge width has been assumed to be 35 ft., about 14 ft. wider than the existing bridge, since it is likely that the new bridge would more closely maintain the roadway width at each approach.

The cost to replace the bridge has been estimated based on bid tabulations provided by the City for past replacement projects and is based on 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes.

Long Term Recommendation(s): **Replace bridge.**		Cost
Design [1]		$ 105,000.00
Construction		$ 700,000.00
Bridge Construction [2]	$ 568,750.00	
Maintenance of Traffic [3]	$ 43,750.00	
Utilities [4]	$ 87,500.00	
Construction Inspection and Administration [5]		$ 140,000.00
Contingency [6]		$ 140,000.00
TOTAL COST		$ 1,085,000.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

Constructor's Plaque

GENERAL PHOTOS OF BRIDGE

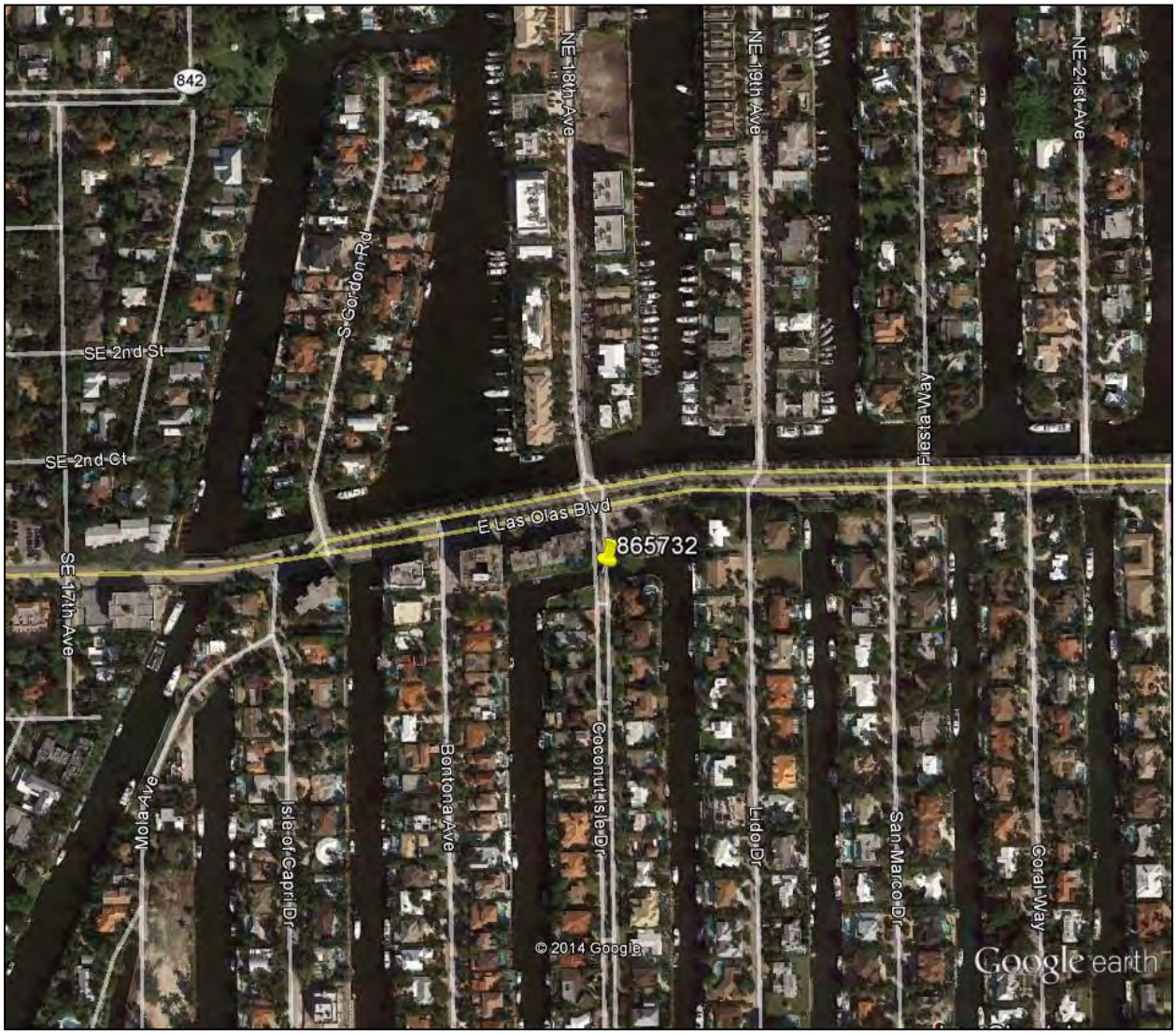
Utilities Mounted at East Fascia

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Delaminated and cracked asphalt overlay.

Photo 2 – Depressed area in west half of asphalt overlay near railing.

CONDITION PHOTOS

Photo 3 – Condition at south transition from approach to bridge.

Photo 4 – Condition at north transition from approach to bridge.

CONDITION PHOTOS

Photo 5 – Crack at north end of east railing.

Photo 6 – Delaminated/spalled area near midspan of east railing.

CONDITION PHOTOS

Photo 7 – Crack on 7th spindle from south at west railing.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865732** Date: **05-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865732 UW Inspection Date: 5/5/2014

Bridge Name: N/A

Road Name/Number: Coconut Isle Dr.

Feature Intersected: Grande Canal

Location: 300 ft South of Las Olas Blvd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.8 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	13 Concrete Deck/AC Overlay (underside)
Bottom:	Muck		220 R/C Sub Pile Cap/Ftg
Water Temp.:	80°		215 R/Concrete Abutment, 290 Channel
Weather:	82° Sunny		110 R/Concrete Open Girder
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids.

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead OP
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

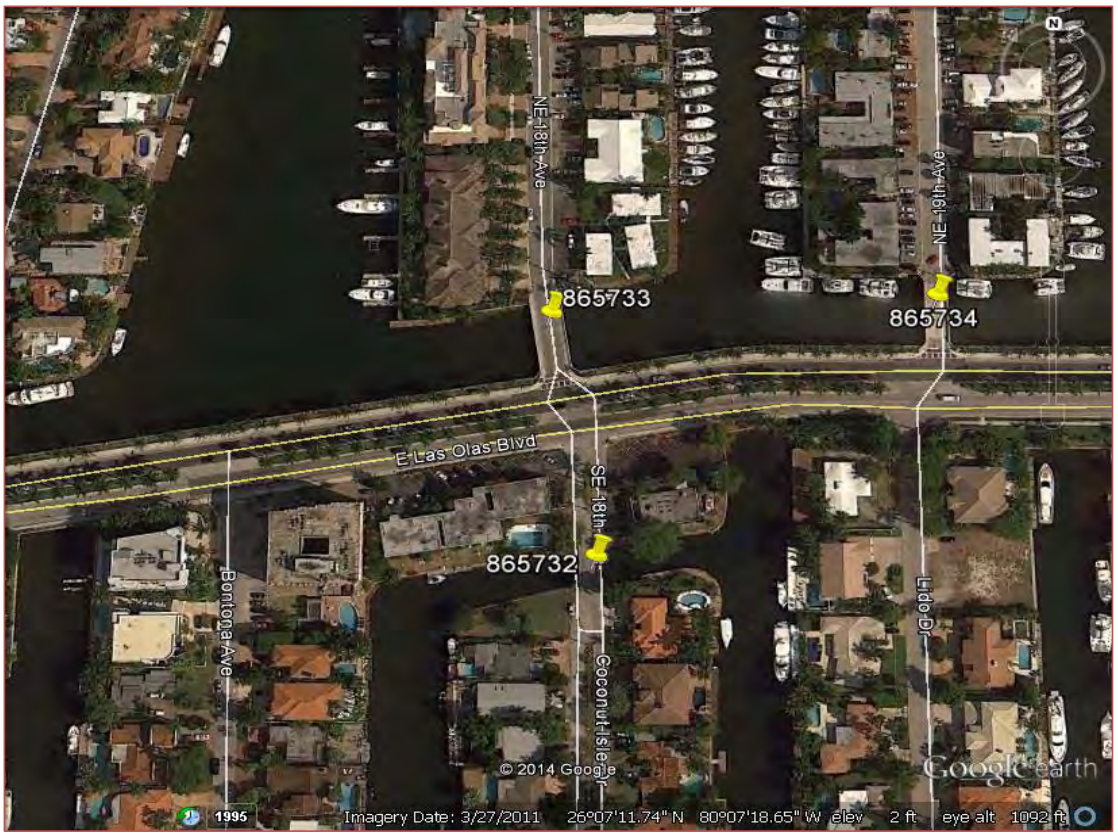
Soria, Miguel, Professional Engineer (P.E. # 49359)

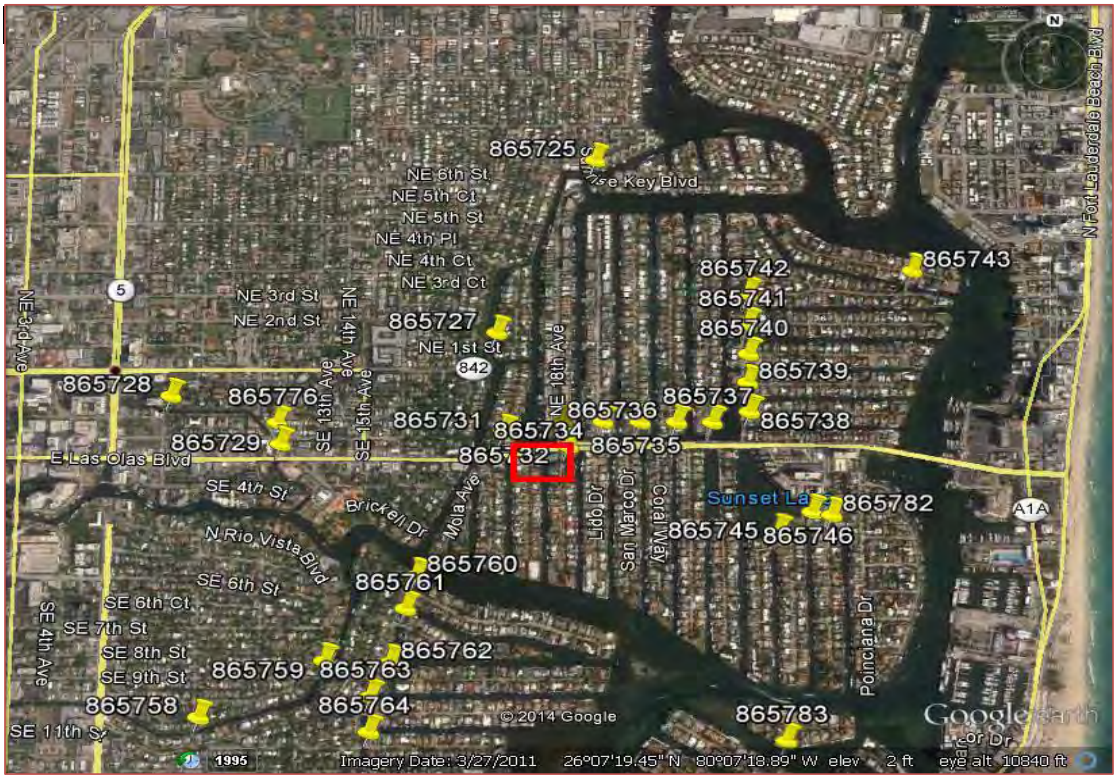
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 6/20/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865732** Date: **05-May-14**

A: LOCATION MAP





Description: 300 ft South of Las Olas Blvd, Coconut Isle Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

13 Concrete Deck/AC Overlay (underside only) **1044 sq. ft.**

Note: The deck underside was inspected by the underwater inspectors during this inspection cycle.

CS-4: **1,044**
_The west overhang has a 4' L x 1/16" W, transverse crack at mid-span which has been sealed with clear epoxy. The cracks have open to 1/8" W. **UW Photo 01. INCREASE**
_The deck underside has a 3' x 1', unsound patched area along the north edge at 2/3 point; the patch is not well bonded. **INCREASE**
_There is a 4' x 18", unsound area within a patch in the west overhang at the 2/3 point. **NO CHANGE**
_The remaining deck underside patches have unsound areas up to 1' diameter and cracks up to 1/32" wide, with efflorescence. **UW Photo 02. INCREASE**

110 R/Concrete Open Girder **94 lf.**

Note: The beams were inspected by the underwater inspectors during this inspection cycle.

CS-3: **94**
_Both beams have widespread cracking up to 1/32 in. wide with minor corrosion bleed out and heavy efflorescence in the gunite, which has been sealed with epoxy in the past; however, the cracks are reoccurring. **NO CHANGE**
_The beams have widespread repairs with random hollow sounding areas up to 1ft. diameter. **NO CHANGE**
_Beam 1-1 has a 14" x 12" x 1", spall/delamination in the east face, 3 ft. north of Abutment 1, with exposed rebar and associated crack 4' x 1/64", with corrosion bleed out. **UW Photo 03. NEW**
_Beam 1-2 has a 30" x 18", delamination in the west face, 9 ft. North of Abutment 1. **UW Photo 04. INCREASE**

215 R/Concrete Abutment **45 lf.**

Notes: The abutments were inspected by the underwater inspectors during this inspection cycle.

CS-1: **45**
_The gunite coating over both abutments has 1/32 in. wide cracking. **NO CHANGE**
_When tapped with a hammer, some areas sounded hollow. **NO CHANGE**
_Abutment 1, SE corner has a undermined area 36" L x 18" D x 5" H. No backfill loss was found. **UW Photo 05. NEW**

220 R/C Sub Pile Cap/Ftg **4 ea.**

No deficiency noted during this inspection cycle.

E: ELEMENT NOTES

Element	Quantity
290 Channel	**1 ea.**
CS-1:	**1**

_The joints between the abutments and the bulkheads are open up to 1in. Wide, no backfill migration was noticed. **UW Photo 06. NO CHANGE**

F: PHOTO SECTION

Description: Top: West overhang, the cracks have open to 1/8" W. **UW Photo 01.**
Bottom: Deck underside patches have unsound areas with cracks. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Beam 1-1 spall/delamination in the east face, 3 ft. north of Abutment 1. **UW Photo 03.**
Bottom: Beam 1-2 delamination in the west face, 9 ft. North of Abutment 1. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Abutment 1, SE corner undermined area with no backfill migration. **UW Photo 05**
Bottom: Joints between the abutments and the bulkheads are open. **UW Photo 06**

H: RECOMMENDED REPAIRS

13 Concrete Deck/AC Overlay (underside only)

_Remove all unsound concrete and patch as needed.

110 R/Concrete Open Girder

_Remove all unsound concrete and patch as needed also epoxy inject all the cracks.

290 Channel

_Seal the joints between the abutments and the bulkheads.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.8	10.5
1.5	13.9	13.7
2	11.1	11.1

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 8.1 ft. and right: 8.3 ft. at mid-channel.
Maximum Channel depth: 5.8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865733 **Bridge Name:** Hendricks Isle Drive over Las Olas Canal

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/07/2014

Report Date: 7/8/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is an 85.2 ft. long, three span, prestressed concrete slab bridge built in 1962. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. There are 5 ft. sidewalks on each side. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is not visible due to an asphalt overlay.
- The scuppers are not visible due to the asphalt overlay.
- There are longitudinal cracks in the asphalt up to slab length x $^{1}/_{8}$ in. wide over the slab unit joints. See Condition Photo 1.
- There are up to deck width x $^{1}/_{8}$ in. wide transverse cracks in the asphalt surface over the expansion joints. See Condition Photo 2.
- There is vegetation at the curb lines along the length of the bridge.
- Both curbs have minor edge spalls up to 6 in. x 4 in. x ½ in.
- There is an area of spilled concrete on the right sidewalk in Span 1 at Abutment 1.

Railings/Barriers

- The mounting bolts for the aluminum handrails have minor surface corrosion.
- The southeast approach barrier has a 4 ft. x 1 ft. delamination in the east face, 6 ft. south of the barrier wall transition.
- The southwest corner of the pedestrian rail above the southwest wingwall exhibits 2 of 4 loose nuts. See Condition Photo 3.

Expansion Joints

- The joints are not visible due to an asphalt overlay. Staining on the caps indicates the joints have been leaking. The portions of the joints that are fully visible are at the right and left sidewalks.
- The sidewalk joint sealant is deteriorated. See Condition Photo 4.

Utilities

- There is a 1 ft. diameter cast iron utility attached to the west face of Beam 1.
- There is a 1 ft. diameter steel utility and a 3 in. diameter steel utility attached to the deck underside adjacent to the east face of Beam 1.
- There is a 1 ft. diameter steel utility, a 4 in. diameter steel utility and a 3 in. diameter PVC utility attached to the deck underside adjacent to the west face of Beam 2.
- There is a 1 ft. diameter fiberglass utility and a 6 in. diameter PVC utility attached to the east face of Beam 2. The 6 in. diameter PVC utility pipe attached to the east face of Beam 2 is disconnected in Span 3. See Condition Photo 5.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- Slab Unit 2-1 has a 6 in. x 4 in. x 1 in. spall in the east edge at mid-span.
- Slab Unit 3-1 has a 1 ft. 8 in. x 10 in. x 2 ¼ in. spall in the east edge at mid-span. See Condition Photo 6.

The sidewalks are supported by tee beams

- The tee beams in Spans 1 and 3 have up to 4 ft. x 1 ft. x 3 in. spalls/delaminations with exposed rebar in the bearing area over the abutments. The exposed reinforced steel in these areas exhibits minor section loss with approximately 85% section remaining. See Condition Photos 7 through 9.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have cap length x 2 ft. 6 in. delaminated areas with associated cracking and corrosion bleedout.
- Abutment 1 cap has a 3 ft. x 4 in. x 2 ¾ in. spall with exposed rebar (approximately 25% section remaining) over Pile 1-1. See Condition Photo 10 and Underwater Inspection Report Photo 2.
- Abutment 4 cap has a 3 ft. x 8 in. x 3 in. spall with exposed rebar (50% section remaining) over Pile 4-1. See Condition Photo 11 and Underwater Inspection Report Photo 3.
- Abutment 4 cap has a 2 ft. 4 in. x 10 in. x 3 in. spall with exposed rebar (up to 50% section remaining) over Pile 4-5. See Condition Photo 12.

Intermediate Piers

- Both intermediate bent caps have cap length x 2 ft. 6 in. delaminated/spalled areas with associated cracking and corrosion bleedout. See Condition Photos 13 through 15 and Underwater Inspection Report Photo 4.
- Bent 2 cap has a 2 ft. x 10 in. x 2 ½ in. spall with exposed reinforcing steel (approximately 50% section remaining) in the southeast corner. See Condition Photo 16 and Underwater Inspection Report Photo 5.
- Piles 3-3, 3-4 and 3-5 have up to 1 ft. long x $^{1}/_{16}$ in. wide vertical cracks with corrosion stains in all faces in the splash zone that extend 1 ft. into the marine growth. See Underwater Inspection Report Photo 1.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.

Retaining Wall

- All four retaining wall caps have full length x $^{1}/_{32}$ in. wide horizontal cracks with associated delaminations and corrosion bleedout. See Underwater Inspection Report Photo 6.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutments and intermediate piers in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently, which is why metalizing the caps, a form of cathodic protection, is recommended.

Fortunately, the deterioration to the 52 year old bridge's prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition. The tee beams that support the sidewalk at each fascia have spalls and delaminations at the abutments. Repairs to these beams should extend the life of the bridge beyond the 20 year timeframe considered in this study.

The latest available load rating does not indicate that the bridge requires posting, and no posting signs are present at the bridge. However, the existing rating is 29 years old and should be updated prior to any significant work planned for the bridge, to ensure that any work will not cause restrictions on the bridge and that the bridge's current conditions are reflected in the analysis.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences on the island. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly maintained throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 5,200 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of Bridge No. 865731, South Gordon Road over Las Olas Canal, which is located immediately east of this bridge, because much of the work required is similar and there will be mobilization cost savings for a contractor to perform the work at both bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The spalls on the reinforced concrete tee beams in the end spans should be repaired, with special care taken to ensure the exposed steel is cleaned properly and the concrete surface prepared correctly to ensure a long lasting repair.

Short Term Recommendation(s): **Repair spalls and delaminations on beams.**			Cost
Design [1]			$ 8,000.00
Construction			$ 13,000.00
Bridge Construction [2]	$	10,000.00	
Maintenance of Traffic [3]	$	3,000.00	
Construction Inspection and Administration [4]			$ 2,600.00
Contingency [5]			$ 2,600.00
		TOTAL COST	$ 26,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) $10,000 for spall repairs

(3) Daily closures for equipment and material access. Spall repair work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

LONG TERM

The abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in the next 5 years. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The existing inspection report notes that 3 piles have wide cracks with corrosion staining evident. These piles will require jackets. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

It is expected that the retaining walls adjacent to the south abutment will require work to address similar concrete deterioration. For the purposes of this report, it has been anticipated that this work would be part of a larger project, not bridge based, which would address deterioration to the bulkheads along Las Olas Boulevard.

Long Term Recommendation(s): **Repair concrete and install metalizing at abutment and bent caps.** **Install jackets at bent piles.**		Cost
Design [1]		$ 40,000.00
Construction		$ 150,000.00
Bridge Construction [2]	$ 140,000.00	
Maintenance of Traffic [3]	$ 10,000.00	
Construction Inspection and Administration [4]		$ 30,000.00
Contingency [5]		$ 30,000.00
	TOTAL COST	$ 250,000.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $3,000 per location for concrete; $12,000 per location for metalizing; Jackets: $4,000 per pile (20 piles total).

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

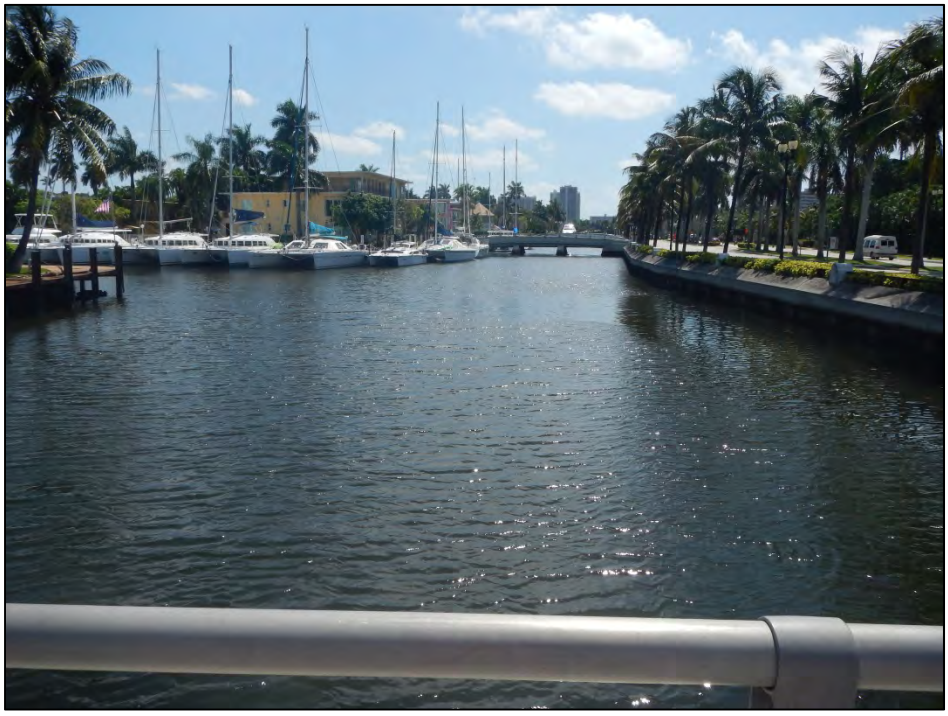
GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

West Channel

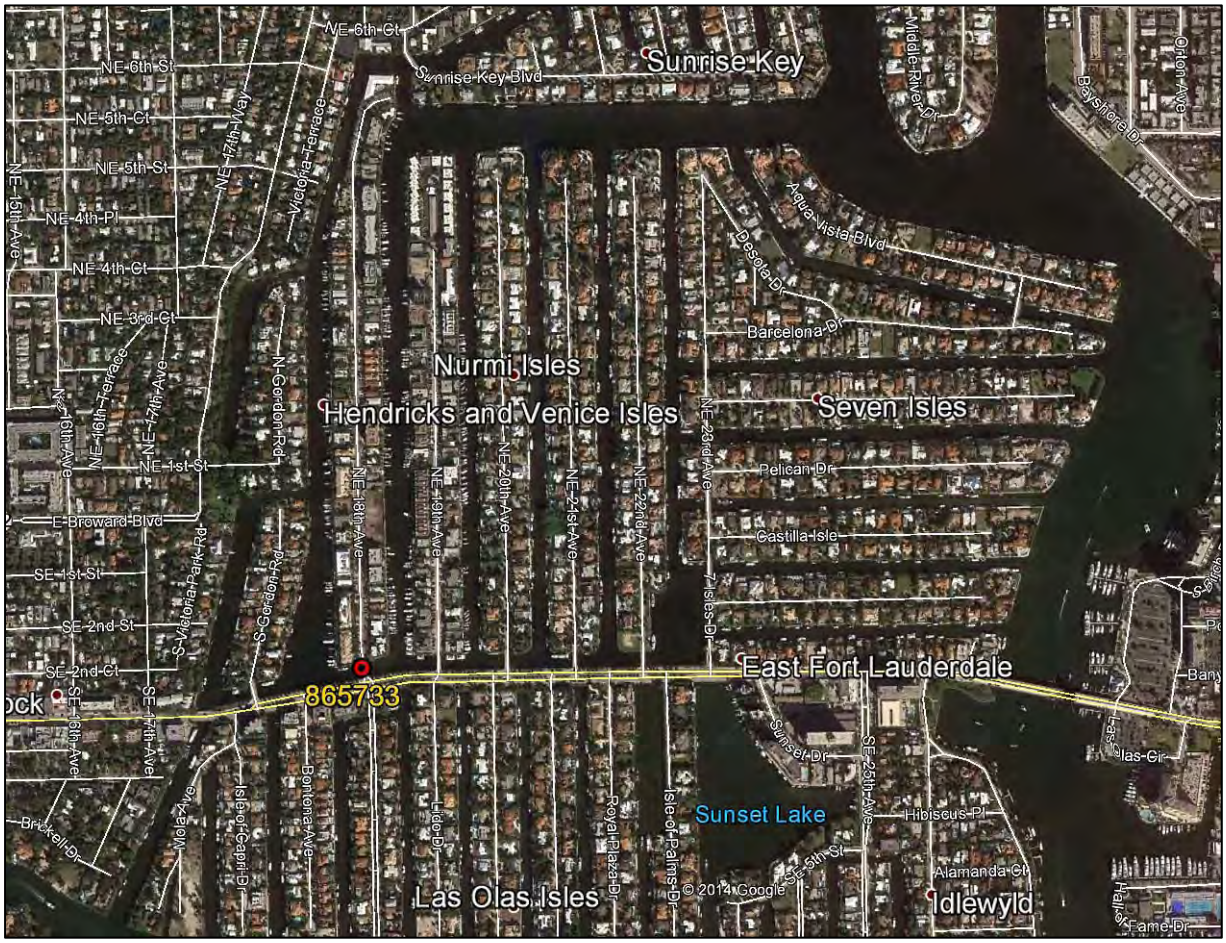


East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Longitudinal cracks in asphalt overlay above the slab unit joints.

Photo 2 – Transverse crack in the asphalt overlay at Abutment 1.

CONDITION PHOTOS

Photo 3 – Loose nuts at the southwest corner of the pedestrian railing.

Photo 4 – Deteriorated sidewalk joint.

CONDITION PHOTOS

Photo 5 – Disconnected utility pipe attached to Beam 2 in Span 3.

Photo 6 – Spall in Slab Unit 3-1.

CONDITION PHOTOS

Photo 7 – Spalls with exposed corroded rebar in Beam 3-1.

Photo 8 – Spall with exposed corroded rebar in Beam 3-2.

CONDITION PHOTOS

Photo 9 – Spalls with exposed corroded rebar in Beam 1-2.

Photo 10 – Spall with exposed corroded rebar at Abutment 1 cap.

CONDITION PHOTOS

Photo 11 – Spall with exposed corroded rebar at Abutment 4 cap over Pile 4-1.

Photo 12 – Spall with exposed corroded rebar at Abutment 4 cap over Pile 4-5.

CONDITION PHOTOS

Photo 13 – Delamination in Bent 2 cap.

Photo 14 – Corrosion staining on Bent 2 cap.

CONDITION PHOTOS

Photo 15 – Spalled/delaminated area in Bent 2 cap.

Photo 16 – Spall with exposed corroded rebar at southeast corner of Bent 2 cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865733** Date: **07-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865733 UW Inspection Date: 5/7/2014

Bridge Name: N/A

Road Name/Number: HENDRICKS ISLE DR.

Feature Intersected: Las Olas Canal.

Location: 50 ft North of East Las Olas Blvd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6.7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		234 R/Concrete Cap
Weather:	84° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

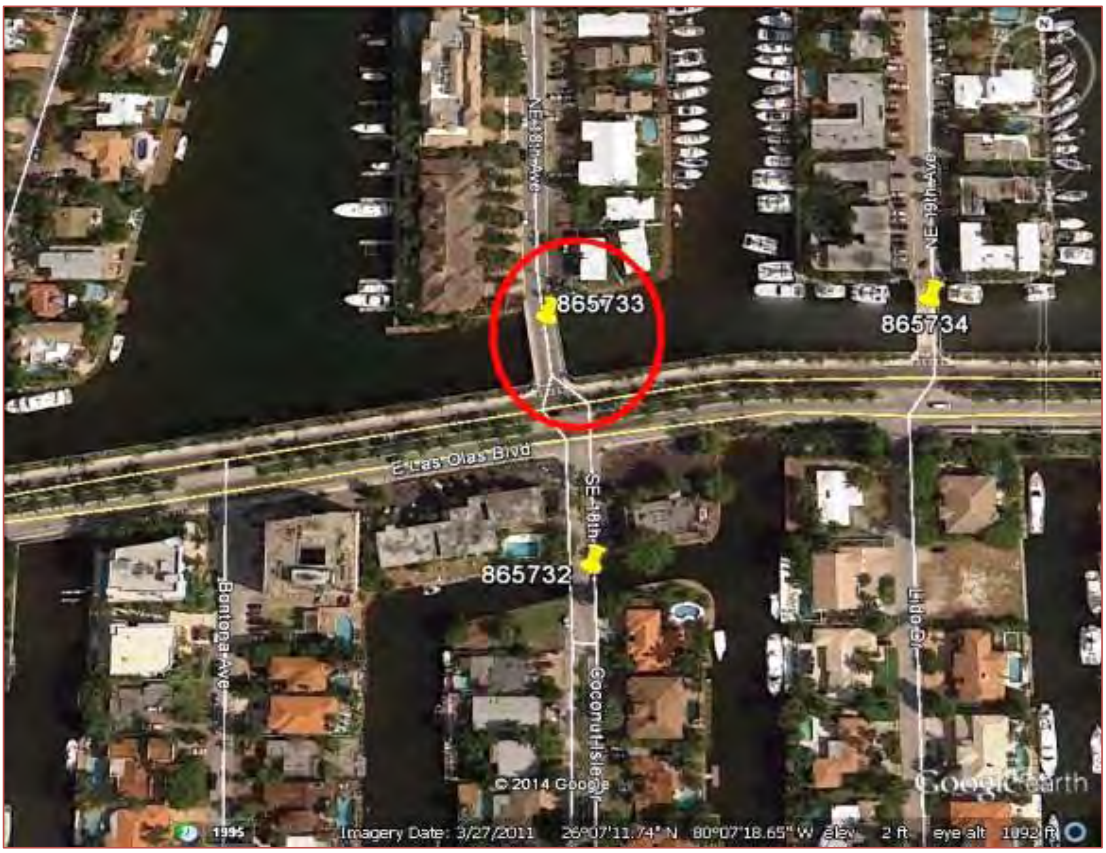
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP.
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865733** Date: **07-May-14**

A: LOCATION MAP



Description: 50 ft North of East Las Olas Blvd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **20 ea.**

Note: Several piles were cleaned at random locations.

CS-3: **3**
_Pile 3-3, 3-4 and 3-5 exhibit vertical cracks up to 12" L x 1/16" W, with corrosion bleed-out in all faces starting at the cap and extending up to 12" into the marine growth. **UW Photo 01. NO CHANGE**

215 R/Concrete Abutment **72 lf.**

Note:
_Abutment cap was inspected by the Underwater inspectors during this inspection cycle.

CS-3: **72**
_Both abutment caps exhibit full length x 30" H, delaminated area with associated cracks and corrosion bleed-out. **INCREASE**
_Abutment cap 1 over Pile 1-1, has a spall 36" x 4" x 2-3/4", with (1) exposed rebar, 75% section loss. **UW Photo 02. NO CHANGE**
_Abutment cap 4 over Pile 4-1, has a spall 36" x 8" x 3", with (1) exposed rebar, 50% section loss. **UW Photo 03. NO CHANGE**
_Abutment cap 4 over Pile 4-5, has a spall 28" x 10" x 3", with (1) exposed rebar, 50% section loss. **NO CHANGE**

234 R/Concrete Cap **72 lf.**

Note: The lower 12" section and bottom face were inspected by the underwater inspectors during this inspection cycle.

CS-3: **72**
_Both intermediate Bent Caps have full length x 30" H, delaminated areas with associated cracks and corrosion bleed-out. **UW Photo 04. NO CHANGE**
_Bent 2 cap, SE corner spall 24" x 10" x 2-1/2", with (1) exposed rebar, 50% section loss. **UW Photo 05. INCREASE**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **114 lf.**

CS-3: **114**
_All four retaining wall caps have full length x 1/32", horizontal cracks with associated delaminations and corrosion bleed-out. **UW Photo 06. NO CHANGE**

F: PHOTO SECTION

Description: Top: Pile 3-3 all faces vertical cracks with corrosion bleed-out. **UW Photo 01.**
Bottom: Abutment cap 1 over Pile 1-1, spall, with exposed rebar. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Abutment cap 4 over Pile 4-1, spall with exposed rebar. **UW Photo 03.**
Bottom: Bent caps have full length x 30" H, delaminated areas with cracks. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Bent 2 cap, SE corner spall with exposed rebar. **UW Photo 05.**
Bottom: Retaining wall caps horizontal cracks with delaminations. **UW Photo 06.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Epoxy inject the cracks on Piles 3-3, 3-4 and 3-5.

215 R/Concrete Abutment

_Remove all unsound concrete and patch. Also epoxy inject all the cracks at both abutments caps.

234 Concrete Cap

_Remove all unsound concrete and patch. Also epoxy inject all the cracks at Bent 2.

475 R/Concrete Walls

_Remove all unsound concrete and patch. Also epoxy inject all the cracks retaining wall cap as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.3	11.2
2	12.7	13.0
2.5	13.8	14.0
3	11.2	11.9
4	7.2	7.1

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 7.4 ft. and right: 7.3 ft. at mid-channel.
Maximum Channel depth: 6.7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865738 **Bridge Name:** SE 23rd Avenue over Rio Del Mar

Topside Inspection Complete: 5/07/2014

Underwater Inspection Complete: 5/07/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:	**Prepared by:**
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 99.1 ft. long, three span, prestressed concrete slab bridge built in 1966. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. sidewalks on each side. The bridge is the only way into or out of the neighborhood. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and it is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is not visible due to a simulated brick paver overlay.
- There are deck width x $^{1}/_{16}$ in. transverse cracks in overlay over the expansion joints.
- There is no roadway striping provided over the structure. See Condition Photo 1.
- In Spans 1 and 3 adjacent to the right sidewalk there are longitudinal cracks up to $^{1}/_{8}$ in. wide.

Railings/Barriers

- The end cap from the left handrail to the northwest approach barrier is missing.
- No guardrails have been provided for the structure.
- No object markers have been provided for the structure.

Expansion Joints

- The joints are not visible due to an asphalt overlay. Staining on the caps indicates the joints are leaking.
- There is no sealant or expansion material in the sidewalk joints and joints are filled with dirt and debris. See Condition Photo 2.

Utilities

- A 1 ft. diameter cast iron utility and an 8 in. diameter steel utility are attached to the deck underside adjacent to Beam 1.
- A 1 ft. diameter cast iron utility is attached to the deck underside adjacent to Beam 2.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Slab Units

- The east face of Slab Unit 2-7 exhibits a spall at Bent 3.

The sidewalks are supported by tee beams

- The sidewalks have up to 2 ft. x $^{1}/_{32}$ in. wide longitudinal cracks extending from the joints.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Intermediate Piers

- Pile 1-1 has two 1 ft. 8 in. long x $^{1}/_{32}$ in. wide vertical cracks with corrosion bleed out on the northwest corner.
- Pile 1-2 has a 1 ft. 6 in. x 8 in. x 2 in. spall in the southeast corner at the cap.
- Pile 2-1 has a 2 ft. x 6 in. delamination in the south face at the cap with corrosion bleedout, previously incorrectly noted on the north face.
- Pile 2-1 has a 1 ft. 6 in. x 1 ft. delamination with associated cracks up to 2 ft. long x $^{1}/_{16}$ in. wide area in the east face, 1 ft. below the cap. See Underwater Inspection Report Photo 1.
- Pile 2-1 has a 2 ft. long x $^{1}/_{16}$ in. wide vertical crack with corrosion bleedout in the east face. See Condition Photo 3.
- Pile 2-4 has two vertical cracks up to 3 ft. long x $^{1}/_{16}$ in. wide with corrosion bleedout in the west face from the cap extending into the marine growth. See Underwater Inspection Report Photo 2.
- Pile 3-1 has a 2 ft. long x $^{1}/_{16}$ in. wide vertical crack with corrosion bleedout in the east face from 4 in. below the cap to 3 in. into the marine growth.
- Pile 3-1 has a 1 ft. 8 in. long x $^{1}/_{32}$ in. wide crack with corrosion bleedout in the west face from the cap down.
- Pile 3-2 has a 1 ft. 6 in. long x 10 in. wide vertical crack starting from the cap along the northwest corner. See Underwater Inspection Report Photo 3.
- Pile 3-2 has a 1 ft. 5in. long x $^{1}/_{64}$ in. wide vertical crack with corrosion bleed-out, starting at the cap on the south face.
- Pile 4-2 has a 1 ft. high x 4 in. wide x 1 in. deep spall, 1 ft. 6 in. below the cap.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.

Retaining Wall

- There are minor washouts up to 3 ft. x 3 ft. x 1 ft. at the northwest, northeast, and southeast retaining walls, adjacent to the bulkheads. See Condition Photo 4.
- The joints are open up to 1 ¾ in. wide with an indication of backfill leakage that was not active at the time of inspection. See Condition Photo 5.
- The backwall at Abutment 1, east of Pile 1-5, has a 1 ft. 7 in. x $^{1}/_{32}$ in. wide vertical crack with corrosion bleed out starting from the cap. See Underwater Inspection Report Photo 4.
- The backwall at Abutment 1, east of Pile 1-1, has a 6 in. high x 5 in. wide x $2^{1}/_{2}$ wide starting from the cap.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles in the worst condition. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to the caps are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The piles at five of the six neighborhood bridges currently have some locations where there are spalls and cracks with corrosion bleed through noted. It is anticipated that the piles at all the bridges in the neighborhood will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Similarly, the abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The concrete panels behind the abutments at four of the six bridges have cracks, spalls or delaminations, some with corrosion staining present. These areas will continue to deteriorate at all of the bridges and it is anticipated that repairs to these areas will be required 11-15 years from now. It is unclear whether the repairs required will be straightforward concrete repairs or construction of a new wall that would encapsulate the abutment piles. For costing purposes, the new wall construction has been assumed. Work to address the loss of fill noted at several bridges behind the seawalls, and likely to occur at the bridges where it hasn't currently been

identified, should be performed at the same time, as the work is similar in type to that required at the abutments.

At this bridge, the beams do not show signs of deterioration. However, it is likely that some repairs will be needed by the time the other work is performed, so a cost has been applied for the repairs.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.** **Install jackets at bent piles.** **Repair abutment backwalls and retaining walls.** **Repair beams.**			Cost
Design [1]			$ 40,000.00
Construction			$ 122,000.00
Bridge Construction [2]	$	112,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 24,400.00
Contingency [5]			$ 24,400.00
TOTAL COST			$ 210,800.00

[1] Design work by same engineer for multiple bridges to be let as single contract.

[2] Metalizing: $15,000 per pier; Jackets: $4,000 per pile (8 piles total); Placing new wall at abutments: $20,000/abutment; Concrete repairs to beams: $10,000.

[3] Daily closures for equipment and material access. Work done from water, under traffic.

[4] Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

[5] Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

South Approach Looking South

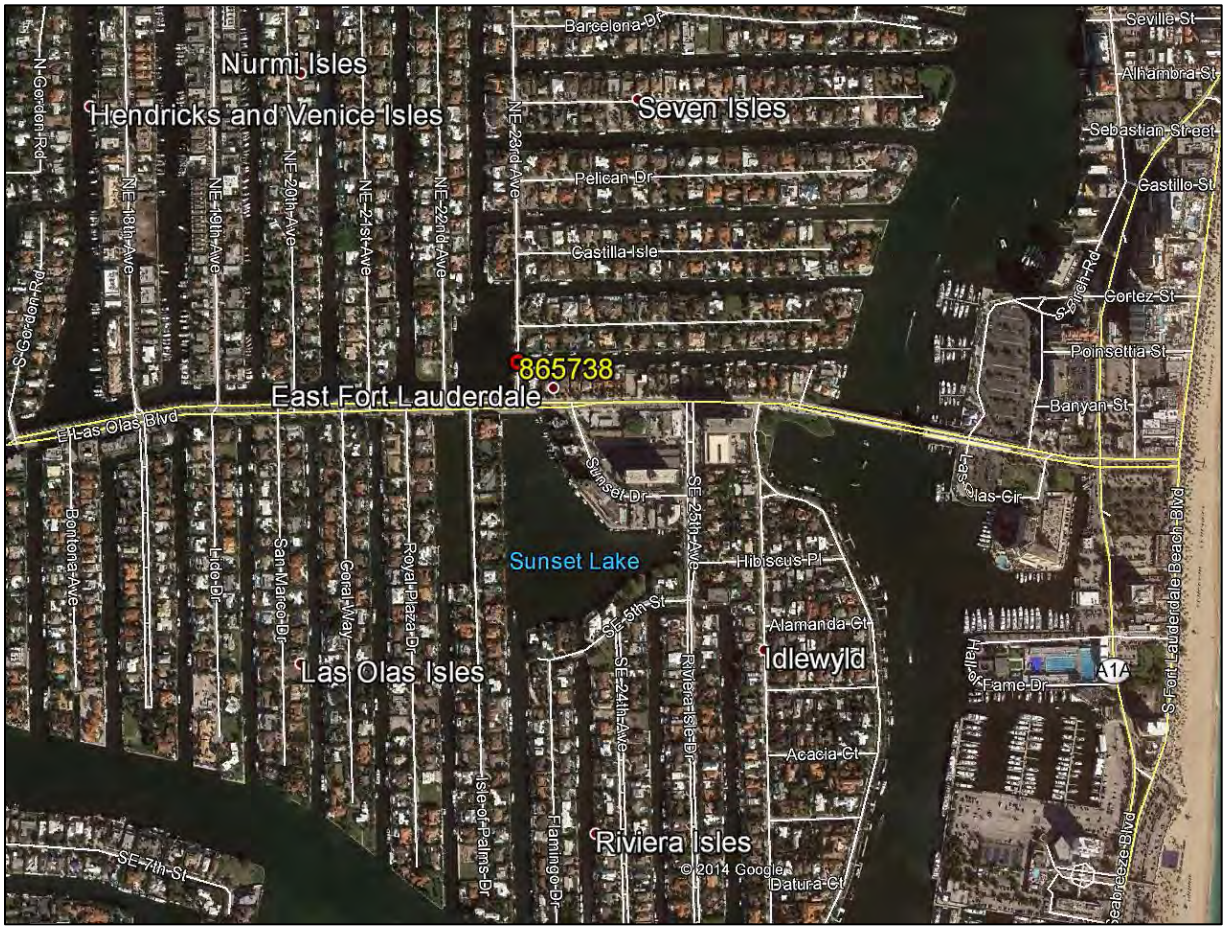
Utilities mounted to deck underside

GENERAL PHOTOS OF BRIDGE

West Channel

East Channel

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Cracks in asphalt overlay at abutment. Note no striping present.

Photo 2 – Sidewalk joints not sealed; they are filled with dirt and debris.

CONDITION PHOTOS

Photo 3 – Crack with corrosion bleedout in Pile 2-1.

Photo 4 – Backfill void at southeast corner.

CONDITION PHOTOS

Photo 5 – Open retaining wall joint and backfill void at the northeast corner.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865738** Date: **07-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865738 UW Inspection Date: 5/7/2014

Bridge Name: N/A

Road Name/Number: SE 23RD AVENUE.

Feature Intersected: RIO DE MAR.

Location: 150 ft North of East Las Olas Blvd.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	8.7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	81°		475 R/Concrete Walls
Weather:	84° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

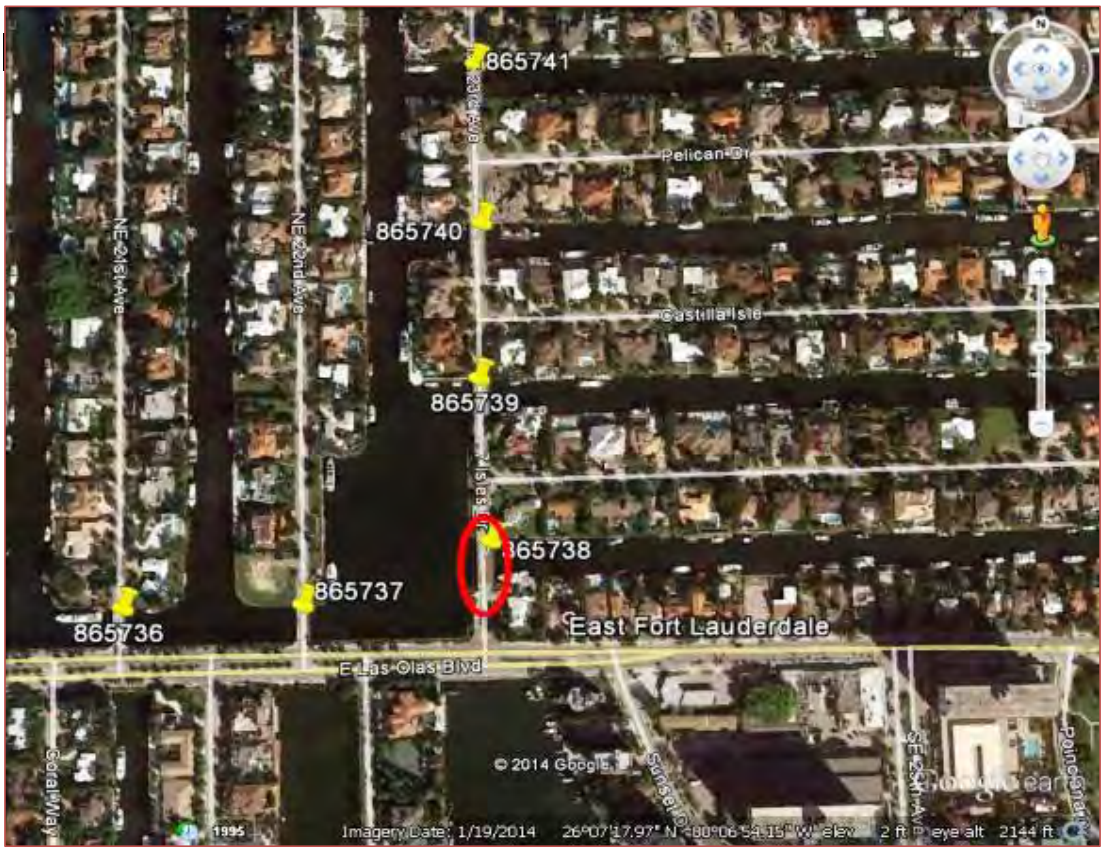
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865738** Date: **07-May-14**

A: LOCATION MAP



Description: 150 ft North of East Las Olas Blvd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **22 ea.**

Notes:
_Piles were inspected from cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **5**
_Pile 1-1, NW corner, (2) vertical cracks up to 20" x 1/32", corrosion bleed-out. **NO CHANGE**
_Pile 2-1, South face (previously documented North face) delamination 24" x 6", with corrosion bleed-out, starting at the cap. **INCREASE**
_Pile 2-1, East face delamination 18" x 12", with associated cracks up to 24" L x 1/16" W, and corrosion bleed-out. **UW Photo 01. INCREASE**
_Pile 2-4, West and East face, (2) vertical cracks up to 36" x 1/16", with corrosion bleed-out starting from the cap and extending into the marine growth. **UW Photo 02. NO CHANGE**
_Pile 3-1, West and East face, (2) vertical cracks up to 24" x 1/16", with corrosion bleed-out, starting from the cap and extending into the marine growth. **NO CHANGE**
_Pile 3-2, NW corner delamination 18" x 10", starting from the cap. **UW Photo 03. INCREASE**
_Pile 3-2, South face, (1) vertical crack 17" x 1/64", with corrosion bleed-out, starting at the cap. **NEW**

CS-2: **2**
_Pile 1-2, SE corner spall 18" x 8" x 2", starting from the cap. **NO CHANGE**
_Pile 4-2, SW corner spall 12" x 4" x 1", 18" below the cap. **NEW**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **137 lf.**

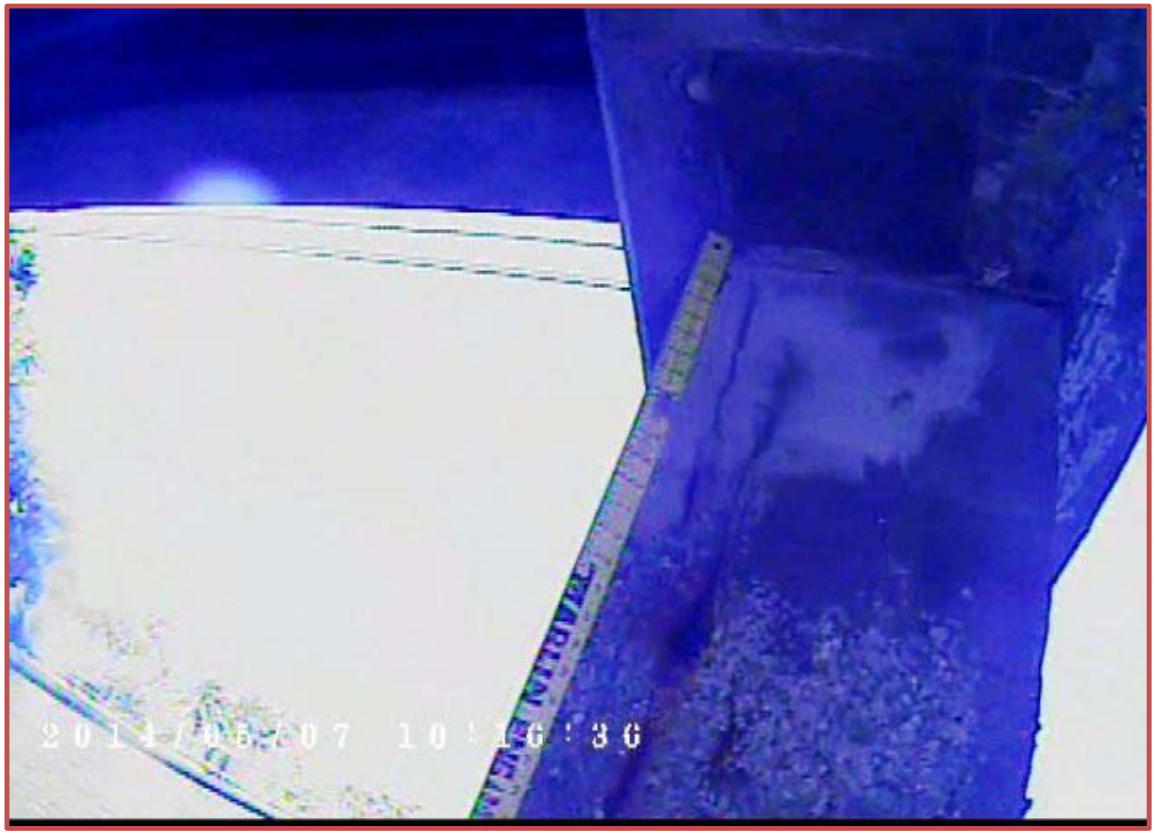
Note: Abutment backwalls were inspected from cap down by

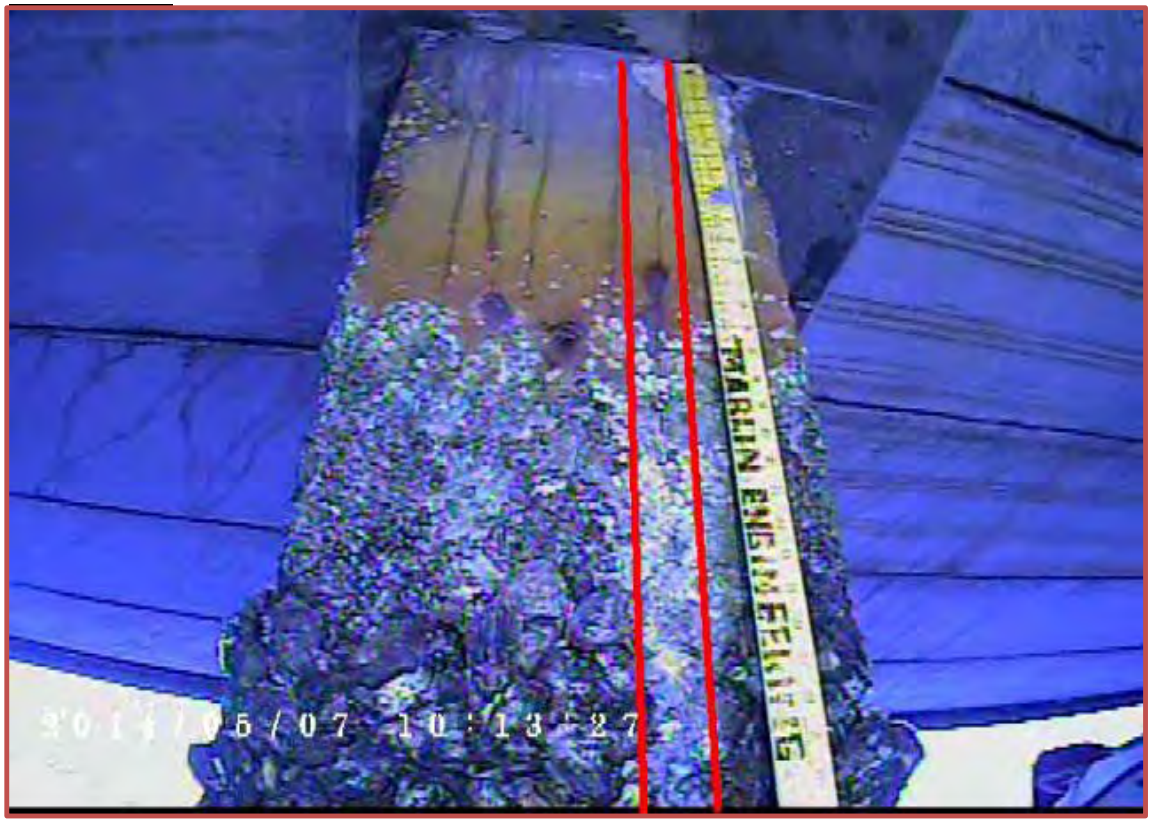
CS-3:
_Abutment 1 backwall, East side of Pile 1-5 has (1) vertical crack 19" x 1/32", with corrosion bleed-out starting from the cap. **UW Photo 04. NEW**

CS-2:
_Abutment 1 backwall, East side of Pile 1-1 has a spall 6" x 5" x 2-1/2", starting from the cap. **NEW**

CS-1:
_The joints are open up to 1-3/4" wide, no backfill leakage was observed during this inspection cycle. **NO CHANGE**

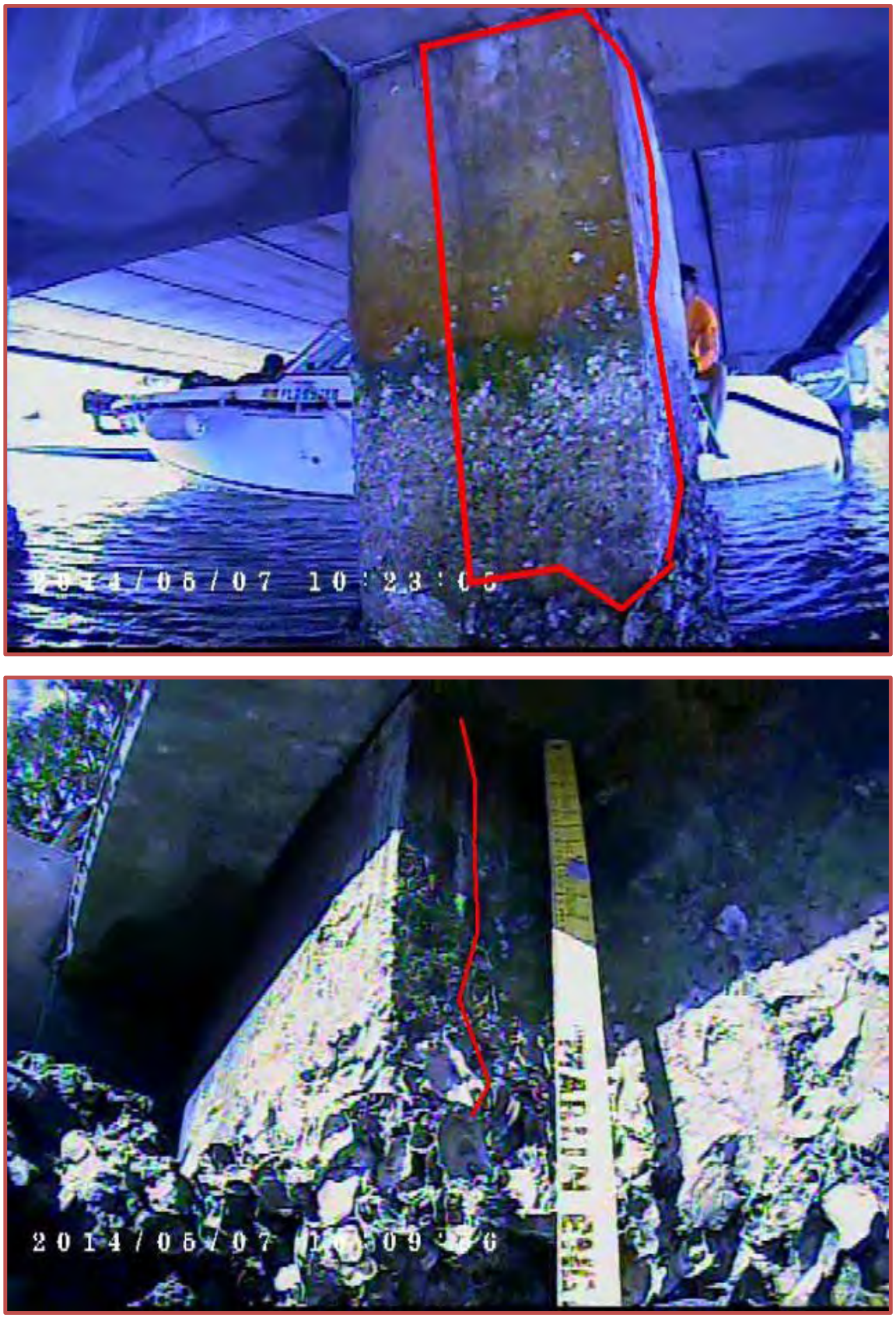
F: PHOTO SECTION





Description: Top: Pile 2-1, East face delamination, with associated cracks and CBO. **UW Photo 01.**
Bottom: Pile 2-4, West and East faces, vertical cracks with CBO. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Pile 3-2, NW corner delamination. **UW Photo 03.**
Bottom: Abutment 1 backwall, East side of P 1-5, vertical crack with CBO. **UW Photo 04.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch and seal the cracks at Piles 1-1, 2-1, 2-4, 3-1, 3-2.

475 R/Concrete Walls

_Seal the crack at Abutment 1, East side of Pile 1-5.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	8.1	8.7
2	14.4	14.7
2.5	14.1	17.0
3	13.5	15.3
4	9.1	9.4

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.4 ft. and right: 8.3 ft. at mid-channel.
Maximum Channel depth: 8.7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865739 **Bridge Name:** SE 23rd Avenue over Rio Castilla Canal

Topside Inspection Complete: 5/06/2014

Underwater Inspection Complete: 5/07/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE NO. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 99.1 ft. long, three span, prestressed concrete slab bridge built in 1966. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. There are 5 ft. sidewalks on each side. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The tops of the slab units are not visible due to an asphalt overlay.
- The deck top has up to slab length x ¼ in. longitudinal cracks in the asphalt surface over the slab unit joints indicative of relative movement between the slab units. See Condition Photo 1.
- The deck top has up to deck width x $^{1}/_{8}$ in. transverse cracks with vegetation growth in the asphalt surface over the expansion joints.

Expansion Joints

- The joints are not visible due to an asphalt overlay. Staining on the caps indicates the joints have been leaking.
- The sidewalk joint sealant is deteriorated and is filled with dirt and debris. See Condition Photo 2.

Utilities

- One 1 ft. diameter cast iron utility, one 6 in. diameter steel utility and one 6 in. diameter PVC utility are attached to the deck underside, adjacent to Beam 1.
- One 1 ft. diameter cast iron utility is attached to the deck underside, adjacent to Beam 2.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

The sidewalks are supported by tee beams.

- The underside of the east tee beam in Span 3 has a 1 ft. diameter x 1 ½ in. deep spall, approximately 5 ft. north of Bent 3 cap. This spall is from a previously removed utility anchor.
- Both sidewalks have up to 2 ft. long x $^{1}/_{32}$ in. wide longitudinal cracks extending from the joints.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- There is a tree root system protruding from the top of Abutment 4 cap at the east end. The previously noted tree has been cut down, but the roots remain. See Condition Photo 3.

Intermediate Piers

- Random piles have cracks that have been covered by grout during previous repairs.
- The piles are covered with heavy marine growth starting 1 ft. 8 in. below the caps.
- Several piles have corner scrapes up to 6 in. x 6 in. x ½ in.
- Pile 1-4, southwest corner, has an 11 in. x 5 in. x 1 ¾ in. spall, 6 in. below the cap.
- Pile 2-5, southeast corner, has a 1 ft. 6 in. x 5 in. delamination and 1 vertical crack 8 in. long x $^{1}/_{16}$ in. wide, 7 in. below the cap.
- Pile 2-6 has up to 1 ft. 10 in. x 11 in. delaminations with corrosion bleed out in all four corners starting from the cap down. See Underwater Inspection Report Photo 1.
- Piles 3-3 and 3-6 have vertical cracks up to 1 ft. 10 in. long x $^{1}/_{16}$ in. wide in one or more faces extending from the cap down 3 ft.
- Pile 3-4 has up to 1 ft. 10 in. long x $^{1}/_{32}$ in. wide vertical cracks with corrosion bleed out in all four faces, starting from the cap down.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is a timber pile between Span 3 and Abutment 4.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The asphalt in the north approach slab exhibits transverse and longitudinal cracks full length x $^{1}/_{8}$ in. wide.
- The ends of the approach slabs exhibit full width transverse cracks up to ¼ in. wide. See Condition Photo 4.
- The northwest and southwest approach sidewalks exhibit cracks up to 4 ft. x $^{1}/_{16}$ in. wide. See Condition Photo 5.

Bulkheads/Seawalls

- The seawall joints are open up to 1 in. wide with no backfill leakage.
- The northeast retaining wall has a delamination 1 ft. 6 in. starting from the abutment cap. See Underwater Inspection Report Photo 2.
- The southwest retaining wall has an area of undermining 6 ft. long x 7 in. high x 4 ft. deep. No backfill leakage was observed. See Underwater Inspection Report Photo 3.
- The southwest approach slope has a 2 ft. 6 in. x 2 ft. 4 in. x 1 ft. 8 in. washout behind the bulkhead. See Condition Photo 6.
- The southeast approach slope has a 2 ft. x 5 ft. 2 in. x 2 ft. washout behind the bulkhead.
- The northeast approach slope has a 4 ft. x 3 ft. x 2 ft. washout behind the bulkhead cap.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles in the worst condition. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The piles at five of the six neighborhood bridges currently have some locations where there are spalls and cracks with corrosion bleed through noted. It is anticipated that the piles at all the bridges in the neighborhood will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Similarly, the abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The concrete panels behind the abutments at four of the six bridges have cracks, spalls or delaminations, some with corrosion staining present. These areas will continue to deteriorate at all of the bridges and it is anticipated that repairs to these areas will be required 11-15 years from now. It is unclear whether the repairs required will be straightforward concrete repairs or construction of a new wall that would encapsulate the abutment piles. For costing purposes, the new wall construction has been assumed. Work to address the loss of fill noted at several bridges behind the seawalls, and likely to occur at the bridges where it hasn't currently been

identified, should be performed at the same time, as the work is similar in type to that required at the abutments.

At this bridge, the beams do not show signs of deterioration. However, it is likely that some repairs will be needed by the time the other work is performed, so a cost has been applied for the repairs.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.** **Install jackets at bent piles.** **Repair abutment backwalls and retaining walls.** **Repair beams.**			Cost
Design [1]			$ 40,000.00
Construction			$ 122,000.00
Bridge Construction [2]	$	112,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 24,400.00
Contingency [5]			$ 24,400.00
TOTAL COST			$ 210,800.00

[1] Design work by same engineer for multiple bridges to be let as single contract.

[2] Metalizing: $15,000 per pier; Jackets: $4,000 per pile (8 piles total); Placing new wall at abutments: $20,000/abutment; Concrete repairs to beams: $10,000.

[3] Daily closures for equipment and material access. Work done from water, under traffic.

[4] Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

[5] Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

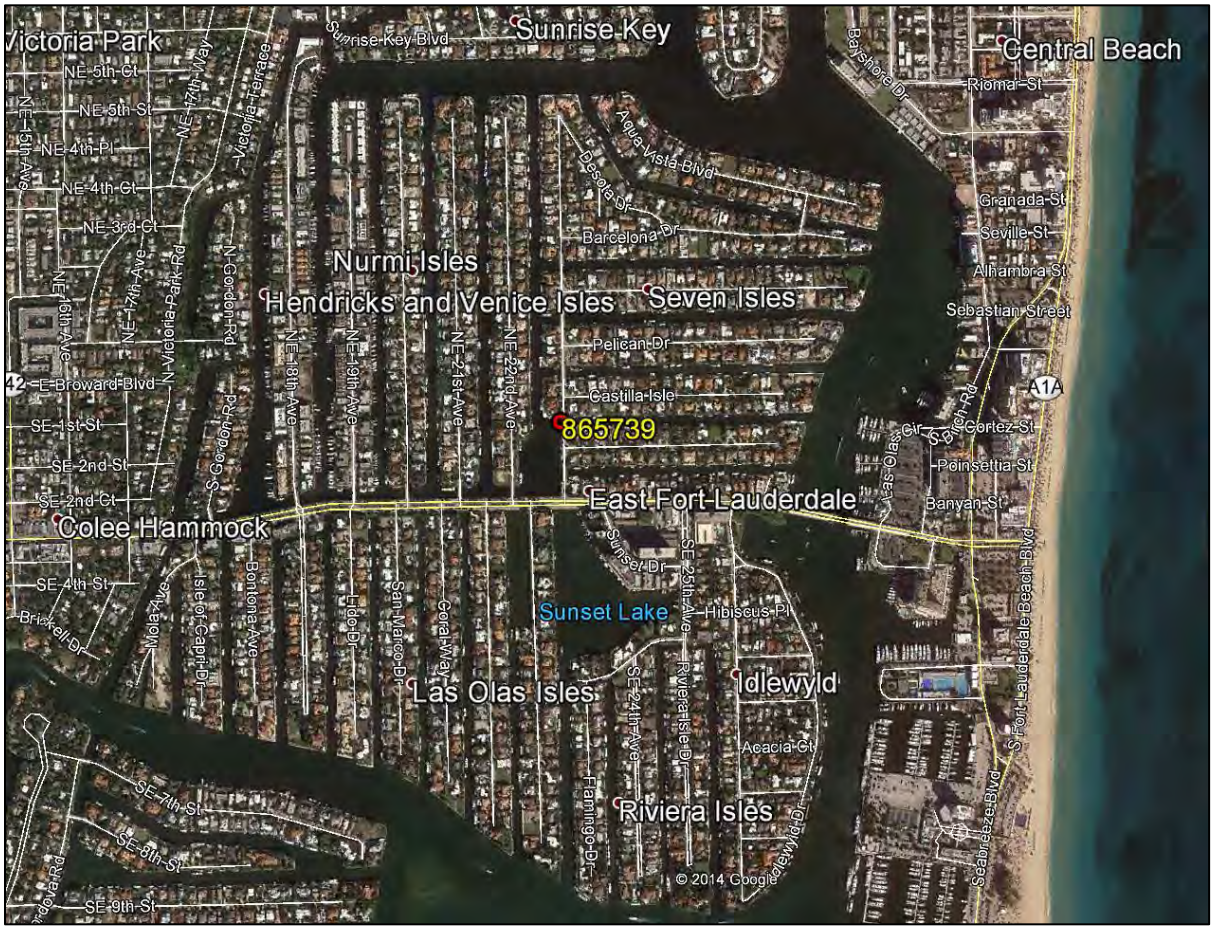
West Channel

East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Longitudinal cracks in asphalt overlay over slab unit joints.

Photo 2 – Deteriorated sidewalk joint sealant filled with dirt and debris.

CONDITION PHOTOS

Photo 3 – Tree roots at southeast corner.

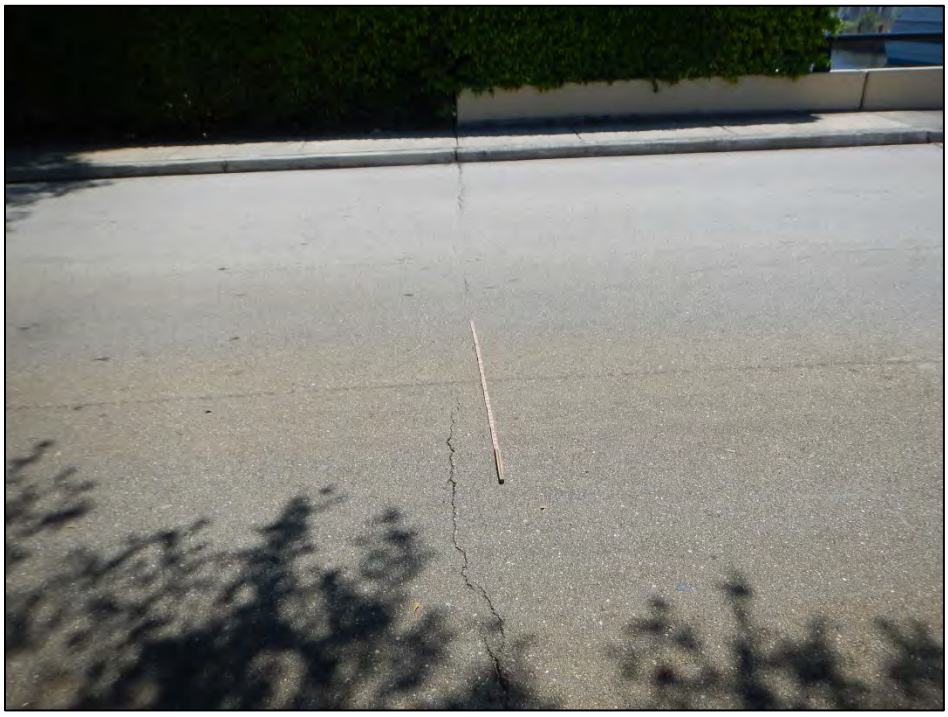


Photo 4 – Typical transverse cracks in asphalt surfacing at end of approach slab.

CONDITION PHOTOS

Photo 5 – Cracks in northwest approach sidewalk.

Photo 6 – Washout at southwest corner.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865739** Date: **07-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865739 UW Inspection Date: 5/7/2014

Bridge Name: N/A

Road Name/Number: SE 23rd Avenue.

Feature Intersected: RIO CASTILLA CANAL

Location: 550ft North of East LAS OLAS BLVD

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6.8 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	81°		475 R/Concrete Walls
Weather:	84° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

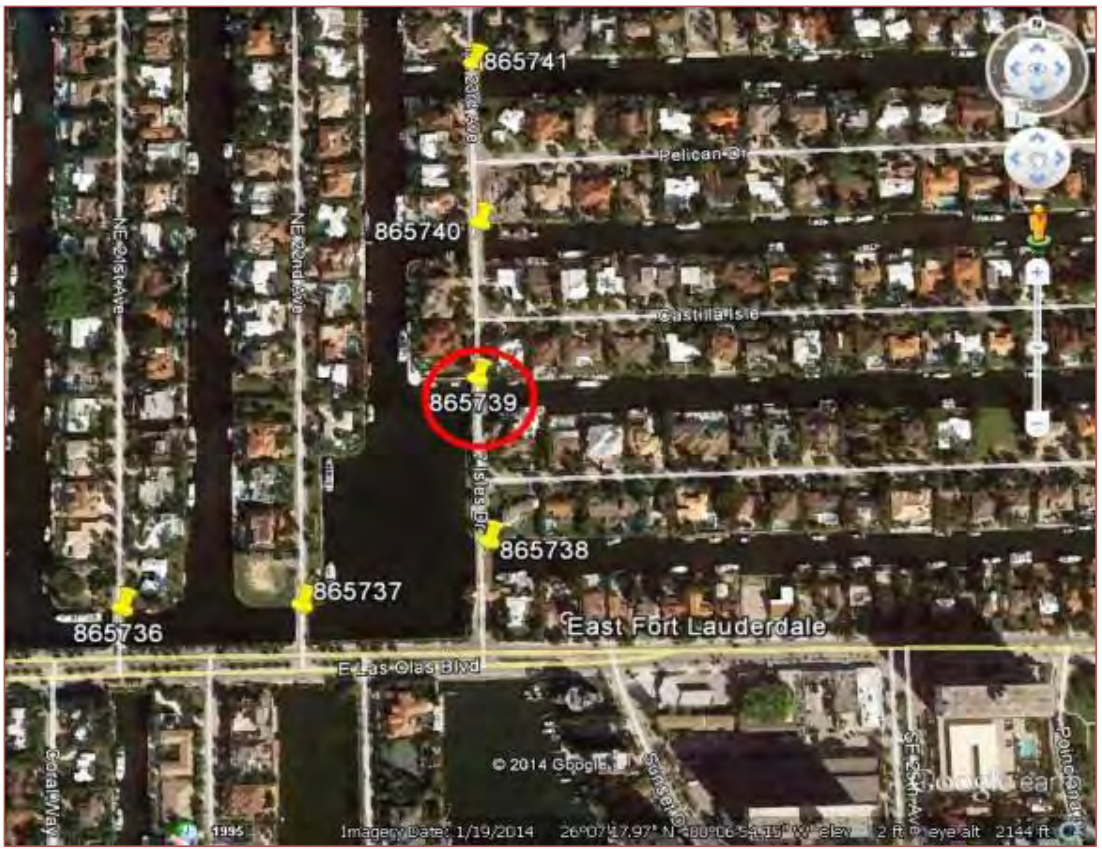
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865739** Date: **07-May-14**

A: LOCATION MAP



Description: 200 ft North of Sea Island Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 20in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **3**
_Pile 2-5, SE corner delamination 18" x 5" x 1", with (1) vertical crack 8" x 1/16", starting 7" below the cap. **NO CHANGE**
_Pile 2-6, all four corners are delaminated up to 22" x 11", with corrosion bleed-out, starting below the cap. **UW Photo 01. NO CHANGE**
_Pile 3-4, all four corners vertical cracks up to 22" x 1/16" wide, with corrosion bleed-out, starting from the cap down. **INCREASE**

CS-2: **3**
_Pile 1-4, SW corner spall 11" x 5" x 1-3/4", starting 6" below the cap. **NO CHANGE**
_Piles 3-3 and 3-6, vertical cracks up to 22" x 1/16" wide in one or more faces, starting from the cap. **NO CHANGE**

CS-1: **16**
_Several piles have corner scrapes up to 6" x 6" x 1/2". **NO CHANGE**

290 Channel **1 ea.**

CS-1: **1**
_There is a timber pile between Span 3 and abutment 4. **NEW**

475 R/Concrete Walls **136 lf.**

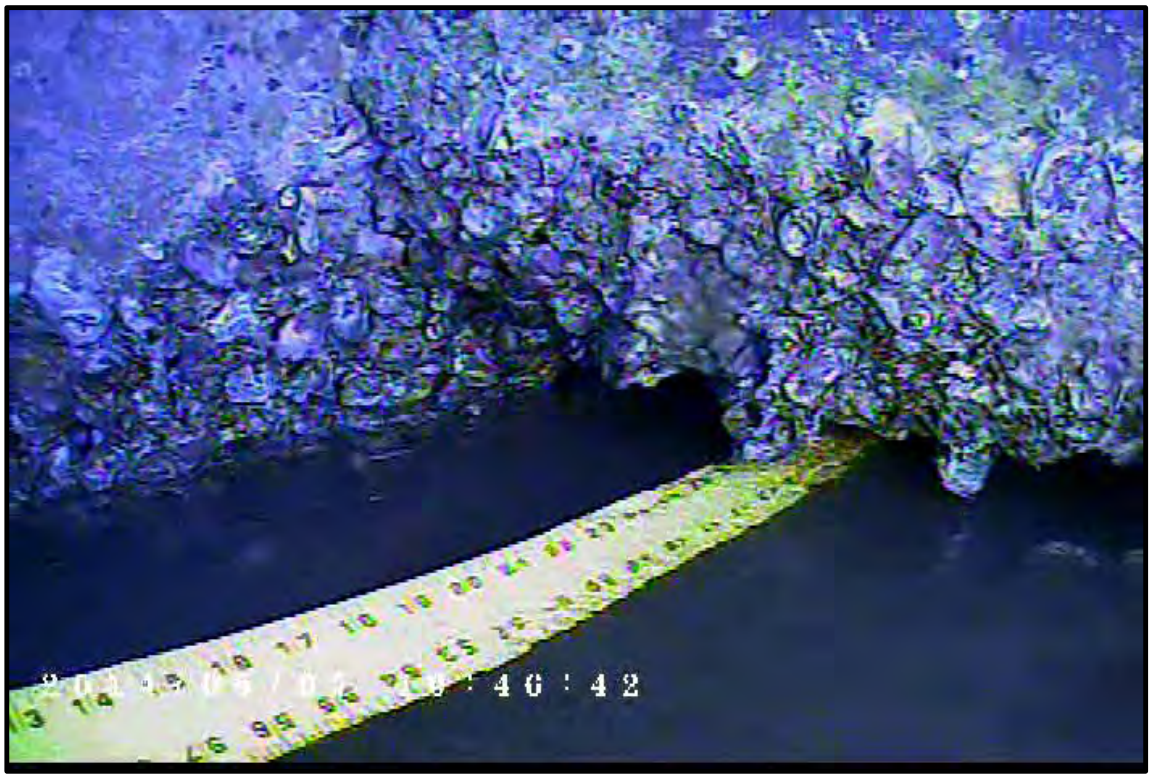
CS-3: **2**
_NE retaining wall has a delamination 18" x 11", starting from the abutment cap. **UW Photo 02. NEW.**

CS-1: **134**
_SW retaining wall adjacent to the private sector has an area of undermining 6' L x 7" H x 48" D. No backfill leakage was observed during this inspection cycle. **UW Photo 03. NEW**
_The retaining wall joints are open up to 1" wide with no backfill leakage was observed during this inspection cycle. **NO CHANGE**

F: PHOTO SECTION

Description: Top: Pile 2-6, all four corners, are delaminated with corrosion bleed-out. **UW Photo 01.**
Bottom: NE retaining wall has a delamination. **UW Photo 02.**

F: PHOTO SECTION



Description: SW retaining wall adjacent to the private sector has an area of undermining.
UW Photo 03.

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove unsound concrete and patch as needed Piles 2-5, 2-6, and 3-4.

475 R/Concrete Walls

_Remove unsound concrete and patch as needed Abutment 2 NE retaining wall.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	8.6	7.5
2	12.9	13.2
2.5	13.6	15.0
3	13.2	13.2
4	7.8	9.0

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.2 ft. and right: 8.2 ft. at mid-channel.
Maximum Channel depth: 6.8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865740 **Bridge Name:** NE 23rd Avenue over Rio Aragon Canal

Topside Inspection Complete: 5/06/2014

Underwater Inspection Complete: 5/06/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 98 ft. long, three span, prestressed concrete slab bridge built in 1968. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. There are 5 ft. sidewalks on each side. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay on the slab units has transverse cracks up to $^{1}/_{8}$ in. wide over the expansion joints and longitudinal cracks up to ¼ in. wide over the slab unit joints. See Condition Photos 1 and 2.

Railings/Barriers

- The left aluminum rail in Span 2 has a 5 ft. long area of moderate impact damage at Bent 2. See Condition Photo 3.

Expansion Joints

- There is no sealant or expansion material in the sidewalk joints and joints are filled with dirt and debris. See Condition Photo 4.

Utilities

- One 6 in. diameter PVC conduit, one 6 in. diameter cast iron conduit, one 3 in. steel conduit and one 2 in. PVC conduit is attached to the deck underside, adjacent to Beam 1. One 1 ft. 1 in. diameter cast iron utility is attached to the deck underside, adjacent to Beam 2.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- The tops of the slab units are not visible due to an asphalt overlay.
- There are span length x ¼ in. wide longitudinal cracks in the asphalt surfacing over the slab unit joints indicative of relative movement between slab units.
- There are span width x $^{1}/_{8}$ in. wide transverse cracks with minor vegetation growth in the asphalt surfacing over the expansion joints.
- The underside of Slab Unit 3-6 has a 2 ft. 2 in. x 1 ft. 6 in. x 1 ¼ in. spall in the east edge, near mid-span. See Condition Photo 5.

The sidewalks are supported by tee-beams:

- The east beam in Span 3 (Beam 3-2) has a 6 in. x 3 in. x 1 in. spall/delamination at Abutment 4. See Condition Photo 6.
- The east beam in Span 2 (Beam 2-2) has a 6 in. x 3 in. x 1 ½ in. spall at midspan.
- Both sidewalks have up to 2 ft. long x $^{1}/_{32}$ in. wide longitudinal/diagonal cracks extending from the joints.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of

the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1, north face, has a 1 ½ ft. x 8 in. delaminated area at the east end.
- Abutment 4 cap, bottom south face, has a 2 ft. x 1 ft. delaminated area between Piles 4-2 and 4-3.
- Abutment 1 backwall has an 8 in. x 3 in. x 1 in. spall, 4 ft. east of Pile 1-4.

Intermediate Pier

- The piles have corner scrapes up to ½ in. deep.
- Piles 1-4, 2-5 and 4-1 have up to 5 in. x 3 in. x ½ in. construction-related spalls.
- Pile 2-1 has a 3 in. long x $^{1}/_{32}$ in. wide vertical crack with corrosion bleedout on the north face at the cap.
- Pile 4-4 has a 1 ft. 3 in. long x $^{1}/_{32}$ in. wide vertical crack with corrosion bleedout on the south face at the cap. See Underwater Inspection Report Photo 1.
- Bent 2 cap exhibits a 3 ft. long x 4 in. high delamination at the east end of the north face. See Condition Photo 7.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The northeast, northwest, and southwest approach sidewalks have up to 4 ft. 5 in. long x $^{1}/_{16}$ in. wide transverse cracks at mid-point and adjacent to the approach roadway. See Condition Photo 8.
- The approach curbs have up to 8 in. long x $^{1}/_{32}$ in. wide cracks near the abutments and mid-span.
- The approach sidewalk joints are not sealed and are filled with dirt and debris.

Retaining Wall

- The southwest and northeast corners have up to 4 ft. x 4 ft. x 1 ft. areas of erosion adjacent to the bulkheads.
- The backwall at Abutment 1 east of Pile 1-4 exhibits an 8 in. x 3 in. x 1 in. spall. See Underwater Inspection Report Photo 2.
- The backwall at Abutment 4 exhibits hollow sounding areas and multiple cracks up to $^{1}/_{16}$ in. wide with corrosion bleedout between the piles. See Underwater Inspection Report Photo 3.
- The retaining wall joints are open up to 1 in. wide with an indication of backfill leakage that was not active at the time of inspection.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in satisfactory to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and caps in the worst condition. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The piles at five of the six neighborhood bridges currently have some locations where there are spalls and cracks with corrosion bleed through noted. It is anticipated that the piles at all the bridges in the neighborhood will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Similarly, the abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The concrete panels behind the abutments at four of the six bridges have cracks, spalls or delaminations, some with corrosion staining present. These areas will continue to deteriorate at all of the bridges and it is anticipated that repairs to these areas will be required 11-15 years from now. It is unclear whether the repairs required will be straightforward concrete repairs or construction of a new wall that would encapsulate the abutment piles. For costing purposes, the new wall construction has been assumed. Work to address the loss of fill noted at several bridges behind the seawalls, and likely to occur at the bridges where it hasn't currently been

identified, should be performed at the same time, as the work is similar in type to that required at the abutments.

At this bridge, the beams do not show signs of deterioration. However, it is likely that some repairs will be needed by the time the other work is performed, so a cost has been applied for the repairs.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.** **Install jackets at bent piles.** **Repair abutment backwalls and retaining walls.** **Repair beams.**			Cost
Design [1]			$ 40,000.00
Construction			$ 122,000.00
Bridge Construction [2]	$	112,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 24,400.00
Contingency [5]			$ 24,400.00
		TOTAL COST	$ 210,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier; Jackets: $4,000 per pile (8 piles total); Placing new wall at abutments: $20,000/abutment; Concrete repairs to beams: $10,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

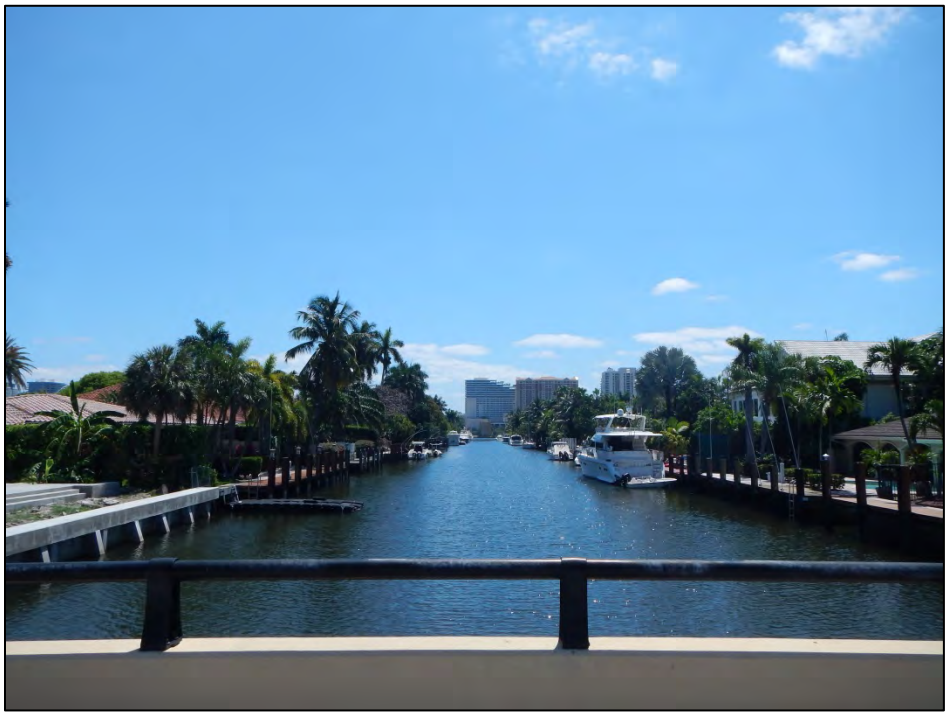
GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

West Channel

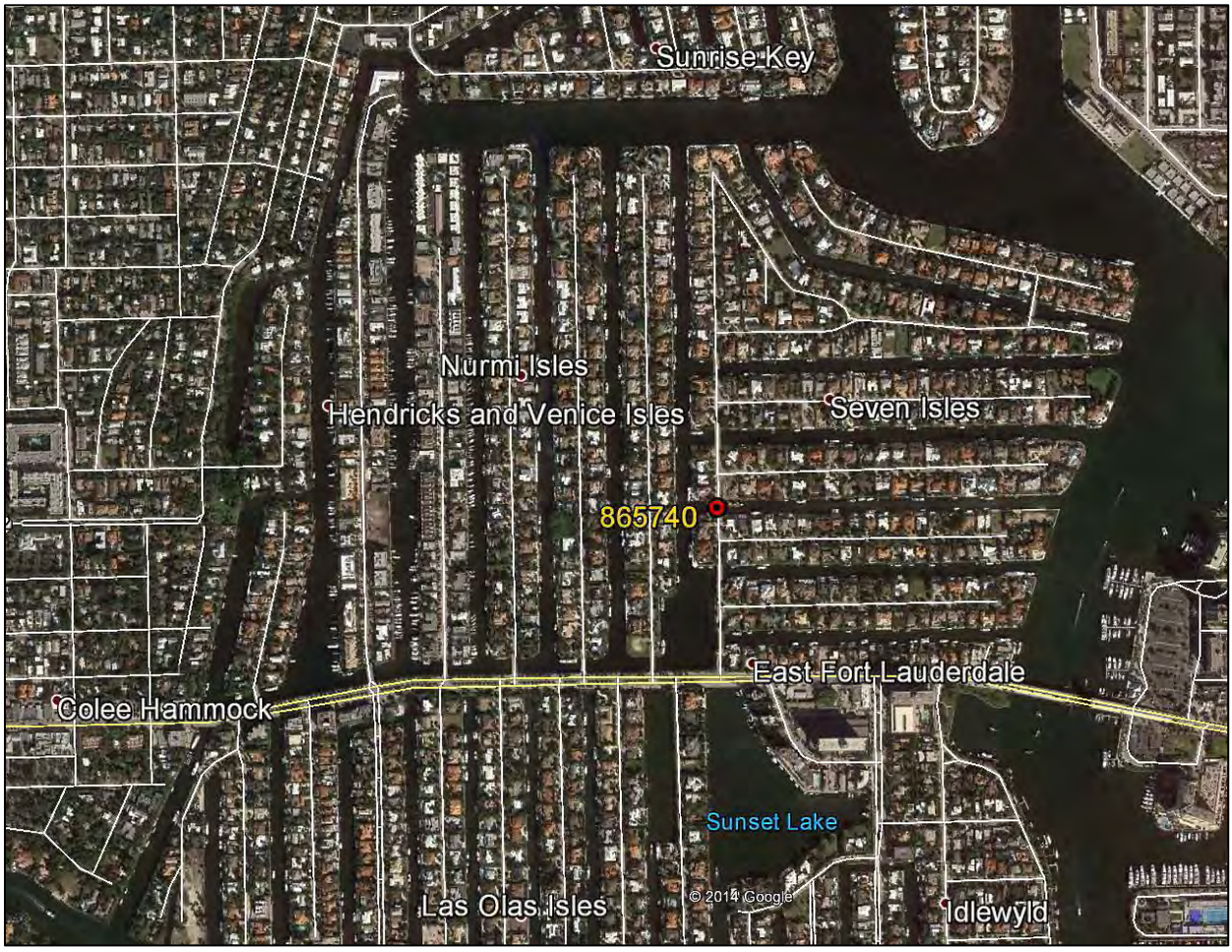


East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Transverse cracks in asphalt overlay at Abutment 1.

Photo 2 – Longitudinal cracks in asphalt overlay in Span 1.

CONDITION PHOTOS

Photo 3 – Impact damage to aluminum rail in Span 2.

Photo 4 – Sidewalk joints filled with dirt and debris.

CONDITION PHOTOS

Photo 5 – Spall in Slab Unit 3-6.

Photo 6 – Spall in Beam 3-2 at Abutment 4.

CONDITION PHOTOS

Photo 7 – Delamination in east end of north face of Bent 2 cap.

