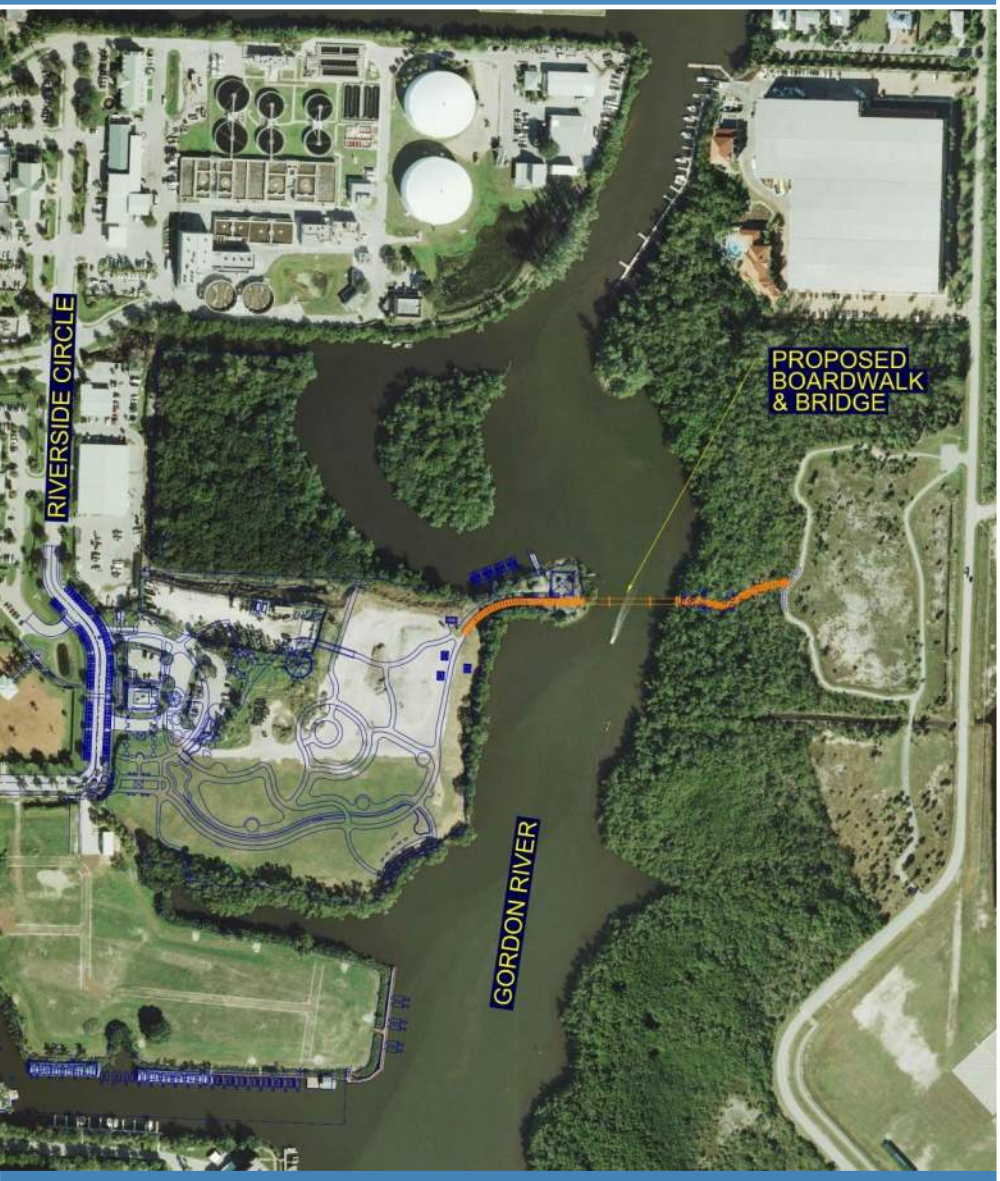
Gordon River Greenway Connector Bridge

City of Naples, Florida



Preliminary Design Report

CDM Smith Project No. 6680-104728

December 4, 2014

CDM Smith

Preliminary Design Report
Gordon River Greenway Connector Bridge

Submitted to:

CITY OF NAPLES, FLORIDA
STREETS AND STORMWATER DEPARTMENT
295 RIVERSIDE CIRCLE
NAPLES, FL 34102

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In accordance with Section 471 of the Florida Statutes, this Report was prepared under the direct supervision of a Professional Engineer registered in the State of Florida.

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Table of Contents

List of Figures

List of Tables

Executive Summary

CDM Smith Inc. (CDM Smith) was contracted by the City of Naples, Florida (City) on June 11, 2014 to prepare a Preliminary Design Report (PDR) at the 30 percent design stage for the Gordon River Greenway Connector Bridge (GRGCB) and associated boardwalks. The bridge and boardwalks are part of the Gordon River Greenway park system, which has the support of the City Council as well as the public at large.

Environmental assessments and an evaluation of permitting requirements was performed by Turrell, Hall and Associates, Inc. (THA) under contract to CDM Smith. Work elements performed by THA included wetlands delineation, a submerged resources survey, protected species survey, and a desktop cultural resources survey. CDM Smith has also supported the City in negotiating with the Conservancy of Southwest Florida regarding an easement for the eastern boardwalk that will connect the GRGCB to the path on the east side of the Gordon River.

A preliminary design criteria recommendation and materials evaluation were submitted to the City on September 5, 2014. CDM Smith recommended a concrete superstructure along with a concrete foundation be used for the bridge over the Gordon River. Treated wood stringers for the superstructure and treated wood caps and piles for the foundations were recommended for the boardwalk. A composite material was recommended for the boardwalk decking. However, subsequent discussions with the City indicated a preference to allow for either composite decking or ipe wood decking. As a result, the boardwalk is configured to accept either a composite deck or an ipe wood deck.

The bridge portion of the greenway is proposed to be approximately 230 feet long. It includes one center span of 100 feet centered over the river and a span on each side of 65 feet. The bridge shall provide a minimum of 11 feet of vertical clearance throughout the navigable center span, which is one foot more than the west span of the S.R. 90 (U.S. 41) Gordon River Bridge. The bridge width is 14 feet from outside to outside of the bridge deck with a clear width of 12 feet. The bridge railings are Florida Department of Transportation Pedestrian/Bicycle Bullet Railing with a 2'-3" high concrete parapet that meets ADA requirements. The bridge deck is a simply reinforced cast in place concrete slab supported by simple span, precast, pre-tensioned concrete, Florida-I Beam 45s. The substructures for the bridge over the Gordon River shall consist of pile bents configured with driven concrete piles embedded in cast in place concrete caps, It is envisioned that the bridge shall be constructed from the river with barge mounted equipment.

The west boardwalk is approximately 320 feet long and the east boardwalk is approximately 292 feet long. Both boardwalks are composed of multiple eight-foot individual spans. The inside clear width of the west boardwalk between handrails will match the bridge inside clear dimension of 12 feet. On the east boardwalk the outside-to-outside dimension of the boardwalk is restricted to 12 feet in order to minimize impacts to the wetlands and the mangroves. This will cause the inside clear width between handrails to be 11'-2". The decking for the boardwalk shall be either fiber reinforced structural grade plastic lumber or ipe wood. The stringers or joists supporting the composite decking or ipe wood decking shall be pressure treated wood. The bent caps shall be pressure treated wood, and shall be

attached to both sides of the top of the wood piling by through bolting. The west boardwalk shall be constructed utilizing the top-down construction technique.

The opinion of probable cost of construction is $2,444,000.00, and this is broken down into the various components as shown below:

Bridge and Boardwalk	$1,530,000.00
Construction Contingency	$310,000.00
Environmental Mitigation	$24,000.00
Final Design and Permitting Services	$395,000.00
CEI	$175,000.00
Permit Application Fees	$10,000.00
TOTAL	**$2,444,000.00**

Section 1

Project Scope

CDM Smith Inc. (CDM Smith) was contracted by the City of Naples, Florida (City) on June 11, 2014 to prepare a Preliminary Design Report (PDR) at the 30 percent design stage for the Gordon River Greenway Connector Bridge (GRGCB) and associated boardwalks. Also included in the agreement between the City and CDM Smith is preparation of a 30 percent design PDR for the basic park elements for the Jay and Patty Baker Park (Baker Park). The City has envisioned the Baker Park and GRGCB project as an important element of the Gordon River Greenway Park system. The City has invested a considerable amount of time and effort to develop plans for the Gordon River Greenway Corridor development and for Baker Park, and these have been approved by the City Council and the public at large.

The scope of work for the GRGCB is described in Task 6 of the agreement between the City and CDM Smith and includes the following:

- Bridge civil and structural engineering
- Refinement of design criteria
- Evaluation of materials for bridge and boardwalk construction
- Geotechnical investigations
- Environmental assessments and identification of permitting requirements

In addition to performing the work elements listed above, CDM Smith also has provided support to the City in negotiations with the Conservancy of Southwest Florida (Conservancy) to obtain the easement for the eastern boardwalk that will connect the GRGCB to the path on the eastern side of the Gordon River.

This PDR includes the following:

- Project history
- Summaries of the environmental assessment and permitting requirements for wetlands and threatened and endangered species, and archeological sites and requirements associated with obtaining the easement from the Conservancy
- Preliminary design criteria
- A summary of the design processes for the bridge and boardwalks
- Identification of bridge construction techniques.
- A summary of the geotechnical investigation
- A preliminary 30 percent construction cost estimate with backup and operation and maintenance cost estimates
- Additional data requirements and issues to be resolved in order to complete the design of the bridge and boardwalks

Section 2

Project History

According to its website, the Gordon River Greenway was initially envisioned in 1987, and this led to the founding of the Southwest Florida Land Preservation Trust (SWFLPT) in 1988. After the acquisition of 140 acres of land, the SWFLPT facilitated the formation of a group of stakeholders including the City, Collier County, Conservation Collier, the Conservancy of Southwest Florida, Naples Airport Authority, and the Naples Zoo to make the Gordon River Greenway a reality.

The GRGCB is one of several projects being undertaken by the stakeholders. In general, the GRGCB as well as the pathways in Baker Park will:

- Provide a connection to the intersection of Goodlette-Frank Road and Central Avenue with a shared-use path across the Gordon River to the existing greenway loop at Naples Municipal Airport
- Enhance the safety of bicyclists and pedestrians in Naples and Collier County
- Significantly expand the current greenway with access to the nearby downtown area

The City initiated work on the GRGCB in 2008 by retaining American Consulting Engineers of Florida, LLC (ACE) to develop conceptual plans. ACE presented their results, including options for bridge and boardwalk alignments and materials, and evaluated environmental issues in the Gordon River Greenway Connector Project Concept Report dated December 2008. Based on their evaluations of several alternative alignments and construction materials, ACE identified Alternative 1 as the least expensive alternative and as the alternative that would result in the fewest environmental impacts. Alternative 1 included an alignment that crossed the Gordon River at its narrowest point (from the Baker Park peninsula). Construction materials for Alternative 1 consisted of concrete or laminated wood for the bridge and wood for the boardwalks. The alignment for Alternative 1, with a minor modification of the alignment of the boardwalk on the Baker Park side of the river, was included in the conceptual plans for Baker Park that have been approved by the City.

Section 3

Environmental Considerations

Environmental assessments and evaluation of permitting requirements was performed by Turrell, Hall and Associates, Inc. (THA) under contract to CDM Smith. Work elements performed by THA included wetlands delineation, submerged resources survey, protected species survey, and a desktop cultural resources survey. Permitting and mitigation were also discussed with FDEP and the U.S. Army Corps of Engineers in a preliminary pre-application meeting. Results of the environmental assessments, permitting and mitigation requirements, and an overview of navigational impacts associated with the built-out park are provided in this section. Results of the wetlands delineation are presented in the Florida Land Use Cover and Classification System (FLUCCS) map and the Submerged Resources Survey Report are in **Appendix A**.

3.1 Wetland and Other Surface Water Impacts

It is estimated that the proposed bridge will impact (directly or through shading) approximately 0.10 acre of wetland mangrove habitat and 0.06 acre of surface waters. The bridge alignment has been discussed and coordinated with the Conservancy of Southwest Florida in an attempt to minimize the number of individual mangrove trees that will be impacted by the bridge. As a result the actual bridge footprint over the wetland area is larger than a straight line would be, but it minimizes the number of mature, larger mangroves that would be impacted. Based on the submerged resource survey, no aquatic resources will be impacted by the open water portion of the bridge. Mitigation will be required to offset the functional losses associated with the wetland impacts.

3.2 Listed Species

A protected species survey was conducted on and adjacent to the proposed project site. Wading birds were documented perched in the mangroves adjacent to the waterway and foraging along the shoreline. This use may be temporarily interrupted during the construction activities, but will not be precluded long-term by the proposed project. Construction activities will also have to take into account protection measures for manatees and smalltooth sawfish, but should not adversely impact these or any other listed species.

3.3 Essential Fish Habitat

A submerged resource survey was conducted, and it indicated no submerged aquatic resources such as seagrasses or oysters were present. Shoreline vegetation of mangroves will be left in place except for the trimming and shading resulting from the actual bridge footprint. Pilings associated with the bridge will provide new substrate for colonization by aquatic organisms. No adverse impact on any essential fish habitat is anticipated as a result of the project.

3.4 Cultural Resources

The State's master site file does not list any previously recorded archaeological sites in the project area. The only historical structure in the vicinity is the Naples Depot, the former Seaboard Coast Line

railroad station. It is approximately 0.65 miles to the southwest and will not be impacted by this proposed project.

3.5 Navigation

Existing navigation within this portion of the river is predominately recreational. There are currently approximately 328 private boat slips upriver from the proposed bridge crossing as well as three boat ramps and a commercial dry storage facility with space for up to 681 vessels. Pilings for the bridge will be located and aligned to allow for continued unrestricted passage up and down the waterway, and the final bridge clearance height will be at or above the current US 41 spans so that navigation of the river will not be impeded. Construction will be staged and will be undertaken to ensure that navigation is not impeded while the structure is being built.

3.6 Mitigation

Based on pre-application meetings with the Florida Department of Environmental Protection (FDEP) and US Army Corps of Engineers (ACOE), mitigation will be required to offset the wetland impacts. The mitigation required will be based on the final alignment impact acreage as well as the existing quality and extent of the impact (shading, trimming, or actual removal). Since the eastern shore mangroves are already under conservation easement protection they may have provided some mitigation value to the project for which they were ultimately placed under the easement. If this is the case, then the mitigation provided by the footprint area, as well as the direct and secondary impact values, will be included in the final mitigation calculations. Mangrove mitigation for State permitting is assumed to be available at Little Pine Island Mitigation Bank at a cost of approximately $120,000 per credit. The estimated number of credits required is 0.2. The ACOE has in the past allowed mangrove mitigation in the Naples Bay area to be purchased from Little Pine Island. However, they recently indicated that since this project is outside of the service area for the Little Pine Island bank, they may not allow use of the Little Pine Island Mitigation Bank.

The mitigation bank option is the least expensive mechanism for mitigation. If the mitigation bank is not available, then the City would likely be required to establish its own “bank” for this project with commitments for long term protections, maintenance, and funding.

3.7 Permits

Environmental permits from the South Florida Water Management District and US Army Corps of Engineers will be required for the proposed bridge project due to the wetland impacts associated with the construction. Criteria for issuance of these permits include justification of the proposed impacts and analysis showing that the impacts are unavoidable, that they are not contrary to the public interest, and that they have been minimized to the maximum extent practicable. Permits or other authorizations from the following agencies will be required:

- Florida Department of Environmental Protection
- Environmental Resource Permit (ERP)
- State Lands Authorization (Lease or Consent of Use)
- National Pollutant Discharge Elimination System (NPDES)
- US Army Corps of Engineers

- Section 404 (Dredge and Fill)
- Section 10 (Structures or work affecting navigable waters of the US)
- US Coast Guard
- Bridge Permit
- Aids to Navigation Permit[1]
- Florida Fish and Wildlife Conservation Commission
- Uniform Waterway Marker Permit[1]
- South Florida Water Management District
- Modification to amend easement for eastern landing

3.8 Other Considerations

The eastern bridge landing falls in a mangrove wetland area that is currently under conservation easements that do not specifically allow for this activity. The existing easements will have to be modified to allow for the bridge landing and public access across the easement area. Coordination with the Conservancy of Southwest Florida and the South Florida Water Management District will be required to amend the easements and the permit under which the easements were established.

[1]Required if markers are installed to help control vessel traffic approaching and under bridge.

Section 4

Design Criteria and Materials Evaluation

One of the first tasks undertaken for this project was a review of the Gordon River Greenway Connector Project Concept Report prepared by American Consulting Engineers of Florida, LLC for the City of Naples in December 2008. Among other things, this report provided design criteria for the bridge over the Gordon River and the adjacent boardwalks. As a result of this review and detailed project discussions with the City, CDM Smith prepared preliminary design criteria recommendations for the City's consideration.

The next task evaluated the construction materials for the bridge and boardwalks. Because the bridge and boardwalk components could be constructed of a multitude of materials, it was necessary to provide the City with the advantages and disadvantage of each material. Based on this evaluation of the various component materials, CDM Smith provided recommendations and a rationale for selecting the material type for each component.

The preliminary design criteria recommendations and materials evaluation were submitted to the City on September 5, 2014. Comments were received on September 15, 2014. These comments have been addressed, additional information has been added, and the preliminary design criteria have been revised to reflect the latest information concerning the western boardwalk alignment as it relates to agreements with the Conservancy of Southwest Florida. In addition to the comments received on September 15, 2014, the City indicated their agreement with the recommendations in the report. Design criteria and materials are discussed in this section.

4.1 Description

The GCGCB with its associated boardwalks is a planned shared-use path for both pedestrians and bicycles. It comprises a combination multi-span bridge over the river and adjoining elevated boardwalk approaches on each side connecting the proposed City of Naples Baker Park on the west bank of the Gordon River to the existing greenway on the east bank of the river. The City's preferred alignment for the greenway was originally shown as Alternate 1 in the Gordon River Greenway Connector Project Concept Report dated December 2008. The alignment was shifted approximately 30 feet to the south as part of the conceptual plan for the park, as shown in **Figure 4-1** in **Appendix D**.

The bridge portion of the greenway is proposed to be approximately 230 feet long. It includes one center span of 100 feet centered over the river so that the center span accommodates navigable marine traffic, and a side span on each side of 65 feet. This arrangement provides for the 40-foot minimum center span requested by the Naples Rowing Association, and allows for the deepest channel to be somewhat off-center of the water body. The US Coast Guard-approved latitude and longitude of the upstream and downstream buoys were provided by the Harbor Master of the Naples Harbor on August 8, 2014 and are shown in **Appendix B**. The location of the 100-foot center span was adjusted to accommodate the navigation channel defined by these buoys and the deepest part of the channel identified by survey information. The river profile, the final bridge length, and individual span lengths have been verified with survey information, which was obtained once the final alignment of the greenway was approved by the City. The bridge shall provide a minimum of 11 feet of vertical clearance throughout the navigable center span, over the FDEP-provided MHW elevation of 0.47 foot

(NAVD 88) or, when rounded, 0.5 foot. The restriction on navigation is currently controlled by the S.R. 90 (U.S. 41) Gordon River Bridge (West) at 10.2 feet over MHW (Florida Department of Transportation, Bridge Management System, Comprehensive Inventory Data Report). The GRGCB must provide equal or greater vertical clearance. The bridge shall have a clear width of 12 feet and shall be ADA-compliant with the appropriate handrails and bridge rail, designed for both pedestrians and bicycles. The bridge rail shall not be designed for vehicular loading.