Photo 8 – Crack in southwest approach sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865740** Date: **06-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865740 UW Inspection Date: 5/6/2014

Bridge Name: N/A

Road Name/Number: NE 23rd Ave

Feature Intersected: RIO ARAGON CANAL

Location: 900ft North of East Las Olas Blvd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		475 R/Concrete Walls
Water Temp.:	82°		290 Channel
Weather:	84° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

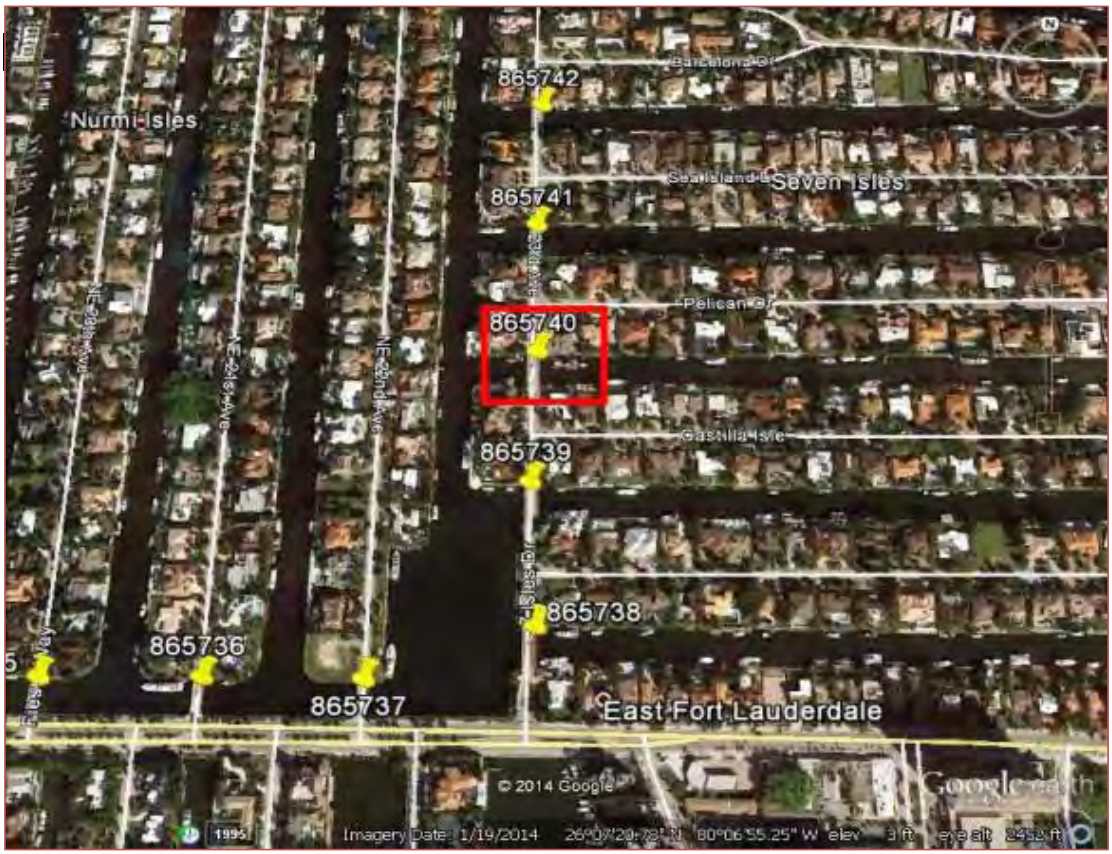
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

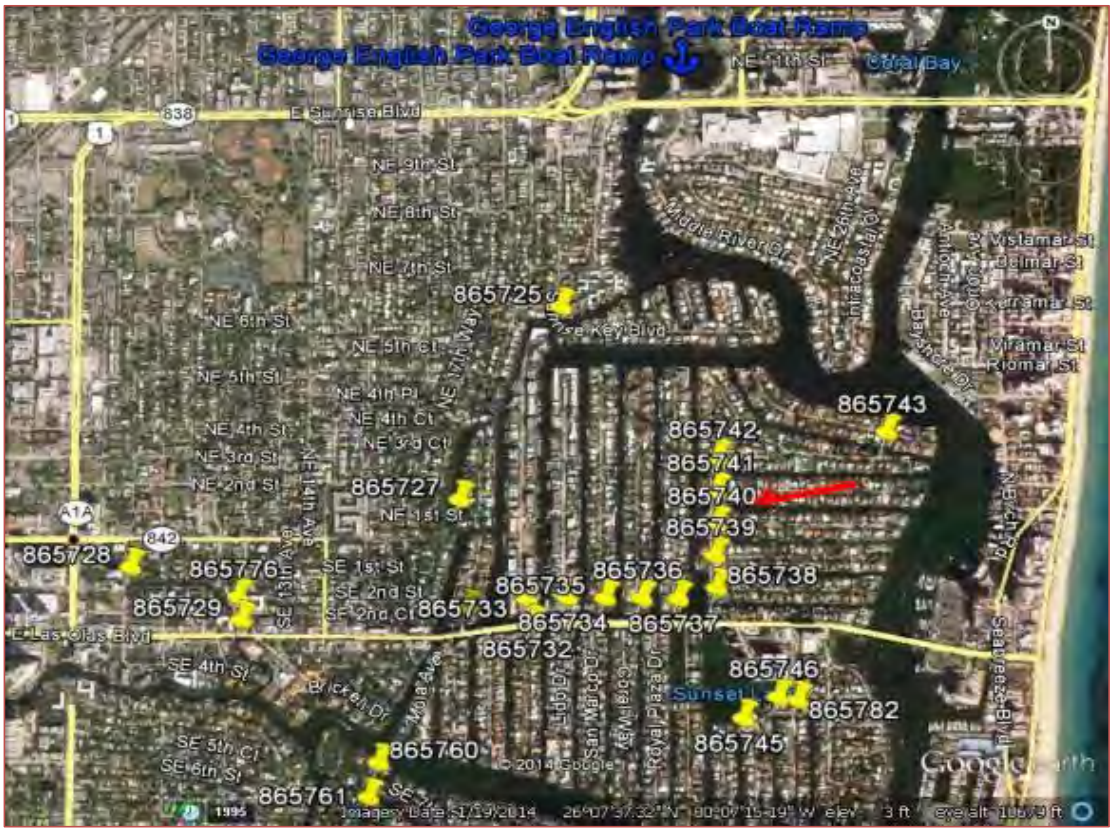
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 2/16/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865740** Date: **06-May-14**

A: LOCATION MAP





Description: 900ft North of East Las Olas Blvd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **22 ea.**

Notes: Several Pile were cleaned at random locations.

CS-3: **2**
_Pile 2-1, North face at the cap, vertical crack 3" x 1/32", with corrosion bleed-out. **NO CHANGE**
_Pile 4-4, South face at the cap, spall/delamination 14" x 3" x 1", with corrosion bleed-out. **UW Photo 01. INCREASE**

CS-2: **3**
_Piles 1-4, 2-5 and 4-1 have up to 5" x 3" x 1/2", construction-related corner spalls. **NO CHANGE**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

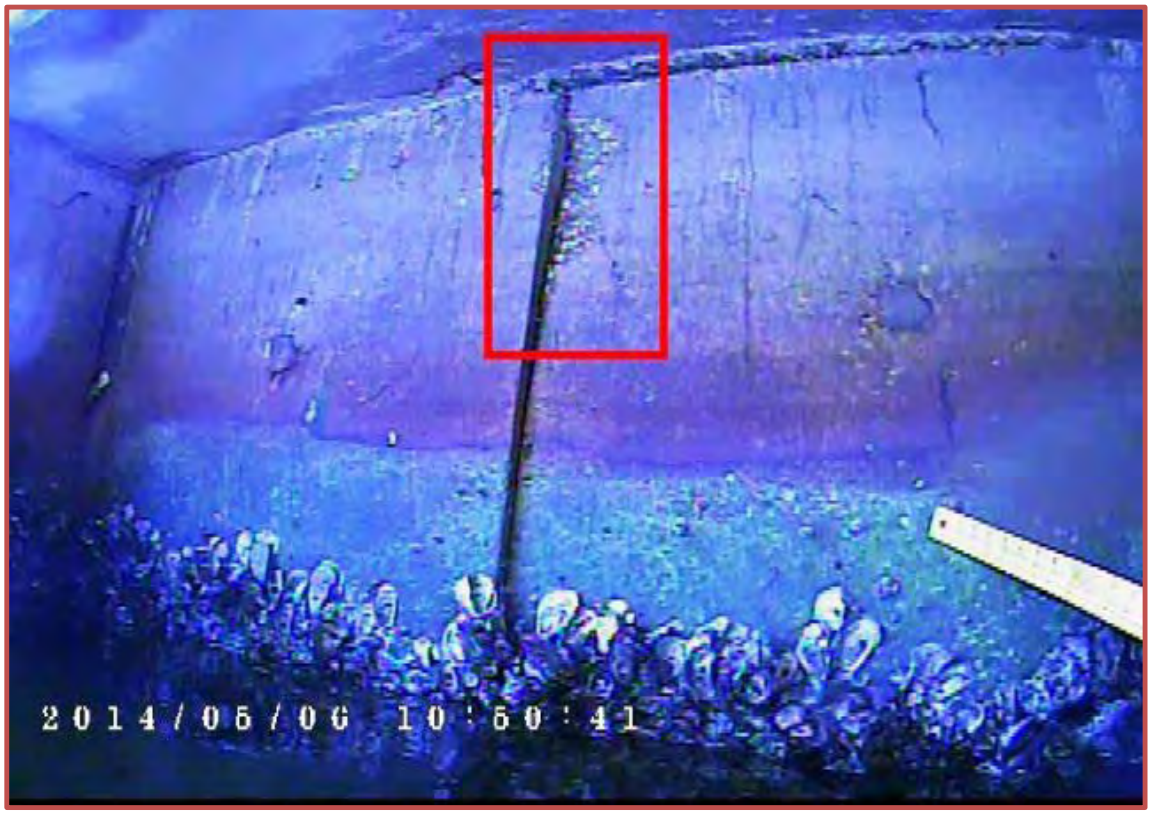
475 R/Concrete Walls **137 lf**

Notes: The retaining walls inspection was conducted from the Abutment Cap down.

CS-1:
_The retaining wall joints are open up to 1" wide. No backfill leakage was observed during this inspection cycle. **NO CHANGE**

CS-3: **50lf**
_Abutment 1 backwall east of Pile 1-4, spall 8" x 3" x 1". **UW Photo 02. NO CHANGE**
_Abutment 4 backwall exhibit hollow sounding areas and multiple cracks up to 1/16", wide with corrosion bleed-out, between the piles. **UW Photo 03. NEW**

F: PHOTO SECTION



Description: Top: Pile 4-4, South face at the cap, spall/delamination. **UW Photo 01.**
Bottom: Abutment 1 backwall east of Pile 1-4, spall. **UW Photo 02.**

F: PHOTO SECTION

Description: Abutment 4 backwall exhibits hollow sounding areas and multiple cracks. **UW Photo 03.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch as needed Pile 4-4.

475 R/Concrete Walls

_Epoxy inject all the cracks at Abutment 4 retaining backwall as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.5	9.9
2	14.8	14.9
2.5	15.8	16.0
3	14.7	15.5
4	10.4	11.5

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 9.3 ft. and right: 9 ft. at mid-channel.
Maximum Channel depth: 7 ft. (low tide)

BRIDGE INSPECTION REPORT

Bridge Number: 865741 **Bridge Name:** NE 23rd Avenue over Rio Toledo Canal

Topside Inspection Complete: 5/06/2014

Underwater Inspection Complete: 5/05/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 98.1 ft. long, three span, prestressed concrete slab bridge built in 1969. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. sidewalks on each side. The bridge is the only way into or out of the neighborhood. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a January 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has intermittent span length x up to ¼ in. wide longitudinal cracks over the slab unit joints. See Condition Photo 1.
- The asphalt along the longitudinal cracks adjacent to the right sidewalk is beginning to ravel. See Condition Photo 2.

Railings/Barriers

- Aluminum handrail Post 1-3 left is missing the northeast and southwest anchor bolt nuts. See Condition Photo 3.
- The aluminum handrail pipe does not extend into Post 2-3 left. See Condition Photo 4.

Expansion Joints

- The sidewalk joint sealant is deteriorated and the joints are filled with dirt and debris. See Condition Photo 5.

Utilities

- A 5 in. diameter steel utility, a 7 ½ in. diameter steel utility, a 2 in. diameter PVC conduit and a 1 in. diameter PVC conduit all are supported by hangers anchored to the underside of the west tee beam. The utilities also bear on the top of the west end of the caps.
- An 11 in. diameter steel utility is supported by hangers anchored to the underside of the east tee beam. The utility also bears on top of the east end of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- Slab Unit 1-1 has a 1 ft. x 4 in. x ½ in. spall in the west edge at mid-span.
- Slab Unit 2-7 has a 1 ft. x 4 in. delamination in the west edge at Bent 3.

The sidewalks are supported by tee beams

- Both sidewalks have up to $^{1}/_{32}$ in. wide longitudinal/diagonal cracks extending from the joints.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a 2 ft. 2 in. x 8 in. delamination in the north face over Pile 1-4. See Condition Photo 6.
- Abutment 1 cap has a 1 ft. 2 in. x 5 in. and a 3 ft. x 4 in. delamination at the east end.
- Abutment 1 cap has a 1 ft. 8 in. long x $^{1}/_{64}$ in. wide horizontal crack over Pile 1-1.
- Abutment 4 cap has a 2 ft. 6 in. x 9 in. delamination at the west end.
- Abutment 4 cap has a 2 ft. x 4 in. delamination in the lower east face.

Intermediate Bents

- Bent 2 cap has a 10 in. x 7 in. x ½ in. spall in the northeast corner.
- Pile 1-1, northwest corner, has a 1 ft. 9 in. x 11 in. delamination with $^{1}/_{32}$ in. vertical cracking with corrosion bleedout, 10 in. below the cap. See Underwater Inspection Report Photo 1.
- Pile 1-1, north face, has a 2 ft. x $^{1}/_{32}$ in. wide vertical crack, 1 ft. 7 in. below the cap.
- The piles have minor edge scrapes up to 5 in. x 4 in. x ½ in. and cracks up to 2 ft. x $^{1}/_{64}$ in. wide that extend a maximum of 8 in. below the top of the marine growth.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The left pipe rail does not penetrate into the second aluminum handrail post over the north approach slab.
- The northwest and southwest approach sidewalks exhibit a 4 ft. long x $^{1}/_{16}$ in. wide crack. See Condition Photo 7.

Retaining Wall

- The backwall of Abutment 1, adjacent to the east side of Pile 1-1, has a 2 ft. x 2 ft. delamination with corrosion bleedout. See Underwater Inspection Report Photo 2.
- The backwall of Abutment 1, adjacent to the west side of Pile 1-1 has a 1 ft. x 5 in. x 10 in. delamination with corrosion bleedout. See Underwater Inspection Report Photo 3.
- The backwall of Abutment 4 has two cracks up to $^{1}/_{32}$ in. wide with corrosion staining between Piles 4-4 and 4-5.
- The backwall of Abutment 4, behind Pile 4-5, has a delamination 2 ft. 2in. x 1 ft. 6 in. with corrosion bleedout. See Underwater Inspection Report Photo 4.
- The northeast retaining wall has a 2 ft. 2 in. x 4 in. delamination at the backwall/retaining wall junction. See Underwater Inspection Report Photo 5.
- The backwall joints are open up to 1 ¼ in. wide with no back fill leakage.
- The backwalls have several vertical cracks up to 1 ft. 6 in. long x $^{1}/_{64}$ in. wide with corrosion bleedout.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in satisfactory to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and caps in the worst condition. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The discontinuous handrail pipe at the left railing should be corrected for safety reasons. This work does not require design or construction supervision to correct. It is anticipated that the total cost to replace the rail with one of the correct size is $3,000.

LONG TERM

The piles at five of the six neighborhood bridges currently have some locations where there are spalls and cracks with corrosion bleed through noted. It is anticipated that the piles at all the bridges in the neighborhood will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Similarly, the abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The concrete panels behind the abutments at four of the six bridges have cracks, spalls or delaminations, some with corrosion staining present. These areas will continue to deteriorate at all of the bridges and it is anticipated that repairs to these areas will be required 11-15 years from now. It is unclear whether the repairs required will be straightforward concrete repairs or construction of a new wall that would encapsulate the abutment piles. For costing purposes, the new wall construction has been assumed. Work to address the loss of fill noted at several bridges behind the seawalls, and likely to occur at the bridges where it hasn't currently been

identified, should be performed at the same time, as the work is similar in type to that required at the abutments.

At this bridge, the beams do not show signs of deterioration. However, it is likely that some repairs will be needed by the time the other work is performed, so a cost has been applied for the repairs.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.** **Install jackets at bent piles.** **Repair abutment backwalls and retaining walls.** **Repair beams.**			Cost
Design [1]			$ 40,000.00
Construction			$ 122,000.00
Bridge Construction [2]	$	112,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 24,400.00
Contingency [5]			$ 24,400.00
		TOTAL COST	$ 210,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier; Jackets: $4,000 per pile (8 piles total); Placing new wall at abutments: $20,000/abutment; Concrete repairs to beams: $10,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

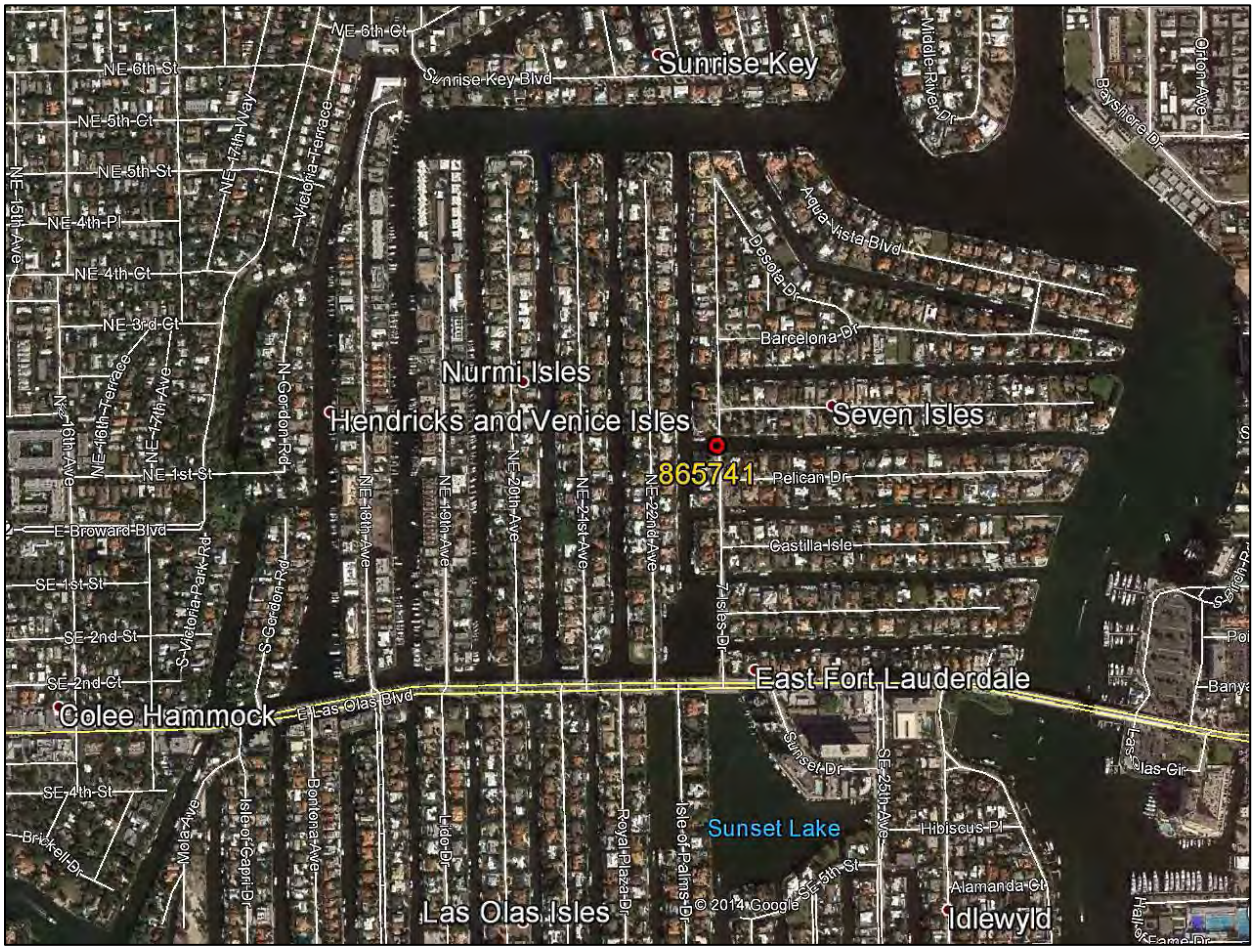
West Channel

East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Longitudinal cracks in asphalt overlay over slab unit joints.

Photo 2 – Longitudinal cracks in asphalt overlay adjacent to right sidewalk.

CONDITION PHOTOS

Photo 3 – Missing anchor bolt nuts at left handrail Post 1-3.

Photo 4 – Handrail pipe does not extend into post.

CONDITION PHOTOS

Photo 5 – Deteriorated sidewalk joint sealant; joint filled with dirt and debris.

Photo 6 – Delamination in Abutment 1 cap over Pile 1-4.

CONDITION PHOTOS

Photo 7 – Transverse crack in southwest approach sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865741** Date: **05-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865741 UW Inspection Date: 5/5/2014

Bridge Name: N/A

Road Name/Number: NE 23rd Avenue

Feature Intersected: RIO TOLEDO CANAL

Location: 200 ft North of PELICAN ISLE.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.2 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	80°		475 R/Concrete Walls
Weather:	84° Sunny		
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

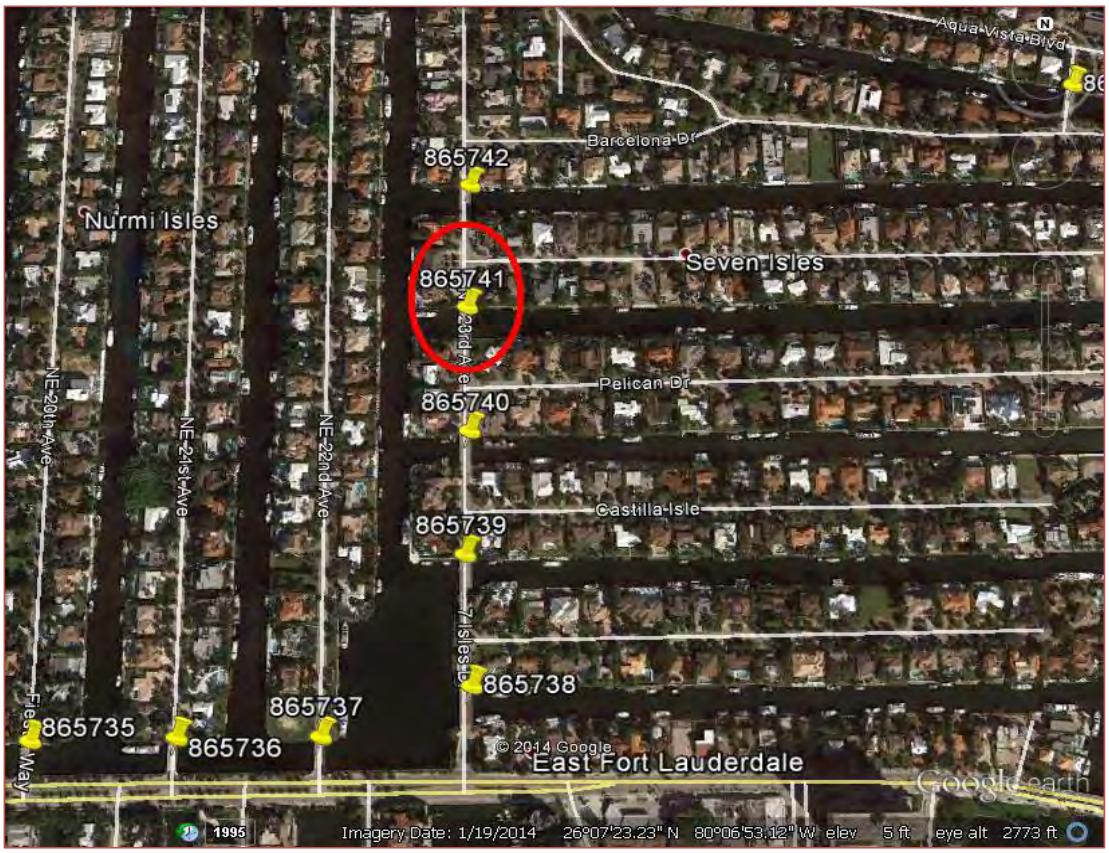
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSED No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865741** Date: **05-May-14**

A: LOCATION MAP



Description: 200 ft North of PELICAN ISLE.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Notes: Several Pile were cleaned at random locations.

CS-3: **1**
_Pile 1-1, NE corner delamination 21" x 11", with associated cracks up to 1/32", and corrosion bleed-out, 10" below the cap. **UW Photo 01. NO CHANGE**
_Pile 1-1, North face vertical crack 24" x 1/32", with corrosion bleed-out, starting 19" below the cap. **NO CHANGE**

CS-1: **21**
_The piles have minor edge scrapes up to 5" x 4" x 1/2", and cracks up to 24" x 1/64", wide that extend a maximum of 8", below the top of the marine growth. **NO CHANGE**

290 Channel	**1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls	**137 lf**

Notes: The retaining walls inspection was conducted from the Abutment Cap down.

CS-3: **137**
_The backwalls have several vertical cracks up to 18" x 1/64", with corrosion bleed-out. **INCREASE**
_Abutment 1 backwall, east side of Pile 1-1, delamination 24" x 24", with corrosion bleed-out. **UW Photo 02. INCREASE**
_Abutment 1 backwall, west side of Pile 1-1, delamination 17" x 10", with corrosion bleed-out. **UW Photo 03. NEW**
_Abutment 4 backwall, between Piles 4-4 and 4-5 has (2) cracks up to 1/32" W, corrosion bleed-out. **NO CHANGE**
_Abutment 4 backwall, behind Pile 4-5, delamination 26" x 18", with corrosion bleed-out. **UW Photo 04. NEW**
_Abutment 4, at the junction with the NE retaining wall, delamination 26" x 4", starting at the cap. **UW Photo 05. INCREASE**
_The retaining wall joints are open up to 1-1/4", wide. No backfill leakage was observe during this inspection cycle. **NO CHANGE**

F: PHOTO SECTION

Description: Top: Pile 1-1, NE corner delamination with associated cracks. **UW Photo 01.**
Bottom: Abutment 1 backwall, east side of Pile 1-1, delamination. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Abutment 1 backwall, west side of Pile 1-1,delamination. **UW Photo 03.**
Bottom: Abutment 4 backwall, behind Pile 4-5, delamination. **UW Photo 04.**

F: PHOTO SECTION

Description: Abutment 4, NE retaining wall at the junction has a delamination. **UW Photo 03.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch Pile 1-1.

475 R/Concrete Walls

_Remove all unsound concrete and patch and epoxy inject all the cracks at abutments as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.9	10.9
2	14.4	14.6
2.5	15.8	15.7
3	13.9	13.8
4	9.1	9.7

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 8.6 ft. and right: 8.6 ft. at mid-channel.
Maximum Channel depth: 7.2 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865742 **Bridge Name:** NE 23rd Avenue over Rio Giraldo Canal

Topside Inspection Complete: 5/06/2014

Underwater Inspection Complete: 5/06/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 98.1 ft. long, three span, prestressed concrete slab bridge built in 1968. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. sidewalks on each side. The bridge is the only way into or out of the neighborhood. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has intermittent longitudinal cracks up to span length x ¼ in. wide over the slab unit joints. See Condition Photo 1.
- There is a 5 ft. x 3 ft. area of spilled concrete adjacent to the right sidewalk at Abutment 1. See Condition Photo 2.
- The asphalt surfacing has transverse cracks over the intermediate bents at the joints. See Condition Photo 3.

Expansion Joints

- The joints are not visible due to an asphalt overlay. Only the left and right sidewalks are visible. The sealant in the sidewalk joints is deteriorated and the joint is filled with dirt and debris. See Condition Photo 4.

Utilities

- A 5 in. diameter steel utility, a 7 ½ in. diameter steel utility, a 2 in. diameter PVC conduit and a 1 in. diameter PVC conduit are supported by hangers anchored to the underside of the west tee beam.
- An 11 in. diameter steel utility is supported by hangers anchored to the underside of the east tee beam.
- All of the above utilities bear on top of the ends of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

The sidewalks are supported by tee beams

- Both sidewalks have up to $^{1}/_{32}$ in. wide longitudinal/diagonal cracks extending from the expansion joints.
- One of the PVC conduits under the west tee beam is separated and hanging down in Span 2.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have up to $^{1}/_{32}$ in. wide vertical/horizontal cracks.
- Abutment 1 has a 1 ft. x 1 ft. x 2 in. delamination/spall with exposed rebar in the west end. Also, exposed rebar exists on the bottom of cap between Piles 1-1 and 1-2. Rebar is 1 in. diameter with ½ in. exposed. See Condition Photo 5.
- Abutment 1 cap has a 2 ft. 4 in. x 3 in. delamination over Pile 1-1.
- Abutment 1 cap has a 4 ft. x 7 in. x 2 in. spall/delamination with corrosion staining over Pile 1-3. See Condition Photo 6.
- Abutment 1 cap has a 4 ft. x 6 in. x 2 in. spall/delamination and a 2 in. long piece of exposed rebar due to insufficient cover in the east end. See Condition Photo 7.
- Abutment 1 cap has an 8 in. x 4 in. x 1 ½ in. spall between Piles 1-3 and 1-4.
- Abutment 4 cap has a 1 ft. 8 in. x 4 in. x 4 in. spall/delamination in the west end at the bulkhead.

Intermediate Bents

- Bent 2 cap has a 1 ft. 11 in. x 11 in. x 1 in. spall in the south face between Piles 2-5 and 2-6. See Condition Photo 8.
- Bent 3 cap has a 1 ft. 4 in. x 4 in. delamination in the bottom north edge over Pile 3-6. See Condition Photo 9.
- There are corner scrapes up to 4 in. x 3 in. x ½ in. on many of the piles.
- Pile 1-1 has a 1 ft. 6 in. x 4 in. x 1 in. spall/delamination in the northwest corner at the cap. See Underwater Inspection Report Photo 1.
- Pile 1-3 has a 3 ft. x 10 in. delamination with associated cracking up to ¼ in. wide with corrosion staining in all four faces starting at the cap. See Condition Photo 6 and Underwater Inspection Report Photo 2.
- Pile 2-1, southeast corner has a 2 ft. 8 in. x 1 ft. 1 in. x 2 $^{1}/_{2}$ in. spall/delamination with corrosion staining, associated $^{1}/_{16}$ in. wide cracks and one (1) exposed strand with 90% remaining section, starting from the cap down. See Condition Photo 10 and Underwater Inspection Report Photo 3.
- Pile 3-1 has two (2) up to 1 ft. 8 in. long x $^{1}/_{32}$ in. wide vertical cracks.
- Pile 3-2 has a 3 in. x 5 in. x 1 in. spall in the southeast corner, 1 ft. below the cap.
- Pile 3-4, northeast corner has a 2 ft. 9 in. x 7 in. x 3 in. spall/delamination with corrosion staining, associated $^{1}/_{16}$ in. wide cracks and one (1) exposed strand with heavy corrosion starting from the cap down. See Underwater Inspection Report Photos 4 and 5.
- Pile 3-5 has a 3 ft. 6 in. x pile width spall/delaminations and associated cracking up to ¼ in. wide with corrosion staining in all four faces starting at the cap. See Underwater Inspection Report Photo 6.
- Pile 4-1 on the west face, starting at the cap, has one 1 ft. 6 in. x $^{1}/_{64}$ in. wide vertical cracks, extending below the high watermark.
- Pile 4-2 has up to 2 ft. 1 in. x 1 ft. 2 in. delaminations in the south and east faces starting at the cap.

- Pile 4-3 has up to 1 ft. 10 in. x 7 in. delaminations with $^{1}/_{32}$ in. wide vertical cracking in the southwest and southeast corners, starting from the cap down.
- Pile 4-4 on the northeast corner, starting at the cap has a 1 ft. x 1 in. x 1 in. spall.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach sidewalk approach barrier joints are filling with dirt, debris and vegetation.
- The southwest and northwest approach sidewalks have several cracks up to 4 ft. long x $^{1}/_{16}$ in. wide. See Condition Photo 11.
- There is a 3 ft. x 2 ft. area of spilled concrete on the south approach slab adjacent to the east sidewalk. See Condition Photo 12.

Retaining Wall

- The backwall at Abutment 1 has a 1 ft. 6 in. x 1 ft. delamination on the east side of Pile 1-2 and a 1 ft. x 1 ft. delamination with $^{1}/_{16}$ in. wide cracking with corrosion bleed out on the east side of Pile 1-3 just below the abutment cap. See Underwater Inspection Report Photo 7.
- The backwall at Abutment 1, behind Pile 1-2, has a 1 ft. 2 in. x 3 in. x 3 in. spall. See Underwater Inspection Report Photo 8.
- The southeast retaining wall has a 2 ft. 6 in. x 1 ft. delamination with corrosion stains at Pile 1-5.
- The backwall at Abutment 4, between Piles 4-3 and 4-4, 3 panels have multiple cracks up to $^{1}/_{64}$ in. wide, with corrosion bleed-out and hollow sounding area 7 ft. x 18 in.
- The northwest retaining wall has a 1 ft. 8 in. x 1 ft. delamination with corrosion bleedout at Pile 4-1.
- The northeast retaining wall has a 1 ft. 4 in. x 3 in. x 1 in. spall/delamination at Pile 4-5.
- The joints are open up to 1 ¼ in. wide with no backfill leakage.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and abutments in the worst condition. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The piles at five of the six neighborhood bridges currently have some locations where there are spalls and cracks with corrosion bleed through noted. It is anticipated that the piles at all the bridges in the neighborhood will require jackets 11-15 years from now. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Similarly, the abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

The concrete panels behind the abutments at four of the six bridges have cracks, spalls or delaminations, some with corrosion staining present. These areas will continue to deteriorate at all of the bridges and it is anticipated that repairs to these areas will be required 11-15 years from now. It is unclear whether the repairs required will be straightforward concrete repairs or construction of a new wall that would encapsulate the abutment piles. For costing purposes, the new wall construction has been assumed. Work to address the loss of fill noted at several bridges behind the seawalls, and likely to occur at the bridges where it hasn't currently been

identified, should be performed at the same time, as the work is similar in type to that required at the abutments.

At this bridge, the beams do not show signs of deterioration. However, it is likely that some repairs will be needed by the time the other work is performed, so a cost has been applied for the repairs.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.** **Install jackets at bent piles.** **Repair abutment backwalls and retaining walls.** **Repair beams.**			Cost
Design [1]			$ 40,000.00
Construction			$ 122,000.00
Bridge Construction [2]	$	112,000.00	
Maintenance of Traffic [3]	$	10,000.00	
Construction Inspection and Administration [4]			$ 24,400.00
Contingency [5]			$ 24,400.00
		TOTAL COST	$ 210,800.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier; Jackets: $4,000 per pile (8 piles total); Placing new wall at abutments: $20,000/abutment; Concrete repairs to beams: $10,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

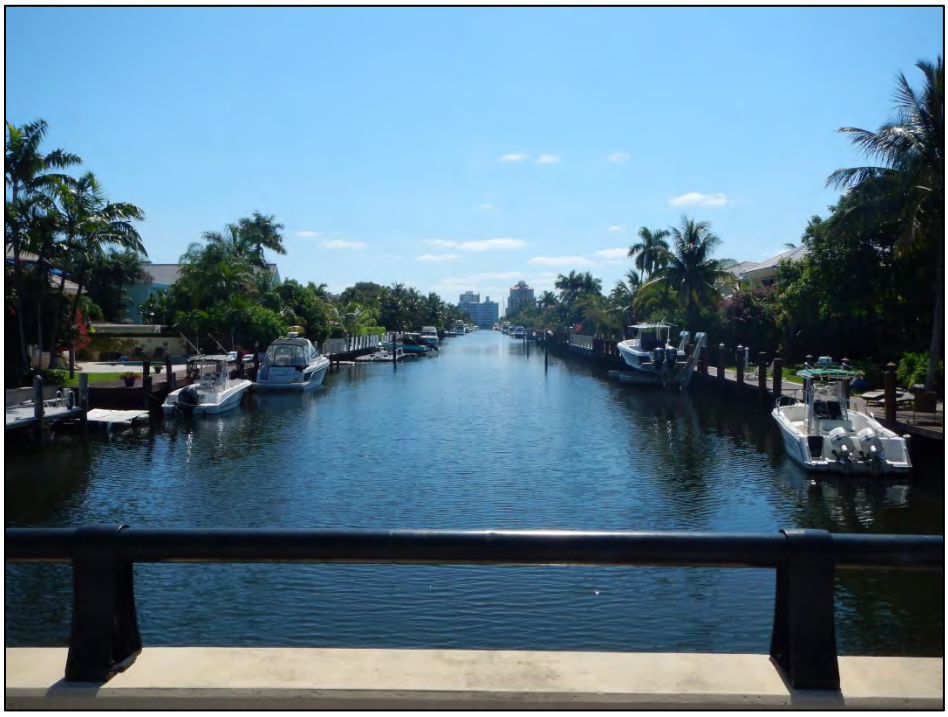
GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

West Channel

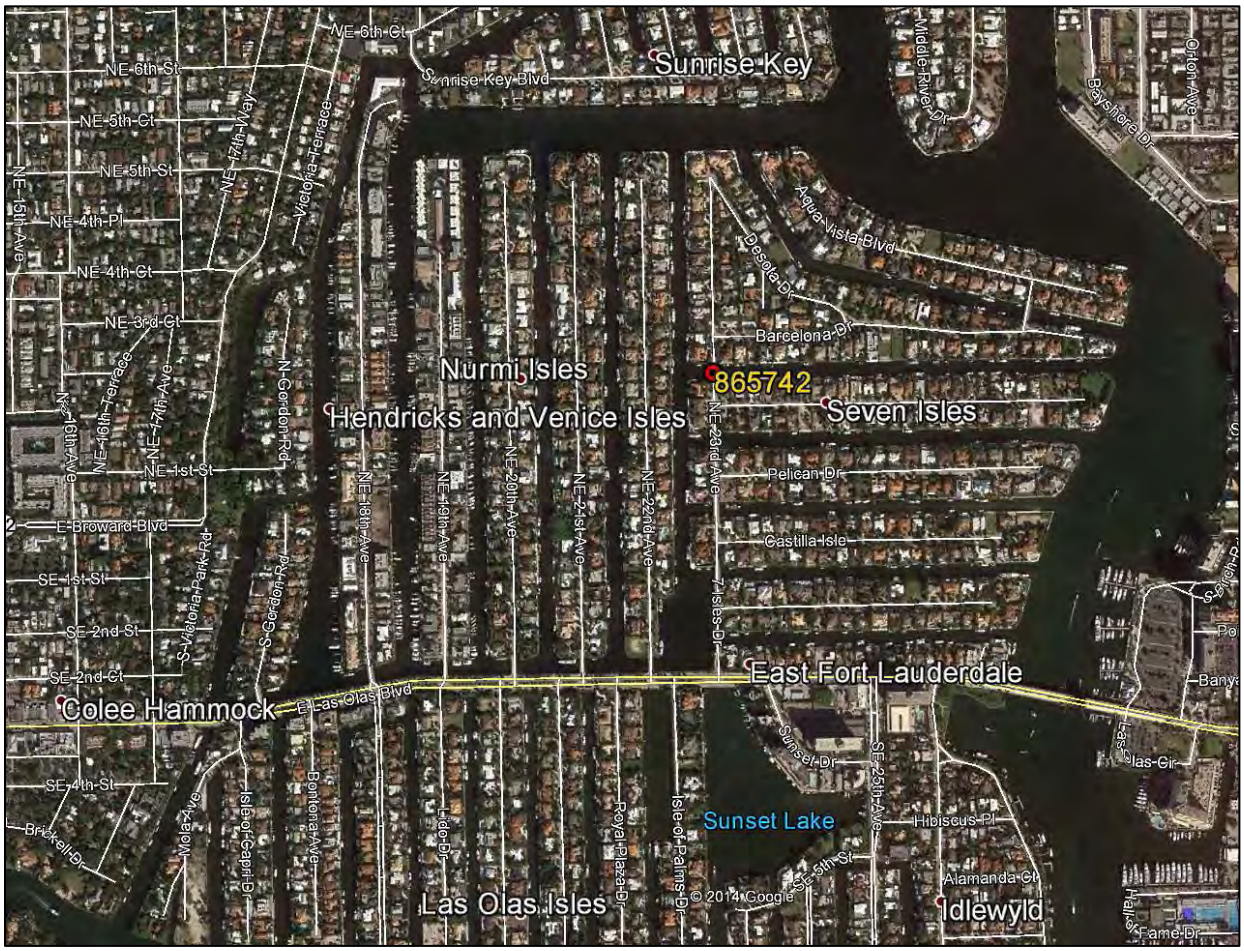


East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Longitudinal cracks in asphalt overlay over slab unit joints.

Photo 2 – Spilled concrete adjacent to the right sidewalk at Abutment 1.

CONDITION PHOTOS

Photo 3 – Typical transverse crack in asphalt overlay at intermediate bent.

Photo 4 – Deteriorated sidewalk joint filled with dirt and debris.

CONDITION PHOTOS

Photo 5 – Delamination in west end of Abutment 1 cap.

Photo 6 – Delamination/spall at Abutment 1 cap above Pile 1-3. Note delaminated/spalled pile.

CONDITION PHOTOS

Photo 7 – Delamination/spall at east end of Abutment 1 cap.

Photo 8 – Spall in south face of Bent 2 cap.

CONDITION PHOTOS

Photo 9 – Delamination in the north face of Bent 3 cap.

Photo 10 – Spall with exposed corroded steel at the southeast corner of Pile 2-1.

CONDITION PHOTOS

Photo 11 – Cracks in southwest approach sidewalk.

Photo 12 – Spilled concrete on the south approach at the east sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865742** Date: **06-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865742 UW Inspection Date: 5/6/2014

Bridge Name: N/A

Road Name/Number: NE 23 Avenue

Feature Intersected: RIO GIRALDO CANAL

Location: 200 ft North of Sea Island Dr.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	80°		475 R/Concrete Walls
Weather:	82° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids.

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

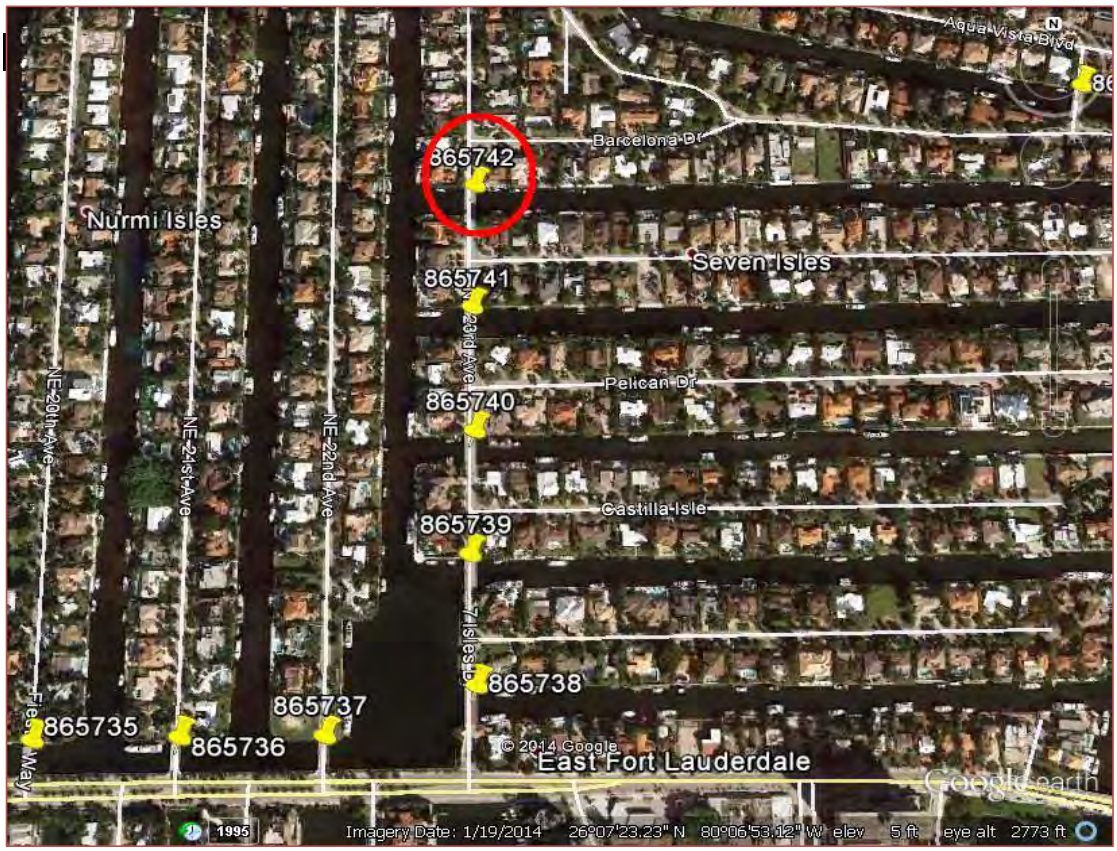
Soria, Miguel, Professional Engineer (P.E. # 49359)

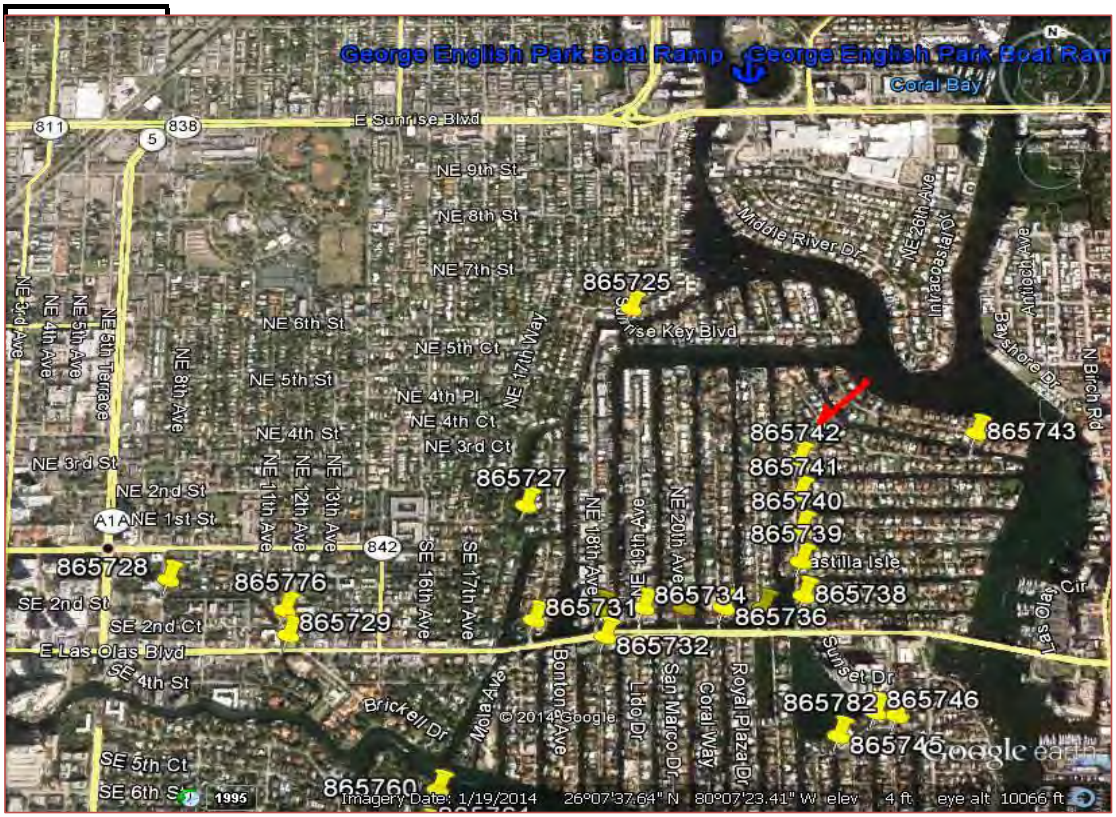
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865742** Date: **06-May-14**

A: LOCATION MAP





Description: 200 ft North of Sea Island Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **22 ea.**

Notes: Piles were inspected from cap down by underwater inspectors. The Piles are covered heavy marine growth starting 20" below the caps. Some piles were cleaned at random locations.

CS-3: **7**

_Pile 1-1, NW corner adjacent to the cap, spall/delamination 18" x 4" x 1", with associated cracks up to 1/4" wide. **UW Photo 01. INCREASE**

_Pile 1-3, all faces starting at the cap are delaminated up to 36" x 10", with associated cracks up to 1/4" wide and corrosion bleed-out. **UW Photo 02**. **NO CHANGE**

_Pile 2-1, SE corner spall/delamination 32" x 13" x 2-1/2", extending 9" below the high watermark, with associated cracks up to 1/16", (1) exposed strand, 90% section loss. **UW Photo 03. INCREASE**

_Pile 3-4, NE corner spall/delamination 33' x 7" x 3", extending 16" below the high watermark with cracks up to 1/16" and (1) exposed strand heavy corrosion. **UW Photo 04 and 05. INCREASE**

_Pile 3-5, all faces starting at the cap spall/delamination up to 42" x pile width, extending 16" below the high watermark with associated cracks up to 1/4" wide. **UW Photo 06. INCREASE**

_Pile 4-2, SE corner starting at the cap delamination 25" x 14". **NO CHANGE**

_Pile 4-3, SE and SW corners are delaminated up to 22" x 7", with associated cracks up to 1/32" wide **NO CHANGE**

CS-2: **4**

_Pile 3-1, NW corner, starting at the cap, has (2) vertical cracks up to 20" x 1/32". **NEW**

_Pile 3-2, SE corner spall 5" x 3" x 1", 12" below the cap. **NO CHANGE**

_Pile 4-1, West face, starting at the cap, has (1) vertical crack 18" x 1/64", extending 4" below the high watermark. **NEW**

_Pile 4-4, NE corner, starting at the cap, spall 15" x 1" x 1". **NEW**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **136 lf.**

CS-3: **25**

_Abutment 1 backwall, east side of Pile 1-2, delamination 18" x 12". **UW Photo 07. NO CHANGE**

_Abutment 1 backwall, east side of Pile 1-3, delamination 12" x 12", with associated cracks up to 1/16" wide, and corrosion bleed-out, just below the cap. **INCREASE**

_Abutment 1 backwall, behind Pile 1-2, spall 14" x 3" x 3", **UW Photo 08. NEW**

_Abutment 4 backwall, between Piles 4-3 and 4-4, (3) panels have multiple cracks up to 1/64" wide, with corrosion bleed-out and hollow sounding area 7' x 18". **NEW**

_SE retaining wall adjacent to Pile 1-5, delamination 30" x 12". **NO CHANGE**

_NW retaining wall at to Pile 4-1, delamination 20" x 12", with corrosion bleed-out. **NO CHANGE**

_NE retaining wall at Pile 4-5, spall/delamination 16" x 3" x 1", with corrosion bleed-out. **INCREASE**

CS-1:

_The joints are open up to 1-1/4" wide. No backfill leakage was observed. **NO CHANGE**

F: PHOTO SECTION

Description: Top: Pile 1-1, NW corner adjacent to the cap, spall/delamination. **UW Photo 01.**
Bottom: Pile 1-3, all faces at the cap are delaminated and cracked. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Pile 2-1, SE corner spall/delamination, w/exposed strand. **UW Photo 03.**
Bottom: Pile 3-4, NE corner spall/delamination. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Pile 3-4, NE corner spall/delamination w/exposed strand. **UW Photo 05**
Bottom: Pile 3-5, all faces at the cap are spall/delaminated, w/exp strand. **UW Photo 06**

F: PHOTO SECTION

Description: Top: Abutment 1 backwall, east side of Pile 1-2, delamination. **UW Photo 07**
Bottom: Abutment 1 backwall, behind Piles 1-2, spall. **UW Photo 08**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and repair Piles 1-1, 1-3, 2-1, 3-2, 3-4, 3-5, 4-2 and 4-3.

475 R/Concrete Walls

_Remove all unsound concrete and patch as needed at both abutment backwalls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.4	9.6
2	14.5	14.2
2.5	16.1	16.0
3	13.6	13.9
4	10.6	9.6

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.2 ft. and right: 8.3 ft. at mid-channel.
Maximum Channel depth: 7.7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865743 **Bridge Name:** NE 26th Terrace over Rio De Sota

Topside Inspection Complete: 5/06/2014

Underwater Inspection Complete: 5/06/2014

Report Date: 7/7/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 98.1 ft. long, three span, prestressed concrete slab bridge built in 1969. The bridge has a roadway width of 24.1 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. sidewalks on each side. The bridge is the only way into or out of the neighborhood. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has longitudinal cracks over the slab unit joints and isolated areas of minor crumbling asphalt associated with the longitudinal cracks up to ½ in. wide over the slab unit joints. The asphalt surfacing also has full roadway width x up to $^{1}/_{16}$ in. wide transverse cracks over the expansion joints. See Condition Photo 1.

Railings/Barriers

- The northwest anchor bolt is sheared on the aluminum handrail Post 3-4 left (west).

Expansion Joints

- The sidewalk joint sealant is deteriorated.

Utilities

- Two 5 in. diameter steel utilities, one 2 ½ in. diameter steel, one 2 in. diameter PVC conduit and one 1 in. diameter PVC conduit are supported by anchors attached to the underside of Beam 1 in all spans.
- One 6 ½ in. diameter and one 7 in. diameter steel utility are supported by hangers anchored to the underside of Beam 2 in all spans.
- All of the above noted utilities/conduits also bear on top of the cap ends.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

The sidewalks are supported by tee beams.

- The sidewalks have up to $^{1}/_{64}$ in. wide longitudinal cracks extending from the joints.
- The sidewalks at the joints have minor spalls up to 5 in. x 4 in. x 1 in.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Intermediate Bents

- The piles have random edge scrapes up to 5 in. x 4 in. x ½ in.
- Pile 3-5 has a 1 ft. 6 in. x 3 in. x 1 ½ in. spall in the southeast corner, extending from the cap down 5 in. below the marine growth.
- Pile 3-6 has a 2 ft. 8 in. x 9 in. delamination with associated cracks up to $^{1}/_{32}$ in. wide, in the southeast corner, extending down from the cap. See Underwater Inspection Report Photos 1 and 2.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The asphalt surfacing over the approach slabs has isolated longitudinal and transverse cracks up to $^{1}/_{16}$ in. wide.
- All four approach sidewalks have up to $^{1}/_{16}$ in. wide transverse cracks. See Condition Photo 3.
- The approach sidewalk joints are not sealed with joint membrane filler.

Retaining Wall

- The south retaining wall has a 1 ft. 1 in. x 6 in. void/open joint at the east transition to private property, with 3 ft. of penetration. See Underwater Inspection Report Photo 03.
- The joints are open up to 1 ¼ in. wide with no backfill leakage.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of six in this neighborhood – the bridges are sequentially numbered 865738 through 865743, starting from the south, nearest Las Olas Boulevard, and moving north. All of the bridges were constructed between 1966 and 1969 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work. This bridge appears to be the last one constructed.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines. At several of the other bridges in the neighborhood, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

At all but two of the bridges, the prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks. At three of the bridges, the tee beams that support the sidewalks at each fascia have spalls and delaminations. It is likely that the bridges showing no signs of deterioration will eventually do so. Repairs to these beams in the short term should extend the life of the superstructure beyond the 20 year timeframe considered in this study.

The latest available load ratings for all six bridges do not indicate that any of them require posting, and no posting signs are present at the bridge. Bridge beams are usually the only elements considered in load ratings, so it is likely that they are still valid, even if they do date back to the 1990s.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

This bridge shows none of the signs of deterioration noted at the other five bridges. As such, it is anticipated that only routine maintenance will continue to be required at this time. As the bridge ages, it is likely that there will be some spall repairs needed to the concrete elements, but there are no signs that such repairs will be widespread.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the railings, which should be maintained in proper condition for safety reasons. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of the other five bridges in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The bridge is in good condition overall. Anticipating large scale work, such as metalizing or jacketing substructure units, or reconstructing the abutments, does not appear to be warranted at this location. No significant work, outside of routine maintenance activities, is expected in the next 20 years.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach Looking North

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

South Approach Looking South

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

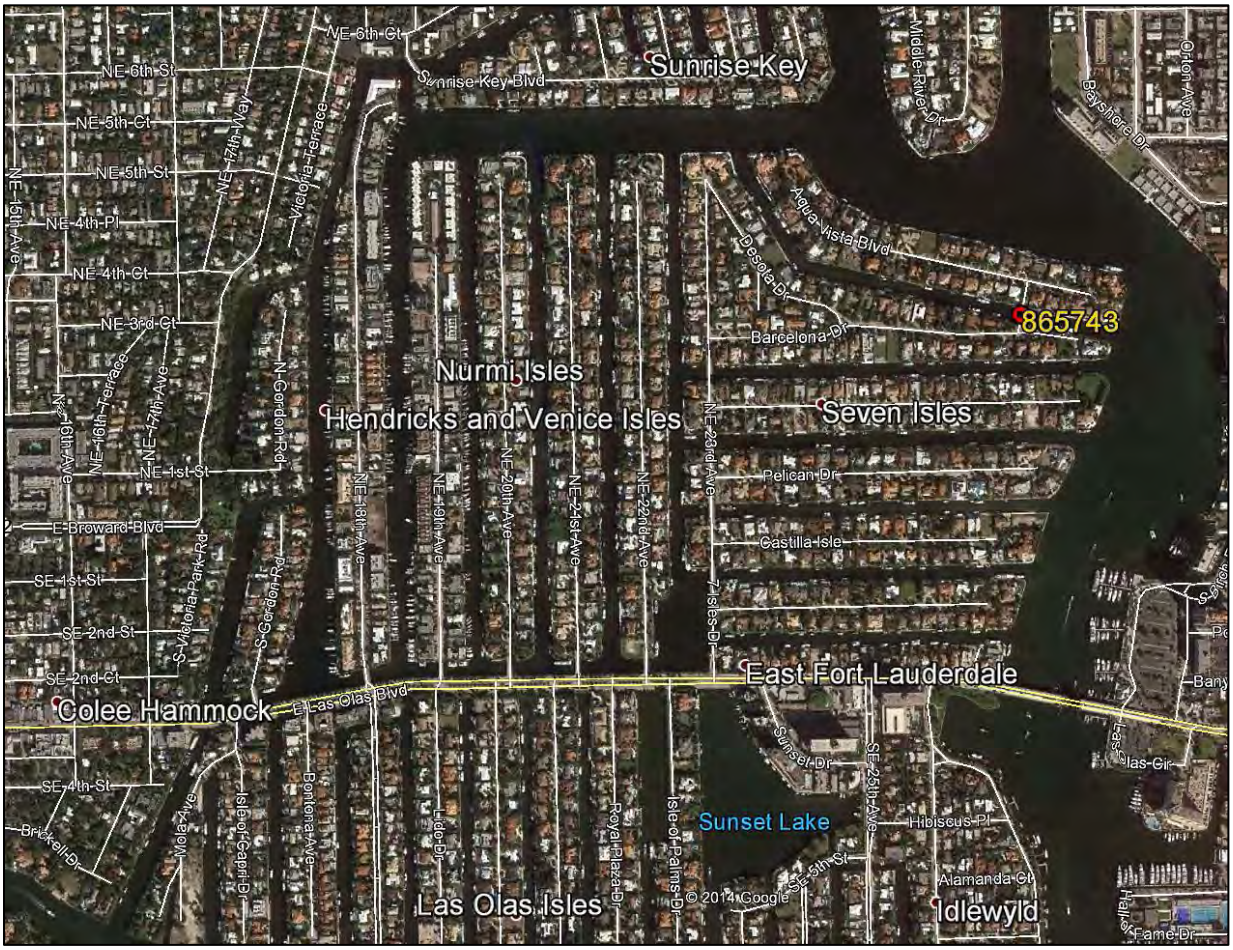
West Channel

East Channel

GENERAL PHOTOS OF BRIDGE

Utilities mounted to deck underside

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Cracks in asphalt overlay at slab unit joints and expansion joints.

Photo 2 – Deteriorated sidewalk joint sealant.

CONDITION PHOTOS

Photo 3 – Cracks in southwest approach sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865743** Date: **06-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865743 UW Inspection Date: 5/6/2014

Bridge Name: N/A

Road Name/Number: NE 26th TERRACE

Feature Intersected: RIO DE SOTA

Location: 100 ft North of BARCELONA DR

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	9.8 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	80°		290 Channel
Weather:	84° Sunny		475 R/Concrete Walls,
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

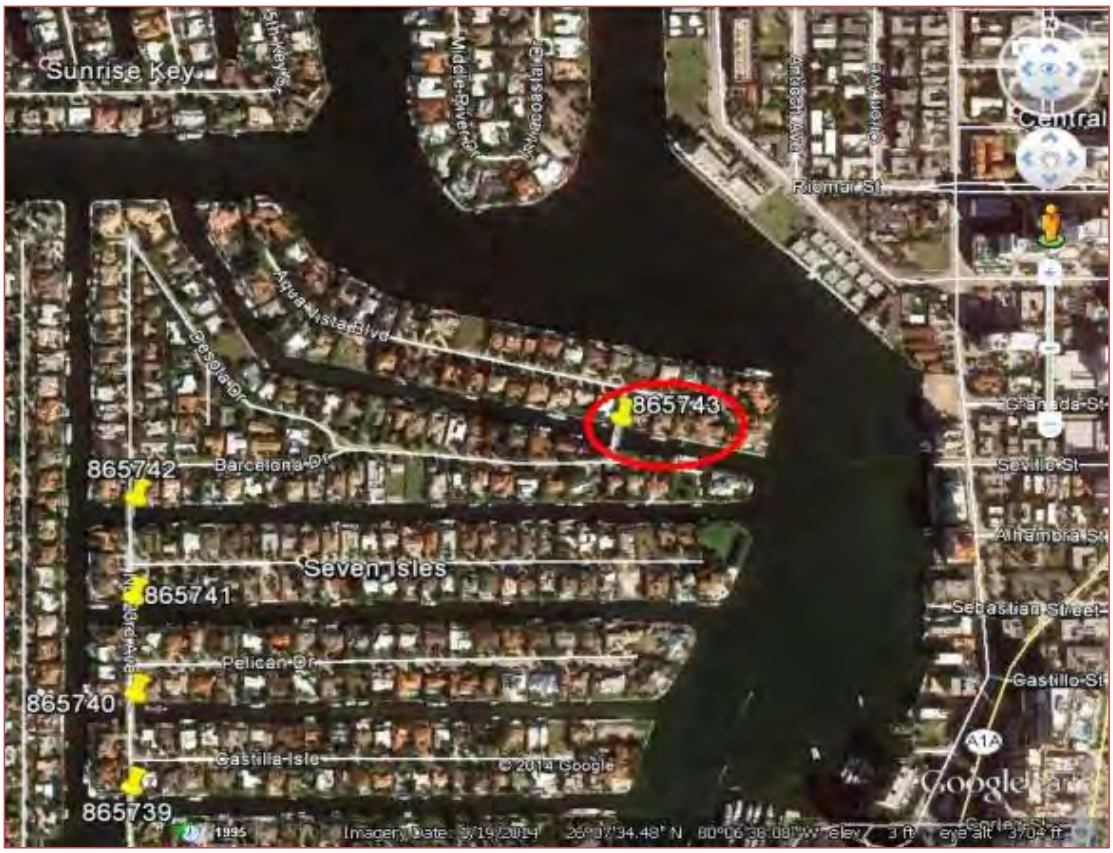
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/6/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865743** Date: **06-May-14**

A: LOCATION MAP



Description: 100 ft North of BARCELONA DR.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**26 ea.**

Notes:
_Piles were inspected from below the cap down during this inspection.
_Several Pile were cleaned at random locations.

CS-3: **1**
_Pile 3-6, SE corner delamination 32" x 9", starting at the cap, with associated cracks up to 1/32" wide.
UW Photos 01 and 02. NO CHANGE

CS-2: **1**
_Pile 3-5, SE corner spall 18" x 3" x 1-1/2", 6" starting at the cap and extending 5", below the high watermark. **NO CHANGE**

CS-1: **24**
_The piles have edge scrapes up to 4" x 3" x 1/2", at random locations. **NO CHANGE**

215 R/Concrete Abutment **73 lf.**

_No deficiency noted during this inspection cycle.

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **137 lf**

CS-2: **2 lf.**
_The South retaining wall has an 13" x 6", void/open joint with up to 3', penetration at the East transition to the private sector. No backfill leakage was observer during this inspection cycle.
UW Photo 03. MINOR CHANGE

CS-1:
_The joints in the abutment backwalls are open up to 1-1/4" wide with no backfill leakage observed during this inspection cycle. **NO CHANGE**

F: PHOTO SECTION

Description: Top: Pile 3-6, SE corner delamination. **UW Photo 01.**
Bottom: Pile 3-6, SE corner delamination, starting at the cap. **UW Photo 02.**

F: PHOTO SECTION

Description: South retaining wall void/open joint with up to 3', penetration at the East transition
UW Photo 03.

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Repair the void/open joint at the SE retaining wall East transition.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.4	8.7
2	14.2	14.1
2.5	16.5	16.4
3	14.1	14.1
4	8.7	9.3

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 6.8 ft. and right: 6.6 ft. at mid-channel.
Maximum Channel depth: 9.8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865745 **Bridge Name:** Solar Plaza Drive over Rio Canal

Topside Inspection Complete: 5/05/2014
Underwater Inspection Complete: 5/05/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DEL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 56.8 ft. long, two span, prestressed concrete slab bridge built in 1971. The bridge has a roadway width of 24.5 ft. and carries two lanes of traffic in a residential neighborhood. It has a 4.6 ft. wide sidewalk at the north side. The bridge is the only way into or out of the neighborhood. There is a 5 ft. sidewalk on the north side of the bridge. The bridge is not classified as Functionally Obsolete, nor is it classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a January 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay on the slab units has transverse cracks up to 2 in. wide over the expansion joints and longitudinal cracks up to 1 in. wide over the slab unit joints and minor heaving up to ¼ in. along the right wheel path of the eastbound lane. See Condition Photos 1 and 2.

Railings/Barriers

- There is no approach guardrail provided.

Expansion Joints

- The sidewalk and curb sealant has major cohesion failures and the joints are filled with dirt and debris. See Condition Photo 3.

Utilities

- There are utilities in the underside along the left (north) side of the structure; a 2½ in. PVC pipe, a 7 in. ductile iron pipe and a 5 in. ductile iron pipe.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has an intermittent cap length x up to $^{1}/_{32}$ in. wide horizontal crack with corrosion staining along the bottom edge.
- Abutment 1 cap also has an 8 ft. x 1 ft. 6 in. delamination with corrosion stains in the east face at the south end. See Condition Photo 4.
- Abutment 3 cap has a 12 ft. x 1 ft. delamination with corrosion stains in the bottom west face at the south end. See Condition Photos 5, 6, and 7.
- Abutment 3 cap has a 7 ft. x 1 ft. 6 in. x 8 in. spall-delamination with exposed rebar in the west face at the north end. See Condition Photo 8.

Intermediate Bent

- Bent 2 cap has a 10 ft. x 2 ft. x 8 in. spall with exposed rebar (up to 10 ft. with 0% remaining) in the west face at the south end. See Condition Photos 9, 10, and 11.
- Bent 2 cap has a cap length x 1 ft. 10 in. x 1 in. spall-delamination with corrosion stains along the bottom of both the west and east faces. See Condition Photo 12.
- The piles are covered with heavy marine growth starting 10 in. below the cap. See Underwater Inspection Report Photo 1.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an asphalt overlay.
- The asphalt surfacing over the west approach slab has up to ¼ in. wide x 20 ft. long diagonal crack. The surfacing over the east slab has an intermittent ¼ in. wide x up to 24 ft. long diagonal-transverse crack. See Condition Photos 13 and 14.
- There are transverse cracks up to ¼ in. wide at both approach roadway transitions.
- The west approach roadway is up to 3 ½ in. lower than the approach slab in the right shoulder (See Condition Photo 15) and the east approach roadway is up to ½ in. lower than the approach slab in the left shoulder.
- The northeast approach curb has a 1 ft. 10 in. x 5 in. x 6 in. spall. See Condition Photo 16.
- There is a ½ in. wide gap between the southwest and southeast wingwall and the approach curb. See Condition Photo 17.

Retaining Wall

- The northeast retaining wall has a 1 ft. 8 in. long x up to $^{1}/_{32}$ in. wide horizontal crack.
- The 3 in. x 1 in. area of corrosion stain from an unknown source on the channel face, 4 ½ in. below the cap was not found at the time of inspection.
- There are voids up to 1 ft. 6in. long x 1 ft. wide x 1 ft. deep behind the southwest and northwest wingwalls near the bulkhead. See Condition Photos 18 and 19
- The abutment sheet pile back retaining walls are masonry grout covered and have an indication of backfill loss through the joint, that was not active during the time of inspection. See Underwater Inspection Report Photo 2.
- The retaining walls are covered with heavy marine growth from 10 in. below the caps.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of a pair of similar bridges in this neighborhood – numbers 865745 and 865746, both carrying Solar Plaza Drive across canals. Both bridges were constructed in 1971 and are of the same type and configuration with similar conditions present, so conditions found at both bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and bent caps in the worst condition. At both bridges, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and

the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks and spalls on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently, which is why metalizing the caps, a form of cathodic protection, is recommended.

The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and do not require repairs.

The latest available load ratings for the two bridges do not indicate that they require posting, and no posting signs are present at either location. Given the condition of the superstructure, it is anticipated that any substantial repair work to the slab units would occur outside the 20 year study timeframe.

GEOMETRIC DEFICIENCIES

The bridge is not classified as functionally obsolete. However, the sidewalk does not meet the 5 ft. width needed to satisfy current ADA criteria.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences west of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 250 vehicles per day, and the road is posted for 20 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with the other bridge in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The abutment and intermediate bent caps should be considered for metalizing in years 0-5. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding. Once that system is in place, it is expected that the bridges will remain in service without need for posting through the 20 year study period.

Long Term Recommendation(s): **Make concrete repairs and install metalizing at abutment and bent caps.**			Cost
Design [1]			$ 10,000.00
Construction			$ 48,000.00
Bridge Construction [2]	$	45,000.00	
Maintenance of Traffic [3]	$	3,000.00	
Construction Inspection and Administration [4]			$ 9,600.00
Contingency [5]			$ 9,600.00
		TOTAL COST	$ 77,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

West Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

East Approach Looking East

GENERAL PHOTOS OF BRIDGE

North Bridge Railing

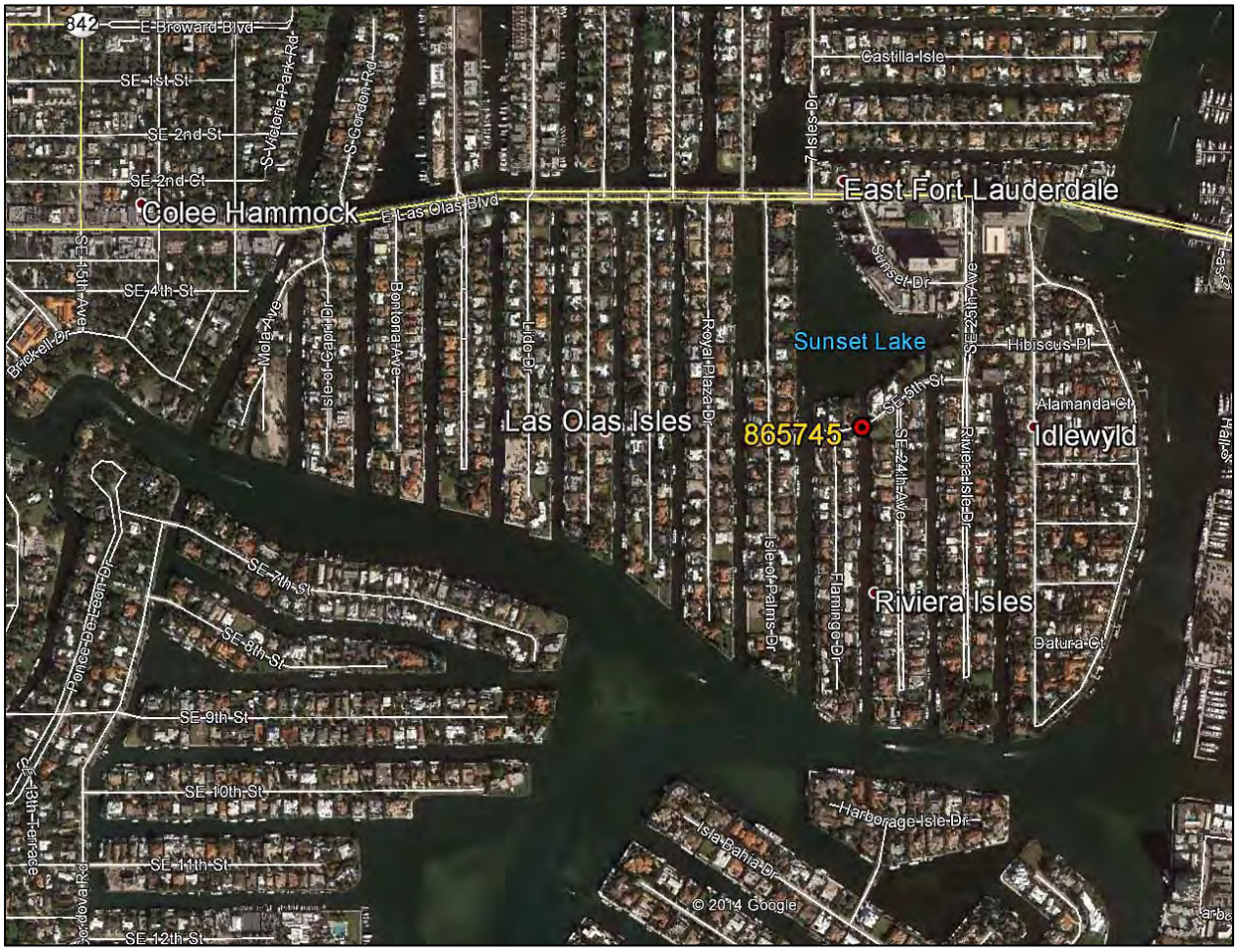
North Channel

GENERAL PHOTOS OF BRIDGE

South Channel

Utilities Mounted Adjacent to Slab Unit

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Cracks in asphalt overlay.

Photo 2 – General view of cracks in asphalt overlay.

CONDITION PHOTOS

Photo 3 – Dirt and debris accumulating in failed sidewalk and curb sealant.

Photo 4 – Delamination in south end of east face of Abutment 1 cap.

CONDITION PHOTOS

Photo 5 – Delaminated area in Abutment 1 cap.

Photo 6 – Delaminated area in Abutment 1 cap.

CONDITION PHOTOS

Photo 7 – Delaminated area in Abutment 1 cap.

Photo 8 – Spalled area in Abutment 3 cap.

CONDITION PHOTOS

Photo 7 – Delaminated area in Abutment 1 cap.

Photo 8 – Spalled area in Abutment 3 cap.

CONDITION PHOTOS

Photo 9 – Spall with exposed rebar at Bent 2 cap.

Photo 10 – Spall with exposed rebar at Bent 2 cap.

CONDITION PHOTOS

Photo 11 – Spall with exposed rebar at Bent 2 cap.

Photo 12 – Delamination/Spall with exposed rebar at Bent 2 cap.

CONDITION PHOTOS

Photo 13 – Diagonal crack in asphalt surfacing over west approach slab.

Photo 14 – Cracks in asphalt surfacing over west approach slab.

CONDITION PHOTOS

Photo 15 – Settlement of west roadway in relation to west approach slab.

Photo 16 – Spall in northeast approach curb.

CONDITION PHOTOS

Photo 17 – Gap between wingwall and approach curb.

Photo 18 – Fill void at northwest wingwall.

CONDITION PHOTOS

Photo 19 – Fill void at southwest wingwall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865745** Date: **05-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865745 UW Inspection Date: 5/5/2014

Bridge Name: N/A

Road Name/Number: Solar Plaza Dr.

Feature Intersected: Rio Canal

Location: 200 ft, West of SE 24th Ave.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6.3 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	80°		475 R/Concrete Walls
Weather:	82° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids.

Critical Deficiency Notes: None

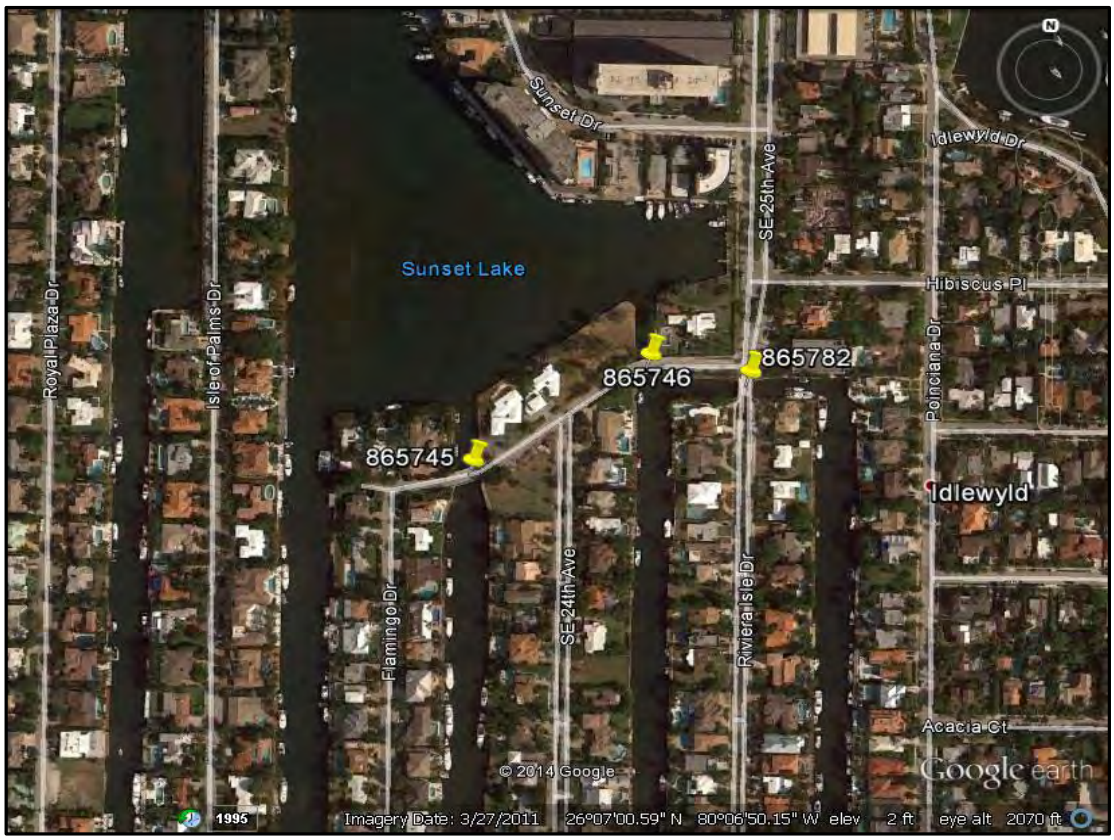
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

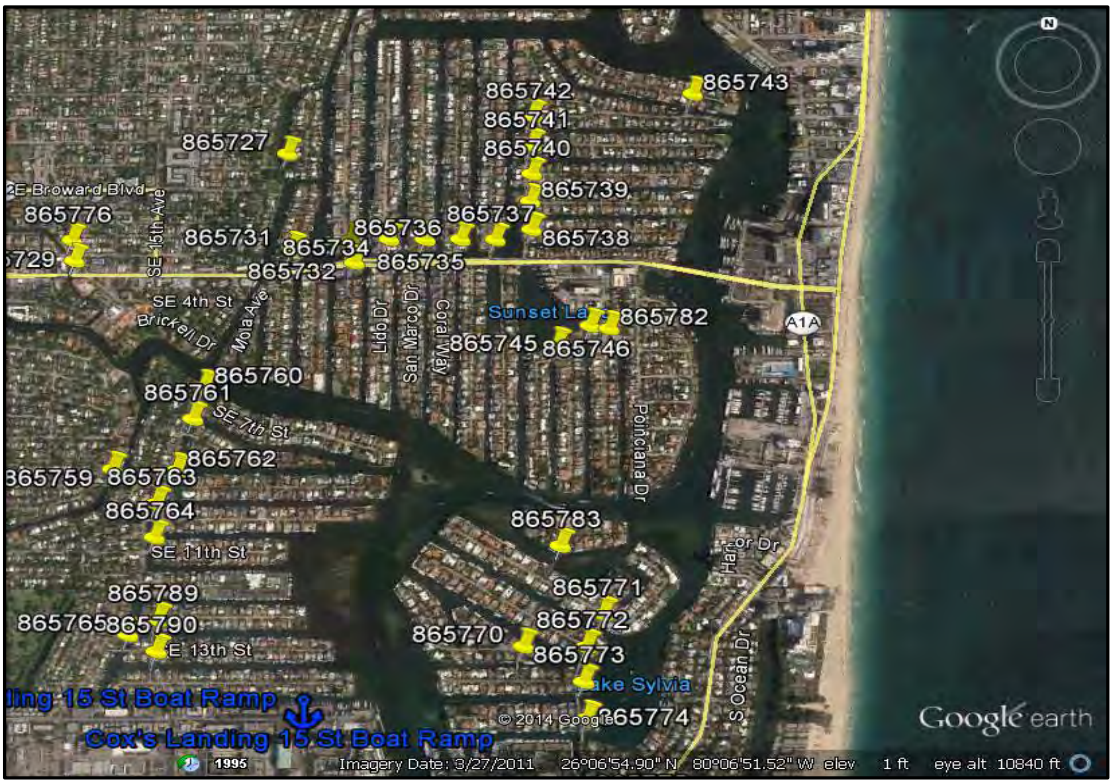
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865745** Date: **05-May-14**

A: LOCATION MAP





Description: Solar Plaza Dr, 200 ft West of SE 24th Ave.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**16 ea.**

CS-1: **16**
_The piles are covered heavy marine growth starting 10in. below the caps. Some piles were cleaned at random locations during this inspection cycle. **UW Photo 0**

475 R/Concrete Walls	**135 lf.**

Note:
_The 3in. x 1in. area of corrosion stain from unknown source, on the channel face, 4-1/2in. below the cap was not found. **NOT FOUND**

CS-1: **135**
_The abutment sheet pile back retaining walls are masonry grout covered and have an indication of backfill loss through the joints, that was not active at the time of this inspection. **UW Photo 02.**
NO CHANGE
_The retaining walls are covered with heavy marine growth from 10in. below the cap. Some area were clean during this inspection cycle. **NO CHANGE**

290 Channel	**1 ea.**

_No deficiencies noted during this inspection cycle.

F: PHOTO SECTION

Description: Top: Piles are covered heavy marine growth starting 10in. below the caps. **UW Photo 01.**
Bottom: The abutment retaining walls backfill loss was not active. **UW Photo 02.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_No corrective action require during this inspection cycle.

475 R/Concrete Walls

_No corrective action require during this inspection cycle.

290 Channel

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.6	10.9
1.5	14.0	13.4
2	10.5	11.1

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 7.7 ft. and right: 8.1 ft. at mid-channel.
Maximum Channel depth: 6.3 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865746 **Bridge Name:** Solar Plaza Drive over Rio Placid Canal

Topside Inspection Complete: 5/05/2014
Underwater Inspection Complete: 5/05/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 44.4 ft. long, two span, prestressed concrete slab bridge built in 1971. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. The bridge is the only way into or out of the neighborhood. There is a 4.6 ft. sidewalk on the north side of the bridge. The bridge is not classified as Functionally Obsolete, nor is it classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to $^{1}/_{16}$ in. wide longitudinal cracks over the slab unit joints and transverse cracks up to ¼ in. wide over the expansion joints. See Condition Photo 1.

Railings/Barriers

- No deficiencies were noted.

Expansion Joints

- The sealant in the left sidewalk and right curb joints is deteriorated and filled with dirt and debris.

Utilities

- One 8 in. diameter steel utility, one 6 in. diameter steel utility, and two 2 ½ in. diameter galvanized conduits are all supported by anchors attached to the underside of Beam 1 in both spans. These utilities and conduits also bear on top of the ends of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- The tops of the slab units are not visible due to an asphalt overlay.
- Slab Unit 1-1 has a 2 ft. x 1 ft. 3 ¼ in. x 2 in. spall with exposed rebar in the north face over Bent 2 cap. This area was chipped out to accommodate the utility pipe bell.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a 24 ft. x 1 ft. delamination with corrosion bleedout and associated cracking up to $^{1}/_{8}$ in. wide extending from the north end of cap past Pile 1-3. See Condition Photo 2 and Underwater Inspection Report Photo 1.
- Abutment 3 cap has a 5 ft. x 10 in. delamination with corrosion bleedout extending from Pile 3-1 to Pile 3-2.

Intermediate Bent

- Pile 1-1 southeast corner has an 8 in. x 4 in. x 1in. spall 6 in. below the cap.
- The lower 20 in. of Bent 2 cap has a full length delamination with corrosion bleedout and associated cracking up to $^{1}/_{8}$ in. wide in the west and east faces. See Condition Photos 3 and 4 and Underwater Inspection Report Photo 2.
- The northeast end of the Bent 2 cap has a 4 ft. x 9 in. x 4 in. spall/delamination with one (1) exposed rebar with 30% section loss and associated cracks up to $^{1}/_{16}$ in. wide. See Underwater Inspection Report Photo 3.
- Pile 3-3 northwest corner has a 7 in. x 5 in. x 1 in. spall at the cap.
- There are edge scrapes up to 4 in. x 3 in. x ½ in. on the piles.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- At the southeast corner of the structure there is a 2 ft. x 6 in. x 6 in. deep washout behind the bulkhead cap, however no undermining or backfill leakage was observed during this inspection. See Condition Photo 5.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The asphalt over the west approach slab has a 7 ft. long x $^{1}/_{8}$ in. wide diagonal crack in the eastbound lane. See Condition Photo 6.
- The asphalt over the east approach slab has an 18 ft. long x $^{1}/_{16}$ in. wide diagonal crack starting in the westbound lane and extending across into the eastbound lane. See Condition Photo 7.
- The asphalt over the east approach slab has a 5 ft. long x $^{1}/_{16}$ in. wide diagonal crack starting in the eastbound lane from Abutment 3.
- The northeast approach curb has a 1 ft. 2 in. x 7 in. x 1 in. spall at the end of the approach slab. See Condition Photo 8.
- The northwest approach curb has a 10 in. x 6 in. x 1 in. spalled and delaminated patch at Abutment 1.
- Both approach roadways are up to 1 in. lower than the approach slabs. See Condition Photo 9.
- The northeast approach sidewalk has a 1 ft. 2 in. x 5 in. x ¾ in. spall at Abutment 3. See Condition Photo 10.
- There are small pop outs in the exterior face of the curb and the sidewalk.
- There is a ½ in. wide gap between the southwest and southeast wingwall and the approach curb. See Condition Photo 11.

Retaining Wall

- The joints in the abutment backwalls are open up to 1 ¼ in. wide with no backfill leakage.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of a pair of similar bridges in this neighborhood – numbers 865745 and 865746, carrying Solar Plaza Drive across canals in a neighborhood. Both bridges were constructed in 1971 and are of the same type and configuration with similar conditions present, so conditions found at both bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and bent caps in the worst condition. At both bridges, the abutments and intermediate piers have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the

extent of delaminations, cracks and spalls on the bent caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently, which is why metalizing the caps, a form of cathodic protection, is recommended.

The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and do not require repairs.

The latest available load ratings for the two bridges do not indicate that they require posting, and no posting signs are present at either location. Given the condition of the superstructure, it is anticipated that any substantial repair work to the slab units would occur outside the 20 year study timeframe.

GEOMETRIC DEFICIENCIES

The bridge is not classified as functionally obsolete. However, the sidewalk does not meet the 5 ft. width currently needed to satisfy ADA criteria.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences west of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 250 vehicles per day, and the road is posted for 20 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with the other bridge in the community, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The one spall with exposed steel on the slab unit should be cleaned and metalized to deter future deterioration and spalling of the concrete in that area. The total cost to clean and metalize the area 2 ft. all around the exposed steel, is $3,000. For cost effectiveness of having the spray equipment on site, it is recommended that the other bridges within the City's inventory that have similar recommendations all be done at the same time.

LONG TERM

The abutment and intermediate bent caps should be considered for metalizing in years 0-5. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding. Once that system is in place, it is expected that the bridges will remain in service without need for posting through the 20 year study period.

Long Term Recommendation(s): **Make concrete repairs and install metalizing at abutment and bent caps.**			Cost
Design [1]			$ 10,000.00
Construction			$ 48,000.00
Bridge Construction [2]	$	45,000.00	
Maintenance of Traffic [3]	$	3,000.00	
Construction Inspection and Administration [4]			$ 9,600.00
Contingency [5]			$ 9,600.00
		TOTAL COST	$ 77,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

West Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

East Approach Looking East

GENERAL PHOTOS OF BRIDGE

North Bridge Railing

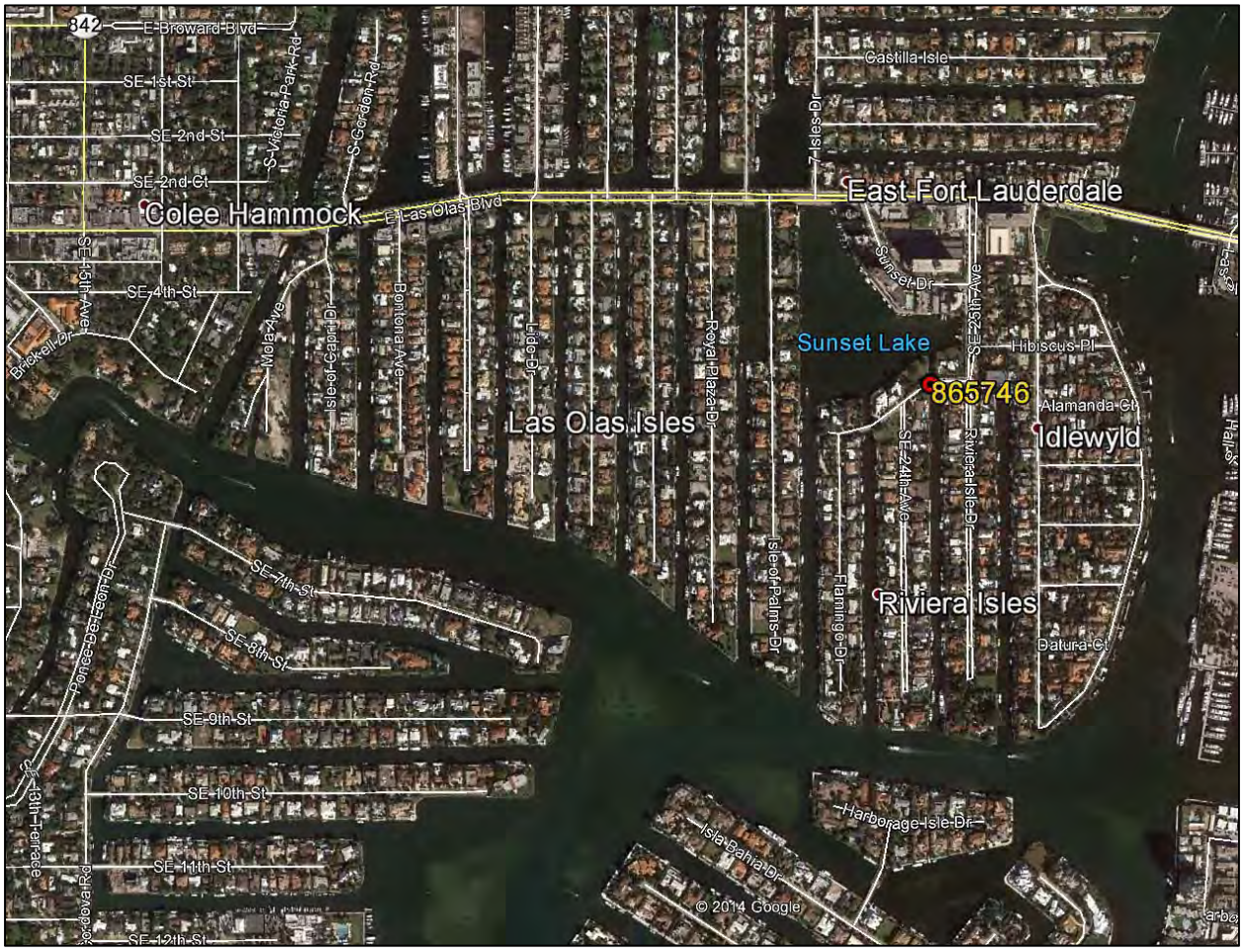
North Channel

GENERAL PHOTOS OF BRIDGE

South Channel

Utilities Mounted Adjacent to Slab Unit

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Cracks in asphalt overlay.

Photo 2 – Delamination in Abutment 1 cap.

CONDITION PHOTOS

Photo 3 – Delamination in Bent 2 cap.

Photo 4 – Delamination in Bent 2 cap.

CONDITION PHOTOS

Photo 5 – Washout at southeast bulkhead.

Photo 6 – Diagonal crack in asphalt over west approach slab.

CONDITION PHOTOS

Photo 7 – Diagonal crack in asphalt over east approach slab.

Photo 8 – Spall in northeast approach curb.

CONDITION PHOTOS

Photo 9 – Typical elevation differential between approach roadway and approach slab.

Photo 10 – Spall in northeast approach sidewalk.

CONDITION PHOTOS

Photo 11 – Gap between wingwall and approach curb.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865746** Date: **05-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865746 UW Inspection Date: 5/5/2014

Bridge Name: N/A

Road Name/Number: SOLAR PLAZA DR.

Feature Intersected: RIO IDLEWILD CANAL

Location: 200 ft West of RIVIERA ISLE D.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	80°		234 R/Concrete Cap
Weather:	84° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

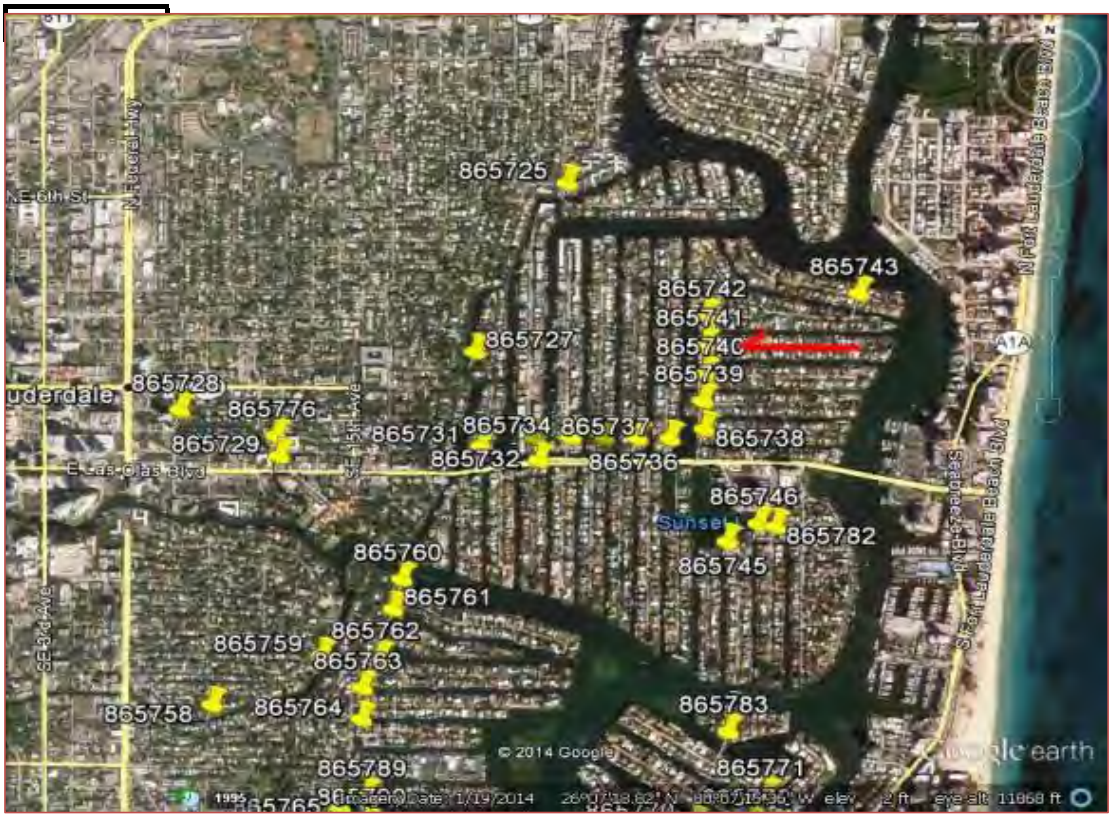
Soria, Miguel, Professional Engineer (P.E. # 49359)

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/11/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865746** Date: **05-May-14**

A: LOCATION MAP



Description: 200ft West of RIVIERA ISLE D.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **16 ea.**

Note:
_Several Pile were cleaned at random locations.