The western boardwalk portion of the greenway shall be ADA-compliant with a maximum five percent (1:20) longitudinal slope without landings. The eastern boardwalk will also have a maximum five percent (1:20) longitudinal slope without landings to minimize impacts to wetlands and mangroves.

The western boardwalk will be approximately 320 feet long. The eastern boardwalk will be approximately 292 feet long. As noted above, the length of each boardwalk on either side of the bridge over the Gordon River was verified using topographic survey information once the final alignments of the boardwalks and bridge were approved by the City. Final alignments are subject to change pending environmental considerations and may be changed following submittal of the Preliminary Design Report (PDR).

The west boardwalk shall have a clear width of 12 feet, matching the bridge, with the appropriate ADA-compliant handrails and boardwalk rail for both pedestrians and bicycles. The out to out width shall be 12 feet 10 inches. The east boardwalk shall have an out-to-out width of 12 feet, including handrails, to minimize the impacts to the wetlands and mangroves. The inside clear width shall be 11 feet 2 inches. It shall be transitioned at the bridge to match the 12 foot clear width, with the appropriate ADA-compliant handrails and boardwalk rail for both pedestrians and bicycles. Final widths of both the bridge and boardwalks are subject to change pending environmental and cost considerations, and may be changed following submittal of the PDR. The boardwalk rails shall not be designed for vehicular loading.

The major components and unique design elements of the bridge are as follows:

Superstructure

- Railing
- Deck
- Beam/Stringers

Substructure

- Pier Cap
- Pier Piles

The major components and unique design elements of the boardwalks are as follows:

Superstructure

- Railing
- Deck
- Beam/Stringers

Substructure

- Pier Cap
- Pier Piles

The bridge and boardwalks shall be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Guide

Specifications for the Design of Pedestrian Bridges, 2nd Edition. Additionally, the vertical load carrying elements of the bridge and boardwalks (not the rails) shall be designed for an H-10 truck (20,000 pounds with 16,000 pounds maximum axle load). The AASHTO LFRD Guide Specifications for the Design of Pedestrian Bridges requires a H10 vehicle design when the clear deck width is greater than 10 feet and vehicular access is not restricted, or unless otherwise specified by the Owner. Also, for purposes of the east boardwalk, the H10 vehicle would provide the Contractor more flexibility in his selection of equipment for the top-down construction technique requirement. The Florida Department of Transportation's (FDOT) Structures Design Guidelines indicates that occasional use of the pedestrian bridge by maintenance or emergency vehicles generally does not warrant the use of a crash tested combination pedestrian/traffic railing.

A wind load of 60 pounds per square foot (psf) shall be applied horizontally at right angles to the longitudinal axis of the bridge and boardwalk. The bridge over the Gordon River shall be designed, and its materials selected, for a 75-year design life. (This 75-year life requires maintenance activities, which will be provided.) The bridge will not be supplied with a fender system to resist marine vessel impact, nor will a vessel impact study be performed. **Table 4-1** presents additional design criteria.

Table 4-1: Project Design Criteria

Design Element	Criteria	Reference
Design Speed	30 mph (max) for bicycles (except where otherwise noted) based radius (R=0.067 V^2/tanθ; V=velocity(mph) & θ=Lean angle desired 20 degrees)	BikFac 5.2.4
	(Design speed for vehicles was not considered due to emergency or occasional use only)	
Design Loads	Loadings	PedBr
	The bridge and boardwalk shall be designed for a pedestrian loading of 90 psf	PedBr 3.1
	Where vehicular access is not prevented by permanent physical methods, the bridge shall be designed for a maintenance vehicle load of H-10 for clear deck width over 10 feet and shall not be placed in combinations with pedestrian loads	PedBr 3.2
	Wind loads of 60 psf for girders and beams in Collier County	SDG 10.5
Other	Railings	PedBr
	42-inch bicycle railing	SDG 10.12
	Must provide ADA-compliant handrails	SDG 10.12
	Handrails will not be designed for impact loading from occasional use vehicles	SDG 10.12
	No fencing on bridge or boardwalk	
Clearance Width	12 feet clear for west boardwalk and bridge	
	12 feet out-to-out for east boardwalk	
Cross Slope	2% on bridge	
Radius of Curvature	Minimum 166 feet due to design speed for bicycles	
	(H-10 vehicle will track through this radius)	
Superelevation	None required on boardwalk or bridge	
Clearance	11 feet minimum from MHW elevation for waterway passage; assumed no vertical obstructions over bridge or boardwalk	
Grades	Longitudinal grade on bridge shall be 1% to accommodate drainage	
	Maximum 5% without landings on boardwalks	ADA
Vertical Curves	None for bridge or boardwalk; straight grade on bridge only	
Bridge	Deck drains or slotted bridge rail are adequate for a 10-year storm frequency	
Boardwalk	Open decking	

References: AASHTO Guide for the Development of Bicycle Facilities (BikFac)
AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition (PedBr)
FDOT's Structure Design Guidelines (SDG)

4.2 Structural Material Types

Structural material types for the bridge and boardwalk could consist of steel, aluminum, concrete, wood, composites, or combinations thereof in the bridge components listed above. Aluminum will not be considered for main load-bearing components because of its relative lack of stiffness when compared to the other materials and its consequent tendency for uncomfortable vibrations under pedestrian loading, and because of its corrosive behavior when in contact with certain concrete mixes. The advantages and disadvantages, considering the cost, durability, and aesthetics of each material, will be discussed below followed by a value-based recommendation on the materials for each bridge and boardwalk component.

The 100-foot center span, which was based on the river profile and the desire to maximize the beneficial use of the river, will essentially dictate the depth of the superstructure and consequently set the profile or height of the bridge. This is noted only because the depth of the superstructure will vary for each structural material type, and a greater depth will slightly increase the length of the boardwalk.

4.2.1 Steel

4.2.1.1 Advantages

Steel beams provide the ability to span relatively long distances in the superstructure with a rather shallow superstructure depth compared to the other structural materials. When used as a substructure component, it provides high axial and lateral capacity (i.e., bridge vertical and lateral load resistance, respectively) with smaller member size than the other structural materials.

4.2.1.2 Disadvantages

Steel, by nature, is highly subject to corrosion when exposed to high humidity and brackish or saltwater environments. Because of high routine maintenance costs, new steel bridge superstructures are generally composed of weathering steel. The weathering steel is typically uncoated, eliminating the need for costly coating systems that require routine reapplications. Through an initial corrosion process, the weathering steel forms a patina on its surface that provides protection from further corrosion. In high humidity conditions and brackish or saltwater environments, as at this site, this initial corrosion process does not completely stop and this can cause loss of capacity. Although steel protection coating systems are available, they are very costly and, as mentioned above, require routine reapplications. Because of these issues and the high initial cost compared to concrete and wood, steel is not recommended for either superstructure or substructures components for the bridge over the Gordon River.

4.2.2 Wood

4.2.2.1 Advantages

Wood[2] offers the advantages of ease of construction, relatively low ease of maintenance, and pleasing appearance. Most woods are a renewable resource, fitting well with a park and its strong environmental theme. Wood is relatively lightweight and easily built. If approaches are of timber, and they likely will be, a timber-beamed bridge span offers aesthetic continuity across the waterway.

[2] The terms timber, lumber, and wood are used interchangeably herein.

4.2.2.2 Disadvantages

Because of the magnitude of the required vehicular load (H-10) and the required length of the spans, simple timber construction cannot be achieved using solely sawn timbers. Glued laminated timber (glulam) beams must be used for the main spanning elements. Where climate conditions surrounding a timber bridge are characterized by intensive and frequent changes in the level of humidity, there is a higher risk of damage from the effect known as "glue line delamination." This decreases the capacity of the beam, especially its ability to resist shear, and so inspection must be part of the bridge maintenance program to alert the owner to any sign of strength loss. Sunlight also has a negative effect on wood because it can chemically alter certain wood cells, which can increase the capacity of the material to absorb water through its surface.

Particular care is required to protect glulam beams from these phenomena. Glulam surfaces which are exposed to sunshine or precipitation must be protected with a pigmented surface at least 60 microns thick. The treatment, which should be carried out in the factory or immediately after erection, can consist of one or two coats of an alkyd oil-based stain with a fungicide additive and two coats of alkyd oil-based opaque paint. It is normally necessary to renew the treatment every few years, which would be done as part of the maintenance program mentioned above.

Without adequate surface protection and toxic wood preservatives, glulam beams can be subject to the greatest hazard faced by timber bridges—living or biotic agents such as decay fungi, bacteria, insects, and marine borers. These agents can cause serious damage to untreated wood in a relatively short period, making it both unsightly and unsafe.

If wood is used in the substructure, glulam could also be used for the pier caps. Timber piles have been used for bridges for decades, and could be used for substructure elements. However, marine waters and the organisms it supports are very aggressive in attacking timber piles. Even using protected timber in the open water will create an ongoing maintenance concern, and that element of the bridge is virtually guaranteed to exhibit a shorter life than other elements. For these reasons, timber substructures in the main spans are not considered in the costing comparisons below.

4.2.3 Concrete

4.2.3.1 Advantages

Concrete offers the advantage of longer life and the ability to span longer distances with a shallower superstructure depth than wood, and it is comparable to steel. Concrete is ideally suited to aggressive environments and, if mix-designed and delivered properly, it can potentially attain a service life of over 100 years. No protective coatings are necessary for concrete bridges when properly designed, produced, and constructed. Properly designed and constructed concrete structures do not lose strength due to moisture or pests. Concrete structures offer greater fire resistance than timber structures, and little or no maintenance is required for concrete bridges. Concrete can be used in all spanning elements of the bridge including the deck. Concrete is also inherently stiffer than the other material options, and so provides a more vibration-free walking path, which is important in some longer spans. Longer spans made of steel or glulam wood can be forced to vibrate by pedestrians, and although they will be designed in the safe zone, vibrations may cause concern for some sensitive users.

4.2.3.2 Disadvantages

Precast concrete structural members are heavier than wood and erecting them requires larger equipment. Precast, prestressed concrete members, which are the most economical, come only in standard shapes. Special member shapes or finishes can cost more. Cast in place concrete is slow

and labor intensive to construct, so the use of precast for beams is encouraged. Still, this relatively small bridge does not provide quantities that would result in significant economy of fabrication. Good quality control is required in cast in place concrete construction to control cracking, although certified plants normally supply this needed QC for precast elements. The initial cost of concrete can be higher than the cost of wood.

4.2.4 Composite vs. Wood Decking

The only structural component for which a composite material is being considered is the decking for the boardwalk approaches. Composites currently are not strong enough for the main beams of this bridge, and to date the use of composites in a substructure (as in pilings) is rare and somewhat experimental. As a deck material, however, composites do offer advantages. Because of this, a direct comparison between pressure treated wood deck and a composite material deck is presented below. A lumber deck and a composite (artificial lumber) deck are the only options considered for decking boards on the boardwalk.

4.2.4.1 Wood Decking

Pressure treated lumber, as typically drawn from US timber sources, has a shorter lifespan than composite materials and requires more frequent maintenance. However, the first-installed linear foot price is approximately three to six times lower for pressure treated lumber than for composite materials. Thereafter, maintenance on pressure treated decks is significantly higher than for composite materials. Maintenance for pressure treated decking includes pressure washing and re-sealing every two to three years. This process would require protective measures to capture the runoff and avoid contaminating the area directly beneath the boardwalk, further increasing the maintenance cost. Pressure treated lumber does offer an obvious wood grain look, and wood can span longer distances than composite material. However, the higher maintenance cost will quickly absorb the initial installation savings. Pressure treated lumber also has a greater tendency to deform (warp), possibly causing a tripping safety issue for pedestrians and therefore further increasing the need for maintenance.

4.2.4.2 Composite Decking

There are several composite materials to consider. The City of Naples recently investigated options to replace dated decking on the existing Naples Pier through a study performed by TKW Consulting in July 2014. The analysis included two options for using composite materials to replace deck boards, Polyforce® and Fiberforce®, and one option using ipe wood. The costs for the two composite materials ranged from $3 to $11 per linear foot for 2x6, 2x8, 3x6, or 3x8 boards. Ipe wood ranges from $4 to $5 per linear foot.

The two composite materials offer advantages: both have greater than 50-year warranties, are impervious to moisture, and do not require pre-drilling. The composites are easy to install, are available in exact lengths, and are resistant to rot and biological attack. They come in a variety of colors simulating natural or weathered wood, and a wood grain texture can be applied to the surface to improve appearance and provide limited slip resistance. They can be molded or extruded, contain UV inhibitors and a fire retardant, and resist static electricity buildup. Both of the composite decking materials mentioned above are manufactured from high density polyethylene (HDPE) which consists of purified blends of recycled HDPE plastics (both pre-consumer and post-consumer, such as plastic milk and detergent bottles) combined with proprietary percentages of fiber strengthening additives.

The span lengths for composite materials are lower than for wood, however, which would increase stringer cost. High surface temperatures have been reported under direct sun exposure, along with

delamination, bubbling, and warping from thermal expansion, specifically for lower grade material. Thermal expansion of composites is greater than that of wood, and this would need to be taken into account in detailing the boardwalk.

The solution that represents a compromise between pressure treated lumber and purely manufactured composite decking is ipe. Ipe lumber does require pre-drilling, but it spans longer distances and, because of the density of the material, deck screws are not as likely to back out—unlike other wood types or even composite materials. However, to avoid problems after installation, ipe lumber must be checked with a moisture meter prior to construction to ensure dryness. If not dried properly, the wood will check (split), crack, and warp over time, and the cracks can have very sharp edges. Sawing is more difficult than for most composites; installers should use carbide-tipped cutting tools, and keep edges sharp. Another disadvantage of ipe lumber is the unavailability of 14-foot lengths. This is an imported lumber, and it generally comes in random lengths from six to 16 feet long in two-foot increments. It could be difficult for a supplier to provide only 12 to 14 foot boards. One last negative consideration for natural ipe lumber is that it is harvested from South American forests that are increasingly threatened. In at least one instance, an ipe boardwalk was boycotted due to environmental concerns.

Untreated ipe lumber also has a projected 30-year life span and can be easily pressure washed, meaning there is no contamination from runoff. If maintaining the original color of ipe lumber is desired, annual coating with a semitransparent UV-blocking stain is recommended. If left to weather naturally, it turns a silver-gray color similar to teak. Ipe lumber also maintains the look of wood over longer periods due to its greater resistance to decay.

4.3 Cost Comparison Matrix

The cost comparison matrix presented on the following page includes two options for materials in the bridge over the Gordon River and three options for the boardwalk. Both bridge options include concrete caps and piling for the foundations in order to meet the owner's expected lifespan for this bridge without water-borne replacement construction. Only concrete would achieve that goal.

For the bridge, the concrete superstructure option is recommended to be paired with a concrete deck. These matched materials provide the longest service life. The second alternate for the bridge, the timber superstructure option, is proposed with an ipe lumber deck. Pressure treated lumber is not considered for the decking because of its high routine maintenance costs and relatively short life. This combination will provide architectural advantages and avoid mixing seemingly incongruent materials.

The boardwalk includes timber caps and piling for the foundations and timber stringers for all options. The reasons for this limitation are discussed in the recommendations. Three options are proposed for the boardwalk decking: the two composite materials and ipe lumber. Pressure treated lumber is not considered for the decking because of its high routine maintenance costs and relatively short life. A concrete deck was not considered for the boardwalk due to the high initial cost. Each option is described in the matrix below and sources for the cost information are provided.

The cost information presented in **Table 4-2** below is for material selection purposes only, and should not be used to estimate total construction costs. The costs shown in the table do not include the following items:

- Permits
- Site access from land or water

- Mobilization
- Unique construction requirements including top-down construction
- Boardwalk railing
- Architectural features
- Excavation to tie boardwalks to the existing or new greenways

Table 4-2: Cost Comparison Matrix (Materials and Basic Construction Costs Only)

Bridge Length over Water	Boardwalk Length	Total Structure Length	Required Width		Bridge Area (SF)	Boardwalk Area (SF)	Total Structure Area (SF)
230	609	839	14		3220	8526	11746

Unit Costs				
Option Name	Structure Type Alternatives	Cost/SF		Source
S1	Concrete Deck/Prestressed Girder-Simple Span	$ 145.00		FDOT Planning/Policy/Cost Bridge Cost April 2014
S2	Laminated Timber Beams, Concrete caps & piles	$ 118.00		RS Means 32 34 20 Fabricated Ped.Bridges 0010 1600
P1	Timber Boardwalk w/Polyforce Decking	$ 32.42		See below
P2	Timber Boardwalk w/Fiberforce Decking	$ 34.87		See below
P3	Timber Boardwalk w/IPE Decking	$ 34.76		See below

Timber Bridge with Concrete Cap & Piles	Unit Cost		Unit	Quantity	Cost	Source
Laminated Timber Beams with IPE Decking	$ 112.00		SF	3220	$360,640.00	RS Means 32 34 20 Fabricated Ped.Bridges 1600 incl. cost increase for IPE Decking of $9/SF
Concrete Caps: 2.5' x 2.5'x 14' - 4 Bents	$ 28.50		CY	16	$ 456.00	RS Means 03 31 13 Heavyweight Strucutre 3750
Pile: 14" Square Ave 30'; 2 Ea/bent-4 bents w/mob;demob	$ 73.28		VLF	240	$ 17,587.20	RS Means 31 62 13 Concrete Piles 3400+100% added for mob/demob 31 62 13 4750 & 4850
				Total	$378,683.20	
				Composite Unit Price	$ 118.00	

Boardwalk Foundation	Unit Cost		Unit	Quantity	Cost	Source
Timber Stringers 2"x14"x10' 2 ea @ 12" OC, 61 spans	$ 1,750.00		MBF	29	$ 50,750.00	RS Means 32 34 20 Fabricated Ped.Bridges 1600
Caps: 3" x 12" x 14' - 4 Ea/Cap - 61 Bents	$ 2,250.00		MBF	11	$ 24,750.00	RS Means 06 13 23 Heavy Timber Framing 0240
Pile: 14" Diameter Ave 15' long; 2 Ea/bent-61 bents w/mob;demob	$ 34.51		VLF	1830	$ 63,147.20	RS Means 31 62 19 Timber Piles 1695+ mob/demob & boot for pile tip $95.50 ea pile- 31 62 19 1700 & 2700
				Total	$138,647.20	
				Composite Unit Price	$ 16.26	

Option Name	Boardwalk Decking	Material/SF		Labor & Equip /SF	Total Unit/SF	Foundation & Deck/SF	
P1	Polyforce	$ 8.11		$ 8.05	$ 16.16	$ 32.42	Materials from TKW report for Deck Replacement;Labor from RS Means 32 06 10 1830
P2	Fiberforce	$ 10.56		$ 8.05	$ 18.61	$ 34.87	Materials from TKW report for Deck Replacement;Labor from RS Means 32 06 10 1830
P3	Ipe Wood	$ 10.45		$ 8.05	$ 18.50	$ 34.76	Materials from TKW report for Deck Replacement;Labor from RS Means 32 06 10 1830

Bridge + Timber Boardwalk			
Option	Bridge Cost	Boardwalk Cost	Total Cost
S1 + P1	$ 467,000.00	$ 276,000.00	$ 743,000.00
S2 + P1	$ 380,000.00	$ 276,000.00	$ 656,000.00
S1 + P2	$ 467,000.00	$ 297,000.00	$ 764,000.00
S2 + P2	$ 380,000.00	$ 297,000.00	$ 677,000.00
S1 + P3	$ 467,000.00	$ 296,000.00	$ 763,000.00
S2 + P3	$ 380,000.00	$ 296,000.00	$ 676,000.00

Notes:
1. The costs listed above are for comparitive purposes only and not to be used for total construction costs
2. All the costs above do not include future routine maintenance
3. All the costs above do not include contigency

4.4 Recommendation

The recommended design life for GRGCB is 75 years. In the matrix above the timber-beamed bridge (option S2) is shown to be the least expensive in terms of its initial cost ($380,000). However, wood traditionally will not achieve the 75-year life expected for this structure without significant and costly maintenance, and predicting the maintenance cost for wood over that period is problematic. Forest Products Laboratory states that the useful life timber bridges treated with preservatives averages about 40 years.