CS-2: **2**
_Pile 1-1, SE corner spall 8" x 4" x 1", 6" below the cap. **NO CHANGE**
_Pile 3-3, NW corner spall 7" x 5" x 1", at the cap. **NO CHANGE**

CS-1: **14**
_The piles have edge scrapes up to 4" x 3" x 1/2", at random locations. **NO CHANGE**

215 R/Concrete Abutment **68 lf.**

CS-3: **29**
_Abutment 1 cap has a delamination 24' x 12", with associated cracks up to 1/8", and corrosion bleed-out, extending from the North end of the cap past Pile 1-3. **UW Photo 01. NO CHANGE**
_Abutment 3 cap, between Piles 3-1 and 3-2 has a delamination 5' x 10", with corrosion bleed-out. **NO CHANGE**

234 R/Concrete Cap **34 lf**

Notes: The lower 12" section and bottom face were inspected by the underwater inspectors during this inspection cycle.

CS-3: **34**
_Bent 2 cap, West and East faces has a delamination full length x 20" H, with associated cracks up to 1/8" wide, and corrosion bleed-out. **UW Photo 02. INCREASE**
_Bent 2 cap, NE end has a spall/delamination 48" x 9" x 4", with (1) exposed rebar 30% section loss and associated cracks up to 1/16" wide. **UW Photo 03. NEW**

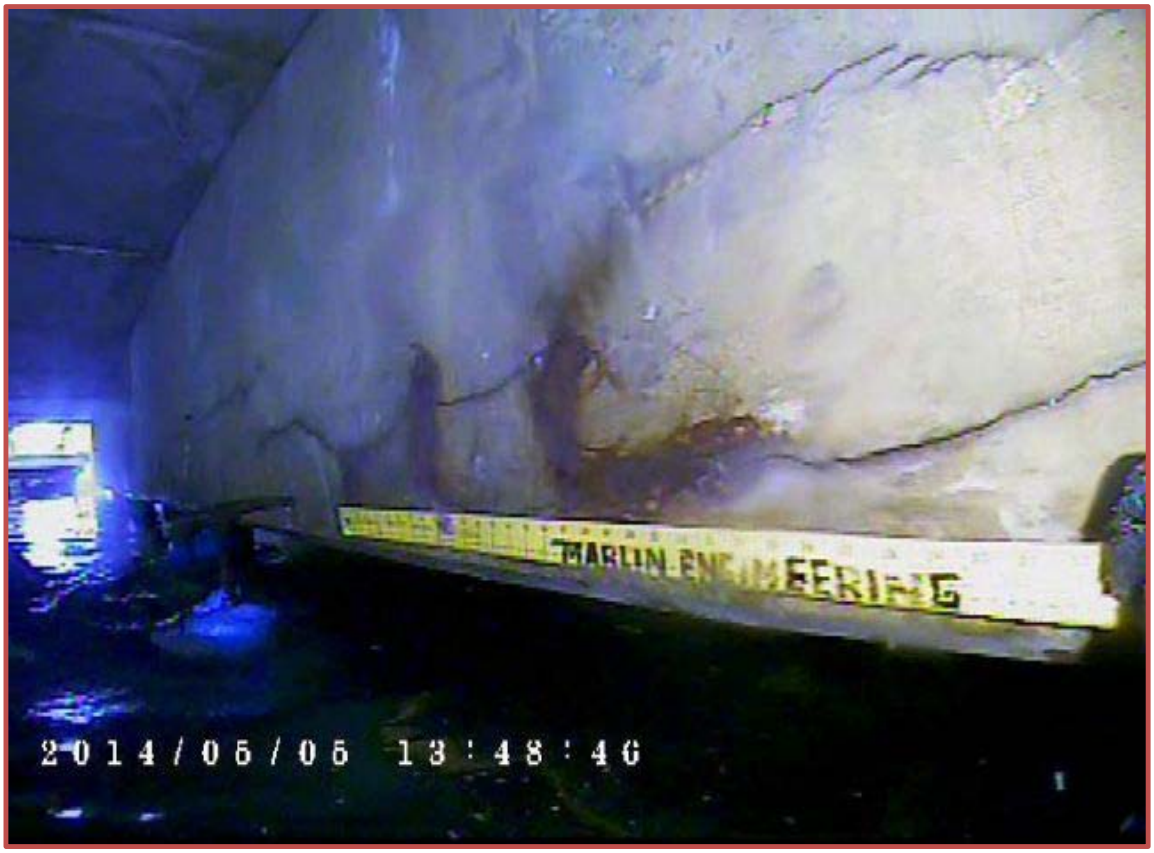
290 Channel **1 ea.**

Note:
_No undermining and backfill leakage observe along the SE corner during this inspection cycle.

475 R/Concrete Walls **148 lf**

CS-1: **148**
_The joints in the abutment backwalls are open up to 1-1/4" wide with no backfill leakage observed during this inspection cycle. **DECREASE**

F: PHOTO SECTION



Description: Top: Abutment 1 cap has a delamination, with associated cracks. **UW Photo 01.**
Bottom: Bent 2 cap, both faces delaminations with associated cracks. **UW Photo 02.**

F: PHOTO SECTION

Description: Bent 2 cap, NE end, spall/delamination with (1) exposed rebar. **UW Photo 03.**

H: RECOMMENDED REPAIRS

215 R/Concrete Abutment

_Remove all unsound concrete and patch. Also epoxy inject all the cracks at both abutments.

234 Concrete Cap

_Remove all unsound concrete and patch. Also epoxy inject all the cracks at Bent 2.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.1	9.8
2	14.2	13.1
3	11.2	10.4

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 7.3 ft. and right: 6.8 ft. at mid-channel.
Maximum Channel depth: 6.9 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865748 **Bridge Name:** SW 11th Avenue over North Fork New River

Topside Inspection Complete: 5/21/2014

Underwater Inspection Complete: 5/19/2014

Report Date: 7/30/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville – Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Sprankle, Nicholas – Electrical Engineer (PE #75594)	
Kopping, Bradley – Mechanical Engineer (PE #72822)	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF PROFESSIONAL ENGINEER

7/30/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The 144.6 ft. long, steel pony truss swing bridge was constructed in 1925 by the Champion Bridge Company of Wilmington, Ohio, to replace a single-lane swing bridge in use from 1916-1924. The existing bridge was rehabilitated in 2010. The bridge has a roadway width of 18 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. wide sidewalks on each side. The bridge is classified as Functionally Obsolete but not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1987 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting and it is currently posted at 5 tons. The end floorbeams control the rating, but it is unclear what deterioration was accounted for in the analysis, if any.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to

easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the deck is a steel open grid. Per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of joints, expansion devices, curbs, sidewalks, parapets, fascias, and bridge rail shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR STEEL DECKS

CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - The steel deck is tightly secured to floor system and showing no corrosion.
7	GOOD - Some connections with minor corrosion. A few cracked welds and/or broken grids.
6	SATISFACTORY - Considerable corrosion with indications of initial section loss. Loose at many locations. Some cracked welds and/or broken grids.
5	FAIR - Heavy corrosion with areas of section loss. Loose at numerous locations. Numerous cracked welds and/or broken grids.
4	POOR - Heavy corrosion resulting in considerable section loss and some holes through deck. Majority of welds cracked and/or grids broken.
3	SERIOUS - This rating will apply if severe or critical signs of structural distress are visible.
2	CRITICAL - Many small holes due to corrosion through the deck.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Steel Open Grid Deck

- There is a cracked weld between the main bar and the top of Stringer 8-8. This condition was not previously noted. See Condition Photos 1 and 2.

Sidewalks

- The east sidewalk between Floorbeams 2 and 3 and the west sidewalk between Floorbeams 7 and 8 each exhibit timber planks with 3 ft. long x 4 in. wide areas of decay. This condition was not previously noted. See Condition Photo 3.
- The southwest and northeast approach sidewalk joints are not sealed, allowing leakage, dirt buildup and vegetation growth. See Condition Photo 4.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR STEEL SUPERSTRUCTURE

CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT - no noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - No visible corrosion.
7	GOOD - Minor surface rust without any section loss.
6	SATISFACTORY - Rusting evident but with no initial section loss (minor pitting, scaling, or flaking) in critical areas.
5	FAIR - Initial section loss in critical stress areas. Fatigue or out-of-plane distortion cracks may be present in non- critical area. Hinges may be showing significant corrosion problems.
4	POOR - Significant section loss in critical stress area. Fatigue or out-of-plane distortion cracks may be present in major structural elements. Hinges may be frozen from corrosion. Load carrying capacity of structural members affected.
3	SERIOUS - Severe section loss or cracking in critical stress areas. Significant weakening of primary members evident.
2	CRITICAL - Severe section loss in many areas with holes rusted through at numerous locations. Bridge closure or close monitoring is required.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is - Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted. See Sketches 1 thru 4 for framing plan and layout of structural members.

Stringers and Floorbeams

- The stringers have areas of painted over section loss along the edges and pitting up to ¼ in. deep randomly throughout. See Condition Photo 5.
- The coped ends of Stringers 5-5 and 5-6, adjacent to Floorbeam 5, exhibit up to ½ in. high cut notches. These areas are prone to fatigue cracking. The coped ends were not fabricated with proper radii. This condition was not previously noted. See Condition Photo 6.
- The floorbeams have areas of painted over section loss and pitting up to ¼ in. deep.

Trusses

- The bottom chords have areas of surface corrosion, painted over section loss and pitting up to ¼ in. deep, abandoned drilled holes, abandoned flame-cut holes and painted over corrosion holes throughout. See Condition Photo 7.
- The upper chords have areas of painted over section loss and pitting up to ¼ in. deep throughout. See Condition Photo 8.
- The connection bolts, nuts, and rivets exhibit up to 90% section loss throughout the truss. This condition was not previously noted. See Condition Photo 8. Several connection bolts, nuts, and rivets additionally exhibit corrosion. See Condition Photo 9.
- Splice plates and connection bolts typically exhibit areas of corrosion and section loss. This condition was not previously noted. See Condition Photo 10.
- Several gusset plates exhibit areas of corrosion with painted over section loss. This condition was not previously noted. See Condition Photo 11.
- There is a loose connection bolt at the east vertical connection to L6 at the inside face. This condition was not previously noted. See Condition Photo 12.
- The bottom inside leg of the west top chord adjacent to U6 is bent over 1 ft. 6 in. long. This condition was not previously noted. See Condition Photo 13.
- The gusset plate at the inside face of the west top chord at U11 is bent over a 6 in. long section leaving a ½ in. gap between the plate and the vertical member. This condition was not previously noted. See Condition Photo 14.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 has intermittent undermining the entire length up to 2 in. high with 3 ft. 4 in. penetration. No backfill loss was observed. See Underwater Inspection Report Photo 4.
- Abutment 3 has intermittent undermining the entire length up to 8 in. high with 9 in. penetration. No backfill loss was observed.

Pivot Pier

- The pivot pier is up to 1½ in. under water during high tide.
- The timber machinery work platform around the pivot pier is up to 3 in. underwater during high tide.
- The timber piles under the machinery work platform have section loss up to 30%.
- The cable from the pivot pier to Abutment 1 is exposed up to the fender from both sides then is buried through the channel. The cable from the tender house to the pivot pier is exposed for 12 ft. near the pivot pier.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD - Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Roadway

- The north approach roadway transition to the backwall of the abutment is lower at the approach pavement. This condition was not previously noted. See Condition Photo 15.

Guardrails

- The northwest guardrail end terminal has minor impact damage. See Condition Photo 16.

MECHANICAL AND ELECTRICAL SYSTEMS

Generally, the mechanical and electrical systems are in excellent condition, having been replaced in 2010. The deficiencies noted are largely maintenance items. If deficiencies noted in this and subsequent inspections are addressed in a timely manner, the systems should provide reliable service for the 20 year study period.

During operation all systems performed as designed with no unusual noise or vibrations. The bridge balance appears to be good. Under vehicular traffic, the live load bearings and end jacks exhibited very little to no movement. See Sketches 5 thru 7 for diagrams of machinery.

Bridge Support System

- The north live load shoes have light to moderate spotty surface corrosion. See Condition Photo 17.
- The track has various welded and bolted repairs performed to prevent the track from lifting. The track base has areas of spot surface corrosion and painted-over corrosion holes. The track teeth are poorly lubricated and have light to moderate surface corrosion on the ungreased areas.
- Because the masonry plates for the elevator wheel bearing assemblies and the base of the track are in the water during high tide, the plates have areas of spot corrosion. Maintenance personnel report that flooding has not been observed in the past 10 months. See Condition Photo 18.

Center Bearing	
General Condition	
ITEM	CONDITION
Bronze Disc	Not visible for inspection
Bottom Plate	OK
Thrust Washers	Good
Lubrication	Fair
Fasteners	Good
Operation	Good

Rollers and Tracks	
General Condition	
ITEM	CONDITION
Roller Wear	Good
Contact With Track	Good
Bushings	Not visible for inspection
Radius Arms	Good
Turnbuckles	Good
Tracks	Good
Fasteners	Good
Lubrication	Fair
Operation	Good

Span Locks - The locks are in good condition with the exception of the following deficiencies:

- The junction box feeding Lock A has an uncapped conductor inside. See Condition Photo 19.
- The limit switch enclosure at Lock A has an uncapped hole. See Condition Photo 20.
- The conductor color coding in the local disconnect switches is inconsistent between the line and load sides of the switch. See Condition Photo 21. The labels for the disconnect switches have fallen off.
- A flexible conduit fitting at Lock B is not secure. See Condition Photo 22.

End Lift Assemblies			
Motor Nameplate			
RACO International, Inc.			
Type:	ZCK T1A5 HEQCAZN		
No.:	18800.002	Max. Current (A):	9.7
Volts:	480	Stroke:	11.8
Phase:	3	Thrust (lbs):	1100
Hertz:	60	Temp (F):	-14-140
General Condition			
ITEM		CONDITION	
Manual Drives		Good	
Motors		Good	
Connecting Rods		Good	
Pins		Good	
Lift Bars		Good	
Receiving Sockets		Good	

Emergency Power

- The emergency power is generated from a portable diesel generator that is stored off site. The condition and functionality of this unit could not be verified. The manual emergency drive operation is reported to perform without incident.
- The emergency drive pinion and emergency drive rack do not fully mesh (60% engagement). See Condition Photo 23.

Span Drive Motor

- The span drive motor is in good condition, with minor deterioration or wear.

Span Drive Motor					
Motor Nameplate					
Baldor Electric Co.					
Cat No.:	____818-010001			Type:	P
Serial:	ES14813	Encl:	TENV	Duty:	Constant
Frame:	2547	Volts:	230/460	Insul.:	P
HP:	5	Amps:	14.6/7.3		
RPM:	880	Hz:	60		

Motor Brake

- The operation of the brake is as designed. The housing, drum, shoes, and bolts are all in good condition. No machinery brakes are present at this bridge.

Mechanical Power Transmission

- Shafts and couplings are in good condition.
- All components in the speed reducers, including the housing, bearings, fasteners, supports are in good condition
- It has been noted in previous inspection reports that several primary drive pinion teeth are chipped, however this condition was not observed. It may be that the chipped locations are very minor with no impact on performance.

Speed Reducer			
Nameplate Data			
Cleveland Custom Helical Speed Reducer			
Size:	PV 1400	Service Factor:	1.5
Ratio:	550.493:1	Input RPM:	850
HP:	5	Output RPM:	1.544
General Condition			
ITEM		CONDITION	
Fasteners		Good	
Housings		OK	
Bearings		Not visible for inspection	
Chain Drive		Good	
Motor		Good	
Lubrication		Good	
Operation		OK	
Noise		OK	
Supports		Good	

Bearings							
Bearing No.	Clearances			Taken at	Bolts	Lube	General Condition
	2001	2012	2014				
B1	Inaccessible for Measurement			--	OK	Fair	Good
B2				--	OK	Fair	Good
B3				--	OK	Fair	Good
B4				--	OK	Fair	Good
B5				--	OK	Fair	Good
B6				--	OK	Fair	Good

Open Gearing							
Part No.	Lube	Measurements				General Condition	Axial Alignment
		Addendum	2001	2012	2014		
P1	Fair	Unknown	--	--	--	Inaccessible	Good
P2	Fair	Unknown	--	--	--	Moderate wear, top lands are rounded, random gouges and surface corrosion	Good
P3	Fair	Unknown	--	--	--	Previously noted chips at top of teeth not observed	Good
G1	Fair	Unknown	--	--	--	Minor cross bearing wear	Good
G2	Fair	Unknown	--	--	--	Moderate wear, top lands slightly rounded	Good
MRP	Fair	0.67"	1.11"	1.05"	1.05"	Moderate to heavy wear, top lands rounded	Good
MR	Fair	0.67"	1.19"	1.23"	1.24"	Light corrosion on teeth	Good
RP	Fair	0.94"	1.26"	1.46"	1.47"	Corrosion on the top lands	Good
Rack	Fair	0.94"	1.16"	1.48"	1.47"	Corrosion along the edges	Good

Control System, Control Panels and Cabinets

- The junction boxes on the west side of the pivot pier and areas of the conduit are in the water during high tide.
- Rubber mats have not been provided in front of the motor control cabinet or the control panel cabinet.
- "DANGER HIGH VOLTAGE" signs have not been provided on the power and wiring cabinets.
- The terminal box in the machinery area has several uncapped conductors, wire nut splices, and evidence of water intrusion within. Additionally, there is an uncapped hole. See Condition Photos 24 and 25.
- There is a cut flexible conduit within the machinery area, permitting water intrusion within the center submarine cable junction box. See Condition Photo 26.

Control System, Control Console

- There are flammable materials stored within the control console and within Control Panel 1.

- "DANGER HIGH VOLTAGE" signs have not been provided on the control console doors and rubber mats have not been provided in front of the control console.
- Within Control Panel 1, there is no door bonding conductor, and there is no grommet for the telephone conductor.
- There is an uncapped conductor within the "T.V.S.S." panel. See Condition Photo 27.

Traffic Control System

- Neither barrier gate properly engages the receiver. See Condition Photo 28.
- The gongs at the barrier gates have been disabled.
- There is minor corrosion on the far gate motor and the striping on the arm has faded. See Condition Photo 29.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines. The steel trusses and framing system have small areas of corrosion. Existing section loss affects the load capacity of the bridge.

The mechanical and electrical systems should last for the next 20 or more years as long as maintenance is properly performed and the components are kept painted and corrosion free. The main gearbox and end jack drive machinery may require an overhaul during this time period (seals, bearings, gaskets checked and/or changed) but other than that no action is foreseen. The largest risk to the electrical system noted during the inspection is the damaged flexible conduit and unplugged holes in the electrical cabinet located at the pivot pier. If left unsealed, water intrusion into the conduit system is likely, which will severely degrade the conductors and electrical equipment in that area over time.

The bridge is posted for 5 tons. The load rating details were not available for review, but the latest rating was done in 1987 and it is unclear whether it incorporates deterioration noted on the steel beams in 2012. The impact of current losses on the beams on the load rating of the bridge should be determined to determine the course of action for the superstructure. It is possible to add supplemental steel to strengthen the structure if needed.

The paint on the steel is in good condition and will likely require re-coating in the next 15 years. Provided the section losses on the steel at the time of recoating do not have a significant impact on the load posting of the structure, painting the steel will extend its life 10-15 years. When steel work is being considered, an analysis should be done to determine whether strengthening of the steel beams should be done to improve load carrying capacity.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unclear whether the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The existing bridge railings are substandard when compared to current criteria, including railing height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

A detour is available for residents on either side of the channel via SW 4th Avenue (Avenue of the Arts). The detour, using Broward Blvd, SW 4th Avenue and Davie Blvd. is approximately 3.6 miles.

CONSTRUCTABILITY ISSUES

Maintenance of Traffic: The bridge average daily traffic is about 6,600 vehicles per day, and the road is posted for 15 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like spot cleaning and painting truss members, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. A short closure may be needed to complete mechanical or electrical work if the length of time the bridge is unable to open is too long for marine traffic.

Historic Bridge: The bridge dates to 1925 and is eligible for inclusion on the National Register of Historic Places. Consultations with historians, the local historical society, and the state historic preservation officer will be required if replacement options are considered. In order to satisfy federal Section 4(f) requirements, a study evaluating no build, rehabilitation and replacement options will need to be performed to confirm that replacement is the only reasonable option. At this time, replacement in the study period is not anticipated.

RECOMMENDATIONS AND PROBABLE COSTS

Having recently been rehabilitated, and with a fairly new coating system, the bridge is in good condition. With the exception of painting the bridge in 15 year and common maintenance to the moving parts of the bridge, little to no other work is expected to be required to keep the bridge operating reliably for the next 20 years.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

To avoid need for more costly and significant maintenance activities, it is recommended that the vegetation and dirt at the concrete sidewalk panel joints in the vicinity of the bridge be cleaned out and those joints sealed with a hot pour elastomeric sealant. This will prevent runoff from penetrating the joints and potentially causing fill washout behind the abutments that could cause destabilization of the approach slopes or settlement of the approach roadway. This work is inexpensive and can be done by City forces, so no cost has been allocated to the work.

For the movable span, the bridge maintenance forces should continue routine maintenance activities, including spot cleaning and painting corroded areas as they are discovered, to include the live load shoe strike plates and other mechanical and electrical elements. The gear teeth should be routinely greased. After any event causing high water levels that would flood the pivot pier and inundate the mechanical and electrical components there, the components should be washed of salt residue using fresh water and re-greased and lubricated to remove contaminants. No cost has been allocated to this work, as it should be a part of the work required by the bridge's maintenance force.

In the short term, all penetrations in the flexible conduits and electrical cabinets should be repaired/sealed to prevent water intrusion from either high water or rain events. Water intrusion will hasten the deterioration of the conduits, cabinets and conductors if not addressed, and could lead to deterioration that would affect reliable operation of the bridge. This work should be done as part of the bridge's routine maintenance, by forces tasked with that work by the City.

LONG TERM

The bridge went through an extensive rehabilitation in 2010 and is in generally good condition. Work to the bridge during the 20 year study period is likely to include replacement of the timber sidewalk planks, which are exposed to the elements and will deteriorate over time, creating trip hazards for pedestrians as they warp and rot, cleaning and painting of the bridge, miscellaneous concrete repairs, and in-depth mechanical maintenance for the main gearbox and end jack drive machinery in the form of replacing seals, bearings, and gaskets. It is recommended that the steel be painted when the sidewalk planks are removed, in order to ensure that the steel supports for the sidewalks are protected by a coating. It is expected that this work will be required 11-15 years from now.

Long Term Recommendation(s): **Replace timber sidewalk planks.** **Clean and paint bridge.** **Perform concrete repairs.** **Perform in-depth mechanical maintenance.**			Cost	
Design [1]			$	65,000.00
Construction			$	345,000.00
Bridge Construction [2]	$	330,000.00		
Maintenance of Traffic [3]	$	15,000.00		
Construction Inspection and Administration [4]			$	69,000.00
Contingency [5]			$	69,000.00
		TOTAL COST	$	548,000.00

[1] Work is anticipated to be done by an engineer experienced with movable bridges. It is unlikely to be combined with any of the City's other bridges.

[2] Replacing timber planks: $75,000; Clean and paint bridge: $200,000; Concrete repairs: estimate $5,000; In-depth maintenance: $50,000.

[3] Daily closures for equipment and material access. A short detour may be required in order to complete the in-depth mechanical work and keep the channel open to marine traffic.

[4] Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

[5] Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

West Elevation

South Approach Looking North

GENERAL PHOTOS OF BRIDGE

Looking South from Center of Bridge

North Approach Looking South

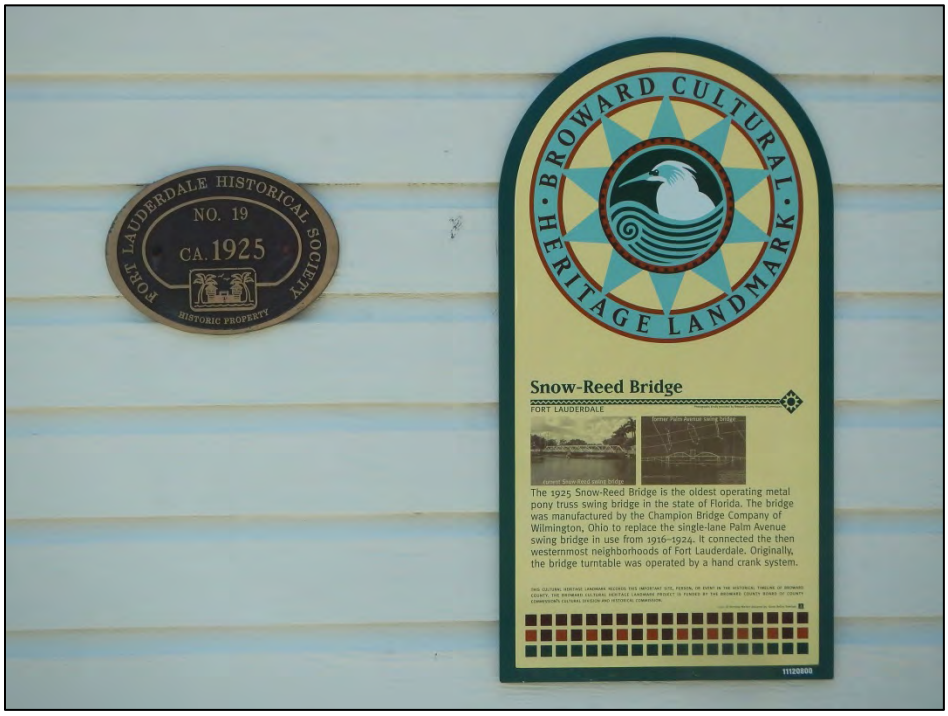
GENERAL PHOTOS OF BRIDGE

Looking North from Center of Bridge

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

Bridge Identification Number



Historic Plaque

GENERAL PHOTOS OF BRIDGE

Machinery at Pivot Pier

Operator's Facilities

GENERAL PHOTOS OF BRIDGE

Control Desk

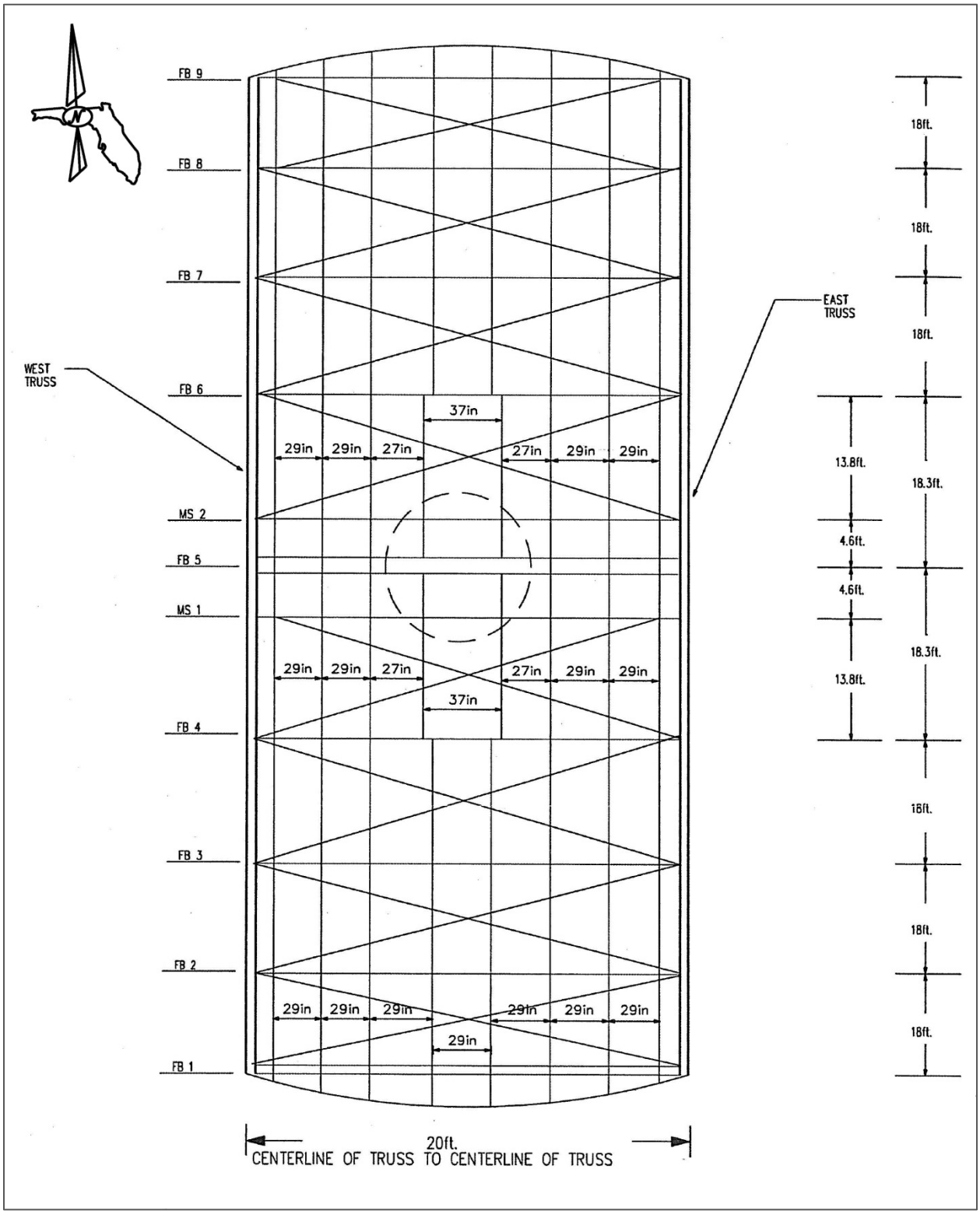
Typical Sidewalk

GENERAL PHOTOS OF BRIDGE

East Channel

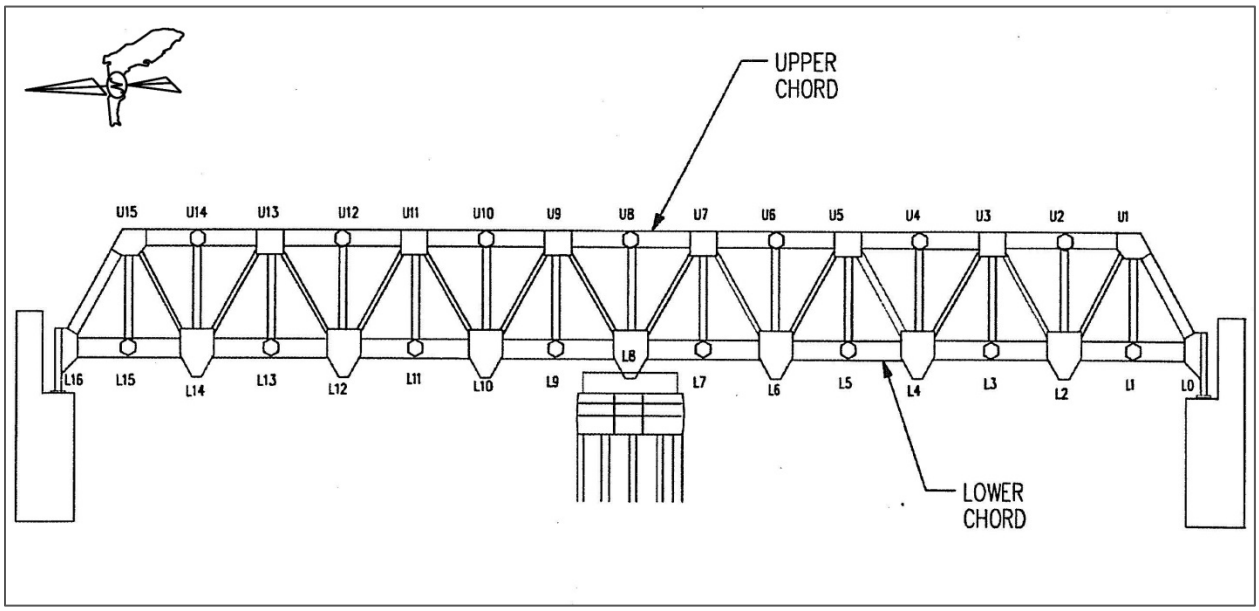
West Channel

SKETCHES

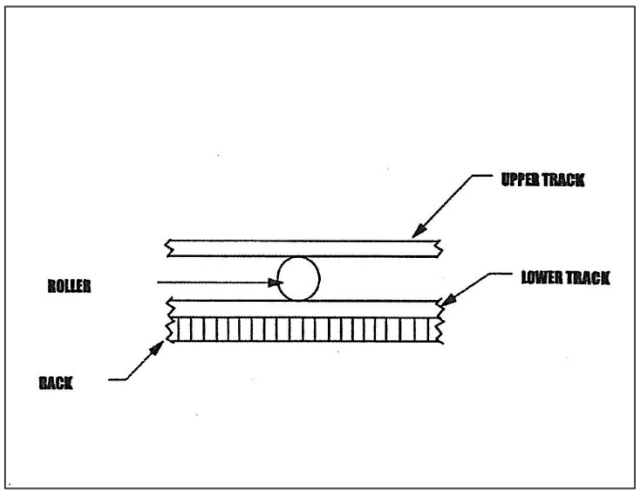


Sketch 1 – Framing Plan

SKETCHES

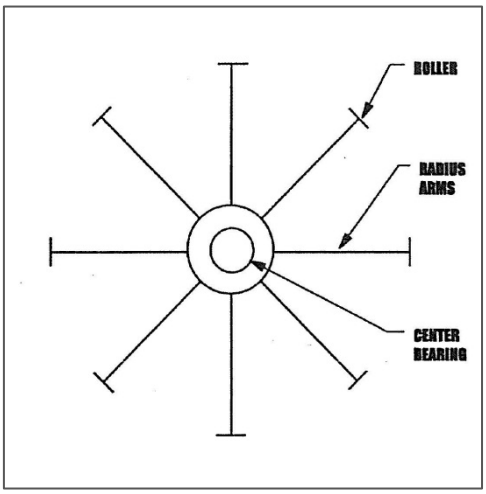


Sketch 2 – Truss Member Numbering Scheme



Sketch 3 – Center Bearing Assembly

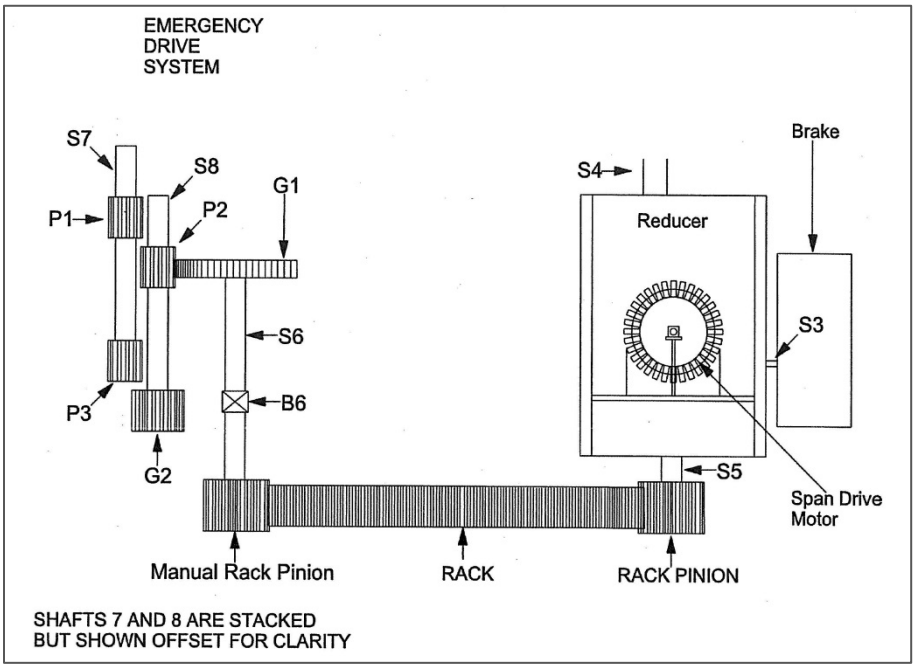
Elevation View



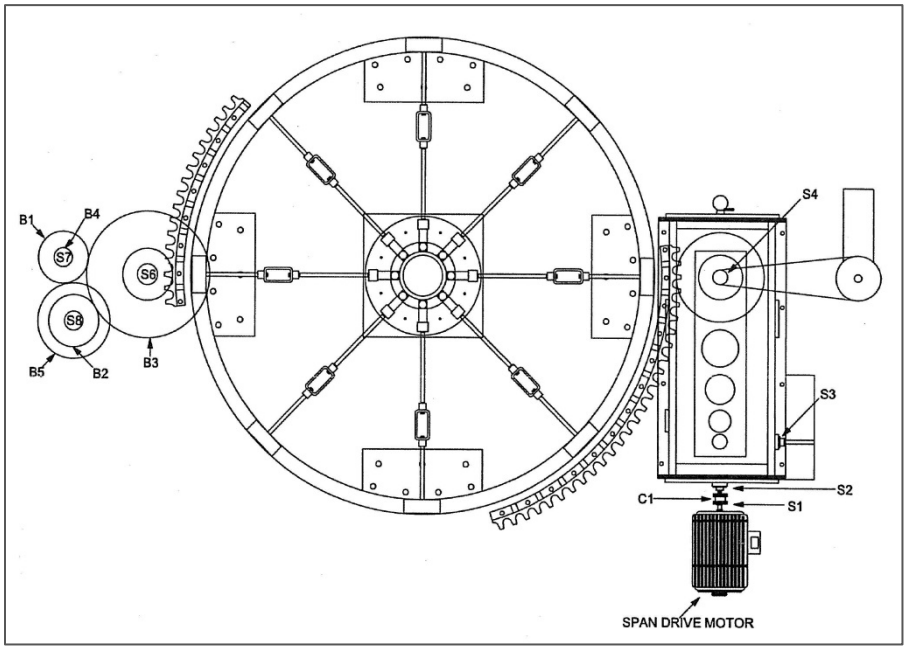
Sketch 4 – Center Bearing Assembly

Plan View

SKETCHES

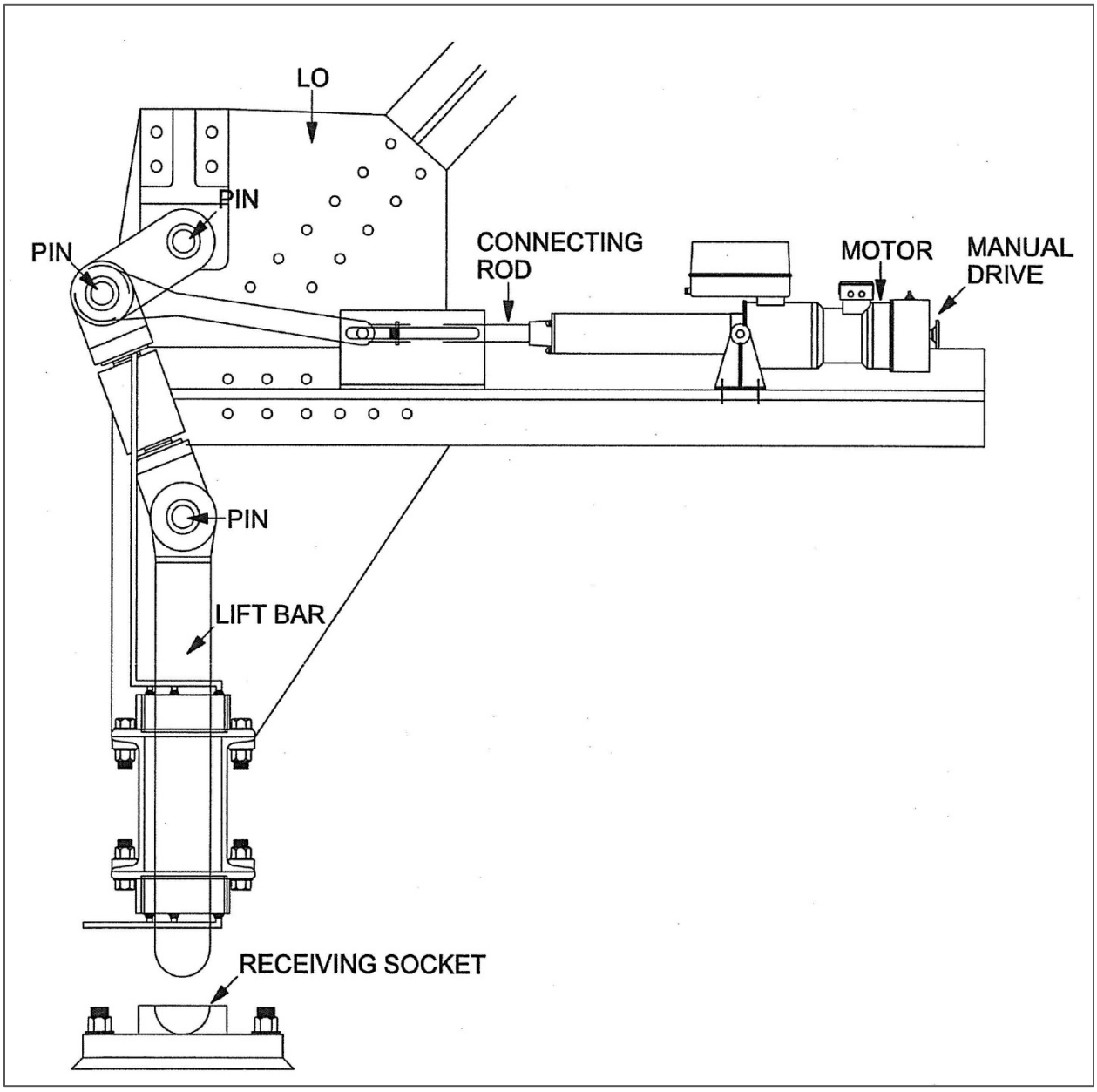


Sketch 5 – Span Drive and Emergency Drive Machinery Layout – Elevation View Looking East



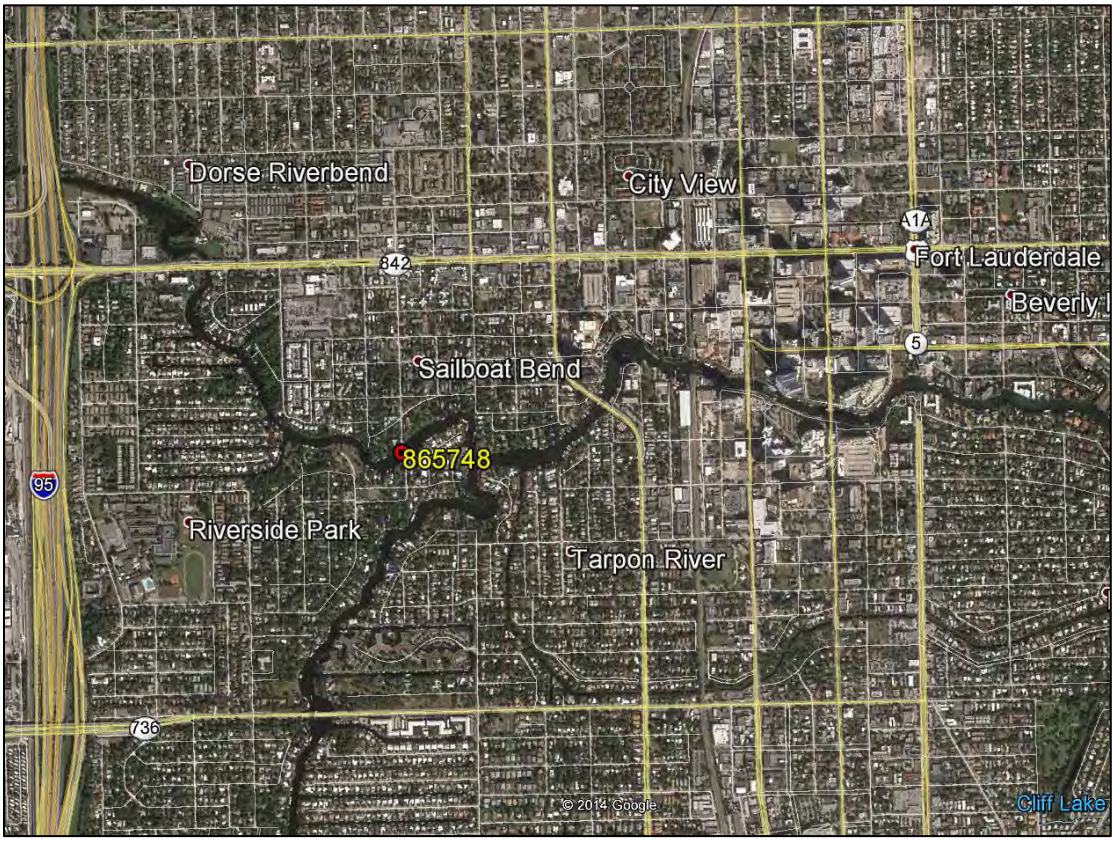
Sketch 6 – Span Drive and Emergency Drive Machinery Layout – Plan View

SKETCHES



Sketch 7 – End Lift Assembly

LOCATION MAP



CONDITION PHOTOS

Photo 1 – General location of cracked weld between Stringer 8-8 and grid deck.

Photo 2 – Cracked weld between main bar and Stringer 8-8.

CONDITION PHOTOS

Photo 3 – Decay at the west sidewalk.

Photo 4 – Typical deteriorated approach sidewalk seal.

CONDITION PHOTOS

Photo 5 – Typical pitting and section loss at stringers.

Photo 6 – Gouge within coping of Stringer 5-6.

CONDITION PHOTOS

Photo 7 – Typical holes in bottom chord.

Photo 8 – Typical painted section loss and pitting in upper chords. Note section loss on rivets.

CONDITION PHOTOS

Photo 9 – Corrosion with section loss on rivets.

Photo 10 – Typical corrosion with section loss on splice plates and connection bolts.

CONDITION PHOTOS

Photo 11 – Typical painted section loss on gusset plates.

Photo 12 – Loose connection bolt at the east vertical connection to L6.

CONDITION PHOTOS

Photo 13 – Bent west top chord adjacent to U6.

Photo 14 – Bent gusset plate at west top chord U11 connection to vertical member.

CONDITION PHOTOS

Photo 15 – Depressed north approach slab relative to abutment backwall.

Photo 16 – Impact damage at northwest guardrail end terminal.

CONDITION PHOTOS

Photo 17 – Northwest Live Load Bearing: Note surface corrosion on Strike Plate.

Photo 18 – West Elevator Wheel: Note surface corrosion on Strike Plate.

CONDITION PHOTOS

Photo 19 – Uncapped conductor within junction box feeding Lock A.

Photo 20 – Unplugged hole in Lock A limit switch enclosure.

CONDITION PHOTOS

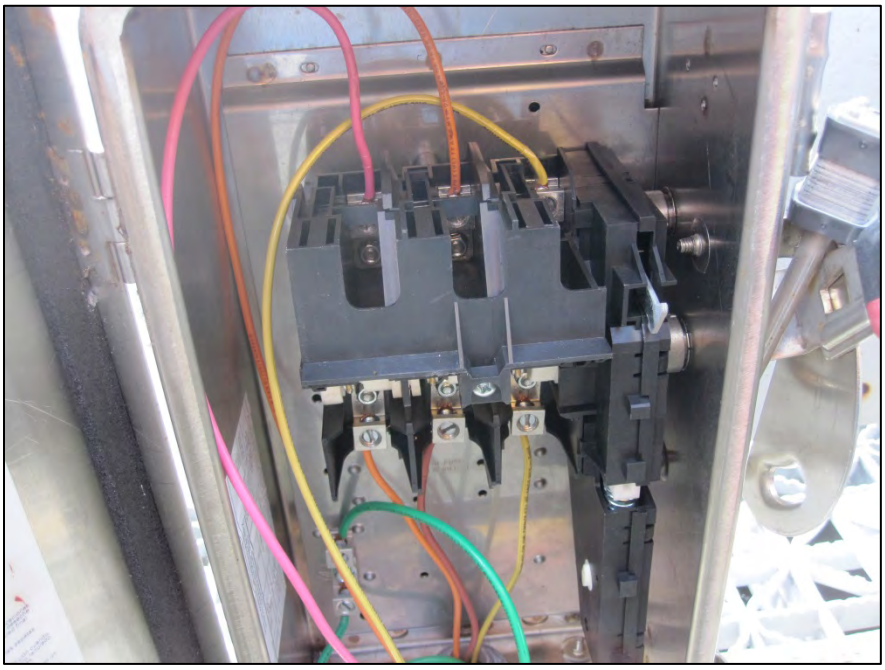


Photo 21 – Inconsistent color coding between load/line sides within lock disconnect switch.

Photo 22 – Insecure flexible conduit fitting at Lock B.

CONDITION PHOTOS

Photo 23 – Emergency Drive Pinion: About 60% engagement with Emergency Drive Rack.

Photo 24 – Unplugged hole at the terminal box in the machinery area.

CONDITION PHOTOS

Photo 25 – Evidence of water intrusion at the terminal box in the machinery area.

Photo 26 – Cut flexible conduit at within the machinery area.

CONDITION PHOTOS

Photo 27 – Uncapped conductor within "T.V.S.S." Panel.

Photo 28 – Barrier gates typically do not fully engage their receivers.

CONDITION PHOTOS

Photo 29 – Faded striping on the far gate arm.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865748** Date: **19-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865748 UW Inspection Date: 5/19/2014

Bridge Name: N/A

Road Name/Number: SW 11 AVENUE

Feature Intersected: N FORK NEW RIVER.

Location: 0.3mi SOUTH of WEST BROWARD BLVD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	9.7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	210 Pier Wall, 220 Submerged Footing
Bottom:	Muck		563 Acc Ladd & Plat
Water Temp.:	82°		571 Submarine Cable, 386 Fender System
Weather:	86° Sunny		215 R/Concrete Abutment
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	475 R/Concrete Walls, 290 Channel
			Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

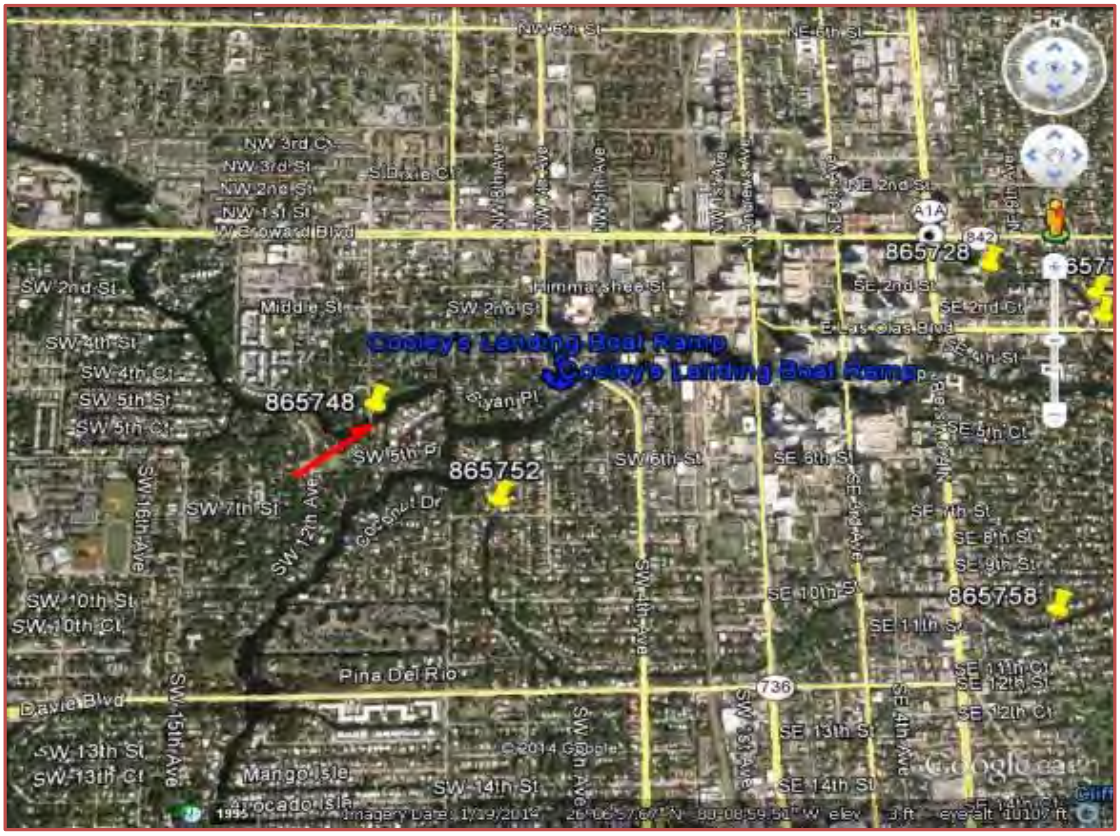
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead.	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Rego, Alexis - Bridge Inspector / Diver (CBI # 409).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369).	
Soria, Miguel, Professional Engineer (P.E. # 49359).	

MIGUEL SORIA LICENSE No. 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865748** Date: **19-May-14**

A: LOCATION MAP



Description: 0.3 mi SOUTH of WEST BROWARD BLVD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
563 Acc Ladd & Plat	**3 ea.**

CS-1: **3**
_The timber piling under the machinery work platform have not been replaced and exhibit up to 40% section loss. **UW Photo 01. INCREASE.**

571 Submarine Cable	**2 ea.**

CS-1: **2**
_The submarine cables are not buried and are laying on the bottom within 20' of Abutment 1 and 2. The cables become buried at the fender and across the channel. **NO CHANGE.**

210 R/Concrete Pier Wall	**23 lf.**

Note:
_The Pivot pier was evaluated under this Element.

CS-2:
_Pivot pier wall has several vertical crack up to 16" x 1/64", starting at the top edge.
UW Photo 02. NEW.

220 R/Concrete Sub Pile Cap/Ftg.	**1 ea.**

Note:
_The underwater inspectors reported the quantity change (two to one) is the result of rock rubble having been placed around Abutment 2, concealing the footing.

CS-1: **1**
_The underwater inspectors reported the footing for Abutment 1 is exposed. **NO CHANGE.**
See Element 290 Channel for exposure heights.

389 Timber Fender/Dolphin	**304 lf.**

Note:
_Fender system was replaced. (estimated during 2009 to 2010).

_No deficiency noted during this inspection cycle.

E: ELEMENT NOTES

Element **Quantity**

290 Channel **1 ea.**

Note:
_The seawalls are considered incidental to this Element.

_Exposed Footer Heights:

Year	2001	2003	2005	2007	2009	2010	2014	
N Abutment	16"	13"	13"	14"	14"	0*	0*	**(NO CHANGE)**
S Abutment	48"	48"	36"	42"	45"	18"	24"	**(INCREASE)**

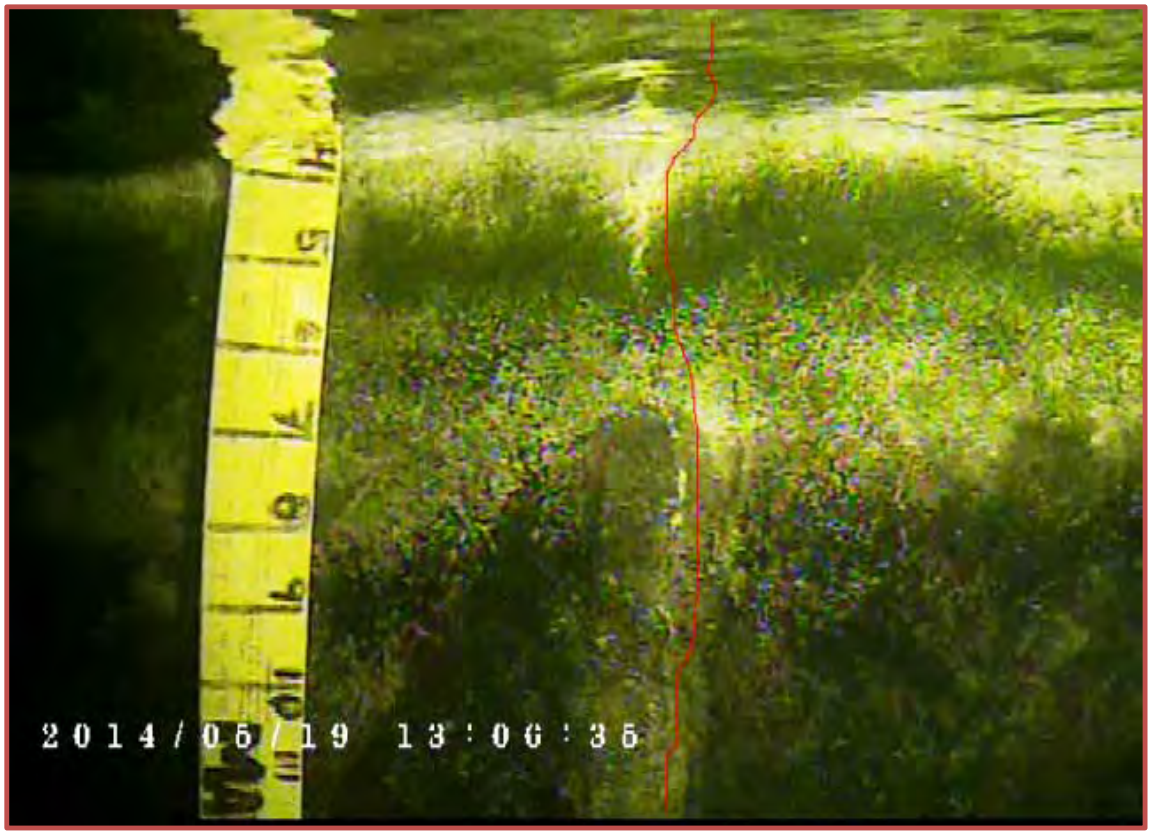
*No longer exposed due to the rock rubble.

475 R/Concrete Walls **105 lf.**

Note:
_This Element represents the retaining walls at the approaches. The retaining wall piling are considered incidental to this Element.

_No deficiency noted during this inspection cycle.

F: PHOTO SECTION



Description: Top: Timber Piling under the machinery platform, up to 40% section loss. **UW Photo 01.**
Bottom: Pivot pier wall has several vertical cracks, starting at the top edge. **UW Photo 02.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.2	11.0
1.5	16.2	15.2
2	13.3	13.4
3	8.6	11.2

Notes: Measurements were taken from the top of the Timber Deck.
Waterline on the left: 6.5 ft. and right: 6.5 ft. at mid-channel.
Maximum Channel depth: 9.7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865752 **Bridge Name:** SW 7th Street over Tarpon River

Topside Inspection Complete: 5/19/2014
Underwater Inspection Complete: 5/19/2014
Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 40 ft. long, single span, concrete encased steel beam and reinforced concrete T-beam bridge was constructed in 1929. The bridge has a roadway width of 24 ft. and carries two lanes of traffic on an urban local roadway in a residential neighborhood. There are 2.9 ft. wide sidewalks on each side. The bridge is classified as Functionally Obsolete but not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a February 2003 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted for SU trucks only at 33 tons. The rating is controlled by the concrete encased steel beams.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt has up to 4 in. wide transverse cracks over both abutments which are filled with dirt and debris and up to ¼ in. wide transverse cracks over the back edge of the backwall. See Condition Photo 1.
- The asphalt has up to $^{1}/_{8}$ in. longitudinal cracks along the deck centerline. See Condition Photo 2.
- The westbound deck top exhibits a pothole over Abutment 1. This condition was not previously noted. See Condition Photo 3.
- There are asphalt pavement drop-offs up to 6 in. at each shoulder.

Deck Underside

- The deck underside in Bays 1 and 8 has several up to 2 ft. x 1 ft. x 1 ½ in. spalls/delaminations with exposed steel (¾ in. section remaining) at the utility hangers. See Condition Photo 4.
- The deck underside in Bay 5 has a 2 ft. 2 in. x 8 in. x 2 in. spall with exposed steel (¾ in. section remaining) adjacent to Abutment 2. See Condition Photo 5.
- The deck underside in Bay 7 has a 2 ft. 4 in. x 1 ft. 8 in. x 1 ½ in. spall/delamination with exposed steel (¾ in. section remaining) adjacent to Abutment 1. See Condition Photo 6.
- The deck underside in Bay 8 has a 3 ft. long x 1 ft. wide spall/delamination with exposed steel. This condition was not previously noted. See Condition Photo 7.
- The northwest approach shoulder has a 4 in. x 4 in. x 8 in. erosion hole.
- A utility conduit attached to the deck underside in Bay 1 is separated, 6 ft. from Abutment 1. See Condition Photo 8.

Railings/Barriers

- There is no approach guardrail system provided for the structure.
- The first light pole on the south barrier is missing 1 of 4 anchor bolt nuts. This condition was not previously noted. See Condition Photo 9.
- The first light pole on the south barrier is missing glass panels at the lamp fixture. This condition was not previously noted. See Condition Photo 10.

Expansion Joints

- No expansion joints are present.

Utilities

- There is one 3 in. steel, one 2 ½ in. steel and one 4 in. steel utility pipe in Bay 1.
- There is one 2 ½ in. steel utility in Bay 7.
- There is one 4 in. PVC and one 4 in. steel utility pipe in Bay 8.
- There is one ½ in. electrical conduit attached to Abutment 1 cap.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the concrete-encased steel beams and reinforced concrete beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Concrete Encased Steel Beams

- The concrete encasements have up to 1/16 in. wide horizontal and vertical cracks throughout.
- Beam 1-2 concrete encasement has a 5 ft. x 6 in. delamination with active leaching in the bottom face, 6 ft. from Abutment 2. See Condition Photo 11.
- Beam 1-3 encasement has an 11 in. x 6 in. x 1 ½ in. spall in the north face at Abutment 2.

- Beam 1-5 encasement has a 6 in. x 2 in. x 1 ½ in. void in the bottom face at Abutment 2 exposing the steel beam. See Condition Photo 12.
- Beam 1-6 encasement has a 10 in. x 3 in. delamination in the bottom face at Abutment 1.
- Beam 1-7 over Abutment 1 exhibits a 2 ft. long x 10 in. wide delamination at the repaired location. This condition was not previously noted. See Condition Photo 13.
- Beam 1-7 encasement has a 6 in. x 4 in. x 1 ½ in. void in the bottom face near mid-span exposing the steel beam. See Condition Photo 14.
- Beam 1-8 encasement has a 5 ft. 6in. long x up to $^{1}/_{16}$ in. wide horizontal crack in the south face at Abutment 1 and a 5 ½ in. x 4 in. x 1 in. spall in the bottom face at Abutment 1. See Condition Photo 15.

Reinforced Concrete Beams

- No deficiencies were noted.

Bearings

- The bearings have moderate corrosion.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- The Abutment caps exhibit several vertical and horizontal cracks up to 1/64 in. wide, at random locations. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.

Footers

- Both abutment footers are exposed, refer to Element 290 for exposed footer heights.
- The Abutment 1 footer has a 2 ft. 3 in. x 8 in. section of missing concrete under Bay 1-1. This appears to be construction related. See Underwater Inspection Report Photo 2.
- Both footers have full height vertical cracks up to $^{1}/_{64}$ in. wide.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The measured exposed footer heights are noted below:
  - Abutment 1:
    - 2009 – 2 ft. 4 in.
    - 2011 – 2 ft.
    - 2014 – 2 ft. 7 in.
  - Abutment 2:
    - 2009 – 3 ft.
    - 2011 – 3 ft.
    - 2014 – 3 ft. 6 in.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Walls

- The southwest wall at the junction to the private sector has a spall 1 ft. 5 in. x 1 ft. 2 in. x 1 ½ in. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is generally in satisfactory to good condition based on National Bridge Inspection Standards and FDOT guidelines. Cracks are present in the concrete encasing the steel beams and spalls to the deck underside, not surprising considering the proximity of the superstructure to the water, and there are cracks in the asphalt overlay, indicating some possible movement of the fill behind the abutments.

Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen T beams cost effectively, because it is difficult to develop the strength of added reinforcing steel without major demolition work to the existing beams.

The bridge is posted for 33 tons for Single Unit trucks, but the load rating completed by FDOT indicates that posting is not required. The posting may be a means to control truck traffic through the neighborhood.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalks on the bridge are 2.9 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge, from SW 4th Avenue to the east and from Davie Road/SW 9th Avenue to the west.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, only making repairs will not improve the load carrying capacity of the bridge.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the south fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is only about 2,500 vehicles per day, and the road is posted for 25 mph, so it is possible to perform repairs on the deck with simple flagging operations to close half of the bridge at a time. Replacing the bridge and maintaining traffic will be challenging, since the bridge only has two beams. Temporary supports would be needed in order to do a phased replacement, and only one lane would be available for two way traffic. Temporary signals would likely be required in order to safely maintain traffic during the work, since temporary barriers and the existing vertical geometry would significantly reduce sight distances for vehicles in both directions.

Historic Bridge: The bridge dates to 1929 and eligible for inclusion on the National Register of Historic Places. The plaques on the bridge indicate that there is likely a constituency that will be interested in preserving the bridge. Consultations with historians, the local historical society, and the state historic preservation officer will be required as any major rehabilitation

or replacement activities are planned. If replacement is considered, a study evaluating no build, rehabilitation and replacement options will need to be performed in order to satisfy federal Section 4(f) requirements.

RECOMMENDATIONS AND PROBABLE COSTS

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term is required to address structural issues at the bridge at this time. Work to extend the life of the bridge is described in Long Term recommendations.

LONG TERM

The main members of the bridge are steel beams that are encased in concrete. The protective concrete shows signs of cracks, which indicates some level of corrosion on the steel. Over time, this concrete will delaminate and spall, exposing the steel. Based on experience and judgment, it is anticipated that this will occur in the next 10 years, after which time the concrete can be removed and replaced. It is recommended that the FDOT State Materials Office be conducted at that time, in order to determine the most up to date methods they suggest for treating the steel prior to encasement. A form of spray-applied metalizing prior to placement of the concrete, after thorough cleaning of the steel, may be a reasonable solution. It is expected that a majority of the deck underside will be spalled and require repair. At that point, with the re-encasement work needed, it is expected that the deck should be replaced as well, which will include replacement of the barriers. While the deck is off and the encasement removed, the bearings should be cleaned and painted. This work is anticipated to be required between years 11-15.

Long Term Recommendation(s): **Replace concrete encasement over steel beams.** **Replace concrete deck and barriers.** **Clean and paint bearings.** **Make concrete repairs to substructure.**			Cost	
Design [1]			$	60,000.00
Construction			$	205,000.00
Bridge Construction [2]	$	195,000.00		
Maintenance of Traffic [3]	$	10,000.00		
Construction Inspection and Administration [4]			$	41,000.00
Contingency [5]			$	41,000.00
		TOTAL COST	$	347,000.00

(1) Design costs includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and rehabilitation design.

(2) Replace concrete encasement: $10,000/beam x 8 beams = $80,000; Replace deck and barriers = $80,000; Clean and paint bearings = $20,000; Concrete repairs: $15,000.

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

West Approach Looking East

Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

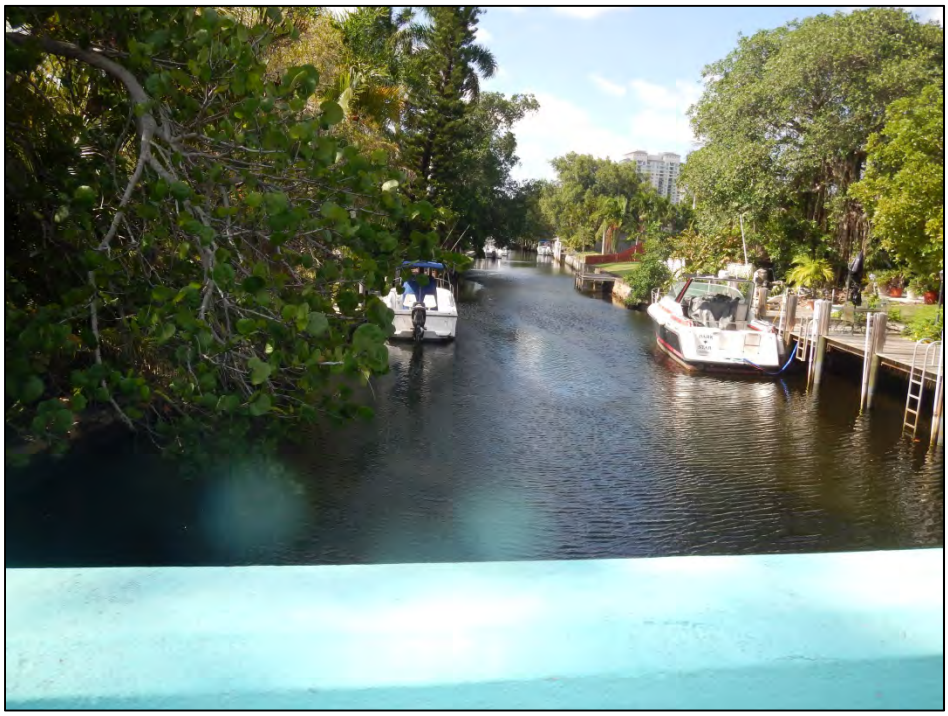
East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

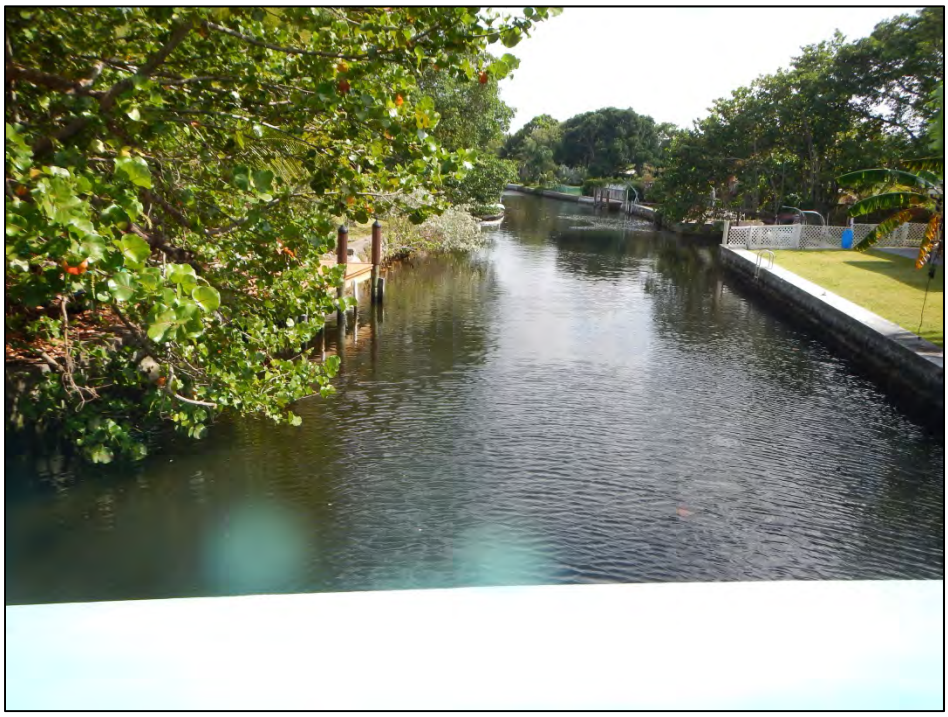
Typical Bridge Railing

Utilities Mounted under North Fascia

GENERAL PHOTOS OF BRIDGE



Channel Looking North



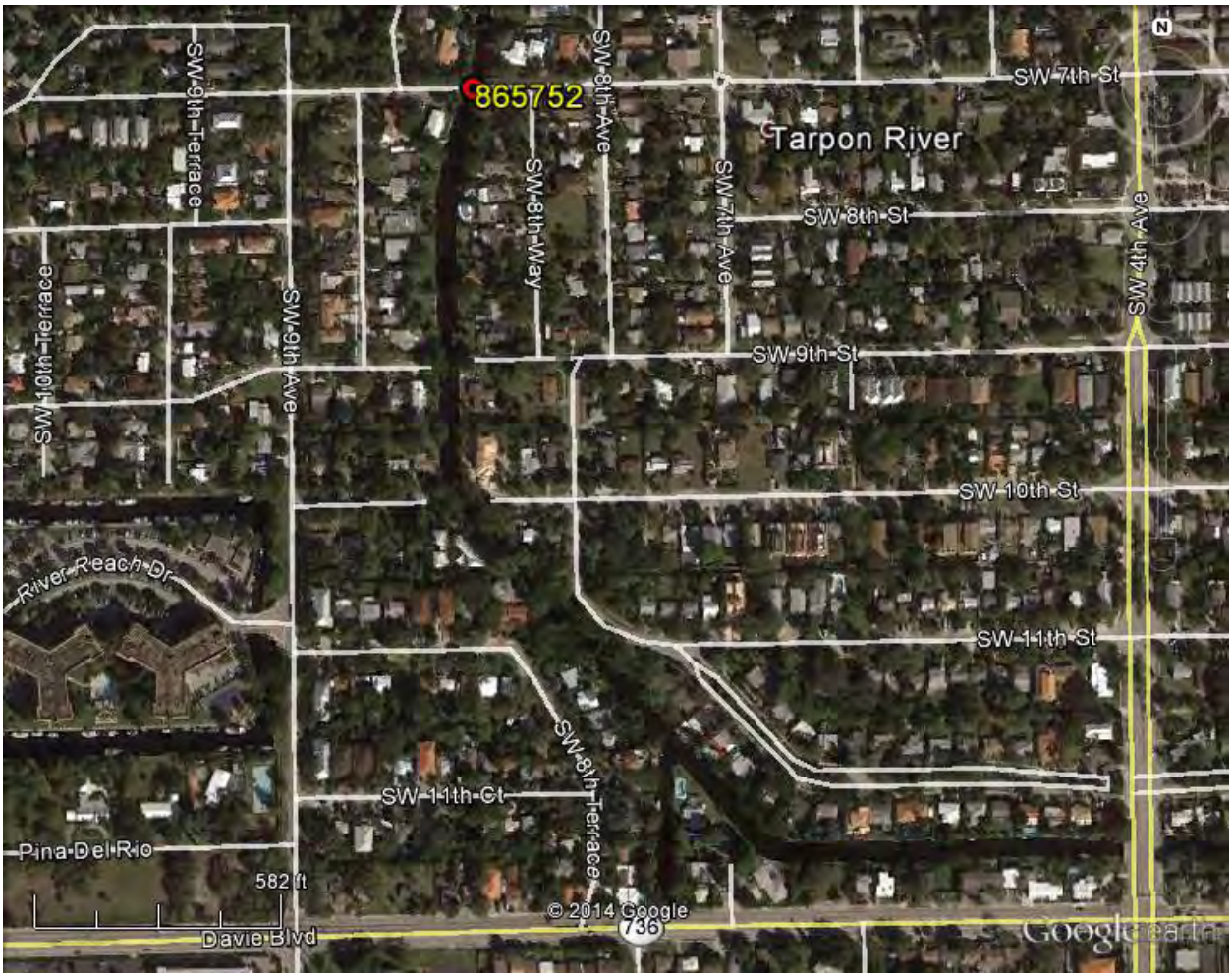
Channel Looking South

GENERAL PHOTOS OF BRIDGE

North Railing Plaque

South Railing Plaque

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Overlay exhibits transverse cracks at Abutment 2.

Photo 2 – The deck top exhibits intermittent longitudinal cracks.

CONDITION PHOTOS

Photo 3 – The westbound deck top exhibits a pothole over Abutment 1.

Photo 4 – Bay 1 mid span exhibits a spall with exposed steel.

CONDITION PHOTOS

Photo 5 – Bay 5 over Abutment 2 exhibits a spall with exposed steel.

Photo 6 – Bay 7 over Abutment 1 exhibits a spall/delamination with exposed steel.

CONDITION PHOTOS

Photo 7 – Bay 8 over Abutment 1 exhibits a spall/delamination with exposed steel.

Photo 8 – The utility conduit under Bay 1 is disconnected.

CONDITION PHOTOS

Photo 9 – The first light pole on the south barrier is missing 1 of 4 anchor bolt nuts.

Photo 10 – The first light pole on the south barrier is missing glass panels at the lamp fixture.

CONDITION PHOTOS

Photo 11 – The bottom face of Beam 1-2, 8 ft. from Abutment 2, exhibits a delamination.

Photo 12 – Beam 1-5 over Abutment 2 exhibits a void.

CONDITION PHOTOS

Photo 13 – Beam 1-7 over Abutment 1 exhibits a delamination.

Photo 14 – Beam 1-7 mid span exhibits a void.

CONDITION PHOTOS

Photo 15 – Beam 1-8 over Abutment 1 exhibits a horizontal crack.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865752** Date: **19-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865752 UW Inspection Date: 5/19/2014

Bridge Name: N/A

Road Name/Number: SW 7th STREET.

Feature Intersected: TARPON RIVER.

Location: 0.3mi WEST of SW 4th AVE.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.3 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	215 R/Concrete Abutments
Bottom:	Muck		220 R/C Sub Pile Cap/Ftg
Water Temp.:	80°		290 Channel
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

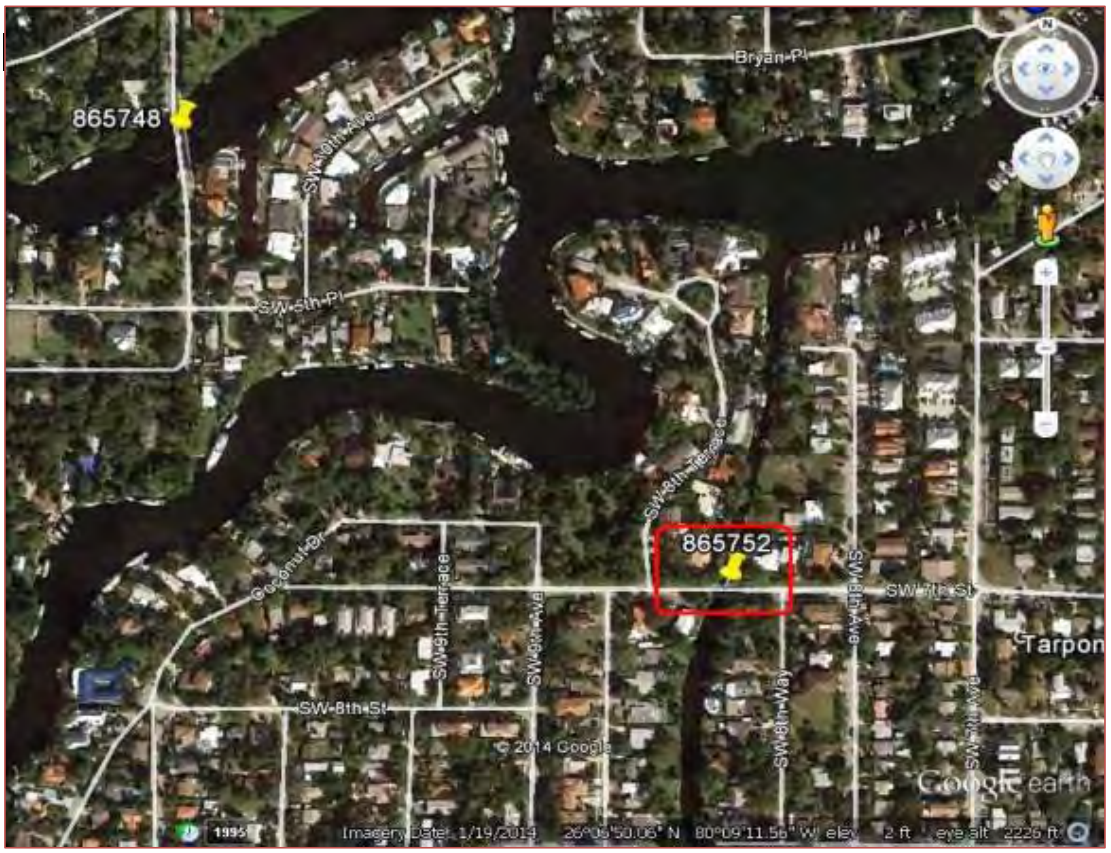
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead.	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Rego, Alexis - Bridge Inspector / Diver (CBI # 409).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

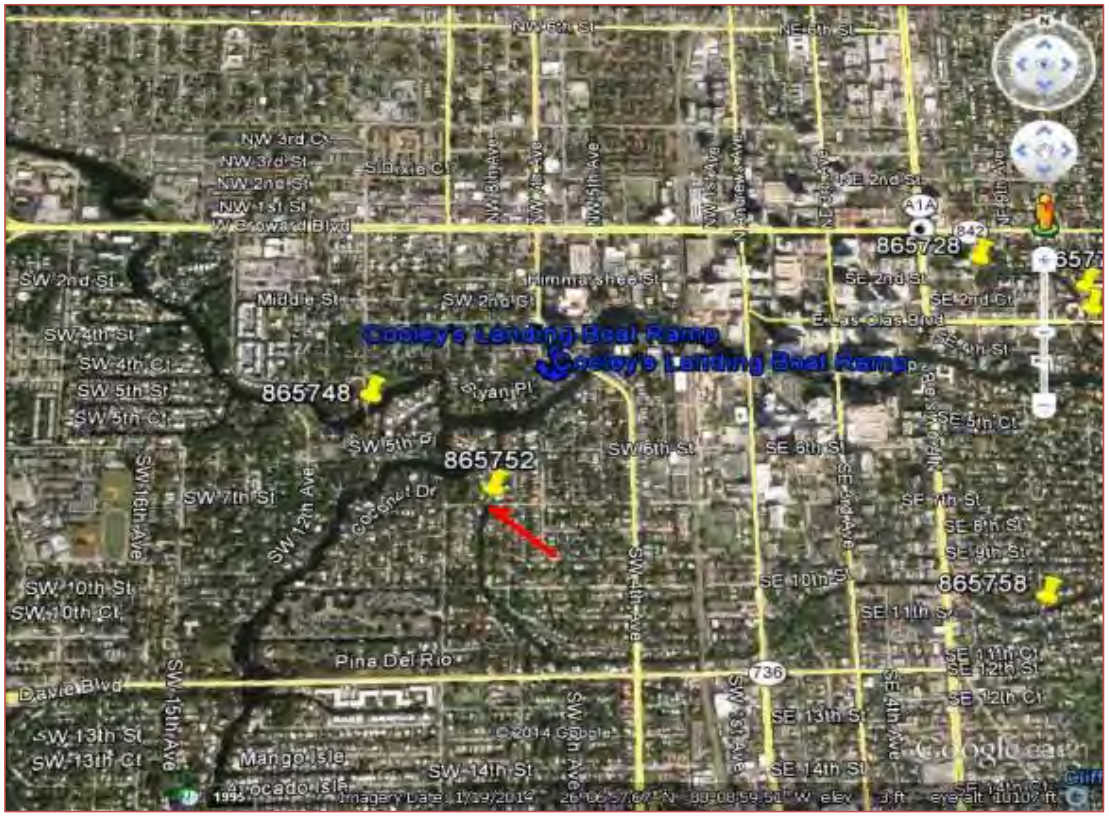
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865752** Date: **19-May-14**

A: LOCATION MAP





Description: 0.3 mi WEST of SW 4th AVE.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
215 R/Concrete Abutments	**72 lf.**

CS-1: **72**
_Abutment caps exhibit several vertical and horizontal cracks up to 1/64" wide, at random locations. **UW Photo 01. (photo taken at Abutment 2) NEW.**

220 R/C Sub Pile Cap/Ftg	**2 ea.**

Note:
_Both Abutment footers are exposed. Refer to Element 290, Channel, for exposed footer heights.

CS-1: **2**
_Abutment 1 footer has a 27" x 8", section of missing concrete under Bay 1-1. No backfill leakage was observed during this inspection cycle. **UW Photo 02. NO CHANGE.**
_Both footer have full height vertical cracks up to 1/64" wide, at random locations. **NO CHANGE.**

290 Channel	**1 ea.**

CS-1: **1**
_The following is the measured exposed footer heights:

Abutment 1
2009 - 28"
2011 - 24"
2014 - 31" mid-section. **INCREASE.**

Abutment 2
2009 - 36"
2011 - 36"
2014 - 42" mid-section. **INCREASE.**

475 R/Concrete Walls	**44 lf.**

CS-2:
_The SW wall at the junction to private sector has a spall 17" x 14" x 1-1/2". **UW Photo 03. NEW.**

F: PHOTO SECTION

Description: Top: Abutment caps, vertical/horizontal cracks at random locations. **UW Photo 01.**
Bottom: Abutment 1 footer, section of missing concrete under Bay 1-1. **UW Photo 02.**

F: PHOTO SECTION

Description: SW wall at the junction to private sector has a spall. **UW Photo 03.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.0	13.3
1.5	17.1	16.8
2	11.5	12.6

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 9.8 ft. and right: 10 ft. at mid-channel.
Maximum Channel depth: 7.3 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865758 **Bridge Name:** SE 9th Avenue over Tarpon River

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/13/2014

Report Date: 7/21/2014

Inspection Personnel / Title / Number	Initials
Gutierrez , Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/21/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 45 ft. long, single span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1971. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. wide sidewalks on each side of the bridge. The bridge is classified as Functionally Obsolete, but not as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 30 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to 40 ft. long x $^{1}/_{8}$ in. wide longitudinal cracks over the slab unit joints and transverse cracks up to $^{1}/_{8}$ in. wide over the expansion joints.
- The deck top has a minor buildup of dirt, debris and vegetation along the shoulder areas.

Railings/Barriers

- No guardrail system or object markers have been provided for the structure.
- Both barriers exhibit pop outs 2 in. diameter x 1in. deep with exposed steel at the base. This deficiency was not previously noted. See Condition Photo 2.

Expansion Joints

- The sidewalk joint sealant is deteriorated and the joints are filled with dirt and debris.

Utilities

- There is one 5 in. diameter steel utility supported by hangers anchored to the underside of the left (west) tee beam (Beam 1-1)

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- Slab Units 1-1 and 1-7 have impact related edge spalls up to 1 ft. x 5 in. x ¾ in. This deficiency was not previously noted. See Condition Photo 1.

Reinforced Concrete T-Beams

- Beam 1-1 and 1-2 have impact related edge spalls up to 9 in. x 9 in. x 1 in. with no exposed rebar. See Condition Photo 3.
- The left (west) tee beam (Beam 1-1) has five impact related edge spalls up to 8 in. x 3 in. x ½ in. near mid-span and minor impact scrapes.
- Both sidewalks have longitudinal cracks up to 4 ft. long x up to $^{1}/_{32}$ in. wide over each abutment.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- No deficiencies were noted.

Intermediate Bents

- Piles 1-1, 1-7, 2-1, 2-2, 2-3, 2-5 and 2-7 have minor construction-related spalls up to 10 in. x 6 in. x ¾ in. Piles 1-1 and 1-7 were not previously noted. See Underwater Inspection Report Photo 1.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The four approach sidewalks have varying degrees of settlement with the northeast corner being the worst with 3 in. of settlement. See Condition Photo 4.
- The northwest approach sidewalk has a ¾ in. wide diagonal crack/fracture and the southeast approach sidewalk has two diagonal crack/fractures up to $^{1}/_{8}$ in. wide. See Condition Photo 5.
- Both approach slabs exhibit longitudinal cracks up to 1 ft. 8 in. long x $^{1}/_{16}$ in. wide. This deficiency was not previously noted.

Wingwalls

- The northeast bulkhead exhibits a fracture 2 ft. x ¼ in. wide. This deficiency was not previously noted.
- The northeast retaining wall exhibits a crack and is rotating toward the channel starting 1 ft. 6 in. into the bulkhead crack, 35 ft. x 10 in. x 2 ft. 1 in. This deficiency was not previously noted. See Condition Photo 6.
- The backwall at Abutment 2 on the west side of Pile 2-2 has a 1 ft. x 1/64 in. wide vertical crack. This deficiency was not previously noted. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- The northeast seawall at Abutment 2, adjacent to the private sector has a 2 ft. 6 in. long x 4 in. wide void with up to 2 ft. 1 in. of penetration. Minor backfill leakage was observed during this inspection. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- There is active backfill erosion seepage. This deficiency was not previously noted.
- The northeast bulkhead is settled up to 4 in. This deficiency was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of two similar bridges in this neighborhood – the bridge numbers are 865758 and 865759. The bridges were constructed in 1971 and 1970, respectively, and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, but there are few signs of deterioration to be main bridge elements. The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks.

The latest available load ratings for both bridges do not indicate that either of them require posting; however, 30 ton signs are present at both bridges, likely to limit truck traffic through the local neighborhood.

GEOMETRIC DEFICIENCIES

This bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 11,700 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. However, uneven sidewalks should be addressed as needed. No cost has been provided for this, as it is assumed that City forces would address those issues.

Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The bridge is in good condition overall. Anticipating large scale work, such as metalizing or jacketing substructure units, or reconstructing the abutments, does not appear to be warranted at this location. No significant work, outside of routine maintenance activities, is expected in the next 20 years.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

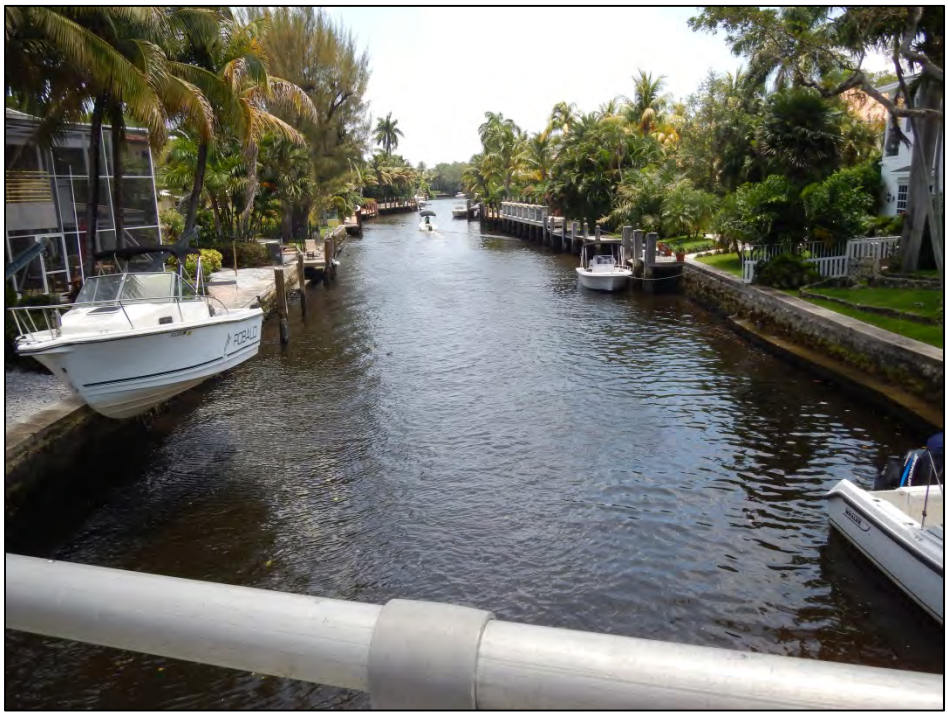
Bridge Posting Sign at South Approach

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

Concrete Slab Underside and Concrete T-beam. Note Utility Pipe in the Bay.

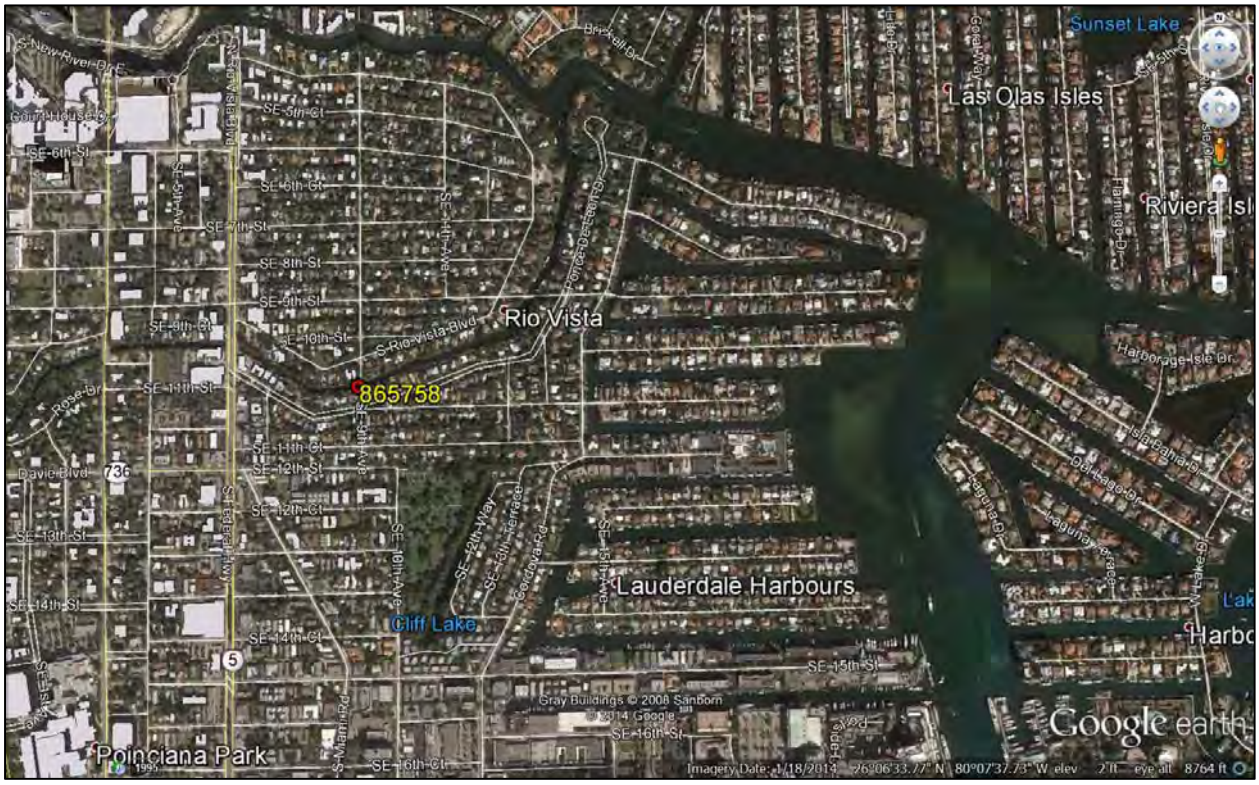
GENERAL PHOTOS OF BRIDGE



Channel Looking East

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Spall in the deck underside, Slab Unit 1-1.

Photo 2 – Pop outs in the barrier.

CONDITION PHOTOS

Photo 3 – Beam 1-1 spalls with no exposed steel.

Photo 4 – Settlement of the northeast approach sidewalk.

CONDITION PHOTOS

Photo 5 – Cracks in the northwest approach sidewalk.

Photo 6 – Crack and rotation in the northeast retaining wall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865758** Date: **13-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865758 UW Inspection Date: 5/13/2014

Bridge Name: N/A

Road Name/Number: SE 9TH AVENUE

Feature Intersected: TARPON RIVER

Location: 100ft North of Ponce Deleon Dr

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	81°		475 R/Concrete Walls
Weather:	84° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

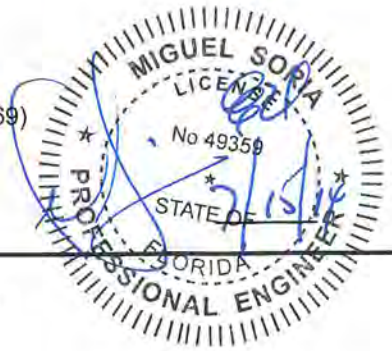
Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

Soria, Miguel, Professional Engineer (P.E. # 49359)



UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865758** Date: **13-May-14**

A: LOCATION MAP

Description: 100 ft North of Ponce Deleon Dr

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**14 ea.**

Note: Several piles were cleaned at random locations.

CS-1: **7**
_Piles 1-1, 1-7, 2-1, 2-2, 2-3, 2-5 and 2-7 have minor construction-related spalls up to 8" x 6" x 3/4". **UW Photo 01. INCREASE**

290 Channel	**1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls	**193 lf.**

Note: This Element represents the abutment retaining walls at all four corners of the structure.

CS-2:
_Abutment 2 backwall, West side of Pile 2-2 has a vertical crack 12" x 1/64". **UW Photo 02. NEW.**

INCIDENTAL:
_Abutment 2, NE seawall adjacent to the private sector, has a diagonal/void 30" L x 4" W, with up to 25" penetration. Minor backfill leakage was observed during this inspection. **UW Photo 03. NEW**

F: PHOTO SECTION

Description: Top: Piles have minor construction-related spalls up to 8" x 6" x 3/4". **UW Photo 01.**
Bottom: Abutment 2 backwall, West side of Pile 2-2, vertical crack. **UW Photo 02.**

F: PHOTO SECTION

Description: Abutment 2 NE seawall, has a diagonal/void with up to 25" penetration. **UW Photo 03.**

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Seal the diagonal void at Abutment 2 NE seawall, adjacent to the private sector.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.4	13.9
1.5	17.4	17.2
2	13.0	13.3

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 11.5 ft. and right: 11.3 ft. at mid-channel.
Maximum Channel depth: 5.9 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865759 **Bridge Name:** SE 9th Street over Tarpon River

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/13/2014

Report Date: 7/21/2014

Inspection Personnel / Title / Number	Initials
Gutiérrez , Carlos–Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF PROFESSIONAL ENGINEER

7/21/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 98 ft. long, three span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1970. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. wide sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a September 1998 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting, although the bridge has posting signs limiting vehicles to 30 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to $^{1}/_{8}$ in. wide longitudinal cracks over the slab unit joints.
- The asphalt overlay in all three spans is starting to upheave with minor rutting and impending potholes along the longitudinal cracks located 2 ft. from the curbs. See Condition Photo 1.
- The asphalt overlay over the expansion joints has transverse cracks up to ¼ in. wide.
- The sidewalks have up to $^{1}/_{64}$ in. wide longitudinal cracks over the bents.

Railings/Barriers

- The south face of the left parapet, 3 ft. from Bent 2, has a 2 in. x 2 in. spall with exposed steel. See Condition Photo 2.
- The concrete parapets have up to $^{1}/_{64}$ in. wide vertical cracks, primarily under the aluminum handrail anchors.
- The mounting hardware for the aluminum handrails has minor surface corrosion.
- The tree growing from the south end of Abutment 1 is beginning to grow into the right (south) bridge rail and around the aluminum handrail.

Expansion Joints

- The sidewalk joint sealant is deteriorated.

Utilities

- There is one 9 in. steel utility is attached to the underside of Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- The southwest corner of the 1st slab adjacent to column 1-5 has a 3 ft. 6 in. x 1/16 in. vertical crack starting from the cap down. This deficiency was not previously noted.

Reinforced Concrete T-Beams

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a large tree growing at the south end. See Condition Photo 3
- The cap at Abutment 4 above Pile 4-3 exhibits vertical crack 2 ft. 2 in. x $^{1}/_{64}$ in. wide.

Intermediate Bents

- Pile 1-5 has an 8 in. x 4 in. x 1 in. spall in the southwest corner, 3 ft. 8 in. below the cap. See Condition Photo 4.
- Pile 4-1 exhibits a spall 7 in. x 4 in. x 1 in. with no exposed steel at the northwest corner. This deficiency was not previously noted.
- Pile 4-4 northwest corner has a 9 in. x 4 in. x ½ in. spall, 5 ft. below the cap. See Underwater Inspection Report Photo 1.
- The northeast corner of Pile 4-5 has a 6 in. x 3 in. x 1 in. spall, starting 8 in. below the high watermark. This deficiency was not previously noted.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is an 8 ft. x 4 ft. x 3 ft. washout behind the northeast retaining wall at Abutment 4.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The southeast approach sidewalk has settlement up to ¾ in. See Condition Photo 5.
- The southwest and southeast approach sidewalks have a moderate amount of dead vegetation.
- The approach sidewalk, curb and barrier wall joints are not sealed.
- The bottom edge of the north face of the northeast approach slab has a 25 ft. long x 1/32 in. wide horizontal crack. This deficiency was not previously noted.

Wingwalls

- The westernmost sheet pile of the northeast retaining wall has a 3 ft. 6 in. x 1 ft. delamination, 1 ft. 1 in. above the waterline. This deficiency has increased since the last inspection. See Underwater Inspection Report Photo 2.
- There is a 1 ft. 2 in. x 4 in. x 1 in. spall in the sheet piles at Abutment 1 retaining wall, 1 ft. from Pile 1-4 at 4 ft. below the cap. See Condition Photo 6.
- The sheet piles have open joints up to 5/8 in. with no backfill leakage.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of two similar bridges in this neighborhood – the bridge numbers are 865758 and 865759. The bridges were constructed in 1971 and 1970, respectively, and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, but there are few signs of deterioration to be main bridge elements. The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in good condition and have no visible spalls or cracks.

The latest available load ratings for both bridges do not indicate that either of them require posting; however, 30 ton signs are present at both bridges, likely to limit truck traffic through the local neighborhood.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available for residents living on either side of the bridge.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 1,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. However, uneven sidewalks should be addressed as needed. No cost has been provided for this, as it is assumed that City forces would address those issues.

The tree growing at the west abutment should be removed to ensure that its roots do not cause further deterioration to the cap. The tree should be cut off at the abutment and any roots extending into the bridge killed. No cost has been provided for this, as it is assumed that City forces would be able to address this condition.

Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The bridge is in good condition overall. Anticipating large scale work, such as metalizing or jacketing substructure units, or reconstructing the abutments, does not appear to be warranted at this location. No significant work, outside of routine maintenance activities, is expected in the next 20 years.

GENERAL PHOTOS OF BRIDGE

South Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Bridge Posting Sign at West Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at East Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

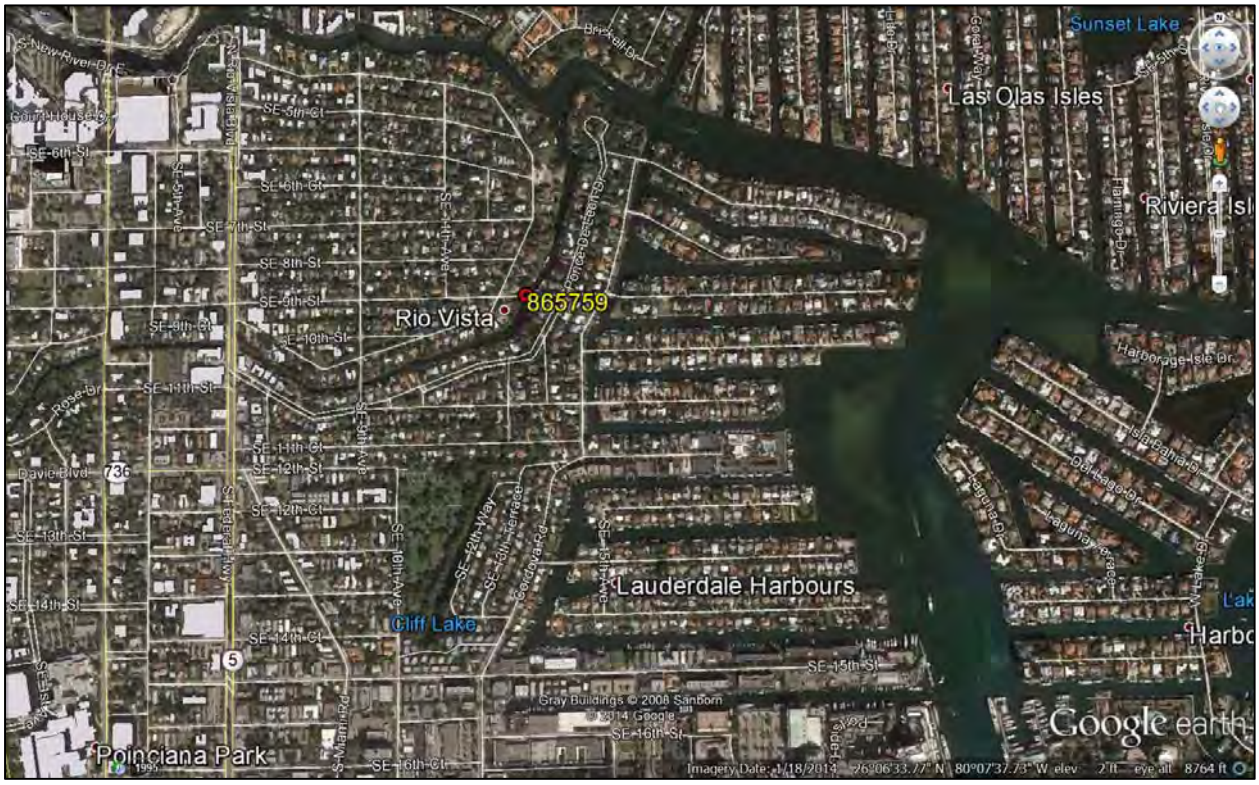
Concrete Slab Underside and Concrete T-beam. Note Utility Pipe.

Channel Looking North

GENERAL PHOTOS OF BRIDGE

Channel Looking South

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Rutting in the asphalt overlay.

Photo 2 – Spall in the south face of the left parapet.

CONDITION PHOTOS

Photo 3 – Tree growing at the south end of the Abutment 1 cap.

Photo 4 – Spall in Pile 1-5.

CONDITION PHOTOS

Photo 5 – Settlement in the southeast approach sidewalk.

Photo 6 – Spall in the sheet piles at Abutment 1 retaining wall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865759** Date: **13-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865759 UW Inspection Date: 5/13/2014

Bridge Name: N/A

Road Name/Number: SE 9th STREET

Feature Intersected: TARPON RIVER

Location: 0.6 mile East of US-1.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.2 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	81°		475 R/Concrete Walls
Weather:	83° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

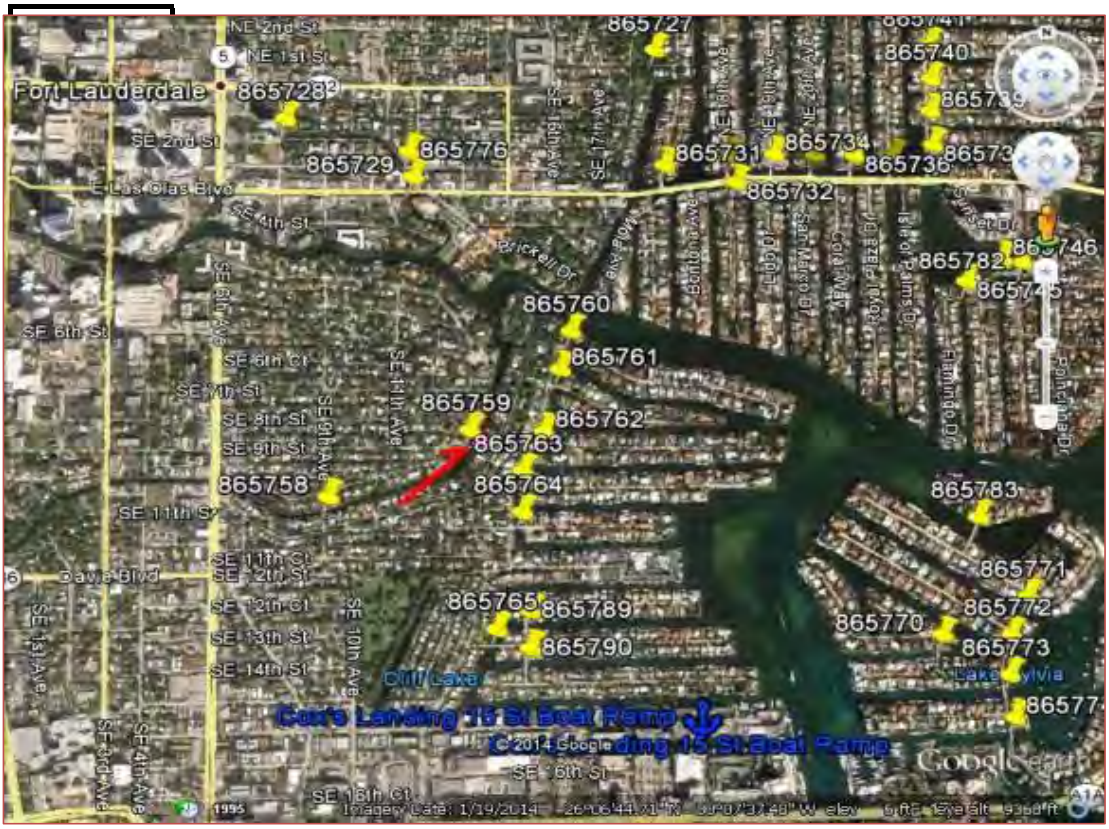
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865759** Date: **13-May-14**

A: LOCATION MAP



Description: 0.6 mile East of US-1.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **24 ea.**

Note:
_Piles were inspected from cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 36in. below the caps. Some piles were cleaned at random locations during this inspection cycle.
_Pile 1-1 could not be inspected due to the private sector retaining wall.

CS-2: **3**
_Pile 1-5, SW corner has a spall 8" x 4" x 1", starting 44" below the cap. **NO CHANGE.**
_Pile 4-4, NW corner has a spall 9" x 4" x 1", starting 60" below the cap. **UW Photo 01. NO CHANGE**
_Pile 4-5, NE corner has a spall 6" x 3" x 1", starting 8" below the high watermark. **NEW.**

290 Channel **1 ea.**

Note:
_The channel bank retaining walls are private sector and are not related to the bridge.

INCIDENTAL:
_There is an 8' x 4' x 3', washout behind the NE retaining wall at Abutment 4. No backfill leakage was observed during this inspection cycle. **NO CHANGE.**

475 R/Concrete Walls **192 lf.**

Note:
_The retaining walls were inspected from below the bulkhead cap to the ground-line by the underwater inspectors during this inspection cycle.

CS-3: **1**
_The westernmost sheet pile of the NE retaining wall has a delamination 42" x 12", 13" above the waterline. **UW Photo 02. INCREASE.**

CS-2: **2**
_Abutment 1 retaining wall has a spall 14" x 8" x 1", 12" from Pile 1-4 and 48" from the cap.

CS-1: **189**
_The sheet piles have open joints up to 5/8" wide. No backfill was observed during this inspection cycle.

F: PHOTO SECTION

Description: Top: Pile 4-4, NW corner spall, starting 60" below the cap. **UW Photo 01.**
Bottom: Westernmost sheet pile of the NE retaining wall, delamination. **UW Photo 02.**

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Remove unsound concrete and patch the delaminated area at the Westernmost sheet pile of the NE retaining wall.

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865759** Date: **13-May-14**

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.6	14.6
2	17.4	18.5
2.5	18.8	19.5
3	18.1	18.4
4	13.6	15.4

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 12.1ft. and right: 12.3ft. at mid-channel.
Maximum Channel depth: 7.2 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865760 **Bridge Name:** SE 7th Street over Rio Cordova

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	**Initials**
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 93 ft. long, three (3) span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1972. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 4.9 ft. wide sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, no posting is required.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida

Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt has up to 1/8 in. wide longitudinal cracks over the slab unit joints - NO CHANGE.
- The left sidewalk in Span 1 has a span length (31ft.) x 1/16 in. wide longitudinal crack, which outlines a 31 ft. x up to 1 ft. 8 in. delamination along the right edge.
- The left sidewalk in Span 1 has a 1 ft. 8 in. x 1 ft. 2 in. delamination adjacent to the barrier at Bent 2.
- The right sidewalk in Span 1 has a 2 ft. long x 1/64 in. wide longitudinal crack extending from Bent 2.
- The left sidewalk in Span 2 has a 5 ft. x 10 in. delamination along the right edge at Bent 2.
- The left sidewalk in Span 2 has a 6 in. x 6 in. delamination adjacent to the barrier 8ft. from Bent 2.
- The left sidewalk in Span 2 has a 6 ft. x 2 ft. delamination along the right edge 11 ft. from Bent 2.
- The left sidewalk in Span 2 has a 1 ft. 2 in. x 11 in. delamination adjacent to the barrier 11 ft. from Bent 2.
- The left sidewalk in Span 2 has a 6 ft. x 2 ft. delamination along the right edge at Bent 3.
- The right sidewalk in Span 2 has a 4 ft. long x 1/64 in. wide longitudinal crack extending from Bent 2.
- The right sidewalk in Span 3 has a 2 ft. 8 in. x 1 ft. 2 in. delamination at Bent 3.

Railings/Barriers

- The right barrier in Span 1 has a 4 ft. x 1 ft. 4 in. delamination in the top face in Span 1 adjacent to Bent 2. See Condition Photo 1.
- The cap on the top of the barrier has up to 1/32 in. wide map cracking throughout.
- Several spots on the bridge rails are missing small areas of the rock facade.
- No guardrail has been provided for this structure.
- No object markers have been provided for this structure.

Expansion Joints

- The sidewalk joint sealant is deteriorated and the joint packed with dirt and debris. See Condition Photo 2.
- The asphalt over the expansion joints has ¼ in. wide transverse cracks.
- Staining on the caps indicates that the joints are leaking.

Utilities

- There is one 5 in. PVC utility and one 4 ½ in. PVC utility attached to the deck underside adjacent to Beam 1 in all spans.

- There is one 7 in. PVC utility and one 4 ½ in. steel utility attached to the deck underside adjacent to Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- Slab Unit 1-2, north edge, has a 2 ft. x 1 ft. 6 in. x 2 in. spall/delamination with exposed rebar at Abutment 1 cap. See Condition Photo 3.
- Slab Unit 1-4, north edge, has a 3 ft. x 3 ft. x 1 ½ in. spall/delamination with exposed rebar at Abutment 1 cap.
- Slab Unit 1-6, north edge, has a 2 ft. 8 in. x 1 ft. 8 in. x 2 in. spall with exposed rebar (100% section loss) at Abutment 1 cap.
- Slab Unit 1-7, bottom face, has a 1 ft. 2 in. x 6 in. delamination at Bent 2 cap.
- Slab Unit 2-1 and 2-2, south edge, has a 2 ft. 6 in. x 11 in. delamination at Bent 2 cap.
- Slab Unit 2-1, south edge, has a 1 ft. x 2 in. delamination at Bent 3 cap.
- Slab Unit 2-6, south edge, has an 11 in. x 8 in. delamination at Bent 2 cap.
- Slab Unit 3-2, north edge, has a 3 ft. x 1 ft. 8 in. x 2 in. spall/delamination with exposed rebar at Abutment 4 cap.
- Slab Unit 3-4, south edge, has a 2 ft. 7 in. x 2 ft. 4 in. spall at Abutment 4 cap. Previously noted as a delamination. See Condition Photo 4.
- Slab Unit 3-6, south edge, has a 2 ft. 8 in. x 2 ft. 7 in. spall at Abutment 4 cap. Previously noted as a delamination.
- Slab Unit 3-7, north edge, has a 2 ft. 8 in. x 1 ft. 8 in. delamination at Abutment 4 cap.

Reinforced Concrete T-Beams

- The sidewalk undersides have minor cracking up to 1/32 in. wide and minor delaminations at the bents up to 8 in. x 6 in.
- The underside of the T-beam at midspan of Span 2 under the left sidewalk exhibits a spall 9 in. x 7 in. x 1 in. with exposed steel. This deficiency was not previously noted. See Condition Photo 5.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a 2 ft. 4 in. x 1 ft. 6 in. delamination with corrosion bleedout at the south end. Corrosion bleedout was not previously noted. See Underwater Inspection Report Photo 3.
- The northwest corner at the wingwall of Abutment 1 exhibits a diagonal crack 10 ft. long x 1 in. wide.
- Abutment 4 cap has a 2 ft. 4 in. x 2 ft. x 4 in. spall/delamination with corrosion bleedout and associated cracks up to 1/32 in. wide in the bottom northwest corner. Previously noted with associated cracking. See Underwater Inspection Report Photo 4.
- Abutment 4 cap has an 8 ft. x 10 in. delamination with corrosion bleedout and associated cracks up to 1/32 in. wide over Piles 3-3 to 3-4. See Condition Photo 6 and Underwater Inspection Report Photo 5.
- Abutment 4 cap, at the south end, has a 2 ft. 10 in. x 1 ft. 8 in. delamination with associated cracks up to 1/32 in. wide with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- The northeast corner of Abutment 4 exhibits an area of undermining 2 ft. long x 5 in. high x 3 ft. deep adjacent to Pile 3-1. This deficiency was not previously noted.
- Both abutment caps have intermittent horizontal cracking up to 1/32 in. wide, some with corrosion staining, along the bottom edge.

Intermediate Bents

- Bent 2 and 3 caps each have a cap length (36 ft. 2 in.) x 1 ft. 6 in. delamination with corrosion bleedout along the bottom 1 ft. 6 in. of the east and west faces. See Underwater Inspection Report Photo 7.
- The cap at Bent 2, bottom edge of the west face, exhibits intermittent horizontal cracks up to 7 ft. long x 1/64 in. wide with corrosion staining. This deficiency was not previously noted.
- The cap at Bent 2 on both faces exhibit delaminations 35 ft. long x 1 ft. 6 in. high with corrosion stains. This deficiency was not previously noted.
- Bent 3 cap has a 1 ft. x 1 ft. x 4 in. spall with exposed rebar on the bottom northwest corner. See Condition Photo 7 and Underwater Inspection Report Photo 5.
- The west face of Bent 3 cap has a 36 ft. long x 1 ft. 1 in. high spall and delamination. This deficiency was not previously noted.
- There are minor vertical cracks up to 1/32 in. wide on random piles extending into the marine growth with no corrosion staining at random locations.
- Pile 3-4 has up to 2 ft. x 10 in. delaminations with corrosion staining in all four edges starting from cap down. See Condition Photo 8 and Underwater Inspection Report Photo 1.
- Pile 3-5 has up to 4 ft. x 1/32 in. vertical cracks with corrosion staining in the northwest and southwest edges starting from the cap down. See Underwater Inspection Report Photo 2.
- Pile 3-6 has up to 2 ft. x 1 ft. delaminations with corrosion staining in the northwest, southwest and southeast edges starting from the cap down.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The seawalls have up to 1 ft. 8 in. x 1 ft. x 1 ft. 8 in. voids in the masonry grout.
- The south side of Pile 4-5 at Abutment 4, there is a spall/void 6 in. x 4 in. at the ground line with minor backfill leakage. This deficiency was not previously noted. See Underwater Inspection Report Photo 9.
- On the south side of Pile 4-5 at the bottom of cap, the bottom of the wingwall cap is visible in the void. See Underwater Inspection Report Photo 10.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The overlay on the west approach slab has two up to 1/8 in. wide diagonal cracks in the eastbound lanes.
- The southwest approach curb has a 1 ft. x 4 in. x 3 in. spall at Abutment 1 and a 6 ft. x 8 in. x 1 in. spall 12 ft. from Abutment 1. See Condition Photo 9.
- The southwest approach curb and sidewalk exhibits an area of settlement 8 ft. x 5 ft.
- The northeast approach sidewalk has a 5 ft. long x 1/8 in. wide transverse crack at the east end of the approach slab. The width of the crack has increased from 1/32 in. to 1/8 in.
- All four approach barriers are missing small areas of the rock facade.

Wingwalls

- The southwest retaining wall cap has horizontal cracks with corrosion bleed-out, up to 1/16 in. wide throughout. This deficiency was not previously noted. See Underwater Inspection Report Photo 11.
- The northwest retaining wall cap bottom edge has an 8 ft. x 1 ft. 4 in. delamination with corrosion staining at the north end. See Condition Photo 10 and Underwater Inspection Report Photo 12.
- Several of the joints are open up to 1 ¼ in. wide with minor edge spalls up to 2 in. wide and minor backfill leakage.
- The northwest corner of the wingwall at Abutment 1 has a 10 ft. x 1 in. diagonal crack. This deficiency was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865760 through 865764. All of the bridges were constructed in 1972 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and intermediate bent caps in the worst condition. At all of the bridges in the neighborhood, the caps have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water

are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen adjacent prestressed slab units cost effectively, because of the inability to post-tension adequately. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that only one of the bridges, 865763, requires posting.

GEOMETRIC DEFICIENCIES

The sidewalks on the bridge are 4.9 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the south fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. Any work to replace the bridge or perform major rehabilitation would require work to half the bridge in order to maintain traffic. The bridge has a roadway width of 24 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

The bridge is 42 years old. The slab units are showing signs of spalls and delaminations, and there are isolated exposed reinforcing steel with section loss. Patching the spalls will require repeated concrete repair cycles every 5-8 years, as new spalls occur. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments. The cost effective decision is to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, then replace the entire bridge prior to the bridge requiring significant weight restrictions. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The five bridges in this neighborhood, including this bridge, are recommended to be replaced in 16-20 years.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 205,200.00
Construction			$ 1,368,000.00
Bridge Construction [2]	$	1,111,500.00	
Maintenance of Traffic [3]	$	85,500.00	
Utilities [4]	$	171,000.00	
Construction Inspection and Administration [5]			$ 273,600.00
Contingency [6]			$ 273,600.00
		TOTAL COST	$ 2,120,400.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot based on square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Bridge ID at West Approach

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

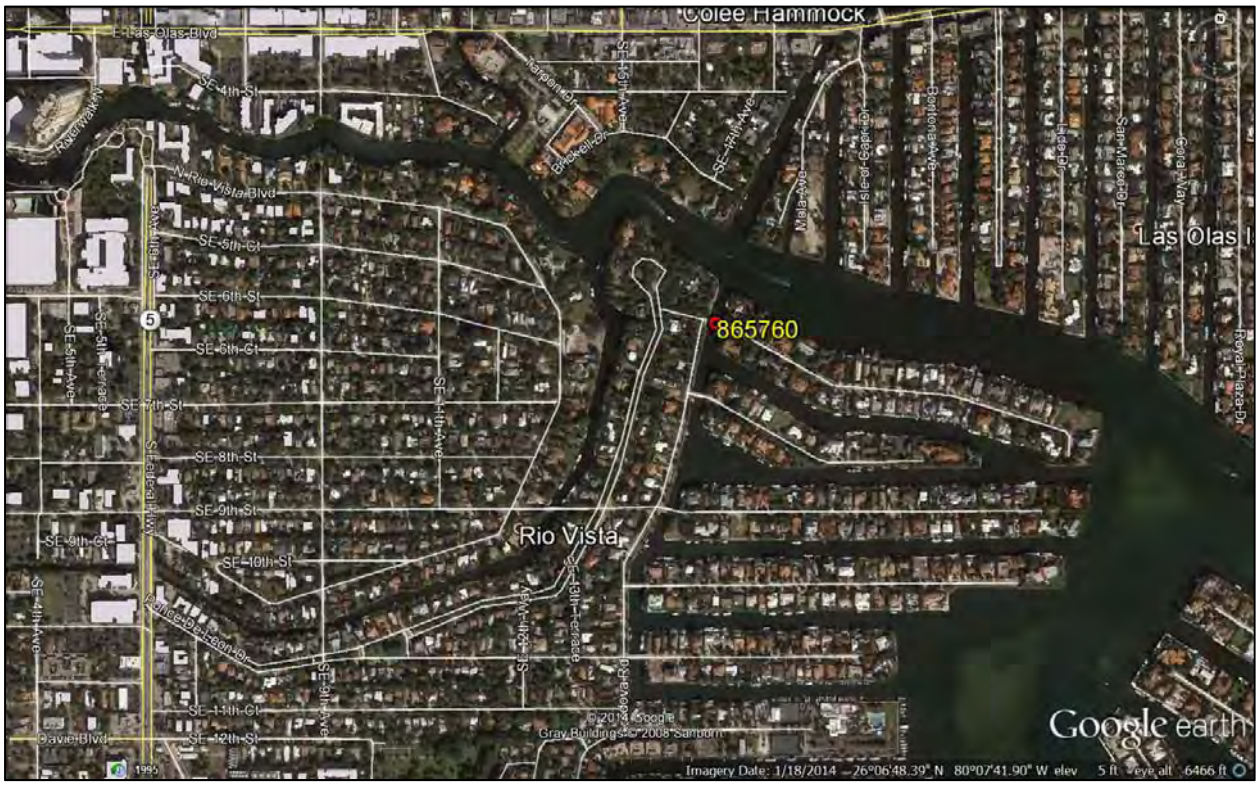
Concrete Slab Underside and Concrete T-beam. Note Utility Pipe.

GENERAL PHOTOS OF BRIDGE

Channel Looking South

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Delamination in the top face of the railing in Span 1.

Photo 2 –Deteriorated sidewalk joint sealant.

CONDITION PHOTOS

Photo 3 – Spall with exposed rebar in the underside of Slab Unit 1-2.

Photo 4 – Spall with exposed rebar in the underside of Slab Unit 3-4.

CONDITION PHOTOS

Photo 5 – Spall in the underside of the left sidewalk in Span 2.

Photo 6 –Delamination at Abutment 4 cap.

CONDITION PHOTOS

Photo 7 – Spall in the underside of the Bent 3 cap.

Photo 8 – Typical delamination and corrosion staining on Pile 3-4.

CONDITION PHOTOS

Photo 9 –Spall in the southwest approach curb.

Photo 10 – Delamination in the northwest retaining wall cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865760** Date: **12-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865760 UW Inspection Date: 5/12/2014

Bridge Name: N/A

Road Name/Number: SE 7th ST.

Feature Intersected: RIO CORDOVA

Location: 30 ft East of Cordova Rd.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7.4 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		290 Channel, 234 R/Concrete Cap
Weather:	85° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSED No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865760** Date: **12-May-14**

A: LOCATION MAP

Description: 30 ft East of Cordova Rd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16" below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **3**
_Pile 3-4, all four corners are delaminated up to 24" x 10", with corrosion bleed-out starting at the cap. **UW Photo 01. NO CHANGE.**
_Pile 3-5, NW, SW and SE corners are delaminated up to 22" x 7", with corrosion bleed-out, starting at the cap. **UW Photo 02. NO CHANGE.**
_Pile 3-6, NW, SW and SE corners are delaminated up to 24" x 12", with corrosion bleed-out, starting at the cap**. NO CHANGE.**

CS-1: **19**
_There are minor up to 1/32" wide, vertical cracks extending 6" into the marine growth at random piles. **NO CHANGE.**

215 R/Concrete Abutment	**73 lf.**

Note:
_The bottom 4" of the Abutment caps are in the salt water during extreme high tides.
_Abutment cap were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3: **16**
_Abutment 1 cap, South end has a delamination 28" x 18", with corrosion bleed-out. **UW Photo 03. INCREASE.**
_Abutment 4 cap, NW end, spall/delamination 28" x 24" x 4", with exposed steel and associated cracks up to 1/32", corrosion bleed-out. **UW Photo 04. INCREASE.**
_Abutment 4 cap, over Piles 3-3 to 3-4, delamination up to 8' x 10", with associated cracks up to 1/32" and corrosion bleed-out. **UW Photo 05. INCREASE.**
_Abutment 4 cap, South end, delamination 22" x 20", with associated cracks up to 1/32", and corrosion bleed-out. **UW Photo 06. NEW.**

E: ELEMENT NOTES

Element **Quantity**

234 R/Concrete Cap **73 lf.**

Note:
_The bottom 4" of the caps are in salt water during extreme high tides.
_Bent caps were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3: **73**
_Bent 2 and 3 caps each exhibit full length x 18" H, delamination with associated cracks up to 1/8" W and corrosion bleed-out along the bottom 18" of the East and West faces. **UW Photo 07. INCREASE.**
_Bent 3 cap NW end has a spall/delamination 16" x 13" x 4" with associated cracks up to 1/16" W and corrosion bleed-out. **UW Photo 08. INCREASE.**

290 Channel **1 ea.**

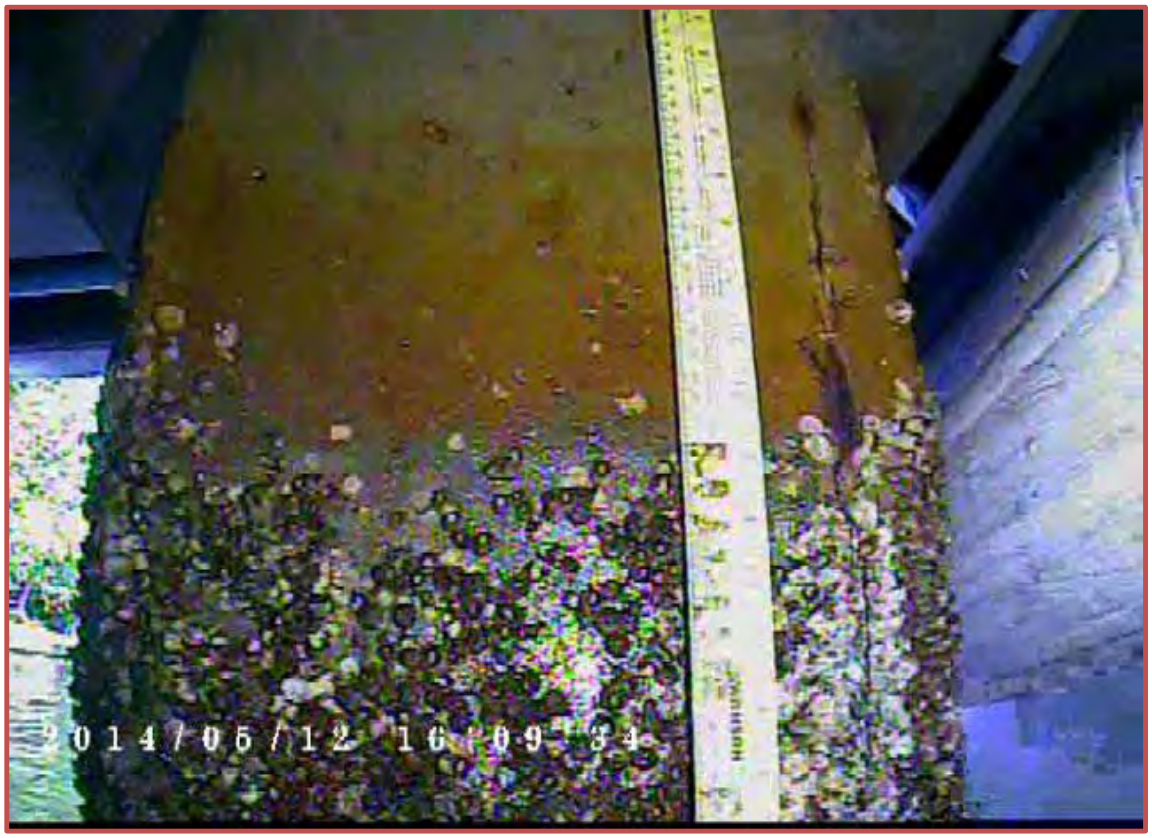
INCIDENTAL: **1**
_The seawalls have up to 20" x 12" x 20" voids in the masonry grout. **NO CHANGE.**
_South side of Pile 4-5 at Abutment 4, there is a spall/void 6" x 4", at the ground-line with minor backfill leakage. **UW Photo 09. NEW**
_South side of Pile 4-5 at Abutment 4, below the cap there is a void area approximately 18" x 10" with 13" penetration. No backfill was observed at the joint locations during this inspection cycle.
UW Photo 10. NO CHANGE.

475 R/Concrete Walls **127 lf.**

CS-3: **60**
_SW retaining wall cap has horizontal cracks with corrosion bleed-out, up to 1/16" wide throughout.
UW Photo 11. NEW.
_NW retaining wall cap has a delamination 8' x 16", with corrosion bleed-out along the East end.
UW Photo 12. NO CHANGE.

CS-1: **67**
_Several of the joints are open up to 1-1/4" wide with minor edge spalls up to 2" wide. No backfill leakage was observed at the joint locations during this inspection cycle. **NO CHANGE**

F: PHOTO SECTION



Description: Top: Pile 3-4, all four corners are delaminated, with corrosion bleed-out. **UW Photo 01.**
Bottom: Pile 3-5, NW, SW and SW corners, delaminated with CBO. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Abutment 1 cap, South end, delamination with corrosion bleed-out. **UW Photo 03.**
Bottom: Abutment 4 cap, North end, spall/delamination, with exposed steel. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: Abutment 4 cap, over Piles 3-3 to 3-4, delamination with cracks. **UW Photo 05.**
Bottom: Abutment 4 cap, South end, delamination with associated cracks. **UW Photo 06.**

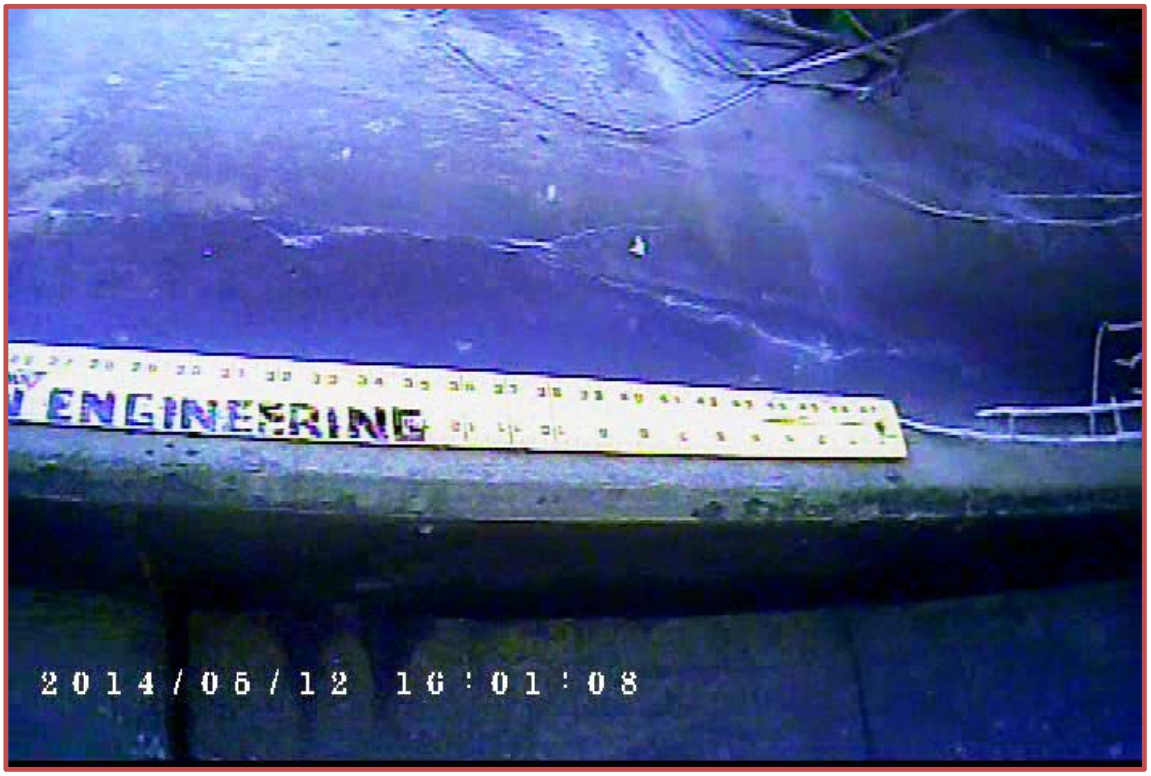
F: PHOTO SECTION

Description: Top: Bent 2 and 3 caps, delamination with associated cracks and CBO. **UW Photo 07.**
Bottom: Bent 3 cap NW end, spall/delamination, with associated cracks. **UW Photo 08.**

F: PHOTO SECTION

Description: Top: South side of Pile 4-5, at Abutment 4, spall/void, at the ground-line. **UW Photo 09.**
Bottom: South side of Pile 4-5, at Abutment 4, void below the cap. **UW Photo 10.**

F: PHOTO SECTION



Description: Top: SW retaining wall cap has horizontal cracks with CBO, throughout.. **UW Photo 11.**
Bottom: NW retaining wall cap has a delamination with CBO, East end. **UW Photo 12.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch and seal the cracks on Piles 3-4, 3-5, and 3-6.

215 R/Concrete Abutment

_Remove all unsound concrete and patch and seal the cracks in the Abutment caps.

234 R/Concrete Cap

_Remove all unsound concrete and patch and seal the cracks at the intermediate Bent caps.

475 R/Concrete Walls

_Remove unsound concrete and patch or seal cracks at the SW and NW wingwalls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.7	10.0
2	15.0	15.4
2.5	16.4	16.4
3	16.4	15.8
4	10.9	10.1

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 9 ft. and right: 9 ft. at mid-channel.
Maximum Channel depth: 7.4 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865761 **Bridge Name:** SE 8th Street over Rio Cordova

Topside Inspection Complete: 5/12/2014
Underwater Inspection Complete: 5/15/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is an 89 ft. long, three (3) span, prestressed slab bridge with reinforced concrete T-beam constructed in 1972. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 4.9 ft. sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is not currently posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt has up to $^{1}/_{8}$ in. longitudinal cracks over the slab unit joints. See Condition Photo 1.
- The asphalt has up to ¼ in. wide transverse cracks over the expansion joints.
- Both sidewalks have up to 2 ft. x 1/64 in. wide diagonal cracks extending from the expansion joints.

Railings/Barriers

- The left barrier has a 1 ½ in. x 1 ½ in. x ½ in. pop out with exposed steel in the top face at Bent 3. Previously noted without exposed steel.
- No guardrails have been provided for the structure.
- No reflectors or object markers have been provided for the structure.

Expansion Joints

- The sidewalk joint sealant is deteriorated. See Condition Photo 2.
- Staining on the caps indicates that the joints are leaking.

Utilities

- There is one 7 in. steel utility, one 4 ½ in. steel utility and one 4 ½ in. PVC utility attached to the deck underside adjacent to Beam 1 in all spans.
- There is one 5 in. and one 7 in. PVC utility attached to the deck underside adjacent to Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- No deficiencies were noted.

Reinforced Concrete T-Beams

- Both sidewalks have up to 2 ft. x $^{1}/_{64}$ in. wide diagonal cracks extending from the expansion joints.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have intermittent $^{1}/_{64}$ in. wide horizontal cracks with along the bottom edge. The previously noted corrosion stains have been removed.
- Abutment 4 cap over Pile 4-5 has an 2 ft. 9 in. x 8 in. area that is missing the concrete cover at the repaired location. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.

Intermediate Bents:

- There is graffiti on the faces of the bent caps.
- The Bent 2 cap exhibits a hollow sounding area at the repaired locations on both faces and at the bottom of the cap. This deficiency was not previously noted. See Condition Photo 3.
- The faces of the Bent 3 cap exhibits map cracking with efflorescence and sounds hollow at the repaired locations. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The seawalls have voids in the masonry grout, minor backfill leakage was observed during this inspection cycle. Backfill leakage was not previously noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The northwest approach sidewalk has three cracks up to 8 ft. long x $^{1}/_{8}$ in. wide that ring hollow when tapped with a hammer.
- The southwest approach sidewalk has $^{1}/_{8}$ in. wide cracks and delaminations around a water pipe.
- The southwest concrete approach barrier at the south face, 2 ft. from the seawall, exhibits a void 3 ft. long x 3 ft. wide x 2 ft. deep. This deficiency was not previously noted.
- Spalls and delaminations are present along the curbs and sidewalks up to 1 ft. x 10 in. x 2 in. See Condition Photo 4.
- The north end of the northwest approach sidewalk has an undermined area 8 in. high x 4 ft. long x 3 ft. deep and there is a 4 ft. x 4 ft. area of the sidewalk that rings hollow when tapped with a hammer.
- The northeast approach curb has two up to 1 ft. 4 in. x 8 in. x 1 in. spalls/delaminations and the adjacent sidewalk is settled up to 1 ½ in.
- The southeast approach sidewalk has a fracture at the east end with a 7 ft. long x $^{1}/_{8}$ in. wide crack emanating from the fractured area, there is also an area of undermining at this location 3 ft. long x 4 in. high x 3 ft. deep.
- The southeast approach barrier has three spalls up to 7 in. x 4 ½ in. x ¾ in. in the north edge.

Wingwalls

- The southeast retaining wall has a delamination 2 ft. x 1 ft. with corrosion bleedout. This deficiency was not previously noted.
- The wall on the south side of Pile 4-1 has a joint open up to 1 in. with light backfill leakage and panel is pushed outward (misaligned) approximately 1 in. See Underwater Inspection Report Photo 3.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865760 through 865764. All of the bridges were constructed in 1972 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and intermediate bent caps in the worst condition. At all of the bridges in the neighborhood, the caps have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen adjacent prestressed slab units cost effectively, because of the inability to post-tension adequately. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that only one of the bridges, 865763, requires posting.

GEOMETRIC DEFICIENCIES

The sidewalks on the bridge are 4.8 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. Any work to

replace the bridge or perform major rehabilitation would require work to half the bridge in order to maintain traffic. The bridge has a roadway width of 24 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

The bridge is 42 years old. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments, and those elements do not require repairs in the next several years. However, based on deterioration found at all of the bridges in this neighborhood, and given that they were constructed at the same time with the same bridge type and materials, it is expected that all of the bridges will deteriorate similarly and it is not expected that they will remain in good condition throughout the 20 year study period. The prestressed slab deficiencies present at 865760 will eventually be present on the other four bridges, including this one. It is recommended to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, then replace the entire bridge prior to the bridge requiring significant weight restrictions. Investing in significant repairs to the substructure units is not cost effective, since it is not possible to provide similar long lasting repairs to the slab unit superstructure. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The five bridges in this neighborhood, including this bridge, are recommended to be replaced in 16-20 years.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 205,200.00
Construction			$ 1,368,000.00
Bridge Construction [2]	$	1,111,500.00	
Maintenance of Traffic [3]	$	85,500.00	
Utilities [4]	$	171,000.00	
Construction Inspection and Administration [5]			$ 273,600.00
Contingency [6]			$ 273,600.00
		TOTAL COST	$ 2,120,400.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Northwest Transition

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

Span Underside and Intermediate Bent. Note Utility Pipe.

GENERAL PHOTOS OF BRIDGE

Channel Looking South

Channel Looking North

LOCATION MAP

CONDITION PHOTOS

Photo 1 – Longitudinal crack in the asphalt.

Photo 2 – Deteriorated sidewalk joint sealant.

CONDITION PHOTOS

Photo 3 – Bent 2 cap delamination.

Photo 4 – Spalls and delaminations along the approach slab curb and sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865761** Date: **15-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865761 UW Inspection Date: 5/15/2014

Bridge Name: N/A

Road Name/Number: SE 8th ST.

Feature Intersected: RIO CORDOVA

Location: 30ft East of CORDOVA RD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	9.2 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		290 Channel, 234 R/Concrete Cap
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

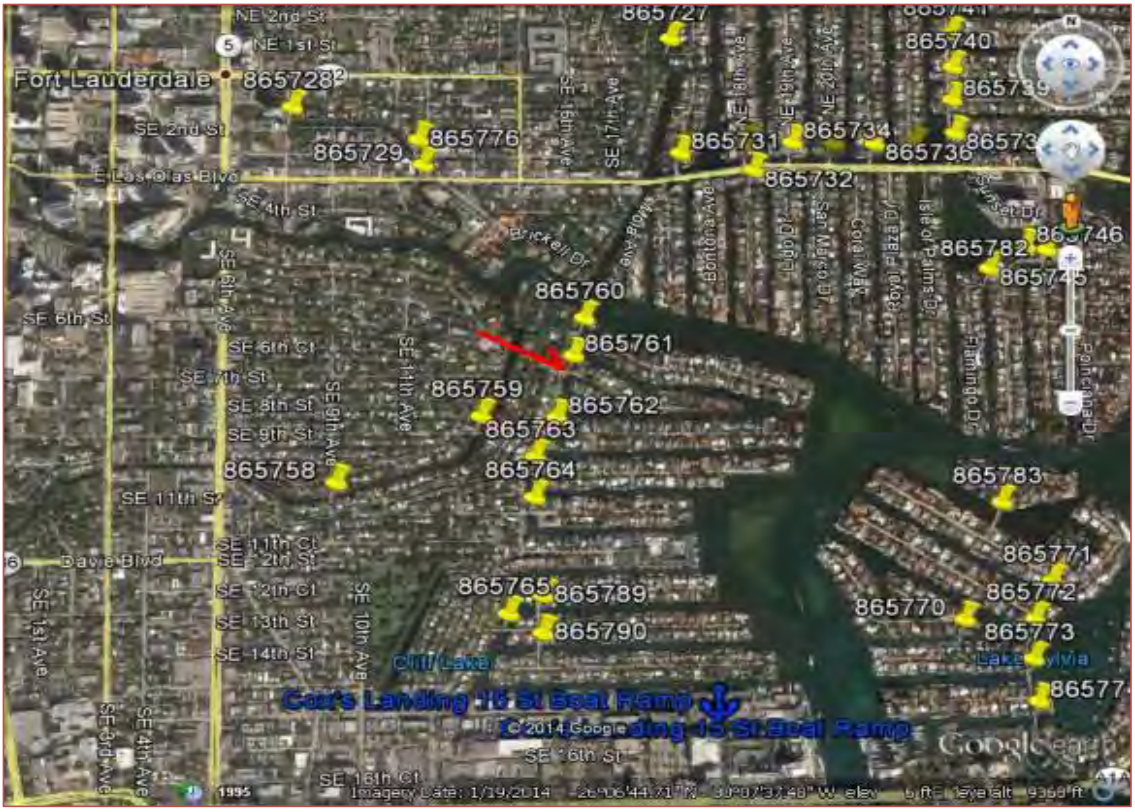
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP.
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865761** Date: **15-May-14**

A: LOCATION MAP



Description: 30ft East of CORDOVA RD.

E: ELEMENT NOTES

Notes: The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Notes:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Several piles were cleaned at random locations during this inspection cycle.
_The Previous Underwater report had documented this Element as 205 R/Concrete columns.

_No deficiency noted during this inspection cycle.

215 R/Concrete Abutment **74 lf.**

Note:
_The bottom 8" of the Abutment caps are in the salt water during high tides.
_Abutment cap were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-2:
_Both Abutment caps have intermittent areas of map cracking up to 1/64". Along the repair locations. **NEW.**
_Abutment 4 cap over Pile 4-5 has an area 33" x 8", that is missing the concrete cover at a repaired. **UW Photo 01. NEW.**

Corrective Action Taken

_Both Abutment caps full length horizontal cracks with corrosion bleed-out, were repaired during this inspection cycle.

234 R/Concrete Cap **73 lf.**

Note:
_The bottom 4" of the caps are in salt water during extreme high tides.
_Bent caps were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-2:
_Bent cap 3, have intermittent areas of map cracking up to 1/64", hollow sounding, along the repaired locations. **UW Photo 02. NEW.**

Corrective Action Taken

_Bent 2 cap horizontal cracking/delaminations with corrosion bleed-out, were repaired.
_Bent 2 cap West face between Piles 2-3 and 2-4, delamination, was repaired.
_Bent 2 cap West face over Pile 2-2, spall/delamination, Was repaired during this inspection cycle.
_The graffiti paint on the Bent caps were removed during this inspection cycle.

E: ELEMENT NOTES

Element	Quantity
290 Channel	**1 ea.**

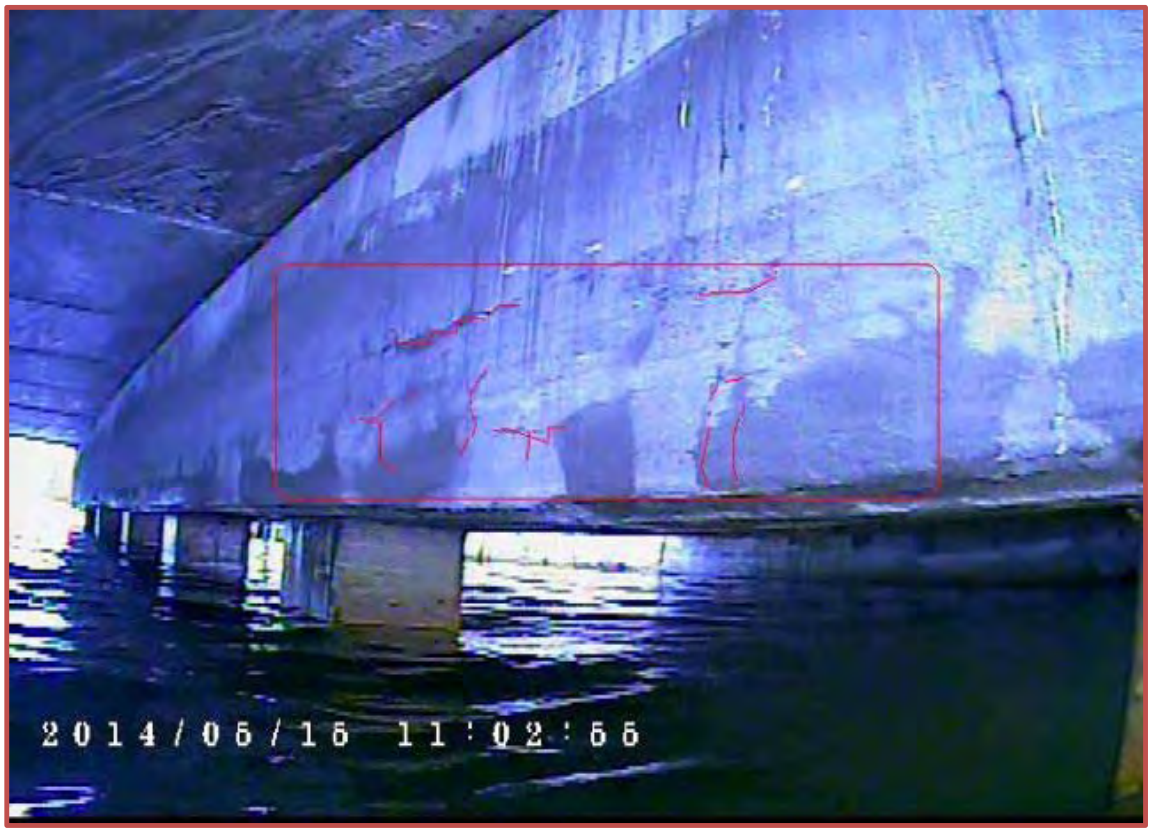
CS-2:
_The seawall have voids in the masonry grout. Minor backfill leakage was observed during this inspection cycle. **INCREASE.**

Element	Quantity
475 R/Concrete Walls	**121 lf.**

CS-3:
_SE retaining wall has a delamination 24" x 12", with corrosion bleed-out. **NO CHANGE.**

CS-1:
_The wall on the South side of Pile 4-1 has a joint open up to 1" wide, with light backfill leakage and the panel pushed outward (misaligned) approximately 1". **UW Photo 03. NO CHANGE.**

F: PHOTO SECTION



Description: Top: Abutment 4 cap over Pile 4-5 has an area missing the concrete cover. **UW Photo 01.**
Bottom: Bent cap 3, have areas of map cracking with hollow sounding. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Backwall on the South side of Pile 4-1 has a joint open up to 1" wide. **UW Photo 03.**

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Seal the open joint at the South side of Pile 4-1.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.8	10.7
2	14.1	14.4
2.5	16.2	17.0
3	15.2	16.7
4	10.2	12.2

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 7.9 ft. and right: 7.8 ft. at mid-channel.
Maximum Channel depth: 9.2 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865762 **Bridge Name:** SE 9th Street over Rio Cordova

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/15/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	**Initials**
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:	**Prepared by:**
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 91 ft. long, three (3) span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1972. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. wide sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, no posting is required.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to $^{1}/_{8}$ in. wide longitudinal cracks over the slab unit joints. See Condition Photo 1.
- Both sidewalks have up to 2 ft. x $^{1}/_{64}$ in. wide diagonal cracks extending from the expansion joints. See Condition Photo 2.

Railings/Barriers

- No guardrails have been provided for the structure.

Expansion Joints

- The sidewalk joint sealant is deteriorated.
- The staining on the caps indicates that the joints are leaking.

Utilities

- There is one 4 in. and one 4 ½ in. PVC conduit attached to the deck underside adjacent to Beam 1 in all spans.
- There is one 7 in. steel utility, one 6 ½ in. PVC conduit and one 4 ½ in. steel utility attached to the deck underside adjacent to Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- Slab Unit 2-3 has a 6 in. x 6 in. x ¾ in. spall with exposed rebar due to the lack of cover, 6 ft. 8 in. From Bent 3.

Reinforced Concrete T-Beams

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have up to full length $^{1}/_{8}$ in. wide horizontal cracks with corrosion bleedout. Previously noted crack as 1/16 in. wide. See Underwater Inspection Report Photo 2.
- The lower 1 ft. 6 in. of both abutment caps are intermittently delaminated along the entire length. See Condition Photo 3. See Underwater Inspection Report Photo 3.

Intermediate Bents

- Both caps have up to full length $^{1}/_{8}$ in. wide horizontal cracks and delaminations along the bottom edges with corrosion bleedout. Previously noted without corrosion bleedout. See Underwater Inspection Report Photo 4.
- The north and south ends of the Bent 2 cap exhibit spalls and delaminations up to 3 ft. 6 in. x 1 ft. 7 in. See Condition Photo 4 and Underwater Inspection Report Photo 5.
- The lower 1 ft. 6 in. of each face of the Bent 2 cap has intermittent delaminations with associated cracks and corrosion bleedout.
- The lower 1 ft. 8 in. of the west face of Bent 3 cap has spalls and delaminations up to cap length x 6 in. deep with exposed rebar having an estimated 1 in. remaining section and the lower 1 ft. 6 in. of the east face of Bent 3 cap is intermittently delaminated with corrosion staining along the length of the cap. See Underwater Inspection Report Photos 6 and 7.
- Pile 2-3 has a 5 in. x 3 in. x 1 in. construction-related spall in the northwest corner at the cap.
- The northeast, northwest and southwest sides of Pile 3-1 have delaminations up to 1 ft. 10 in. x 7 in. starting at the cap. Also on the southeast side there is one vertical crack with corrosion bleedout starting at the cap and extending 6 in. into the marine growth. Previously noted as cracks only. See Condition Photo 5 and Underwater Inspection Report Photo 1.
- The piles have vertical and horizontal cracks extending a maximum of 6in. into the marine growth, up to 3 ft. x $^{1}/_{32}$ in. wide.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The seawall at the south end of Abutment 4 has a 2 ft. 6 in. x 1 ft. x 3 ft. 3 in. void with minor backfill leakage, 3 ft. 3 in. below the cap adjacent to Pile 4-5. See Underwater Inspection Report Photo 8.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The southwest approach sidewalk has a 1 ft. 2 in. x 6 in. delamination adjacent to the wingwall.
- The southwest approach sidewalk has up to ¼ in. wide cracking and minor settlement. Cracking has increased since the last inspection.
- The northwest sidewalk is undermined 4 ft. long x 8 in. high x 2 ft. back under and has settled up to 2 in. See Condition Photo 6.
- The west approach roadway has intermittent longitudinal and horizontal cracks up to $^{1}/_{8}$ in. wide.
- The southwest corner of the west approach roadway to approach slab transition, there is a slight settlement in the roadway.
- The north side of the west approach barrier exhibits an area of erosion 4 ft. long x 4 ft. high x 1 ft. deep. This condition was not previously noted.
- The north sidewalk on the west approach exhibits 2 diagonal cracks up to 7 ft. long x $^{1}/_{16}$ in. wide due to settlement in this area.

Wingwalls

- The southwest wingwall cap has a 6 ft. x 8 in. delamination with corrosion bleedout and associated cracks up to 1/8 in. wide. Associated cracking was not previously noted. See Underwater Inspection Report Photo 9.
- The west retaining wall has a 6 in. x 8 in. x 1 ¼ in. spall behind Pile 1-2 at the cap.
- The joints are open up to 1 ¼ in. wide, with no indication of backfill leakage at the time of this inspection.
- At the transition joint to the southwest wingwall, there is a 1 ft. x 6 in. cracked and delaminated area at the cap with associated cracks up to 1/8 in. wide. Associated cracking was not previously noted. See Condition Photo 7 and Underwater Inspection Report Photo 10.
- The rock facade is missing in several areas on the southwest and northwest bridge end posts.
- There is minor erosion behind the seawall and northwest wingwall.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865760 through 865764. All of the bridges were constructed in 1972 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and intermediate bent caps in the worst condition. At all of the bridges in the neighborhood, the caps have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen adjacent prestressed slab units cost effectively, because of the inability to post-tension adequately.

The latest available load ratings for all five bridges indicate that only one of the bridges, 865763, requires posting.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or

replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. Any work to replace the bridge or perform major rehabilitation would require work to half the bridge in order to maintain traffic. The bridge has a roadway width of 24 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. However, the uneven sidewalk at the northwest corner should be addressed in the short term to avoid a potential tripping hazard for pedestrians. No cost has been provided for this, as it is assumed that City forces would address those issues.

LONG TERM

The bridge is 42 years old. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments, and those elements do not require repairs in the next several years. However, based on deterioration found at all of the bridges in this neighborhood, and given that they were constructed at the same time with the same bridge type and materials, it is expected that all of the bridges will deteriorate similarly and it is not expected that they will remain in good condition throughout the 20 year study period. The prestressed slab deficiencies present at 865760 will eventually be present on the other four bridges, including this one. It is recommended to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, then replace the entire bridge prior to the bridge requiring significant weight

restrictions. Investing in significant repairs to the substructure units is not cost effective, since it is not possible to provide similar long lasting repairs to the slab unit superstructure. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The five bridges in this neighborhood, including this bridge, are recommended to be replaced in 16-20 years.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 196,560.00
Construction			$ 1,310,400.00
Bridge Construction [2]	$	1,064,700.00	
Maintenance of Traffic [3]	$	81,900.00	
Utilities [4]	$	163,800.00	
Construction Inspection and Administration [5]			$ 262,080.00
Contingency [6]			$ 262,080.00
		TOTAL COST	$ 2,031,120.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Southeast Transition

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

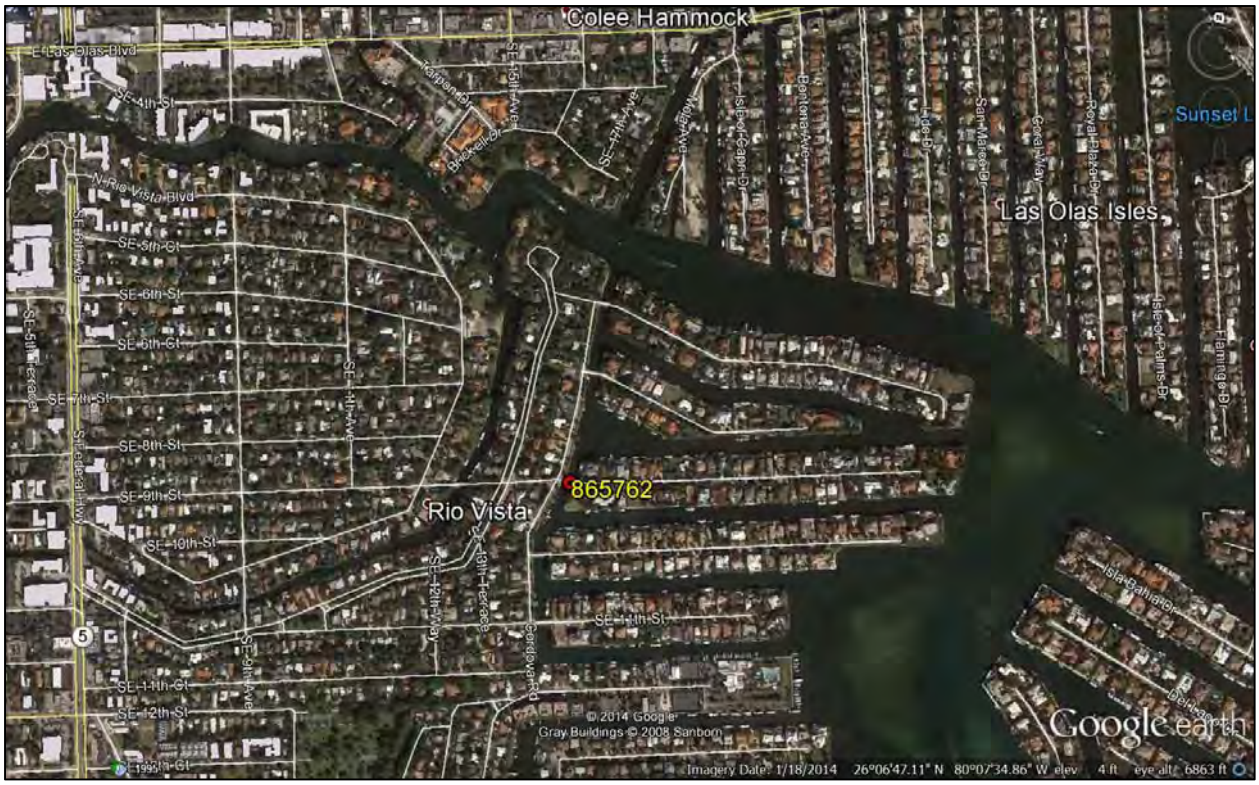
Concrete Slab Underside and Concrete T-beam. Note Utility Pipe.

GENERAL PHOTOS OF BRIDGE

Channel Looking South

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Longitudinal cracks in the asphalt overlay.

Photo 2 – Typical cracks in the sidewalk.

CONDITION PHOTOS

Photo 3 –Delaminations and cracks in the End Bent 1 cap.

Photo 4 – Spalls and delaminations in the cap at Bent 2.

CONDITION PHOTOS

Photo 5 – Corrosion staining and cracks on Pile 3-1.

Photo 6 – Undermining at the northwest approach sidewalk.

Photo 7 – Cracked and delaminated area at the transition to the southwest wingwall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865762** Date: **15-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865762 UW Inspection Date: 5/15/2014

Bridge Name: N/A

Road Name/Number: SE 9th ST.

Feature Intersected: RIO CORDOVA

Location: 30ft East of CORDOVA RD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	13.6 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		290 Channel, 234 R/Concrete Cap
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

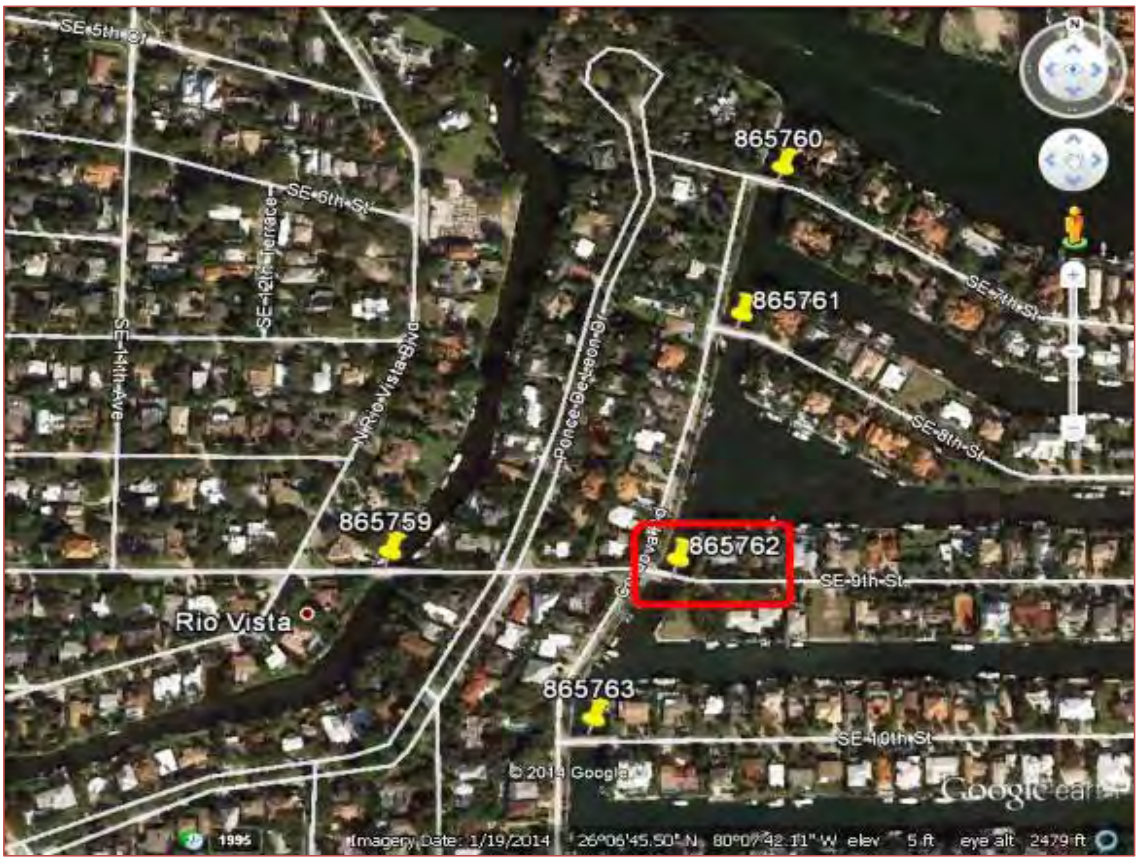
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE № 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865762** Date: **15-May-14**

A: LOCATION MAP



Description: 30ft East of CORDOVA RD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3:
_Pile 3-1, Northeast, Northwest and Southwest have delaminations up to 22" x 7", starting at the cap, Also on the Southeast (1) vertical crack with corrosion bleed-out starting at the cap and extending 6" into the marine growth. **UW Photo 01. INCREASE.**

CS-2:
_Pile 2-3, Northwest corner has construction related edge spall 5" x 3" x 1", starting at the cap.
NO CHANGE.
_Piles exhibit horizontal and vertical cracks up to 36" x 1/32", extending up to 6" into the marine growth.
NO CHANGE.

215 R/Concrete Abutment	**74 lf.**

Note:
_The bottom 8" of the Abutment caps are in the salt water during high tides.
_Abutment cap were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3:
_Both Abutment caps have full length horizontal cracks x up to 1/8" wide, with corrosion bleed-out.
UW Photo 02 (photo taken at Abutment 1). INCREASE.
also the lower 18" at both abutment caps are intermittently delaminated along the entire length.
UW Photo 03 (photo taken at Abutment 2). INCREASE.

E: ELEMENT NOTES

Element **Quantity**

234 R/Concrete Cap **72 lf.**

Note:
_The bottom 4" of the caps are in salt water during extreme high tides.
_Bent caps were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3:
_Bent cap 2 and 3 have full length x up to 1/8" horizontal vertical cracks with corrosion bleed-out along the bottom edge. **UW Photo 04 (photo taken at Bent 2 bottom face) INCREASE.**
_Bent cap 2, The lower 18" of each face has intermittently delaminated with associated cracks and corrosion bleed-out. **INCREASE.**
_Bent cap 2, South end delaminated with a spall 7" x 5" x 1", West face. **UW Photo 05. INCREASE.**
_Bent cap 3, lower 20" of the West face has intermittent spall/delaminating up to cap length x up to 6" D, with exposed rears and up to 100% section loss. Also the lower 18" of the East face is intermittently delaminated with corrosion bleed-out along the length of the cap. **UW Photos 06 and 07. INCREASE.**

290 Channel **1 ea.**

CS-2:
_The seawall at the South end of Abutment 4 has a 30" x 12" x 40", void with minor backfill leakage, 40" below the cap adjacent to Pile 4-5, at the ground-line. **UW Photo 08. NO CHANGE.**

475 R/Concrete Walls **133 lf.**

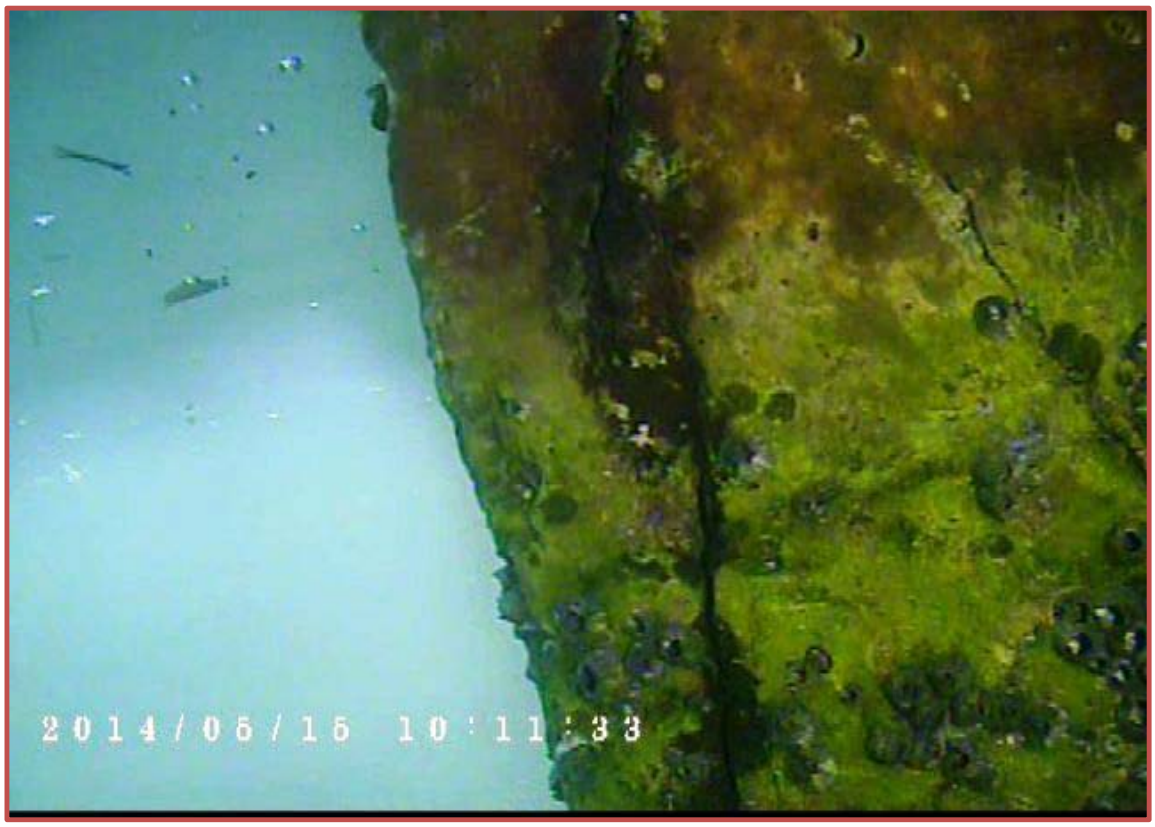
Note:
_The bottom 18" of the wingwalls are in salt water during extreme high tides.

CS-3:
_Southwest wingwall cap has a delamination 6' x 8", with associated cracks up to 1/8", and corrosion bleed-out. **UW Photo 09. INCREASE.**
_West retaining wall cap has a spall 8" x 6" x 1-1/4", behind Pile 1-2 at the cap. **NO CHANGE.**

CS-1:
_The joints are open up to 1-1/4" wide, with several having an indication of backfill leakage that was not active during this inspection cycle. **NO CHANGE.**
_Southwest wing wall transition, there is a delamination 12" x 6", with associated cracks up to 1/8". **UW Photo 10. INCREASE.**

INCIDENTAL
_The rock façade is missing in several areas on the Southwest and Northwest bridge end post. **NO CHANGE.**

F: PHOTO SECTION

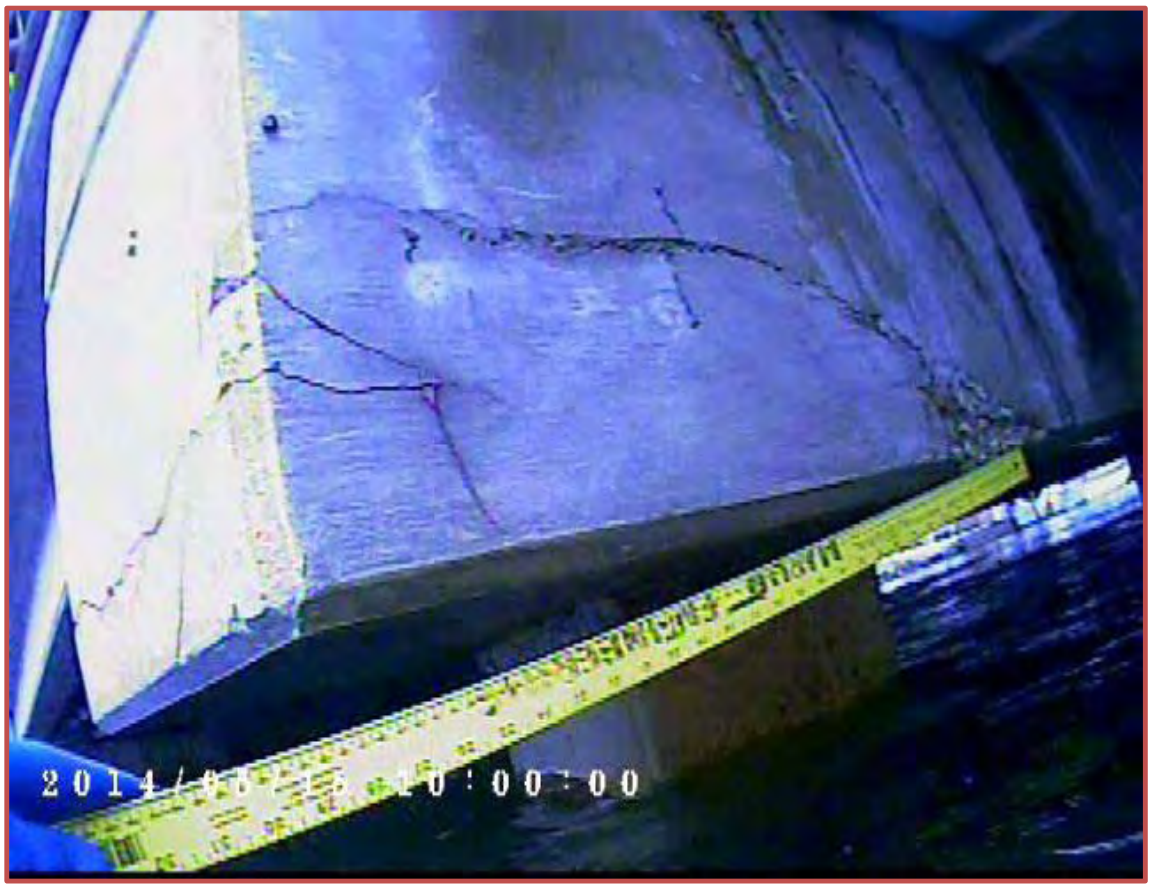


Description: Top: Pile 3-1, SE corner vertical crack with corrosion bleed-out. **UW Photo 01.**
Bottom: Abutment caps have full length horizontal cracks x up to 1/8" wide. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Abutment caps are intermittently delaminated along the entire length. **UW Photo 03.**
Bottom: Bent caps 2 and 3 full length x up to 1/8" horizontal vertical cracks. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Bent cap 2, South end delaminated with a spall on the West face. **UW Photo 05.**
Bottom: Bent cap 3, West face spall/delamination, up to cap length. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: Bent cap 3, West face, spall/delamination, exposed rebars. **UW Photo 07.**
Bottom: Seawall, South end of Abutment 4 has a void, minor loss of fill. **UW Photo 08.**

F: PHOTO SECTION

Description: Top: SW wingwall cap delamination, with associated cracks up to 1/8". **UW Photo 09.**
Bottom: SW wingwall transition, delamination, with associated cracks. **UW Photo 10.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove unsound concrete and patch on Pile 3-1.

215 R/Concrete Abutment

_Remove unsound concrete and patch and seal the cracks as needed at both Abutment caps.

234 R/Concrete Cap

_Remove unsound concrete and patch and seal the cracks as needed at both Bent caps.

475 R/Concrete Walls

_Remove unsound concrete and patch along the SW wingwall.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.9	11.1
2	20.4	18.5
2.5	21.5	19.3
3	19.2	17.4
4	10.3	10.8

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 7.9 ft. and right: 7.8 ft. at mid-channel.
Maximum Channel depth: 13.6 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865763 **Bridge Name:** SE 10th Street over Rio Cordova

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 97 ft. long, three (3) span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1972. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 5 ft. wide sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting for only SU vehicles at 30 tons but is currently posted generally for 30 tons. The interior slab unit controls the rating.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to ¼ in. wide longitudinal cracks over the slab joints.
- Both sidewalks have up to $^{1}/_{32}$ in. wide diagonal cracks extending from the joints.

Railings/Barriers

- No guardrails have been provided for the structure.
- No reflectors or object markers have been provided for the structure.

Expansion Joints

- The sidewalk joint sealant is deteriorated. See Condition Photo 2.
- The staining on the caps indicates that the joints are leaking.

Utilities

- There is one 6 ½ in. steel utility, one 4 ½ in. steel utility and one 4 ½ in. PVC conduit attached to the deck underside adjacent to Beam 1 in all spans.
- There is one 7 ½ in. PVC conduit, one 4 ½ in. PVC conduit and one 2 ½ in. galvanized steel conduit attached to the deck underside adjacent to Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units:

- Slab Unit 2-6 has a 4 in. x 3 in. x ½ in. spall with exposed steel with 90% section remaining in the underside near mid-span. See Condition Photo 1.

Reinforced Concrete T-Beams

- Beam 1-2 in Span 1 has a 1 ft. 6 in. x beam width x 1 in. spall/delamination with exposed rebar over Abutment 1. See Condition Photo 3.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has intermittent horizontal cracks up to 10 in. x 1/64 in. wide with corrosion bleed out along the recently repaired areas. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.

Intermediate Bents

- The Bent 2 cap, east face, exhibits graffiti. This condition was not previously noted.
- Bent 2 cap has intermittent 10 in. x 1/16 in. horizontal cracks with corrosion bleedout along the repaired areas. This condition was not previously noted. See Underwater Inspection Report Photo 3.
- The west face of the Bent 3 cap has intermittent delaminated areas with associated cracking up to 1/64 in. wide along the recently repaired areas. This condition was not previously noted. See Underwater Inspection Report Photo 4.
- The east face of the Bent 3 cap has intermittent delaminated areas with associated cracking up to 1/64 in. wide, and corrosion bleedout along the recently repaired areas. This condition was not previously noted. See Underwater Inspection Report Photo 5.
- All bent caps exhibit hairline cracks with efflorescence at the repaired locations.
- Pile 1-5 has a 10 in. x 8 in. x 1 in. spall in the southwest corner at the cap. See Condition Photo 4.
- The south face of Pile 2-6 has a 5 in. x 4 in. x 1 in. spall 2 ft. above the groundline. See Underwater Inspection Report Photo 1.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The southwest approach curb and sidewalk has up to $^{1}/_{8}$ in. wide cracks, two up to 1 ft. x 2 in. x 1 in. spalls and a 1 ft. 6 in. x 3 in. delamination.
- The southwest approach sidewalk at the end of the approach barrier has a 3 ft. long x 2 ft. high x 3 ft. deep area of undermining. The sidewalk in this area (4 ft. x 4 ft.) rings hollow when tapped with a hammer and has areas of settlement. The area of undermining has increased since the last inspection.
- The northeast approach sidewalk is up to 4 in. higher than the curb and the northeast approach roadway sidewalk has a $^{1}/_{16}$ in. wide diagonal fracture. This condition has increased in size since the last inspection. See Condition Photo 5.
- The northwest approach sidewalk is up to 1 ½ in. higher than the sidewalk across the structure.

Wingwalls

- The southwest wingwall cap has a 1 ft. 6 in. x 1 ft. delamination with associated cracks up to 1/8 in. wide with corrosion bleedout. This deficiency has increased in size since the last inspection, cracks were not previously noted. See Condition Photo 6.
- Below the waterline, the panel joint behind Pile 1-5 had an indication of backfill leakage, however no backfill leakage was observed during this inspection.
- The panel joints are open up to 1 in. wide and have up to 2 in. x 2 in. x 1 in. edge spalls.
- The southwest, northwest and southeast approach barriers are missing the rock facade in small areas.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865760 through 865764. All of the bridges were constructed in 1972 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and intermediate bent caps in the worst condition. At all of the bridges in the neighborhood, the caps have cracks, spalls and delaminations. Low-lying

coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen adjacent prestressed slab units cost effectively, because of the inability to post-tension adequately.

The latest available load ratings for all five bridges indicate that only this bridge requires posting.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the south fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. Any work to replace the bridge or perform major rehabilitation would require work to half the bridge in order to maintain traffic. The bridge has a roadway width of 24 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. However, uneven sidewalk at the east and west ends of the north sidewalk, off of the bridge, should be addressed since they are a tripping hazard. No cost has been provided for this, as it is assumed that City forces would address those issues.

LONG TERM

The bridge is 42 years old. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments, and those elements do not require repairs in the next several years. However, based on deterioration found at all of the bridges in this neighborhood, and given that they were constructed at the same time with the same bridge type and materials, it is expected that all of the bridges will deteriorate similarly and it is not expected that they will remain in their present condition throughout the 20 year study period. The prestressed slab deficiencies present at 865760 will eventually be present on the other four bridges, including this one. It is recommended to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, then replace the entire bridge prior to the bridge requiring significant weight restrictions. Investing in significant repairs to the substructure units is not cost effective, since it is not possible to provide similar long lasting repairs to the slab unit superstructure. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The five bridges in this neighborhood, including this bridge, are recommended to be replaced in 16-20 years.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 209,520.00
Construction			$ 1,396,800.00
Bridge Construction [2]	$	1,134,900.00	
Maintenance of Traffic [3]	$	87,300.00	
Utilities [4]	$	174,600.00	
Construction Inspection and Administration [5]			$ 279,360.00
Contingency [6]			$ 279,360.00
		TOTAL COST	$ 2,165,040.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Posting Sign at West Approach

GENERAL PHOTOS OF BRIDGE

Posting Sign at East Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

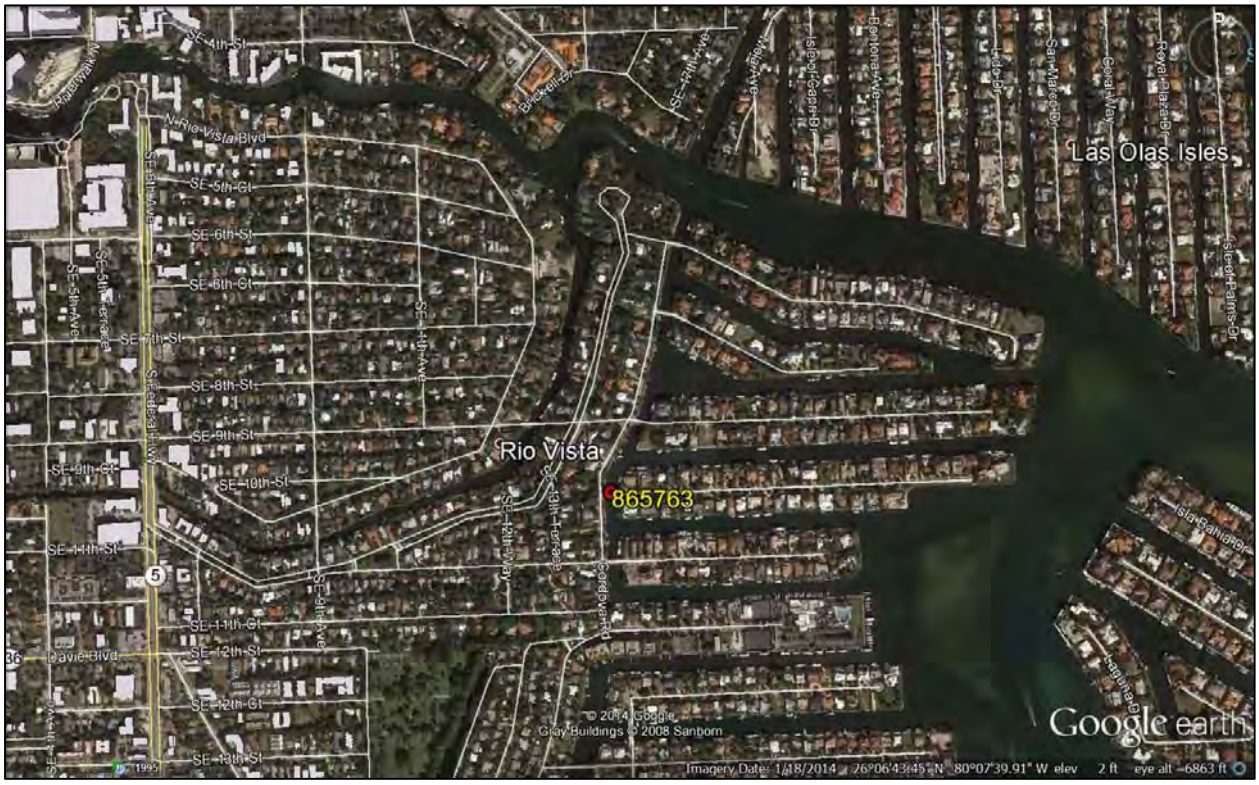
Concrete Slab Underside and Concrete T-beam. Note Utility Pipe in the Bay.

Channel Looking South

GENERAL PHOTOS OF BRIDGE

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

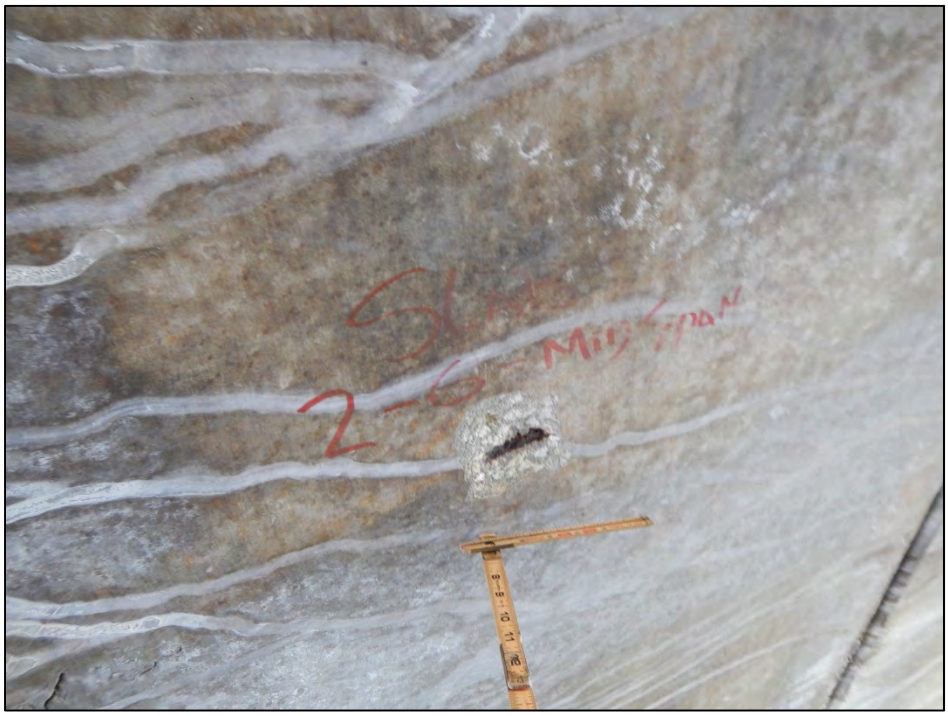


Photo 1 – Spall in the underside of Slab Unit 2-6.

Photo 2 – Deteriorated sidewalk joint sealant.

CONDITION PHOTOS

Photo 3 – Spall in Beam 1-2 over Abutment 1.

Photo 4 – Spall in Pile 1-5.

CONDITION PHOTOS

Photo 5 – Elevation differential in the northeast approach sidewalk.

Photo 6 – Delamination with corrosion staining in the southwest wingwall cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865763** Date: **15-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865763 UW Inspection Date: 5/15/2014

Bridge Name: N/A

Road Name/Number: SE 10th ST.

Feature Intersected: RIO CORDOVA

Location: 30ft East of CORDOVA RD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	10 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		290 Channel, 234 R/Concrete Cap
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

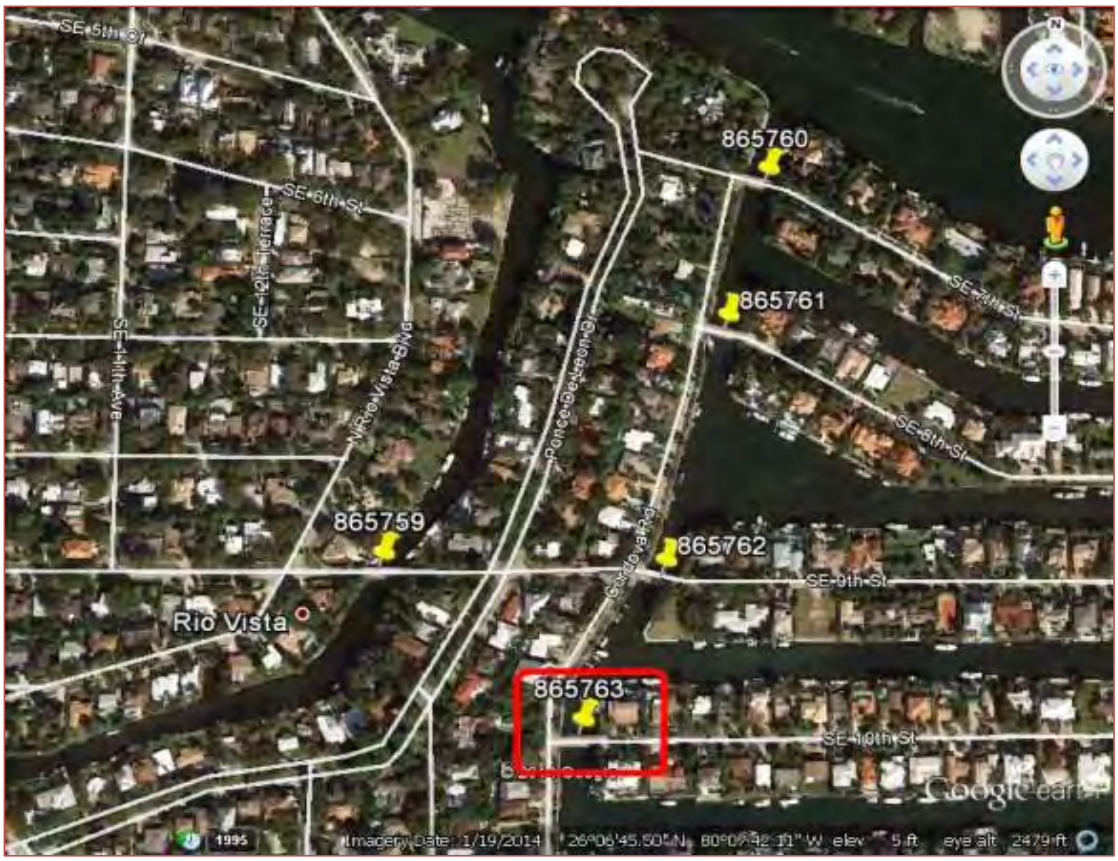
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP.
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865763** Date: **15-May-14**

A: LOCATION MAP



Description: 30ft East of CORDOVA RD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-2:
_Pile 1-5, Southwest corner has a spall 10" x 8" x 1", starting at the Abutment cap. **NO CHANGE.**
_Pile 2-6, South face has a spall 5" x 4" x 1", 2' above the groundline. **UW Photo 01. NO CHANGE.**

215 R/Concrete Abutment	**72 lf.**

Note:
_The bottom 8" of the Abutment caps are in the salt water during high tides.
_Abutment cap were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-2:
_Abutment 1 cap has intermittent horizontal cracks 10" x up to 1/64" along the repaired areas. **NEW.**

CS-3:
_Abutment 1 cap has intermittent horizontal cracks 10" x up to 1/64", with corrosion bleed-out along the repaired areas. **UW Photo 02. NEW.**

Corrective action taken
_Both Abutment caps full length horizontal cracks with corrosion bleed-out and delaminated areas were repaired during this inspection cycle.