Due to this high-maintenance consideration and the relatively short lifespan of wooden bridges, we recommend a concrete superstructure along with a concrete foundation (Option S1) be used for the bridge over the Gordon River. Expected savings associated with lower maintenance justify the higher initial cost ($467,000) for the bridge element of the Greenway. For the purposes of this evaluation, bridge and boardwalk members have not been sized based on the design load criteria, but simply estimated for relative comparative purposes. In addition, some components that are common to both bridge types and all three boardwalk configurations were not included in this comparative evaluation because those costs would remain constant regardless of the bridge or boardwalk selected. All of the costs shown in the table above are for comparative purposes only and do not reflect the total cost of construction.

Because the boardwalk has shorter land-based spans and consequently smaller member sizes, and routine maintenance can be performed on the boardwalk using City forces, a shorter design life is more acceptable with the necessary periodic and selective member replacement. Because of this relative ease of maintenance, treated wood stringers for the superstructure and treated wood caps and piles for the foundations are recommended for the boardwalk.

As shown in the matrix above, the cost of the three options for boardwalk decking materials are all relatively close, ranging from $276,000 to $297,000. However, because of its longer warranty, reduced maintenance requirement, and general ease of construction, we recommend either of the composite material options (P1 or P2). However, subsequent discussions with the City indicated a preference to allow for composite decking or ipe wood decking. As a result, the boardwalk is configured to accept either a composite deck or an ipe wood deck.

Section 5

Design

5.1 Gordon River Greenway Connector Bridge

Introduction

The 30% alignment of the boardwalk and bridge started with the base alignment Alternative F (see **Appendix E**) prepared by CDM Smith and followed the Design Criteria (Table 1) previously mentioned in section 4. The Alternative F alignment evolved by using updated survey topographical data of both the east and west sides including the bathymetry of the channel, locations of mangroves on the east side and locations of the navigable buoys. The design was broken down into civil and structural for the bridge and boardwalks.

5.1.1 Civil

5.1.1.1 Horizontal Alignment

The bridge alignment is based on Alternative F for Baker Park and attaching the bridge to the proposed alignments of both the east and west boardwalks, as described below. The horizontal alignment is one continuous tangent for the full length of the bridge. The bearing of the tangent is slightly skewed from perpendicular to the river to avoid the mangroves on the east bank of the river, as shown in **Figures 5-1** and **5-2** in **Appendix D**.

5.1.1.2 Vertical Profile

Establishing the bridge profile was first based on setting the low beam elevation eleven feet above the published mean-high-water elevation (MHWE) of one-half foot for the 100-foot center span. The proposed grade of the bridge slopes one percent down from west to east. The structural depth of the bridge beams and superstructure is 4.5 feet perpendicular to the one percent grade. Since the bridge is sloping, the east bent of the center span was set to the minimum height of eleven feet (given navigable clearance) above the MHWE (0.47 feet NAVD 88). The elevation of the superstructure at the east bent of the center span was set at 16.02 feet (0.5 MHWE +11 Nav.Clr. +4.52 Str.Depth at 1% grade). This set the starting elevation and point of the bridge and, subsequently, the boardwalks as shown in Figures 5-1 and 5-2 in the Appendix.

5.1.1.3 Drainage

As stated above in discussing the vertical profile, the bridge is proposed to slope longitudinally by one percent. In addition, a normal crown is proposed along the centerline of the bridge sloping two percent downwards from the center to the outside edges. There will be no deck drains within the bridge; therefore, all of the runoff will flow into an inlet/gutter system on the farthest east end of the bridge. The drainage system will be designed in a later phase, including controlling outfall velocities to prevent erosion. The drainage system will outfall directly to the east bank and river and since the bridge is classified for pedestrians and bicycles only no water quality measures will be needed. According to the South Florida Water Management District, treatment is not required for runoff from the bridge or boardwalks. Additional treatment will be provided by the stormwater treatment system for the Jay and Patty Baker Park to cover treatment requirements for the connection of the east boardwalk to the existing paved path.

5.1.2. Structural

5.1.2.1 Superstructure

The GRGCB is 230 feet long and consists of three simple spans of 65 feet, 100 feet, and 65 feet as shown in **Figure 5-4** in **Appendix D**. The bridge essentially spans from the west bank of the Gordon River to the east bank along the proposed alignment of the greenway. The alignment of the bridge was set so that the eastern end of the 100-foot span coincides with a line projected from the theoretical location of the US Coast Guard's red upstream and downstream buoys. The perpendicular distance between the red and green buoys demarking the navigation channel is approximately 40 feet, which is contained within the 100 foot span. The western end of this center span captures the deepest part of the river as shown in Figure 5-4 in the Appendix. The 65-foot end spans provide a balanced and symmetrical arrangement for this structure and a transition to the adjacent boardwalks. The bridge width is 14 feet from outside to outside of the bridge deck. The bridge railings are Florida Department of Transportation Pedestrian/Bicycle Bullet Railing with a 2'-3" high concrete parapet that meets ADA requirements. The environmental classification for the superstructure shall be considered extremely aggressive as defined by the Florida Department of Transportation's Structures Design Guidelines.

5.1.2.1.1 Deck

The bridge deck is a simply reinforced cast in place concrete slab supported by a two-beam system, as shown in **Figure 5-6** in **Appendix D**. The slab is eight inches thick with the primary reinforcing in the transverse direction. The slab is made composite with the girders by reinforcing projecting vertically from the top flange of the girders. A continuous cast deck over the interior supports will be used to eliminate deck joints and the cover plates that meet ADA requirements. Supplemental longitudinal slab reinforcing will be used in the top of the slab where the deck is continuous over the interior supports. The deck shall be discontinuous with expansion joints at the end bents with thickened end slabs. The minimum concrete cover over the reinforcing steel shall be two inches.

5.1.2.1.2 Beams

The beams for all spans in the bridge are simple span, precast, pre-tensioned concrete, Florida-I Beam 45s. The typical section for the bridge is shown in Figure 5-6 in the Appendix.

5.1.2.2 Substructure

The substructures for the bridge over the Gordon River shall consist of pile bents configured with driven concrete piles embedded in cast in place concrete caps, as shown in Figure 5-6 in the Appendix. The substructure skew, as measured from a line perpendicular to the centerline of the greenway, shall be at 0 degrees. The two intermediate bents in the river shall support double lines of fixed bearings for the Florida I-beam 45s. The two bents at either end of the bridge shall essentially serve as transition substructures between the concrete superstructure of the river bridge and the wood superstructure of the boardwalks. These transition or stepped bents shall support the Florida I-beam 45s on expansion bearings on one side of the bent and the wood stringers for the boardwalk fixed to the substructure on the other side. The environmental classification for the substructure shall be considered extremely aggressive as defined by the Florida Department of Transportation's Structures Design Guidelines.

5.1.2.2.1 Pier Cap

The pier caps shall be cast in place concrete and shall have a minimum of four inches of cover over the reinforcing steel except at the top of the beam pedestals. The top of the beam pedestals shall have two inches of cover over the reinforcing steel.

5.1.2.2.2 Pier Piles

The pier piles will be driven, standard, FDOT prestressed 18-inch-square concrete piling. The minimum embedment in the pier cap shall be one foot. The piles shall have a minimum of three inches of cover over the reinforcing steel.

5.1.3 Geotechnical

The bridge foundations will be pile-supported. Preliminary design assumed 18-inch square precast concrete piles with an embedment depth of 50 to 60 feet below the riverbed. Each bridge bent will have two piles, each driven to a capacity of 277 kips. The preliminary pile design is based on the calculated bridge loads provided by our bridge engineering staff and the subsurface conditions observed during the geotechnical exploration program. The exploration program for the bridge consisted of three borings, GR-1, GR-2, and GR-3, drilled to a depth of 60 feet below the riverbed in the vicinity of the proposed pedestrian bridge. The geotechnical report including the boring logs can be found in **Appendix C**.

5.2 East and West Boardwalks

5.2.1 Civil

5.2.1.1 Horizontal Alignment

Design constraints for the boardwalk horizontal alignment included tracking the wheel alignments for an H-10 vehicle and avoiding mangroves on the east side as will be required for the easement that will be granted by the Conservancy. The H-10 vehicle was custom designed using AutoTURN software with an overall length of 24 feet and a wheelbase of 14 feet to best represent the construction vehicle for top-down boardwalk construction. The mangroves on the east side were marked by survey and are represented by tree symbols in an electronic AutoCAD drawing. In addition, the drawing included a conceptual boardwalk alignment as flagged in the field by the Conservancy and surveyed. The alignment for the east boardwalk followed this conceptual alignment along with the H-10 vehicle wheel tracking route. This resulted in using a minimum 50-foot radius for one of the east side curves, which is smaller than the 166-foot radius required for bicycle paths on grades which is below the required radius as stated in the design criteria Table 4-1. This will require lowering the bicycle speed and posting warning signs should be considered during a later design phase. The termination point for the east boardwalk connects to the existing walkway path. The west boardwalk alignment connects to the proposed Baker Park walkway and runs parallel to the path to the proposed boathouse structure. The curve for this west alignment was set to the minimum 166-foot radius. These alignments are shown in Figures 5-1 and 5-2 in Appendix D.

5.2.1.2 Vertical Profile

As stated in the discussion of the bridge vertical profile, the elevation of the structure was set by the MHWE, and the boardwalk elevations at the bridge ends were set accordingly. In addition, the longitudinal slopes of the boardwalks were set to 1.78 percent for the west boardwalk and 4.18 percent for the east boardwalk. Both grades (under 5%) will not require intermediate landings, according to ADA. The termination point at the at-grade walking paths and the beginning of the boardwalks may require adjusting the existing or proposed elevations to maintain the proposed slopes of the boardwalks. During the next design phase it may be possible to reduce the boardwalk lengths (for both the east and west sides) if fill can be placed to extend the walkways. Figures 5-1 and 5-2 in the Appendix illustrate the layout of the east and west boardwalks.

5.2.1.3 Drainage

Both the east and west boardwalks will drain between the proposed decking boards due to the proposed longitudinal slope. No cross slope is planned as it is neither needed nor required. Similar to the bridge, there will be no need for water quality measures to capture the storm runoff.

5.2.1.4 Lighting

Navigation lighting shall be provided as shown in FDOT's 2015 Design Standards, Index No. 21220. These requirements as well as additional lighting for the bridge and boardwalks for pedestrian safety and aesthetics will be included in the next phase of the design. Lighting for safety and for aesthetics will also consider environmental issues as appropriate. Power for the bridge lighting will be provided via the Jay and Patty Baker Park electrical system and the design will be coordinated with the design of the park.

5.2.2 Structural

5.2.2.1 Superstructure

The east and west boardwalks provide the elevated transition for the greenway from the bridge over the Gordon River to the ground line at the park on the west, and to the ground line at the existing greenway on the east, as shown in **Figures 5-3, 5-4,** and **5-5** in **Appendix D**. The west boardwalk is approximately 320 feet long and the east boardwalk is approximately 292 feet long. Both boardwalks are composed of multiple eight-foot individual spans. The inside clear width of the west boardwalk between handrails will match the bridge inside clear dimension of 12 feet. This will cause the outside-to-outside dimension of the west boardwalk to be 12'-10" as shown in **Figure 5-8** in **Appendix D**. On the east boardwalk the outside-to-outside dimension of the boardwalk is restricted to 12 feet in order to minimize impacts to the wetlands and the mangroves. This will cause the inside clear width between handrails to be 11'-2" as shown in **Figure 5-7** in **Appendix D**. This width will need to be transitioned to the full 12-foot clear width at the bridge as shown in **Figure 5-9** in **Appendix D**. The railing for the boardwalk shall consist of a 4x4 pressure treated wood post bolted through a pressure treated perimeter beam and exterior pressure treated stringer as shown in Figures 5-7, 5-8, and 5-9 in the Appendix. A 1x6 continuous handrail shall be attached to the top of the posts. Continuous 1x4 top and bottom rails securing black wire mesh with a PVC coating shall be attached to the posts.

5.2.2.1.1 Decking

The composite decking for the boardwalk shall be fiber reinforced structural grade plastic lumber (SGPL). This material is a recycled plastic product utilizing high density polyethylene. Tangent Technologies and Bedford Technology are two of the largest manufacturers of this material; Tangent produces a product called Polyforce® and Bedford produces a product called FiberForce®. Because very little information exists for these products when designing for large wheel loads (such as the H10 design vehicle and corresponding 8,000 pound wheel load required for this project), representatives from both companies were asked to assist with the sizing of the decking material as a function of the stringer spacing. The information they provided is shown below.

Tangent Technologies provided the following for their PolyForce® material:

4x12 Polyforce® decking on a joist spacing of 8.8 inches
6x12 PolyForce® decking on a joist spacing of 17.5 inches

Bedford Technology provided the following for their FiberForce® material:

3x6 FiberForce® decking on a joist spacing of 12 inches

4x6 FiberForce® decking on a joist spacing of 16 inches

A maximum joist spacing of 12 inches was determined, which would accommodate both the 6x12 PolyForce® decking and the 3x6 FiberForce® decking. The decking will span between wood joists and will be attached to them with deck screws as shown in Figures 5-7, 5-8, and 5-9 in the Appendix.

At the direction of the City, the option to utilize ipe wood for decking was also investigated. In order to allow for the flexibility to use either ipe wood decking or composite decking, the stringer spacing determined for the composite decking was held at 12 inches and the ipe wood decking was sized based on this spacing. It was determined that 3x8 ipe wood decking would be required for the 12 inch stringer spacing. The additional dead load from the ipe wood decking could be accommodated by the stringers, bent caps, and bent piles utilized for the composite decking.

5.2.2.1.2 Stringers

The stringers or joists supporting the composite decking or ipe wood decking shall be pressure treated wood. Because of the magnitude of the live load vehicle and the need to minimize member size, the stringers will span between bents located on 8-foot centers. The stringers shall be supported by pressure treated wood bent caps and attached to them with joist straps, as shown in Figures 5-7, 5-8, and 5-9 in the Appendix. The stringers shall be 3x10s, spaced on a maximum of 12-inch centers across the bent caps. Pressure treated wood blocking shall be placed between the joists for the full width of the boardwalk at the location of every handrail post.

5.2.2.2 Substructure

5.2.2.2.1 Bent Cap

The bent caps shall be pressure treated wood, and shall be attached to both sides of the top of the wood piling by through bolting. The stringers shall bear on the top of the bent cap and shall be attached to the bent cap with joist straps. The bent caps shall be double 4x12s attached to each side of the wood piling.

5.2.2.2.2 Bent Piles

The bent piles will be 12-inch diameter driven, pressure treated wood piling. To ensure stability the minimum embedment shall be ten feet. 2x6 pressure treated wood cross bracing shall be affixed to the wood piling for transverse stability.

5.2.3 Geotechnical

The boardwalk foundations will be pile-supported. Preliminary design assumed 12-inch diameter tapered timber piles with an embedment depth of 20 feet below the ground surface. Each boardwalk bent will have two piles, each driven to a capacity of 62 kips. The preliminary pile design is based on the calculated boardwalk loads provided by our bridge engineering staff and the subsurface conditions observed during the geotechnical exploration program. The exploration program for the boardwalk consisted of two borings, BSB-1 and BSB-2, drilled a depth of 60 feet below ground surface in the vicinity of the proposed boardwalk section to the west of the Gordon River. The geotechnical report including boring logs can be found in **Appendix C.**

Section 6

Recommendations

Several issues must be resolved prior to the completion of the bridge and boardwalk design. These include the following:

- This PDR should be submitted to the US Coast Guard for review and approval prior to proceeding with final design. This is important given the relationship between the locations of buoys that were provided by the harbormaster to the City to the locations of the channel and span of the bridge.

- During the next phase the drivability of the bridge and boardwalk piles should be analyzed to evaluate whether the piles can be driven to required depths and capacities without overstressing the piles. Predrilling the piles may be required depending on the results of the analysis.

Section 7

Cost Estimate

The information contained below in the Opinion of Probable Cost of Construction is based on the City's acceptance of CDM Smith's recommendations contained in the Design Criteria and Materials Evaluation Report. Given the design criteria for pedestrian loading and vehicular loading and material type, calculations were performed to size the structural components in the bridge and boardwalk. With member sizes determined from these calculations, costs were derived utilizing historic data from the Florida Department of Transportation, R.S. Means, CDM Smith, price quotes from Bedford Technology, and the Tennessee Department of Transportation Estimating Guidelines.