E: ELEMENT NOTES

Element **Quantity**

234 R/Concrete Cap **72 lf.**

Note:
_The bottom 4" of the caps are in salt water during extreme high tides.
_Bent caps were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3
_Bent 2 cap has intermittent horizontal cracks 10" x up to 1/16", with corrosion bleed-out along the repaired areas. **UW Photo 03. (photo taken adjacent to Pile 3 bottom face). NEW.**
_Bent 3 cap West face has intermittent delaminated areas with associated cracking up to 1/64, along the repaired area. **UW Photo 04. NEW.**
_Bent 3 cap East face has intermittent delaminated areas with associated cracking up to 1/64, and corrosion bleed-out along the repaired area. **UW Photo 05. (photo taken adjacent to Pile 2). NEW.**

Corrective action taken
_Bent 2 and 3 caps full length horizontal cracks with corrosion bleed-out and delaminated areas were repaired during this inspection cycle.

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **133 lf.**

Note:
_The bottom 18" of the wingwalls are in salt water during extreme high tides.

CS-3:
_Southwest wingwall cap has a delamination 18"'x 12", with associated cracks up to 1/8", and corrosion bleed-out. **UW Photo 06. INCREASE.**

CS-1:
_Below the watermark the panel joint behind the Pile 1-5 had an indication of backfill leakage. No backfill leakage was observer during this inspection cycle. **DECREASE.**
_The panel joints are open up to 1" wide, with several having up to 2" x 2" x 1" edge spalls. **NO CHANGE**.

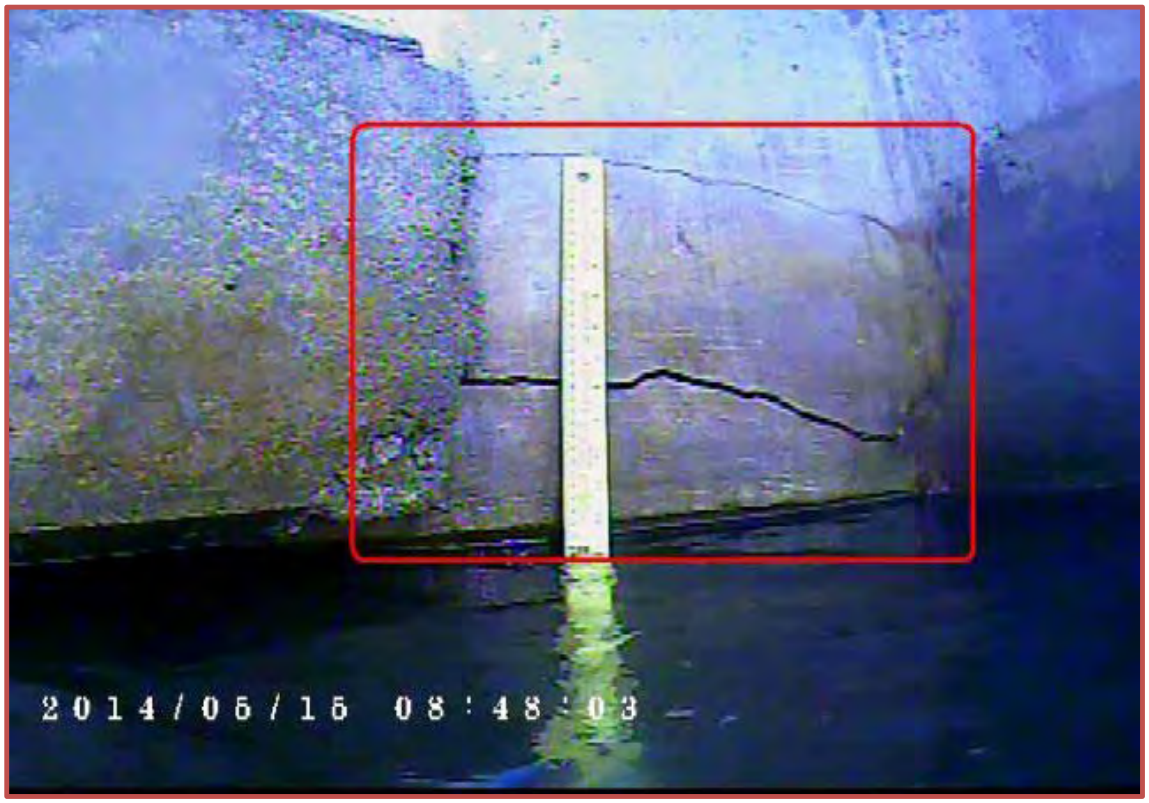
F: PHOTO SECTION

Description: Top: Pile 2-6, South face has a spall, 2' above the groundline. **UW Photo 01.**
Bottom: Abut 1 cap has intermittent horizontal cracks, w/corrosion bleed-out. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Bent 2 cap intermittent horizontal cracks, with corrosion bleed-out. **UW Photo 03.**
Bottom: Bent 3 cap West face, intermittent delaminated areas. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Bent 3 cap East face, intermittent delaminated areas. **UW Photo 05.**
Bottom: SW wingwall cap, delamination, with cracks up to 1/8" wide. **UW Photo 06.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.6	10.9
2	17.8	17.0
2.5	18.1	15.4
3	16.3	16.0
4	9.3	8.1

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 7.8 ft. and right: 7.8 ft. at mid-channel.
Maximum Channel depth: 10 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865764 **Bridge Name:** SE 11th Street over Rio Cordova

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/14/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER
7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 94 ft. long, three (3) span, combination prestressed slab and reinforced concrete T-beam bridge constructed in 1972. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There are 4.9 ft. wide sidewalks on each side of the bridge. The bridge provides the only access to residences east of the bridge. The bridge is neither Functionally Obsolete nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, no posting is required.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay has up to $^{1}/_{16}$ in. wide longitudinal cracks over the slab unit joints.
- Both sidewalks have up to 2 ft. long x $^{1}/_{64}$ in. wide diagonal cracks extending from the joints.
- The water main access cover in the right sidewalk of Span 2 extends ¼ in. above the deck and is creating a tripping hazard for pedestrians. See Condition Photo 1.

Railings/Barriers

- No guardrails have been provided for the structure.
- No reflectors or object markers have been provided for the structure.

Expansion Joints

- The sidewalk joint sealant is deteriorated and filled with dirt and debris.
- The asphalt overlay over the joints has up to ¼ in. wide transverse cracks and are filled with dirt, debris and vegetation. See Condition Photo 2.
- Staining on the caps indicates that the joints are leaking.

Utilities

- There is one 6 ½ in. steel utility, one 4 ½ in. steel utility and one 4 ½ in. PVC conduit attached to the deck underside adjacent to Beam 1 in all spans.
- There is one 7 ½ in. PVC conduit, one 4 ½ in. PVC conduit and one 4 in. galvanized steel conduit attached to the deck underside adjacent to Beam 2 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the slabs and beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition. The conditions are unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

Prestressed Concrete Slab Units:

- No deficiencies were noted.

Reinforced Concrete T-Beams

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutments have intermittent $^{1}/_{16}$ in. wide horizontal and vertical cracks at the repaired locations. See Underwater Inspection Report Photo 1.

Intermediate Bents

- The intermediate caps exhibit $^{1}/_{16}$ in. horizontal cracks up to 10 ft. long at repair locations. See Underwater Inspection Report Photo 2.
- The Bent 2 cap, east face, exhibits an intermittent horizontal crack and sounds hollow at the repaired locations. This deficiency was not previously noted.
- Pile 2-6, southeast corner exhibits a 1 ft. 6 in. x 8 in. delamination and 2 vertical cracks up to 2 ft. high x $^{1}/_{32}$ in. wide, 8 in. below the cap extending down into the marine growth. See Condition Photo 3.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2009 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The south approach sidewalk curb has a 1 ft. 6 in. x 6 in. x 6 in. deep spall. This deficiency has increased in severity since the last inspection. See Condition Photo 4.
- The southwest approach sidewalk, south face adjacent to the southwest approach barrier wall is undermined up to 4 ft. long x 10 in. high x 4 ft. deep. The sidewalk in this area sounds hollow when tapped with a hammer.
- The southwest corner adjacent to the southwest concrete barrier behind the retaining wall exhibits a washout area 5 ft. long x 2 ft. wide x 10 in. deep. This deficiency was not previously noted. See Condition Photo 5.

Wingwalls

- The southwest corner adjacent to the southwest concrete barrier behind the retaining wall exhibits a washout area 5 ft. x 10 in. x 2 ft. deep. See Condition Photo 5.
- The southwest approach barrier is missing the rock facade in small areas.
- The northwest retaining wall has a delamination 3 ft. x 5 in. with associated cracks up to 1/32 in. wide. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- Below the high waterline, the retaining wall joints are open up to 1 ¼ in. wide, edge spalls up to 2 ½ in. wide. No backfill loss was observed during this inspection.
- Several panel joints are misaligned up to 1 ½ in.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865760 through 865764. All of the bridges were constructed in 1972 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in satisfactory to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the abutment and intermediate bent caps in the worst condition. At all of the bridges in the neighborhood, the caps have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from

occurring at adjacent locations. It is particularly difficult to strengthen adjacent prestressed slab units cost effectively, because of the inability to post-tension adequately.

The latest available load ratings for all five bridges indicate that only one of the bridges, 865763, requires posting.

GEOMETRIC DEFICIENCIES

The sidewalks on the bridge are 4.9 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 800 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. Any work to replace the bridge or perform major rehabilitation would require work to half the bridge in order to maintain traffic. The bridge has a roadway width of 24 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

The bridge is 42 years old. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments, and those elements do not require repairs in the next several years. However, based on deterioration found at all of the bridges in this neighborhood, and given that they were constructed at the same time with the same bridge type and materials, it is expected that all of the bridges will deteriorate similarly and it is not expected that they will remain in their present condition throughout the 20 year study period. The prestressed slab deficiencies present at 865760 will eventually be present on the other four bridges, including this one. It is recommended to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, then replace the entire bridge prior to the bridge requiring significant weight restrictions. Investing in significant repairs to the substructure units is not cost effective, since it is not possible to provide similar long lasting repairs to the slab unit superstructure. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The five bridges in this neighborhood, including this bridge, are recommended to be replaced in 16-20 years.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 203,040.00
Construction			$ 1,353,600.00
Bridge Construction [2]	$	1,099,800.00	
Maintenance of Traffic [3]	$	84,600.00	
Utilities [4]	$	169,200.00	
Construction Inspection and Administration [5]			$ 270,720.00
Contingency [6]			$ 270,720.00
		TOTAL COST	$ 2,098,080.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

Northeast Transition

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

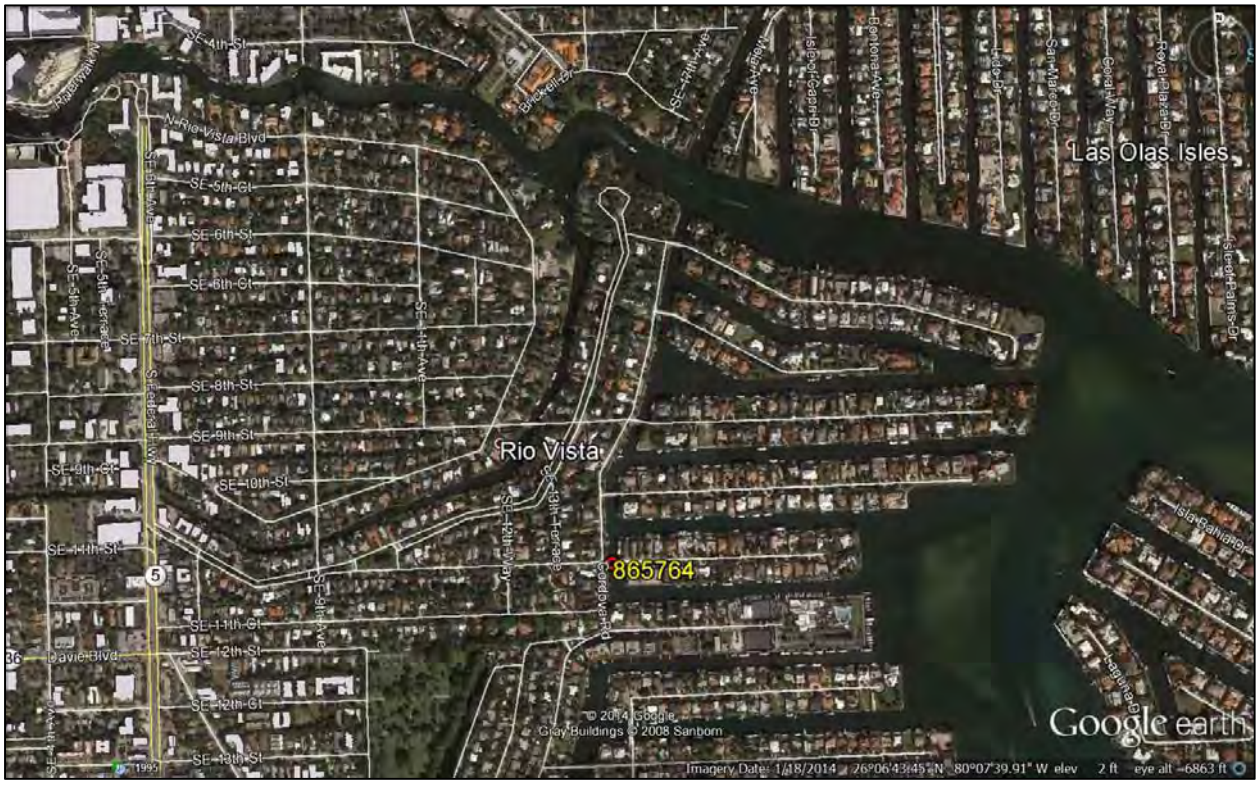
Concrete Slab Underside and Concrete T-beam. Note Utility Pipe.

GENERAL PHOTOS OF BRIDGE

Channel Looking South

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Elevated water main access cover.

Photo 2 – Crack in the asphalt over the joints.

CONDITION PHOTOS

Photo 3 – Vertical cracks on Pile 2-6.

Photo 4 – Spall in the south approach sidewalk curb.

CONDITION PHOTOS

Photo 5 – Washout area behind the retaining wall adjacent to the southwest concrete barrier.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865764** Date: **14-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865764 UW Inspection Date: 5/14/2014

Bridge Name: N/A

Road Name/Number: SE11th ST.

Feature Intersected: RIO CORDOVA

Location: 30 ft East of Cordova Rd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	8.8 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		290 Channel, 234 R/Concrete Cap
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865764** Date: **14-May-14**

A: LOCATION MAP

Description: 30 ft East of Cordova Rd

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**22 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Several piles were cleaned at random locations during this inspection cycle.
_The Previous Underwater report had documented this Element as 205 R/Concrete columns.

CS-3:
_Pile 2-6, SE corner has a delamination 18" x 8", starting 8" below the cap. **NO CHANGE.**

215 R/Concrete Abutment	**73 lf.**

Note:
_The bottom 8" of the Abutment caps are in the salt water during high tides.
_Abutment cap were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-2:
_Both Abutments have intermittent horizontal and vertical cracks x up to 1/16" wide, along the repaired locations. **UW Photo 01. NEW.**

Corrective Action Taken:
_Abutments 1 and 4, all the spall/delaminated areas were repaired during this inspection cycle.

234 R/Concrete Cap	**72 lf.**

Note:
_The bottom 4" of the caps are in salt water during extreme high tides.
_Bent caps were inspected from the underdeck down to the Piles by underwater inspectors during this inspection cycle.

CS-3:
_Bent cap 2 and 3 have intermittent horizontal and vertical cracks x up to 1/16" wide, with efflorescence, along the repaired locations. **UW Photo 02. NEW.**

Corrective Action Taken:
_Bent caps 2 and 3, all the spall/delaminated areas were repaired during this inspection cycle.

290 Channel	**1 ea.**

_No deficiency noted during this inspection cycle.

E: ELEMENT NOTES

Element	Quantity
475 R/Concrete Walls	**123 lf.**
CS-3:	**3**

_NW retaining wall has a delamination 36" x 5", with associated cracks up to 1/32" wide.
UW Photo 03. NEW.

CS-2:	**120**

_Below the high watermark, the retaining wall joints are open up to 1-1/4" wide, with edge spalls up to 2-1/2" wide. No backfill loss was observed at the joint locations during this inspection cycle.
DECREASE

F: PHOTO SECTION

Description: Top: Abutments have intermittent cracks along the repaired areas. **UW Photo 01.**
Bottom: Bent caps 2 and 3, intermittent cracks along repaired areas. **UW Photo 02.**

F: PHOTO SECTION

Description: NW retaining wall delamination with associated cracks up to 1/32" wide. **UW Photo 03.**

H: RECOMMENDED REPAIRS

215 R/Concrete Abutment

_Seal all the cracks on Abutments 1 and 4 as needed.

234 R/Concrete Cap

_Seal all the cracks on Bents 2 and 3 as needed.

475 R/Concrete Walls

_Remove unsound concrete and patch along the NW wingwall.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	10.0	10.7
2	15.7	15.8
2.5	16.0	15.2
3	14.4	13.7
4	9.5	9.1

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 7 ft. and right: 7 ft. at mid-channel.
Maximum Channel depth: 8.8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865765 **Bridge Name:** SE 13th Street over Cerro Gordo River

Topside Inspection Complete: 5/12/2014

Underwater Inspection Complete: 5/13/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 180.5 ft. long, nine (9) span, reinforced concrete double T-beam bridge constructed in 1952. The bridge has a roadway width of 21 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.5 ft. sidewalk on the south side of the bridge. This bridge serves as the only entry point for residences east of the bridge. The bridge is classified as Functionally Obsolete, but not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 1997 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting for and is currently posted for SU and C vehicles at 28 and 35 tons, respectively. The interior double T-beams control the rating, but it is unknown whether the rating included deterioration like what is currently noted at the bridge.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to

easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally improved, with many previous deficiencies being repaired, from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by an asphalt overlay.

Railings/Barriers

- The southwest approach bridge barrier has an 8 in. x 5 in. x 4 in. spall at the east end. See Condition Photo 1.

Expansion Joints

- The asphalt over the expansion joints has up to ½ in. wide transverse cracks.

Utilities

- There is one 7 ½ in. PVC conduit attached to the underside of Beam 1 in all spans.
- There is one 9 in. steel utility attached to the underside of Beams 2 and 3 in all spans.
- There is one 9 ½ in. PVC utility attached to the underside of Beam 3 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. Several of the deficiencies from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program have been repaired.

Reinforced Concrete T-Beams

- The beams typically have widespread patching from numerous repair cycles with the majority being spalled, delaminated and/or cracked. These deficiencies have been repaired several times but due to the age and condition of the bridge the repairs inevitably fail soon after repairs are completed. See Condition Photos 2 and 3.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutments have intermittent $^{1}/_{64}$ in. wide horizontal and vertical cracks at the repaired locations. See Condition Photo 4.

Intermediate Bents

- Bent 2 cap has corrosion stains in the east face under the left leg of Beam 2-3 and Beam 2-5.
- The caps have a gunite coating which has $^{1}/_{32}$ in. to $^{1}/_{16}$ in. wide cracking and sound hollow when tapped hit a hammer.
- Pile Jacket 5-6 has a 1 ft. 4 in. x 8 in. delamination with associated $^{1}/_{32}$ in. wide cracks and corrosion bleedout in the northwest corner starting 1 ft. below the cap. See Underwater Inspection Report Photo 1.
- Pile Jacket 7-5 has a 1 ft. 8 in. x $^{1}/_{32}$ in. wide crack with corrosion staining in the northwest corner starting 1 ft. below the cap and extending 7 in. into the marine growth.
- Pile Jacket 8-6 has horizontal cracks 2 ft. 4 in. x 1/32 in. wide with efflorescence on the north, west and east faces, starting 10 in. below the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- All jackets have minor voids up to 10 in. x 4 in. x 1 in. at one or more of the bottom corners. See Underwater Inspection Report Photo 3.
- There are up to 3 ft. long x $^{1}/_{16}$ in. wide vertical cracks in the jackets and gunite repairs extending down from the caps.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The end of the southeast retaining wall has an area of undermining 1 ft. 2 in. long x 3 in. high with up to 1 ft. 2 in. of penetration. No backfill leakage was observed during this inspection. See Underwater Inspection Report Photo 4.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Wingwalls

- The southeast bulkhead cap has a 4 ft. long x $^{1}/_{16}$ in. wide horizontal crack, 4 ft. from Abutment 10.
- The northwest retaining wall at the transition has a 1 ft. 8 in. x 2 in. x 1 in. spall with corrosion bleedout, starting at the bulkhead cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 5.
- The southeast retaining has intermittent areas of corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- The west retaining wall has a gunite coating. The gunite coating has up to $^{1}/_{8}$ in. wide cracks with no corrosion staining.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge was constructed in 1952 and is in fair condition based on National Bridge Inspection Standards and FDOT guidelines, with the beams and bents having numerous repaired locations, with many of the repairs having cracks and delaminations, indicating a future need to repair again. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen reinforced concrete T-beams cost effectively, because of the inability to post-tension adequately.

The latest available load rating for the bridge indicates that it requires posting. Whether the posting is due to the deteriorated condition of the T-beams, or if it is not, is not known.

Additionally, the bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalk on the south side of the bridge is 2.5 ft. wide, less than the current 5 ft. width needed to meet ADA requirements. The sidewalk terminates at the end of the bridge on the east side, but ties into a wider sidewalk off the bridge on the west side.

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences east of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the north fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 1,400 vehicles per day, and the road is posted for 25 mph. The bridge requires replacement in the long term, not repairs, but any repair work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk. The work to replace the bridge would require phased construction over half the bridge at a time in order to maintain traffic. The bridge has a roadway width of 21 ft. It may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the

qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 11-15 years from now.

LONG TERM

The bridge is 62 years old. The T-beams have numerous repairs, many of which are showing signs of cracks, spalls and delaminations. The spalls can be patched, but given the age of the bridge and that the beams have already gone through a significant repair program, the cost to repair the beams and the frequency of needed patching, will only increase with time. The cost effective decision is to allow the bridge to deteriorate, including the abutments and intermediate bents which exhibit cracks and delaminations, and the piles which have deteriorated concrete jackets, then replace the entire bridge. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. The bridge is recommended to be replaced in 11-15 years.

The new bridge should provide for at least one 5 ft. sidewalk, so it has been assumed that a new bridge would maintain the existing lane width, but provide for one 5 ft. sidewalk, an increase of 2.5 ft. from the existing bridge. The length has been estimated to remain the same as the existing bridge.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 283,920.00
Construction			$ 1,892,800.00
Bridge Construction [2]	$	1,537,900.00	
Maintenance of Traffic [3]	$	118,300.00	
Utilities [4]	$	236,600.00	
Construction Inspection and Administration [5]			$ 378,560.00
Contingency [6]			$ 378,560.00
		TOTAL COST	$ 2,933,840.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

North Elevation

West Approach Looking East

GENERAL PHOTOS OF BRIDGE

West Approach from Bridge

East Approach from Bridge

GENERAL PHOTOS OF BRIDGE

East Approach Looking West

West Approach Posting

GENERAL PHOTOS OF BRIDGE

East Approach Posting

Southeast Transition

GENERAL PHOTOS OF BRIDGE

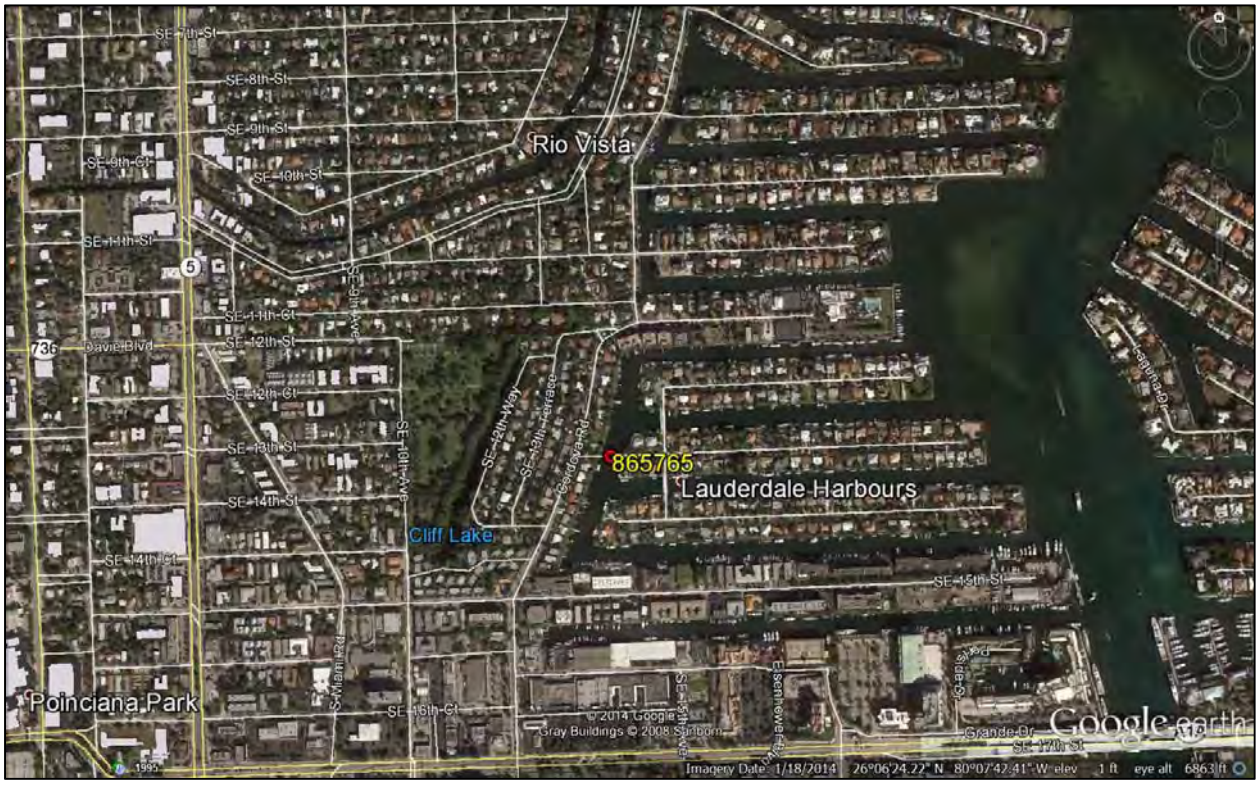
Concrete T-beam. Note Utility Pipe.

Channel Looking South

GENERAL PHOTOS OF BRIDGE

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Spall in the barrier.

Photo 2 – Typical patching on the T-beams.

CONDITION PHOTOS

Photo 3 – Typical repair patch on bottom flange of T-beams.

Photo 4 – Abutment 4 face with typical repair patches.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865765** Date: **13-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865765 UW Inspection Date: 5/13/2014

Bridge Name: N/A

Road Name/Number: SE 13th Street

Feature Intersected: CERRO GORDO RIVER

Location: 100 ft East of Cordova Rd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	7 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Con Column, 215 R/Con Abutment
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		290 Channel
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

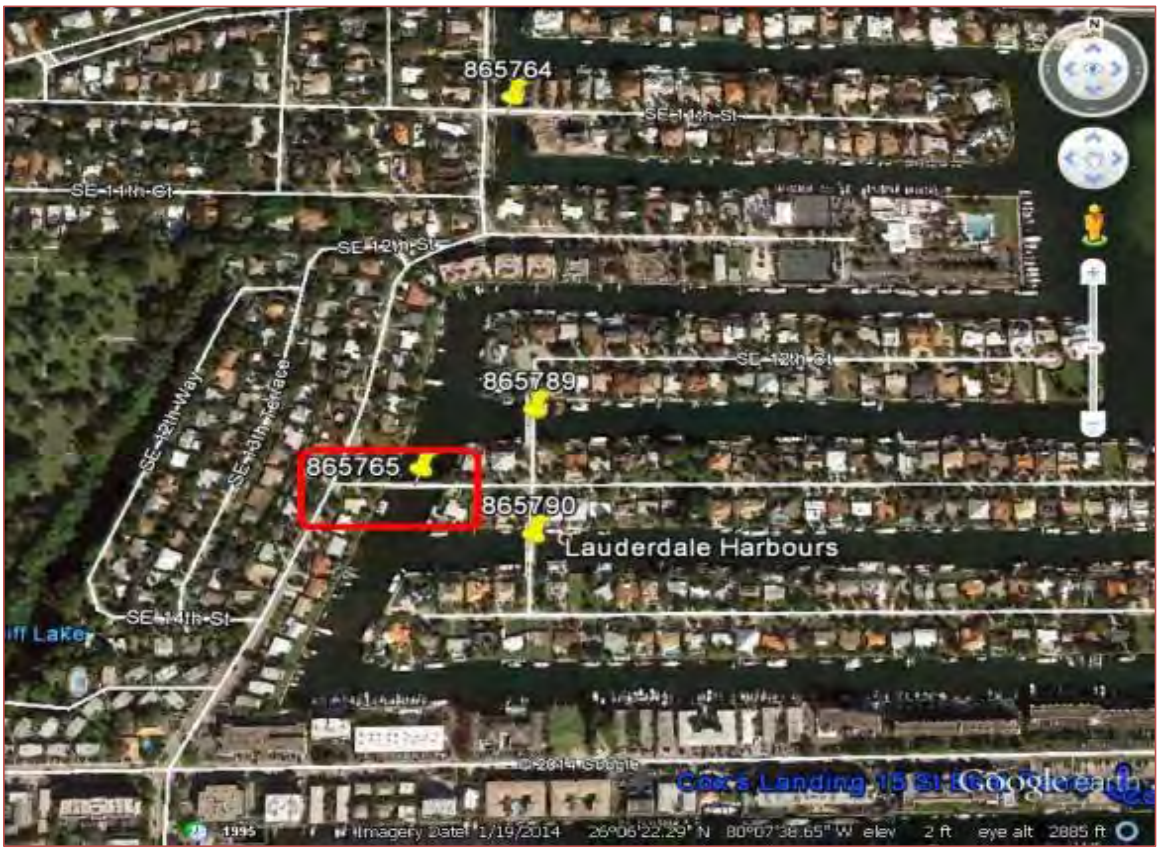
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

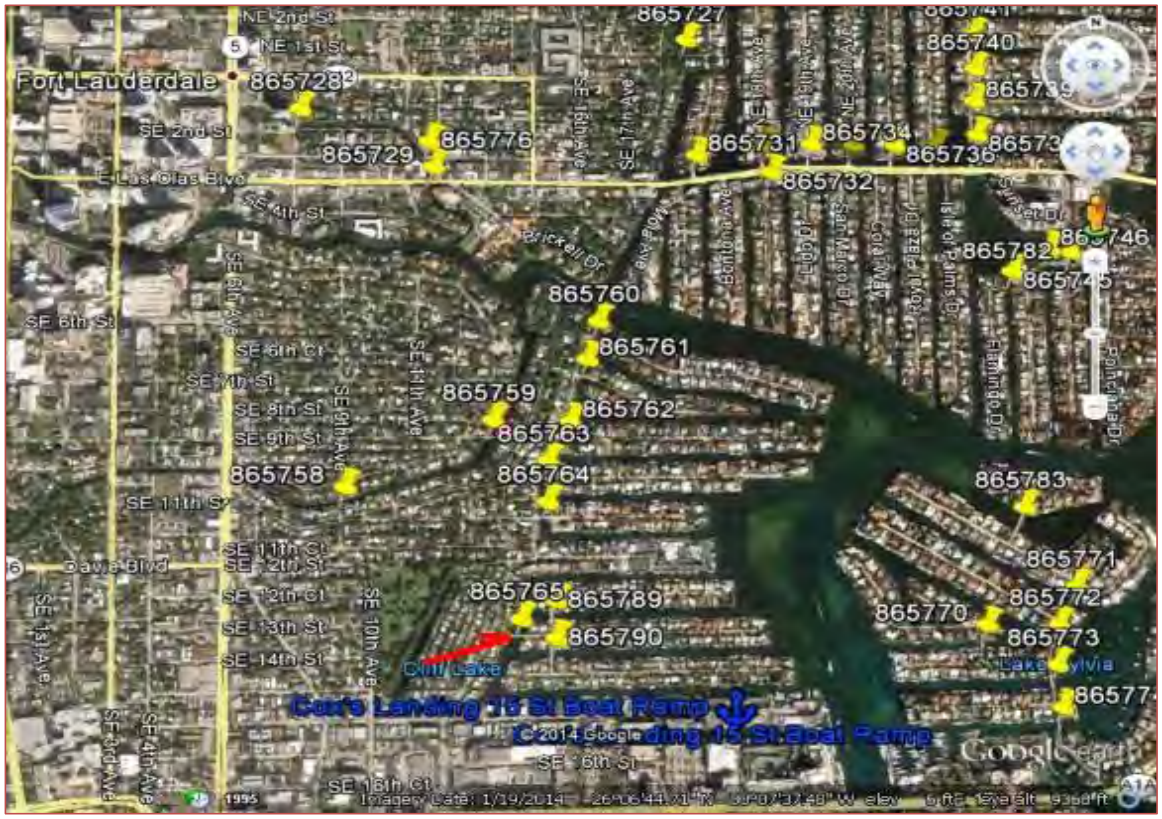
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865765** Date: **13-May-14**

A: LOCATION MAP





Description: 100 ft East of Cordova Rd

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

205 R/Concrete Column **60 ea.**

Notes:
_All the Piles are gunite from the cap down up to 55".
_Some Piles were cleaned at random locations underwater.

CS-3: **60**
_The piles have been placed in Condition State 3 due to unknown conditions prior to being jacked. Refer to Element 298 Pile Jacket Bare for related comments. **NO CHANGE**

298 Pile Jacket Bare **60 ea.**

Note:
_All the Piles have been encased in gunite from the cap down up to 55", and are 17" square.
_Pile jacket were inspected from the cap down by underwater inspectors.
_The Pile Jackets (PJ) are covered heavy marine growth starting 24" below the caps. Some jackets were cleaned at random locations during this inspection cycle.

CS-3: **3**
_PJ 5-6, NW corner has a delaminating 16" x 8", with associated cracks up to 1/16" with CBO. **UW Photo 01. NO CHANGE.**
_PJ 7-5, NW corner vertical crack 20" x 1/32", with CBO, starting 12" below the cap. **NO CHANGE.**
_PJ 8-6, North, West and East faces horizontal cracks 28" x 1/32", with efflorescence, starting 10" below the cap. **UW Photo 02. NEW.**

CS-1: **57**
_All the Pile jackets have minor voids up to 10" x 4" x 1", at (1) or more of the bottom corners. **UW Photo 03. NO CHANGE.**
_There are up to 36" L x 1/16" W, vertical cracks in the Pile Jacket gunite repairs extending down from the caps. **NO CHANGE.**

290 Channel **1 ea.**

Note: The water level (tide) was extremely low at the time of this inspection.

CS-2:
_The end of the SE retaining wall has an area of undermining 14" x 3" with up to 14" penetration. No backfill leakage was observed during this inspection cycle. **UW Photo 04. NO CHANGE.**

E: ELEMENT NOTES

Element	Quantity
475 R/Concrete Walls	**86 lf.**

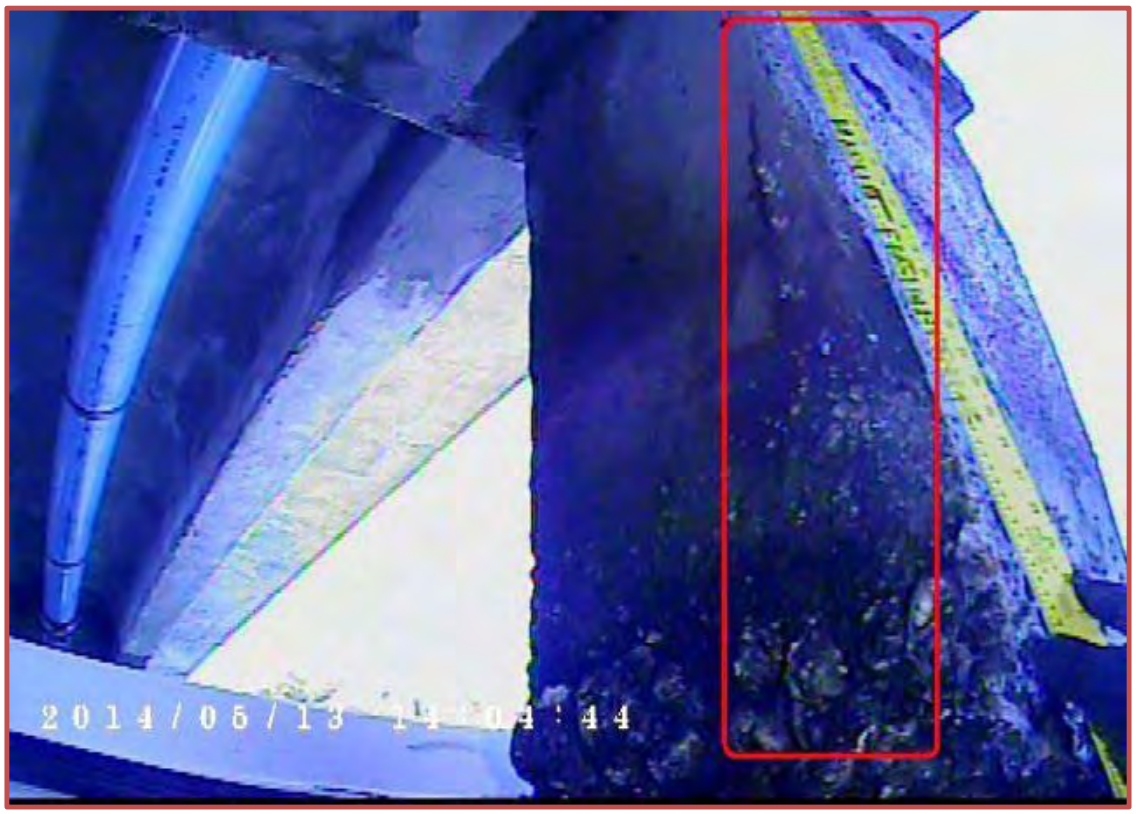
Note:
_The retaining walls were inspected from the bulkhead cap to the ground-line by the underwater inspectors during this inspection cycle.
_No retaining wall is provided at the NW corner of the Bridge.

CS-1: **72**
_West retraining wall has a gunite coating. The gunite coating has up to 1/8" wide cracks. **NEW**
_NW retaining wall at the transition has a spall 20" x 2" x 1", with corrosion bleed-out, starting at the bulkhead cap. **UW Photo 05. NEW.**

CS-2: **4**
_SE bulkhead has a horizontal crack 48" x 1/16", 10' from the abutment cap. **NO CHANGE.**

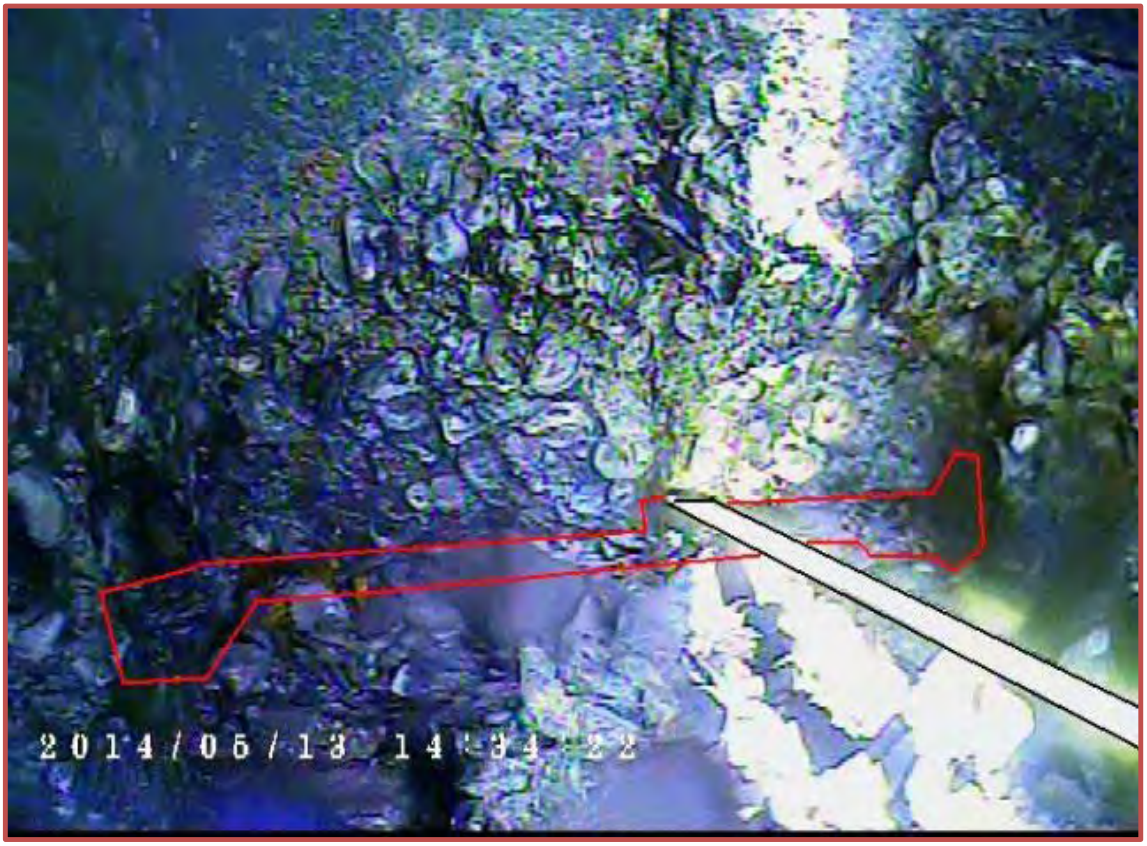
CS-3: **10**
_SE retaining wall has intermittent areas of corrosion bleed-out. **UW Photo 06. NEW.**

F: PHOTO SECTION



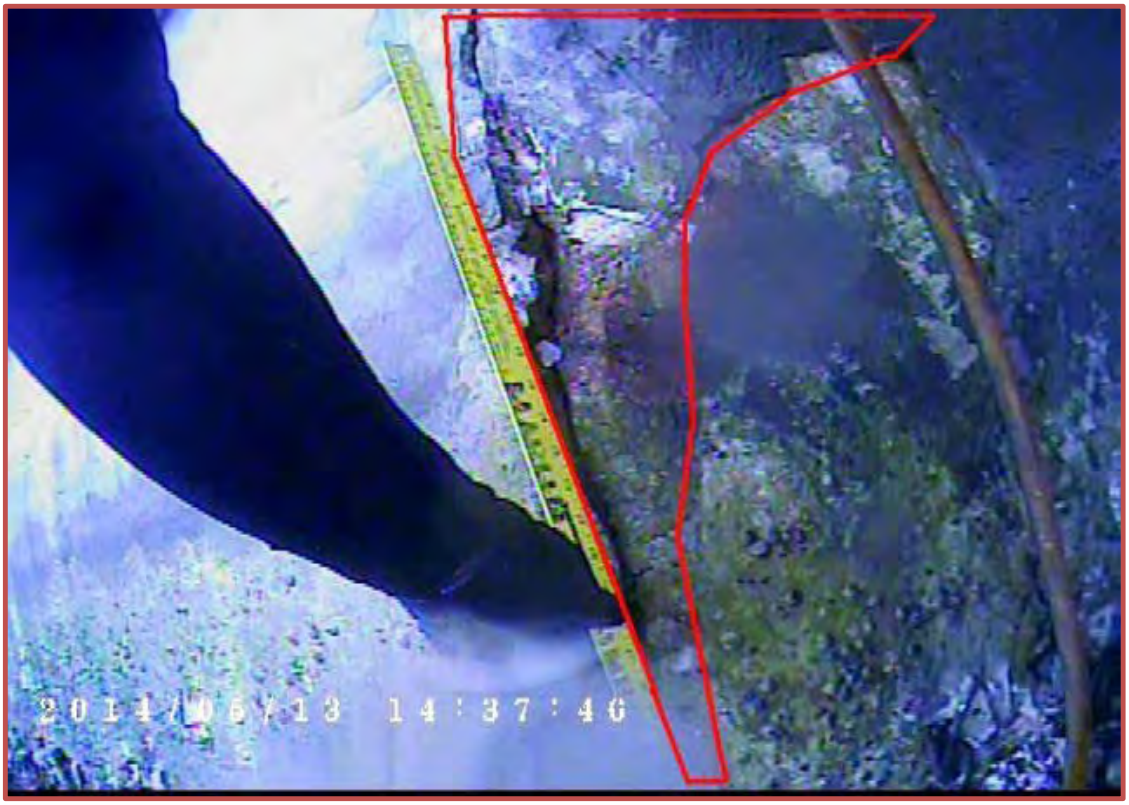
Description: Top: PJ 5-6, NW corner delamination with associated cracks. **UW Photo 01.**
Bottom: PJ 8-6, N, W and E faces, horizontal cracks with efflorescence. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: All the pile jackets have minor voids at the bottom corners. **UW Photo 03.**
Bottom: SE retaining wall, area of undermining, up to 14" penetration. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: NW retaining wall transition, spall with corrosion bleed-out. **UW Photo 05.**
Bottom: SE retaining wall has intermittent areas of corrosion bleed-out. **UW Photo 06.**

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Repair the spall on the NW retaining wall transition.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	8.4	9.0
2	12.4	9.8
3	15.5	15.4
4	16.0	16.5
5	14.6	15.3
5.5	14.6	14.5
6	14.1	14.1
7	14.7	13.5
8	13.9	13.9
9	11.9	12.6
10	8.9	9.3

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 9.5 ft. and right: 9.5 ft. at mid-channel.
Maximum Channel depth: 7 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865770 **Bridge Name:** Laguna Terrace over Diane River

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 100.3 ft. long, five span, reinforced concrete double T-beam bridge constructed in 1958. The bridge has a roadway width of 25 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.4 ft. sidewalk on the west side. The bridge provides access to residences along W. Lake Drive, and the only access to homes along Laguna Drive and Laguna Terrace. The bridge is classified as Functionally Obsolete, but not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge requires posting and it is currently posted for SU and C vehicles at 25 and 34 tons, respectively. The interior legs of the double T-beams are the controlling members in moment.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to

easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by a layer of asphalt. Repairs were made to the asphalt to address the cracks and depressions in the asphalt.

Railings/Barriers

- The left bridge rail has a 6 ft. x 6 in. delaminated repair in the west face just north of Post 1-1. Post 1-2 has a 1 ft. long x 1 in. wide area of delamination. The first delamination has increased in size, the second delamination was not previously noted.
- Post 1-1 left, top southwest corner has a 1 ft. x 6 in. x 4 in. spall/delamination.
- Post 4-1 left has a 9 in. x 5 in. delamination in the bottom northwest corner.
- Post 5-3 left has a 1 ft. 1 in. x 6 in. x ¾ in. spall delamination in the top north edge. See Condition Photo 1.
- The bridge rails have up to 1/16 in. longitudinal cracks intermittently throughout all faces.

Expansion Joints

- At Abutments 1 and 6 left sidewalk and Bents 2 and 5 right curb, there are major sealant failures.
- The asphalt over the expansion joints has up to ¼ in. wide transverse cracks. See Condition Photo 2.

Utilities

- There is one 2 ½ in. PVC conduit and one 5 ½ in. steel utility are attached to the outside face of Beam 1 in all spans.
- There is one 6 ½ in. steel utility attached to the underside of the keyway between Beams 3 and 4 in all spans.
- There is one 5 in. steel utility attached to the underside of Beam 4 in all spans.
- There is one 2 ½ in. steel conduit bears on top of the east end of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Double T-Beams

- The beams typically have widespread patching from numerous repair cycles with the majority being delaminated or cracked.
- There are several spalls with exposed rebar and delaminations throughout the beams. The deficiencies listed in the table have either remained the same or increased in size, and some new delaminations, spalls, and/or cracks have been noted. See Condition Photo 3. See Table Below:

BEAM	LOCATION	DEFICIENCY
1-1	Left leg at mid-span	6 in. x 6 in. x 1 in. spall with exposed scrap steel
1-1	Middle flange at Abutment 1	6 in. x 8 in. x 1 in. spall with exposed rebar
1-4	Left leg at 2/3 point	2 ft. 6 in. x 10 in. delamination
2-1	Left flange over Bent 2	6 in. x 6 in. x 1 ½ in. spall with exposed rebar
2-1	Left leg at Bent 2	1 ft. 6 in. x 8 in. delaminated patch
2-1	Middle flange	10 in. x 6 in. x 1 in. spall/delamination with exposed rebar
2-1	Middle left leg	6 ft. x 4 in. delamination
2-3	Middle flange over Bent 2	8 in. x 10 in. x 1 in. spall/delamination
2-3	Left leg at mid-span	1 ft. x 4 in. delamination
2-3	Middle flange at 1/3 point	Three up to 8 in. x 3 in. x ½ in. spalls/delaminations with exposed rebar
2-4	Left leg at 1 /4 point	3 ft. x 8 in. delamination
2-4	Right flange at Bent 3	5 in. x 3 in. x 1 in. spall/delamination with exposed rebar
3-1	Left flange near mid-span	Six areas of exposed rebar due to lack of cover
3-1	Right flange at Bent 3	1 ft. diameter delamination
3-1 / 3-2	Keyway at Bent 3	7 in. x 7 in. x ¾ in. spall with exposed rebar
3-2	Left leg near mid-span	3 ft. x 10 in. delamination
3-2	Right flange at 1/4 point	8 in. x 5 in. x 1 in. spall with exposed rebar
3-2	Right flange at mid-span	6 in. x 5 in. x 1 in. spall with exposed rebar
3-2	Right flange at mid-span	1 ft. diameter delamination
3-3	Right leg at Bent 3	1 ft. 6 in. x 10 in. delaminated patch
3-3	Left leg at Bent 4	10 in. x 10 in. delaminated patch
3-4	Left leg near 1 /3 point	3 ft. x 10 in. delamination
4-1	Left leg near Bent 5	10 ft. x 7 in. x 1 in. spall with exposed rebar
4-1	Center flange near Bent 4	1 ft. x 7 in. 1 in. spaII with exposed rebar
4-1	Center flange at Bent 5	Two spall/delaminations up to 10 in. diameter x 1 ½ in. with exposed rebar
4-3	Right leg at mid-span	3 ft. 3 in. x 6 in. delamination
4-4	Left leg at Bent 4	3 ft. x 10 in. delaminated patch

BEAM	LOCATION	DEFICIENCY
4-4	Middle flange at Bent 4 cap	1 ft. 8 in. x 1 ft. 5 in. delaminated repair
4-4	Middle flange at mid-span	1 ft. 8 in. x 10 in. x 1 in. spall with exposed rebar
5-1	Middle flange at Bent 5	2 ft. x 7 in. x ½ in. spall/delamination with exposed rebar
5-1	Left leg at Bent 5	2 ft. x 8 in. delaminated patch
5-2	Middle flange over Bent 5	1 ft. 2 in. x 9 in. delamination
5-2	Right flange at mid-span	8 in. diameter delamination
5-3	Left flange at Bent 5	4 ft. x 5 in. delamination
5-4	Left leg 6 ft. from Bent 5	3 ft. x 5 in. delamination
5-4	Right flange over Bent 5	4 in. x 5 in. x 2 in. spall with exposed rebar

- The majority of the repairs have up to 1/32 in. wide cracking randomly throughout and some areas ring hollow when tapped with a hammer.

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has a 2 ft. x 1 ft. 6 in. x 3 in. spall with exposed reinforcing steel in the top face between Piles 1-6 and 1-7. See Condition Photo 4.
- Abutment 1 cap bottom edge has corrosion stains between Piles 1-3 and 1-4.
- Both abutment caps have up to 1/32 in. wide horizontal cracks along the lower 8 in.

Intermediate Bents

- Bent 4 cap has up to 1 ft. long x 1/32 in. wide horizontal cracks with corrosion stains in the south face over Piles 4-6, 4-7 and 4-8.
- Bent 4 cap has a 1 ft. 6 in. x 7 in. delamination with corrosion stains in the east end.
- The caps have minor horizontal and vertical cracks up to 1/32 in. wide along the bottom flanges and some vegetation growth at the east side.
- All piles have been jacketed 16 in. square from the cap down approximately 4 ft. 6 in.
- There are several cracks with corrosion bleedout and random delaminations throughout the pile jackets. This condition has increased in severity since the last inspection.
- The jackets have up to 1/16 in. wide vertical cracks that extend 1 ft. 8 in. into the marine growth.
- The bottom 10 in. of the jackets are irregular.
- The north and east faces of Pile 2-1 has two (2) vertical cracks up to 2 ft. x 1/16 in. wide with corrosion bleed out, starting at the cap. This deficiency was not previously noted.
- The north face of Pile 2-2 has a vertical crack 2 ft. 2 in. x 1/8 in. wide with corrosion bleedout starting at the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.
- The east face of Pile 3-2 has a vertical crack 2 ft. 2 in. x 1/16 in. wide with corrosion bleedout starting at the cap. This deficiency was not previously noted.
- The east face of Pile 3-3 has a vertical crack 2 ft. 2 in. x 1/16 in. wide with corrosion bleedout starting at the cap. This deficiency was not previously noted.
- The north and east faces of Pile 3-4 has two (2) vertical cracks up to 2 ft. x 1/16 in. wide with corrosion bleed out, starting at the cap. This deficiency was not previously noted.
- The south face of Pile 6-2 has a vertical crack 1 ft. 4 in. x 1/16 in. wide with corrosion bleedout starting at the cap. This deficiency was not previously noted.
- The west face of Pile 6-4 has a vertical crack 1 ft. 10 in. x 1/64 in. wide with corrosion bleedout starting at the cap and extending 8 in. into the marine growth. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition. The conditions are unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific deficiencies noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The north approach slab has a full width x ¾ in. wide fractured area adjacent to Abutment 6, no new settlement was noted during this inspection.
- The north approach slab has an area of undermining at the northwest corner of the bridge. The undermining starts at the edge of new concrete for the northwest slope; the area of undermining is approximately 6 ft. long x 2 ft. high and extends east approximately 10 ft. and south to north up to 10 ft.

Slope Protection

- No deficiencies were noted.

Wingwalls

- There is an indication of backfill leakage at the north retaining wall between the piling and the corrugated panels that was not active at the time of inspection.
- There are corrugated panels with concrete fill on the southeast and northeast wingwalls.
- The bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.
- The backwall at Abutment 1, between Piles 1-1 thru 1-3 exhibits a horizontal crack up to 1/8 in. wide at various elevations along the backwall. The area adjacent to the cracks also sounds hollow when hit with a hammer. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- The southwest wingwall has a 1 ft. 7 in. x 5 in. x 4 in. spall/void. This deficiency was not previously noted. See Underwater Inspection Report Photo 4.
- The southeast wingwall at the transition to the backwall has a 2 ft. x 5 in. x 4 in. gap/void with 2 ft. 2 in. of penetration with backfill leakage. This deficiency was not previously noted. See Underwater Inspection Report Photo 5.
- The southwest corner wingwall on the west side of Pile 1-1 has a 1 ft. x 7 in. delamination with 9 in. of penetration. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- The northeast wingwall below the cap has a 1 ft. 1 in. x 1 ft. 1i in. x 11 in. spall/void. This deficiency was not previously noted. See Underwater Inspection Report Photo 7.
- The corrugated panel at Abutment 6, between Piles 6-7 and 6-8, has multiple holes up to 4 in. x 2 in. This deficiency was not previously noted. See Underwater Inspection Report Photo 8.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865770 through 865774. All of the bridges were constructed between 1956 and 1958 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete double T-beams in the worst condition. At all of the bridges in the neighborhood, the beams have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen double-T beams cost effectively, because it is difficult to splice in additional reinforcing steel on the thin double webs that are common to the type. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that all of them require posting, and posting signs are present at the bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

Maintenance of Traffic: The bridge average daily traffic is about 2,700 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 25 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. However, it may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

All of the bridges in this neighborhood have roughly the same level of deterioration to the double-T beams and abutments/intermediate bents. They are all at least 56 years old and have

exceeded the expected 50 year design life associated with design codes from the 1950s. Because it is not cost effective to strengthen the beams, it is recommended that the bridges be allowed to deteriorate and then replaced. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. Four of the bridges are recommended to be replaced in 16-20 years, but bridge 865771 should be replaced in 11-15 years because the deterioration at that location is more advanced than the others. Waiting at least 11 years to replace any of the bridges is justifiable when considering that the bridges, although posted for loads, are still in fair to satisfactory condition. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 181,800.00
Construction			$ 1,212,000.00
Bridge Construction [2]	$	984,750.00	
Maintenance of Traffic [3]	$	75,750.00	
Utilities [4]	$	151,500.00	
Construction Inspection and Administration [5]			$ 242,400.00
Contingency [6]			$ 242,400.00
		TOTAL COST	$ 1,878,600.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign at North Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at South Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

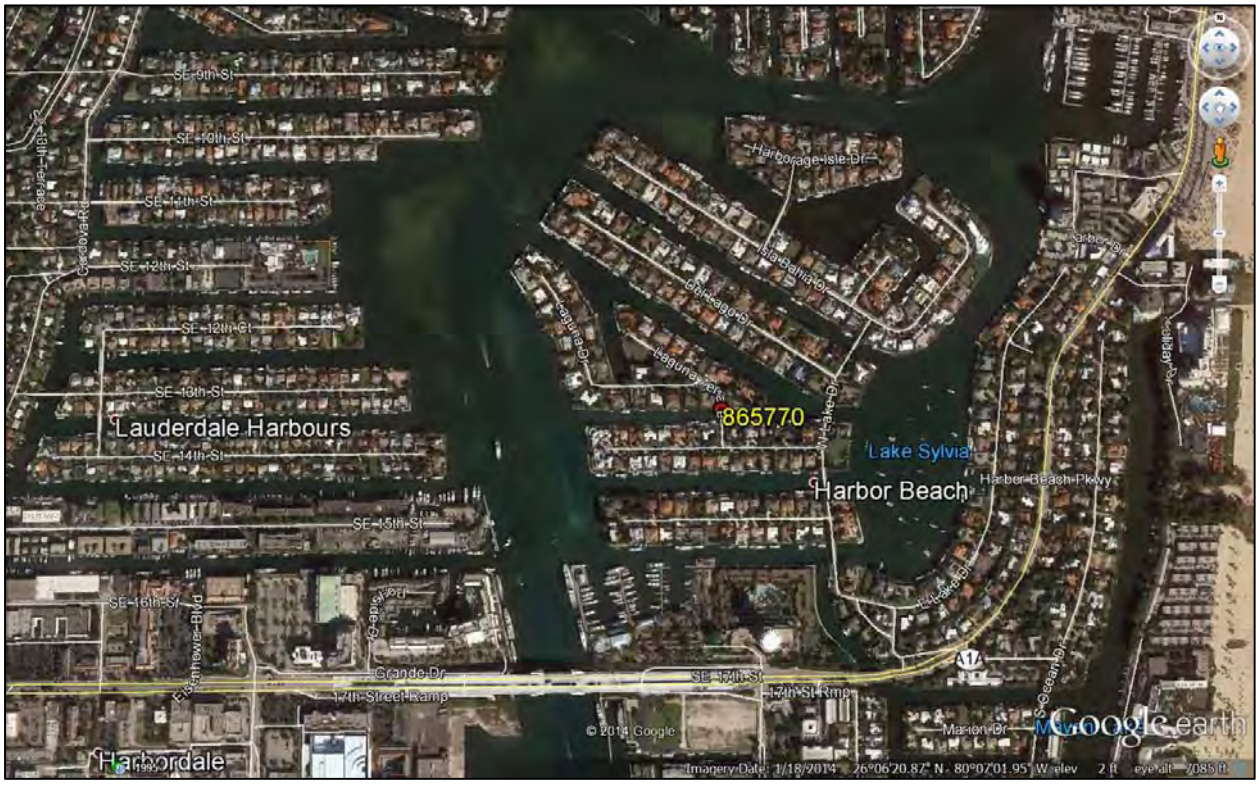
Typical Double T-Beam

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Spall in Post 5-3, left.

Photo 2 – Cracks in the asphalt over the expansion joints.

CONDITION PHOTOS

Photo 3 – Spall in the Double T-beam.

Photo 4 – Spall in Abutment 1 cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865770** Date: **12-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865770 UW Inspection Date: 5/12/2014

Bridge Name: N/A

Road Name/Number: LAGUNA TERRACE

Feature Intersected: DIANNE RIVER

Location: 150 ft North of LUCILLE DR.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	11.5 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Con Column
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		290 Channel
Weather:	84° Sunny		475 R/Concrete Walls, 477 Other Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead OP.
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

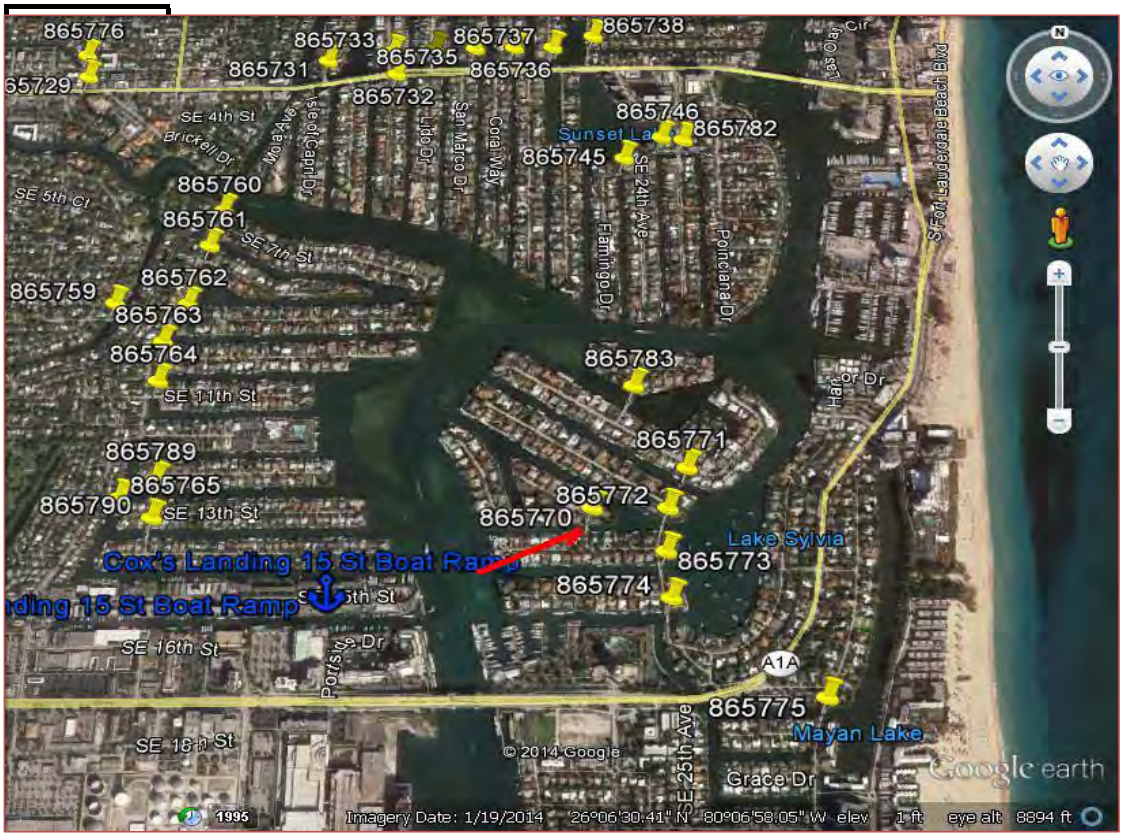
Soria, Miguel, Professional Engineer (P.E. # 49359)

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865770** Date: **12-May-14**

A: LOCATION MAP



Description: 150 ft North of LUCILLE DR.

E: ELEMENT NOTES

Notes: The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**

205 R/Concrete Column **48 ea.**

Note:
_All the Piles have been jacked from the cap down approximately 54". The piles have been placed in Condition State 3 due to unknown conditions prior to being jacked.

_No deficiency noted during this inspection cycle.

298 Pile Jacket Bare **48 ea.**

Note:
_All the Piles have been jacked from the cap down approximately 54".
_Piles Jackets (PJ) were inspected from the cap down by underwater inspectors.
_The PJ are covered heavy marine growth starting 18in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **7**
_There are several cracks with CBO and random delaminations throughout the jackets. **INCREASE**
_PJ 2-1, North and East faces, (2) vertical cracks up to 24" x 1/16", with corrosion bleed-out, starting at the cap. **NEW.**
_PJ 2-2, North face, (1) vertical crack 26" x 1/8", with corrosion bleed-out, starting at the cap. **UW Photo 01. NEW.**
_PJ 3-2, East face, (1) vertical crack 26" x 1/16", with corrosion bleed-out, starting at the cap. **NEW.**
_PJ 3-3, East face, (1) vertical crack 26" x 1/16", with corrosion bleed-out, starting at the cap. **NEW.**
_PJ 3-4, North and East faces, (2) vertical cracks up to 24" x 1/16", with corrosion bleed-out, starting at the cap. **NEW.**
_PJ 6-2, South face, (1) vertical crack 16" x 1/16", with corrosion bleed-out, starting at the cap. **NEW.**
_PJ 6-4, West face, (1) vertical crack 22" x 1/64", with corrosion bleed-out, starting at the cap and extending 8" into the marine growth. **UW Photo 02. NEW.**
_The bottom 10" of the jackets are irregular. **NO CHANGE.**

290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **103 lf.**

CS-3:
_Abutment 1, between Piles 1-1 thru 1-3 exhibits a horizontal crack up to 1/8" wide, at various elevations along the backwall, also with hollow sounding area adjacent to the crack. **UW Photo 03. NEW.**
_SW wingwall, has a spall/void 19" x 5" x 4"**. UW Photo 04. NEW.**
_SE wingwall at transition to the backwall, has a gap/void 24" x 5" x 4" with 26" of penetration and with backfill leakage. **UW Photo 05. NEW.**
_SW corner wingwall, West side of Pile 1-1 has a delamination 19" x 10", with 9" of penetration. **UW Photo 06. NEW.**
_NE wingwall below the cap spall/void 13" x 13" x 11". **UW Photo 07. NEW.**

E: ELEMENT NOTES

Element	Quantity
477 Other Walls	**30 lf.**

Note: This element represents the corrugated panels (possibly fiberglass) with a concrete cap between the abutment Piles at Abutment 6 that start approximately 40" below the abutment cap and extend to the ground-line.

CS-3:
_Abutment 6, The corrugated panel have multiple holes up to 4" x 2", between Pile 6-7 and 6-8.
UW Photo 08. NEW.

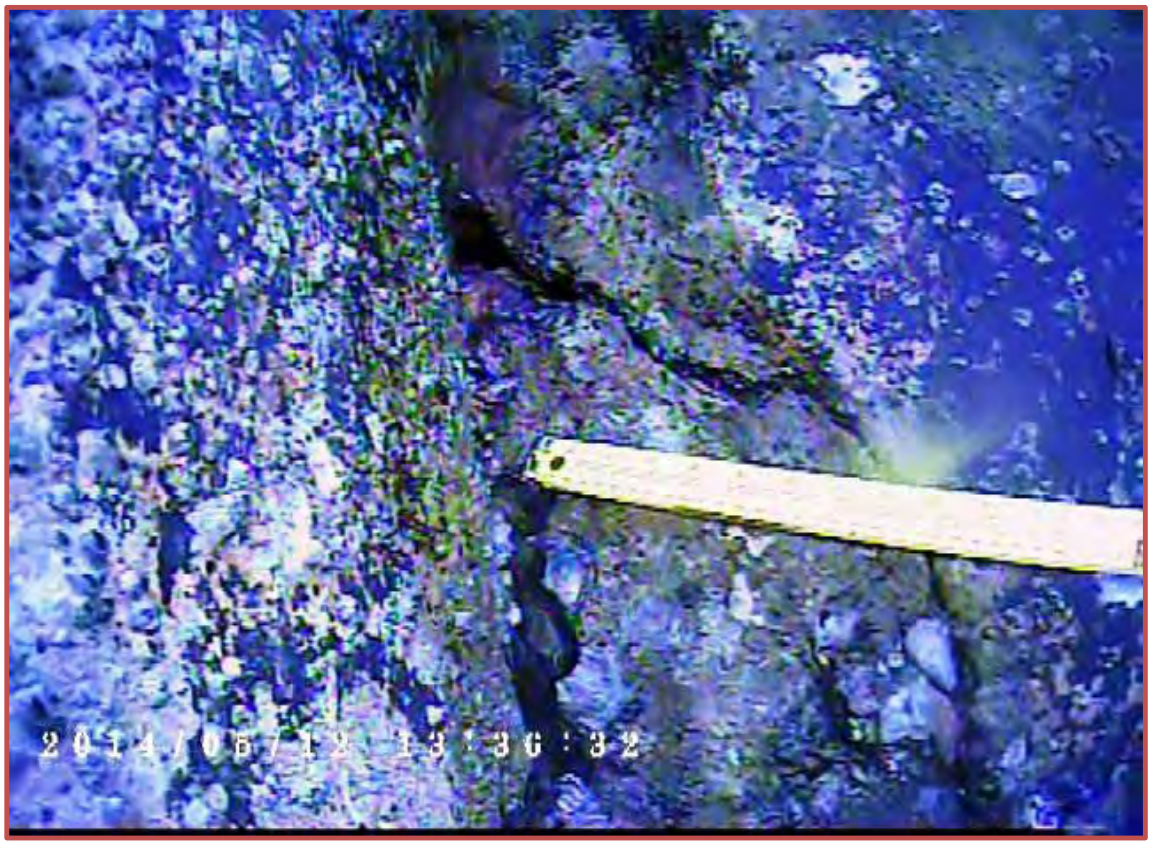
F: PHOTO SECTION

Description: Top: PJ 2-2, North face, (1) vertical crack with CBO, starting at the cap. **UW Photo 01.**
Bottom: PJ 6-4, West face, (1) vertical crack with CBO, starting at the cap. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Abutment 1, horizontal crack up to 1/8" wide at various elevations. **UW Photo 03.**
Bottom: Southwest wingwall, has a spall/void 19" x 5" x 4". **UW Photo 04.**

F: PHOTO SECTION



Description: Top: SE wingwall at transition to the backwall, has a gap/void. **UW Photo 05.**
Bottom: SW corner wingwall, West side of Pile 1-1 has a delamination. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: Northeast wingwall below the cap has a spall/void. **UW Photo 07.**
Bottom: Abutment 6, corrugated panel have multiple holes at random location. **UW Photo 0**

H: RECOMMENDED REPAIRS

298 Pile Jacket Bare

_Remove all unsound concrete and patch and seal the cracks as needed.

475 R/Concrete Walls

_Remove unsound concrete and patch the spall/void at the SW wingwall.
_Remove all unsound concrete and patch and seal the horizontal crack along the Abutment 1 backwall.
_Seal the gap at the SE transition to backwall.
_Repair the spall/void on the NE wingwall below the cap.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.0	13.5
2	19.3	19.6
3	21.3	20.7
3.5	21.6	21.1
4	20.1	20.5
5	20.5	20.0
6	14.5	14.9

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 10 ft. and right: 9.9 ft. at mid-channel.
Maximum Channel depth: 11.5 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865771 **Bridge Name:** West Lake Drive over Estelle River

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/10/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 100.4 ft. long, five span, reinforced concrete double T-beam bridge constructed in 1956. The bridge has a roadway width of 25 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.4 ft. sidewalk on the west side. The bridge provides access to residences along W. Lake Drive and provides the only access to homes along Isla Bahia Drive. The bridge is classified as neither as Functionally Obsolete, nor as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU and C vehicles at 25 and 34 tons, respectively. The interior legs of the double T-beams are the controlling members in moment.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida

Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by a layer of asphalt. Repairs were made to the asphalt to address the cracks and depressions in the asphalt.

Railings/Barriers

- Post 1-1 Left has a 6 in. x 4 in. x 2 in. spall with exposed rebar in the southwest corner at the curb.
- Post 1-1 Right has a 3 in. diameter spall in the west face.
- Post 2-2 Right has a 7 in. x 4 in. x 2 in. spall with exposed rebar in the west face at the curb.
- Post 4-3 Left has a 1 ft. 8 in. x 4 in. x 2 in. spall with exposed rebar in the southwest corner. See Condition Photo 1.
- No guardrail system or object markers have been provided for the structure.

Expansion Joints

- The joint sealant in the left sidewalk at Abutments 1 and 6 and the right curb at Abutments 1, 6 and Bent 5 have areas of complete adhesion failure and tearing of the sealant. See Condition Photo 2.
- Intermittent transverse cracks up to 1/16 in. wide are present in the asphalt surface over the expansion joints.

Utilities

- There is one 2 ½ in. PVC conduit is attached to the outside face of the left bridge rail.
- There is one 5in. and one 3 ½ in. steel utilities are attached to the outside face of Beam 1 in all spans. These utilities also bear on the top of the west end of the caps.
- There is one 9 in. steel utility is attached to the underside of Beam 4 in all spans but also bears on top of the caps.
- There is one 5 in. steel utility bears on top of the east ends of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Double T-Beams

- All the repaired areas in the beams have random cracks up to 1/32 in. wide throughout and ring hollow when struck with a hammer.
- There are several spalls with exposed rebar and delaminations throughout the beams. The deficiencies listed in the following table have either remained the same or increased in size, and some new delaminations, spalls, and/or cracks have been noted:

BEAM	LOCATION	DEFICIENCY
1-1	Left leg at Abutment 1	4 ft. x 8 in. delaminated patch
1-1	Left leg near 2/3 point	1 ft. 3 in. x 5in. delaminated patch
1-1	Right leg	Intermittent beam length x 8 in. delaminated patch
1-2	Right leg at Abutment 1	2 ft. x 10 in. x 4 in. spall with exposed rebar. See Condition Photo 3.
1-2	Right leg at mid-span	4 ft. x 1 ft. x 4 in. spall with exposed rebar.
1-2	Center Flange at Bent 2 and 3ft. from Bent 2	Up to 1 ft. 8 in. in. x 10 in. delamination
1-3	Right leg at Abutment 1	36 in. x 8 in. delaminated patch
1-3	Right leg at 3/4 point	4 ft. x 10 in. delamination
1-3	Center flange 2ft. from Abutment 1	8 in. x 5 in. x 1 in. spall with exposed rebar
1-3	Left leg at Bent 2	1 ft. x 5 in. x 1 ½ in. spall/delamination with exposed rebar
1-4	Left leg at Abutment 1	15 ft. x 4 in. delaminated patch. See Condition Photo 4.
1-4	Right leg near mid-span	3 ft. x 10 in. delamination
1-4	Left leg at Bent 2	2 ft. x 1ft. delaminated patch
2-1	Right leg at keyway	Spall 12 in x 6 in. x 2 in.
2-1	Right leg at Bent 2	1 ft. 8 in. x 8 in. delaminated patch
2-1	Left leg at Bent 2	2 ft. 6 in. x 1 ft. delamination
2-1	Left overhang at mid-span	4 ft. x 6 in. x 1 in. spall/delamination with exposed rebar
2-1	Left leg at Bent 3	1 ft. x 10 in. delamination
2-1	Right leg at Bent 3	4 ft. x 1 ft. 6 in. delaminated patch
2-2	Left & Right leg at Bent 2	1 ft. 8in. x 10 in. delaminated patch
2-2	Right flange at 1/4 point	3 ft. x 6 in. delamination
2-3	Left leg at Bent 2	2 ft. x 10 in. delaminated patch
2-3	Left leg near mid-span	3 ft. x 8 in. delamination
2-3	Center flange, 2ft. from Bent 2	10 ft. x 1 ft. delamination patch
2-3	Right leg at Bent 2	4 ft. x 7 in. x 1 ½ in. spall/delamination with exposed rebar.
2-3	Right leg beginning at Bent 2	10 ft. x 10 in. intermittent delamination/delaminated patch (overlaps above deficiency) and spall 2 ft. x 1 ft. x 2 in. with exposed steel. See Condition Photo 5.
2-3	Right flange at Bent 2	1 ft. x 7 in. delamination
2-3	Right flange at mid-span	1 ft. 7 in. x 7 in. x 1 ½ in. spall with exposed rebar
2-3	Left leg at Bent 3	1 ft. 6 in. x 10 in. delamination
2-3	Right leg at Bent 3	10 in. x 10 in. delamination
2-4	Right leg at Bent 2	2 ft. x 10 in. delamination
2-4	Left flange starting at Bent 2	10 ft. x 8 in. spall/delamination with exposed rebar
2-4	Right leg at mid-span	3 ft. x 6 in. delamination
2-4	Center flange 4ft. from Bent 3	1 ft. 8 in. x 1 ft. 3 in. delamination
2-4	Left leg at Bent 3	1 ft. 6 in. x 10 in. delamination
3-1	Left overhang, starting at Bent3	10 ft. x 6 in. delamination
3-1	Left leg at Bent 3	2 ft. x 10 in. delaminated patch
3-1	Center flange at 1/4 point	1 ft. diameter delamination

BEAM	LOCATION	DEFICIENCY
3-1	Right leg at Bent 3	2 ft. x 10 in. delamination - NEW
3-1	Right leg at Bent 4	2 ft. x 6 in. delamination
3-2	Left leg at Bent 3	2 ft. x 10 in. delaminated patch
3-2	Right leg at Bent 3	1 ft. x 1 ft. delaminated patch
3-2	Right leg at mid-span	6 ft. x 10 in. delamination.
3-2	Right leg at Bent 4	1ft. 6 in. x 1 ft. delaminated patch & spall 2 ft. x 1 ft. x 4 in. with exposed rebar
3-3	Center flange near Bent 3	4 ft. 6 in. x 1 ft. 6in. x 1 in. spall/delamination with exposed rebar
3-3	Center flange at mid-span	4 ft. x 2 ft. delaminated patch
3-3	Center flange al 2/3 point	3 ft. x 1 ft. 6 in. x 1 in. spall/delamination with exposed rebar
3-3	Right flange at 2/3 point	3 ft. x 1 ft. x ½ in. deep delamination
3-3	Left leg at Bent 4	2 ft. x 8 in. delaminated patch
3-3	Right leg at Bent 4	3 ft. x 10 in. spall and delamination
3-3	Right flange at Bent 4	7 in. x 5 in. x 1 in. spall with exposed rebar
3-4	Left leg at Bent 4	1 ft. 6 in. x 8 in. delamination
3-4	Right leg lower west face	Beam length x 10 in. delamination
3-4	Left flange, 6ft. from Bent4	1 ft. x 8 in. x 2 in. spall with exposed reinforcing steel
4-1	Left leg at Bent 4	3 ft. x 11 in. delaminated patch
4-2	Left leg at Bent 4	1 ft. x 6 in. delaminated patch
4-2	Right leg at Bent 4	2 ft. x 10 in. delaminated patch
4-2	Left leg at Bent 5	1 ft. 10 in. x 1 ft. 9 in. x 3 in. spalled/delaminated patch with exposed rebar
4-2	Right leg at Bent 5	1 ft. 6 in. x 8 in. delaminated patch
4-3	Left leg at Bent 4	1 ft. x 10 in. delaminated patch
4-3	Center flange at mid-span	2 ft. 6 in. x 1 ft. delamination
4-3	Center flange at Bent 4	2 ft. 8in. x 8 in. delamination
4-3	Right leg at Bent 4	1 ft. 8 in. x 10 in. delamination
4-3	Right flange at mid-span	1 ft. x 8 in. x 1 in. spall with exposed rebar
4-3	Left leg at Bent 5	4 ft. x 10 in. delamination
4-3	Right leg at Bent 5	1 ft. 8 in. x 10 in. delamination
4-4	Left leg at Bent 4	3 ft. x 1 ft. 5 in. x 4 in. spall/delamination with exposed rebar
4-4	Lower right leg at Bent 5	Beam length x 10 in. delamination
5-1	Right leg at Abutment 6	3 ft. x 10 in. delaminated patch
5-2	Right leg at Bent 5	2 ft. x 8 in. delamination
5-2	Left leg at Abutment 6	1 ft. x 5 in. delaminated patch
5-2	Center flange at Abutment 6	2 ft. x 1 ft. 3 in. delamination
5-2	Right leg at Abutment 6	1 ft. 8in. x 8 in. delaminated patch
5-3	Left leg at Bent 5	10 in. x 10 in. delaminated patch
5-3	Center flange at 1/4 point	Three up to 8 in. diameter delaminations
5-3	Left leg at Abutment 6	1 ft. 3 in. x 8 in. delaminated patch

BEAM	LOCATION	DEFICIENCY
5-3	Right leg at Abutment 6	2 ft. 6 in. x 8 in. delaminated patch
5-4	Left leg at Bent 5	1 ft. 6 in. x 8 in. delaminated patch
5-4	Right flange at Bent 5	4 ft. 8 in. x 8 in. x 3 in. spall/delamination with exposed rebar
5-4	Right leg at Bent 5	4 ft. x 10 in. delaminated patch
5-4	Left leg at Abutment 6	2 ft. 6 in. x 8 in. delaminated patch
5-4	Right flange at Abutment 6	6 ft. x 5 in. x 2 in. spall/delamination with exposed rebar

- Beam 3-4 has up to 1/64 in. wide map cracking throughout the east face of the right leg.
- The right curb has a 1 ft. x 1 ft. delamination near bridge rail Post 3-3 Right and exposed rebar near Post 5-1 Right.
- There are up to 4 in. diameter delaminations throughout the undersides of both curbs.
- The diaphragms at both abutments are heavily deteriorated.
- The south weight limit sign has minor impact damage.

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap has horizontal cracks for the entire length x up to 1/16in. wide with corrosion staining and a full length x 1 ft. 3 in. delamination along the bottom north edge. This deficiency has increased in severity since the last inspection. See Underwater Condition Photo 3.
- Abutment 6 cap over Pile 6-6 has a 1 ft. x 1 ft. x 1 in. spall and delamination.
- There is a ¾ in. crack between Abutment 6 and the northeast retaining wall.
- The Abutment 6 cap over Pile 5-5 exhibits a delamination 2 ft. x 1 ft. 6 in. This deficiency was not previously noted.

Intermediate Bents

- Bent 4 cap has a 4 ft. x 1 ft. delamination in the south and north faces over Pile 4-6 and 4-7.
- Bent 5 cap has a 3 ft. x 10 in. delamination and spall 2 ft. x 1 ft. x 6 in. in the south face between Piles 2 and 3. The spall was not previously noted. See Condition Photo 6.
- The caps have up to 1/16 in. wide intermittent horizontal cracks along the bottom edges.
- All piles have been jacketed 1 ft. 4 in. square from the cap down approximately 4ft. 6in.
- Pile 4-4 has up to 8 in. long x 1/32 in. wide cracks in the west face, 2 ft. 4 in. below the cap and also has an 8 in. long x 1/32 in. wide vertical crack with corrosion bleed out in the south face, 2 ft. 8 in. below the cap. This deficiency has increased since the last inspection report. See Underwater Condition Photo 4.
- The southeast corner of Pile 4-7 has a 1 ft. 9 in. x 7 in. x 2 in. spall and delamination with corrosion staining. See Condition Photo 7.
- The east face of Pile 5-1 has (1) vertical crack 3 ft. x 1/32 in. extending 1 ft. into the marine growth. This deficiency was not previously noted.
- The east face of Pile 6-1 has a 2 ft. x 1/32 in. wide vertical crack with corrosion staining in the east face extending down from the cap.
- Pile 6-1 is fractured with ½ in. wide cracks along the south face 1 ft. above the ground line. See Underwater Inspection Report Photo 1.
- Pile 6-4 is fractured with four pieces of exposed rebar (100% section loss), 7 ft. below the cap. See Underwater Inspection Report Photo 2.
- The jackets have vertical cracks up to 2 ft. long x 1/32 in. wide that extend up to 6 in. into the marine growth.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The northwest approach sidewalk has a 3 ft. x 1 ft. 4 in. delamination at Abutment 6. See Condition Photo 8.

Wingwalls

- The southwest and southeast retaining wall caps have up to 1/8 in. wide horizontal cracks with corrosion bleedout along the bottom edge.
- The southwest retaining wall cap has a 3 ft. x 8 in. delamination with corrosion bleedout, 1 ft. 8 in. from the west end.
- The southeast retaining wall cap has a 3 ft. x 6 in. delamination with corrosion bleedout at Abutment 1.
- Abutment 6 backwall has up to 16 ft. long x ½ in. wide horizontal cracks at various elevations and the wall appears to be pushed out 1 ½ in. in several locations. See Underwater Inspection Report Photo 6.
- Along the northwest wingwall transition joint there is a 2 ft. 6 in. x 1 ft. 2 in. x 3 ft. of penetration void/spall/delamination with two pieces of exposed steel with 100% section loss. See Underwater Inspection Report Photo 7.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865770 through 865774. All of the bridges were constructed between 1956 and 1958 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete double T-beams in the worst condition. At all of the bridges in the neighborhood, the beams have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen double-T beams cost effectively, because it is difficult to splice in additional reinforcing steel on the thin double webs that are common to the type. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that all of them require posting, and posting signs are present at the bridges.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the west fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

Maintenance of Traffic: The bridge average daily traffic is about 600 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 25 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. However, it may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 11-15 years from now.

LONG TERM

All of the bridges in this neighborhood have roughly the same level of deterioration to the double-T beams and abutments/intermediate bents. They are all at least 56 years old and have exceeded the expected 50 year design life associated with design codes from the 1950s. Because it is not cost effective to strengthen the beams, it is recommended that the bridges be allowed to deteriorate and then replaced. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. Four of the bridges are recommended to be replaced in 16-20 years, but bridge 865771 should be replaced in 11-15 years because the deterioration at this location is more advanced than the others. Waiting at least 11 years to replace any of the bridges is justifiable when considering that the bridges, although posted for loads, are still in fair to satisfactory condition. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 181,800.00
Construction			$ 1,212,000.00
Bridge Construction [2]	$	984,750.00	
Maintenance of Traffic [3]	$	75,750.00	
Utilities [4]	$	151,500.00	
Construction Inspection and Administration [5]			$ 242,400.00
Contingency [6]			$ 242,400.00
		TOTAL COST	$ 1,878,600.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign at North Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at South Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

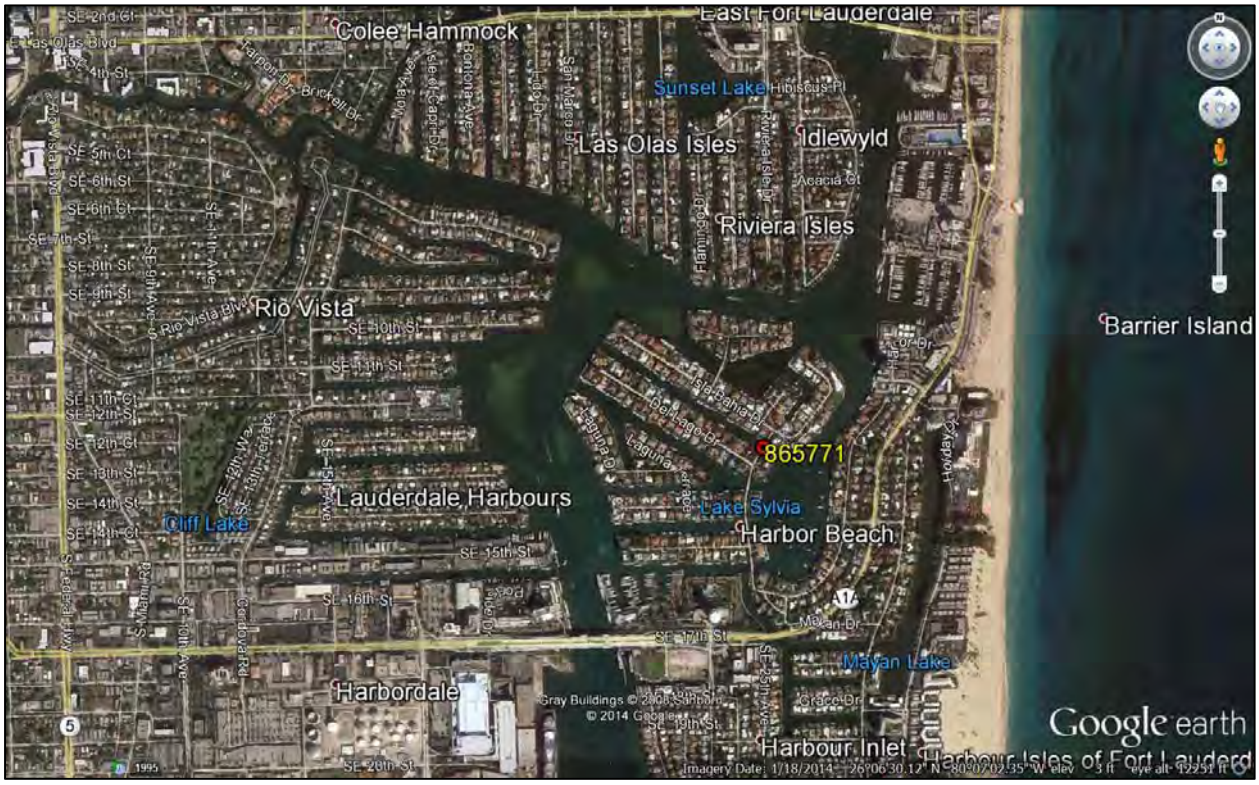
Typical Double T-Beam

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Spall in Post 4-3, left.

Photo 2 – Complete adhesion failure of the joints in the left sidewalk.

CONDITION PHOTOS

Photo 3 – Spall in the Double T-beam 1-2 Right Leg.

Photo 4 – Delaminated patch on Beam 1-4.

CONDITION PHOTOS

Photo 5 – Spall and delamination on Beam 2-3 right leg.

Photo 6 – Delamination on the Bent 5 cap.

CONDITION PHOTOS

Photo 7 – Spall and delamination on the southeast corner of Pile Jacket 4-7.

Photo 8 – Delamination on the northwest approach sidewalk.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865771** Date: **12-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

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PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865771 UW Inspection Date: 5/12/2014

Bridge Name: N/A

Road Name/Number: WEST LAKE DRIVE.

Feature Intersected: ESTELLE RIVER

Location: 200 ft South of ISLA BAHIA DR.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	11.5 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Con Columns, 205 R/Con Column
Bottom:	Muck		215 R/Con Abutment
Water Temp.:	81°		298 Pile Jacket Bare
Weather:	84° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

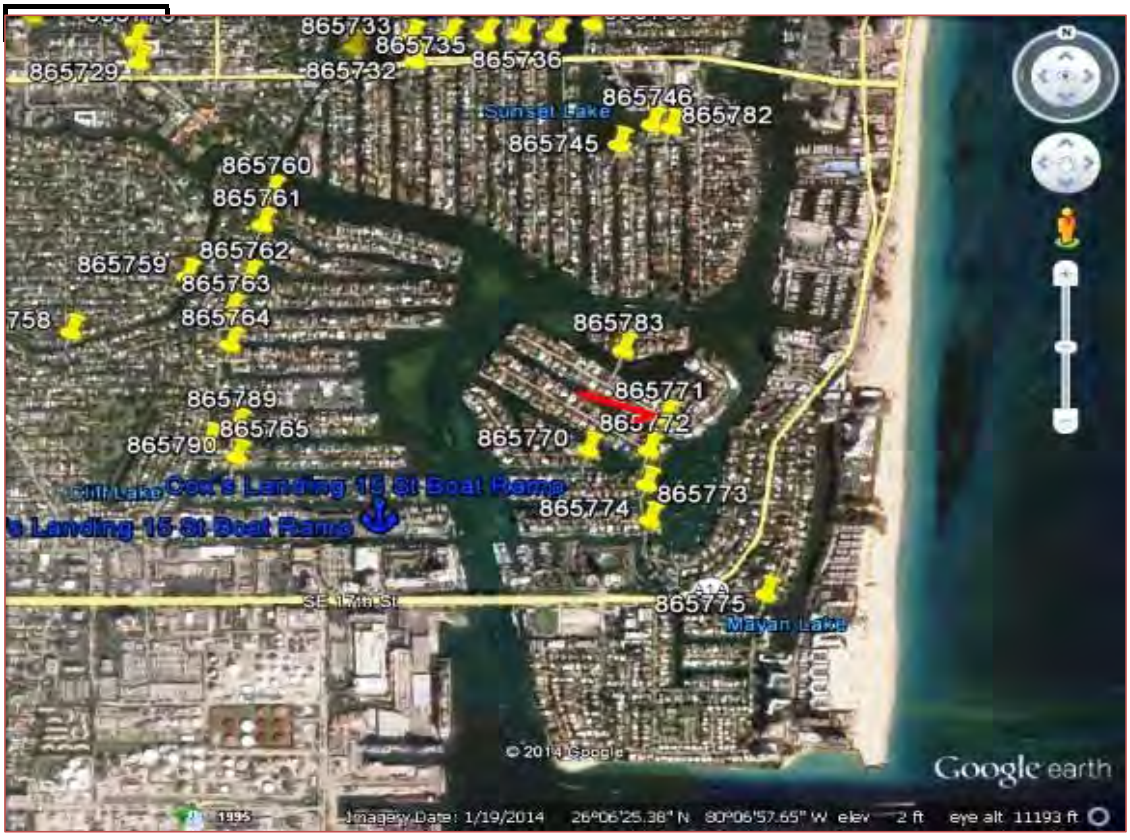
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865771** Date: **12-May-14**

A: LOCATION MAP



Description: 200 ft South of ISLA BAHIA DR.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**9 ea.**

Note:
_The Piles at Abutment 1 are pre-stressed concrete. All other piles are reinforced concrete.

_No deficiency noted during this inspection cycle.

205 R/Concrete Column	**40 ea.**

Note:
_All the Piles in Bent 2 through Abutment 6 are jacked from the cap down approximately 54". The piles have been placed in condition State 3 due to unknown conditions prior to being jacked.

CS-4: **2**
_Pile 6-1 is fractured with a 1/2" wide crack along the South face, 12" above ground-line.
UW Photo 01. NO CHANGE.
_Pile 6-4 is fractured with (4) pieces of rebar exposed up to 100% section loss, 18" above ground-line.
UW Photo 02. NO CHANGE.

CS-3: **1**
_The previously noted delaminated patch in Pile 6-6 was not found during this inspection cycle.
NOT FOUND.

215 R/Concrete Abutment	**60 lf**

Note:
_Abutment cap was inspected by the Underwater inspectors during this inspection cycle.
_A portion of Abutment 6 was reconstructed to slightly different lines and offset from the original construction.