GORDON RIVER GREENWAY CONNECTOR 30% LEVEL ESTIMATE OPINION OF PROBABLE COST OF CONSTRUCTION 12/3/2014					
ITEM	QUANTITY	UNIT	UNIT RATE	TOTAL	SOURCE
Bridge[1]	3220	S.F.	$172.50	$555,450.00	2014 FDOT Structures Design Guidelines BDR Cost Estimate
East Boardwalk					
Wood Piles, Treated, C.C.A., 2.5# per C.F. 12" butts, 21' to 35' long	1960	V.L.F.	$30.00	$58,800.00	2014 R.S. Means 31 62 19.10 1680
Boot for pile tip, maximum	70	Ea.	$103.00	$7,210.00	2014 R.S. Means 31 62 19.10 1800
Timber Piles, Wood piles, mobilization for 10,000 L.F. pile job, add	1960	V.L.F.	$2.00	$3,920.00	2014 R.S. Means 31 62 19.10 2700
Protective Wrapping of Piles, with nails 12" diameter	234	V.L.F.	$40.50	$9,477.00	2014 R.S. Means 35 01 50.20 0120
Bent Caps: Heavy Timber Framing Multiple 4"x12" (Double 4"x12" each side of cap)	6	M.B.F.	$2,425.00	$14,550.00	2014 R.S. Means 06 13 23.10 0280
Stringers: Heavy Timber Framing Multiple 3" x 10"	7	M.B.F.	$2,650.00	$18,550.00	2014 R.S. Means 06 13 23.10 0230
Material for Decking: FiberForce® 3x6 Earthtone with embossed Woodgrain one face or 3x8 ipe wood whichever is greater	1	L.S.	$128,000.00	$128,000.00	Quote from Bedford Technology/Quote from AdvantageLumber
Labor for Decking: Heavy Timber Framing Floor Planks 3" thick, 3" x 6"	11	M.B.F.	$1,065.00	$11,715.00	2014 R.S. Means 06 13 23.10 1100
Treated Lumber Framing Material 4"x6" (Double Unit Rate for 4"x12")	6	M.B.F.	$1,880.00	$11,280.00	2014 R.S. Means 06 11 10.38 0210
Treated Lumber Framing Material 2"x10" (Add 50% to Unit Rate for 3"x10")	7	M.B.F.	$1,298.00	$9,086.00	2014 R.S. Means 06 11 10.38 0130
Guardrails: Wood Framing Post and Columns 4"x4"	550	L.F.	$4.78	$2,629.00	2014 R.S. Means 06 11 10.38 0100
Guardrails: Framing Light, Average cost for all light framing (Use this for 1"x6" rail, 1"x3" & 1"x10" fascia board, Double 1"x4" top & bottom rails)	2	M.B.F.	$1,775.00	$3,550.00	2014 R.S. Means 06 11 10.20 0200
Treated Lumber Framing Material 4"x4"	1	M.B.F.	$975.00	$975.00	2014 R.S. Means 06 11 10.38 0200
Treated Lumber Framing Material 2"x4" (Use this for Double 1"x4" top and bottom rails)	1	M.B.F.	$800.00	$800.00	2014 R.S. Means 06 11 10.38 0100
Treated Lumber Framing Material 2"x6" (Use this for 1"x6" top rail and 2"x6" cross frames)	2	M.B.F.	$825.00	$1,650.00	2014 R.S. Means 06 11 10.38 0110
Framing Light, Platform Framing 2"x6" (Use this for 2"x6" cross bracing)	2	M.B.F.	$2,125.00	$4,250.00	2014 R.S. Means 06 11 10.20 4100
Wire Fences and Gates, Chain link fabric, steel, 2" mesh vinyl coated	20	C.S.F.	$97.00	$1,940.00	2014 R.S. Means 32 31 26.20 1350
Rough Hardware In seismic of hurricane areas	1	L.S.	10% cost of carpentry material	$20,897.50	2014 R.S. Means 06 05 23.70 0210
Top Down Construction	1	L.S.	30% of construction cost	$92,783.85	Historical experience from LA1 Project

(continued on following page)

ITEM	QUANTITY	UNIT	UNIT RATE	TOTAL	SOURCE
West Boardwalk					
Wood Piles, Treated, C.C.A., 2.5# per C.F. 12" butts, 21' to 35' long	2184	V.L.F.	$30.00	$65,520.00	2014 R.S. Means 31 62 19.10 1680
Boot for pile tip, maximum	78	Ea.	$103.00	$8,034.00	2014 R.S. Means 31 62 19.10 1800
Timber Piles, Wood piles, mobilization for 10,000 L.F. pile job, add	2184	V.L.F.	$2.00	$4,368.00	2014 R.S. Means 31 62 19.10 2700
Protective Wrapping of Piles, with nails 12" diameter	210	V.L.F.	$40.50	$8,505.00	2014 R.S. Means 35 01 50.20 0120
Bent Caps: Heavy Timber Framing Multiple 4"x12" (Double 4"x12" each side of cap)	6	M.B.F.	$2,425.00	$14,550.00	2014 R.S. Means 06 13 23.10 0280
Stringers: Heavy Timber Framing Multiple 3" x 10"	9	M.B.F.	$2,650.00	$23,850.00	2014 R.S. Means 06 13 23.10 0230
Material for Decking: FiberForce® 3x6 Earthtone with embossed Woodgrain one face or 3x8 ipe wood whichever is greater	1	L.S.	$152,000.00	$152,000.00	Quote from Bedford Technology/Quote from AdvantageLumber
Labor for Decking: Heavy Timber Framing Floor Planks 3" thick, 3" x 6"	12	M.B.F.	$1,065.00	$12,780.00	2014 R.S. Means 06 13 23.10 1100
Treated Lumber Framing Material 4"x6" (Double Unit Rate for 4"x12")	6	M.B.F.	$1,880.00	$11,280.00	2014 R.S. Means 06 11 10.38 0210
Treated Lumber Framing Material 2"x10" (Add 50% to Unit Rate for 3"x10")	9	M.B.F.	$1,298.00	$11,682.00	2014 R.S. Means 06 11 10.38 0130
Guardrails: Wood Framing Post and Columns 4"x4"	596	L.F.	$4.78	$2,848.88	2014 R.S. Means 06 11 10.38 0100
Guardrails: Framing Light, Average cost for all light framing (Use this for 1"x6" rail, 1"x3" & 1"x10" fascia board, Double 1"x4" top & bottom rails)	2	M.B.F.	$1,775.00	$3,550.00	2014 R.S. Means 06 11 10.20 0200
Treated Lumber Framing Material 4"x4"	1	M.B.F.	$975.00	$975.00	2014 R.S. Means 06 11 10.38 0200
Treated Lumber Framing Material 2"x4" (Use this for Double 1"x4" top and bottom rails)	1	M.B.F.	$800.00	$800.00	2014 R.S. Means 06 11 10.38 0100
Treated Lumber Framing Material 2"x6" (Use this for 1"x6" top rail and 2"x6" cross frames)	2	M.B.F.	$825.00	$1,650.00	2014 R.S. Means 06 11 10.38 0110
Framing Light, Platform Framing 2"x6" (Use this for 2"x6" cross bracing)	2	M.B.F.	$2,125.00	$4,250.00	2014 R.S. Means 06 11 10.20 4100
Wire Fences and Gates, Chain link fabric, steel, 2" mesh vinyl coated	22	C.S.F.	$97.00	$2,134.00	2014 R.S. Means 32 31 26.20 1350
Rough Hardware In seismic or hurricane areas	1	L.S.	10% cost of carpentry material	$24,234.99	2014 R.S. Means 06 05 23.70 0210
Navigation Lighting	1	L.S.	$10,000.00	$10,000.00	
Bridge and Boardwalk Lighting	1	L.S.	$20,000.00	$20,000.00	
Other Construction Items				$111,394.64	2007 TDOT Estimating Guidelines
Mobilization				$72,595.99	2007 TDOT Estimating Guidelines
20% Contigencies				$304,903.17	2007 TDOT Estimating Guidelines
TOTAL				**$1,829,419.03**	
[1] Includes 3% increase for construction over water and 15% for small quantity					
[2]Estimated Engineering Fee from 30% to 100% including Permitting Services				$395,000.00	
Estimated Services During Construction				$175,000.00	
[2]This Fee Includes Hydraulic and Scour Analysis; However,This Does Not Include Any FEMA Permit Applications					

Appendix A
Florida Land Use Cover and Classification System Map and Submerged Resource Survey Report

P:\1425-Naples Baker Park\CAD\SHEETIE\A1\425-FLUCCS.dwg FLUCCS 9/23/2014

FLUCCS	LEVEL3	ACRES
612	MANGROVE SWAMPS	17.83
641	FRESHWATER MARSHES	4.21
740	DISTURBED LAND	10.76
OSW	OTHER SURFACE WATER	0.25

UPLAND (ACRES):	10.76
WETLAND (ACRES):	22.29
PROJECT (ACRES):	33.05

NOTES:

- THESE DRAWINGS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT INTENDED FOR CONSTRUCTION USE.
- SURVEY COURTESY OF: **"NO SURVEY DATA AVAILABLE "**
- SURVEY DATED: **MM-DD-YYYY**

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NAPLES BAKER PARK

FLUCCS MAP

THESE DRAWINGS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT INTENDED FOR CONSTRUCTION USE.

		REV#:	REV BY:	DATE:	CHK BY:	CHANGED:
DESIGNED:	AP	1.	-	-	-	-
DRAWN BY:	RMJ	2.	-	-	-	-
CREATED:	07-17-14	3.	-	-	-	-
JOB NO.:	1425	4.	-	-	-	-
SHEET NO.:	01	5.	-	-	-	-

SECTION- 03 TOWNSHIP- 50S RANGE- 25E

CITY OF NAPLES

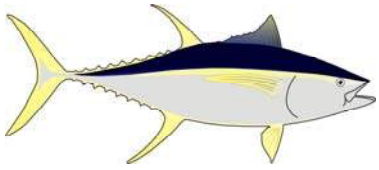
JAY AND PATTY BAKER PARK

AND

GORDON RIVER GREENWAY CONNECTOR BRIDGE

SUBMERGED RESOURCE SURVEY

JULY 2014



PREPARED BY:
TURRELL, HALL & ASSOCIATES, INC.
3584 EXCHANGE AVENUE
NAPLES, FL 34104
(239) 643-0166

1.0 INTRODUCTION & OBJECTIVE

Baker Park is located at 50 Riverside Circle, FL 34102, (folio 20767004002, 20762000001, & 20760840001) on the City of Naples' land located at the corner of Goodlette-Frank Road and Central Ave/Riverside Circle. The northern, eastern and southern shorelines lie along the Gordon River, while the western portion of the property lies along Central Avenue. There is a combination of mangroves with scattered medium sized riprap along the shoreline that currently has one unimproved boat slide where the rowing club launches its shells located along the northern shoreline. The entire site lies within Section 03, Township 50 South, Range 25 East, in Collier County Florida.

In addition to the Park site, the Gordon River Greenway connector bridge is proposed to connect the Naples Greenway path from the east side of the river to the Park site on the west side of the river. Parcel 20760680009, lying on the west side of North Road and immediately south of Naples Harbor Yacht Club, will be the connector site for the east end of the bridge. This site is dominated by mangrove and marsh with an existing pathway on the east half of the site which will be used to access the bridge. It also lies within Section 03, Township 50 South, Range 25 East, in Collier County Florida.

Turrell, Hall & Associates was contracted to provide marine permitting and design services for proposed docking facility and improved boat ramp at Baker Park, as well as the pedestrian bridge and connection areas. The purpose of the submerged resource survey was to identify and locate any existing marine resources within the limits of the proposed project footprint. Specific resource locations would also help reconfigure designs to reduce impact footprints as much as possible, while maintaining the needed structural integrity.

The following report documents the Submerged Resource Survey findings associated with this project.

2.0 METHODOLOGY

Prior to onsite examination of benthic habitats aerial maps of the current (Appendix 1) and historical site conditions from 2008 (Appendix 2) were examined to determine what kind of marine work has taken place onsite prior to this visit (i.e. dredging, bulkhead construction, riprap installation, dock construction, etc.).

A system of 2 meter wide transects was laid out on a waterproof aerial map for field use with GPS locations noted. Site access is also established before the survey on the aerial map.

A GPS was taken to the dive site, along with dive slates, camera equipment and a 1 meter square quadrat which was further broken down into sections for better coverage identification. Depending on current, depth and visibility, the site will either be evaluated by snorkeling or with scuba tanks.

All findings were reported to a staff member tending the diver(s) from the surface and if resources were located their location limits were recorded on the GPS, while the species present and their percent coverage were documented on the dive slate and with photographs (and/ or video).

Upon completion of the survey, all data was immediately downloaded and unknown species were identified using office reference material (5.0).

Each report contains the following information:

1. Date and time of day (start and finish)
2. Water depth at substrate for shallowest and deepest edges of bed(s)
3. General sediment type (e.g., silt, mud, sand, shell, etc)
4. Estimate of the percent cover of submerged aquatic vegetation (SAV) within the project vicinity (for each species, if applicable) and approximate square footage/ acreage. [e.g, barren, sparse (1-10% cover), low (11-25%), moderate (26-50%), and high (> 50%].
5. Estimate species density, if applicable (Braun Blanquet Method).
6. Shoot density, if applicable (random or systematic shoot counts within quadrates distributed within the project area).
7. Notable biological observations (e.g., shellfish or algal beds, crabs or lobsters, and fish fauna).

Submerged aquatic vegetation (SAV) includes: seagrasses, oligohaline grasses, attached macroalgae and drift macroalgae that covers a substrate.

3.0 RESULTS

DATE	TIME	CURRENT	TIDE	WEATHER	VISIBILITY
7/3/14	9:30 – 11:00	<1.5 Kn	Outgoing-Low	Sunny, 94˚F Wind <3 Kn	8-12 inches

Surface water conditions at the time of the submerged resource surveys were calm, with fair (8-12 inches) visibility throughout the entire surveyed area. Boat traffic was encountered but a very limited amount considering the location of the property on the Gordon River. During the survey a slow outgoing tide was encountered, with low tide being registered at 11:08 (1.2 MLLW) and high tide registered at 16:52 (2.3 MHW) on this date.

The substrate found at the site consisted of a silt/sand and silt muck material with scattered oyster debris, rocks, and shells throughout the nearly entire surveyed area and stretching out past the distances of this survey. It is estimated that 98% of the surveyed area was covered with 1.5'– 2.5' of the silt /sand and silt muck mixed debris material. The remaining 2% of the substrate was covered with various types of filamentous and macro algae.

Numerous barnacles and some sporadic oysters were observed growing on the rocks along the shoreline and mangrove prop roots (see Submerged Resource Map- Appendix 1). All observed fish species were located within the mangrove shoreline, which provides the only natural cover on the property.

3.1 OBSERVED SPECIES

FISH

Common Name	Scientific Name
snook	*Centropomus undecimalis*
sheepshead	*Archosargus probatocephalus*
mangrove snapper	*Lutjanus griseus*
jack crevalle	*Caranx hippos*
glass minnow	*Anchoa mitchilli*
striped mullet	*Mugil cephalus*

CRUSTACEAN

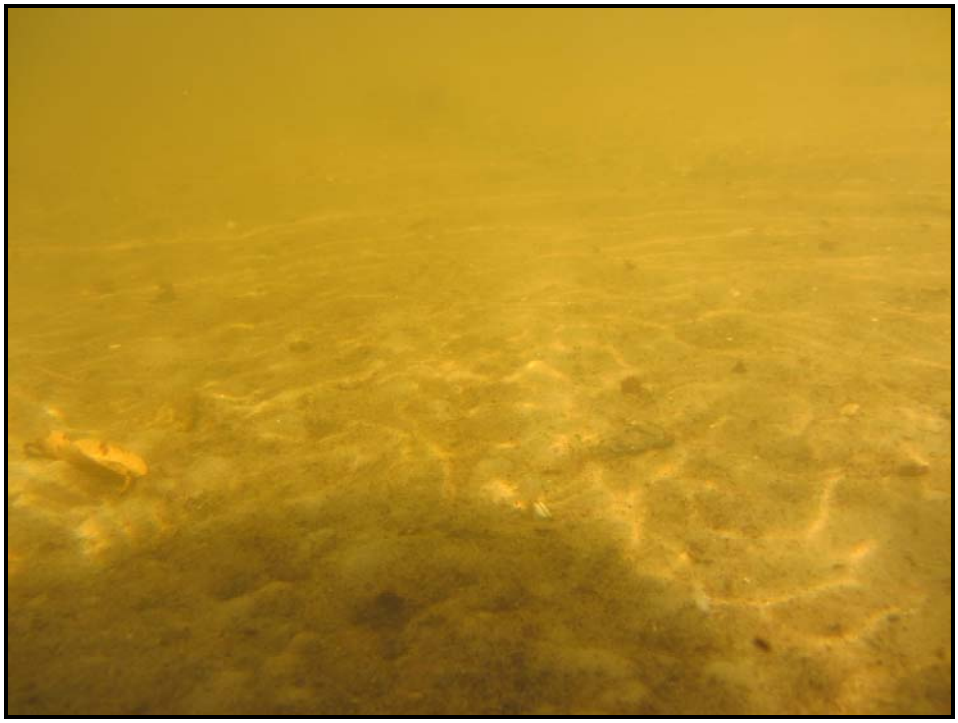
Common Name	Scientific Name
eastern oyster	*Crassotraea virginica*
stone crab	*Menippe mercenaria*
barnacle	unknown

3.2 PHOTOGRAPHS

Southern mangrove shoreline on Baker Park site (facing west)

South end of Bake Park Shoreline looking north along river towards peninsula (on right)

Looking south along Baker Park Shoreline



Typical silt/sand substrate habitat onsite (on peninsula)

View of eastern shoreline connector site (north end facing east from river)

View of eastern shoreline connector site (south end facing east from river)

Typical silt/sand muck sediment observed onsite

Typical oyster debris found onsite

4.0 CONCLUSIONS

The submerged resource survey yielded few findings. Barnacles were the most abundant fauna found, which were all observed growing on shoreline mangrove prop roots and existing riprap. Oyster growth was also noted on mangrove prop roots and riprap. All observed fish species were found within the mangrove shoreline as well.

Various filamentous algae and macro algae were observed and documented growing along the bottom sediments in approximately 2% of the surveyed areas, while 98% of the surveyed transects were comprised of a silty-sand and shell debris/ rock mix.

In September 2008 Turrell, Hall & Associates performed a similar submerged resource survey for a proposed footpath bridge associated with the Gordon River Greenway. No resources were located during the 2008 survey and the substrate was primarily silty mud mixed with oyster debris.

Based on past and current survey findings it does not appear the proposed project footprint would result in marine resource impacts on either the park site or the bridge connector site that might cause permitting issues or require a change in the planned footprint.