CS-3: **31**
_Abutment 1 cap has horizontal cracks full-length x up to 1/8" wide, with corrosion bleed-out. Also, along the bottom edge is delaminated full-length x up to 15". **UW Photo 03. INCREASE.**
_Abutment 6 cap over Pile 6-6 exhibits a spall/delamination 12" x 12" x 1". **NO CHANGE**

E: ELEMENT NOTES

Element **Quantity**

298 Pile Jacket Bare **40 ea.**

Note:
_All Piles in Bent 2 through Abutment 6 are jacketed from the cap down approximately 54".
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 16in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **4**
_PJ 4-4, South and West faces (previously documented East) have (2) vertical cracks up to 8" x 1/32", with corrosion bleed-out, starting 26" below the cap. **UW Photo 04. INCREASE.**
_PJ 4-7, Southeast corner has a spall/delamination 21" x 7" x 2", with corrosion bleed-out. **NO CHANGE.**
_PJ 5-1, East face has (1) vertical crack 36" x 1/32", extending 12" into the marine growth. **NEW.**
_PJ 6-1, East face has (1) vertical crack 24" x 1/32", starting at the cap with corrosion bleed-out. **NO CHANGE.**

CS-1: **36**
_The jackets exhibit vertical cracks up to 24" x 1/32", that extend up to 6" into the marine growth. **NO CHANGE.**

290 Channel **1 ea.**

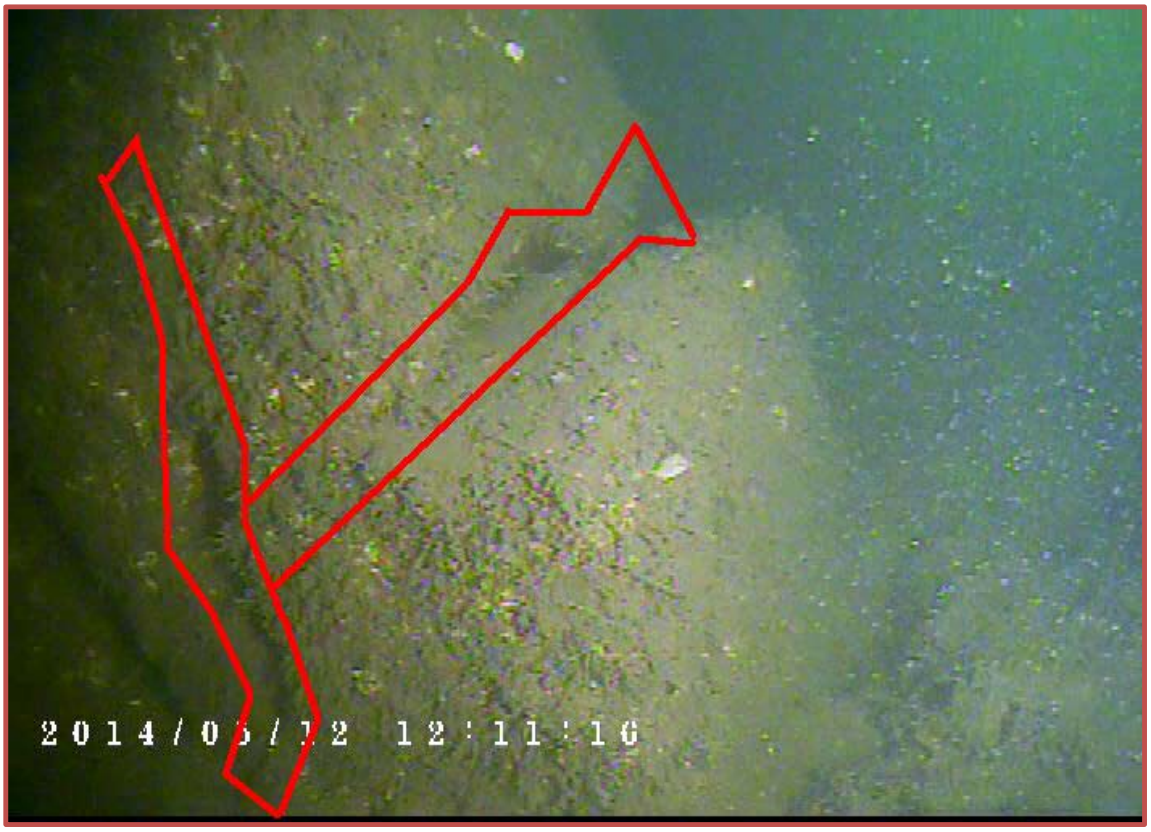
_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **103 lf.**

Note:
_A portion of Abutment 6 and the associated retaining wall were reconstructed to slightly different lines and offsets the original construction.

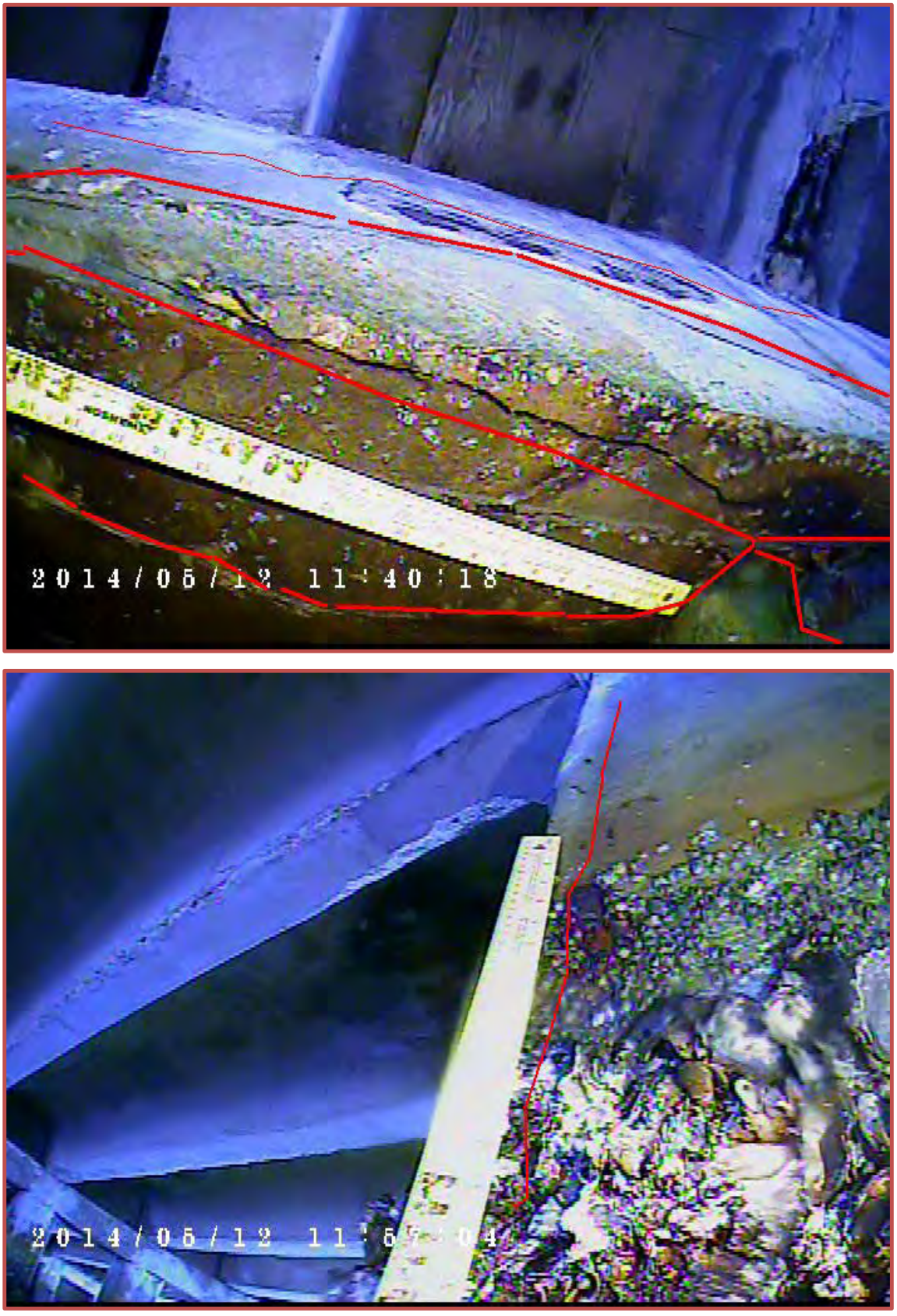
CS-3:
_SW and SE retaining wall caps have up to 1/8" wide horizontal cracks with corrosion bleed-out along the bottom edge. **NO CHANGE.**
_SW retaining wall cap has a delamination 36" x 8", with corrosion bleed-out, starting 20" from the West end. **NO CHANGE.**
_SE retaining wall cap has a delamination 36' x 6", with corrosion bleed-out. **UW Photo 05. NO CHANGE.**
_Abutment 6 backwall between Piles 6-8 thru 6-10 has a horizontal crack up to 16' L x 1/2" W, at various elevation and the wall appears to be pushed out 1/2" in several location. No backfill leakage was observer during this inspection cycle. **UW Photo 06. NO CHANGE.**
_Along the NW wingwall transition joint there is a 30" x 14" x 36" of penetration void/spall/delamination with (2) pieces of exposed steel with 100% section loss. **UW Photo 07. NO CHANGE.**

F: PHOTO SECTION



Description: Top: Pile 6-1, South face, fractured, 12" above ground-line. **UW Photo 01.**
Bottom: Pile 6-4, fractured, (4) pieces of rebar exposed. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Abutment 1 cap, delamination with associated cracks and CBO. **UW Photo 03.**
Bottom: PJ 4-4, South and West faces (2) vertical cracks and CBO. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: SE retaining wall cap, delamination with corrosion bleed-out. **UW Photo 05.**
Bottom: Abutment 6 backwall between Piles 6-8 thru 6-10, horizontal crack. **UW Photo 06.**

F: PHOTO SECTION

Description: NW wingwall transition joint, 36" of penetration void/spall/delamination. **UW Photo 07.**

H: RECOMMENDED REPAIRS

205 R/Concrete Column

_Repair the fractured Piles 6-1 and 6-4 as needed.

215 R/Concrete Abutment

_Remove all unsound concrete and patch and seal the cracks at Abutment 1 cap and Abutment 6 cap.

298 Pile Jacket Bare

_Remove all unsound concrete and patch and seal the cracks as needed.

475 R/Concrete Walls

_Remove all unsound concrete and patch and seal the cracks at both Abutment backwalls.
_Remove all unsound concrete and patch and seal the cracks along the retaining walls.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.1	12.8
2	16.9	17.4
3	19.3	19.2
3.5	20.7	20.1
4	20.3	19.4
5	18.1	18.2
6	12.5	13.0

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 9.2 ft. and right: 9.2 ft. at mid-channel.
Maximum Channel depth: 11.5 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865772 **Bridge Name:** West Lake Drive over Diane River

Topside Inspection Complete: 5/09/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 100.5 ft. long, five span, reinforced concrete double T-beam bridge constructed in 1956. The bridge has a roadway width of 25 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.4 ft. sidewalk on the west side. The bridge is the sole means of access to properties north of the bridge. The bridge is classified as Functionally Obsolete, but not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an August 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU, C and ST vehicles at 20, 24 and 32 tons, respectively. The interior double T-beams are the controlling members.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top consists of a layer of asphalt on top of the double T-beams. No deficiencies were noted.

Railings/Barriers

- There is a 4 in. x 3 in. x 1 in. spall with exposed reinforcing steel and corrosion bleed out on the northwest corner of Post 3-2L.
- There is a spall with exposed reinforcing steel and corrosion bleed out up to 2 in. diameter x ¾ in. on the southeast corner of Post 2-2R.
- The following bridge rail posts have delaminations up to post height (2 ft.) x post width (1 ft.) See Condition Photo 1.:
    - Left Side: 1-1, 1-2, 1-3, 2-1, 2-3, 3-1, 3-2, 3-3, 4-1, 4-2, 5-2 and 5-3
    - Right Side: 1-1, 3-1, 3-3, 5-2 and 5-3

Expansion Joints

- There are cracks up to 1/8 in. wide in the asphalt covering the joints over each bent. See Condition Photo 2.

Utilities

- There is one 6 in. ductile iron and one 3 in. galvanized utility pipe attached to the left side of the bridge.
- There is one 6 in. ductile iron, one 3 in. PVC and one 4 in. ductile iron utility pipe attached to the center flange of Beam 4 in all spans.
- There is one 4 in. utility attached to the right side of the structure in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Double T-Beams

- The double T-beams have spalls and/or delaminations some with exposed rebar in the legs, flanges and keyway. The deficiencies listed in the following table have either remained the same or increased in size, and some new delaminations, spalls, and/or cracks have been noted. See Condition Photo 3.

BEAM	LOCATION	DEFICIENCY
1-1	Center flange 2 ft. from Abutment 1	8 in. diameter x 1 in. spall with exposed rebar
1-2	Left leg, 1 ft. from Abutment 1	2 ft. x 1 ft. delaminated patch
1-2	Center flange at Bent 2	1 ft. 2 in. x 1 ft. 2 in. x 2 in. spall/delamination with exposed rebar
1-2	Right leg at Abutment 1	4 ft. x 1/16 in. crack on the bottom face
1-3	Center flange at Abutment 1	3 ft. x 2 ft. x 1 in. spalled/delaminated patch with exposed rebar
2-1	Right flange at Bent 3	8 in. x 6 in. x 1 in. spall with exposed rebar
2-2	Left leg at Bent 3	2 ft. x 8 in. delaminated patch
2-3	Left leg at Bent 3	10 in. x 8 in. x 2 in. spall with exposed rebar
2-3	Right leg at Bent 3	1 ft. x 8 in. delaminated patch
2-3	Right leg over Bent 3	1 ft. x 6 in. delamination
2-3	Right flange over Bent 3	1 ft. x 1 ft. delamination
2-4	Left flange 1ft. from Bent 2	2 ft. 6 in. x 1 ft. delamination
2-4	Left flange 5ft. from Bent 2	4 ft. x 1 ft. delamination at the east face
3-1	Right flange at Bent 3	8 in. x 6 in. x 1 in. spall with exposed rebar
3-1	Right flange at Bents 3 & 4	1 ft. 3 in. x 5 in. x 1 in. spall with exposed rebar
3-1	Right leg over Bents 3 & 4	1 ft. x 5 in. delamination
3-2	Right leg at Bent 3	1 ft. x 7 in. delaminated patch
3-2/3-3	Keyway at midspan	1 ft. 2 in. x 7 in x 2 in. spall with exposed rebar
3-3	Right leg at Bent 3	1 ft. 6 in. x 8 in. delaminated patch
3-4	Left leg over Bent 3	2 ft. x 10 in. x 3 in. spall/delamination with exposed rebar
3-4	Left flange at ¼ and ¾ points	Spalls/delaminations up to 2 ft. x 10 in. x 1 ½ in
3-4	Right leg over Bent 4	2 ft. x 10 in. delaminated patch
4-2	Left leg at Bent 5	2 ft. x 10 in. delaminated patch
4-2	Right flange at mid span	6 in. x 6 in. delamination
4-3	Left flange at Bent 5	3 ft. x 2 ft. delamination
4-4	Left leg, 5ft. from Bent 5	1 ft. 6 in. x 10 in. delamination
4-4	Left flange at ¼ point	2 ft. 6 in. x 10 in. x 1 ½ in. spall/delamination with exposed rebar
4-4	Left flange at ¾ point	2 ft. x 1 ft. 4 in. delaminated patch
4-4	Left leg at Bent 5	1 ft. 6 in. x 1 ft. delaminated patch
4-4	Center flange 2 ft. from Bent 5	2 ft. x 1 ft. delamination
5-2	Right leg at mid span	4 ft. x 10 in. delamination
5-4	Left leg at mid-span	6 ft. x 10 in. delamination

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- The abutment caps have up to 1/16 in. wide horizontal cracks some with corrosion staining.
- Abutment 1 cap has up to 1/64 in. wide by 3ft. long horizontal cracks with corrosion staining at both ends.
- Abutment 1 cap also has a 6 ¼ in. x 6 in. delamination with corrosion staining in the southeast corner. See Condition Photo 4.
- Abutment 6 cap has an 8 in. long x up to 1/64 in. wide horizontal crack with corrosion staining in the east and west end. Previously noted at east end only.
- Abutment 6 cap has a 2 ft. x 1/32 in. horizontal crack with corrosion staining just east of Pile 6-1.

Intermediate Bents

- Bent 2 cap has vertical and horizontal cracks with corrosion staining in the west end.
- Bent 2 cap also has a 1 ft. x 6 in. delamination with corrosion staining in the north face over Pile 2-8. See Condition Photo 6.
- Bent 3 cap has up to 1/64 in. wide x 10 in. long vertical cracks in the north face under the right leg of Beam 3-2 and under the left leg of Beam 3-3.
- Bent 4 cap has a 6 in. x 5 in. delamination in the south face under the center flange of Beam 3-1.
- Bent 4 cap has a 1/64 in. wide vertical crack in the south face over Pile 4-8.
- The piles have been encased in gunite from the cap down approximately 4 ft. 7 in. The conditions of the piles prior to encasement is unknown.
- The gunite has insignificant cracks that extend to 6 in. below the top of the marine growth.
- Pile 2-1 has corrosion spots on the west and north faces, 1 ft. 10 in. below the cap and a 4 ft. x 1/32 in. W vertical crack with corrosion staining on the north face 2 ft. below the cap. See Condition Photo 5.
- The west face of Pile 2-2 has two (2) vertical cracks up to 1 ft. 3 in. x 1/32 in. extending 10 in. into the marine growth with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.
- The west face of Pile 2-3 has three (3) vertical cracks up to 1 ft. x 1/32 in. starting at the marine growth and extending up with corrosion bleed-out. This deficiency was not previously noted.
- The east face of Pile 2-7 has a vertical crack 1 ft. 9 in. x 1/64 in. extending 1 ft. 2 in. into the marine growth. This deficiency was not previously noted.
- The north faces of Piles 3-1 through 3-4, south face of 5-6, and east face of 5-8 all exhibit corrosion staining up to 8 in. x 2 in.
- The west and north faces of Pile 3-1 has two (2) vertical cracks up to 1 ft. x 1/32 in. extending 9 in. into the marine growth with corrosion bleedout. This deficiency was not previously noted.
- The northeast corner of Pile 3-5 has two (2) vertical cracks up to 2 ft. x 1/32 in. extending 1 ft. 2 in. into the marine growth with corrosion bleedout. This deficiency was not previously noted.

- The southwest corner of Pile 3-6 has one (1) vertical crack 1 ft. 8 in. x 1/8 in. starting at the marine growth with corrosion bleedout. This deficiency was previously not noted.
- The southeast corner Pile 3-7 has one (1) vertical crack 1 ft. 1 in. x 1/8 in. starting at the cap with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- The north and east faces of Pile 4-1 have multiple cracks up to 2 ft. 1 in. x 1/16 in. extending 1 ft. 2 in. into the marine growth with corrosion bleedout. This deficiency was not previously noted.
- Pile 4-3 has a 9 in. x 1/64 in. wide crack with corrosion staining on the east face 1 ft. 8 in. below the cap with corrosion bleedout. This deficiency was not previously noted.
- All three visible faces of Pile 6-3 have horizontal cracking up to full pile width x ¼ in. wide 8 feet below the cap.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is rated as satisfactory (bank slumping), based on the conditions described below. The conditions are changed from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is scattered drift and debris around Bent 3.
- The southwest wingwall has an area of undermining up to 10 ft. long x 3 in. high x 1 ft. of penetration. This condition has increased in severity since the previous inspection report. The length of the undermining has increased significantly.
- The northwest wingwall has an area of undermining up to 10 ft. long x 1 ft. high x 1 ft. 4 in. of penetration. See Underwater Inspection Report Photo 3.
- Abutment 6 backwall has an area of undermining between Piles 6-3 and 6-6 up to 4 in. H x 1ft. 8 in. of penetration. This condition has increased in severity since the last inspection. See Underwater Inspection Report Photo 4.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- At both slab/roadway transitions, there are up to 1/16 in. wide transverse cracks.
- Through resurfacing has been done over the slabs, intermittent 1/64in. diagonal cracks are beginning to occur in the right wheel path of the northbound lane.
- The northwest approach sidewalk has a ½ in. wide x 3 ft. 7 in. long diagonal fracture at Abutment 6. Crack was previously noted as ¼ in. wide. See Condition Photo 6.

Wingwalls

- The southwest wingwall cap has a 2 ft. 4in x 11 in. x ¾ in. spall with exposed rebar near Abutment 1.
- The southwest wingwall has a ¾ in. wide diagonal fracture near Abutment 1. See Condition Photo 7.
- The backwall panel at Abutment 1on the west side of Pile 1 has a gap 2 in. wide with up to 3 ft. of penetration, approximately 1 ft. 6 in. below the high watermark. No backfill leakage was observed during this inspection. See Underwater Inspection Report Photo 5.
- The southwest wingwall/backwall has a 2 ft. 6 in. x 8 in. x 3 in. spall/delamination. See Underwater Inspection Report Photo 7.
- The southwest wingwall has two (2) diagonal fractures up to 4 ft. 8 in. long x ¾ in. wide with corrosion bleedout, from the utility to the south end. This deficiency has increased in severity since the last inspection, the fractures were previously noted as ¼ in. wide cracks. See Underwater Inspection Report Photo 6.

- The southwest wingwall has up to ¼ in. wide x 1 ft. long horizontal cracks in the west panel.
- The southeast wingwall/backwall transition joint is open up to 6 in. wide with a 1 ft. 6 in. x 1 ft. x 6 ft. depth of penetration. The depth of penetration has increased from 1 ft. 6 in. to 6 ft. See Condition Photo 8 and Underwater Inspection Report Photo 8.
- The southeast wingwall has up to 1/16 in. wide x 10 ft. long horizontal cracks near Abutment 1.
- The southeast wingwall piles have up to 1/16in. wide cracks.
- The northwest wingwall piles have delaminations up to 4 ft. x full pile width and up to 1/8in wide cracks with corrosion bleedout. This deficiency has increased in severity, the delaminations were not previously noted.
- The northeast wingwall/backwall joint has a 1 ft. 6 in. x 1 ft. x 1 ft. 6 in. void. See Condition Photo 9 and Underwater Inspection Report Photo 9.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865770 through 865774. All of the bridges were constructed between 1956 and 1958 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete double T-beams in the worst condition. At all of the bridges in the neighborhood, the beams have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen double-T beams cost effectively, because it is difficult to splice in additional reinforcing steel on the thin double webs that are common to the type. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that all of them require posting, and posting signs are present at the bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalk on the bridge is 3 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 2,400 vehicles per day, and the road is posted for 25 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

Maintenance of Traffic: The bridge average daily traffic is about 2,700 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 25 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. However, it may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

All of the bridges in this neighborhood have roughly the same level of deterioration to the double-T beams and abutments/intermediate bents. They are all at least 56 years old and have exceeded the expected 50 year design life associated with design codes from the 1950s. Because it is not cost effective to strengthen the beams, it is recommended that the bridges be allowed to deteriorate and then replaced. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. Four of the bridges are recommended to be replaced in 16-20 years, but bridge 865771 should be replaced in 11-15 years because the deterioration at that location is more advanced than the others. Waiting at least 11 years to replace any of the bridges is justifiable when considering that the bridges, although posted for loads, are still in fair to satisfactory condition. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 181,800.00
Construction			$ 1,212,000.00
Bridge Construction [2]	$	984,750.00	
Maintenance of Traffic [3]	$	75,750.00	
Utilities [4]	$	151,500.00	
Construction Inspection and Administration [5]			$ 242,400.00
Contingency [6]			$ 242,400.00
		TOTAL COST	$ 1,878,600.00

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign South

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

Bridge Posting Sign North

GENERAL PHOTOS OF BRIDGE

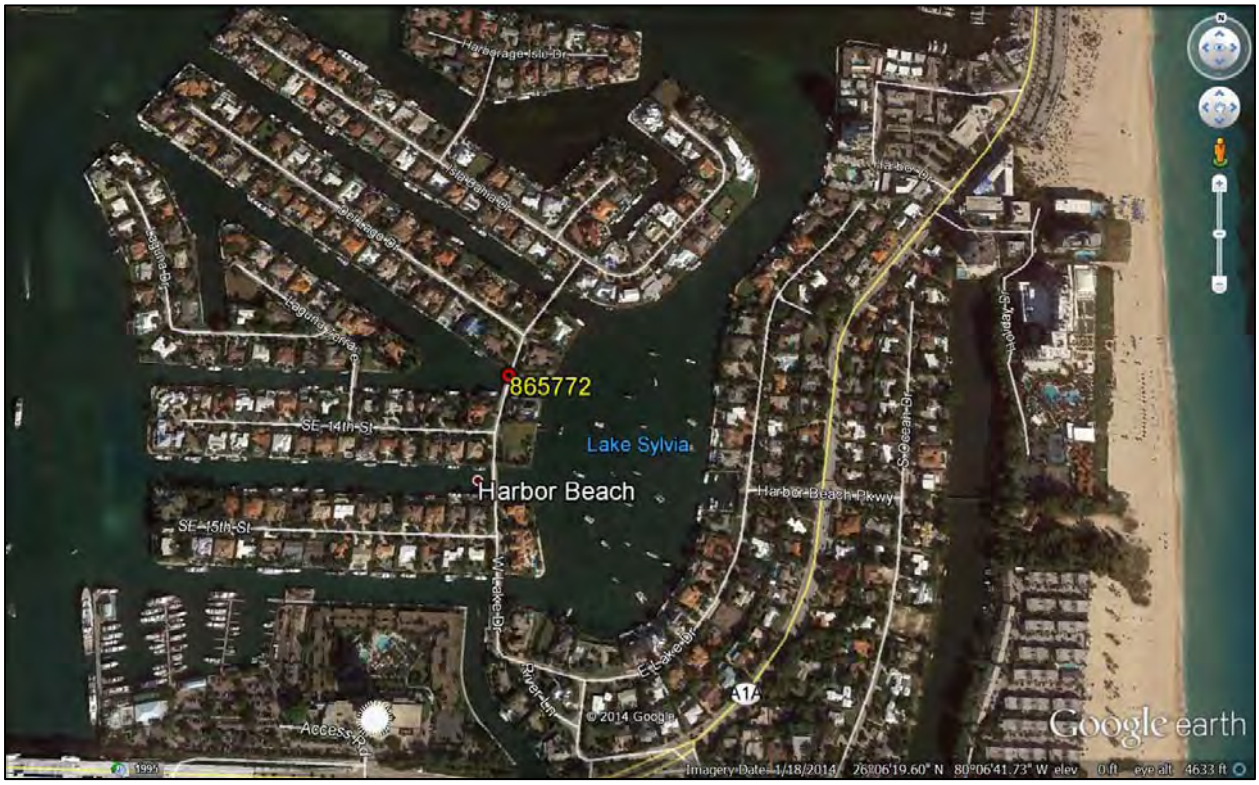
Utilities Mounted at West Fascia

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Delamination and spall with exposed rebar in Post 1-1, Left.

Photo 2 – Typical cracking in the asphalt over intermediate bents.

CONDITION PHOTOS

Photo 3 – Spall with exposed reinforcing in the top flange of the left leg of Beam 1-2.

Photo 4 – Delamination with corrosion staining on the cap at Abutment 1.

CONDITION PHOTOS

Photo 5 – Delaminations and cracks in the cap at Bent 2.

Photo 6 – Crack in the north approach sidewalk.

CONDITION PHOTOS

Photo 7 – Southwest wingwall crack/fracture.

Photo 8 – Southeast corner open transition joint in the wingwall.

CONDITION PHOTOS

Photo 9 – Northeast wingwall void.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865772** Date: **12-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865772 UW Inspection Date: 5/12/2014

Bridge Name: N/A

Road Name/Number: WEST LAKE DRIVE.

Feature Intersected: DIANE RIVER

Location: 400ft South of Del Lago Dr.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	12.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Con Column, 215 R/Con Abutment
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		290 Channel
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

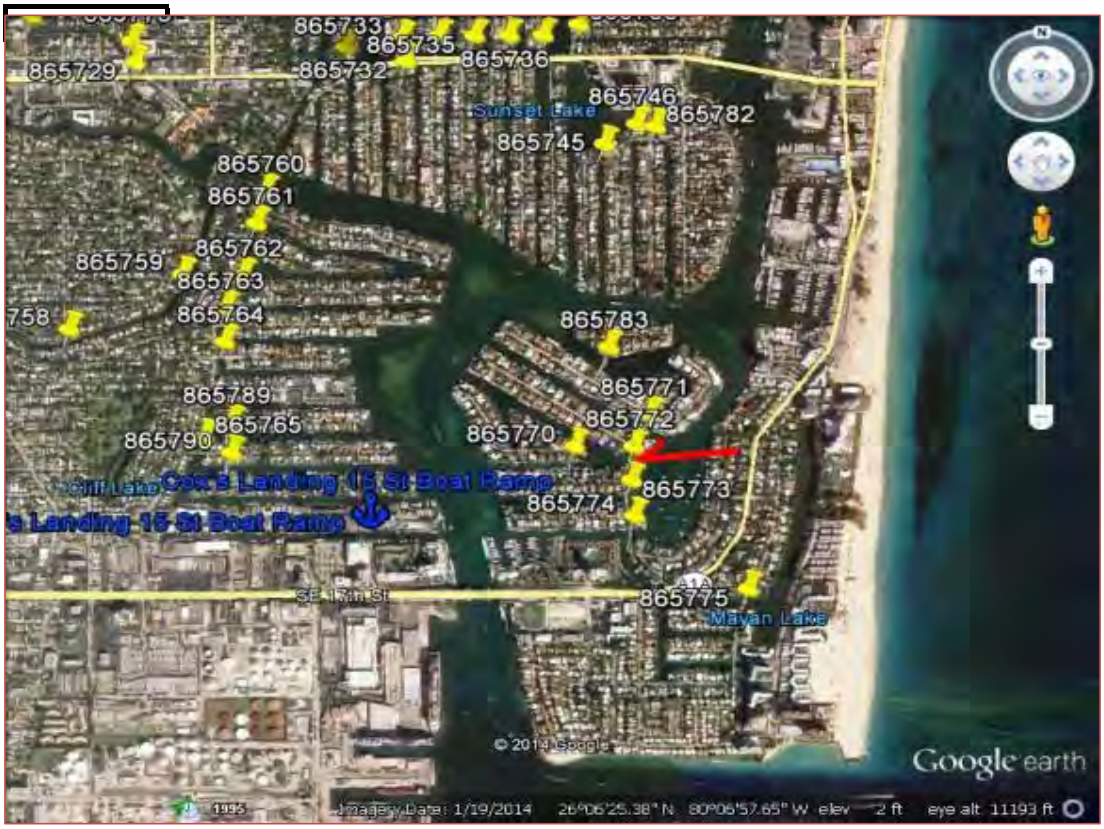
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 368)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865772** Date: **12-May-14**

A: LOCATION MAP



Description: 400ft South of Del Lago Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
205 R/Concrete Column	**48 ea.**

CS-3: **47**
_All the Piles are gunite from the cap down up to 55". The piles have been placed in condition State 3 due to unknown conditions prior to being jacked. Refer to Element 298 Pile Jacket Bare for related comments.

CS-4: **1**
_All three visible faces of Pile 6-3, 8' below the cap, have horizontal cracking up to full pile width x 1/4" wide. **NO CHANGE.**

298 Pile Jacket Bare **56 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 18in. below the caps. Some piles were cleaned at random locations during this inspection cycle.
_All the Piles have been encased in gunite from the cap down up to 55".

CS-3: **9**
_PJ 2-1, North and West faces exhibits corrosion spots, starting 22" below the cap. **NO CHANGE.** also North face (1) vertical crack 48" x 1/32", starting 23" below the cap. **NO CHANGE.**
_PJ 2-2, West face (2) vertical cracks up to 15" x 1/32", extending 10" into the marine growth with corrosion bleed-out. **UW Photo 01. NEW.**
_PJ 2-3, West face (3) vertical cracks up to 12" x 1/32", starts at the marine growth with corrosion bleed-out. **NEW.**
_PJ 3-1, West and North faces (2) vertical cracks up to 13" x 1/32", extending 9" into the marine growth with corrosion bleed-out. **NEW.**
_PJ 3-2, South face (1) vertical crack 13" x 1/64", starts at the marine growth with corrosion bleed-out. **NEW.**
_PJ 3-5, Northeast corner (2) vertical cracks up to 24" x 1/32", extending 14" into the marine growth with corrosion bleed-out. **NEW.**
_PJ 3-6, Southwest corner (1) vertical crack 20" x 1/8", starts at the marine growth with corrosion bleed-out. **NEW.**
_PJ 3-7, Southeast corner (1) vertical crack 13" x 1/8", starts at the cap with corrosion bleed-out. **UW Photo 02. NEW.**
_PJ 4-3, East face (1) vertical crack 9" x 1/64", starts 20" below the cap with corrosion bleed-out. **NEW.**

CS-2: **2**
_PJ 2-7, East face (1) vertical crack 21" x 1/64", extending 14" into the marine growth. **NEW.**
_PJ 4-1, North and East faces multiple cracks up to 25" x 1/16", extending 14" into the marine growth with corrosion bleed-out. **NEW.**

CS-1: **45**
_The gunite has insignificant cracks that extend to 6" below the top of the marine growth. **NO CHANGE.**

E: ELEMENT NOTES

Element **Quantity**

290 Channel **1 ea.**

CS-3: **1**

_There is scattered drift and debris around Bent 3. **NO CHANGE.**

_SW wingwall has an undermined area 10' long x 3" high, with up to 12" of penetration and backfill leakage. **INCREASE.**

_NW wingwall has an undermined area 10' long x 4" high, with up to 16" of penetration and backfill leakage. **UW Photo 03. INCREASE.**

_Abutment 6, backwall between Piles 6-3 thru 6-8 has an undermined area 4" H, with up to 20" penetration and backfill leakage. **UW Photo 04. INCREASE.**

475 R/Concrete Walls **102 lf.**

Note:

_The retaining walls were inspected from the high watermark to the ground-line by the underwater inspectors during this inspection cycle.

CS-3: **26**

_Abutment 1, the backwall panel on the West side of Pile 1 has a gap 2" wide with up to 36" penetration approximately 18" below the high watermark. No backfill leakage was observe during this inspection cycle. **UW Photo 05. NEW.**

_SW wingwall, has (2) diagonal fractures up to 56" L x 3/4" wide, with corrosion bleed-out. **UW Photo 06. INCREASE.**

_SW wingwall, has an horizontal crack 12" x 1/4", on the West panel. **NO CHANGE**

_SW wingwall/backwall, has a spall/delaminated area 30" x 8" x 3". **UW Photo 07. NEW.**

_SE wingwall/backwall transition joint is open up to 6" wide with 18" x 12" x 18" delamination/void. **UW Photo 08. NO CHANGE.**

_SE wingwall has an horizontal crack 10' x 1/8", near Abutment 1. **NO CHANGE.**

_SE wingwall piles multiple cracks up to 1/16" wide. **NO CHANGE.**

_NW wingwall piles have delaminations up to 48" x full width with multiple cracks up to 1/8" wide. and corrosion bleed-out. **INCREASE.**

_NW wingwall/backwall joint has an 18" x 12" x 18" void. **UW Photo 09. NO CHANGE.**

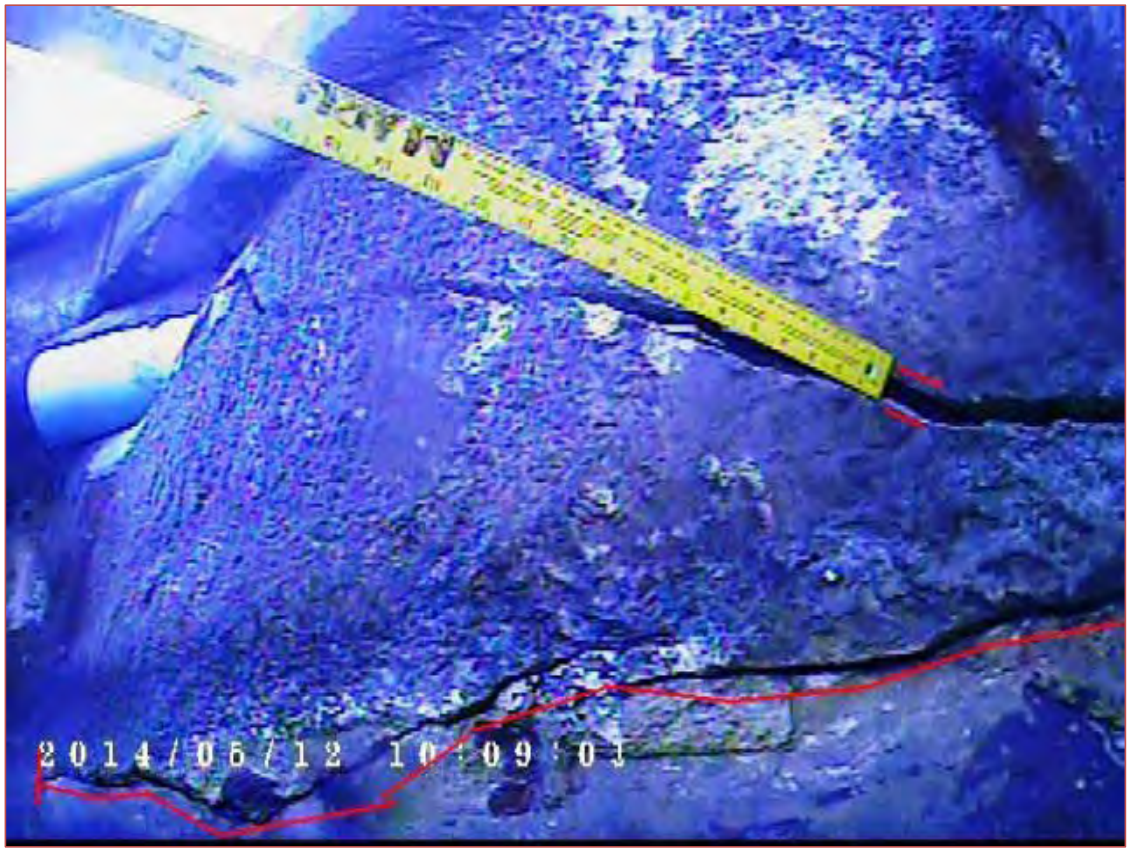
F: PHOTO SECTION

Description: Top: PJ 2-2, West face (2) vertical cracks, with CBO. **UW Photo 01.**
Bottom: PJ 3-7, SE corner (1) vertical crack, starts at the cap with CBO. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: NW wingwall has an undermined area, up to 16" of penetration. **UW Photo 03.**
Bottom: Abutment 6 backwall between Piles 6-3 thru 6-8, undermined area. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Abutment 1, backwall panel on the West side of Pile 1 gap 2" wide. **UW Photo 05.**
Bottom: SW wingwall, has (2) diagonal fractures up 3/4" wide, with CBO. **UW Photo 06.**

F: PHOTO SECTION

Description: Top: SW wingwall/backwall, has a spall/delaminated area. **UW Photo 07.**
Bottom: SE wingwall/backwall transition joint, delamination/void. **UW Photo 08.**

F: PHOTO SECTION

Description: NW wingwall/backwall joint has an 18" x 12" x 18" void. **UW Photo 09.**

H: RECOMMENDED REPAIRS

205 R/Concrete Column

_Seal the cracks on Pile 6-3 as needed.

298 Pile Jacket Bare

_Seal the cracks on Pile Jackets 2-1, 2-2, 2-3, 2-7, 3-1, 3-1, 3-6, 3-7 and 4-1.

290 Channel

_Repair the areas of undermining to prevent backfill from leaking out.

475 R/Concrete Walls

_Seal the cracks on the wingwalls as needed.
_Seal the gap at abutment 1 backwall, West side of Pile 1-1.
_Repair the delamination area on the Southeast wingwall/backwall transition joint.
_Repair the delaminated area on the Southwest wingwall/backwall.
_Remove unsound concrete and patch. Seal the crack on the SW and NW wingwall piles.
_Patch the void located at the NW wingwall/backwall joint.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.0	12.2
2	16.0	17.5
3	19.2	20.0
3.5	20.4	21.3
4	20.1	20.3
5	19.5	19.3
6	13.0	13.7

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.3ft. and right: 8.4ft. at mid-channel.
Maximum Channel depth: 12.9 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865773 **Bridge Name:** West Lake Drive over Lucille River

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/08/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 164 ft. long, four span, reinforced concrete double T-beam bridge constructed in 1956. The bridge has a roadway width of 25 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.4 ft. sidewalk on the west side. The bridge provides the only access from SR A1A to the West Lake Dr. neighborhoods north of SE 15th St. The bridge is classified as Functionally Obsolete, but it is not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an August 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU, ST, C vehicles at 20, 31 and 24 tons, respectively. The interior double T-beams control the rating.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida

Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by a layer of asphalt. Repairs were made to the asphalt to address the cracks and depressions in the asphalt.

Railings/Barriers

- Bridge rail Post 5-1 right has a 3 ft. x 5 in. x 3 in. spall delamination with exposed painted rebar in the top face extending down the northeast corner. See Condition Photo 1.
- The posts and beams have vertical and horizontal cracks up to 1/32 in. wide.
- No guardrail system or object markers have been provided for the structure.

Expansion Joints

- The asphalt overlay has full width and intermittent up to 1/8 in. wide transverse cracks over the bents and abutments. See Condition Photo 2.

Utilities

- There is one 2-1/2 in. PVC conduit and one 7 in. steel utility are attached to the outside fascia of Beam 1 in all spans. The steel utility also bears on top of the west ends of the cap.
- There is one 10 in. and one 4 in. steel utility, as well as one 5 in. PVC conduit running under Beam 4 in all spans.
- There is one 5 in. steel utility bears on top of the east end of the caps.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete T-Beams

- There are several spalls with exposed rebar and delaminations in the beams. The deficiencies listed in the following table have either remained the same or increased in size, and some new delaminations, spalls, and/or cracks have been noted. See Condition Photo 3.

BEAM	LOCATION	DEFICIENCY
1-3	Center flange within 5 ft. of Abutment 1	2 ft. 6 in. x 1 ft. 6 in. delaminated patch
1-3	Center flange 1 ft. south of Bent 2	2 ft. x 1 ft. 6 in. delaminated patch
1-4	Left leg at Abutment 1, bottom flange	Spall/delamination 2 ft. x 8 in. x 1 in. with exposed steel
1-4	Right leg at Abutment 1, bottom west face	Delamination/Spall 3ft. x 6in. x 4in. with exposed steel.
1-4	Left leg at Bent 2	3ft. x 1ft. delaminated patch
2-3	Right flange 2 ft. south of Bent 3	1 ft. 3 in. x 10 in. x 1 in. spall with exposed rebar
2-3	Right leg at Bent 3	2 ft. x 8 in. delaminated patch
2-4	Center flange at Bent 2	1 ft. 6 in. x 10 in. x 1 in. spall with exposed rebar
2-4	Center flange at Bent 3	2 ft. x 4 in. x ½ in. spall with exposed rebar
3-1	Center flange at midspan	7 in. x 5 in. x 1 in. spall with exposed rebar
3-3	Right leg 3ft. south of Bent 4	2 ft. 6 in. x 9 in. delamination
4-1	Center flange 5 ft. north of Bent 5	2 spalls 2 ft. x 1 ft. 6 in. x 2 in. with exposed rebar
Span 5	Right and left overhang over Bent 6	7 in. x 5 in. x 2 in. spall with exposed rebar
5-3	Right flange over Bent 6	6 in. x 6 in. x 1 in. spall with exposed rebar
Span 6	Right overhang over Bent 7	5 in. x 5 in. x 2 in. spall with exposed rebar
7-4	Left leg over Bent 8	Crack ¼ in. wide
8-4	Right leg near Bent 8	1 ft. 6 in. x 6 in. x 1 in. spall/delamination
Bay 2-7	At Bent 2	Spall 1 ft. 6 in. x 2 in. x 2 in. with exposed steel
Bay 2-6	At Bent 3	Spall 1 ft. 6 in. x 1 ft. 6 in. x 2 in. with exposed steel
4-1	Right leg at keyway at Bent 5	Spall 1 ft. x 8 in. x 2 in. with exposed steel
5-1	Right leg at keyway	Two spalls up to 1 ft. x 8 in. x 2 in. D with exposed rebar.

- The majority of the beams have up to 1/32 in. wide vertical cracks in both faces of the legs near mid-span that extend up into the flanges.
- The beams have up to 5 in. x 4 in. x ½ in. spalls throughout. See Condition Photo 4.
- Beam 6-4 right leg bottom face has a 2 ft. long x 1/32 in. wide longitudinal crack.
- All repairs done to the beams have up to 1/64 in. wide cracking.
- The diaphragms have minor spalls along the bottom edges at Abutments 1 and 9.
- Several of the previously repaired diaphragms have up to 1/32 in. wide shrinkage cracks.
- The PVC utility line under Beam 4 in Spans 3, 4, and 5 is sagging up to 1 ft.

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 has intermittent horizontal cracks with corrosion bleedout up to 1/32 in. wide. between Piles 1-1 and 1-2, Piles 1-4 and 1-5, Piles 1-6 and 1-7, and Piles 1-7 and 1-8. Corrosion bleedout was not previously noted.
- Abutment 9 cap has intermittent horizontal cracks with corrosion bleedout up to 1/32 in. wide over Pile 9-1, Pile 9-4, and Pile 9-7. Corrosion bleedout was not previously noted. See Condition Photo 5.
- Both abutment caps have a gunite coating with intermittent vertical and horizontal cracks up to 3 ft. 6 in. x 1/32 in. wide with corrosion bleedout. This deficiency has increased in severity since the previous inspection. Corrosion bleedout was not previously noted and the crack length has increased in size. See Underwater Inspection Report Photo 1.
- There is exposed sheet metal in Bays 1-1 and 1-3 at Abutment 1 and in all bays at Abutment 9 above the cap. This deficiency was not previously noted.

Intermediate Bents

- The caps have several cracks with corrosion bleedout and delaminations.
- The caps have intermittent horizontal cracks up to 1/32 in. wide.
- The caps have a gunite coating with vertical and horizontal cracks up to 1/32 in. wide with corrosion bleedout. Corrosion bleedout was not previously noted. See Underwater Inspection Report Photos 2 and 3.
- The brackets for the utility on the east end of the caps are heavily corroded.
- Bent 8 cap on the bottom face between Piles 8-4 and 8-5 on the south side exhibits a delamination 2 ft. x 4 in. This deficiency was not previously noted. See Condition Photo 6.
- Bent 8 cap under Beam 8-2 right leg has an 8 in. x 4 in. x 1 in. spall.
- The piles have been jacketed with 16 in. square jackets and extend approximately 5 ft. 3 in. below the caps. Gunite repairs extend approximately 2 ft. below the top of the marine growth.
- The bottom 1 ft. of jackets for Piles 2-5, 2-6, 2-7, 2-8, 3-5, 3-6, 3-7, 3-8, 4-5, and 4-7 have irregular and washed out areas with exposed rebar with 100% section loss. See Condition Photo 7.
- The south face of Pile 3-4 has a 1 ft. 8 in. x 1/32 in. starting at the cap, with corrosion bleed-out. This deficiency was not previously noted. See Underwater Inspection Report Photo 4.
- Pile 4-1 has a 1 ft. 6 in. x 1 ft. 6 in. delamination in the east face at the cap and a vertical crack 2 ft. 4 in. x 1/32 in with corrosion bleed out.

- The southwest and northwest corners of Pile 4-2 has five (5) vertical cracks up to 2 ft. x 1/16 in. with corrosion bleedout starting at the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 5.
- The south face of Pile 4-3 has one (1) vertical crack 1 ft. x 1/64 in. with corrosion bleedout, starting 1 ft. 6 in. below the cap. This deficiency was not previously noted.
- Pile 4-4 has a 1 ft. 8 in. x 10 in. delamination in the northeast corner at the cap.
- Pile 5-1 has up to 1/16 in. vertical cracks with corrosion staining in all faces extending 6in. into the marine growth.
- Pile 5-2 has a 1 ft. 6 in. x 1/32 in. vertical crack with corrosion staining in the west face 6 in. below the cap.
- Pile 6-1, on the northwest corner, has one (1) vertical crack up to 1 ft. 6 in. x 1/16 in. with corrosion bleedout starting at the cap. This deficiency was not previously noted.
- Pile 7-2 has multiple cracks up to 1/16 in. wide, with corrosion bleedout, on all faces extending into the marine growth. This deficiency was not previously noted.
- Pile 7-4 has a 2 ft. x 1/32 in. vertical crack with corrosion bleedout in the southwest corner extending down from the cap.
- The west face of Pile 8-1 has one (1) vertical crack up to 1 ft. 6 in. x 1/16 in. with corrosion bleedout starting 2 ft. below the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- All gunite coatings on the piles have up to 1/16 in. wide vertical cracks extending 5ft. into the marine growth.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.
- There are several 12 ft. long timber piles adjacent to Bents 2 and 3. This deficiency was not previously noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- The southwest approach sidewalk has a 3 ft. x 10 in. x 8 in. spall/delamination with exposed rebar at Abutment 1. See Condition Photo 8.

Wingwalls

- The southwest retaining wall cap has a 2 ft. x 6 in. x 1 ft. spall with exposed rebar that has up to 100% section loss. See Condition Photo 9.
- The southwest wingwall has several horizontal and diagonal cracks up to 1 in. wide some with corrosion bleedout and up to 6 in. of penetration. No backfill loss was observed during this inspection. Corrosion bleedout was not previously noted. See Underwater Inspection Report Photo 7.
- The northeast retaining wall cap has a cap length x cap height spall and delamination with exposed rebar.
- The northeast retaining wall has a 1 ft. 8 in. long x ¾ in. wide diagonal crack at Abutment 9.
- The Abutment 9 backwall between Piles 9-1 and 9-3 exhibits a joint separation up to 4 ft. 4 in. x 2 in. wide with up to 2 ft. of penetration.
- The end of the northwest retaining wall cap has a 1 ft. 6 in. x cap height width spall with exposed rebar.
- The southeast retaining wall cap has a 10 in. x 4 in. x 2 in. spall with exposed rebar at the transition to the privately owned wall.
- The channel side of the southeast, northeast and northwest wingwalls has a 4 ft. high corrugated plastic panel wall with a concrete cap. This appears to be a repair to stop the backfill leakage. No backfill loss was observed during this inspection.
- The north retaining wall near the groundline between Piles 9-1 and 9-3 has a horizontal joint separation 4 ft. 4 in. x 2 in. wide that can be probed 2 ft. deep. No backfill loss was observed during this inspection. See Underwater Inspection Report Photo 8.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865770 through 865774. All of the bridges were constructed between 1956 and 1958 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete double T-beams in the worst condition. At all of the bridges in the neighborhood, the beams have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen double-T beams cost effectively, because it is difficult to splice in additional reinforcing steel on the thin double webs that are common to the type. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that all of them require posting, and posting signs are present at the bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

The sidewalk on the bridge is 3 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 2,700 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 25 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. However, it may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

All of the bridges in this neighborhood have roughly the same level of deterioration to the double-T beams and abutments/intermediate bents. They are all at least 56 years old and have exceeded the expected 50 year design life associated with design codes from the 1950s. Because it is not cost effective to strengthen the beams, it is recommended that the bridges be allowed to deteriorate and then replaced. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. Four of the bridges are recommended to be replaced in 16-20 years, but bridge 865771 should be replaced in 11-15 years because the deterioration at that location is more advanced than the others. Waiting at least 11 years to replace any of the bridges is justifiable when considering that the bridges, although posted for loads, are still in fair to satisfactory condition. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 295,200.00
Construction			$ 1,968,000.00
Bridge Construction [2]	$	1,599,000.00	
Maintenance of Traffic [3]	$	123,000.00	
Utilities [4]	$	246,000.00	
Construction Inspection and Administration [5]			$ 393,600.00
Contingency [6]			$ 393,600.00
		TOTAL COST	$ 3,050,400.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign at North Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at South Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

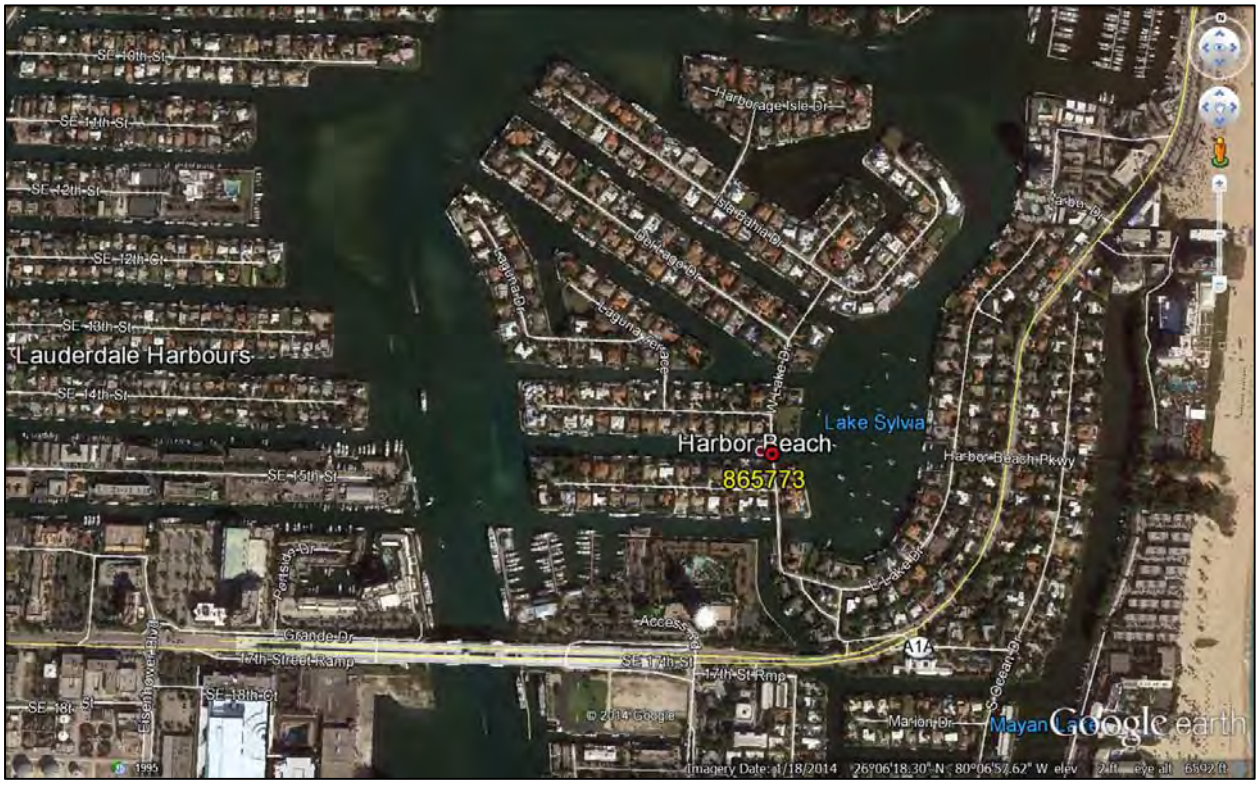
Typical Double T-Beam

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Spall in Post 5-1, right.

Photo 2 – Cracks in the asphalt over the expansion joints.

CONDITION PHOTOS

Photo 3 – Spall in Beam 4-1 north of Bent 5.

Photo 4 – Typical spall with exposed rebar and delamination in the double T-beams.

CONDITION PHOTOS

Photo 5 – Abutment 9 cap cracks with corrosion staining.

Photo 6 – Delamination in the cap at Bent 8.

CONDITION PHOTOS

Photo 7 – Typical spalling (UW may take out).

Photo 8 – Spall with exposed reinforcing steel in the Approach Slab sidewalk.

CONDITION PHOTOS

Photo 9 – Spall with exposed reinforcing steel in the southwest retaining wall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865773** Date: **08-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865773 UW Inspection Date: 5/8/2014

Bridge Name: N/A

Road Name/Number: WEST LAKE DRIVE.

Feature Intersected: LUCILLE RIVER.

Location: 150 ft South of Lucille Drive.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	13.6 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Con Column, 215 R/Con Abutment
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		234 R/Concrete Cap, 290 Channel
Weather:	84° Sunny		475 R/Concrete Walls
Special Crew Hours:	3 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

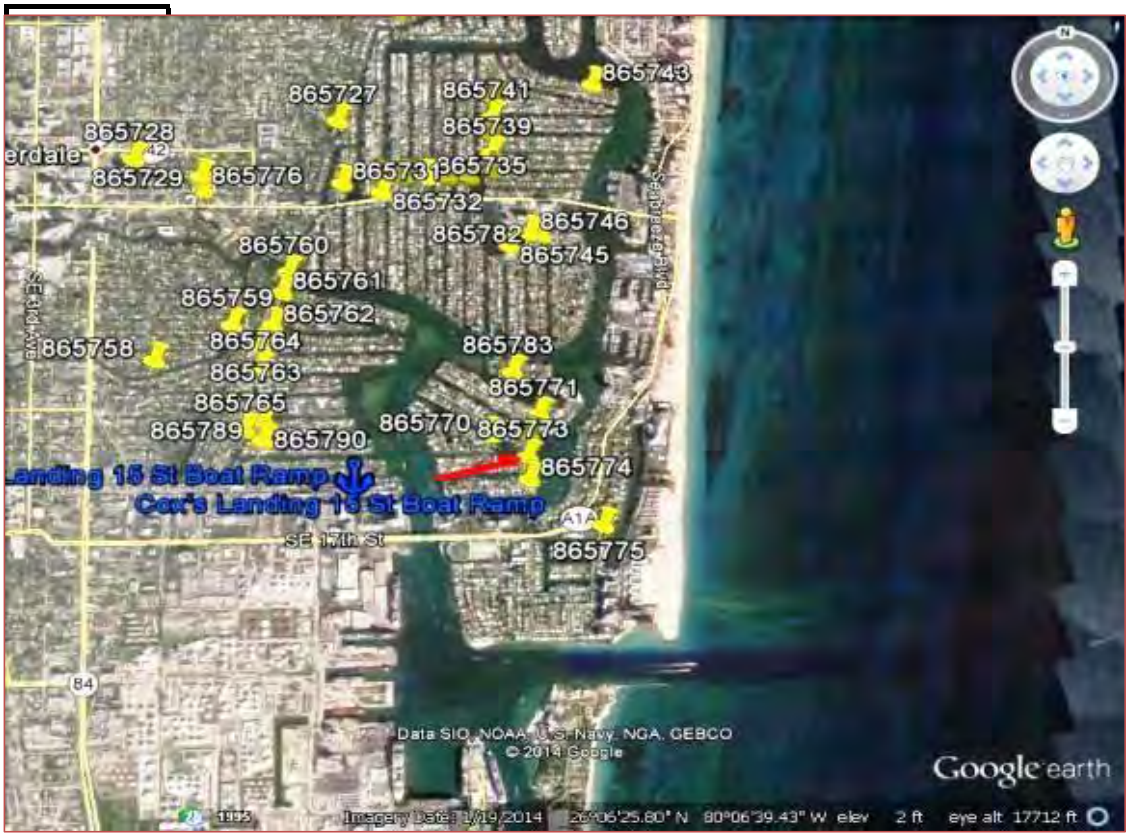
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP.
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSED No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/16/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865773** Date: **08-May-14**

A: LOCATION MAP



Description: 150 ft South of Lucille Drive.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
205 R/Concrete Column	**72 ea.**
CS-3:	**72**

_All the Piles are jacked from the cap down. The piles have been placed in condition State 3 due to unknown conditions prior to being jacked.

215 R/Concrete Abutment	**60 lf**

Note:
_Abutment cap was inspected by the Underwater inspectors during this inspection cycle.

CS-3:	**60**

_Abutment 1 backwall has intermittent horizontal and diagonal cracks up to 1/32" wide, with corrosion bleed-out, between Piles 1-1 and 1-2, Piles 1-4 and 1-5, Piles 1-6 and 1-8. **INCREASE.**

_Abutment 9 backwall has intermittent horizontal and diagonal cracks up to 1/32" wide, with corrosion bleed-out, over Piles 9-1, 9-4, 9-7. **INCREASE.**

_Both abutment caps have a gunite coating with intermittent vertical and horizontal cracks up to 42" x 1/16", with corrosion bleed-out. **UW Photo 01. INCREASE.**

234 R/Concrete Cap	**72 lf.**

Note:
_Bent Caps were inspected by underwater inspectors during this inspection cycle.

CS-3:	**72**

_The Bent caps have several intermittent cracks with corrosion bleed-out and spall/delaminations. Also the cap have area of gunite coating with vertical and horizontal cracks up to 1/32" wide with corrosion bleed-out. **UW Photos 02 and 03. INCREASE.**

_Bent 8 cap under beam 8-2 right leg, has a spall 8" x 4" x 1". **NO CHANGE.**

1

E: ELEMENT NOTES

Element **Quantity**

298 Pile Jacket Bare **72 ea.**

Note:

_All jackets are 16" square and extend approximately 5' below the cap.

_Piles were inspected from the cap down by underwater inspectors.

_The Piles are covered heavy marine growth starting 20in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **20**

_The bottom 12", of the jacket for Piles 2-5, 2-6, 2-7, 2-8, 3-5, 3-6, 3-7, 3-8, 4-5, and 4-7, have irregular and washed out areas with exposed rebars with 100% section loss. **NO CHANGE.**

_PJ 3-4, South face, (1) vertical crack 20" x 1/32", starting at the cap, with corrosion bleed-out (CBO). **UW Photo 04. NEW.**

_PJ 4-1, East face, delamination 18" x 18", starting at the cap. **NO CHANGE.** Also North face (1) vertical crack 28" x 1/32", with corrosion bleed-out. **NEW.**

_PJ 4-2, SW and NE corners, (5) vertical cracks up to 24" x 1/16", with corrosion bleed-out, starting at the cap. **UW Photo 05. NEW.**

_PJ 4-3, South face, (1) vertical crack 12" x 1/64", with CBO, starting 18" below the cap. **NEW.**

_PJ 4-4, NE corner delamination, 20" x 10", starting at the cap. **NO CHANGE.**

_PJ 5-1, all faces multiple cracks up to 1/16" wide, extending up to 6", into the marine growth with CBO. **NO CHANGE.**

_PJ 6-1, NW corner, (1) vertical crack up to 18" x 1/16", with CBO, starting at the cap. **NEW.**

_PJ 7-2, all faces multiple cracks up to 1/16" wide, extending up to 6", into the marine growth and CBO. **NEW.**

_PJ 7-4, SW corner, (1) vertical crack up to 24" x 1/32", with CBO, starting at the cap. **NO CHANGE.**

_PJ 8-1, West face, (1) vertical crack up to 18" x 1/16", with CBO, starting 24" below the cap. **UW Photo 06. NEW.**

CS-1: **52**

_All Piles have been jacketed and the jackets have gunite coating which has up to 1/16" wide vertical cracks extending 5' into the marine growth. **NO CHANGE.**

290 Channel **1 ea.**

CS-2: **1**

_There are several 12' long timber piles adjacent to Bents 2 and 3. **UW photo 07. NEW.**

475 R/Concrete Walls **91 lf.**

CS-3: **15**

_SW wingwall has several horizontal and diagonal cracks up to 1" wide, some with CBO, and up to 6" of penetration. No backfill was observed during this inspection. **UW Photo 07. INCREASE.**

CS-1:

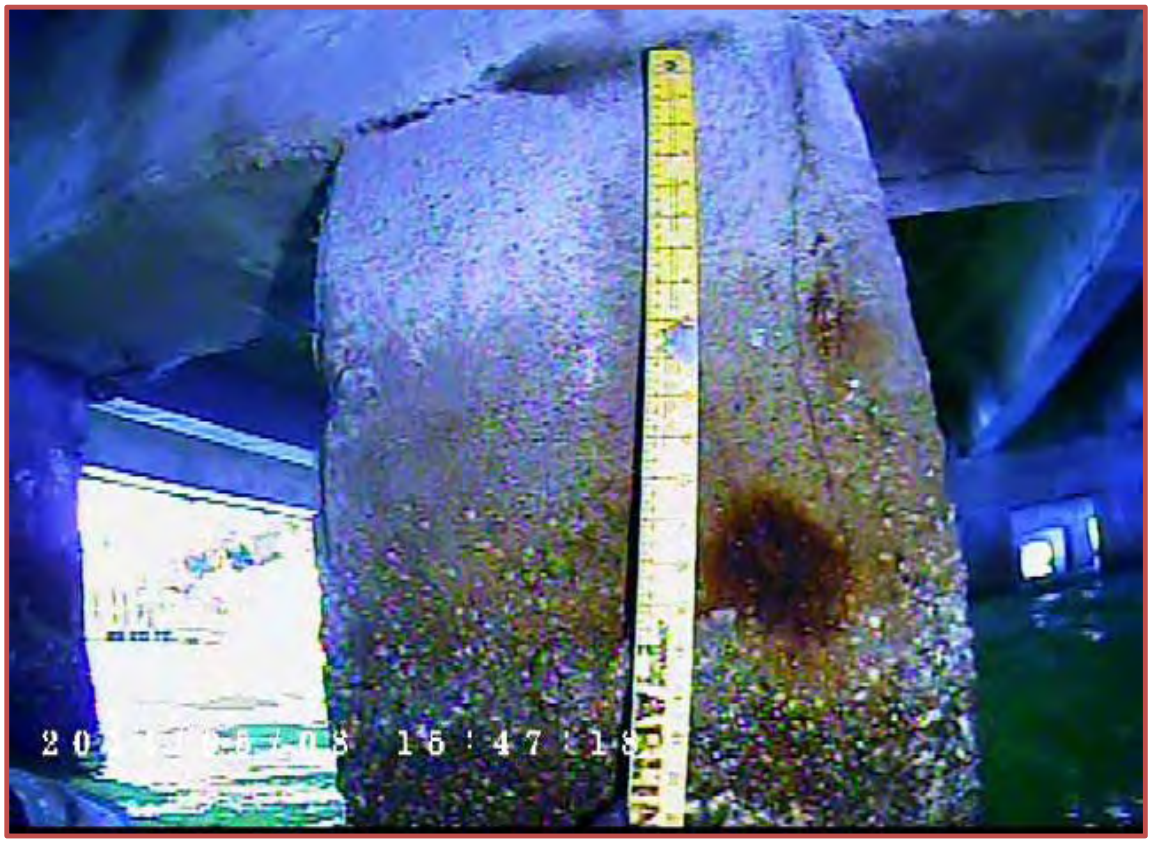
_Abutment 9 backwall between Piles 9-1 and 9-3 exhibits a joint separation up to 52" L x 2" W, with up to 24" penetration. No backfill was observed during this inspection. **UW Photo 08. NO CHANGE.**

_The channel side of the SE, NE and NW wingwalls has a 48" H, corrugated plastic panel wall with a concrete cap. This appears to be a repair to stop the backfill leakage. No backfill was observed during this inspection. **NO CHANGE.**

F: PHOTO SECTION

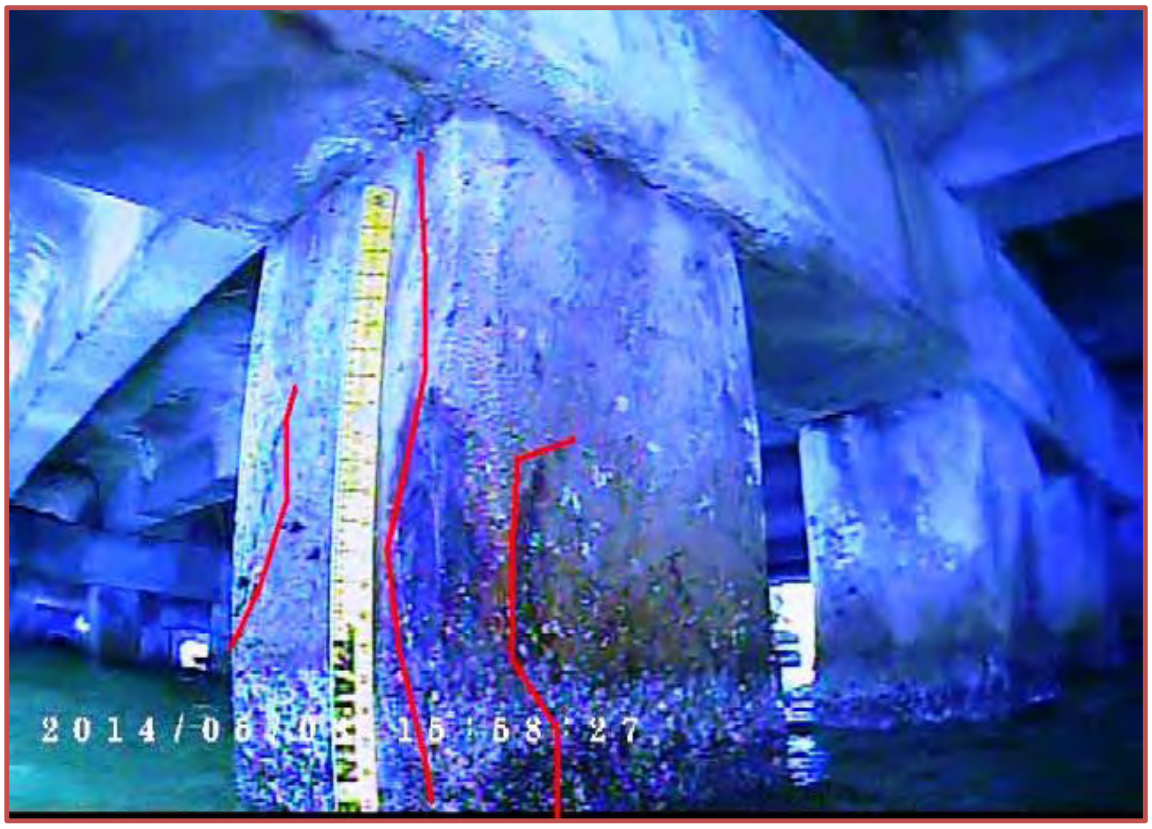
Description: Top: Both abutment caps, gunite coating has vertical and horizontal cracks. **UW Photo 01.**
Bottom: Bent caps have several intermittent cracks with CBO. **UW Photo 02.**

F: PHOTO SECTION



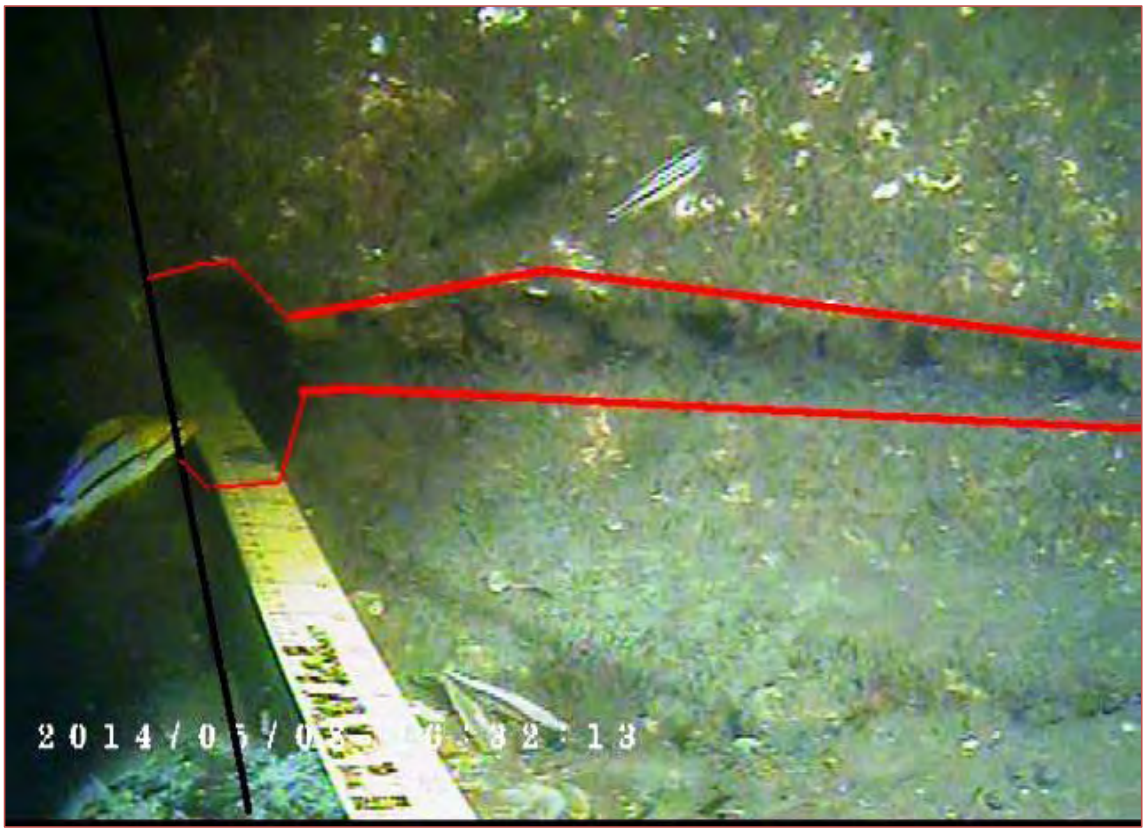
Description: Top: Bent caps have several intermittent cracks with corrosion bleed-out. **UW Photo 03.**
Bottom: PJ 3-4, South face, (1) vertical crack, with corrosion bleed-out. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: PJ 4-2, SW and NE corners, (5) vertical cracks, with CBO. **UW Photo 05.**
Bottom: PJ 8-1, West face, (1) vertical crack, with corrosion bleed-out. **UW Photo 06.**

F: PHOTO SECTION



Description: Top: SW wingwall has several horizontal and diagonal cracks up to 1" W. **UW Photo 07.**
Bottom: Abutment 9 backwall between Piles 9-1 and 9-3, joint separation. **UW Photo 08.**

H: RECOMMENDED REPAIRS

215 R/Concrete Abutment

_Seal the cracks as needed at abutment 1 backwall.

234 R/Concrete Cap

_Remove all unsound concrete and patch and seal the cracks as needed.

298 Pile Jacket Bare

_Remove all unsound concrete and patch and seal the cracks as needed.

475 R/Concrete Walls

_Seal the joint separation at abutment 9 as needed.
_Seal the horizontal and diagonal cracks on the SW and NW wingwalls.

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865773** Date: **08-May-14**

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.0	9.6
2	18.4	20.5
3	22.3	23.2
4	22.4	22.6
5	21.6	22.0
5.5	21.4	21.9
6	23.0	21.5
7	20.5	19.4
8	18.7	16.0
9	8.3	10.0

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.2 ft. and right: 8.3 ft. at mid-channel.
Maximum Channel depth: 13.6 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865774 **Bridge Name:** West Lake Drive over Mercedes River

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/08/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No. 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 120 ft. long, six span, reinforced concrete double T-beam bridge constructed in 1956. The bridge has a roadway width of 25 ft. and carries two lanes of traffic in a residential neighborhood. There is a 2.4 ft. sidewalk on the west side. The bridge provides access to residences along W. Lake Drive from SR A1A. The bridge is not classified as either Functionally Obsolete, or Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an August 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU, C, and ST vehicles at 22, 27 and 36 tons, respectively. The interior legs of the double T-beams are the controlling members in moment.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to

easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced in the below text, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by a layer of asphalt. Repairs were made to the asphalt to address the cracks and depressions in the asphalt.

Railings/Barriers

- No guardrail system or object markers have been provided for the structure.

Expansion Joints

- The left sidewalk over Abutments 1 and 7 and the right curb over Abutment 7 have deteriorated joint sealant. See Condition Photo 1.
- The asphalt overlay has intermittent transverse cracks up to 1/16 in. over the joint.

Utilities

- There is one 5 in. PVC conduit is attached to the outside fascia of Beam 1 in all spans.
- There is one 10 in. steel utility is suspended from the west overhang between bents but also bears on top of the caps.
- There is one 4 in. PVC conduit and one 4 in. steel conduit bear on top of the caps under Beam 1 in all spans.
- There is one 10 in. steel utility is attached to the underside of Beam 4 in all spans and also bears on tops of the caps.
- There is one 5 in. steel utility is attached to the outside fascia of Beam 4 in all spans.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete T-Beams

- The double T-beams have spalls and/or delaminations some with exposed rebar in the legs, flanges and keyway. The deficiencies listed in the table have either remained the same or increased in size, and some new delaminations, spalls, and/or cracks have been noted. See Table Below:
- Most of the beams have up to 1/32 in. wide vertical cracks in both sides of the legs that extend up into the flanges.
- The beams typically have widespread patching from numerous repairs.

- There is a 4 ft. x 4 ft. concrete repair in the right side of Span 6 at Abutment 7 which also replaces part of the top flange on Beam 6-4 at Abutment 7 cap.
- A utility line in Span 2 is sagging up to 1ft. adjacent to Beam 2-1. See Condition Photo 2.
- The north weight limit sign is blocked by vegetation and a column. Refer to the north weight limit sign photo.

BEAM	LOCATION	DEFICIENCY
1-1	West face midspan	Crack and delamination 10 ft. x 1/16 in. wide
1-2	Left leg, west face near Abutment 1	Crack 4 ft. long x 1/16 in. wide
2-1	Bottom east face of Left leg	Crack and delamination 6 ft. x 1/16 in.
2-3	Right leg at Bent 3	1 ft. x 1 ft. delamination
2-4	Left leg at midspan	Crack and delamination 10 ft. long x 1/16 in. wide
2-4	Left leg 6ft. south of Bent 3	1 ft. 6 in. x 7in. delamination.
3-1	Left leg at mid-span	2 ft. x 3 in. delamination with corrosion stains
3-1	Center flange at mid-span	2 ft. x 1 ft. x 2 in. with exposed steel
3-3	Center flange at mid-span	1 ft. 6 in. x 1 ft. delamination
4-2	Right keyway at Bent 5	1 ft. x 5 in. x 3 in. spall with exposed rebar
5-3	Left leg, west face, mid span	Crack 4 ft. long x 1/16 in. wide
5-4	Right flange at Bent 6	Three 3 in. x 3 in. x 1 in. spalls with exposed rebar
6-1	Left flange at Abutment 7	3 in. x 3 in. x 1 in. spall with exposed rebar
6-1	Center flange at Abutment 7	3 ft. x 1 ft. delaminated patch
6-1	Right flange 5ft. from Abutment 7	2 ft. x 5 in. delamination
6-4	Left leg at Abutment 7	1 ft. 6 in. x 6 in. delamination
6-4	Right flange at and near Abutment 7	4 spalls up to 4 in. x 4 in. x 1 ½ in. with exposed rebar
6-4	Right leg at Abutment 7	3 ft. x 8 in. delaminated patch. See Condition Photo 3.

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- The bottom face of both abutment caps has full cap length x 1/32 in. wide horizontal cracks with corrosion stains.

Intermediate Bents

- The intermediate bent caps have several horizontal cracks up to 1/32 in. wide with corrosion stains throughout. See Condition Photo 4 and Underwater Inspection Report Photo 1.
- The caps have a gunite coating with vertical and horizontal cracks up to 1/32 in. wide with corrosion bleedout. This deficiency was not previously noted.
- The bottom face of the Bent 4 cap adjacent to Pile 3 has a spall/delamination 1 ft. 8 in. x 4 in. x 2 in., with associated cracks and corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.
- The west end of Bent 4 cap has a 1 ft. x 6 in. x 3 in. spall and delamination with exposed rebar. See Underwater Inspection Report Photo 3.
- The Bent 5 cap between Piles 5 and 6 has a 1 ft. 6 in. x 8 in. delamination with corrosion bleedout. This deficiency was not previously noted.
- The 4 in. diameter steel conduit bearing on top of the caps under Beam 1 in all spans has heavy corrosion with some areas of 100% section loss.
- All piles have been jacketed 16in. square from the cap down approximately 4 ft. 6 in.
- Several pile jackets have cracks with corrosion stains, spalls, delaminations and areas of exposed rebar.
- The pile jackets have vertical cracks up to 1/32 in. wide that extend a maximum of 1 ft. 8 in. into the marine growth.
- The bottom 8 in. of the jackets are irregular and some areas are missing the grout coating.
- The southeast corner of Pile 2-4 has a 2 ft. 3 in. x 1 ft. 5 in. delamination with associated cracks up to 1/16 in. wide and corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 4.
- The southwest corner of Pile 4-4 has a 1 ft. 8 in. x 4 in. x 1 in. spall starting at the cap. This deficiency was not previously noted.
- Pile 4-6 has washout areas up to 1 ft. x 1 ft. x 2 in. in the bottom edge of all four faces.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The south approach slab/roadway transition has a full width by 1/16 in. wide transverse crack.

Wingwalls

- The southeast wingwall has a 3 ft. 4 in. x 4 in. x 1 ft. 4 in. area of undermining with minor backfill leakage between the 2nd and 3rd concrete H-piles from the transition joint.
- The northeast wingwall at the top of the marine growth has a horizontal crack with corrosion staining, 3 ft. 6 in. x 1/32 in. wide. See Underwater Inspection Report Photo 5.
- At the outboard of the original southwest and southeast wingwalls, there is a corrugated plastic panel with a concrete cap that has a minimum height of 5 ft. 3 in. above the groundline. This appears to be a repair to arrest backfill leakage.
- The area around the utilities at the northwest wingwall is beginning to wash out. This deficiency was previously repaired. See Condition Photo 5.
- There is a void behind the northwest wingwall in the shrubs. This deficiency was not previously noted.
- The southeast wingwall adjacent to Pile 2 has a 2 ft. x 1 ft. 3 in. delamination with associated cracks up to 1/16 in. and corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 6.
- The southwest wingwall adjacent to Pile 3 has multiple cracks with corrosion bleedout and that extend 8 in. into the marine growth. This deficiency was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

This bridge is one of five in this neighborhood that are of the same type – the bridges are sequentially numbered 865770 through 865774. All of the bridges were constructed between 1956 and 1958 and are of the same type and configuration with similar conditions present, so conditions found at all of the bridges have been taken into consideration when determining likely future deterioration and anticipating future work.

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to satisfactory condition based on National Bridge Inspection Standards and FDOT guidelines, with the reinforced concrete double T-beams in the worst condition. At all of the bridges in the neighborhood, the beams have cracks, spalls and delaminations. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the

waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of deterioration found. Concrete repairs to elements in close proximity to the water are likely to last only 5-8 years, but not stop the deterioration from occurring at adjacent locations. It is particularly difficult to strengthen double-T beams cost effectively, because it is difficult to splice in additional reinforcing steel on the thin double webs that are common to the type. Additionally, isolated bent caps have cracks, delaminations and spalls.

The latest available load ratings for all five bridges indicate that all of them require posting, and posting signs are present at the bridges.

GEOMETRIC DEFICIENCIES

The sidewalk on the bridge is 2.5 ft. wide, less than the current 5 ft. width needed to meet ADA requirements.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally from the east side at the north approach, to the west side at the south approach. Any work to the bridge will require careful consideration of those lines by the individuals doing the work. Relocation of the lines to one side of the bridge prior to construction should be considered.

Maintenance of Traffic: The bridge average daily traffic is about 600 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 25 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. However, it may be difficult to maintain a dedicated space for pedestrians to cross the bridge since the work must be phased to maintain traffic, with only a single lane available for two way traffic. The lane width is likely to be less than 10 feet.

RECOMMENDATIONS AND PROBABLE COSTS

It is recommended that work for this bridge be contracted with that of the other bridges in the community as much as possible, because the bridges are almost identical in design, much of the work required is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement 16-20 years from now.

LONG TERM

All of the bridges in this neighborhood have roughly the same level of deterioration to the double-T beams and abutments/intermediate bents. They are all at least 56 years old and have exceeded the expected 50 year design life associated with design codes from the 1950s. Because it is not cost effective to strengthen the beams, it is recommended that the bridges be allowed to deteriorate and then replaced. It is expected that the conditions of the superstructure and substructure will degrade over time, but that no significant maintenance will be required prior to replacement. The inspection reports provided by FDOT annually should be reviewed and any significant spalls on the beams addressed; however, it is not anticipated that this effort will amount to a large drain on city resources. Four of the bridges are recommended to be replaced in 16-20 years, but bridge 865771 should be replaced in 11-15 years because the deterioration at that location is more advanced than the others. Waiting at least 11 years to replace any of the bridges is justifiable when considering that the bridges, although posted for loads, are still in fair to satisfactory condition. The substructure units have some deterioration, but the deterioration is not widespread on all of the intermediate bents and abutments.

Long Term Recommendation(s): **Replace bridge.**			Cost
Design [1]			$ 195,187.50
Construction			$ 1,301,250.00
Bridge Construction [2]	$	1,170,000.00	
Maintenance of Traffic [3]	$	43,750.00	
Utilities [4]	$	87,500.00	
Construction Inspection and Administration [5]			$ 260,250.00
Contingency [6]			$ 260,250.00
		TOTAL COST	$ 2,016,937.50

[1] Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, coordination with SHPO regarding historic features, and new structure design.

[2] $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

[3] $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[4] $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

[5] Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

[6] Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign at North Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at South Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

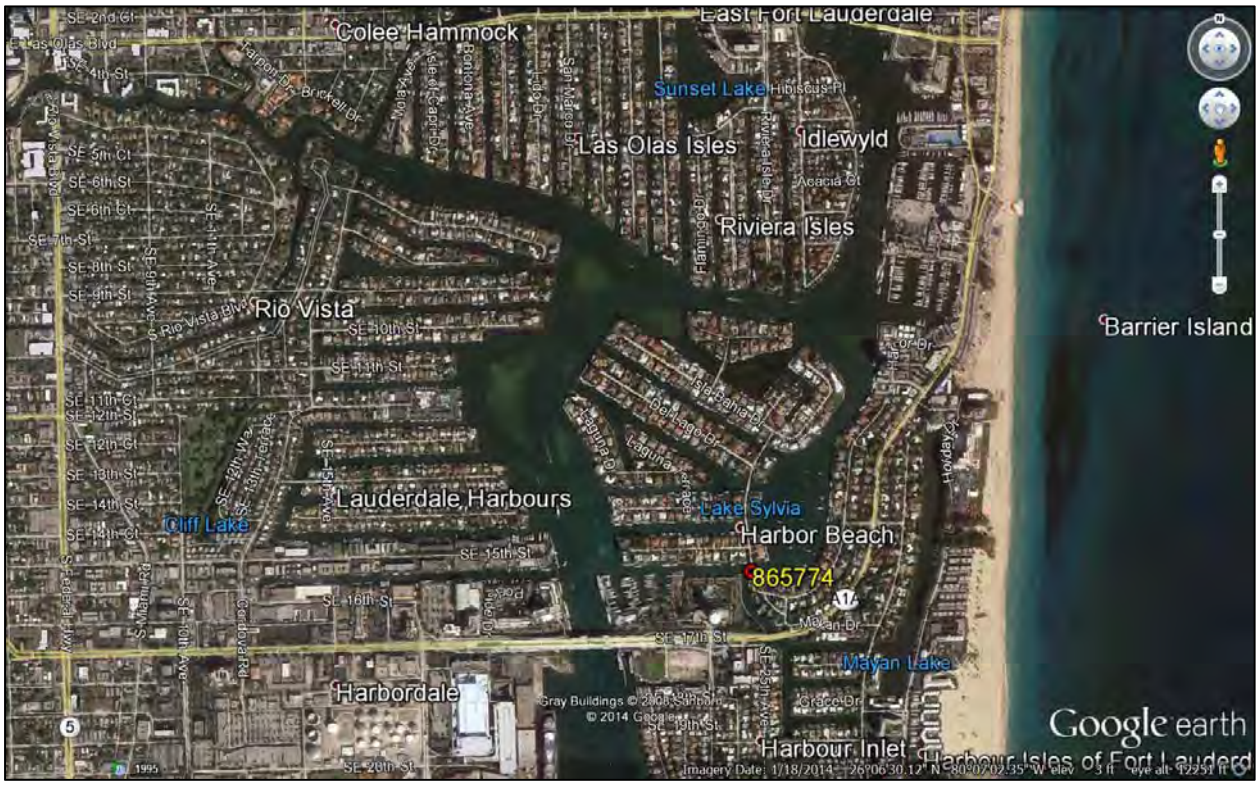
Typical Double T-Beam. Note Utility Pipe in the Bay.

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Deteriorated joint sealant in the left sidewalk over Abutment 1.

Photo 2 – Sagging utility line in Span 2.

CONDITION PHOTOS

Photo 3 – Delaminated patch on Beam 6-4, right leg at Abutment 7.

Photo 4 – Cracks and corrosion staining on the intermediate Bent caps.

CONDITION PHOTOS

Photo 5 – Area of washout around the utilities at the northwest wingwall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865774** Date: **08-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865774 UW Inspection Date: 5/8/2014

Bridge Name: N/A

Road Name/Number: WEST LAKE DRIVE.

Feature Intersected: MERCEDES RIVER

Location: 150 ft South of Mercedes Dr.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	8.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	205 R/Con Column, 215 R/Con Abutment
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	81°		234 R/Concrete Cap, 290 Channel
Weather:	84° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

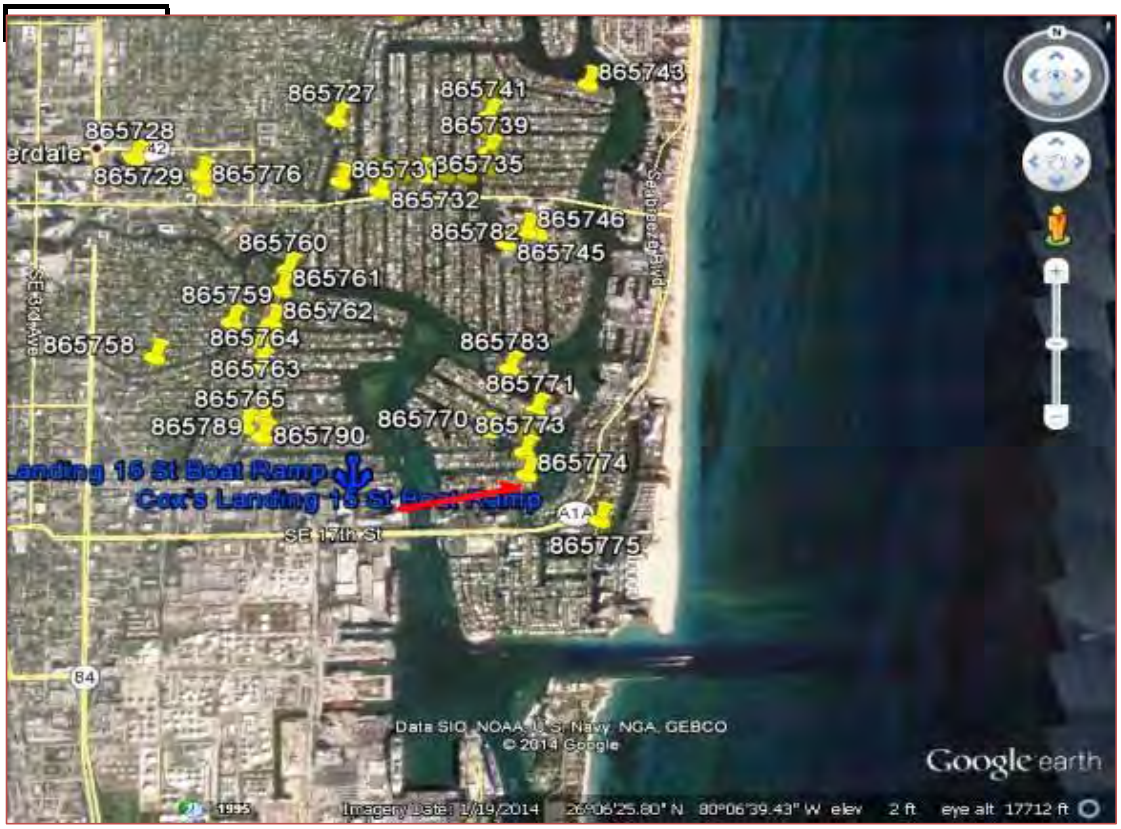
Soria, Miguel, Professional Engineer (P.E. # 49359)

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865774** Date: **08-May-14**

A: LOCATION MAP



Description: 150 ft South of Mercedes Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
205 R/Concrete Column	**56 ea.**
CS-3:	**56**

_All the piles are jacked from the cap down up to 55". The piles have been placed in condition State 3 due to unknown conditions prior to being jacked.

215 R/Concrete Abutment	**60 lf.**

Note:
_Abutment caps were inspected by the Underwater inspectors during this inspection cycle.

CS-3:	**60**

_The bottom face of both abutment caps has a full length x 1/32" wide horizontal cracks with corrosion bleed-out. **NO CHANGE.**

234 R/Concrete Cap	**149 lf.**

Note:
_Bent caps were inspected by underwater inspectors during this inspection cycle.

CS-3:	**149**

_The Bent caps have several intermittent cracks with corrosion bleed-out and spall/delaminations. **UW Photos 01. INCREASE.** Also the cap have area of gunite coating with vertical and horizontal cracks up to 1/32" wide with corrosion bleed-out. **NEW**

_Bent 3 cap bottom face adjacent to Pile 3, has a spall/delamination 20" x 4" x 2", with associated cracks and corrosion bleed-out. **UW Photos 02. NEW.**

_Bent 4 cap West end, has a spall/delamination 12" x 6" x 3", with exposed rebar and associated cracks. **UW Photos 03. NO CHANGE.**

_Bent 5 cap between piles 5 and 6, delamination 18" x 8", with corrosion bleed-out. **NEW.**

E: ELEMENT NOTES

Element **Quantity**

298 Pile Jacket Bare **56 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 18in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-3: **1**
_PJ 2-4, SE corner, has a delamination 27" x 17", with associated cracks up to 1/16" wide, and corrosion bleed-out, extending 7" into the marine growth. **UW Photos 04. NEW.**

CS-2: **2**
_PJ 4-4, SW corner spall 20" x 4" x 1", starting at the cap. **NEW.**
_PJ 4-6, has washout areas up to 12" x 12" x 2", along all four bottom edge face. **NO CHANGE.**

CS-1: **53**
_The bottom 8" of the jackets are irregular and some areas are missing the grout coating. **NO CHANGE**

290 Channel **1 ea.**

Note:
_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **91 lf.**

INCIDENTAL:
_SE wingwall has a 40" x 4" x 16", area of undermining between the 2nd and 3rd concrete H-piles from the transition joint. (previously under Element 290). **NO CHANGE.**
_At the outboard of the original SW and SE wingwalls, has a 63" H, corrugated plastic panel with concrete cap. This appears to be a repair to stop the backfill leakage. No backfill was observer during this inspection cycle.