5.0 REFERENCES

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Universidad Nacional de Columbia. *The Sponge Guide*.
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University of Warwick Coralpedia. *Coralpedia*.
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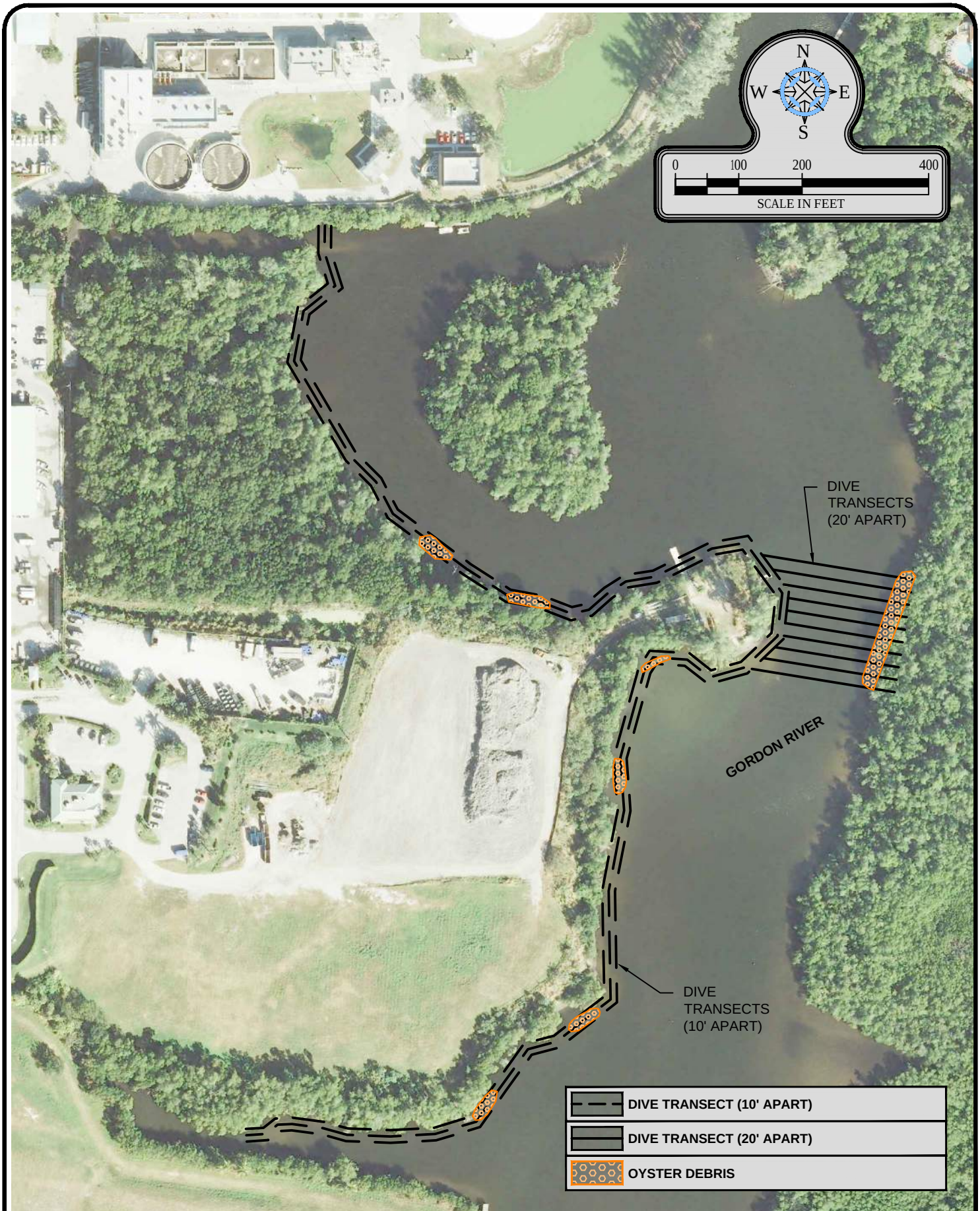
APPENDIX 1

SUBMERGED RESOURCE MAP

(July 2014)

P:\1425-Naples Baker Park\CAD\SHEETS\RS1425-SRS.dwg 8/18/2014



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NAPLES BAKER PARK

SUBMERGED RESOURCE SURVEY

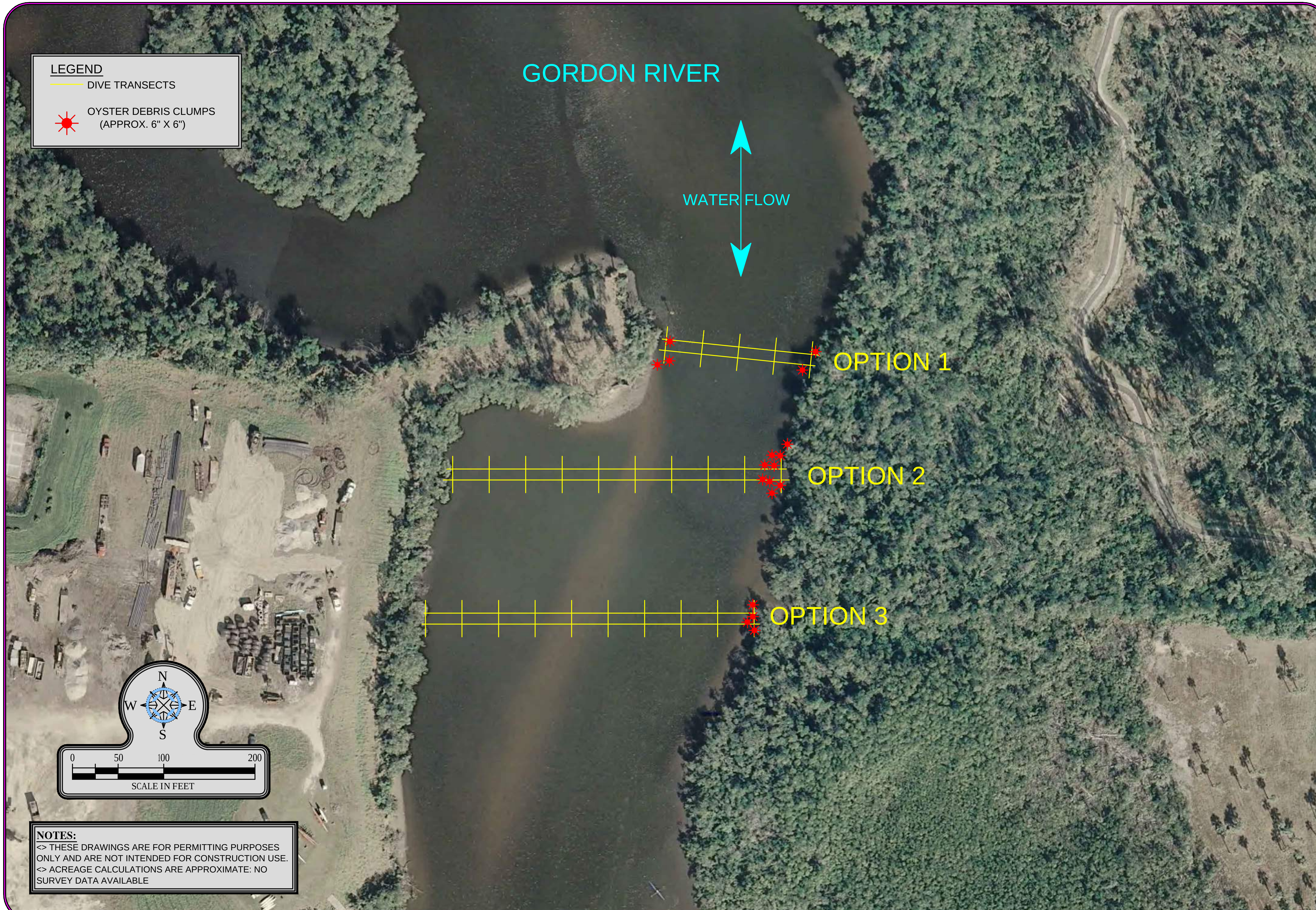
DESIGNED	MK	REVISION	TAB NAME	SUBMERGED
DRAWN	RMJ	N/A	SHEET	01
DATE	08-18-14	N/A	SCALE	1" = 200'
JOB NO.	1425	N/A		

SECTION- 03 TOWNSHIP- 50S RANGE- 25E

APPENDIX 2

SUBMERGED RESOURCE MAP

(September 2008)



NOTES:
<> THESE DRAWINGS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT INTENDED FOR CONSTRUCTION USE.
<> ACREAGE CALCULATIONS ARE APPROXIMATE: NO SURVEY DATA AVAILABLE

GORDON RIVER GREEN WAY
DIVE TRANSECTS MAP

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email: tuna@turrell-associates.com

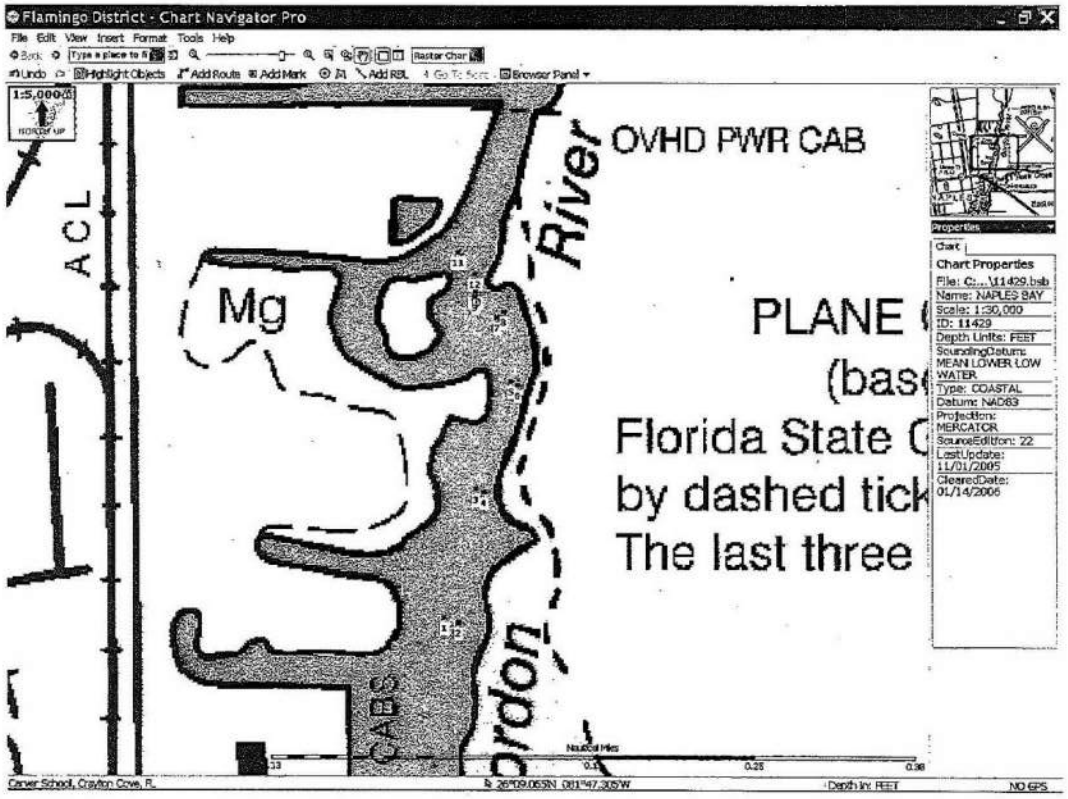
DRAWN BY: SS	REVIEWED BY: TTT
PROJECT #: 0503.1	SHEET: 1 OF 1
DATE: 09-25-08	
SCALE: AS SHOWN	
TAB NAME: 11x17 (3)	REVISIONS: 10-03-08 JWM
	N/A

FILE NAME: O:\CLOSED FILES\0503.1 Gordon River Greenway Bridge\Drawings 09-30-2008\Gordon River Bridge.dwg

Appendix B
Buoy Information from City/Harbormaster

Coast Guard Buoy Coordinates and Buoy Location Map

Buoy	Color	Lat	Long
1	Green	26 08.779	081 47.179
2	Red	26 08.775	081 47.167
3	Green	26 08.879	081 47.152
4	Red	26 08.876	081 47.145
5	Green	26 08.964	081 47.121
6	Red	26 08.961	081 47.115
7	Green	26 09.014	081 47.133
8	Red	26 09.019	081 47.127
9	Green	26 09.030	081 47.152
10	Red	26 09.034	081 47.151
11	Green	26 09.065	081 47.166
12	Red	26 09.048	081 47.152



Appendix C
Geotechnical Report

City of Naples, Florida
Gordon River Greenway
Connector Bridge

Preliminary Geotechnical Investigation and Design Recommendations Report

November 2014

Table of Contents

Appendices

Tables

Figures

Section 1
Introduction

1.1 Project Description

CDM Smith has been retained by the City of Naples (City), Florida to provide professional engineering and technical services associated with the Gordon River Greenway Connector Bridge (Bridge). As part of these services, CDM Smith performed a geotechnical investigation and prepared this report summarizing our field investigation, laboratory testing program, and geotechnical engineering recommendations for design of the proposed structures. This report addresses the bridge and includes the following:

- Boardwalk: The boardwalk will consist of two sections. The west section will be 336 feet long at a grade of +1.31%. The east section will be 292-feet-long at a grade of -4.18%. Both boardwalk sections will bear on timber piles.
- Pedestrian Bridge: This structure will be a 230-foot-long concrete bridge bearing on precast concrete piles.

1.2 Elevation Datum

All elevations noted herein are reported in feet and referenced to the North American Vertical Datum of 1988 (NAVD 88).

1.3 Purpose and Scope

The purpose of this report is to summarize the subsurface conditions encountered at the proposed structure locations and provide geotechnical engineering recommendations for design and construction. Specifically, the scope of work included the following:

- Review available subsurface information,
- Drill six (6) geotechnical test borings for the purpose of gathering information on the subsurface conditions and obtaining soil samples for laboratory testing,
- Conduct laboratory tests to assist with classification of soils encountered and estimate the engineering properties of the underlying strata,
- Perform analyses and develop geotechnical engineering recommendations for design and construction of the bridge and identify special construction considerations, and
- Prepare this engineering report presenting CDM Smith's recommendations, including data collected as part of this investigation.

1.4 Report Limitations

These recommendations have been prepared for the design of the proposed improvements associated with the bridge as understood at this time and described in this report. This report has been prepared in accordance with generally accepted engineering practices. No other warranty, express or implied is made. In the event that changes in design or location of the proposed improvements occur, the conclusions and recommendations contained herein should not be considered valid unless verified in writing by CDM Smith.

Section 2
Site and Subsurface Conditions

2.1 Regional Geology

The project site is located in Collier County which is underlain by near-surface geology of the Pliocene period. Subsurface conditions in this region generally consist of sand and clay or mud. The site lies within the Tamiami formation, which consists primarily of layers of fossiliferous sand, clayey sand, and fossiliferous limestone, based on the Florida USGS geologic map. The site geology is also impacted by the nearby Gordon River and Gulf of Mexico.

2.2 Subsurface Investigations

2.2.1 Test Borings

To investigate subsurface conditions at the proposed structures and to characterize the overall site subsurface conditions, a total of six geotechnical test borings were drilled by Ambient Technologies, Inc. of St. Petersburg, Florida, Madrid Engineering Group, Inc. of Bartow, Florida, and GFA International, Inc. of Fort Myers, Florida between July 29, 2014 and October 24, 2014. Three borings were drilled in the river near the proposed bridge location (GR-1, GR-2, and GR-3), two borings were drilled near the proposed west boardwalk (BSB-1 and BSB-2), and one boring was drilled near the eastern landing for the boardwalk on the Gordon River Greenway trail (BSB-3). Locations of borings BSB-1 and BSB-2 were selected by CDM Smith and located in the field by a surveyor. The location of BSB-3 was selected and located in the field by CDM Smith. Locations of borings GR-1, GR-2, and GR-3 were selected by CDM Smith and located in the field by the drilling subcontractor using GPS. The approximate locations of the borings are shown on **Figure 2-1**.

Drilling of the geotechnical test borings was overseen by CDM Smith (BSB-3) and a subcontracted geologist (all other borings). Test boring logs were prepared by CDM Smith and are included in Appendix A.

The test borings were drilled using an ATV drill rig and were typically advanced by mud rotary with a 2- 7/8-inch tricone roller bit. The land test borings were terminated at depths of 60 feet below the existing ground surface. The barge test borings were drilled to 60 feet below the river bottom, which is approximately 8 feet beneath the top of water.

Split-spoon sampling was typically conducted continuously for the first 20 feet and at five-foot intervals thereafter to the depth of boring. Samples were collected in accordance with ASTM D1586 (2-inch-diameter sampler driven 24 inches by blows from a 140-pound hammer falling freely for a 30-inch drop). The number of blows required to drive the sampler each 6-inch increment was recorded. The Standard Penetration Resistance (N-value) was calculated as the sum of the blows over the second and third 6-inch-increments of penetration. Representative soil samples from the test borings were collected and stored in jars for later review and laboratory testing. Upon completion, borings were tremie grouted to ground surface with cement grout.

Source of Aerial Photography - Collier County 2014

N

Legend

● Soil Boring

Gordon River Greenway Connector Bridge
Locations of Geotechnical Borings

1 inch = 50 feet

0 25 50 100

Feet

Figure 2-1

CDM Smith

2.3 Subsurface Conditions

2.3.1 General

Subsurface soil conditions were interpreted from the test borings conducted as part of the exploration program and our understanding of the local geology. Test borings generally encountered soils consisting of layers of silty clay, silty sand, and limestone. A summary of soil, rock, and groundwater conditions encountered in the test borings is included in **Table 2-1**.

2.3.2 Subsurface Conditions

A silty clayey sand layer was encountered in all bridge and boardwalk test borings. This layer typically consisted of light brown to light green, very loose to loose, fine grained SAND, varying amounts of silt and clay. The layer thickness ranged from 5.0 to 14.0 feet at the test boring locations.

An upper limestone layer was encountered in all bridge and boardwalk test borings. This layer typically consisted of light gray, very soft to hard, LIMESTONE, some silty clay. While this material is classified as limestone, it displays properties more consistent with that of a soil. Layer thickness ranged from 1.6 to 13.0 feet at the test boring locations where present.

A silty clay layer was encountered in all bridge and boardwalk test borings. This layer typically consisted of light green, very soft to soft, Silty CLAY, some limestone fragments, little shell. The layer thickness ranged from 0.5 to 27.5 feet at the test boring locations where present.

A lower limestone layer was encountered in all bridge and boardwalk test borings. This layer typically consisted of light yellowish gray, loose to dense, LIMESTONE, some silty clay, some fine sand. As with the upper limestone layer, the lower limestone layer also displays properties more consistent with that of a soil. Layer thickness ranged from 17.0 to greater than 44.0 feet at the test boring locations where present.

2.3.3 Variation in Subsurface Conditions

The interpretation of general soil conditions presented herein is based on soil, rock, and groundwater conditions observed at the test boring locations. However, subsurface conditions may vary between test boring locations. If conditions are found to be different from those assumed, recommendations contained in this report should be reevaluated by CDM Smith and confirmed in writing. Water levels measured in the test borings should not necessarily be considered to represent stabilized groundwater levels. In addition, water levels are expected to fluctuate with season, temperature, climate, construction in the area, and other factors. Actual conditions during construction may be different from those observed at the time of the test borings.

2.4 Laboratory Test Results

Laboratory testing will be conducted on select split–spoon samples, as follows:

- Four (4) grain-size analyses performed in accordance with ASTM D422;
- Two (2) Atterberg limits tests performed in accordance with ASTM D4318; and
- Six (6) moisture content tests performed in accordance with ASTM D2216.

Laboratory results are summarized in **Table 2-2** and contained in Appendix B.

Table 2-1. Summary of Subsurface Investigations

Test Boring Number	Drill Date	Approximate Ground Surface Elevation[1] (feet)	Exploration Depth (feet)	Approximate Stratum Thickness (feet)					Approx. Groundwater Elevation[1] (feet)
				Fill	Clayey/Silty Sand	Upper Limestone	Silty Clay	Lower Limestone	
BSB-1	7/30/2014	2.4	60.0	3 - Peat	7.0	13.0	11.5	>25.5	0.2
BSB-2	7/29/2014	2.5	60.0	3 - Peat	14.0	11.0	15.0	>17.0	0.0
BSB-3	10/24/2014		60.0	0.8	13.1	1.6	0.5	44.0	-1.4
GR-1	9/17/2014	0.0	60.0	-	7	5	21	>27.0	8.0
GR-2	9/18/2014	0.0	60.0	-	5	5.5	27.5	>22.0	8.0
GR-3	9/19/2014	0.0	60.0	-	7	9	18	>26.0	7.0

Notes:

1. Elevations are in feet and referenced to the NAVD 88.

Abbreviations:

- Indicates stratum was not encountered.
> Indicates stratum was not fully penetrated.