CS-3: **7**
_NE wingwall at the top of the marine growth, horizontal cracks 42" x 1/32", with corrosion bleed-out **UW Photos 05. NO CHANGE.**
_SE wingwall, Pile 2, has a delamination 24" x 15", with associated cracks up to 1/16", and corrosion bleed-out. **UW Photos 06**. **NEW.**
_SW wingwall, Pile 3 has multiple horizontal cracks with corrosion bleed-out and that extend up to 8" into the marine growth. **NEW.**

F: PHOTO SECTION

Description: Top: Bent caps have several intermittent cracks and spall/delaminations. **UW Photo 01.**
Bottom: Bent 3, bottom face adjacent to Pile 3, spall/delamination. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: Bent 4 West end, has a spall/delamination, with exposed rebar. **UW Photo 03.**
Bottom: PJ 2-4, SE corner has a delamination, with associated cracks. **UW Photo 04.**

F: PHOTO SECTION

Description: Top: NE wingwall, top of the marine growth, horizontal cracks with CBO. **UW Photo 05.**
Bottom: PJ 2, NE corner delamination with associated cracks. **UW Photo 06.**

H: RECOMMENDED REPAIRS

215 R/Concrete Abutment

_Seal the cracks as needed at both abutment caps.

234 R/Concrete Cap

_Remove all unsound concrete and patch and seal the cracks as needed.

298 Pile Jacket Bare

_Remove all unsound concrete and patch and seal the cracks on Pile Jacket 2-4.

475 R/Concrete Walls

_Seal the horizontal and cracks on the Northwest wingwall.
_Remove all unsound concrete and patch and seal the cracks at SE wingwall Piles 2.
_Seal the horizontal and cracks at the Southwest wingwall Piles 3.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.5	11.3
2	14.7	14.4
3	14.9	15.0
4	15.2	17.2
4.5	15.5	16.9
5	14.5	15.3
6	13.7	13.9
7	10.3	9.6

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 8.4ft. and right: 8ft. at mid-channel.
Maximum Channel depth: 8.9 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865775 **Bridge Name:** South Ocean Drive over Marion River

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/08/2014

Report Date: 6/17/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER 6/17/14

Prepared for:	Prepared by:
City of Fort Lauderdale	TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 80 ft. long, four span, reinforced concrete double T-beam bridge constructed in 1952 and rehabilitated in 1968. The bridge has a roadway width of 36 ft. and carries two lanes of traffic in a residential neighborhood. The bridge provides direct access from SR A1A to the neighborhoods on Marion Drive and Grace Drive. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an August 2010 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge is currently posted for SU and C vehicles at 29 and 34 tons, respectively. The interior double Tee-beams control the rating.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced in the below text, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida

Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top is covered by a layer of asphalt. Repairs were made to the asphalt to address the cracks and depressions in the asphalt. See Condition Photo 1.

Railings/Barriers

- Post 1-1 has a 2 ft. 5 in. x 1 ft. 1 in. x 6 in. spall/fracture with exposed rebar at the curb.
- The lower portions of the right and left rails between posts 1-1 and 1-2 exhibits a spall/delamination with exposed rebar 6 in. x 10 in. x 3 in. See Condition Photo 2.
- The rail sections have up to 1/32 in. wide longitudinal cracks throughout, some with efflorescence.

Expansion Joints

- The left curb and right sidewalk joints over the intermediate bents are deteriorated. See Condition Photo 3.

Utilities

- There are three 4½ in. fiberglass conduits and one 4½ in. steel conduit attached to the deck underside (outside face of Beam 1-1) at the west side of the structure.
- There is one 3½ in. steel conduit that bears on top of the west end of the caps.
- There is one 7 in. utility attached to the underside of Beam 5.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE SUPERSTRUCTURE	
CODE	**DESCRIPTION**
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the superstructure.
8	VERY GOOD - Minor cracking and no spalling, delamination or water saturation.
7	GOOD - Hairline cracks with shallow and light spalling or less than 10 percent of the superstructure is water saturated.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence is present. Minor water saturation of slab ends, girder ends, precast items, etc., is present.
5	FAIR - Substantial water saturation and/or deterioration of slab ends, girder ends, precast girder ends or a substantial portion of the top of deck girder. No shear cracks are present and flexural bending cracks are minor in nature.
4	POOR - Extensive deterioration and spalling of girders, slabs, precast units, etc. Shear cracks are not present; however, flexural bending cracks may be present. Corroded reinforcing steel evident with measurable section loss. Load carrying capacity of some structural members may be diminished.
3	SERIOUS - Extensive spalling or deterioration of concrete is present. Large flexural bending cracks or diagonal shear cracks may be present.
2	CRITICAL - Close monitoring or bridge closure is required. Shear cracks or fractured or unbonded reinforcing steel is present.
1	"IMMINENT" FAILURE - The bridge is closed to vehicular traffic. Corrective action may put back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the superstructure is required.

The superstructure is in overall poor condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Reinforced Concrete Tee Beams

- There are several spalls with exposed rebar and delaminations throughout the beams. See table below. See Condition Photo 4.

Beam	Location	Deficiency
1-1	Center flange at Abutment 1	7 in. x 6 in. x 1 in. spall with exposed rebar
1-1	Left leg at Abutment 1	2 ft. x 4 in. delaminated repair
1-1	Left leg at 1/3 point	5 ft. x 8 in. delamination along the bottom flange.
1-1	Left at Bent 2	2 ft. 6 in. x 6 in. delaminated patch.

1-2	Center flange near mid span	1 ft. x 1 ft. delamination
1-4	Along length left and right legs	Delaminated patches in up to 10 ft. x 10 in. areas
1-4	Left leg at Abutment 1	3 ft. x 10 in. x 1 in. delaminated and spalled patch with exposed rebar.
1-4	Right Leg Abutment 1	Delamination 4ft. x 6in.
1-5	Left Leg Abutment 1	Crack and delamination
1-5	Right leg	Delaminated patch with associated cracking along the entire length
2-1	Left leg Bent 2 to midspan	12 ft. x 10 in. x 2½ in. spall delamination with exposed rebar
2-1	Right leg	Intermittent beam length delamination
2-2	Left leg at Bent 2	1 ft. x 6 in. delaminated patch
2-2	Right leg near 1/3 point	1 ft. x 8 in. delamination
2-4	Right leg	Delamination and crack
2-4	Right leg	Spall at mid span
2-5	Left leg	Delamination and crack
2-5	Left leg	Delamination and crack
3-1	Left leg	Intermittent beam length delamination
3-1	Right leg at Bent 3	1 ft. x 8 in. delaminated patch
3-1	Center flange at mid-span	1 ft 4 in. x 1 ft 4 in. x 1½ in., two spalls with exposed rebar
3-2	Left leg at Bent 3	1 ft. x 6 in. delaminated patch
3-3	Left leg near Bent 3	4 ft. x 2 in. x 1 in. spall with exposed rebar
3-3	Right leg at Bent 3	2 ft. x 6 in. delaminated patch
3-4	Right leg at Bent 3	1 ft. x 8 in. delaminated patch
3-5	Left leg at Bent 3	8 ft. x 8 in. intermittent delaminated patch
3-5	Left leg at Bent 4	1 ft. x 6 in. delaminated patch
3-5	Right leg east face over Bent 4	5 in. diameter spall with exposed rebar
3-5	Right leg at Bent 4	3 ft. x 8 in. delaminated patch
4-1	Left leg at Bent 4	6 ft. x 1 ft. x 2 in. spall/delaminated patch with exposed rebar
4-1	Left flange at midspan	1 ft 6 in. x 8 in. x 1½ in. spall with exposed rebar
4-1	Center flange at ¼ point	8 in. x 4 in. x ¾ in. spall with exposed rebar
4-5	Right flange at ¼ point	Three spalls up to 1 ft. x 8 in. x ¾ in. with exposed rebar
4-5	Left leg at Abutment 5	1 ft 6 in. x 8 in. delamination/delaminated patch
4-5	Right leg at Abutment 5	1 ft. x 8 in. delaminated patch

- The majority of previous repairs on beams have 1/64 in. to 1/32 in. cracking randomly throughout and sound hollow when hit with a hammer. See Condition Photo 5.

Bearings

- The T-beams rest directly on the concrete caps. No bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutment 1 cap between Piles 1-8 and 1-9 has a 1 ft. x 1/64 in. horizontal crack with corrosion staining.
- The backwall at Abutment 1 exhibits spalls with exposed reinforcing steel. See Condition Photo 6.
- The cap at the west end of Abutment 1 exhibits a spall 1 ft. x 8 in. x 2 in. with exposed reinforcing steel. See Condition Photo 7.

Reinforced Concrete Caps

- The upper north edge of Bent 3 cap has an 1 ft. 6 in. x 8 in. delamination under the keyway between Beams 3-3 and 3-4.
- The Bent 4 cap has a 2 ft. x 4 in. delamination in the bottom south face between Piles 4-1 and 4-2 and another in the top south face between Piles 4-2 and 4-3.
- Bent 4 cap also has a 2 ft. x 4 in. delamination with corrosion staining in the bottom north face between Piles 4-9 and 4-10.

Reinforced Concrete Piles

The piles have been jacketed with 16 in. square jackets and extend approximately 5 ft.-3 in. below the caps. Gunite repairs extend approximately 2 ft. below the top of the marine growth.

- There are several spalls with exposed steel and delaminations, ranging in length from 1 ft. to 5 ft. with corrosion bleed out at the jackets on the following piles:
    - Abutment 1: 1-2, 1-3, 1-4, 1-5, 1-7, 1-8, 1-9, 1-10
    - Intermediate Bents: 2-1, 3-2, 4-1, 4-2, 4-3, 4-5, 4-7, 4-10 (See Underwater Condition Photo 1)
    - Abutment 5: 5-1,5-2, 5-3, 5-4, 5-7, 5-8, 5-9, 5-10
- There are vertical cracks up to 5 ft. x 1/16 in. in the jackets and gunite repairs at/or above the marine growth.
- The bottom 4 in. of the jackets are irregular.

Wingwalls

- There are voids behind the southwest retaining wall up to 4 ft. x 2 ft. x 1 ft. 6 in. and a 3 ft. x 2 ft. x 2 ft. void behind railing post 1-1. See Condition Photo 10.
- The retaining walls have several cracks, spalls and delaminations throughout.
- The southwest wingwall at the junction to private sector exhibits a spall 3 ft. x 6 in. x 3 in. extending 6 in. below the high water mark. See Underwater Condition Photo 2.
- The southeast retaining wall behind Pile 1 has a gap 1 ft. long. No backfill was observed. See Underwater Condition Photo 3.
- All the piles exhibit spall/delaminations with associated cracks up to 1/16 in., with corrosion bleed out and some with exposed rebar.
- The southeast retaining wall Pile 5 exhibits a spall/delamination full height x 1 ft. 4 in. wide with associated cracks up to 1/16 in. wide with exposed rebar. See Underwater Condition Photo 4.

- The northwest retaining wall Pile 1, exhibits a spall/delamination 3 ft. x 1 ft. 4 in. x 2 in. with associated cracks up to 1/16 in. wide with exposed rebar. See Underwater Condition Photo 5.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The channel bulkhead caps at the southwest and southeast corners of the bridge have 1/8 in. wide cracking with heavy corrosion staining.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in poor to fair condition based on National Bridge Inspection Standards and FDOT guidelines. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements are very likely to have chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the piles and beams. The double T-beams are particularly susceptible to this contamination, as the internal reinforcing steel has little concrete cover to protect it from the chlorides. The act of making repairs helps to extend the bridge's lifespan by limiting the deterioration of the reinforcing steel, but it does not address the root condition that is causing the deterioration. Concrete repairs to bridges like this one are likely to last only 5 years.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unlikely that the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

The bridge is posted for two of the three Florida legal load types. The load rating details were not available for review, but the latest rating was done in 2010 and likely represents the bridge as it appears in 2014.

GEOMETRIC DEFICIENCIES

The bridge is not classified as functionally obsolete and it appears that the roadway width is adequate. The bridge is striped such that there is a large west shoulder that serves as a sidewalk. There is no provision for a sidewalk at the east side; however, the approaches also do not have a sidewalk on that side.

The existing bridge railings are substandard when compared to current criteria, including railing height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

Detour routes are available to properties at both ends of the bridge, from Mayan Drive at the north side and SE 23rd Avenue/Barbara Drive at the south side. Closing the bridge to perform work is a viable option.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs, estimated to be required every 5 years. The minimal concrete cover over the reinforcing steel at the double T-beams makes repairs less effective and more likely to result in quicker deterioration of repaired areas.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck, particularly at the west side. Any rehabilitation or new construction activities will need to address temporary support or relocation of the utilities. Bridge construction could be done to the eastern portion first, so that the existing bridge would provide support for the existing utility lines while new lines were constructed on the east side, with the west portion of the bridge constructed after utility service is cut over to those new lines.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 10,000 vehicles per day, and the road is posted for 25 mph. The bridge has a roadway width of 36 ft., so bridge work can be performed on half the bridge at a time in order to maintain traffic. Maintaining a space for pedestrians to cross will make it likely that only a single lane would be available for two way traffic. However, detour routes exist for residents at each end of the bridge, so it is recommended that the road be closed at each approach to the bridge ad all work done during a bridge closure.

RECOMMENDATIONS AND PROBABLE COSTS

There are no feasible and prudent ways to strengthen reinforced double T-beam bridges to improve load carrying capacity. It is recommended that the bridge be replaced in the next five years. No repairs are recommended for the years prior to the bridge being replaced.

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

No short term recommendations have been made, since the bridge is recommended for replacement in the next 0-5 years.

LONG TERM

Replacement of the bridge is recommended in the next five years because of the extent of existing deterioration present on the piles, which have previously been jacketed but exhibit deterioration throughout, and the extent of deterioration present on the double T-beams, which have repaired areas, delaminations, cracks and spalls throughout. The concrete is likely saturated with concrete chlorides, providing little to no protection over the reinforcing steel from conditions that promote corrosion of the steel. The bridge is posted for load.

There are adequate detour routes available to perform the work with the bridge closed to vehicle traffic. Utility service can be maintained throughout construction by constructing the portion of the bridge where the utilities are not present, then cutting service to new utility lines mounted on that new portion prior to demolishing and reconstructing the rest of the bridge.

The new bridge is anticipated to be the same size as the existing bridge and should include railings that meet current design standards.

The cost to replace the bridge has been estimated based on FDOT bridge type unit costs, and is based on 2014 dollars. The costs for construction, design, construction inspection, with a factored contingency, have been broken out below for budgeting purposes.

Long Term Recommendation(s): **Replace bridge.**		Cost
Design [1]		$ 201,600.00
Construction		$ 1,344,000.00
Bridge Construction [2]	$ 1,092,000.00	
Maintenance of Traffic [3]	$ 84,000.00	
Utilities [4]	$ 168,000.00	
Construction Inspection and Administration [5]		$ 268,800.00
Contingency [6]		$ 268,800.00
	TOTAL COST	$ 2,083,200.00

(1) Design costs estimated 15% of cost for new construction, maintenance of traffic and utilities. Includes cost for project development and environment efforts, public involvement support to City, and new structure design.

(2) $325 per square foot base don square foot bridge deck area costs from City past project construction bid tabulations.

(3) $25 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(4) $50 per square foot based on bridge deck area costs from City past project construction bid tabulations.

(5) Construction inspection and administration costs estimated 20% of cost for new construction, maintenance of traffic and utilities.

(6) Estimated at 20% of cost for new construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Bridge Posting Sign at North Approach

GENERAL PHOTOS OF BRIDGE

Bridge Posting Sign at South Approach and Typical Monument at Bridge Approach

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

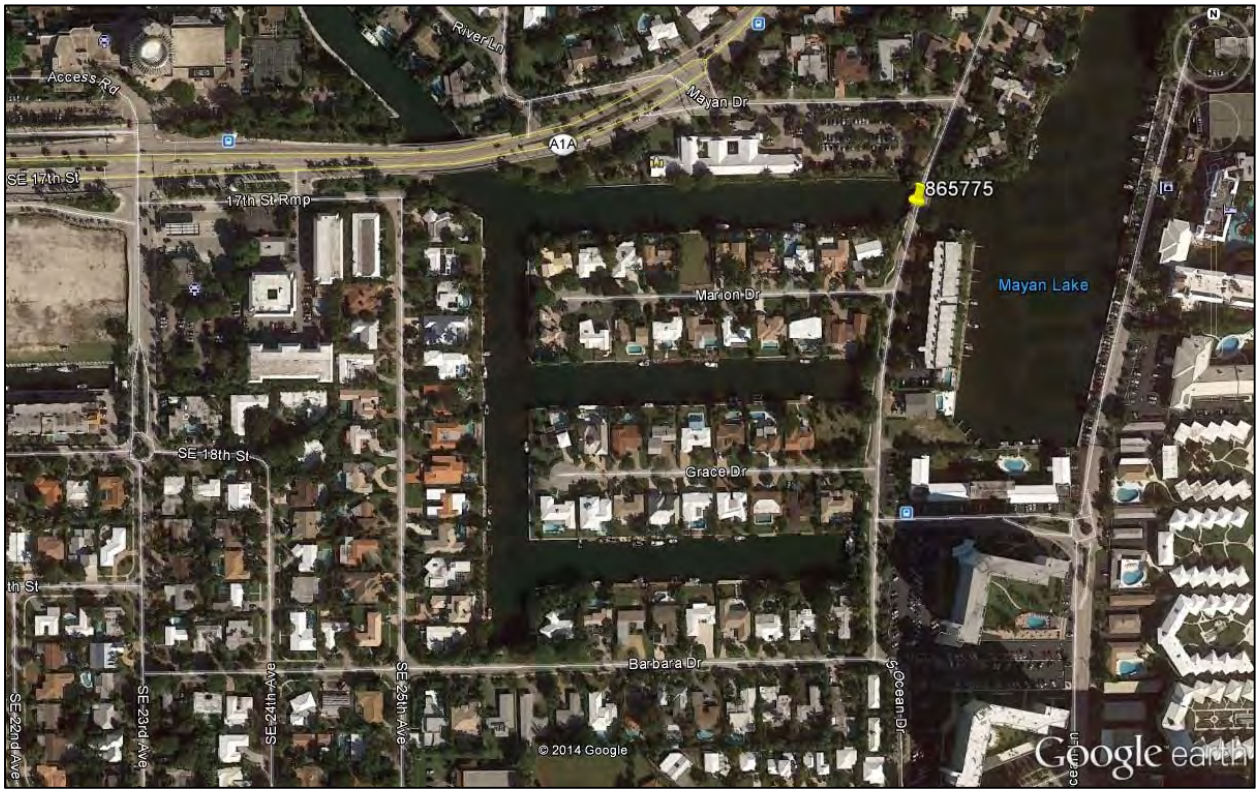
Typical Double T-Beam. Note Utilities Mounted at West Fascia

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Repaired asphalt over expansion joint.

Photo 2 – Spalled concrete railing with exposed reinforcing steel.

CONDITION PHOTOS

Photo 3 – Deteriorated joint over the right sidewalk.

Photo 4 – Typical spall with exposed rebar and delamination in the double T-beams.

CONDITION PHOTOS

Photo 5 – Typical cracks in previously repaired areas on the double T-Beams

Photo 6 – Spall with exposed reinforcing steel in the backwall at Abutment 1.

CONDITION PHOTOS

Photo 7 – Spall in the cap at Abutment 1 with exposed reinforcing steel.

Photo 8 – Spall with exposed reinforcing steel in Pile 1-2 at Abutment 1.

CONDITION PHOTOS

Photo 9 – Spall with exposed reinforcing steel and crack in Pile 1-5 at Abutment 1.

Photo 10 – Void behind the southwest retaining wall at railing post 1-1.

CONDITION PHOTOS

Photo 11 – Spalls in the piles at the northwest wingwall.

Photo 12 – Spalls in the piles at the northeast wingwall.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865775** Date: **08-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865775 UW Inspection Date: 5/8/2014

Bridge Name: N/A

Road Name/Number: South Ocean Drive

Feature Intersected: Marion River

Location: 200 ft South of Mayan Lake Drive

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.1 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		298 Pile Jacket Bare
Water Temp.:	82°		215 R/Concrete Abutment
Weather:	86° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

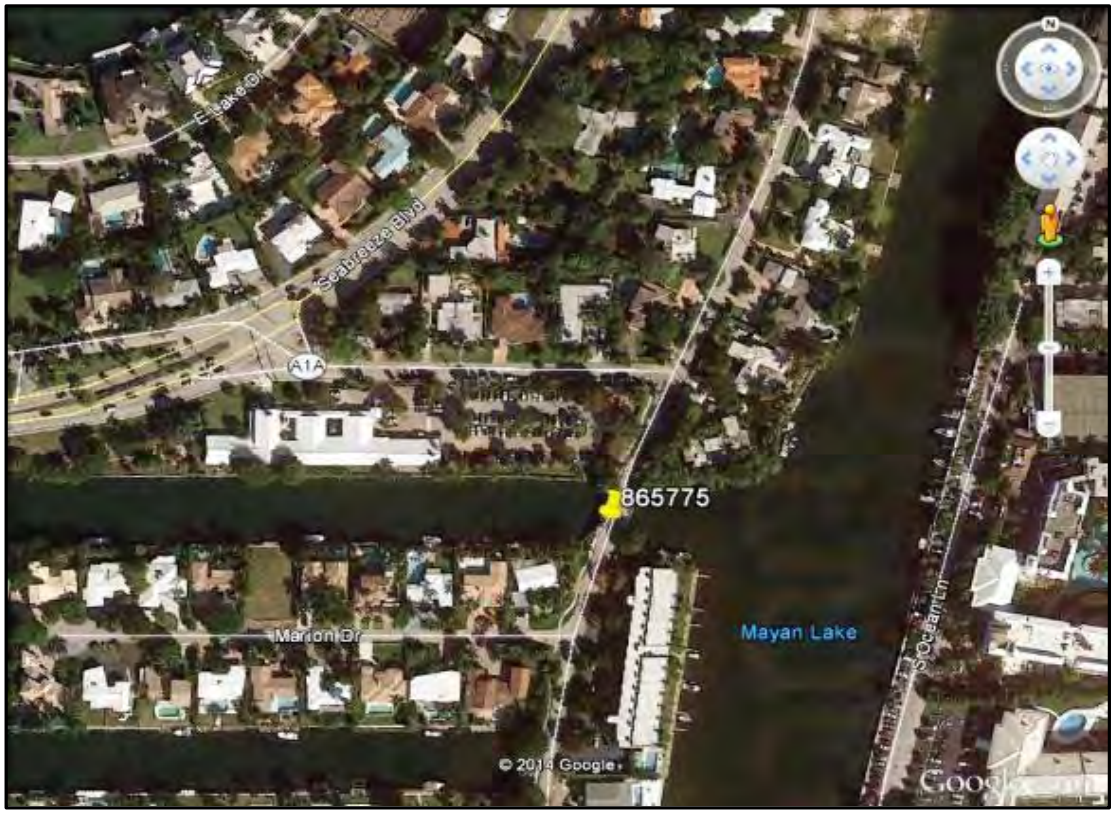
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 6/20/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865775** Date: **08-May-14**

A: LOCATION MAP



Description: South Ocean Drive, 200 ft South of Mayan Lake Drive

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **50 ea.**

Note:
_The piles have been jacketed and are placed in **CS-3** due to unknown deficiencies prior to being jacketed. Refer to Element 298 Pile Jacket Bare for related comments

298 Pile Jacket Bare **50 ea.**

Note:
_All jackets are up to 18" square and extend approximately 5'- 3" below the cap. Gunite repairs extend approximately 24" below the top of the marine growth.
_Several Pile Jackets were cleaned at random locations.

CS-3: **25**
_There are several spalls and delaminations with corrosion bleed-out throughout following Pile Jackets (PJ). **INCREASE**
PJ 1-2, 1-3, 1-4, 1-5, 1-7, 1-8, 1-9, 1-10.
PJ 2-1.
PJ 3-2.
PJ 4-1, 4-2, 4-3, 4-5, 4-7, 4-10. **UW Photo 01.** (Photo taken at PJ 4-1)
PJ 5-1, 5-2, 5-3, 5-4, 5-5, 5-7, 5-8, 5-9, 5-10.

CS-2: **25**
_The bottom 4" of the jackets are irregular. **NO CHANGE**

290 Channel **1 ea.**

INCIDENTAL: **1**
_The channel bulkhead cap at the SW and SE corners of the bridge have up to 1/8" wide cracking with heavy corrosion bleed-out. **NO CHANGE**

475 R/Concrete Walls **171 lf.**

CS-3: **171**
_The retaining walls have several spalls/delamination with associated cracks at random locations. **INCREASE**
_SW retaining wall at junction to private sector, spall 36" x 6" x 3", ext 6" BHWM, with (1) exposed rebar. **UW Photo 02. NEW**
_SE retaining wall behind Pile 1 has a gap 12" L. No backfill loss was observed during this inspection cycle. **UW Photo 03. NEW**

E: ELEMENT NOTES

Element **Quantity**

475 R/Concrete Walls (Continuation)

The following is considered incidental to this Element.

_There is 5 concrete piles at each retaining wall.

_All the piles exhibit spalls/delaminations with associated cracks up to 1/16", corrosion bleed-out and some with exposed rebar. **INCREASE**

_SE retaining wall Pile 5, spall/delamination full high x 16" wide with associated cracks up to 1/16", (1) exposed rebar**. UW Photo 04. INCREASE**

_NW retaining wall Pile 1, spall/delamination 36" x 16" x 2", with associated cracks up to 1/16", (1) exposed rebar. **UW Photo 05. INCREASE**

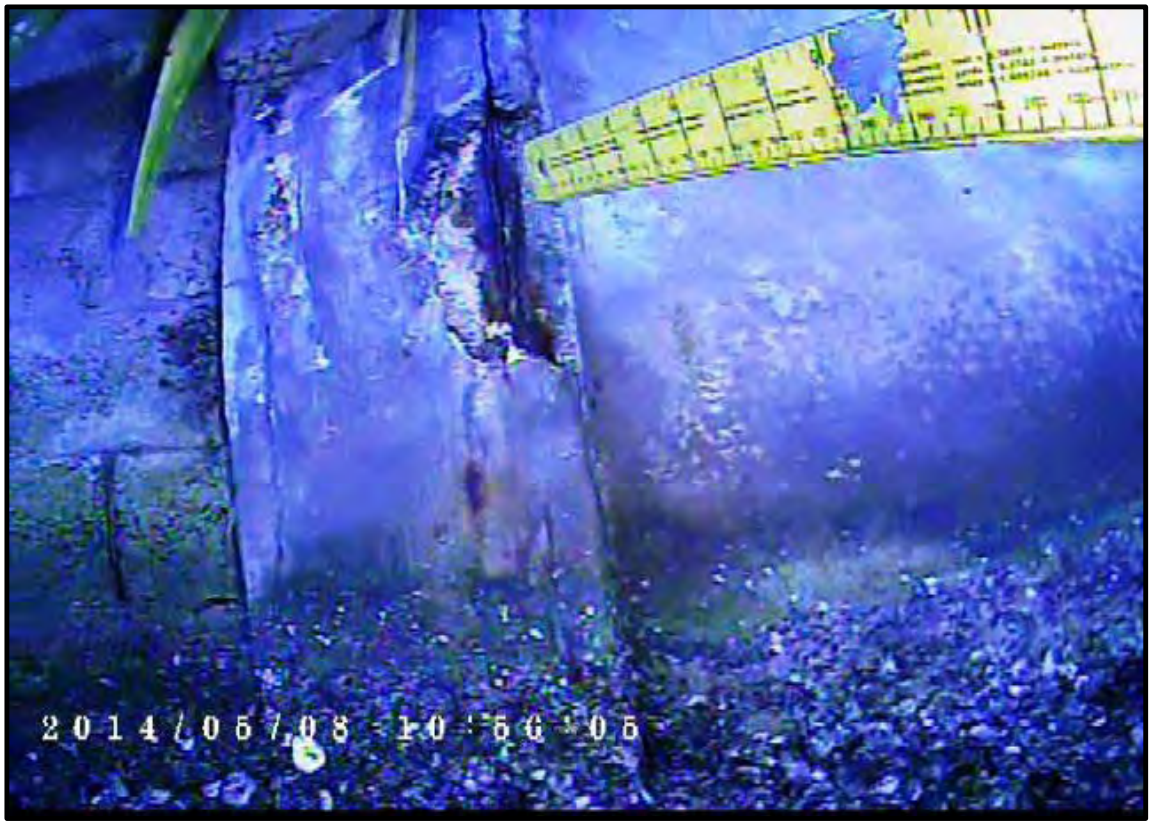
F: PHOTO SECTION

Description: Top: Pile Jackets typical spall/delaminations (Photo taken at Pile 4-1). **UW Photo 01.**
Bottom: SW retaining wall spall at junction to private sector. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: SE retaining wall behind Pile 1 has a gap, no back fill loss. **UW Photo 03.**
Bottom: SE retaining wall Pile 5, spall/delamination, with associated cracks. **UW Photo 04.**

F: PHOTO SECTION



Description: NW retaining wall Pile 1, spall/delamination, with associated cracks. **UW Photo 05**

H: RECOMMENDED REPAIRS

298 Pile Jacket Bare

_Repair all pile jackets with spalls and delaminations.

290 Channel

_Epoxy inject the cracks at both bulkhead caps.

475 R/Concrete Walls

_Remove all unsound concrete and patch and epoxy inject the cracks as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	13.1	12.0
2	15.5	15.4
2.5	16.7	17.2
3	16.4	17.6
4	15.1	15.6
5	12.6	12.8

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 12.3 ft. and right: 12.5 ft. at mid-channel.
Maximum Channel depth: 5.1 ft. (low tide).

BRIDGE INSPECTION REPORT

Bridge Number: 865776 **Bridge Name:** SE 2nd Court over Himmarshee Canal

Topside Inspection Complete: 5/20/2014
Underwater Inspection Complete: 5/27/2014

Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 55.1 ft. long, three-span, prestressed concrete slab bridge was constructed in 1975. The bridge has a roadway width of 24 ft. and carries two lanes of traffic on an urban local roadway in a residential neighborhood. There are 4.6 ft. wide sidewalks on each side. The bridge is neither Functionally Obsolete, nor Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a November 1985 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting, but is currently posted at 29 tons.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall very good condition, based on the condition of the prestressed slab units. The conditions are generally unchanged from the 2011 inspection report conducted as part of

the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has up to ¼ in. wide transverse cracks over the abutments and intermediate bents which are filled with dirt and debris. See Condition Photo 1.

Joint Seal

- The sidewalk joints are heavily deteriorated and filled with dirt and debris. See Condition Photo 2.

Railings/Barriers

- The concrete cap of both barrier walls has up to $^{1}/_{64}$ in. wide map cracking throughout.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- The left side of Span 3, mid span, 4 ft. from Bent 3 exhibits 2 spalls up to 1 ft. long x 4 ft. wide x 1 in. deep with exposed steel. This condition was not previously noted. See Condition Photo 3.

Bearings

- The neoprene bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps exhibit up to 2 ft. high x $^{1}/_{32}$ in. wide vertical cracks. This condition was not previously noted. See Condition Photo 4.

Intermediate Bents

- Piles 2-4, 2-7, 3-2 and 3-5 have pick-up points with shallow spalls with exposed steel and vertical cracks up to 3 ft. long x 1/16 in. wide. See Condition Photo 5 and Underwater Inspection Report Photos 1 and 2. This condition was not noted at Pile 2-4 and cracks were not noted at any of the piles previously.
- Bent 2 cap has a 1 ft. x 6 in. delamination in the haunch at the north end. See Condition Photo 6.
- Several piles have up to 2 ft. 2 in. long x $^{1}/_{16}$ in. wide vertical cracks that extend from the high-water line into the marine growth. See Condition Photo 7.
- The piles have construction-related edge scrapes.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- The southwest retaining wall is undermined the entire length x up to 3 in. x 8 in. back under. Previously noted as up to 8 in. x 1 ft. 6 in.
- The southeast masonry grout covered bulkhead has horizontal and vertical cracking up to ½ in. wide which extends 1 ft. 8 in. below the high waterline.
- The storm drain concrete apron at Abutment 4 is undermined up to 5 ft. along the north and west sides. See Underwater Inspection Report Photo 3.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Retaining Wall

- Both abutment backwalls have areas of corrosion bleedout up to 5 in. diameter.
- The south end of Abutment 4 sheet pile backwall has a 1 ft. 8 in. x 6 in. x ¾ in. spall/delamination with corrosion staining in the south side of Pile 4-10, 1 ft. 8 in. below the cap. See Condition Photo 8.
- Abutment 4 backwall at the northeast end has a 3 ft. x 3 ft. delamination with associated cracks up to 1/16 in. wide, at and below the high watermark. This condition was not previously noted. See Underwater Inspection Report Photo 4.
- The southeast end of the Abutment 4 backwall has a spall/delamination 2 ft. 4 in. x 7 in. x 1 ½ in. with associated cracks up 1/16 in. wide, and corrosion bleedout starting 2 ft. below the cap. This condition was not previously noted. See Underwater Inspection Report Photo 5.
- The northwest retaining wall has a 1 ft. 8 in. x 1 ft. 11 in. delamination with corrosion stains at the north side of Pile 1-1, 1 ft. 8 in. below the cap. This condition has increased in severity – the delamination was previously noted as 1 ft. 8 in. x 1 ft. 3 in. See Condition Photo 9.
- The northeast retaining wall has a 3 ft. x 3 ft. 3 in. delamination at the north side of Pile 4-1, 1 ft. 8 in. below the cap at the angle break.
- The sheet pile backwall on the north side of Pile 1-7 has a 3 ft. long x $^{1}/_{64}$ in. wide vertical crack, 1 ft. 3in. from the cap. See Condition Photo 10.
- Above water, a void is present at the top of the backwall behind Pile 1-7. Void dimensions are unknown, but it goes back a minimum of 4 ft. See Condition Photo 11.
- There is a disconnected PVC utility pipe that is not attached to the structure, at the southwest wingwall/End Bent 1 cap transition that is leaking water and has begun to deteriorate the southwest wingwall cap. See Condition Photo 12.
- The joints between the sheet piles are open up to 1 ½ in. wide and have isolated areas with minor edge spalls and up to $^{1}/_{16}$ in. wide cracking. No backfill leakage was evident.
- Behind Pile 1-7 at the southwest corner of the west retaining wall has a moderate amount of active backfill leakage but the joint is not visible. Previously noted as inactive backfill leakage. See Underwater Inspection Report Photo 6.
- The east retaining wall has a 1 ft. 2 in. x 1 ft. x 1 ft. in. spall 5 ft. below the cap at the joint between Piles 4-7 and 4-8, with active backfill leakage. Active backfill leakage was not previously noted. See Underwater Inspection Report Photo 7.

Approach Slab

- Across both approach slab/approach roadway transitions, there is a full roadway width x $^{1}/_{16}$ in. wide crack in the asphalt surface. See Condition Photo 1.
- The northwest approach sidewalk has up to 6 in. high x 4 ft. long undermining with up to 6 in. of penetration. See Condition Photo 13.

- There is an approximately 1 ft. drop-off to natural ground at the end of the northeast sidewalk. See Condition Photo 14.
- The southeast approach curb has a 1 ft. x 7 in. x 2 in. spall at the approach slab/approach roadway transition.
- The northwest approach sidewalk at the bridge transition exhibits an up to 1 ½ in. drop-off. This condition was not previously noted. See Condition Photo 15.

Guardrails

- There is no approach guardrail system provided for the structure. See general photos.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in good condition based on National Bridge Inspection Standards and FDOT guidelines, with the majority of deficiencies in the retaining wall structures at the abutments. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, particularly where water intrusion into waterline cracks and spalls with exposed steel exist. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently.

The prestressed concrete slab units, which are very difficult to protect or provide long lasting repairs on, are in very good condition and have no visible spalls or cracks. The latest available load rating analysis indicates that despite the bridge being load posted for 29 tons, posting is not required. Bridge beams are usually the only elements considered in load ratings, so it is likely that the analysis is still valid, even if it dates back to 1985. It is anticipated that the superstructure will remain in service, without weight restrictions, for the next 20 years.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unknown whether the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge railings are substandard when compared to current design criteria for height and crashworthiness.

ESSENTIALITY OF BRIDGE

A detour route is available for residents on either side of the bridge using Las Olas Boulevard, one block to the south.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally over the bridge at the south fascia, in close proximity to the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 1,400 vehicles per day, and the road is posted for 25 mph, so it is possible to perform repairs on the deck with simple flagging operations to close half of the bridge at a time. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The uneven northwest approach sidewalk panel should be repaired or replaced to eliminate tripping hazard. It is assumed that these actions can be completed by City forces, so no cost has been provided.

LONG TERM

The piles exhibit cracks that allow water to contact the internal reinforcing steel to foster corrosion. For budgeting purposes, it is anticipated that the piles will require jackets in the next 16-20 years.

The bulkheads adjacent to the bridge also show signs of deterioration and are likely to need major work within the next 20 years. For budgeting purposes, it is anticipated that this work would be done with the bridge work 16-20 years from now.

For all concrete work, surface preparation, to both the sound concrete left in place after loose material is removed and to the exposed reinforcing steel, are key to providing long lasting repairs.

Long Term Recommendation(s): **Install pile jackets.** **Make concrete repairs.**			Cost	
Design [1]			$	20,000.00
Construction			$	188,000.00
Bridge Construction [2]	$	178,000.00		
Maintenance of Traffic [3]	$	10,000.00		
Construction Inspection and Administration [4]			$	37,600.00
Contingency [5]			$	37,600.00
		TOTAL COST	$	283,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $4,000 per pile (32 piles total); Repairs to abutment backwalls: $25,000/abutment (2 total).

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

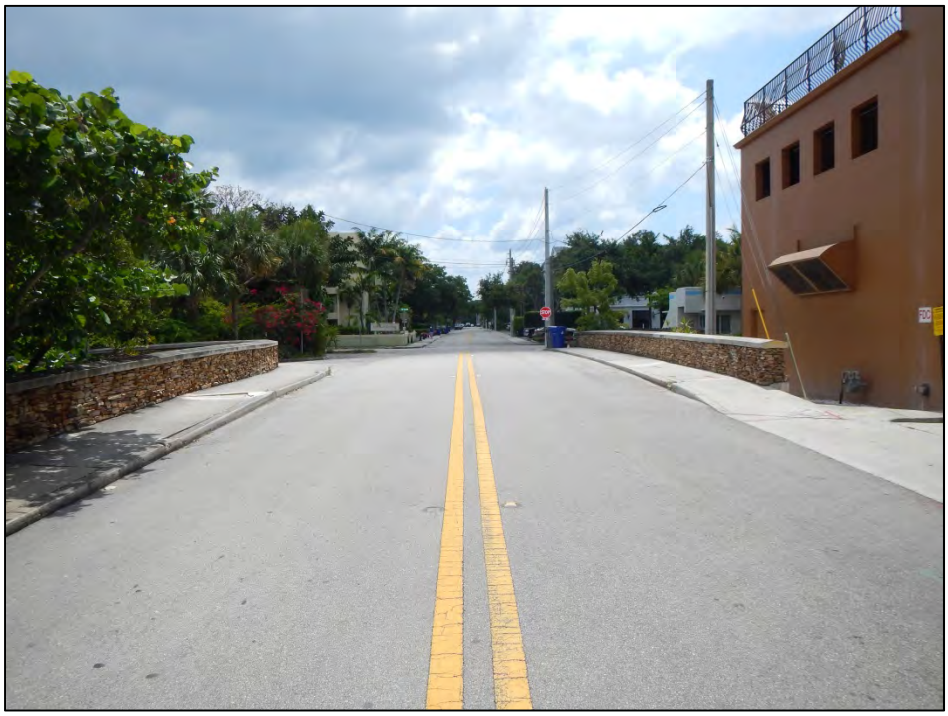
(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

South Elevation

East Approach Looking West

GENERAL PHOTOS OF BRIDGE



West Approach Looking East

West Bridge Posting Sign

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

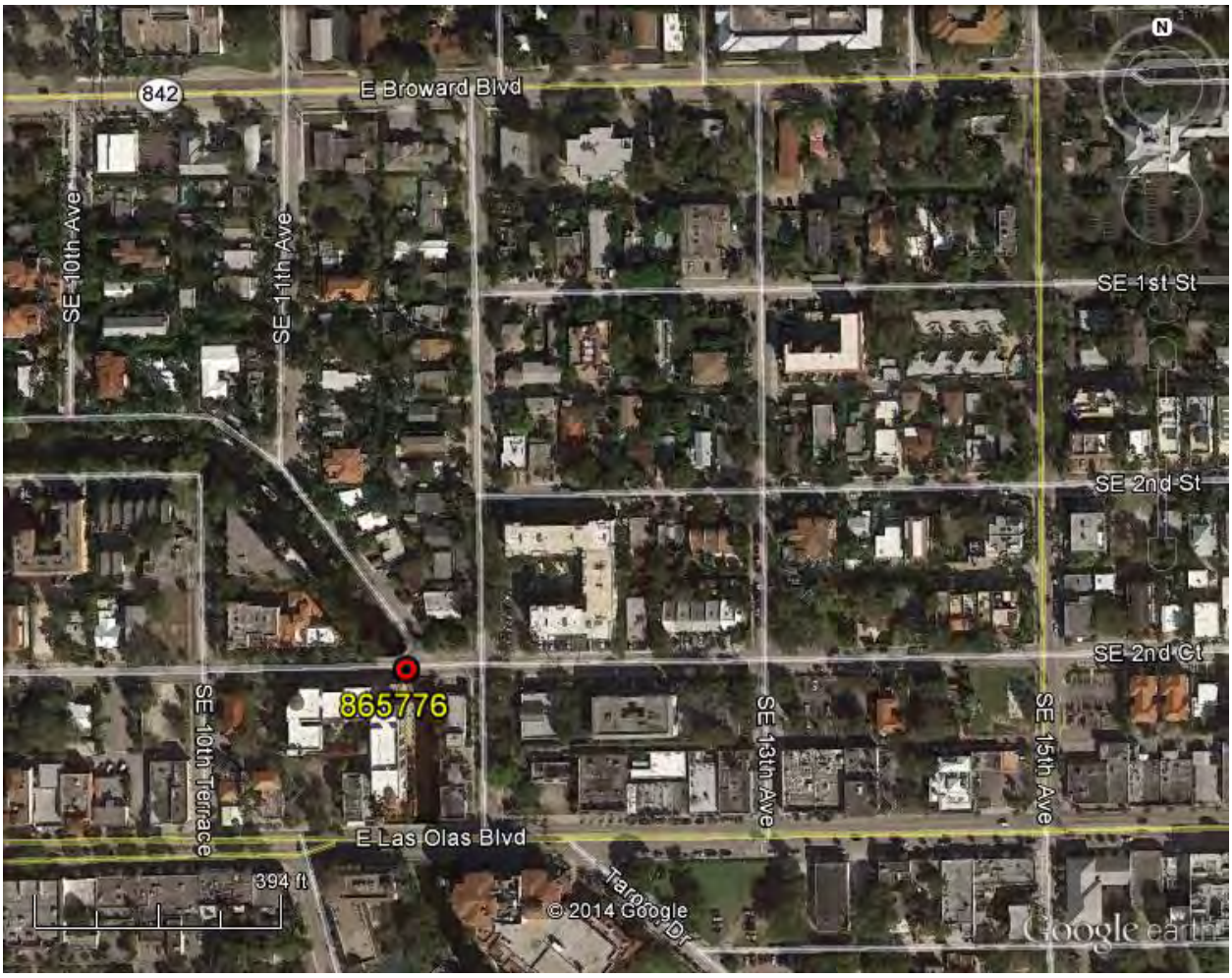
Typical Bridge Railing

Channel Looking South

GENERAL PHOTOS OF BRIDGE

Channel Looking North

LOCATION MAP



CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal exhibits a transverse crack.

Photo 2 – The right sidewalk joint seal over Bent 3 is deteriorated.

CONDITION PHOTOS

Photo 3 – The left side of Span 3, mid span, exhibits a spall.

Photo 4 – Abutment 1 cap exhibits a vertical crack.

CONDITION PHOTOS

Photo 5 – The east face of Pile 3-2 exhibits an unpatched pickup point.

Photo 6 – The Bent 2 cap has a delamination in the north end.

CONDITION PHOTOS

Photo 7 – The east face of Pile 2-4 exhibits a vertical crack.

Photo 8 – The south end of the End Bent 4 retaining wall exhibits a spall.

CONDITION PHOTOS

Photo 9 – The northwest retaining wall exhibits a delamination.

Photo 10 – The End Bent 1 retaining wall north of Pile 1-7 exhibits a vertical crack.

CONDITION PHOTOS

Photo 11 – The End Bent 1 retaining wall exhibits a void behind Pile 1-7.

Photo 12 – The southwest wingwall has a utility pipe disconnection.

CONDITION PHOTOS

Photo 13 – The northwest sidewalk exhibits undermining.

Photo 14 – The northeast sidewalk exhibits a drop-off.

CONDITION PHOTOS

Photo 15 – The northwest sidewalk exhibits a drop-off.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865776** Date: **27-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865776 UW Inspection Date: 5/27/2014

Bridge Name: N/A

Road Name/Number: SE 2nd Court

Feature Intersected: HIMMARSHEE CANAL.

Location: 0.2 miles East of SE 8th Avenue

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.1 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	82°		475 R/Concrete Walls
Weather:	86° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids.

Critical Deficiency Notes: None

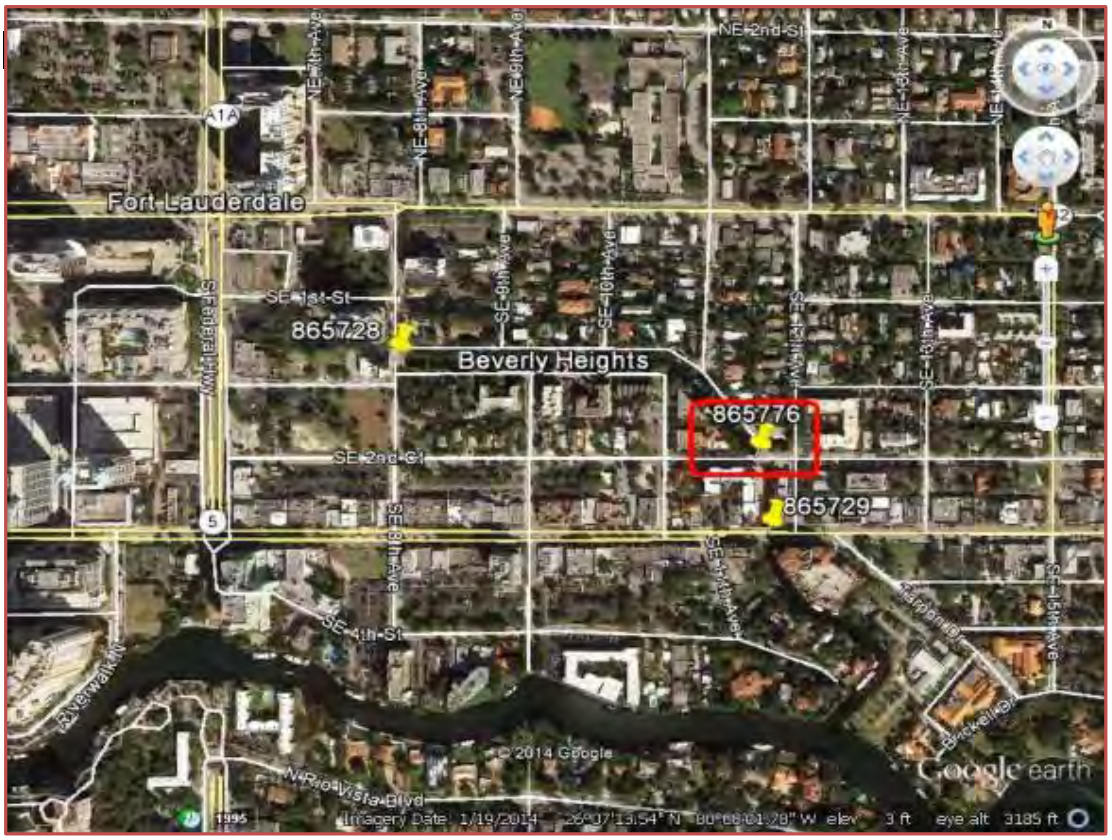
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/18/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865776** Date: **27-May-14**

A: LOCATION MAP



Description: 0.2 miles East of SE 8th Avenue

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**50 ea.**

Note:
_Piles were inspected from the cap down by underwater inspectors during this inspection cycle.
_The Piles are covered heavy marine growth starting 40in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-2: **6**
_The following Piles have pick-up points with shallow spalls with exposed steel and vertical cracks up to 36" long x 1/16" wide. Piles 2-4, 2-7, 3-2 and 3-5. **UW Photos 01 and 02. INCREASE.**
_Pile 2-2, East and West face have (2) vertical cracks up to 14" x 1/64". **NEW.**
_Pile 4-6, North and West face have (2) vertical cracks up to 16" x 1/64". **NEW.**

290 Channel **1 ea.**

CS-3: **1**
_The SW retaining wall is undermined intermittently up to 3" H x 8" D. **DECREASE.**
_The SE masonry grout covered bulkhead has horizontal and vertical cracking up to 1/2" wide which extends 20" below the high watermark. **NO CHANGE.**
_The storm drain concrete apron at Abutment 4 is undermined up to 5' along the North and West sides. **UW Photo 03. INCREASE.**

475 R/Concrete Walls **178 lf.**

CS-3: **10**
_Both Abutment backwalls have areas of corrosion bleed-out up to 5" in diameter. **NEW**
_Abutment 4 backwall NE end has a delamination 36" x 36", with associated cracks up to 1/6" wide, at and below the high watermark. **UW Photo 04. NO CHANGE.**
_Abutment 4, SE end backwall has an spall/delamination 28" x 7" x 1-1/2", with associated cracks up to 1/6" wide, and corrosion bleed-out, starting 2' below the cap. **UW Photo 05. NEW.**

CS-2: **168**
_The joint between the sheet Piles are open up to 1-1/2" wide, and have isolated areas with minor edge spall and up to 1/16" wide, cracking. **NO CHANGE.**
_Behind Pile 1-7 at the SW corner of the West retaining wall has a moderate amount of backfill leakage, joint is not visible. Active backfill leakage was observed during this inspection cycle.
UW Photo 06. INCREASE.
_East retaining wall has a spall 14" x 12" x 12", at the groundline at the joint between Piles 4-7 and 4-8, Active backfill leakage was observed during this inspection cycle. **UW Photo 07. INCREASE.**

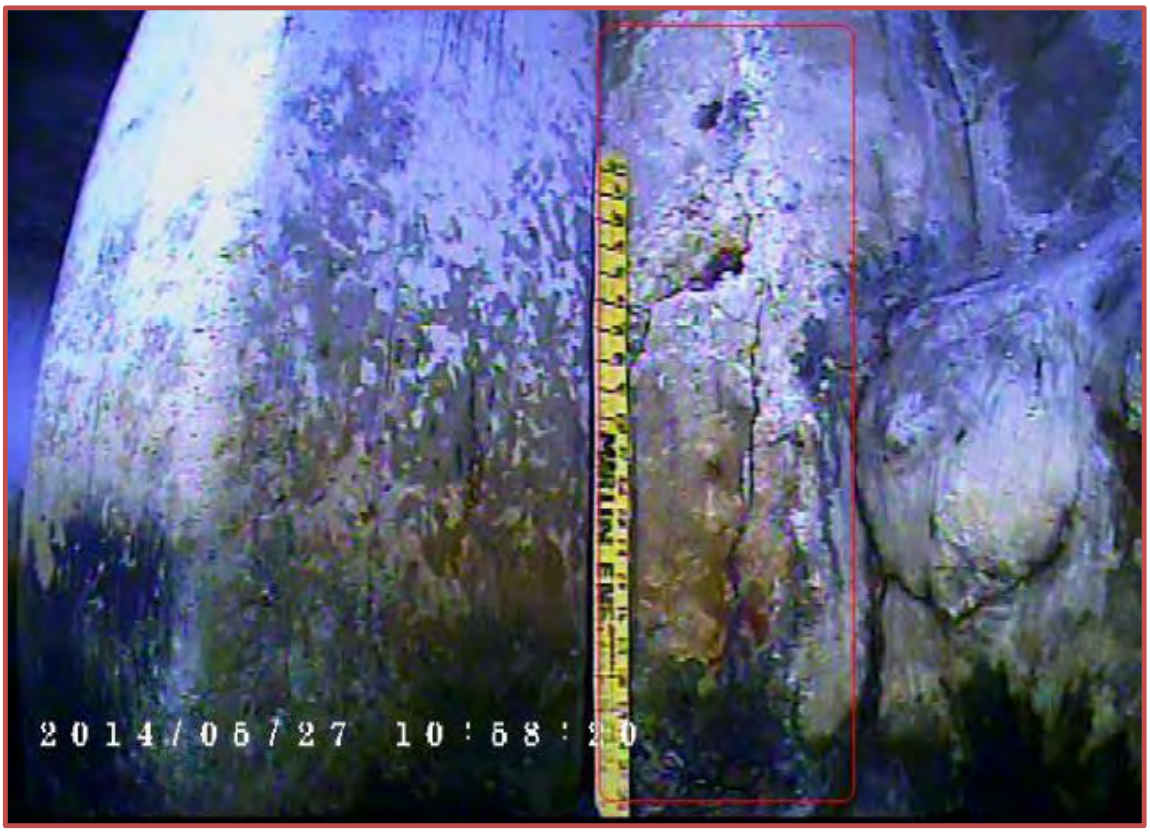
F: PHOTO SECTION

Description: Top: Pick-up points, shallow spalls with exposed steel and vertical cracks. **UW Photo 01.**
Bottom: Pick-up points, shallow spalls and vertical cracks up to 1/16". **UW Photo 02.**

F: PHOTO SECTION

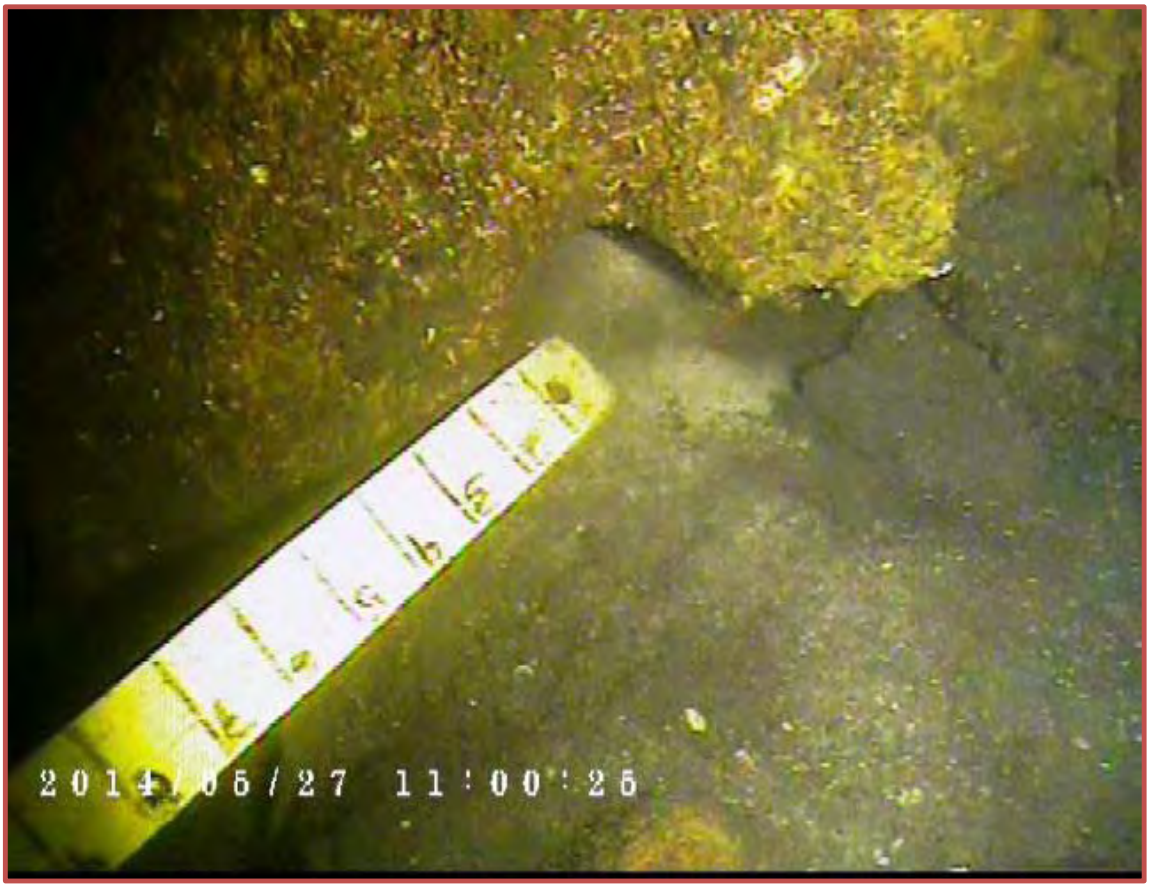
Description: Top: Storm drain concrete apron at Abutment 4 is undermined. **UW Photo 03.**
Bottom: Abutment 4 backwall NE end delamination, with cracks. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Abutment 4, SE end backwall, spall/delamination, with cracks. **UW Photo 05.**
Bottom: Behind Pile 1-7, SW corner of the West retaining, backfill leakage. **UW Photo 06.**

F: PHOTO SECTION



Description: East retaining wall has a spall 14" x 12" x 12", at the groundline at the joint between Piles 4-7 and 4-8, with active backfill leakage. **UW Photo 07.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Epoxy inject the cracks at the following Piles: 2-2, 2-4, 2-7, 3-2, 3-5 and 4-6.

290 Channel

_Repair undermined areas at the SW retaining wall and the storm drain concrete apron at Abutment 4.

475 R/Concrete Walls

_Remove all unsound concrete and patch and epoxy inject the cracks as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.5	14.3
2	15.4	15.5
2.5	15.6	14.1
3	16.3	13.5
4	13.0	12.6

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 10.5 ft. and right: 10.5 ft. at mid-channel.
Maximum Channel depth: 5.1 ft. .

BRIDGE INSPECTION REPORT

Bridge Number: 865777 **Bridge Name:** NE 18th Avenue over Cypress Creek Canal C-14

Topside Inspection Complete: 5/16/2014

Underwater Inspection Complete: 6/10/2014

Report Date: 7/25/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/25/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 188 ft. long, five span, prestressed concrete slab bridge was constructed in 1959 and widened in 1981. The bridge has a roadway width of 59 ft. and carries four lanes of traffic. The bridge has 5 ft. wide sidewalks on each side. The bridge is classified as Functionally Obsolete but not Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a September 1996 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting but is currently posted at 30 tons. The rating is controlled by the prestressed slab units.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the condition of the prestressed concrete slabs. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has up to 6 in. wide transverse cracks and spalls over the intermediate bents and the abutments, some of which are beginning to upheave up to ½ in. See Condition Photo 1.
- The surfacing has up to 1 in. wide longitudinal cracks over the slab unit joints. See Condition Photo 2.
- The south weight limit sign is obscured by vegetation. See general photos.

Railings/Barriers

- The fasteners for the aluminum handrails have moderate surface corrosion. See Condition Photo 3.
- The bolts attaching the rail to Posts 1-3 right and 1-4 right are missing. See Condition Photo 4.
- The concrete barrier in Span 3 has a 1 ft. x 6 in. x 3 in. spall exposing the anchor bolts for Post 3-4 left. See Condition Photo 5.
- No guardrail is provided. See general photos.

Expansion Joints

- The sidewalk joints have areas of adhesion failure and are filled with dirt and debris.

Utilities

- There are two 2½ in. diameter galvanized utilities and one 6 in. diameter ductile iron utility along the west side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the prestressed concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall fair condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Abutments 1 and 6 have large trees growing at the west end.
- The End Bent 1 backwall bay exhibits a 30 in. long x 10 in. high spall and delamination. This condition was not previously noted. See Condition Photo 6.
- The root system for the trees at Abutment 1 extends under the structure and is undermining the slope protection. See Condition Photo 7.
- Abutment 6 cap also has a large tree growing at the east end; however, the roots do not extend under the structure. See Condition Photo 8.
- The southeast corner is missing riprap bags and exhibits an eroded area 10 in. high x 10 in. wide. This condition was not previously noted. See Condition Photo 9.

Reinforced Concrete Cap

- The east ends of Bent caps 4 and 5 exhibit vegetative growth. This condition was not previously noted. See Condition Photo 10.

Piles

- Several of the prestressed concrete piles have minor construction-related spalls and unpatched pickup points.
- The steel H-piles (Piles 10 and 11 at Abutments 1 and 6; Piles 10, 11 and 12 at Bents 2 through 5) have been jacketed from the cap down to the groundline. The jackets are round concrete with no forms and extend from the cap to or near the groundline.
- Specific conditions to the steel H-piles are as follows:
    - The H-piles have light corrosion with no measurable section loss.
    - The H-piles are exposed up to 1 ft. high at the groundline at Piles 3-10 and 3-11. See Underwater Inspection Report Photo 1. This condition has increased from 4 in. high at the last inspection.
- Specific conditions to the jackets are as follows:
    - Jacket 2-10 has a 5 ft. x 2 ft. 6 in. x 1½ in. spall/delamination with exposed rebar (50% remaining section) in the north quadrant, 4 ft. below the cap. See Underwater Inspection Report Photo 2. This condition has increased in size since the previous inspection.
    - Jacket 2-11 has a 1 ft. 6 in. x 1 ft. 6 in. x 1 in. spall/delamination with exposed rebar (50% remaining section) in the west quadrant, 2 ft. 6 in. below the cap. See Underwater Inspection Report Photo 3. This condition was not previously noted.
    - Jacket 2-12 has a vertical crack 3 ft. long x 1/32 in. wide on the west quadrant, extending 1 ft. 4 in. below the high water mark. This condition was not previously noted.
    - There is washout under Jacket 3-10, 2 ft. 6 in. x 6 in., with exposed rebar that has 75% section loss.
    - The south and southwest quadrants of Jacket 3-10 exhibit delaminations with associated cracks up to 3 ft. high x 2 ft. wide. See Condition Photo 11. This condition was not previously noted.

  - The northeast quadrant of Jacket 3-11 has a 2 ft. 9 in. square x 1½ in. deep spall/delamination 2 ft. below the cap, and up to 1 ft. 4 in. x 6 in. vertical voids with exposed vertical and horizontal rebar (50% remaining section) near the groundline. This condition has increased in severity since the last inspection. See Condition Photo 12.
  - All quadrants of Jacket 3-12 exhibit spalls and delaminations with associated cracks and exposed steel up to 4 ft. x 3 ft. 4 in. x 3 in. See Condition Photo 13 and Underwater Inspection Report Photos 4 and 5. These conditions have increased in size since the last inspection.
  - The east quadrant of Pile 4-12 exhibits map cracking at a repair location. This condition was not previously noted.
  - Jackets 5-10, 5-11 and 5-12 have repaired areas with map cracking present on the repair. This condition was not previously noted.
- All piles and caps exhibit graffiti at various locations. See Condition Photo 14.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is scattered drift throughout the channel.

MISCELLANEOUS ELEMENTS

Approach Slabs

- The north and south approach slabs have up to ¼ in. intermittent transverse cracks at the roadway transition. See Condition Photo 16.
- The southeast approach sidewalk has up to a $^{1}/_{8}$ in. wide x 1 ft. long crack at the approach slab/approach roadway transition.
- The southeast approach sidewalk has longitudinal, transverse and diagonal cracks up to ¼ in. wide at the end post due to a 5 ft. x 5 ft. area of undermining with 4 ft. maximum penetration at the end post. See Condition Photos 17 and 18.
- The northwest approach sidewalk has a ¼ in. wide x 2 ft. 4 in. long crack adjacent to the curb at the approach slab/approach roadway transition.
- The northeast approach sidewalk has a 2 ft. x 4 in. area of undermining with 8 in. maximum penetration adjacent to the structure.
- The southeast wingwall below the sidewalk panel exhibits a 1 ft. high x 2 in. wide delamination. This condition was not previously noted. See Condition Photo 19.

Slope Protection

- The slope protection at both abutments has been washed away undermining the abutment caps and exposing the concrete sheet pile backwalls.
- The southeast slope sand-cement rip rap bags are collapsed and displaced.
- The west face of the southeast corner retaining wall exhibits a 4 in. high x 1 in. wide crack. This condition was not previously noted. See Condition Photo 15.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in fair to good condition based on National Bridge Inspection Standards and FDOT guidelines, with delaminations and repaired areas present on the pile jackets at the eastern part of the bridge. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently. The prestressed slab units are in good condition with

no deficiencies noted. The bridge does not require posting, but has been signed with 30 ton gross limit signs.

The bridge has been identified as scour critical by FDOT because the foundations are unknown. No conditions were found to indicate that the foundations are insufficient to support the bridge; however, it is unknown whether the foundations were constructed in a way that meets current design criteria for scour-susceptible bridges.

GEOMETRIC DEFICIENCIES

The bridge is classified as functionally obsolete. It appears that this is primarily because the roadway width at the bridge does not meet current requirements for roads that have the volume of average daily traffic documented by FDOT.

ESSENTIALITY OF BRIDGE

Considering roads of similar or better classification, detour routes approximately 2.5 miles long are available via Federal Highway and McNab Road to the east and Dixie Highway and SW 6th Street from the west. There are local roads available through the Imperial Point neighborhood using NE 62nd Street and NE 20th Way, NE 21st Way, or NE 21st Road, but these options require traffic to use roads not configured to accept the volume of vehicles that currently use the bridge. With four lanes carried across the bridge, there is available width to phase construction to work on part of the bridge, if needed.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge at the west side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Overhead Utilities: There are pole-mounted utility lines, likely telephone and electrical, crossing longitudinally near the east fascia of the bridge. Any work to the bridge will require careful consideration of those lines by the individuals doing the work.

Maintenance of Traffic: The bridge average daily traffic is about 23,000 vehicles per day, and the road is posted for 35 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for pile jackets or concrete repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

It is expected that work will be required in the next 20 years, to repair the pile jackets, to ensure that the bridge will last the next 20 years without interruption to service.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are tree roots growing at the abutments that should be removed before it causes significant problems to the slope protection. These trees should be cut off at the ground and treated with a herbicide to kill the roots. In addition, the southeast approach sidewalk has a panel that has significant undermining present adjacent to the end of the wingwall. This panel should be removed, the soil replaced and sacked concrete or other means installed to stabilize and protect the slope, and a new sidewalk panel poured in place. It is anticipated that these tasks could be carried out by City forces, so no cost has been provided.

LONG TERM

The pile jackets are in fair condition, with spalls, delaminations and cracks present. It is anticipated that the existing jackets will require replacement in 6-10 years. It is recommended that jackets with galvanic anodes be installed to extend the pile life as long as possible.

Long Term Recommendation(s): **Replace pile jackets.**			Cost	
Design [1]			$	10,000.00
Construction			$	85,000.00
Bridge Construction [2]	$	80,000.00		
Maintenance of Traffic [3]	$	5,000.00		
Construction Inspection and Administration [4]			$	17,000.00
Contingency [5]			$	17,000.00
		TOTAL COST	$	129,000.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Jackets: $5,000 per pile (16 piles total)

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Channel Looking East

Channel Looking West

GENERAL PHOTOS OF BRIDGE

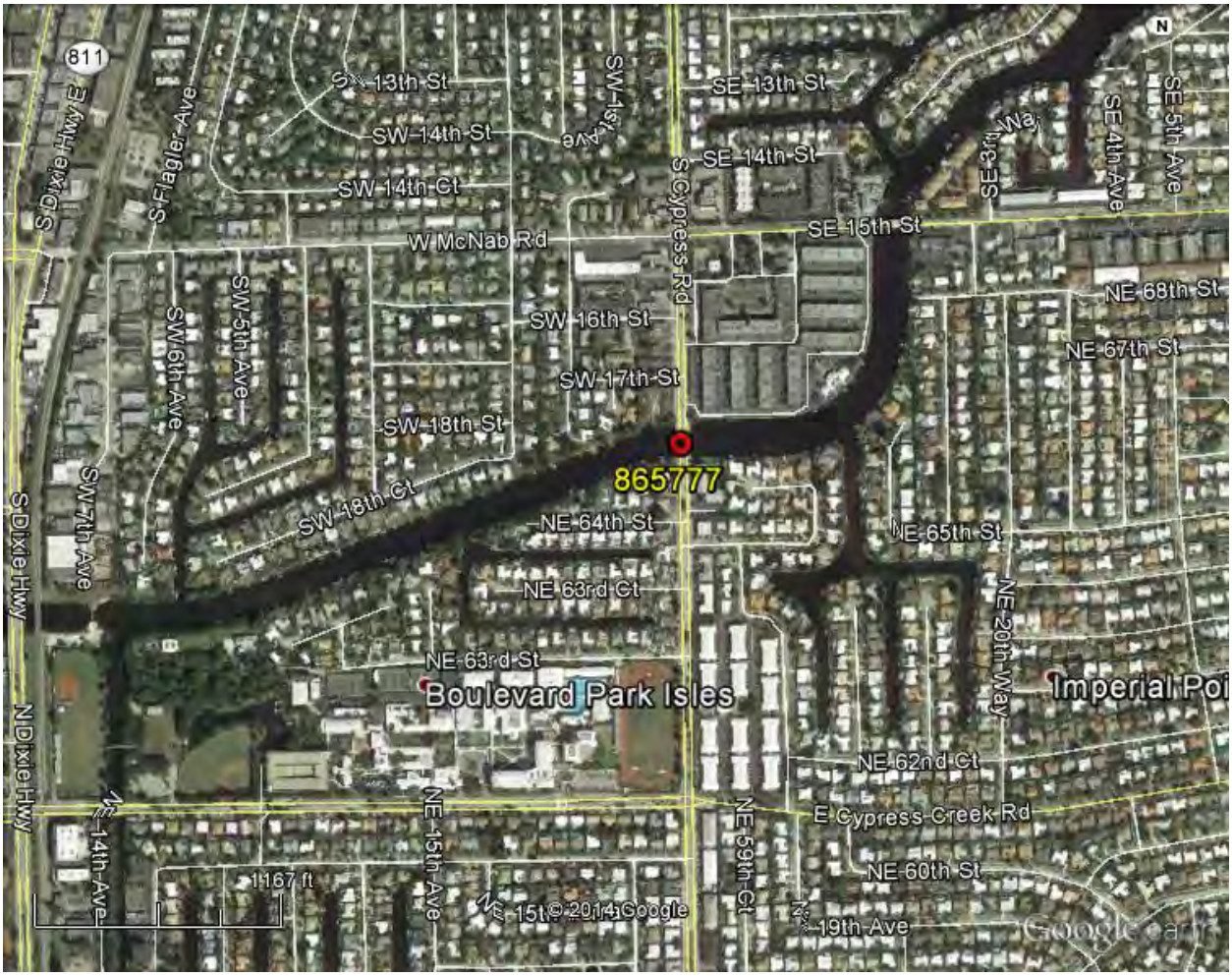
Utilities Mounted on West Side of Bridge

Weight Limit Posting Sign – North Approach

GENERAL PHOTOS OF BRIDGE

Weight Limit Posting Sign – South Approach

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Bent 2 joint seal transverse crack.

Photo 2 – Span 1 deck top longitudinal cracks.

CONDITION PHOTOS

Photo 3 – The aluminum railing Post 1-3 right exhibits bolt corrosion.

Photo 4 – Bolts are missing at Post 1-3R.

CONDITION PHOTOS

Photo 5 – Spall with exposed steel below Post 3-4L.

Photo 6 – End Bent 1 backwall spall and delamination

CONDITION PHOTOS

Photo 7 – Tree root is undermining the west end of End Bent 1.

Photo 8 – Tree growth at End Bent 6 cap.

CONDITION PHOTOS

Photo 9 – Southeast abutment corner exhibits missing riprap and an erosion.

Photo 10 – The east end of Bent 4 exhibits vegetative growth.

CONDITION PHOTOS

Photo 11 – The southwest quadrant of Pile 3-10 exhibits a delamination.

Photo 12 – Pile 3-11 exhibits a spall with exposed steel.

CONDITION PHOTOS

Photo 13 – Pile 3-12 exhibits spalls and delaminations.

Photo 14 – Graffiti at Bent 4.

CONDITION PHOTOS

Photo 15 – Crack at the west face of the southeast corner retaining wall.

Photo 16 – Approach slab roadway transverse crack.

CONDITION PHOTOS

Photo 17 – Southeast approach sidewalk exhibits multi-directional cracks.

Photo 18 – Southeast approach sidewalk undermining.

CONDITION PHOTOS

Photo 19 – Southeast wingwall exhibits a delamination.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865777** Date: **10-Jun-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865777 UW Inspection Date: 6/10/2014

Bridge Name: N/A

Road Name/Number: NE 18th AVENUE

Feature Intersected: CYPRESS CREEK CANAL C-14.

Location: 0.3 MI SOUTH of MC NAB ROAD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	16.1 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	201 Unpainted Steel Column
Bottom:	Muck		204 P/S Concrete Column
Water Temp.:	81°		298 Pile Jacket Bare
Weather:	84° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	3 hrs. x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

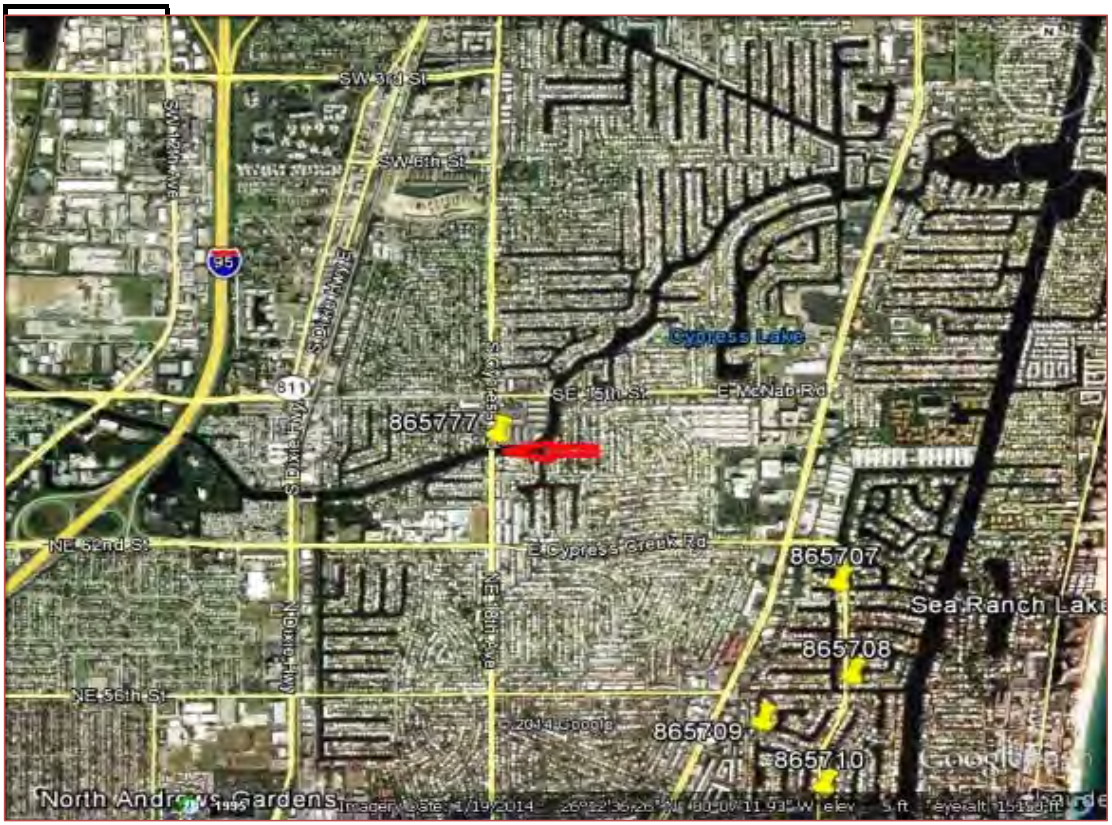
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865777** Date: **10-Jun-14**

A: LOCATION MAP



Description: 0.3 MI SOUTH of MC NAB ROAD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

201 Unpainted Steel Column **16 ea.**

Note:
_The steel H-piles (Piles 10 and 11 at Abutments 1 and 6 and Piles 10, 11 and 12 at Bent 2 through 5) have been jacketed from the cap down to the groundline and remain in **CS-3** due to pile deficiencies prior to being jacketed.

CS-3: **16**
_The bottom 6" to 12" of the Piles are exposed at the bottom of the jacket on Piles 3-10, 3-11 and 3-12. **UW Photo01. NO CHANGE.**

204 P/S Concrete Column **51 ea.**

Notes:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 36" below the caps. Some piles were cleaned at random locations during this inspection cycle.

CS-1: **51**
_Several of the Piles have minor construction-related spalls. **NO CHANGE.**

INCIDENTAL:
_Several of the Piles have un-patched pickup points. **NO CHANGE.**

298 Pile Jacket Bare **16 ea.**

Notes:
_Pile jackets were inspected from the cap down by underwater inspectors.
_The Pile jackets are covered heavy marine growth starting 16" below the caps. Some piles were cleaned at random locations during this inspection cycle.
_This element represents the jackets on Piles 1-10,1-11 , 2-10,2-11,2-12, 3-10, 3-11,3-12,4-10, 4-11, 4-12, 5-10,5-11,5-12,6-10 and 6-11 .
_The jackets are round concrete with no forms and extend from the cap to or near the groundline.

CS-3: **6**
_Jacket 2-10 spall/delamination 60" x 30" x 1-1/2", with exposed rebar 50% section loss, in the North quadrant, 48" below the cap. **UW Photo 02. INCREASE**
_Jacket 2-11 spall/delamination 18" x 18" x 1", with exposed rebar 50% section loss, in the West quadrant, 30" below the cap. **UW Photo 03. NEW**
_Jacket 2-12 vertical crack 36" x 1/32", on the West quadrant, extending 16" below the high watermark. **NEW**
_Jacket 3-10, washout 30" x 6", under the jacket with exposed rebar, 75 % section loss. **NO CHANGE**

E: ELEMENT NOTES

Element **Quantity**

298 Pile Jacket Bare

CS-3 (Continuation):

_Jacket 3-11, NE quadrant spall/delamination, 33" x 33" x 1-1/2", 24" below the cap and up to 16" x 6" 16" x 6" vertical voids with exposed vertical and horizontal rebars , 50% section loss, near the groundline. **INCREASE**

_Jacket 3-12, vertical voids up to 24" x 6" with exposed rebar, 75% section loss, near the groundline. **UW Photo 04. NO CHANGE**

_Jacket 3-12, spall/delamination 48" x 40" x 2", with associated cracks up to 1/8" wide, 18" below the cap, with exposed rebar 50% section loss. **UW Photo 05. INCREASE**

_The H-piles are exposed up to 12" high at the groundline at Piles 3-10 and 3-11. The H-piles have light corrosion with no measurable section loss. **NO CHANGE**

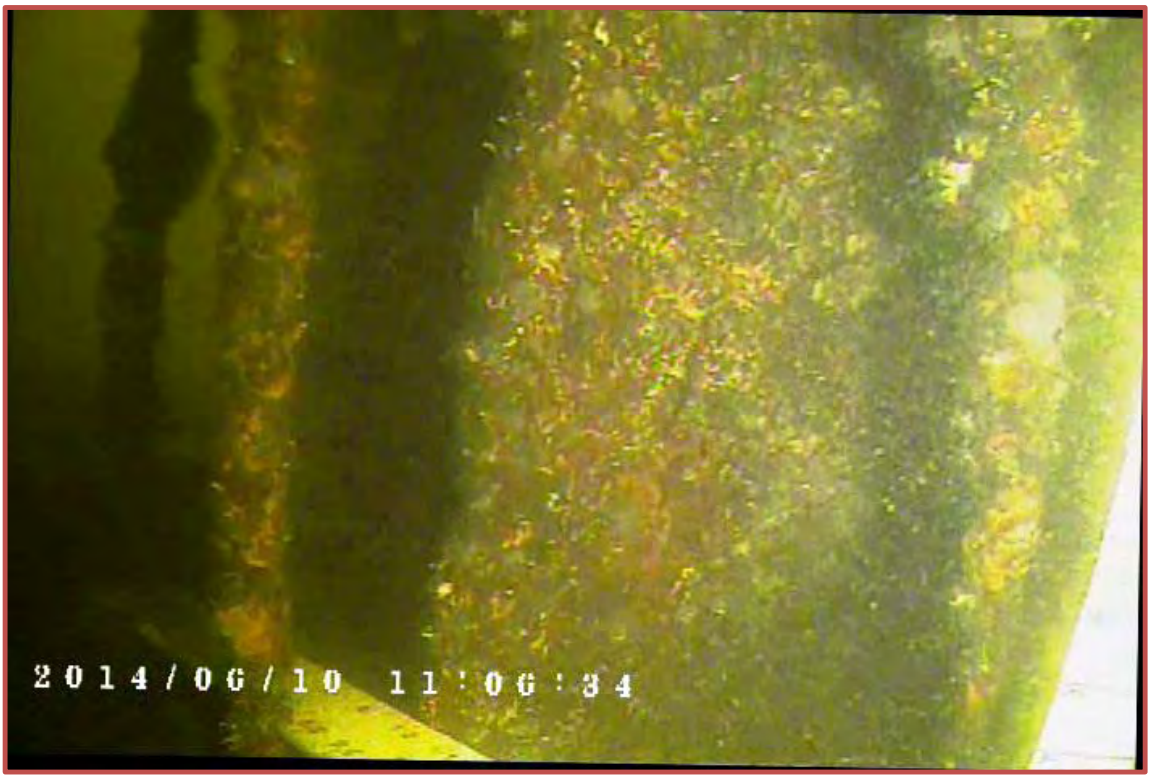
290 Channel **1 ea.**

_No deficiency noted during this inspection cycle.

475 R/Concrete Walls **163 lf.**

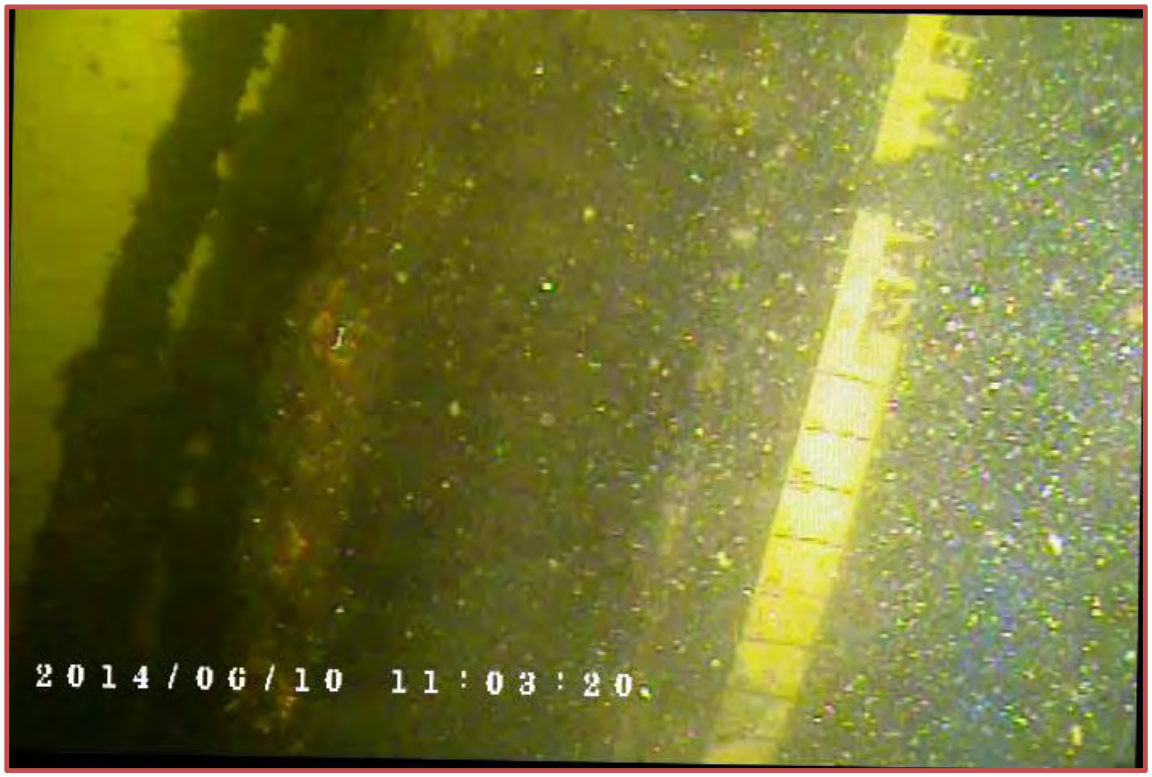
_No deficiency noted during this inspection cycle.

F: PHOTO SECTION



Description: Top: Bottom 6" to 12" of the piles are exposed at some jackets. **UW Photo 01.**
Bottom: Jacket 2-10 spall/delamination with exposed rebar. **UW Photo 02.**

F: PHOTO SECTION



Description: Top: Jacket 2-11 spall/delamination with exposed rebar. **UW Photo 03.**
Bottom: Jacket 3-12, vertical voids w/exposed rebars, near the groundline. **UW Photo 04.**

F: PHOTO SECTION

Description: Jacket 3-12, spall/delamination with exposed rebars. **UW Photo 05.**

H: RECOMMENDED REPAIRS

298 Pile Jacket Bare

_Repair the bottom 6" to 12" of the bottom of the jacket on Piles 3-10, 3-11 and 3-12.
_Repair spalls and delaminations at Jackets 2-10, 2-11, 2-12, 3-10, 3-11 and 3-12.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	11.4	13.0
2	21.5	17.7
3	25.7	27.0
3.5	26.4	29.3
4	24.4	27.1
5	17.3	17.8
6	9.2	12.7

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 13.2 ft. and right: 13.2 ft. at mid-channel.
Maximum Channel depth: 16.1 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865781 **Bridge Name:** Access Road over Mills Pond Canal

Topside Inspection Complete: 5/15/2014

Underwater Inspection Complete: 5/20/2014

Report Date: 7/22/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/22/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

This 161.4 ft. long, five span, prestressed concrete slab unit bridge was constructed in 1987. The bridge has a roadway width of 28.3 ft. and carries two lanes of traffic at a park entrance. There are 5.2 ft. wide sidewalks on each side. The bridge is not classified as Functionally Obsolete or Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an October 1990 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below and the conditions noted for the slab units. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has up to ¼ in. wide transverse cracks over the abutments. See Condition Photo 1.
- The asphalt surfacing has up to ½ in. wide longitudinal cracks over the slab unit joints. See Condition 2.
- The surfacing also has a structure length x up to 4 in. wide longitudinal crack down the centerline of the roadway. This condition has increased in severity – the cracks were previously noted as 1 ½ in. wide. See Condition Photo 3.

Railings/Barriers

- There are up to $^{1}/_{64}$ in. wide vertical cracks in both traffic faces from the expansion joints out 5 ft.

Expansion Joints

- The expansion material in the sidewalk joints over both abutments is heavily deteriorated and the joints are filled with dirt and debris. See Condition Photo 4.

Utilities

- No utilities are present.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the precast concrete slab units; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- The deck underside has minor longitudinal cracks with efflorescence in the poured keyways.
- The keyways have up to 1 ft. diameter x 3 in. spalls around several small construction-related holes.
- Slab Unit 1-1 has a 2 ft. long x $^{1}/_{16}$ in. wide vertical crack in the north face over Abutment 1.
- Slab Unit 1-6 has a 2 ft. long x $^{1}/_{16}$ in. wide vertical crack in the south face over Abutment 1. See Condition Photo 5.
- Slab Unit 3-3 has up to 6 in. diameter x 1 in. spalls at mid-span. See Condition Photo 6.
- Slab Unit 4-3 has an 8 in. x 3 in. x 1 in. spall in the south edge 5 ft. from Bent 5.
- Slab Unit 5-1 has a 2 ft. long x ½ in. wide vertical crack in the north face over Abutment 6.
- Slab Unit 5-6 has a 1 ft. 6 in. x 1 ft. x 6 ft. 5 in. spall/delamination in the south face over Abutment 6.
- The joint between Slab Units 4-1 and 4-2 above Column 5-8 exhibits a 10 in. diameter x 1 in. deep spall. This condition was not previously noted. See Condition Photo 7.
- The joint between Slab Units 3-2 and 3-3 exhibits a longitudinal crack. This condition was not previously noted. See Condition Photo 8.
- The joint between Slab Units 2-2 and 2-3 over Bent 2 exhibits a 1 ft. x 2 in. x 10 in. x 1 in. spall with exposed steel. This condition was not previously noted. See Condition Photo 9.
- The Span 2 deck underside exhibits hairline cracks with efflorescence. This condition was not previously noted. See Condition Photo 10.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- There are vagrant possessions near Abutment 6. See Condition Photo 12.

Intermediate Bents

- There are no deficiencies noted on the concrete caps.
- The southwest corner of Pile 2-1 has a 2 ft. x 3 in. x 1 in. spall/delamination, starting at the cap. This deficiency was not previously noted. See Underwater Inspection Report Photo 1.
- Pile 5-5 has two delaminations up to 1 ft. 6 in. x 1 ft. in the north and west faces at the cap. Previously noted on the west face only. See Condition Photo 11 and Underwater Inspection Report Photo 2.
- Pile 5-7 has a 10 in. x 4 in. x ¾ in. spall in the northeast corner, 3 ft. 6 in. below the cap. See Underwater Inspection Report Photo 3.
- There are minor edge scrapes up to 5 in. x 5 in. x ½ in. in the piles.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is scattered drift throughout the channel.

MISCELLANEOUS ELEMENTS

Reinforced Concrete Approach Slabs

East Approach Slab:

- There are two diagonal cracks up to 20 ft. long x ½ in. wide in each lane. This condition has increased in severity since previously noted. See Condition Photo 13.
- Approach slab is up to ¾ in. higher than the approach roadway. See Condition Photo 14.
- There is a transverse crack up to 1 in. wide at the approach roadway/approach slab transition.

West Approach Slab:

- There is a longitudinal and diagonal crack up to ¼ in. wide x 25 ft. long at the centerline of the westbound lane. This condition has increased in severity since previously noted. See Condition Photos 15-16.
- Approach slab is up to 1 in. higher than the approach roadway. See Condition Photo 17.
- There is a transverse crack up to 1 in. wide at the approach roadway/approach slab.

Approach Sidewalks

- The approach sidewalks have up to an 8 in. drop off at the ends in all corners. There are no sidewalks off of the bridge. See Condition Photo 18.

Guardrails

- The southeast guardrail has one decayed cushion block.
- The northwest and northeast guardrails each have three decayed cushion blocks.
- There is impact damage to the second panel from the west approach slab in the northwest guardrail.
- All guardrail sections are missing reflectors.
- The guardrails are not attached to the approach barriers. See inventory photos.

Slope Protection

- No deficiencies were noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge was constructed in 1987 and is in good condition, based on National Bridge Inspection Standards and FDOT guidelines. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, but there are few signs of deterioration to be

main bridge elements. The prestressed concrete slab units are in good condition and have minimal spalls and cracks.

The latest available load rating for the bridges does not indicate that it requires posting.

GEOMETRIC DEFICIENCIES

The bridge railings are reported as substandard in the FDOT inspection report.

ESSENTIALITY OF BRIDGE

The bridge carries the sole road into the park.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Maintenance of Traffic: The bridge average daily traffic is about 500 vehicles per day, and the road is posted for 15 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term. Work required to maintain the bridge, without weight restrictions, for the next 20 years is described in the following section, Long Term.

LONG TERM

The bridge is in good condition overall. Over the next 20 years, it is anticipated that some concrete repairs will be needed, likely in years 16-20 of the study period. The work is estimated to cost $15,000.

GENERAL PHOTOS OF BRIDGE

North Elevation

South Elevation

GENERAL PHOTOS OF BRIDGE

Channel Looking North

Channel Looking South

GENERAL PHOTOS OF BRIDGE

East Approach from Bridge

East Approach Looking West

GENERAL PHOTOS OF BRIDGE

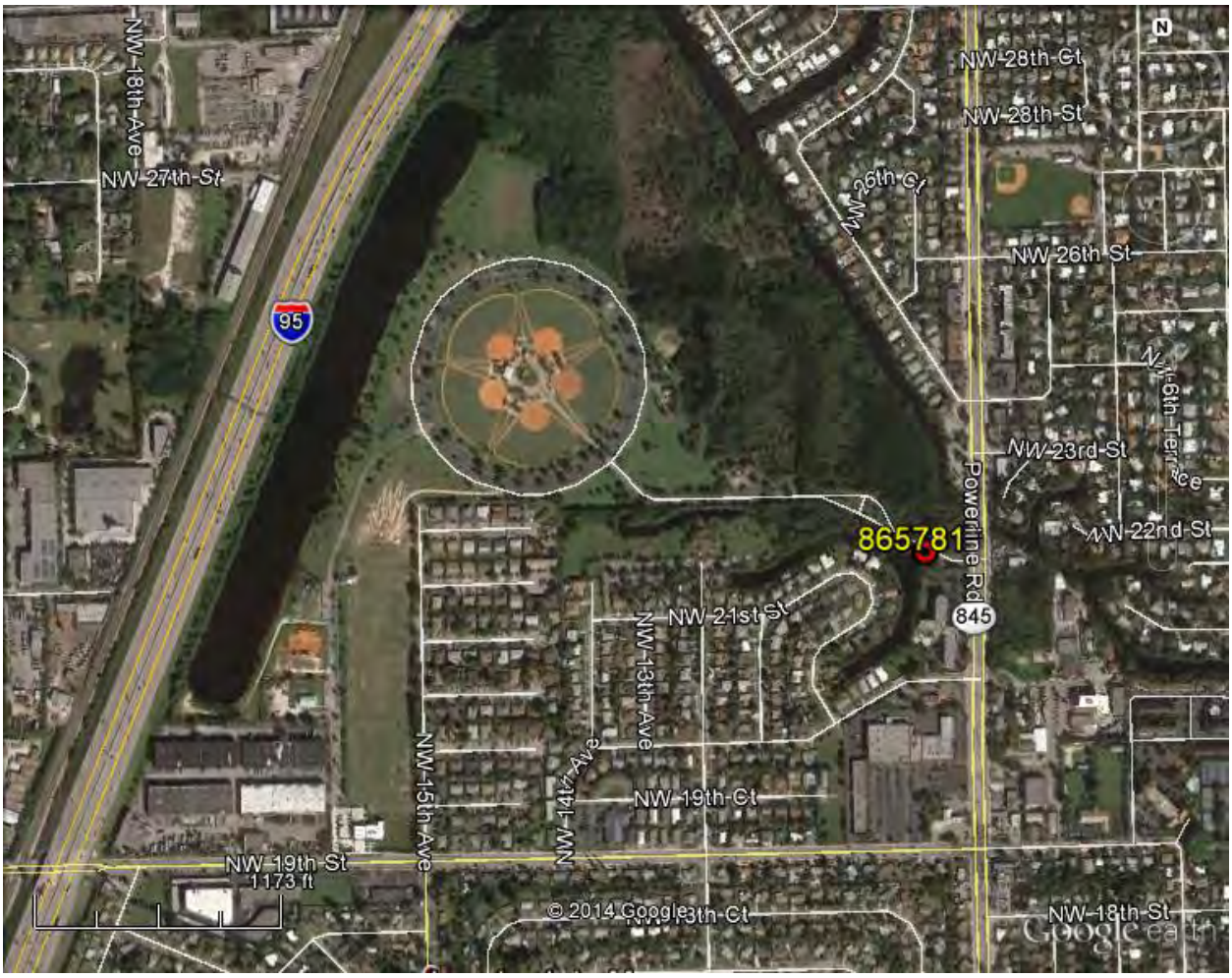
West Approach Looking East

West Approach from Bridge

GENERAL PHOTOS OF BRIDGE

Typical Bridge Railing

LOCATION MAP



CONDITION PHOTOS

Photo 1 – End Bent 1 joint seal transverse crack.