Jay and Patty Baker
Gordon River Greenway Connector and Pedestrian Bridge
Naples, Florida

Table 2-2. Summary of Laboratory Test Results

Test Boring No.	Sample No.	Sample Depth (ft-bgs)	Strata	Moisture Content [1] (%)	Soils Finer Than No. 200 Sieve [2] (%)	Atterberg Limits [3] (%)	
						LL	PI
BSB-1	11	23-25	Silty SAND	28.1	37.6	-	-
BSB-2	5	8-10	SAND	22.5	3.8	-	-
GR-1	7	12-14	CLAY	37.0	-	23	4
GR-1	12	28-30	SAND	26.6	35.0	-	-
GR-2	13	33-35	SAND	23.6	16.5	-	-
GR-3	11	23-25	CLAY	27.6	-	22	6

Notes:

1. Moisture contents were determined in accordance with ASTM D2216.
2. Soils finer than the No. 200 sieve were determined in accordance with ASTM D1140.
3. Atterberg limits tests were performed in accordance with ASTM D4318.

- Not Tested
S- Jar Sample
ft-bgs feet below ground surface

Abbreviations:

LL Liquid Limit
PI Plasticity Index

Section 3
Geotechnical Engineering Evaluation and Design Recommendations

3.1 General

This section describes CDM Smith's preliminary geotechnical engineering evaluation and design recommendations for the proposed bridge. In general, geotechnical engineering evaluations and recommendations are based on the results of the field explorations conducted as part of this work, published correlations with soil properties, and the minimum requirements of the Florida Department of Transportation (FDOT) and the International Building Code of 2009 (IBC 2009). In addition, recommended design criteria and requirements are based on performance tolerances.

3.2 Pedestrian Bridge Recommendations

3.2.1 Foundation Design Recommendations

The pedestrian bridge foundations will be pile-supported. For preliminary design, we assume 18-inch-square precast concrete piles with an embedment depth of 50 feet below the riverbed will provide adequate capacity. Each bridge bent will have two piles, each designed to withstand 277 kips of driving force. Based upon the subsurface conditions encountered in the bridge borings, the first 10 feet of subsurface materials should be pre-drilled to advance through thin layers of hard limestone and clay.

The boardwalk foundations will be pile-supported. For preliminary design, we assume each bent will require two 12–inch-diameter tapered timber piles. Piles will extend 20 feet into the existing ground surface and will be designed to withstand 62 kips of driving force.

3.2.2 Estimated Foundation Settlement

Settlement of the proposed bridge and boardwalk, under the anticipated loads and designed as recommended above, is expected to be less than 0.5 inches.

3.3 Seismic Considerations

For purposes of determining design earthquake forces, in accordance with the 2012 International Building Code, the soil may be considered a site class "E".

Based on the Standard Penetration Test N-values and/or fines content of the subsurface soils, the soils at the site are not considered susceptible to liquefaction.

3.4 Design Groundwater Levels

Groundwater was measured at the time of drilling. Groundwater levels varied but were generally encountered around El. 2.0 to 4.0.

The design groundwater level for the site should be assumed to be the 100-year flood elevation of the river.

3.5 Final Design Considerations

The cap rock layer of limestone and occasional deeper limestone layers present high blowcounts that may result in difficult driving conditions for the piles. During final design, a GRLWEAP analyses will be performed to confirm that stresses during driving are within tolerable limits for the pile. Consideration may be given to pre-drilling to depths greater than 10 feet and/or installation of an additional test pile.

Section 4
Construction Considerations

4.1 General

The purpose of this section is to discuss issues related to geotechnical aspects of construction as required for development of the project specifications. Included are anticipated methods of construction and identification of potential construction related problems. The Contractor will be required to base his/her construction methods and cost estimates on an independent interpretation of the subsurface conditions.

4.2 Pile Installation

4.2.1 Pile Monitoring

Dynamic pile monitoring should be conducted by a professional engineer registered in the state of Florida with at least 5 years of experience in similar testing conducted in accordance with ASTM D4945. A complete test report summarizing the data and results from the dynamic pile monitoring program should be provided by the Contractor for review.

4.2.2 Test Piles

A minimum of two test piles will be performed for the bridge. The test piles will be at least 15 feet longer than the estimated required length of the precast concrete piles. Pile installation shall be performed in accordance with FDOT Structures Manual, Section 3.5.

4.3 Protection of Adjacent Structures

4.3.1 Bridge and Boardwalk Construction

Ground vibrations due to pile installation can cause damage to structures. To avoid or mitigate this potential damage, limits on ground vibrations in the form of ground displacement, velocity, or acceleration at given frequencies are typically established.

The Contractor will be responsible to determine the maximum vibration tolerable at each adjacent facility and develop his pile installation methods accordingly. The Bureau of Mines has established criteria to limit ground vibrations using the peak particle velocity (PPV) and frequency parameters. These limits have been established using the cracking of plaster walls in a residential house as a model. In no case should the following be exceeded:

Frequency (Hz)	Max. Peak Particle Velocity (in. per sec.)
Over 40	2.0
30 to 40	1.5
20 to 30	1.0
Less than 20	0.5

Vibrations should be monitored using seismographs for all buildings and other structures within 150 feet of pile driving.

4.4 Construction Monitoring

It is recommended that a qualified Geotechnical Engineer or experienced technician under the direction of the Geotechnical Engineer be present during construction to confirm that the Contractor complies with the intent of these recommendations. Specifically, the field representative would undertake the following responsibilities:

- Observe pile installation; and
- Review the geotechnical instrumentation readings and provide an assessment of the impact of the construction on the adjacent structures.

In addition, the field representative would be present to identify and provide response should conditions encountered differ from those assumed during preparation of this report.

Appendix A

Test Boring Logs

CDM Smith

BOREHOLE LOG
BSB-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.): 2.4
Drilling Method/Rig: Mud Rotary/BR2500
Total Depth (ft.): 60
Drillers: Scott Smith
Depth to Initial Water Level (ft-bgs): 2.2
Drilling Date: Start: 7-30-14 **End:** 7-31-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: FP

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			2.4					
			0					
SS	S-1	24/20		5	2 3 2 6		SP	Poorly-graded SAND (SP), loose, medium to dark gray brown, dry, little silt, trace organic material.
SS	S-2	24/12		7	4 4 3 2			
SS	S-3	24/24	-2.6 5	2	WOH 1 1 1		PT	PEAT (Pt), very soft to soft, dark brown, wet, little sand, little silt.
SS	S-4	24/20		2	WOH 1 1 1		SP-SM	Poorly-graded SAND with SILT (SP-SM), very loose to loose, light brown, wet, little SILT.
SS	S-5	24/17		5	1 2 3 7			Poorly-graded SAND with SILT (SP-SM), very dense, light brown, wet, little SILT.
SS	S-6	2/0	-7.6 10	>50	50/2"		LS	
SS	S-7	24/17		16	2 7 9 8			LIMESTONE with Silty CLAY (LS), very stiff, light brown, wet, some Silty CLAY, trace sand.
			-12.6		4 3			LIMESTONE with Silty CLAY (LS), stiff, light gray, wet, some Silty CLAY, trace sand.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in.,
Spoon Size = 2 in. OD and 24 in. length.
WOH = Weight of Hammer.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
BSB-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			-12.6					
SS	S-8	24/12	15	11	8 5		LS	
SS	S-9	24/3		6	3 2 4 6			LIMESTONE with Silty CLAY (LS), medium stiff, light gray, wet, some SIlty CLAY, trace sand.
SS	S-10	24/17	-17.6	46	12 28 18 19			LIMESTONE with Silty CLAY (LS), hard, light gray, wet, some Silty CLAY, trace sand.
			20					
SS	S-11	24/22	-22.6	5	3 2 3 3		CL	Silty CLAY with poorly-graded SAND (CL), medium stiff, light green gray, wet, some fine SAND.
			25					
SS	S-12	24/24	-27.6	4	2 1 3 2			Silty CLAY with poorly-graded SAND (CL), soft to medium stiff, light green gray, wet, some fine SAND.
			30					
SS	S-13	24/24	-32.6	5	2 2 3 5			Silty CLAY with poorly-graded SAND (CL), medium stiff, light green gray, wet, some fine SAND.
			35				LS	LIMESTONE with Silty CLAY (LS), medium stiff, light green gray, wet, some Silty CLAY.
					3 4			LIMESTONE with Silty CLAY (LS), stiff, light gray, wet, some Silty CLAY, trace sand.

CDM Smith

BOREHOLE LOG
BSB-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-14	24/22	-37.6	9	5 4		LS	
			40					
SS	S-15	24/17	-42.6	18	10 8 10 13			LIMESTONE with Silty CLAY (LS), very stiff, light gray, wet, some Silty CLAY, trace sand.
			45					
SS	S-16	24/20	-47.6	31	7 10 21 61			LIMESTONE with Silty CLAY (LS), hard, light gray, wet, some Silty CLAY, trace sand.
			50					
SS	S-17	24/18	-52.6	53	17 25 28 25			LIMESTONE with Silty CLAY (LS), hard, light gray, wet, some Silty CLAY, trace sand.
			55					
SS	S-18	24/14	-57.6	26	16 16 10 17			LIMESTONE with Silty CLAY (LS), very stiff, light gray, wet, some Silty CLAY, trace sand.
			60					End of boring at 60' bgs.

CDM Smith

BOREHOLE LOG
BSB-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.): 2.5
Drilling Method/Rig: Mud Rotary/BR2500
Total Depth (ft.): 60
Drillers: Scott Smith
Depth to Initial Water Level (ft-bgs): 2.5
Drilling Date: Start: 7-29-14 **End:** 7-30-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: FP

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			2.5					
			0					
SS	S-1	24/22		9	4 4 5 7		SP-SM	Poorly-graded SAND (SP-SM), loose, gray brown, moist, little silt.
SS	S-2	24/20		6	3 3 3 3			Poorly-graded SAND (SP-SM), loose, gray brown, wet, little silt.
SS	S-3	24/20	-2.5 5	2	3 1 1 0		PT	PEAT (Pt), very soft, dark brown, wet, little fine sand.
SS	S-4	24/22		3	WOH 1 2 1			
SS	S-5	24/12	-7.5	11	3 3 8 9		SP	Poorly-graded SAND (SP), medium dense, light brown, wet, fine grained, trace silt.
SS	S-6	24/12	10	3	2 2 1 2		SC	Poorly-graded SAND with CLAY (SC), very loose, light gray green, wet, fine grained, some Silty CLAY, some shells.
SS	S-7	24/0		2	1 1 1/12"			No Recovery.
			-12.5					

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in.,
Spoon Size = 2 in. OD and 24 in. length.
WOH = Weight of Hammer; WOR = Weight of Rod.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
BSB-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-8	24/0	-12.5 15					
SS	S-9	24/0					LS	LIMESTONE with Silty CLAY (LS), very stiff, light gray, wet, some Silty CLAY, little fine grained SAND.
SS	S-10	24/22		25	16 15 10 5			
			-17.5 20					
SS	S-11	24/0		0	WOR/24"			LIMESTONE with Silty CLAY (LS), very soft, light gray, wet, some Silty CLAY, little fine grained SAND.
			-22.5 25					
SS	S-12	24/24		4	2 2 2 3		CL	Silty CLAY (CL), soft to medium stiff, light green gray, wet, trace shells.
			-27.5 30					
SS	S-13	24/24		8	1 2 6 6			Silty CLAY (CL), medium stiff to stiff, light green gray, wet, trace shells.
			-32.5 35					
					3 3			Silty CLAY (CL), medium stiff, light green gray, wet, trace shells.

CDM Smith

BOREHOLE LOG
BSB-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-14	24/24	-37.5	7	4 4		CL	
			40					
SS	S-15	24/17	-42.5	27	12 16 11 13		LS	LIMESTONE with CLAY (LS), medium dense, light gray, wet, little CLAY, little shells.
			45					
SS	S-16	24/20	-47.5	37	8 22 15 17			LIMESTONE with CLAY (LS), medium dense, light gray, wet, little CLAY.
			50					
SS	S-17	24/18	-52.5	61	37 34 27 26			LIMESTONE with CLAY (LS), very dense, light gray, wet, fine grained, little CLAY.
			55					
SS	S-18	24/12	-57.5	29	16 15 14 16			LIMESTONE with CLAY (LS), medium dense, light gray, wet, fine grained, little CLAY.
			60					End of boring at 60 feet bgs.

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
BSB-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.):
Drilling Method/Rig: Mud Rotary/D-50
Total Depth (ft.): 60
Drillers: Greg Cole
Depth to Initial Water Level (ft-bgs): 1.4
Drilling Date: Start: 10-24-14 **End:** 10-24-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: DR

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			0		13		ASPH	Asphalt.
					7			Roadbase.
SS	S-1	24/17		15	8		SP	SAND (SP), loose, yellowish brown, moist, well sorted, fine grained, subrounded, quartz.
	S-2				9			
SS	S-3	9/9		>50	6			SAND (SP), moderately loose, pale yellowish brown, wet, well sorted, fine grained, subrounded, quartz.
	S-4				50/3"		LS	SAND with PEAT (SP), moderately loose, pale yellowish brown and black, wet, well sorted, fine grained, subrounded, quartz, with lenses of peat.
								Weathered Sandy LIMESTONE (LS), dense, very pale orange, wet, poorly cemented becoming well cemented with depth, marly, sand is reworked carbonate and quartz.
SS	S-5	24/14	5	5	3		SC	
					3			
					2			Clayey SAND (SC), soft, moderate yellowish brown, wet, fine grained, moderately well sorted, subrounded, quartz, with dispersed, highly plastic, soft clay.
					2			
SS	S-6	24/11		9	4		SP	SAND (SP), moderately loose, pale olive gray, wet, fine to medium grained, moderately well sorted, subrounded, quartz and reworked limestone, slightly silty.
					5			
					4			
					4			
SS	S-7	24/10		6	4			SAND (SP), moderately loose, pale olive gray, wet, fine to medium grained, moderately well sorted, subrounded, quartz, slightly silty.
					3			
					3			
					3			
			10		3		SP	SAND with GRAVEL (SP), dense, yellowish gray, wet, fine to medium grained, moderately well sorted, subrounded to subangular, quartz with some limestone, fine to medium, well cemented, subangular to angular limestone gravel.
SS	S-8	24/16		19	4			
					15			
					8			
					9		SW	SAND with GRAVEL (SP), dense, yellowish light gray, wet, fine to coarse grained, poorly sorted, subrounded to subangular, quartz with some limestone, fine to medium, well cemented, subangular to angular limestone gravel.
SS	S-9	24/14		34	17			
					17			
					12			
					16			SAND with GRAVEL (SP), dense, yellowish gray becoming very light gray with depth, wet, fine to coarse grained, marly, poorly
					13			

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in.,
Spoon Size = 2 in. OD and 24 in. length.
WOH = Weight of Hammer.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
BSB-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-10	24/11	15	18	5 3		SW LS	sorted, subrounded to subangular, quartz with some limestone, fine to medium, well cemented, subangular to angular limestone gravel.
SS	S-11	24/16		3	3 2 1 1			Weathered LIMESTONE with GRAVEL (LS), moderately soft, very light gray, wet, moderately poorly cemented, marly, reworked carbonate grains with some quartz, some fine to medium gravel.
SS	S-12	24/23		1	WOH WOH 1 1			Weathered LIMESTONE (LS), soft, very light gray, wet, poorly cemented, marly, limestone present as fine to medium gravel in clayey matrix, some fine grained subrounded quartz sand.
			20					
SS	S-13	24/24		1	1 WOH 1 1			
			25					
SS	S-14	24/22		3	1 2 1 4			Weathered LIMESTONE (LS), moderately soft, very light gray, wet, moderately poorly cemented, moderately marly, fine to medium gravel, some shell fragments, some to few fine to medium grained subrounded sand.
			30					
SS	S-16 S-15	24/22		6	1 3 3 2		CL LS	Sandy CLAY (CL), soft, light olive gray, wet, low plasticity, slightly sticky, some limestone gravel, some fine grained quartz sand.
			35					Weathered LIMESTONE (LS), moderately soft, pale olive gray, wet, moderately poorly cemented, moderately marly, limestone present as fine to medium gravel and fine to coarse grained sand, some to few fine to medium grained quartz sand.
					6 10			Sandy LIMESTONE (LS), dense, light olive gray, wet, poorly cemented with some moderately cemented, subrounded, fine to coarse grained reworked limestone sand, trace to few fine grained quartz sand, trace to few marl.

CDM Smith

BOREHOLE LOG
BSB-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-17	24/14		18	8 8		LS	
			40					
SS	S-18	24/18		15	7 7 8 10			Sandy LIMESTONE (LS), dense, pale olive gray, wet, poorly cemented with some moderately cemented, some subrounded, fine to medium with some coarse grained, reworked limestone sand, few shell fragments, trace to few marl, trace to few fine grained quartz sand.
			45					
SS	S-19	24/14		19	8 8 11 16			
			50					
SS	S-20	24/16		12	11 5 7 16			Sandy LIMESTONE (LS), dense, mottled light olive gray and pale olive gray, wet, poorly cemented with some moderately cemented, subrounded, fine to medium with some coarse grained, reworked limestone sand, few to some shell fragments, trace to few marl, trace to few fine grained quartz sand.
			55					
SS	S-21	24/14		9	7 5 4 5			Sandy LIMESTONE (LS), dense, yellowish gray, wet, poorly cemented with few to some moderately cemented, fine to medium grained reworked limestone sand, trace to few shell fragments, trace quartz sand, trace marl.
			60					End of boring at 60 feet bgs.

CDM Smith

BOREHOLE LOG
GR-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.): 0.0
Drilling Method/Rig: Mud Rotary/SIMCO2400
Total Depth (ft.): 60
Drillers: Marco Sanchez
Depth to Initial Water Level (ft-bgs): -8
Drilling Date: Start: 9-17-14 **End:** 9-17-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: FP

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			0.0					
SS	S-1	5/5	0	>50	50/5"		CL	Silty CLAY with ORGANICS (CL), hard, light grayish green, wet, little fine grained sand.
							LS	Mud-rotary drilling. Note: drill cuttings indicate presence of cap rock.
SS	S-2	24/10		16	2 9 7 6		CL	Silty CLAY (CL), very stiff, light grayish green, wet, some limestone, little fine grained sand.
SS	S-3	24/8	-5.0 5	1	1/12" 1 1		SP-SM	Poorly graded SAND with Clayey SILT (SP-SM), very loose, greenish gray, wet, fine grained, some limestone fragments.
SS	S-4	24/24		30	11 14 16 11		LS	LIMESTONE with CLAY (LS), medium dense to dense, light gray, wet, little fine grained sand.
SS	S-5	24/18		8	6 5 3 1			LIMESTONE with CLAY (LS), loose to medium dense, light to medium gray, wet, little fine grained sand.
			-10.0 10				CL	
SS	S-6	24/24		1	2 1/12" 1			Silty CLAY (CL), very soft, very light green, wet, trace limestone fragments.
SS	S-7	24/24		1	2 1/12" 1			Silty CLAY (CL), very soft, very light green, wet.
			-15.0		1 2			Silty CLAY (CL), very soft to soft, very light green, wet.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
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NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in.,
Spoon Size = 2 in. OD and 24 in. length.
WOH = Weight of Hammer.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
GR-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-8	24/24	-15.0 15	3	1 2		CL	
SS	S-9	24/24		1	WOH/12" 1 2			Silty CLAY (CL), very soft, very light green, wet.
SS	S-10	24/24		3	3 2 1/12"			Silty CLAY (CL), very soft, very light green, wet.
			-20.0 20					
SS	S-11	24/24		4	2 3 1 2			Silty CLAY (CL), soft, very light green, wet, trace limestone fragments.
			-25.0 25					
SS	S-12	24/24		6	3 3 3 5		LS	LIMESTONE (LS), loose, light to medium gray, wet, little silty clay.
			-30.0 30					
SS	S-13	24/24		15	9 7 8 13			LIMESTONE (LS), medium dense, light to medium gray, wet, little silty clay.
			-35.0 35					
					11 15			LIMESTONE (LS), dense, light gray, wet.

CDM Smith

BOREHOLE LOG
GR-1

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-14	24/24	-40.0	37	22 18		LS	
			40					
SS	S-15	24/22	-45.0	20	8 8 12 12			LIMESTONE (LS), medium dense, light gray, wet.
			45					
SS	S-16	24/24	-50.0	11	6 5 6 6			LIMESTONE with Silty CLAY (LS), medium dense, light gray, wet, little fine grained sand.
			50					
SS	S-17	24/12	-55.0	9	5 5 4 5		SP-SM	Poorly graded SAND (SP-SM), loose, light gray, wet, fine grained, little clayey silt, trace limestone fragments.
			55					
SS	S-18	24/24	-60.0	32	7 15 17 24		LS	LIMESTONE with poorly graded SAND (LS), dense, light to medium gray, wet, trace silt.
			60					End of boring at 60 feet below river bottom.

CDM Smith

BOREHOLE LOG
GR-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.): 0.0
Drilling Method/Rig: Mud Rotary/SIMCO2400
Total Depth (ft.): 60
Drillers: Marco Sanchez
Depth to Initial Water Level (ft-bgs): -8
Drilling Date: Start: 9-18-14 **End:** 9-18-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: FP

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			0.0					
SS	S-1	5/5	0	>50	50/5"		CL	CLAY with poorly graded SAND (CL), soft, dark brown, wet, fine grained SAND, little organics, little limestone fragments.
							LS	Mud-rotary drilling. Note: drill cutting indicate presence of cap rock.
SS	S-3	24/15	-5.0 5	22	8 8 14 17		CL	Silty CLAY with poorly graded SAND (CL), very stiff, light green, wet, fine grained SAND, little limestone fragments.
SS	S-4	24/15		21	9 12 9 20			Silty CLAY with poorly graded SAND (CL), very stiff, light green, wet, fine grained SAND, little limestone fragments.
SS	S-5	24/17		27	11 12 15 9		LS	LIMESTONE with CLAY (LS), medium dense, medium gray, wet, some clay, little fine grained sand.
			-10.0					
SS	S-6	24/24	10	4	3 2 2 2		CL	Silty CLAY (CL), soft to medium stiff, very light green, wet.
SS	S-7	24/24		4	2 1 3 3			Silty CLAY (CL), soft to medium stiff, very light green, wet.
			-15.0		2 1			Silty CLAY (CL), soft, very light green, wet.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in., Spoon Size = 2 in. OD and 24 in. length.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
GR-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-8	24/24	-15.0 15	3	2 2		CL	
SS	S-9	24/24		3	1 1 2 3			Silty CLAY (CL), soft, very light green, wet.
SS	S-10	24/24		4	2 2 2 4			Silty CLAY (CL), soft, very light green, wet.
			-20.0 20					
SS	S-11	24/24		3	2 1 2 3			Silty CLAY (CL), soft, very light green, wet, some limestone fragments.
			-25.0 25					
SS	S-12	24/24		6	2 2 4 6			Silty CLAY (CL), soft to medium stiff, very light green, wet, some limestone fragments, some shell fragments.
			-30.0 30					
SS	S-13	24/24		19	11 10 9 11		LS	LIMESTONE (LS), medium dense, medium gray to yellowish gray, wet, little silty clay.
			-35.0 35					
					12 20			LIMESTONE (LS), dense, yellowish gray, wet.

CDM Smith

BOREHOLE LOG
GR-2

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-14	24/16	-40.0	36	16 16		LS	
			40					
SS	S-15	24/17	-45.0	29	10 13 16 15			LIMESTONE (LS), medium dense, light gray to yellowish gray, wet.
			45					
SS	S-16	24/24	-50.0	18	6 9 9 10			LIMESTONE (LS), medium dense, light gray to yellowish gray, wet.
			50					
SS	S-17	24/12	-55.0	9	5 5 4 5		SP-SM	Poorly graded SAND with Clayey SILT (SP-SM), loose, light grayish green, wet, fine grained, some Clayey SILT, trace limestone fragments.
			55					
SS	S-18	24/18	-60.0	24	11 13 11 17		LS	LIMESTONE with poorly graded Silty SAND (LS), medium dense, light to medium gray, wet, some fine grained SAND, little silt.
			60					End of boring at 60 feet below river bottom.

CDM Smith

BOREHOLE LOG
GR-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Drilling Contractor:
Surface Elevation (ft.): 0.0
Drilling Method/Rig: Mud Rotary/SIMCO2400
Total Depth (ft.): 60
Drillers: Marco Sanchez
Depth to Initial Water Level (ft-bgs): -7
Drilling Date: Start: 9-19-14 **End:** 9-19-14
Abandonment Method:
Borehole Coordinates:
Field Screening Instrument:
Northing Easting
Logged By: FP

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			0.0					
SS	S-1	24/12	0	2	1 1 1 1		ML	Clayey SILT (ML), very soft to soft, dark greenish brown, wet, some shell fragments, some organics.
SS	S-2	24/14		10	7 5 5 7		SC	Poorly graded SAND with Silty CLAY (SC), loose to medium dense, light olive green, wet, fine grained, some Silty CLAY, some limestone fragments.
SS	S-3	24/8	-5.0 5	15	4 6 9 4		LS	LIMESTONE with poorly graded SAND (LS), medium dense, yellowish gray to light greenish gray, wet, some fine grained SAND, little clay.
SS	S-4	24/20		39	12 17 22 23			LIMESTONE with poorly graded SAND (LS), dense, yellowish gray, wet, some fine grained SAND, little clay.
SS	S-5	24/18		14	9 7 7 5			LIMESTONE with poorly graded SAND (LS), medium dense, yellowish gray, wet, some fine grained SAND, little clay.
SS	S-6	24/24	-10.0 10	1	4 1/12" 1		CL	Silty CLAY (CL), very soft, light green, wet.
SS	S-7	24/24		3	2 1 2 1			Silty CLAY (CL), very soft to soft, light green, wet, some shell fragments.
			-15.0		4 1			Silty CLAY (CL), very soft to soft, light green, wet.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer weight = 140 lbs, Hammer drop height = 30 in., Spoon Size = 2 in. OD and 24 in. length.

Reviewed by: SW, 11/14/2014

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
GR-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			-15.0					
SS	S-8	24/24	15	2	1 2		CL	
SS	S-9	24/24		3	2 2 1 1			Silty CLAY (CL), very soft, light green, wet.
SS	S-10	24/24		6	2 2 4 12			Silty CLAY (CL), very soft, light green, wet, some shell fragments.
			-20.0 20				LS	LIMESTONE with Silty CLAY (LS), medium dense, yellowish gray, wet, some Silty CLAY.
							CL	
SS	S-11	24/24	-25.0 25	4	3 3 1 3			Silty CLAY (CL), soft, olive green, wet, trace limestone fragments.
SS	S-12	24/16	-30.0 30	17	5 5 12 7			Silty CLAY (CL), stiff, olive green, wet, trace limestone fragments.
							LS	LIMESTONE (LS), medium dense, light to medium gray, wet.
SS	S-13	24/17	-35.0 35	32	9 11 21 19			LIMESTONE (LS), dense, light gray, wet.
					12 14			LIMESTONE with Silty CLAY (LS), medium dense to dense, light gray, wet, some Silty CLAY.

BOREHOLE BAKER LOGS.GPJ CDM_CORP.GDT 11/3/14

CDM Smith

BOREHOLE LOG
GR-3

Client: City of Naples
Project Name: Jay and Patty Baker Park
Project Location: Naples, FL
Project Number: 6680-104728

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
SS	S-14	24/17	-40.0	28	14 15		LS	
			40					
SS	S-15	24/12	-45.0	26	12 12 14 16			LIMESTONE with poorly graded SAND (LS), medium dense, light olive gray, wet, some fine grained SAND, little silty clay.
			45					
SS	S-16	24/16	-50.0	16	8 10 6 10			LIMESTONE with poorly graded SAND (LS), medium dense, light olive gray, wet, some fine grained SAND, little silty clay.
			50					
SS	S-17	24/12	-55.0	9	6 5 4 6		SP-SM	Poorly graded SAND with Clayey SILT (SP-SM), loose, light greenish gray, wet, fine grained, some Clayey SILT, trace limestone fragments.
			55					
SS	S-18	24/20	-60.0	38	11 15 23 40		LS	LIMESTONE with poorly graded Silty SAND (LS), dense, light to medium gray, wet, fine grained SAND, little silt.
			60					End of boring at 60 feet below river bottom.

Appendix D
Figures

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. DAWSON
DRAWN BY: D. PICKEL
SHEET CHK'D BY: F. BALE
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2014

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Fort Myers, FL 33901
Tel: (239) 938-9600
FL COA No. EB-0000020

CITY OF NAPLES

JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR

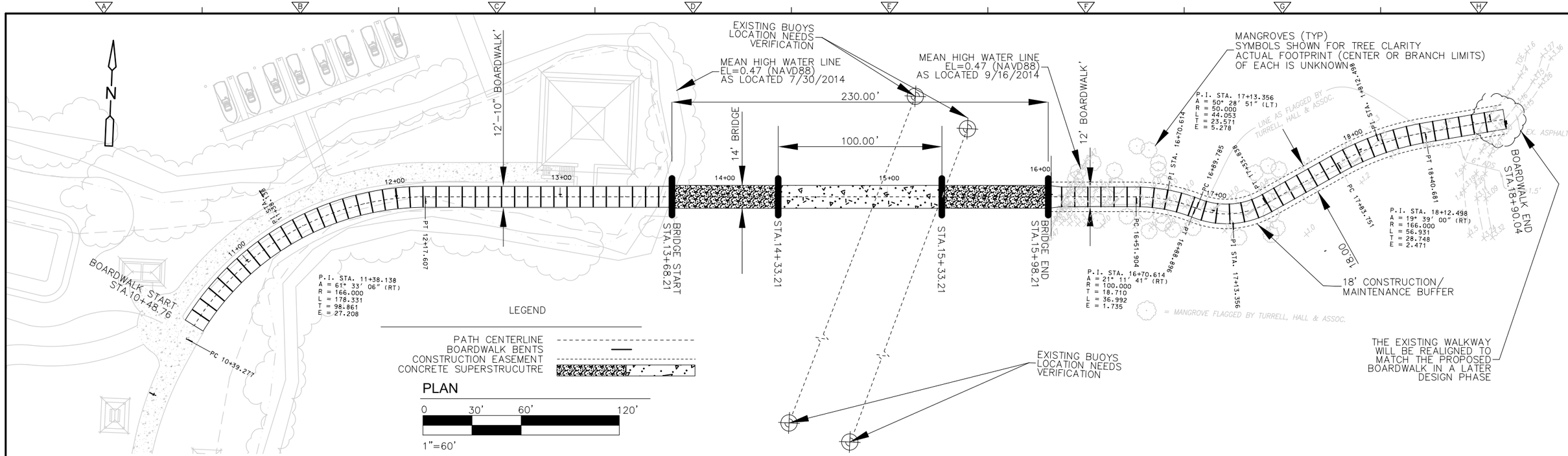
LOCATION SKETCH

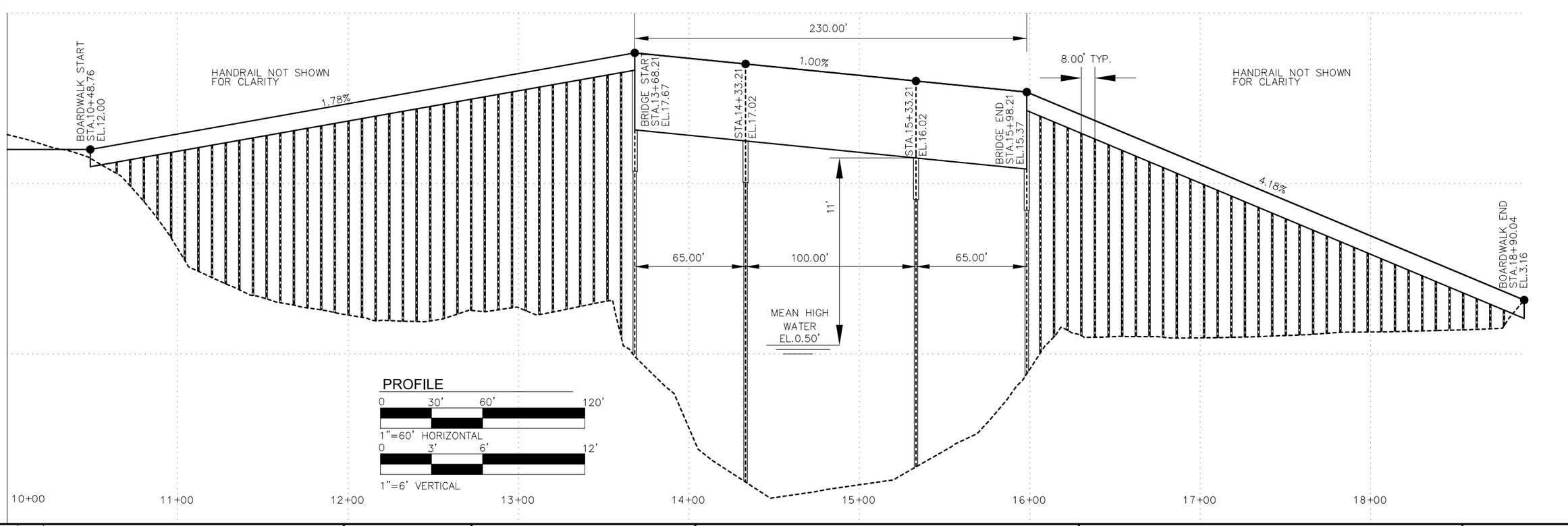
PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.

FIGURE 4-1

NOT FOR CONSTRUCTION





REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: SEPTEMBER 2014

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Fort Myers, FL 33901
Tel: (239) 938-9600
FL COA No. EB-0000020