Photo 2 – Deck top longitudinal cracks at Span 4.

CONDITION PHOTOS

Photo 3 – Centerline longitudinal crack.

Photo 4 – End Bent 6 sidewalk right side joint deterioration.

CONDITION PHOTOS

Photo 5 – Vertical crack in the south face of Slab Unit 6-1.

Photo 6 – Slab 3-3 spalls mid-span.

CONDITION PHOTOS

Photo 7 – Slab 4-1 joint spall.

Photo 8 – Slab 3-2 to 3-3 longitudinal crack.

CONDITION PHOTOS

Photo 9 – Spall at the joint between Slab Units 2-2 and 2-3.

Photo 10 – Span 2 deck underside exhibits hairline cracks with efflorescence.

CONDITION PHOTOS

Photo 11 – Pile 5-5 exhibits delaminations in the west face.

Photo 12 – Vagrant possessions near Abutment 6.

CONDITION PHOTOS

Photo 13 – East approach slab diagonal crack.

Photo 14 – East approach slab difference in elevation.

CONDITION PHOTOS

Photo 15 – West approach slab longitudinal crack.

Photo 16 – West approach slab diagonal crack.

CONDITION PHOTOS

Photo 17 – West approach slab difference in elevation.

Photo 18 – Southwest approach sidewalk exhibits a difference in elevation.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865781** Date: **20-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865781 UW Inspection Date: 5/20/2014

Bridge Name: N/A

Road Name/Number: ACCESS ROAD.

Feature Intersected: MILLS POND CANAL.

Location: 200ft WEST of POWERLINE ROAD.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	8 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights,
Currents:	None		Probing Device, Profile Equipment
Visibility:	1 ft.	Elements Inspected:	204 P/S Concrete Column.
Bottom:	Muck		290 Channel.
Water Temp.:	81°		
Weather:	82° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Hayes, Steven - Bridge Inspector / Diver (CBI # 438). Lead.
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368).
Padrino Reinaldo - Bridge Inspector / Diver (CBI # 242).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

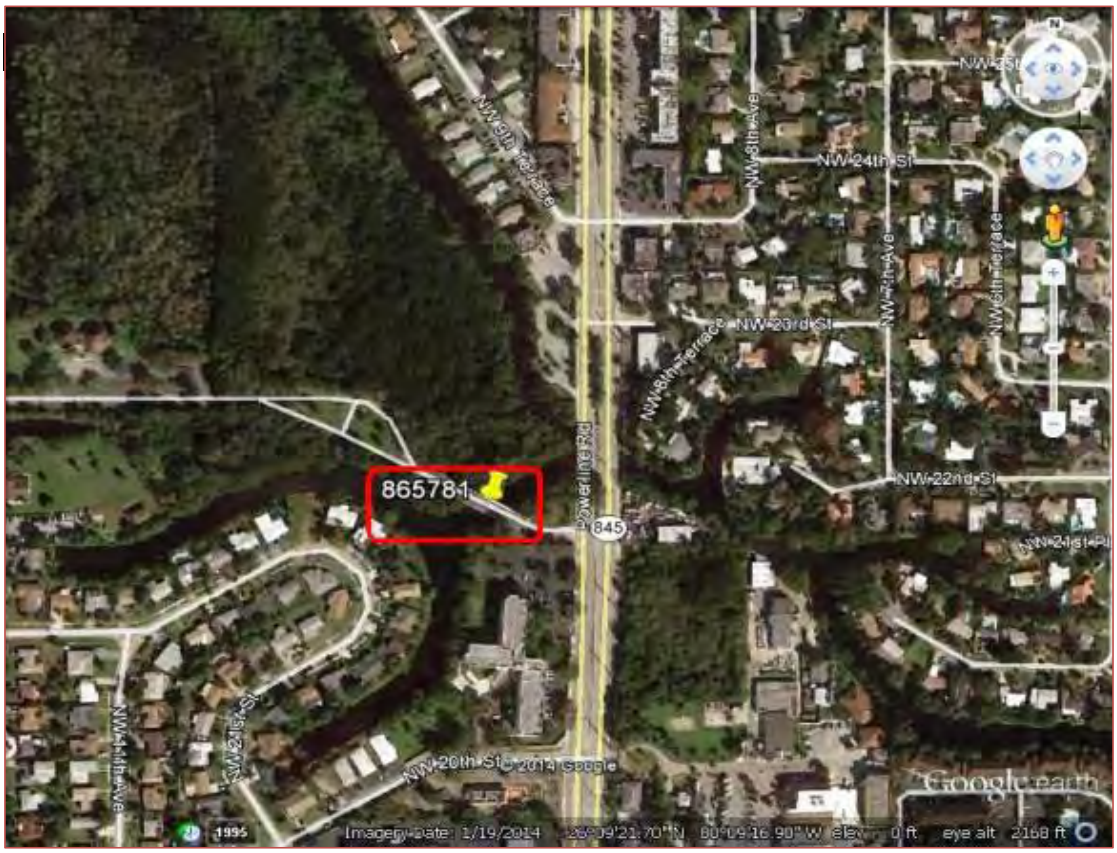
Soria, Miguel, Professional Engineer (P.E. # 49359)

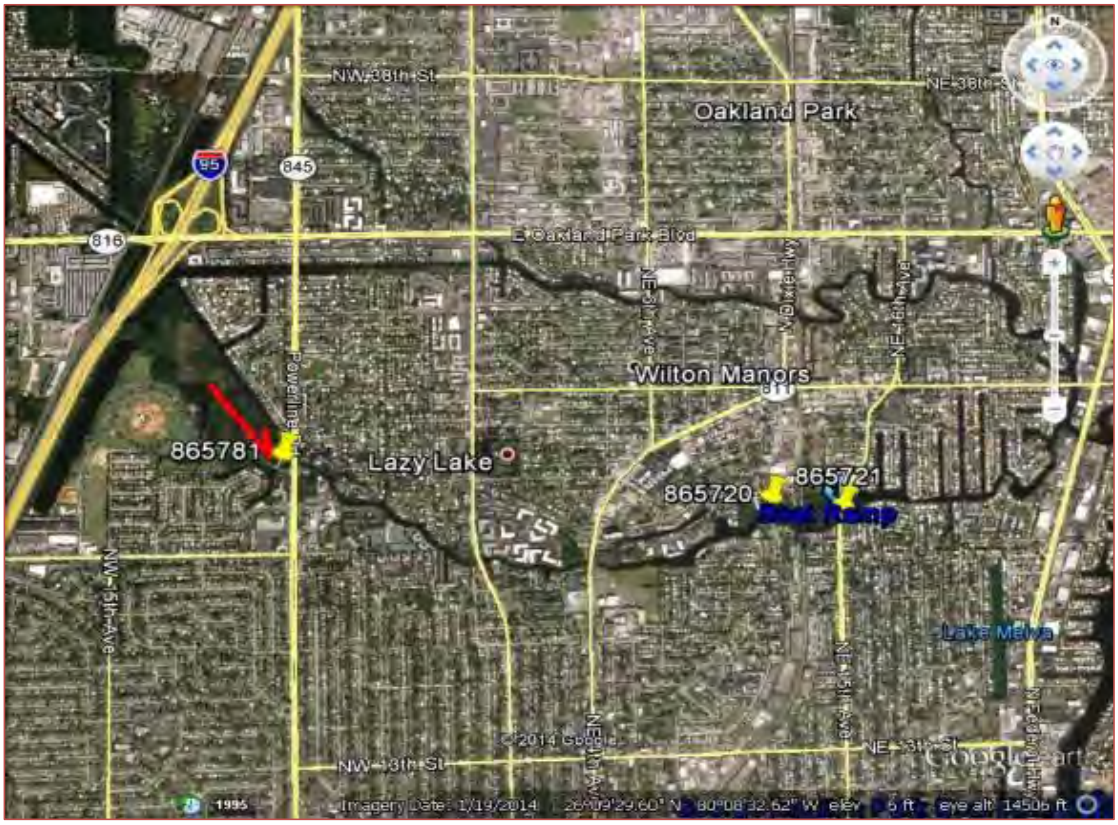
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865781** Date: **20-May-14**

A: LOCATION MAP





Description: 200 ft WEST of POWERLINE ROAD.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**36 ea.**

Notes:
_Piles were inspected from the cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 24in. below the caps. Several piles were cleaned at random locations during this inspection cycle.

CS-3: **2**
_Pile 2-1, SW corner spall/delamination 24" x 3" x 1", starting at the cap. **UW Photo 01. NEW.**
_Pile 5-5, North and West faces have (2) spall/delamination 18" x 12" x 1-1/2", starting at the cap. **UW Photo 02. INCREASE.**

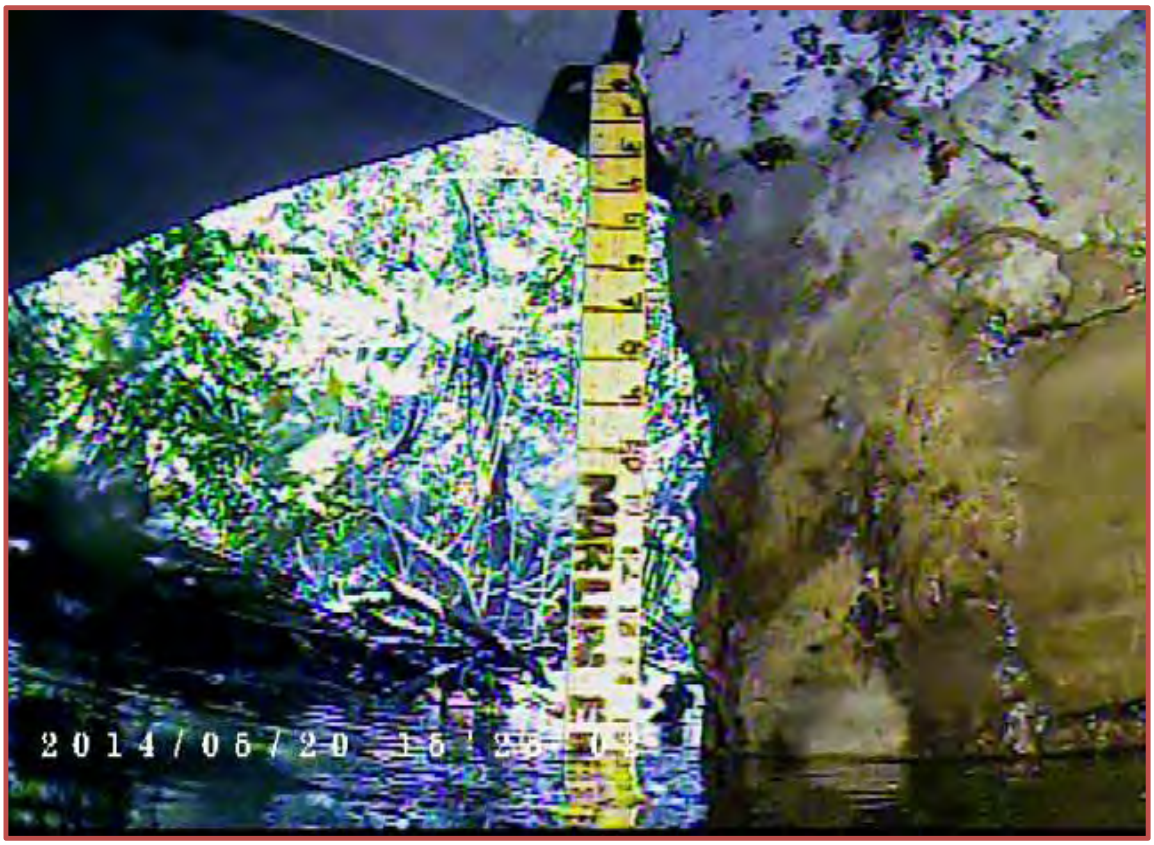
CS-2: **1**
_Pile 5-7, NE corner spall 10" x 4" x 3/4", starting 42" below the cap. **UW Photo 03. NO CHANGE.**

CS-1: **33**
_There are minor edge scrapes up to 5" x 5" x 1/2", in the Piles. **NO CHANGE.**

290 Channel **1 ea.**

CS-1: **1**
_There is scattered drift throughout the channel. **NO CHANGE.**

F: PHOTO SECTION



Description: Top: Pile 2-1, SW corner spall/delamination, starting at the cap. **UW Photo 01.**
Bottom: Pile 5-5, N and W faces, (2) spall/delamination, starting at the cap. **UW Photo 02.**

F: PHOTO SECTION

Description: Pile 5-7, NE corner spall 10" x 4" x 3/4", starting 42" below the cap. **UW Photo 03.**

H: RECOMMENDED REPAIRS

204 P/S Concrete Column

_Remove all unsound concrete and patch Piles 2-1 and 5-7.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	7.0	6.7
2	12.0	11.0
3	16.2	16.3
3.5	17.1	17.0
4	17.1	18.0
5	12.0	12.1
6	6.4	6.4

Notes: Measurements were taken from the top of the concrete barrier wall.
Waterline on the left: 10 ft. and right: 10 ft. at mid-channel.
Maximum Channel depth: 8 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865782 **Bridge Name:** SE 25th Avenue over Rio Idlewild Canal

Topside Inspection Complete: 5/05/2014

Underwater Inspection Complete: 5/05/2014

Report Date: 7/15/2014

Inspection Personnel / Title / Number	Initials
Lawes, Donville –Bridge Inspector (CBI #0326) (lead)	DSL
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/15/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 35.4 ft. long, two-span, prestressed concrete slab bridge constructed in 1993. The bridge has a roadway width of 21.6 ft. and carries two lanes of traffic in a residential neighborhood. It has 3.9 ft. wide sidewalks on each side. The bridge is the only way into or out of the neighborhood. There are 3.9 ft. sidewalks on both sides. The bridge is classified as Functionally Obsolete, but is not classified as Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on an April 1995 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is not currently posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by

the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The deck is the portion of the bridge above the beams. At this bridge, the top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt surfacing has up to ½ in. wide transverse cracks over the expansion joints. See Condition Photo 1.
- The asphalt exhibits several $^{1}/_{8}$ in. wide x up to 10 ft. long longitudinal cracks. See Condition Photo 2. This condition was not previously noted.

Railings/Barriers

- The outside face of the right bridge rail has a 2 in. diameter x ½ in. spall with exposed steel and corrosion staining 2 ft. south of Abutment 3.
- The outside face of the right bridge rail has a 2 in. diameter x ½ in. spall with exposed painted steel starting 1 ft. 6 in. above the base over Bent 2. The exposed steel has been painted since the last inspection.
- There is no approach guardrail.

Expansion Joints

- No expansion joints are present.

Utilities

- There are one 5 in. diameter painted steel pipe and one 3 in. diameter galvanized utility pipe attached to the deck underside along the east side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab

- The deck underside in Span 1 has a piece of protruding all-thread, 8 ft. from the east side and 1 ft. from the Bent 2 cap. See Underwater Inspection Report Photo 1.
- The deck underside in Span 1 has a 1 ft. x 8 in. x 1 ½ in. spall/delamination with exposed steel, 6 ft. from the east end adjacent to abutment 1. This deficiency was not previously noted. See Underwater Inspection Report Photo 2.

The following refers to the arch fascia on each side of the structure:

- The east face of Span 1 has two 3 in. x 1 in. x ½ in. spalls with exposed steel due to lack of cover, 3 ft. from Bent 2 and at midspan. See Condition Photo 3.
- The east face of Span 2 has four spalls up to 1 ft. 6 in. x 1 in. x ½ in. with exposed steel due to lack of cover, 2 ft. from Abutment 3 and at midspan. The number of spalls has increased from two to four. See Condition Photo 4.
- Both exterior and bottom faces at Bent 2 have longitudinal cracks with corrosion staining up to 3 ft. long x $^{1}/_{32}$ in. wide.
- In Span 1, the bottom east and west faces exhibit up to a 4 ft. long x $^{1}/_{16}$ in. wide crack, starting 2 ft. from Abutment 1. This deficiency was not previously noted. See Condition Photo 5.
- In Span 1 the bottom face of the east arch adjacent to abutment 1 has a delamination 3 ft. 6 in. x 7 in. with associated cracks up to $^{1}/_{16}$ in. wide and corrosion bleedout. The corrosion bleedout was not previously noted. This deficiency was not previously noted. See Underwater Inspection Report Photo 3.
- The bottom and east face of the west side of Span 2, 1 ft. from Abutment 3, has a 2 ft. 10 in. x 1 ft. x 1 ½ in spall/delamination with exposed steel, ½ in. section remaining.
- The bottom face of the west arch in Span 2 has a 1 ft. 2 in. x 2 in. spall/delamination with corrosion bleedout. The corrosion bleedout was not previously noted. See Underwater Inspection Report Photo 4.

Bearings

- The beams are integral with the abutments; no bearings are present.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in overall satisfactory condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- Both abutment caps have vertical cracks up to 6 in. long x $^{1}/_{16}$ in. wide with corrosion bleedout at the east wingwall transition joint and along the length of the caps. This deficiency was not previously noted. See Underwater Inspection Report Photo 5.
- Abutment 3 cap has a 10 in. x 8 in. x 1 in. spall/delamination under the east edge of Slab Unit 2-1 and a 4 ft. long x $^{1}/_{32}$ in. wide horizontal crack with corrosion stains in the bottom edge between Slab Units 2-2 and 2-3. See Underwater Inspection Report Photo 6.

Intermediate Bent

- Bent 2 cap has up to 1 ft. 6 in. long x $^{1}/_{8}$ in. wide vertical and horizontal cracks with corrosion stains in the southwest corner. See Underwater Inspection Report Photo 7.
- Bent 2 cap also has 3 ft. long x up to $^{1}/_{8}$ in. wide horizontal cracks with corrosion bleedout in the north face over Pile 2-2. The deficiency has increased since the last inspection.
- The south face of the Bent 2 cap is delaminated up to cap length x 1 ft. and a 1 ft. 3 in. x 3 in. x 1 ½ in. spall.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2011 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- Gravel placed along the abutments and wingwalls is being displaced by tidal currents resulting in exposure of several piles.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Retaining Wall

- The northwest wingwall at the junction to the private sector has a 1 ft. 5 in. x $^{1}/_{16}$ in. wide diagonal crack with corrosion bleedout. This deficiency was not previously noted. See Underwater Inspection Report Photo 8.
- The northwest wingwall at the west end has two (2) 3 ft. 4 in. x $^{1}/_{16}$ in. wide horizontal cracks with corrosion bleedout. This deficiency was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge is in satisfactory to good condition based on National Bridge Inspection Standards and FDOT guidelines, with the piles and caps at the abutments and intermediate bent in the worst condition. Low-lying coastal bridges like this one are continuously subjected to wet-dry conditions near the waterline and the concrete elements likely have some level of chloride contamination, as evidenced by the extent of delaminations, cracks, spalls and repaired areas on the caps. Concrete repairs to elements in close proximity to the water are likely to last less than 10 years, but they will likely not resolve the problem and concrete repairs will be needed more frequently, which is why metalizing the caps, a form of cathodic protection, is recommended.

The bridge is 21 years old and has minimal deterioration to the prestressed concrete slab. The exposed steel all thread bar should be cut off at least 1 in. below the surface of the concrete and a patch applied to prevent the bar from corroding and causing larger delaminations and spalls from occurring. The fascia arches are cosmetic in nature and already have some areas with exposed steel. These areas have less than desirable concrete cover over the reinforcing steel, so it is recommended that a metalizing spray be applied in order to slow the rate of deterioration. It is likely that similar work will be required at least once again during the 20 year study period.

The 1995 load rating for the bridge is for the prestressed slab units only, but the lack of noted deterioration indicates that the rating is still valid, even though it is almost 20 years old.

There are areas behind the bulkheads at four of the bridges where loss of fill exists. It is likely that some form of repairs to these areas, and at the two bridges where loss has not been noted but may occur if constructed like the other bridges, will be required. Similarly, multiple bridges show signs of deterioration to the panels behind the abutments; they are likely to require repair in 11-15 years from now.

GEOMETRIC DEFICIENCIES

The bridge is not classified as functionally obsolete. However, the sidewalk does not meet the 5 ft. width currently needed to satisfy ADA criteria.

The bridge railings are substandard when compared to current design criteria for height, openings and crashworthiness.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences south of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

CONSTRUCTABILITY ISSUES

Quality of Repairs: Making good concrete repairs is dependent upon the maintainer's ability to properly prepare the concrete substrate, clean the existing reinforcing steel properly, and keep the brackish canal water from the area being repaired. However, even the best quality repairs will not eliminate future concrete repairs.

Bridge-Mounted Utilities: There are utilities supported by the bridge deck at each side. Any rehabilitation or new construction activities will need to ensure that the existing utilities are properly protected throughout construction.

Maintenance of Traffic: The bridge average daily traffic is about 400 vehicles per day, and the road is posted for 15 mph. The bridge does not appear to require major rehabilitation or replacement in the next 20 years, but any work that requires contractors to access from the deck, like providing concrete for cap repairs, may require daily closures and flagger use, as well as consideration for pedestrian and bicyclist detours to the opposite sidewalk.

RECOMMENDATIONS AND PROBABLE COSTS

The bridge superstructure is in good condition and is expected to require little to no work in the next 20 years, based on conditions noted. The exceptions to that are the minor areas of deterioration to the slabs and fascia beams. Repair those areas in the near term will help defer larger areas of deterioration from occurring. The substructure elements – abutments and bents – do require repairs to ensure they will last the next 20 years without interruption to service.

It is recommended that work for this bridge be contracted with that of other bridges scheduled for work 11-15 years from now, because the work expected – substructure concrete repairs and metalizing - is similar and there will be mobilization cost savings for a contractor to perform similar work at multiple bridges at the same time.

The costs to perform bridge repairs have been estimated based on FDOT unit cost history using 2014 dollars. The costs for design, construction, maintenance of traffic, utility work, construction inspection, and a factored contingency, have been broken out below for City

budgeting purposes. As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

The minor deterioration at the prestressed concrete slab and fascia arches should be repaired while the work is minor. This work does not require design or construction supervision to correct, as long as the work is done per manufacturer's specifications for surface preparation. It is anticipated that the total cost to cut off the all-thread bar in Span 1 1 in. below the surface and patch the area is $2,000. The cost to clean the areas of exposed steel and apply metalizing 2 ft. all around is $3,000. Total costs to perform short term work are about $5,000.

LONG TERM

The abutment and intermediate bent caps should be considered for metalizing or an impressed current cathodic protection system in years 11-15. This would entail removing the existing concrete to beneath the existing reinforcing steel, restoring that concrete back to the original profile, and applying a metalizing coating connected to the internal reinforcing steel to keep that steel from corroding.

Long Term Recommendation(s): **Install metalizing at abutment and bent caps.**			Cost
Design [1]			$ 10,000.00
Construction			$ 48,000.00
Bridge Construction [2]	$	45,000.00	
Maintenance of Traffic [3]	$	3,000.00	
Construction Inspection and Administration [4]			$ 9,600.00
Contingency [5]			$ 9,600.00
		TOTAL COST	$ 77,200.00

(1) Design work by same engineer for multiple bridges to be let as single contract.

(2) Metalizing: $15,000 per pier

(3) Daily closures for equipment and material access. Work done from water, under traffic.

(4) Construction inspection and administration costs estimated 20% of cost for construction, maintenance of traffic and utilities.

(5) Estimated at 20% of cost for construction, maintenance of traffic and utilities, since no preliminary engineering was prepared as part of this inspection report.

GENERAL PHOTOS OF BRIDGE

East Elevation

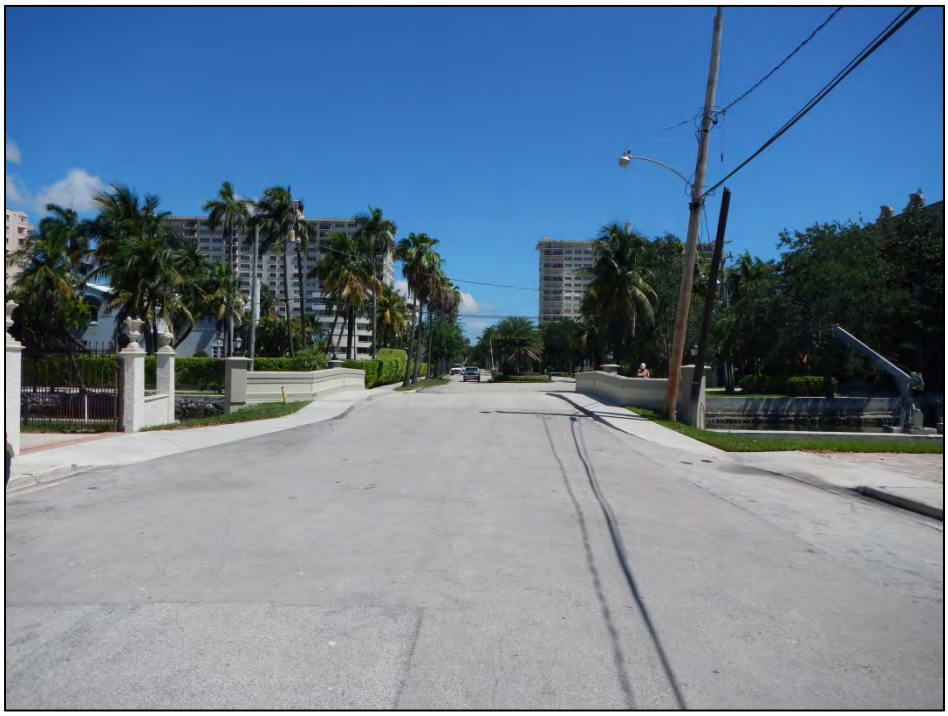
North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE



South Approach Looking North

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

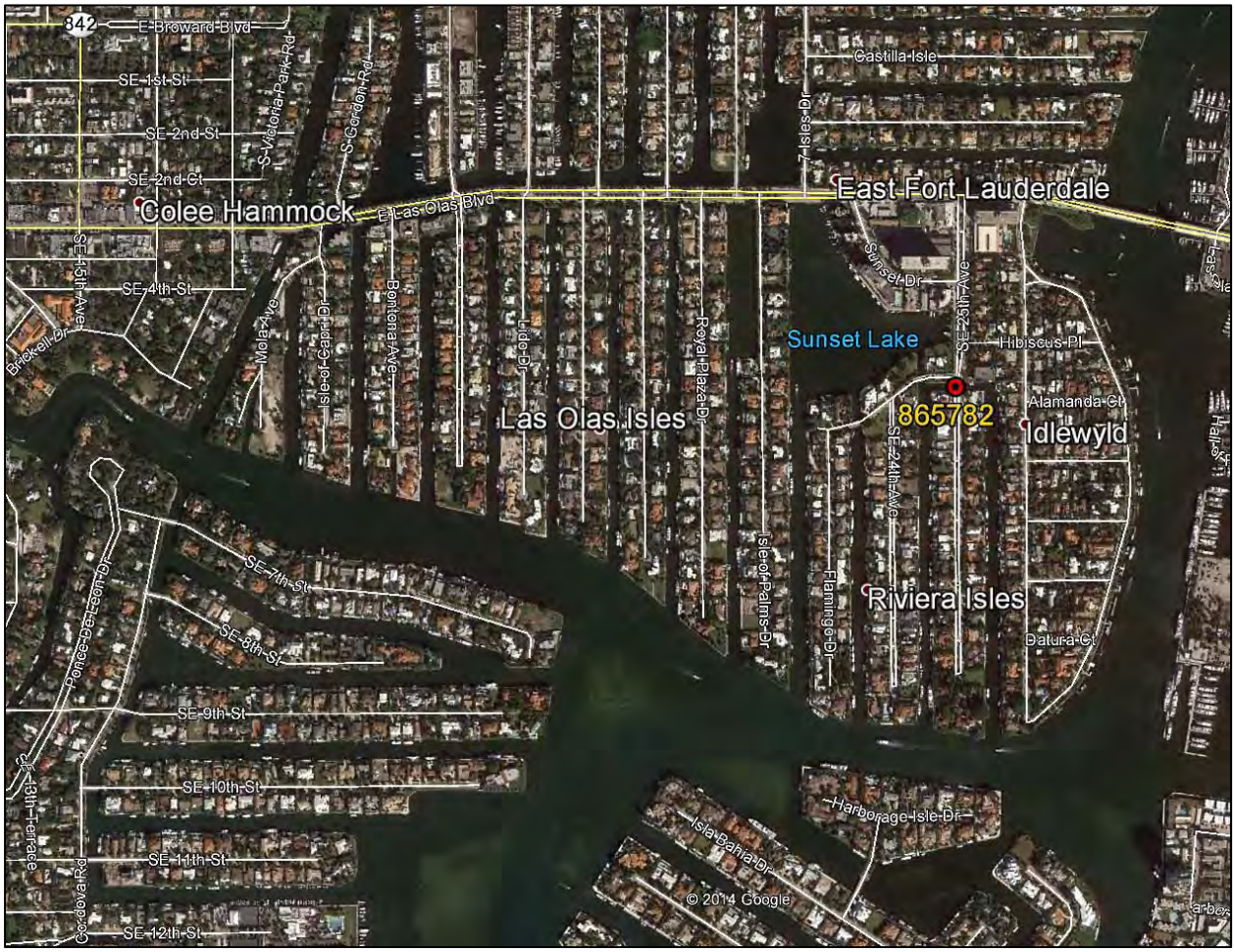
Bridge Plaque

Channel Looking East

GENERAL PHOTOS OF BRIDGE

Channel Looking West

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Cracks in asphalt surfacing over joints.

Photo 2 – Longitudinal cracks in asphalt surfacing.

CONDITION PHOTOS

Photo 3 – Spall with exposed steel at east face of Span 1.

Photo 4 – Spall with exposed steel at east face of Span 2.

CONDITION PHOTOS

Photo 5 – Crack in east face of Span 1 near Abutment 1.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865782** Date: **05-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865782 UW Inspection Date: 5/5/2014

Bridge Name: N/A

Road Name/Number: SE 25th Avenue.

Feature Intersected: Rio Idlewild Canal

Location: 300 yds South of Las Olas Blvd

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	4.2 ft.	Equipment Used:	Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights, Digital
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	99 Concrete Slab/(underside)
Bottom:	Muck		204 P/S Conc Column, 234 Concrete Cap
Water Temp.:	82°		215 R/Concrete Abutment
Weather:	86° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

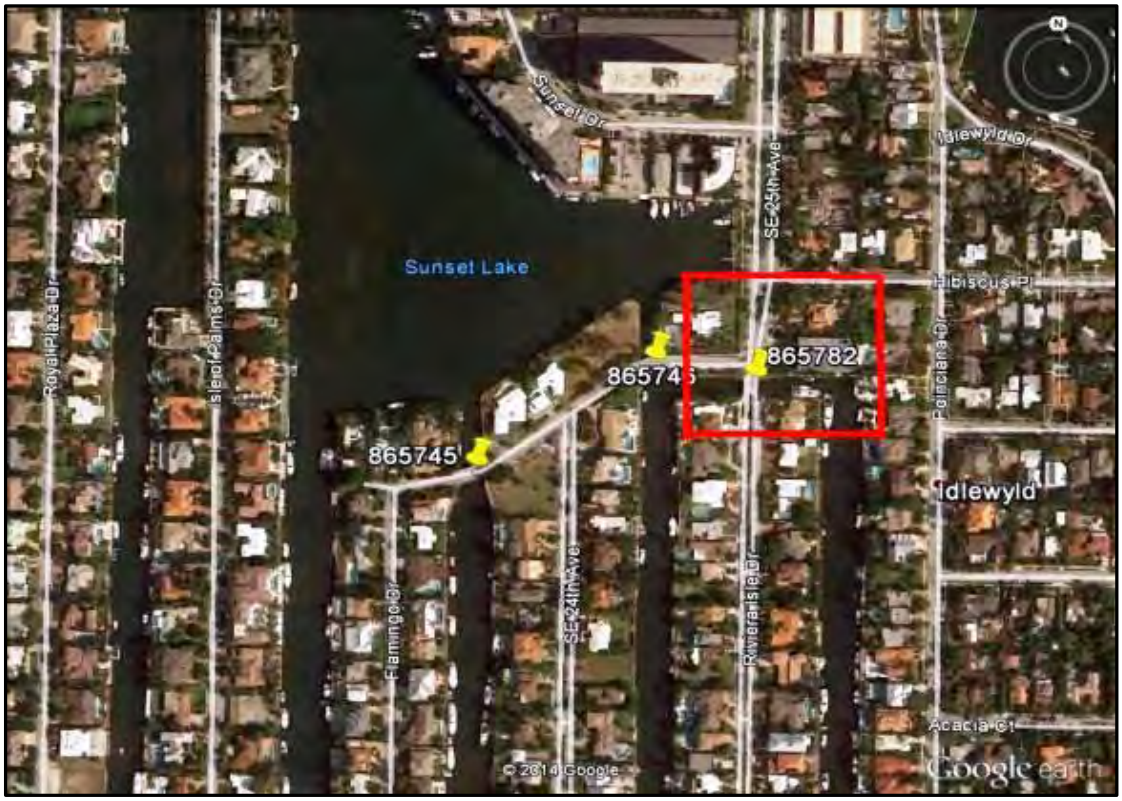
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865782** Date: **05-May-14**

A: LOCATION MAP



Description: SE 25th Avenue, 300 yds South of Las Olas Blvd.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
99 P/S Concrete Slab (underside only)	**1,115 sq. ft.**

Note: The deck underside was inspected by the underwater inspectors during this inspection cycle.

CS-1: **1,115**

_Deck underside in Span 1 has a piece of protruding all-thread, 8' from the east side and 12" from Bent 2 cap. **UW Photo 01. NO CHANGE**

_Deck underside in Span 1, 6' from east end adjacent to abutment 1 has a spall/delamination 12" x 8" x 1-1/2", with exposed steel. **UW Photo 02. NEW**

The following refers to the arch interior and bottom fascia of the structure only.

_East arch bottom face adjacent to abutment 1 has a delamination 42" x 7", with associated cracks up to 1/16" wide and corrosion bleed-out. **UW Photo 03. NEW**

_West and East arch interior and bottom fascia have longitudinal cracks with corrosion bleed-out up to 3' L x 1/16" wide. **INCREASE**

_West arch, span 2 bottom fascia has a full length x 14" W x 2" D", spall/delamination with corrosion bleed-out. **UW Photo 04. INCREASE**

204 P/S Concrete Column	**22 ea.**

Note:
This element includes the exposed piles at the abutment and wingwalls.

215 R/Concrete Abutment	**45 lf.**

Notes: The abutments were inspected by the underwater inspectors during this inspection cycle.

CS-3:

_Both abutment caps have vertical cracks up to 6" L x 1/16" W, with corrosion bleed-out, **UW Photo 05. NEW**

_Both abutment caps have vertical cracks up to 6" L x 1/16" W, with corrosion bleed-out, at the East wing wall transition joint. **NO CHANGE**

_Abutment 3 cap has a spall/delamination 10" x 8" x 1", under the east edge of Slab Unit 2-1 and a 48" x 1/32" horizontal crack with corrosion bleed-out in the bottom edge between Slab Units 2-2 and 2-3. **UW Photo 06. NO CHANGE**

E: ELEMENT NOTES

Element **Quantity**

234 Concrete Cap **32 lf.**

Notes: The Concrete Caps were inspected by the underwater inspectors during this inspection cycle.

CS-3:

_Bent 2 cap has up to 18" L x 1/8" W, vertical and horizontal cracks with corrosion bleed-out in the SW corner. **NO CHANGE**

_Bent 2 cap north face also has a full length x high cap, vertical and horizontal cracks with corrosion bleed-out. **UW Photo 07. INCREASE**

_Bent 2 cap south face is delaminated up to full length x 15" H, with corrosion bleed-out. **NO CHANGE**

_Bent 2 cap south face has a spall 15" x 3" x 1-1/2", over pile 2-5. **NO CHANGE**

290 Channel **1 ea.**

CS-1: **1**

_Gravel placed along the abutments and wing walls is being displace by tide currents resulting in exposure of several piles. The gravel continues to be displaced, but no corrective action is required during this inspection cycle. **NO CHANGE**

475 R/Concrete Walls **36 lf.**

CS-3: **5**

_The NW wingwall at the junction to the private sector has a diagonal crack 17" x 1/16", with corrosion bleed-out. **UW Photo 08. NEW**

_The NW wingwall at the West end has (2) horizontal cracks up to 40" L x 1/16", with corrosion bleed-out. **NEW**

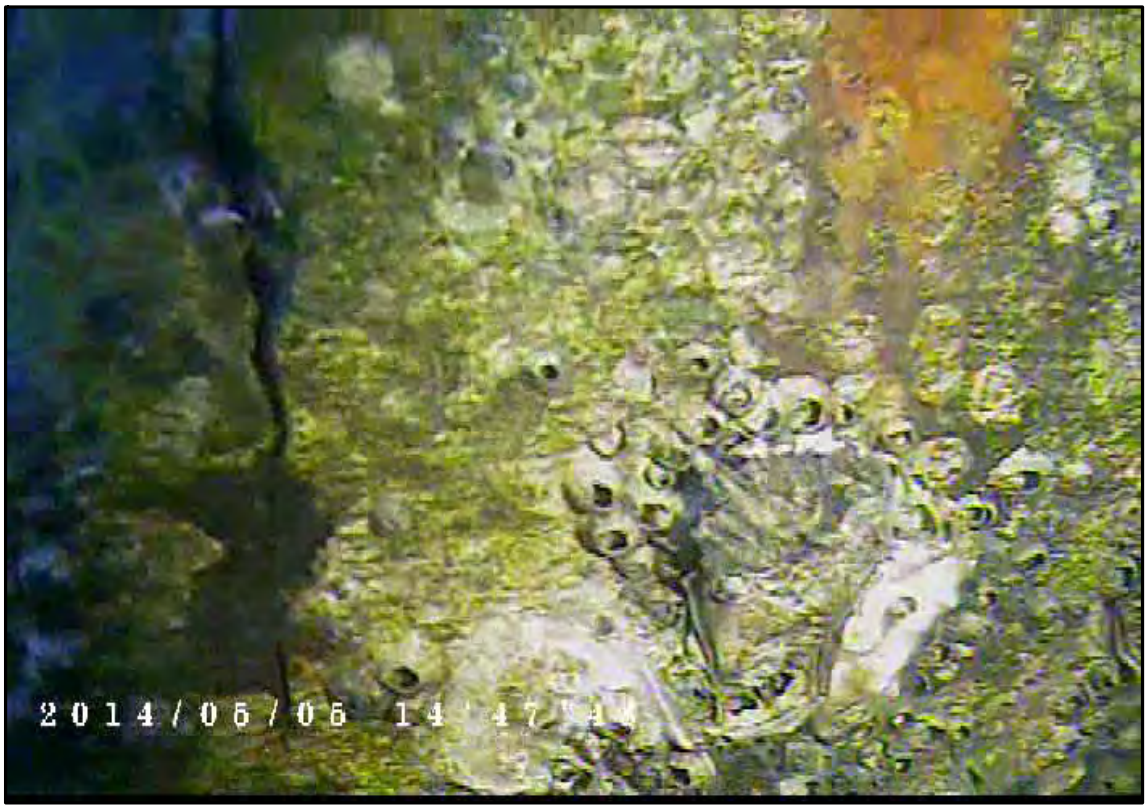
F: PHOTO SECTION

Description: Top: Deck underside, Span 1 has a piece of protruding all-thread. **UW Photo 01.**
Bottom: Span 1, 6' from East end, at Abutment 1, spall/delamination. **UW Photo 02.**

F: PHOTO SECTION

Description: Top: East arch bottom face adjacent to abutment 1 has a delamination. **UW Photo 03.**
Bottom: West arch, Span 2 bottom fascia has a spall/delamination. **UW Photo 04.**

F: PHOTO SECTION



Description: Top: Both abutment caps have vertical cracks with corrosion bleed-out. **UW Photo 05**
Bottom: Abutment 3 cap, spall/delamination under Slab Unit 2-1. **UW Photo 06**

F: PHOTO SECTION

Description: Top: Bent 2 cap North face, vertical and horizontal cracks. **UW Photo 07**
Bottom: NW wingwall at the junction to the private sector diagonal crack. **UW Photo 08**

H: RECOMMENDED REPAIRS

99 P/S Concrete Slab (underside only)

_Remove all unsound concrete and patch as needed in span 1.

215 R/Concrete Abutment

_Remove all unsound concrete and patch and epoxy inject all the cracks at both abutments.

234 Concrete Cap

_Remove all unsound concrete and patch. Epoxy inject all the cracks at Bent 2 and 3.

475 R/Concrete Walls

_Epoxy inject all the cracks at the NW wingwall as needed.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	8.6	8.9
1.5	11.0	11.1
2	8.6	9.2

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 6.8 ft. and right: 7 ft. at mid-channel.
Maximum Channel depth: 4.2 ft. (low tide)

BRIDGE INSPECTION REPORT

Bridge Number: 865783 **Bridge Name:** Harborage Isle Drive over New River Sound

Topside Inspection Complete: 5/08/2014

Underwater Inspection Complete: 5/12/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	**Initials**
Lawes, Donville – Bridge Inspector (CBI #0326) (lead)	_____
Jassin, Ben – Engineering Intern	_____
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	_____
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	_____
Alvarez, Mariano – Assistant Bridge Inspector/Tender	_____
Tamayo, Williams – Assistant Bridge Inspector/Tender	_____

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants _____

Prepared for:	**Prepared by:**
City of Fort Lauderdale	TranSystems Corporation Consultants

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SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 94 ft. long, three (3) span, prestressed concrete slab bridge constructed in 2012. The bridge has a roadway width of 24 ft. and carries two lanes of traffic in a residential neighborhood. There is a 4 ft. 5 in. sidewalk on the west side of the bridge. The bridge provides the only access to residences north of the bridge. The bridge is not classified as Functionally Obsolete, nor is it Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on the results of a July 2008 load rating documented as part of the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and it is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The asphalt overlay within the travel lanes has up to $^{1}/_{8}$ in. wide transverse cracks over both abutments. See Condition Photo 1.
- The west sidewalk has up to full width x $^{1}/_{64}$ in. wide transverse cracks in all spans.
- There is a $^{1}/_{16}$ in. wide longitudinal crack near the center line of the roadway.

Deck Underside

- The underside of the slab units exhibit several $^{1}/_{32}$ in. wide cracks with efflorescence over each bent. See Condition Photo 2.

Utilities

- There is a 7 in. ductile iron utility pipe and a 2½ in. steel utility pipe along the west side of the structure.
- There is a 5 in. ductile iron utility pipe along the east side of the structure.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- There are areas of exposed fabric in the rock rip rap areas at both abutments.

Intermediate Bents

- The piles are covered in heavy marine growth starting 1 ft. 6 in. below the caps.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall very good condition. The conditions are unchanged from the 2012 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, with no specific conditions noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slab

- In the southbound lane of the north approach slab there is a full approach slab length x $^{1}/_{16}$ in. wide longitudinal crack.
- Both approach slab-approach roadway transitions have transverse cracks up to $^{1}/_{16}$ in. wide.
- There is no approach guardrail system or object markers provided for the structure.

Wingwalls

- Pile 1 at the northwest wingwall has a 9 in. x 3 in. x ½ in. spall on the southeast corner, 8 in. below the cap. See Underwater Inspection Report Photo 1. This condition was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge was constructed in 2012 and is in very good condition based on National Bridge Inspection Standards and FDOT guidelines. The bridge elements have few deficiencies, and those that exist are not significant enough to warrant repair or rehabilitation. The bridge is not load posted, nor is posting required.

GEOMETRIC DEFICIENCIES

There are no apparent geometric deficiencies.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

RECOMMENDATIONS AND PROBABLE COSTS

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term.

LONG TERM

There are no conditions at the bridge that require structural repairs, or indicate that repairs will be needed, to maintain the bridge, without weight restrictions, for the next 20 years.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

North Approach Looking South

Bridge ID

GENERAL PHOTOS OF BRIDGE

Southeast Corner

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

Typical Deck Underside and Intermediate Bent. Note Utility Pipe.

Channel Looking West

GENERAL PHOTOS OF BRIDGE

Channel Looking East

LOCATION MAP

CONDITION PHOTOS

Photo 1 – Cracks in the asphalt overlay.

Photo 2 – Cracks in the slab unit over each bent.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865783** Date: **12-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865783 UW Inspection Date: 5/12/2014

Bridge Name: N/A

Road Name/Number: HARBORAGE Isle Dr.

Feature Intersected: New River Sound.

Location: 200ft North of Isla Bahia Dr.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	11.4 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Con Abutment
Water Temp.:	81°		290 Channel, 396 Abut Slope Protection
Weather:	83° Sunny		475 R/Concrete Walls
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

Personnel / Title / Number **Initials**

Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).
Alvarez, Mariano - Assistant Bridge Inspector / Tender.
Tamayo, Williams - Assistant Bridge Inspector / Tender.

Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)

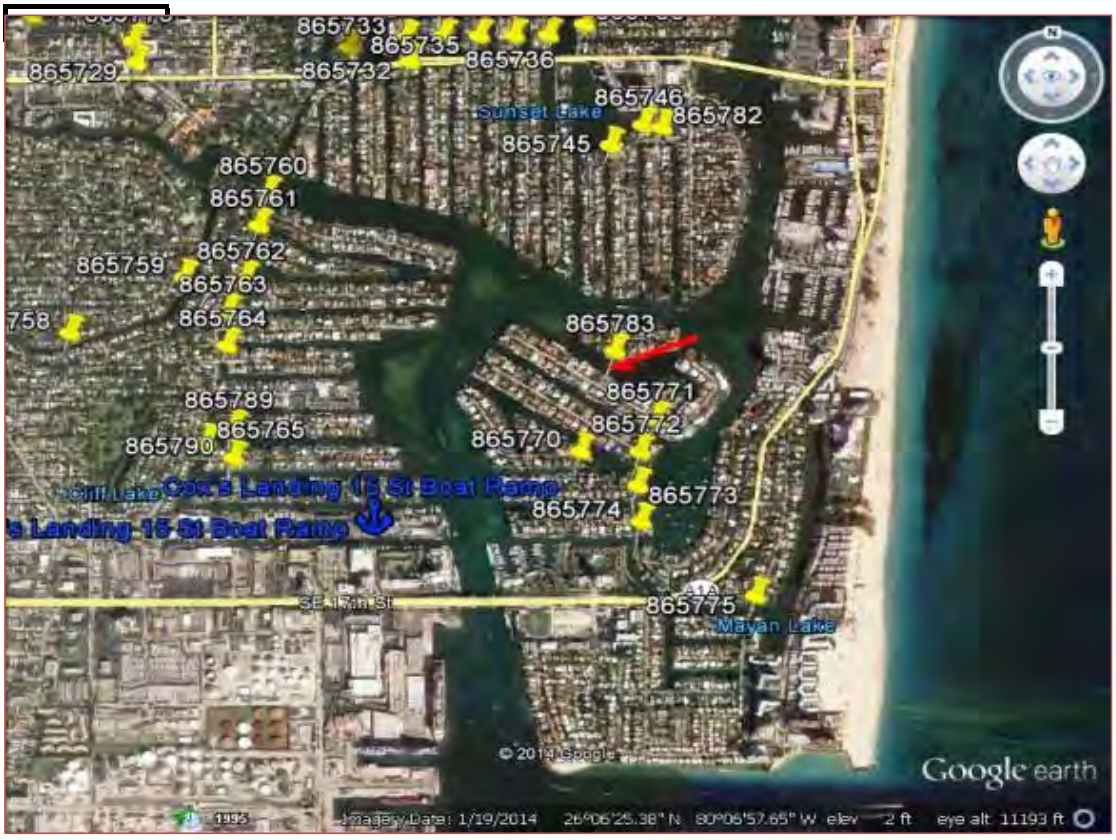
Soria, Miguel, Professional Engineer (P.E. # 49359)

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 5/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865783** Date: **12-May-14**

A: LOCATION MAP



Description: 400ft South of Del Lago Dr.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**
204 P/S Concrete Column	**24 ea.**

Note:
_Piles were inspected from cap down by underwater inspectors.
_The Piles are covered heavy marine growth starting 18in. below the caps. Some piles were cleaned at random locations during this inspection cycle.

_No deficiency noted during this inspection cycle.

290 Channel **1 ea.**

CS-1:
_There is rip-rap rock place at both Abutments with some of the fabric exposed in random areas.
NO CHANGES

396 Abut Slope Protection **1800 sf.**

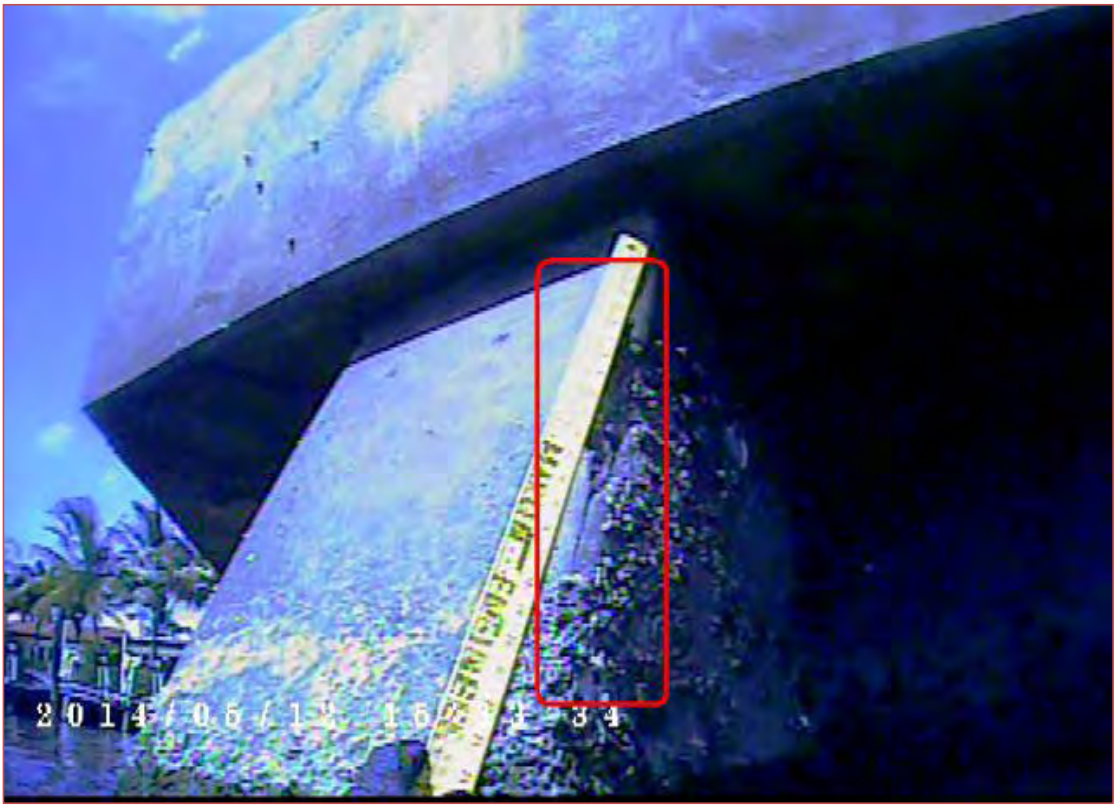
CS-1:
_There is rip-rap rock place at both Abutments with some of the fabric exposed in random areas.
NO CHANGES

475 R/Concrete Walls

Note:
_The retaining walls were inspected from the high watermark to the ground-line by the underwater inspectors during this inspection cycle.

CS-2:
_NW wingwall, pile 1 has a spall 9" x 3" x 1/2", on the SE corner, 8" below the cap. **UW Photo 01. NEW**

F: PHOTO SECTION



Description: NW wingwall, Pile 1 spall 9" x 3" x 1/2", on the SE corner, 8" below the cap. **UW Photo 01.**

H: RECOMMENDED REPAIRS

475 R/Concrete Walls

_Seal the crack, on the NW wingwall, Pile 1, SE corner, 8" below the cap.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	12.4	13.1
2	19.2	21.6
2.5	20.2	21.4
3	16.5	16.4
4	11.8	13.5

Notes: Measurements were taken from the top of the concrete railing wall.
Waterline on the left: 10ft. and right: 10ft. at mid-channel.
Maximum Channel depth: 11.4 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865789 **Bridge Name:** SE 15th Avenue over Marcheta River

Topside Inspection Complete: 5/12/2014
Underwater Inspection Complete: 5/13/2014

Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

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SCOPE OF WORK

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Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 137.7 ft. long, three (3) span, prestressed concrete slab bridge constructed in 2013. The bridge has a roadway width of 23 ft. and carries two lanes of traffic in a residential neighborhood. The bridge provides the only access to the residences north of the bridge. There is a 5 ft. sidewalk on the west side of the bridge. The bridge is not classified as Functionally Obsolete, nor is it Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 2007 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and it is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The east fascia over Bent 3 exhibits 2 vertical cracks up to 2 ft. 6 in. high x $^{1}/_{64}$ in. wide with efflorescence. See Condition Photo 1.

Utilities

- There is a 5 in. unknown steel utility along the west side of the west bridge rail and a 7 in. unknown steel utility along the east side of the east bridge rail.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Prestressed Concrete Slab Units

- No deficiencies were noted.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- No deficiencies were noted.

Intermediate Bents

- The north and south faces of the Bent 3 cap exhibit 2 ft. 5 in. high x $^{1}/_{64}$ in. wide vertical cracks over Piles 3-1, 3-2, 3-3 and between Beams 3-2 and 3-3. See Condition Photo 2.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is a 1 ft. 6 in. long pile cut-off south of Pile 6-1.
- There is small construction debris, less than 6 in. high, throughout the channel.
- The predrilled hole for Pile 2-6, 1 ft. 8 in. deep x 8 in. wide, has not been filled in. See Underwater Inspection Report Photo 2. This was not previously noted.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Approach Slabs

- The approach slabs are not visible due to an overlay of asphalt.

Slope Protection

- The rock rubble rip-rap at both Abutments has areas of exposed fabric. This was not previously noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge was constructed in 2012 and is in very good condition based on National Bridge Inspection Standards and FDOT guidelines. The bridge elements have few deficiencies, and those that exist are not significant enough to warrant repair or rehabilitation. The bridge is not load posted, nor is posting required.

GEOMETRIC DEFICIENCIES

There are no apparent geometric deficiencies.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences north of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

RECOMMENDATIONS AND PROBABLE COSTS

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term.

LONG TERM

There are no conditions at the bridge that require structural repairs, or indicate that repairs will be needed, to maintain the bridge, without weight restrictions, for the next 20 years.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

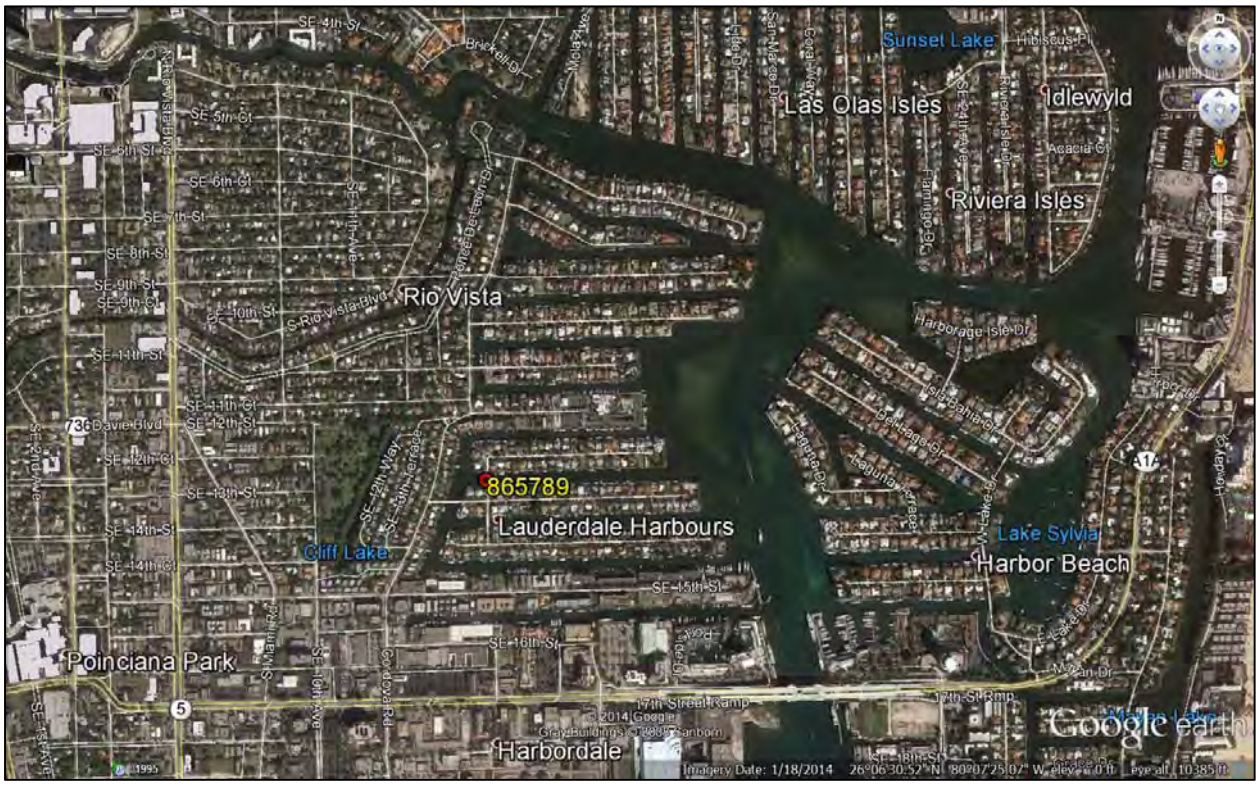
Slab Underside and Abutment. Note Utility Pipe.

Channel Looking West

GENERAL PHOTOS OF BRIDGE

Channel Looking East

LOCATION MAP



CONDITION PHOTOS

Photo 1 – Vertical cracks in the east fascia over Bent 3.

Photo 2 – Cracks in the south face of the Bent 3 cap.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865789** Date: **13-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865789 UW Inspection Date: 5/13/2014

Bridge Name: N/A

Road Name/Number: SE 15th AVE.

Feature Intersected: Marcheta River.

Location: 100 ft North of SE 13th Street.

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	6 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		215 R/Concrete Abutment
Water Temp.:	81°		234 R/Concrete Cap
Weather:	84° Sunny		475 R/Concrete Walls, 290 Channel
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

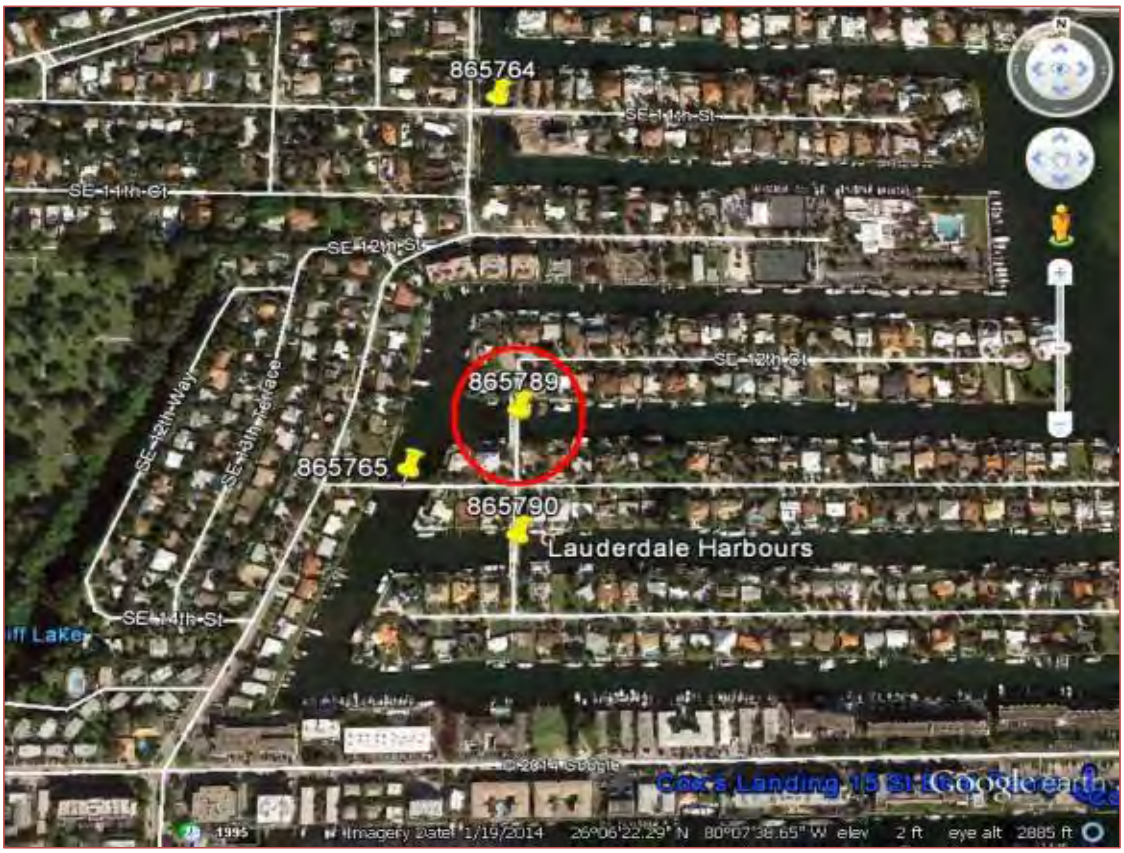
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER 7/15/14

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865789** Date: **13-May-14**

A: LOCATION MAP



Description: 100 ft North of SE 13th Street.

E: ELEMENT NOTES

Notes:
_The Underwater inspection was conducted from the high watermark to the ground-line.

Element	**Quantity**

204 P/S Concrete Column **12 ea.**

Note: Several piles were cleaned at random locations.

_No deficiency noted during this inspection cycle.

215 R/Concrete Abutment **72 lf.**

Note: Abutment backwalls were inspected by the Underwater inspectors during this inspection cycle.

_No deficiency noted during this inspection cycle.

396 Other Abutment Slope Protection. **1,088 sf.**

Note: This Element represents the rock rubble slope protection in front of the Abutments and retaining walls. **UW Photo 01.**

CS-1:
_The rock rubble at both Abutments has some of the fabric exposed in random areas. **NEW**

290 Channel **1 ea.**

CS-1: **1**
_The rock rubble at both Abutments has some of the fabric exposed in random areas. **NEW**
_There is an 18" long pile cut-off South of Pile 6-1. **NO CHANGE.**
_There is small construction debris, less than 6" high, through the channel. **NO CHANGE.**
_Pile 2-6, the predrilled hole (up to 20" Deep x 8" Wide) has not filled in. **UW Photo 02. NEW.**

475 R/Concrete Walls **78 lf.**

Note: The retaining walls were inspected from below the bulkhead to the ground-line by the Underwater inspectors during this inspection cycle.

_No deficiency noted during this inspection cycle.

F: PHOTO SECTION

Description: Top: Rock rubble slope protection at the Abutments and retaining walls. **UW Photo 01.**
Bottom: Pile 2-6, the predrilled hole (20" D x 8" W) has not filled in. **UW Photo 02.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

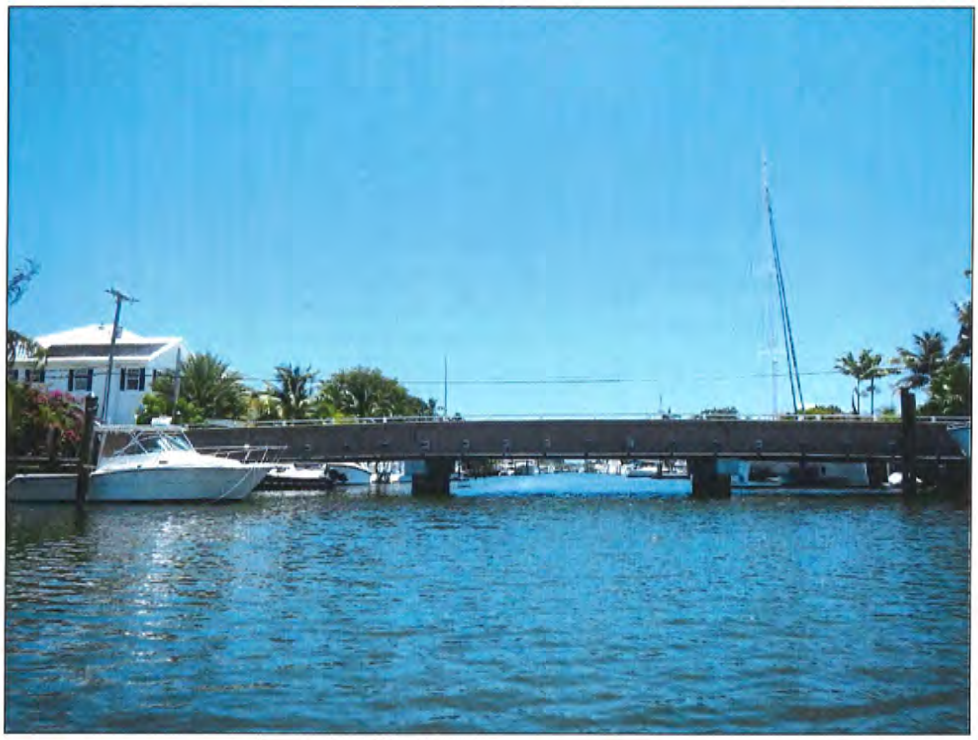
Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.5	9.5
2	17.2	16.0
2.5	16.3	16.1
3	15.7	15.5
4	9.8	10.0

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 11.4 ft. and right: 11.2 ft. at mid-channel.
Maximum Channel depth: 6 ft.

BRIDGE INSPECTION REPORT

Bridge Number: 865790 **Bridge Name:** SE 15th Avenue over Carlotta River



Topside Inspection Complete: 5/12/2014
Underwater Inspection Complete: 5/13/2014
Report Date: 7/18/2014

Inspection Personnel / Title / Number	Initials
Gutierrez, Carlos – Bridge Inspector (CBI #0492) (lead)	CG
Jassin, Ben – Engineering Intern	
Porras, Omar – Lead Underwater Bridge Inspector (CBI #0368)	
Hayes, Steven – Bridge Inspector/Diver (CBI #0438)	
Alvarez, Mariano – Assistant Bridge Inspector/Tender	
Tamayo, Williams – Assistant Bridge Inspector/Tender	

Shaup, Steven A. - Professional Engineer (PE #52099)
TranSystems Corporation Consultants

STEVEN A. SHAUP LICENSE No 52099 STATE OF FLORIDA PROFESSIONAL ENGINEER

7/18/14

Prepared for:

City of Fort Lauderdale

Prepared by:

TranSystems Corporation Consultants

TABLE OF CONTENTS

SCOPE OF WORK

TranSystems has been retained by the City of Fort Lauderdale to perform bridge inspections and prepare bridge inspection reports for each of the City's bridges as part of the project Structural Bridge Engineering Consulting Services Master Plan, RFQ No. 946-11310. Inspections were completed and reports prepared for 46 of the City's bridges. The remaining five bridges in the City's inventory were not inspected because they are in the process of being replaced.

Field inspection included a review of all visible bridge structural elements. Inspection of substructure elements below the waterline, including bridge bulkheads, was performed by Marlin Engineering, Inc., using a four person team consisting of three individuals to meet Occupational Safety and Health Administration (OSHA) and Association of Diving Contractors International, Inc. (ADCI) commercial diving standards, with an additional individual attending video equipment used to document the underwater inspection. Deterioration visible to inspectors was documented. Bulkheads and seawalls outside the limits of the bridge width were not included in the field inspection, or included in the deficiency report.

Per the scope of work, a bridge inspection report has been prepared for each bridge inspected. This report includes all deficiencies noted during the inspection, organized by bridge component. Photographs have been included as warranted to supplement and support noted conditions, as well as clarify conditions and locations. In addition to documentation of deficiencies, each report includes discussion of necessary short term and long term recommendations. Short term recommendations reflect the need for repairs to be performed now, and focus on serious conditions that may require action before the long term recommendations could be implemented. Long term recommendations are grouped into five year program windows, i.e. 0-5 years, 6-10 years, 11-15 years and 16-20 years from the time of inspection, and focus on anticipated remaining life and the need for rehabilitation or replacement. Opinions of probable costs have been provided for both short term and long term recommendations.

CURRENT CONDITIONS

The bridge is a 136 ft. long, three (3) span, prestressed concrete slab bridge constructed in 2013. The bridge has a roadway width of 23 ft. and carries two lanes of traffic in a residential neighborhood. There is a 5 ft. sidewalk on the west side of the bridge. The bridge provides the only access to residences south of the bridge. The bridge is not classified as Functionally Obsolete or Structurally Deficient. See General Photos of Bridge in the Addendum.

Based on a December 2007 load rating done by others for the FDOT Local Government Bridge Inspection Program, the bridge does not require posting and is currently not posted.

The bridge inspections were led by Florida Certified Bridge Inspectors, following Florida Department of Transportation (FDOT) guidance regarding numbering of elements, in order to easily be compared with previous and future bridge inspection reports provided to the City by the FDOT. General photographs of the bridge and specific condition photos, referenced throughout the report, are included as an Addendum.

DECK

The top surface of the deck is covered by an asphalt overlay; however, per Federal Highway Administration (FHWA) and FDOT bridge inspection guidance, the condition of the wearing surface is not to be considered in the overall deck evaluation. In addition, they prescribe that the conditions of joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, stay-in-place metal deck forms, and scuppers shall not be considered in the overall deck evaluation. See Table 1 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 1 - OVERALL CONDITION RATING GUIDANCE FOR CONCRETE DECKS

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the deck.
8	VERY GOOD - Minor transverse cracks and no spalling, scaling, delamination or water saturation.
7	GOOD - Sealable deck cracks, light scaling (less than 6 mm depth) or less than 10% of the deck is water saturated. This area would include any repaired areas and/or areas in need of corrective action. No spalling but with visible tire wear in the wheel lines.
6	SATISFACTORY - Excessive number of open cracks with or without efflorescence (excessive being at 1.5 meter intervals or less over the entire deck). Medium scaling (6 mm to 13 mm in depth), 2% or less of the deck spalled, or 10% to 20% of the deck area is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Deterioration of deck edges or around scuppers. Some partial but no full depth failures.
5	FAIR - Excessive cracking resulting in 2% to 5% of the deck spalled. Heavy scaling (13 mm to 25mm in depth) or 20% to 40% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Disintegration of deck edges or around scuppers. Some partial and full depth failures. Considerable leaching through deck.
4	POOR - More than 5% of the deck is spalled or 40% to 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures present or imminent. Leaching throughout deck.
3	SERIOUS - More than 60% of the deck is water saturated and/or deteriorating. This area would include any repaired areas and/or areas in need of corrective action. Many full depth failures. This rating will apply if severe or critical signs of structural distress are visible on bridges where the deck is integral with the superstructure.
2	CRITICAL - The deck has advanced deterioration. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE - The bridge deck is considered unsafe for vehicular use and the bridge is closed; however, corrective action may enable the structure to be placed into light service.
0	FAILED - The bridge deck is Out-of-Service and replacement is necessary.

The deck is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Deck Top

- The deck top exhibits shrinkage cracks up to 16 ft. long x $^{1}/_{64}$ in. wide. See Condition Photo 1.
- The west sidewalk exhibits transverse cracks up to 5 ft. long x $^{1}/_{64}$ in. wide.

Railings/Barriers

- The concrete barriers exhibit vertical cracks with efflorescence up to 3 ft. 6 in. high x $^{1}/_{64}$ in. wide.

Utilities

- There is a 5 in. unknown steel utility along the west side of the west bridge rail and a 7 in. unknown steel utility along the east side of the east bridge rail.

SUPERSTRUCTURE

The superstructure rests upon the substructure elements and supports the deck. The overall condition of the superstructure is based on the condition of the beams; secondary members, bearings, joints, etc., are not included in this rating. See Table 2 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 2 - OVERALL CONDITION RATING GUIDANCE FOR PRESTRESSED CONCRETE SUPERSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable
9	EXCELLENT - New condition.
8	VERY GOOD - No problems noted.
7	GOOD - Non-structural cracks less than 0.4 mm in width may be evident. No rust stains apparent.
6	SATISFACTORY - Minor concrete damage or deterioration. Non-structural cracks over 0.4 mm. Isolated and minor exposure of mild steel reinforcement may be present.
5	FAIR - Isolated and minor exposure of prestressing stands may be present. Structural cracks with little or no rust staining. Primary members sound, but may be cracked or spalled.
4	POOR - Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present. May be loss of camber.
3	SERIOUS - Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s), or strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section in the web, but not occurring at the same location as of concrete section in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.
2	CRITICAL - Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following: a. Cracks extend across the bottom flange or in the web directly above the bottom flange damage that are not closed below the surface damage. (This indicates that the prestressing strands have exceeded yield strength.) b. An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands. (This also indicates that the prestressing strands have exceeded yield strength.) c. Loss of prestress force to the extent that calculations show that repair cannot be made. d. Excessive vertical misalignment. Longitudinal cracks at the interface of the web and the top flange that are not substantially closed below the surface damage. (This indicates permanent deformation of stirrups.)
1	"IMMINENT" FAILURE - Critical damage requiring the replacement of a member. Bridge is closed to traffic, and installation of temporary falsework to safeguard the public and the bridge should be taken at the time of inspection.
0	FAILED - Bridge closed and out-of-service.

The superstructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Precast Concrete Slab Units

- The right (east) edge of Slab Unit 2-3 has an 1 ft. 6 in. x 5 in. delamination, 12 ft. from Bent 3.

Bearings

- The bearings are not visible for inspection.

SUBSTRUCTURE

The substructure supports the deck and superstructure and generally consists of piers, abutments, piles, fenders, footings, or other substructure elements. The presence of scour may have a significant effect on the overall condition of the substructure if it has had significant effects. See Table 3 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 3 - OVERALL CONDITION RATING GUIDANCE FOR SUBSTRUCTURE

CODE	DESCRIPTION
N	Not Applicable.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.
8	VERY GOOD- Shrinkage cracks, light scaling or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
7	GOOD - Minor deterioration or initial disintegration, minor water saturation, cracking with some leaching or spalls on concrete or masonry unit with no effect on bearing area. Leakages of expansion devices have initiated minor cracking. Some rusting of steel without section loss. Insignificant decay, cracking, splitting or crushing of timber.
6	SATISFACTORY- Moderate deterioration or disintegration, spalls, moderate cracking and leaching on concrete or masonry units with little or no loss of bearing area. Initial (discernible) loss of steel section. Moderate decay, cracking, splitting or crushing of timber.
5	FAIR - Many concrete or masonry units show loss with exposed reinforcing steel. Significant but minor (measurable) section loss in steel members. Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing or backfilling is required. For fracture critical members, defective welds, nicks or gouges without fatigue cracks.
4	POOR - Structural cracks in concrete and masonry units. Extensive section loss in steel members. For fracture critical members, defective welds, nicks or gouges without corresponding fatigue cracks located in the steel which are parallel to the primary stress. Some piling and/or timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.
3	SERIOUS - Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. For fracture critical members: any crack in the steel which is perpendicular to the primary stress will result in serious consideration of bridge closure and immediate repair of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.
2	CRITICAL - Concrete cap may be soft and spalling with bottom row of reinforcing steel exposed with no bond to the concrete. Top of pier cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.
1	"IMMINENT" FAILURE - Bridge is closed to vehicular traffic. Corrective action may put the structure back into light service.
0	FAILED - The bridge is Out-of-Service. Replacement of the substructure is required.

The substructure is in very good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

Abutments

- There are areas of exposed fabric in the rock rip rap areas at both abutments. This was not previously noted.

Intermediate Bents

- The northeast corner of Pile 2-1 has a 1 ft. 1 in. x 3 in. x ¾ in. spall adjacent to the cap.

CHANNEL

This item deals with the overall physical condition associated with the flow of water through the bridge or culvert. Stream stability and the condition of the channel, riprap, slope protection or stream control devices, such as spur dikes, are included in the evaluation. See Table 4 for condition guidance provided in the FDOT Bridge Management System Coding Guide, dated September 2013.

Table 4 - OVERALL CONDITION RATING GUIDANCE FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD- Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition.
7	GOOD - Bank protection is in need of minor repairs. River controls devices and embankment protections have minor damage. Banks and/or channel have minor amounts of drift.
6	SATISFACTORY - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.
5	FAIR - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	POOR - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS - Bank protection has failed completely. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL - The waterway has changed to the extent that the bridge is near a state of collapse.
1	"IMMINENT" FAILURE - Bridge closed because of channel failure. Corrective action may put the structure back into light service.
0	FAILED - Bridge closed because of channel failure. Replacement necessary.

The channel is in overall good condition, based on the conditions described below. The conditions are generally unchanged from the 2013 inspection report conducted as part of the

Florida Department of Transportation Local Government Bridge Inspection Program, unless otherwise noted.

- There is small construction debris, less than 6in. high, throughout the channel.
- Several of the predrilled holes around the piles have not filled in. The holes measure up to 2 ft. deep x 8 in. wide. See Underwater Inspection Report Photo 1.
- South of Bent 3 there are several pieces of rebar extending up to 2 ft. above the groundline.

MISCELLANEOUS ELEMENTS

This section includes elements of the bridge and approaches that are not clearly defined as deck, superstructure, substructure or channel related components.

Slope Protection

- No deficiencies were noted.

Approach Slab

- The approach slabs are not visible due to an overlay of asphalt.

Wingwalls

- No deficiencies were noted.

DISCUSSION OF BRIDGE CONDITION AND WORK NEEDED

EXISTING BRIDGE CONDITION AND CAPACITY

The bridge was constructed in 2012 and is in very good condition based on National Bridge Inspection Standards and FDOT guidelines. The bridge elements have few deficiencies, and those that exist are not significant enough to warrant repair or rehabilitation. The bridge is not load posted, nor is posting required.

GEOMETRIC DEFICIENCIES

There are no apparent geometric deficiencies.

ESSENTIALITY OF BRIDGE

The bridge is the only means of access to the residences south of the bridge. Closing the bridge is not a feasible option, because it is used by residents, service vehicles and emergency vehicles.

RECOMMENDATIONS AND PROBABLE COSTS

As to any opinion of probable costs for both short term and long term recommendations, TranSystems has no control over the current or future costs or current or future price of labor, equipment or materials, or over any Contractor's method of pricing. The opinions of probable construction costs provided in the following sections are based on the qualifications and experience of TranSystems' staff. TranSystems makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

SHORT TERM

There are no conditions at the bridge that require structural repairs to ensure bridge longevity in the short term.

LONG TERM

There are no conditions at the bridge that require structural repairs, or indicate that repairs will be needed, to maintain the bridge, without weight restrictions, for the next 20 years.

GENERAL PHOTOS OF BRIDGE

West Elevation

North Approach Looking South

GENERAL PHOTOS OF BRIDGE

North Approach from Bridge

South Approach from Bridge

GENERAL PHOTOS OF BRIDGE

South Approach Looking North

Typical Bridge Railing

GENERAL PHOTOS OF BRIDGE

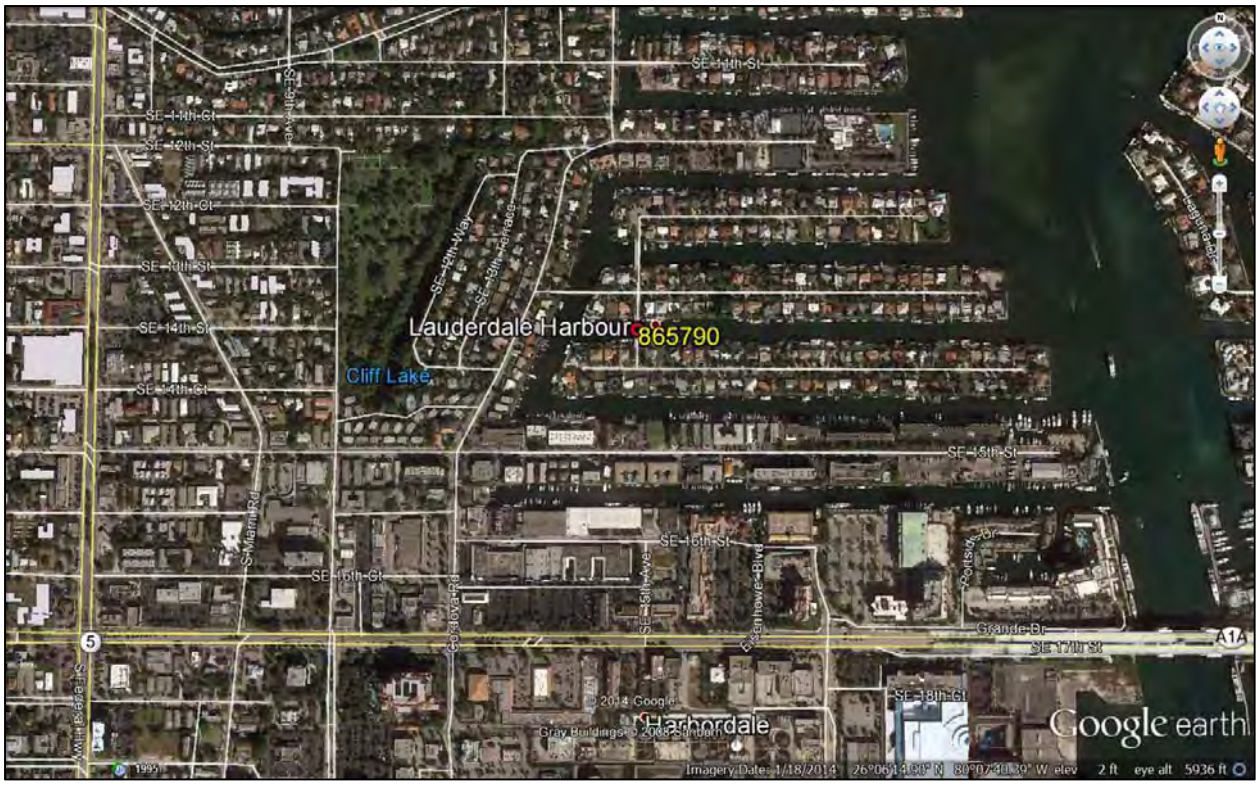
Slab Underside and Intermediate Bent. Note Utility Pipe.

Channel Looking West

GENERAL PHOTOS OF BRIDGE

Channel Looking East

LOCATION MAP



CONDITION PHOTOS

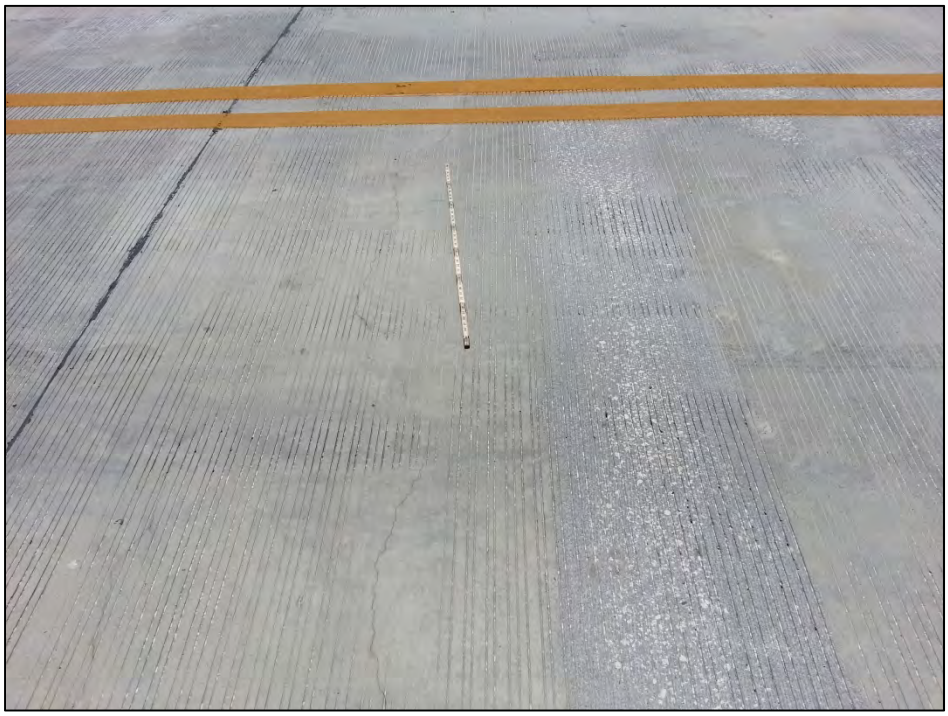


Photo 1 – Cracks in the Deck Top.

UNDERWATER INSPECTION REPORT

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865790** Date: **13-May-14**

ROUTINE UNDERWATER REPORT

Prepared by: Marlin Engineering, Inc.

2191 NW 97th Ave. Miami, Fl 33172
Phone: 305-477-7575

CONTENTS OF REPORT

PREPARED FOR: TRANSYSTEMS CORPORATION AND CONSULTANT
BY: MARLIN ENGINEERING, INC.

REPORT IDENTIFICATION

Bridge No.: 865790 UW Inspection Date: 5/13/2014

Bridge Name: N/A

Road Name/Number: SE 15th Avenue

Feature Intersected: Carlotta River

Location: 100 ft South of SE 13th Street

Type of Inspection: [X] Routine UW [ ] Interim [ ] Initial [ ] Special

INSPECTION CONDITIONS

Maximum Depth:	5.9 ft.	Equipment Used:	Dive Boat, Dive Gear, Dive Flag, Camera,
Water Type:	Salt water		Inspection Tools, U/W Lights.
Currents:	None		Probing Device, Profile Equipment
Visibility:	3 ft.	Elements Inspected:	204 P/S Concrete Column
Bottom:	Muck		290 Channel
Water Temp.:	81°		396 Other Abutment Slope Protection
Weather:	85° Sunny		
Special Crew Hours:	2 hrs x 3 inspectors	Hazards:	Boat Traffic, Stinging Hydroids, Sharks

Critical Deficiency Notes: None

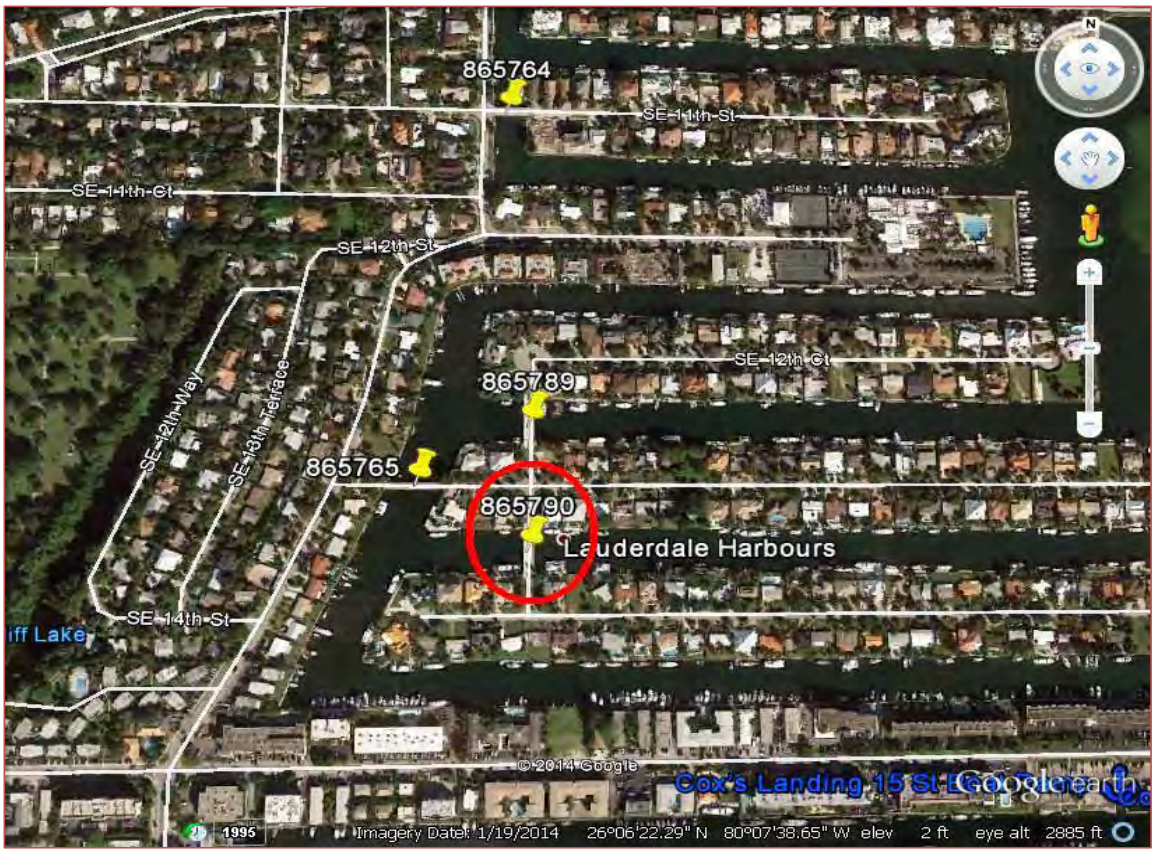
Personnel / Title / Number	Initials
Porras, Omar - Senior Diver Bridge Inspector (CBI # 368) Lead	OP
Hayes, Steven - Bridge Inspector / Diver (CBI # 438).	
Alvarez, Mariano - Assistant Bridge Inspector / Tender.	
Tamayo, Williams - Assistant Bridge Inspector / Tender.	
Vazquez, Eduardo - Bridge Inspection Supervisor (CBI # 369)	
Soria, Miguel, Professional Engineer (P.E. # 49359)	

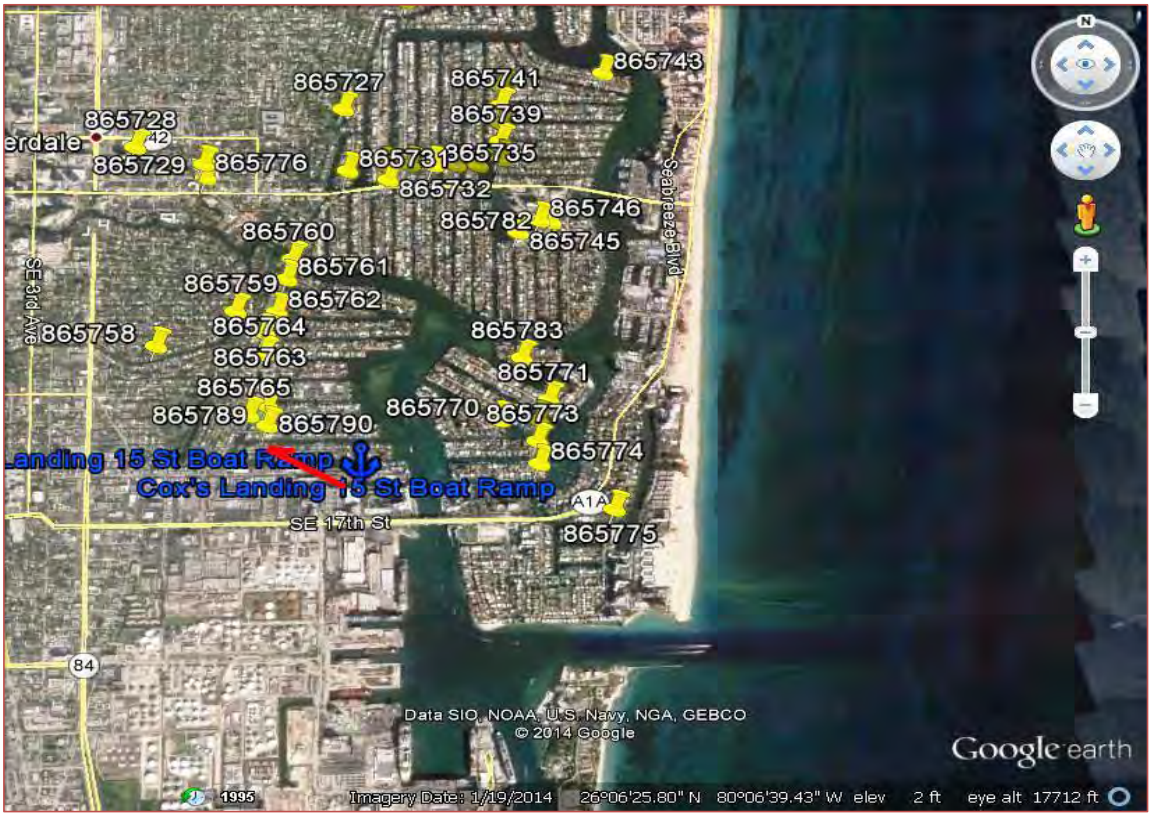
MIGUEL SORIA LICENSE No 49359 STATE OF FLORIDA PROFESSIONAL ENGINEER

UNDERWATER BRIDGE INSPECTION REPORT

Bridge No. : **865790** Date: **13-May-14**

A: LOCATION MAP





Description: 100 ft South of SE 13th Street

E: ELEMENT NOTES

Notes: The Underwater inspection was conducted from the high watermark to the ground-line.

Element **Quantity**

204 P/S Concrete Column **12 ea.**

Note: Several piles were cleaned at random locations.

CS-2: **1**
_Pile 2-1, NE corner has a spall 13" x 3" x 3/4", 22" below the cap. **NO CHANGE.**

396 Other Abutment Slope Protection **1,088 sf.**

Note: This Element represents the rock rubble in front of the abutments and retaining walls. The rock rubble is underwater.

CS-1: **1,088**
_There are areas along the rock rubble where the fabric is exposed. **NEW**

290 Channel **1 ea.**

CS-2: **1**
_There is small construction debris, less than 6" high, throughout the channel. **NO CHANGE**
_Several of the predrilled holes around the piles have not filled in. Measuring up to 24" Deep x 8" Wide. **UW Photo 01. NO CHANGE.**
_South of Bent 3 there are several pieces of rebar extending up to 24", above the groundline. **NO CHANGE.**

475 R/Concrete Walls **78 lf.**

Note: This Element represents both abutment backwalls and all four retaining walls.

_No deficiency noted during this inspection cycle.

F: PHOTO SECTION

Description: Several of the predrilled holes around the piles have not filled in. **UW Photo 01.**

H: RECOMMENDED REPAIRS

_No corrective action require during this inspection cycle.

I: SCOUR EVALUATION

Sounding Data - Numerical Summary

Bent #	Left Height (ft.)	Right Height (ft.)
1	9.9	10.9
2	16.8	16.6
2.5	16.1	16.2
3	16.6	16.4
4	11.6	10.1

Notes: Measurements were taken from the top of the concrete barrier.
Waterline on the left: 10.8 ft. and right: 10.9 ft. at mid-channel.
Maximum Channel depth: 5.3 ft.