CITY OF NAPLES

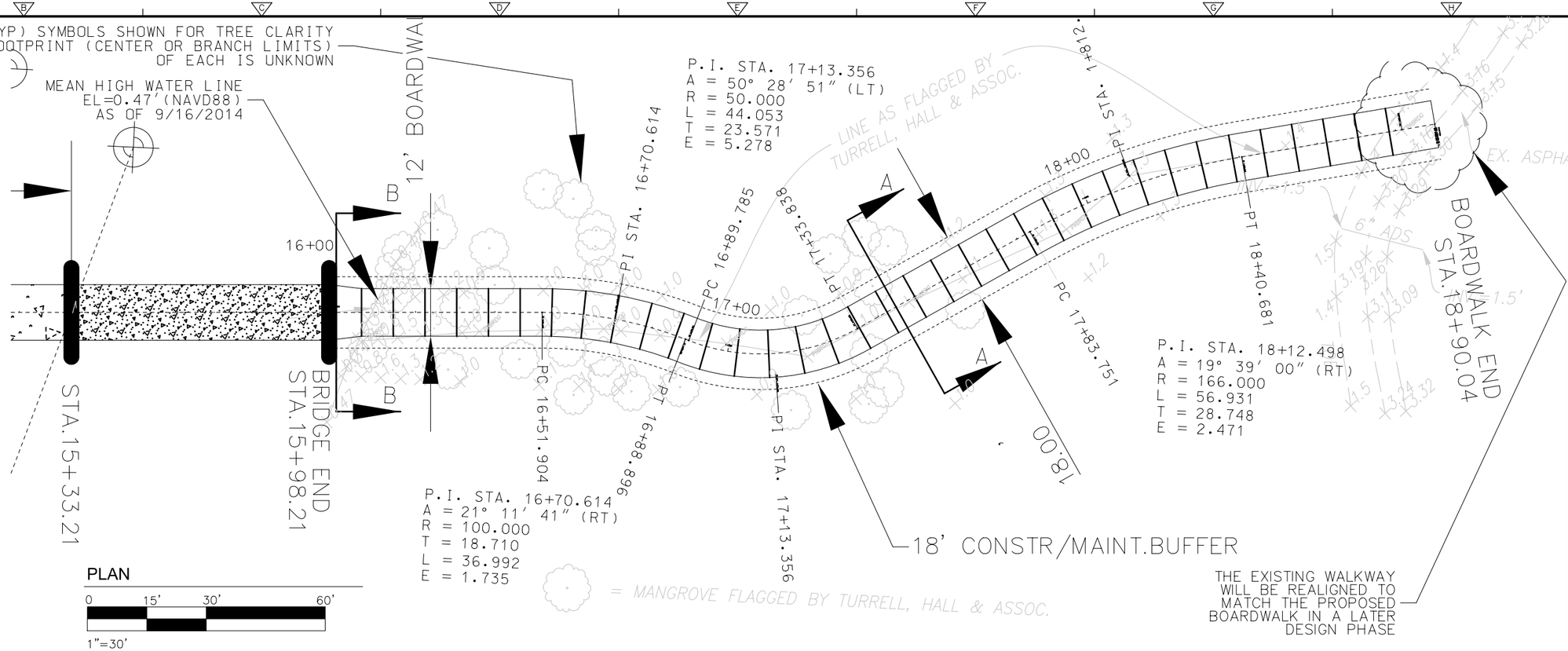
JAY AND PATTY BAKER PARK

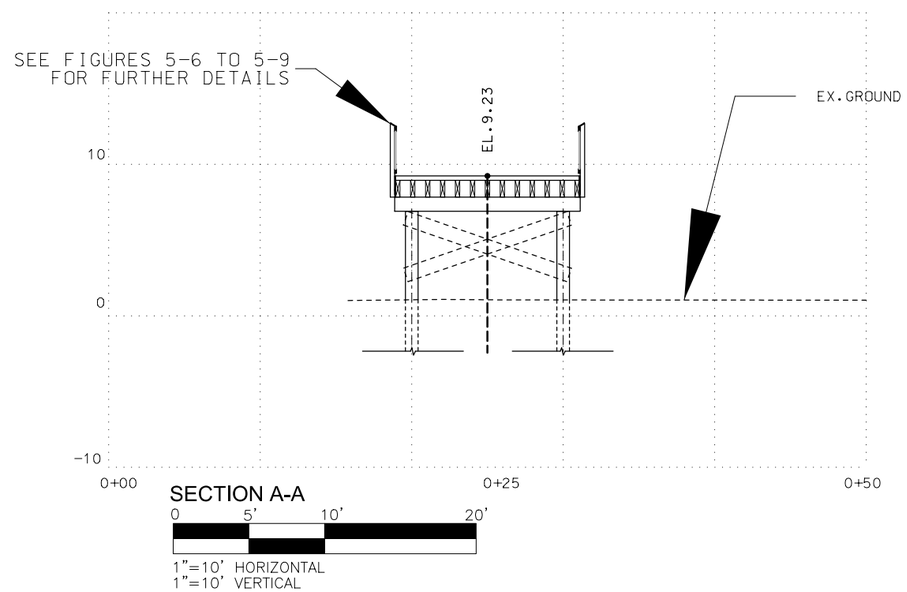
GORDON RIVER GREENWAY CONNECTOR BOARDWALK AND BRIDGE PLAN AND ELEVATION

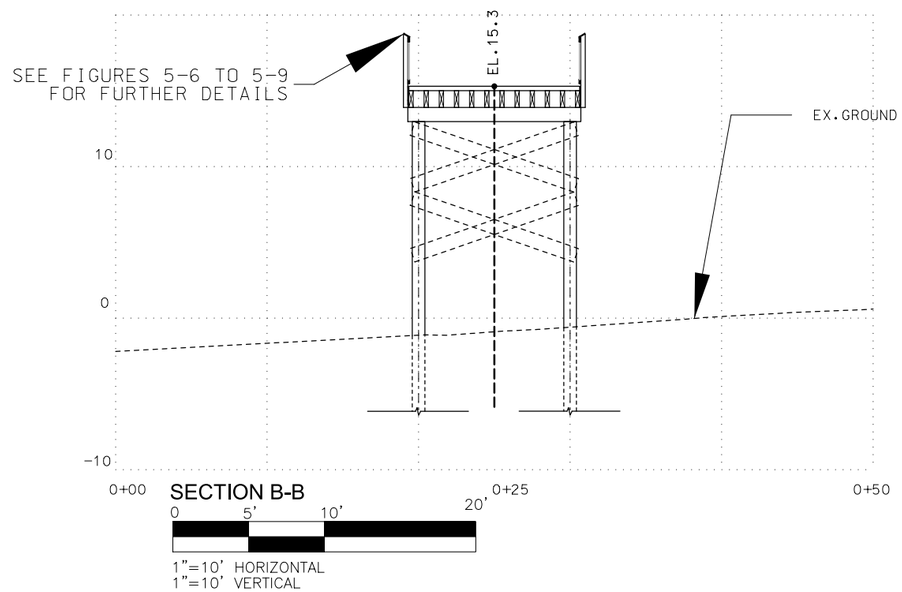
PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.
FIG.5-1

NOT FOR CONSTRUCTION







REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: SEPTEMBER 2014

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CITY OF NAPLES

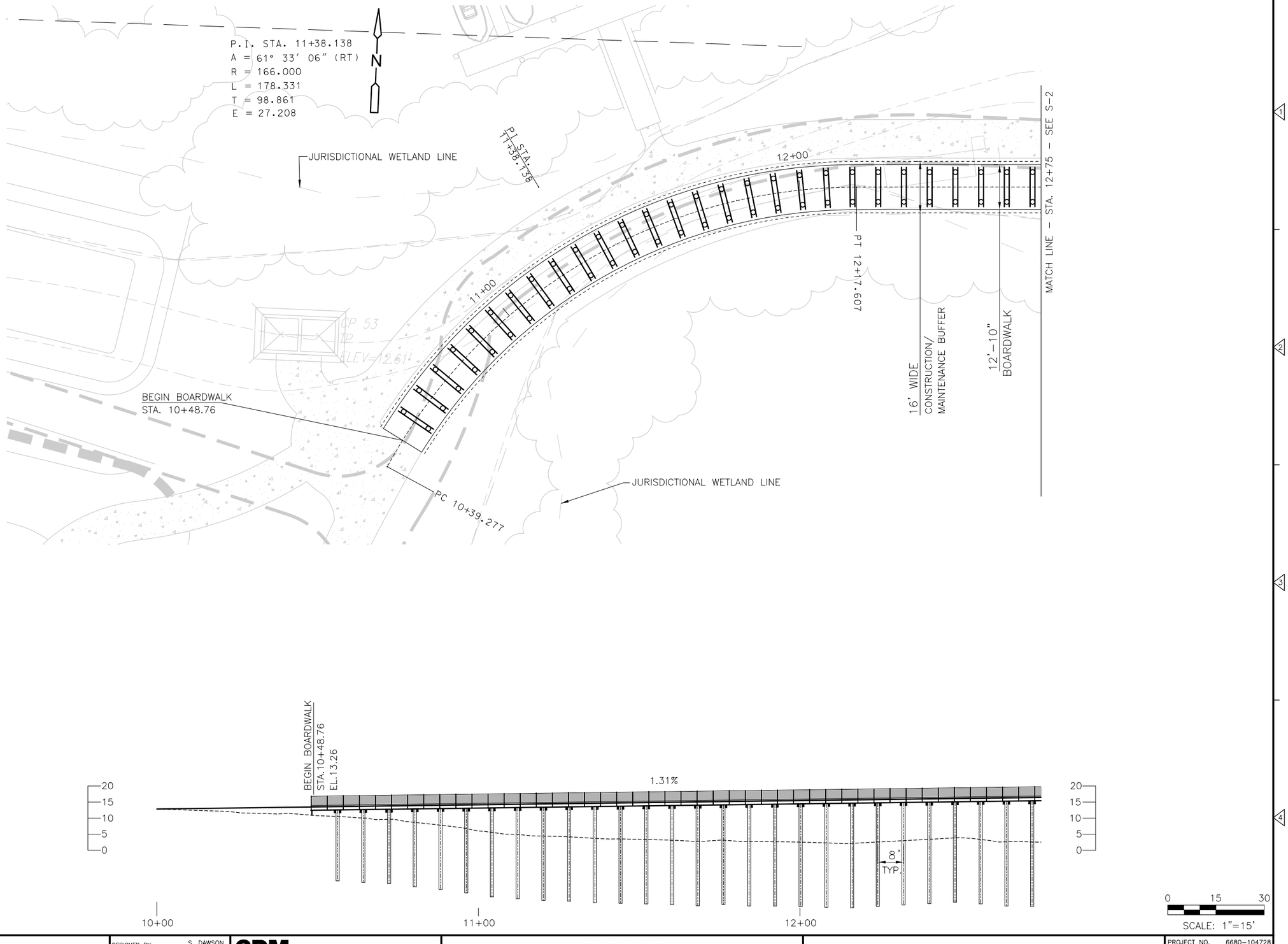
JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR
EAST BOARDWALK
PLAN AND SECTIONS

PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.
FIG.5-2

NOT FOR CONSTRUCTION



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. DAWSON
DRAWN BY: D. PICKEL
SHEET CHK'D BY: F. BALE
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2014

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FL COA No. EB-0000020

CITY OF NAPLES

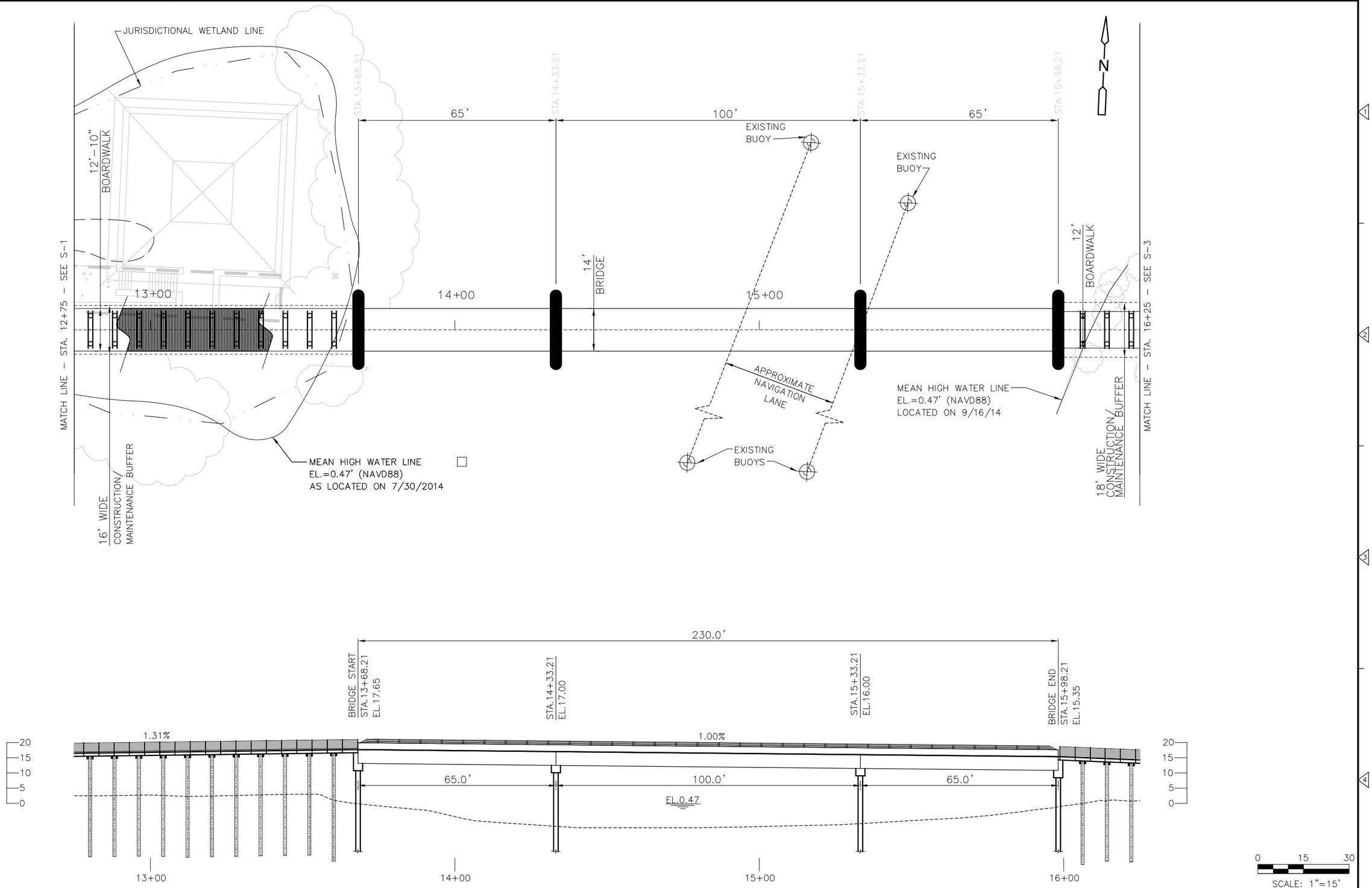
JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR
BOARDWALK AND BRIDGE
PLAN AND ELEVATION

PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.
FIGURE 5-3
(1 OF 3)

NOT FOR CONSTRUCTION



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. DAWSON
DRAWN BY: D. PICKEL
SHEET CHK'D BY: F. BALE
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2014

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CITY OF NAPLES

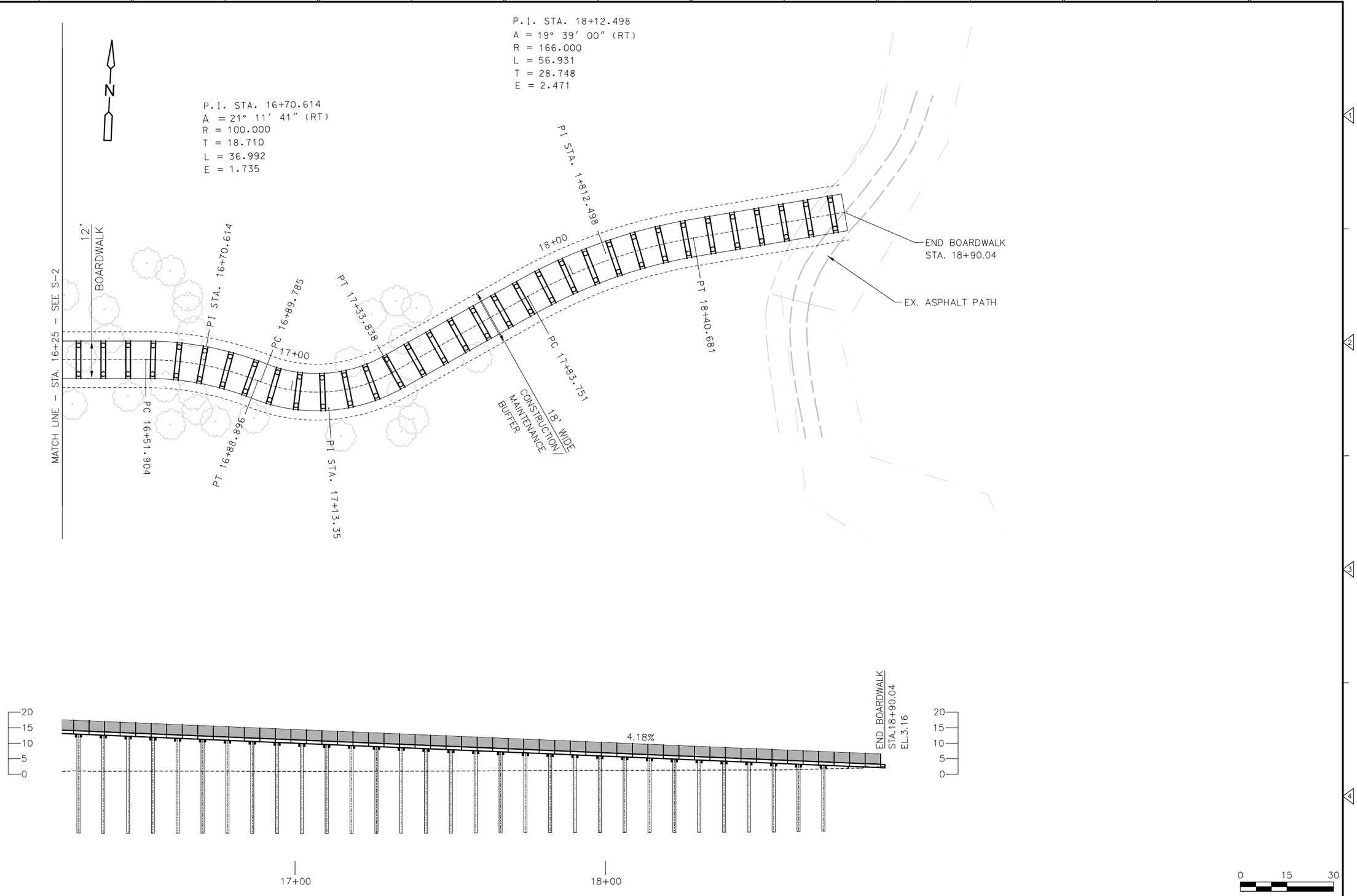
JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR
BOARDWALK AND BRIDGE
PLAN AND ELEVATION

PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.
FIGURE 5-4
(2 OF 3)

NOT FOR CONSTRUCTION



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. DAWSON
DRAWN BY: D. PICKEL
SHEET CHK'D BY: F. BALE
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2014

CDM Smith
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Fort Myers, FL 33901
Tel: (239) 938-9600
FL COA No. EB-0000020

CITY OF NAPLES

JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR
BOARDWALK AND BRIDGE
PLAN AND ELEVATION

PROJECT NO. 6680-104728
FILE NAME:

SHEET NO.
FIGURE 5-5
(3 OF 3)

NOT FOR CONSTRUCTION

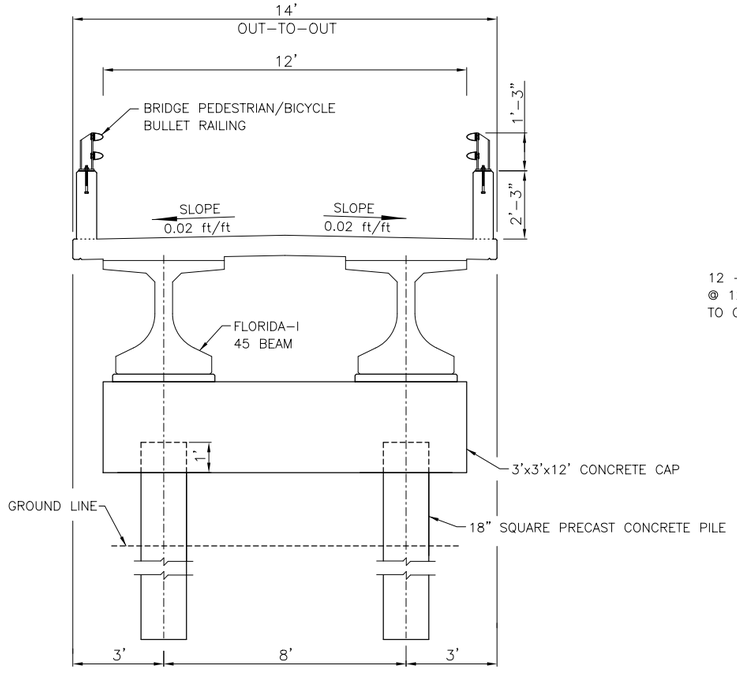

FIGURE 5-6
BRIDGE TYPICAL SECTION

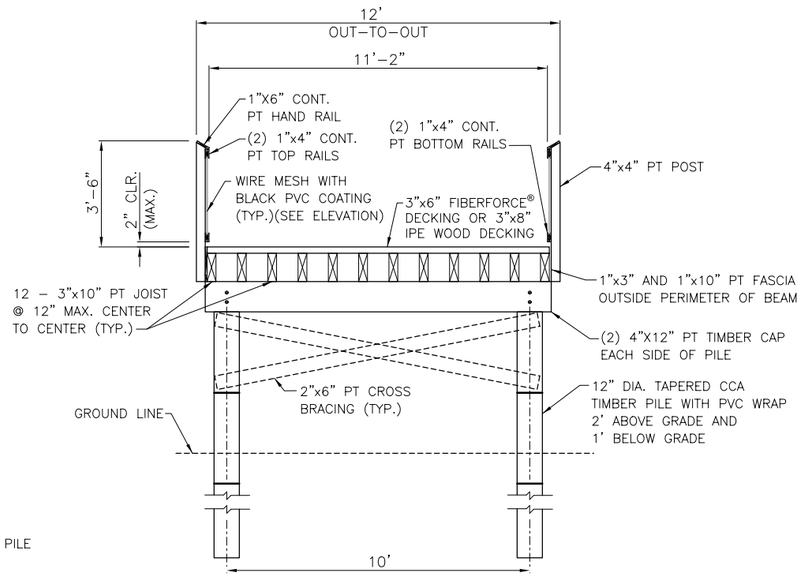

FIGURE 5-7
EAST BOARDWALK TYPICAL SECTION

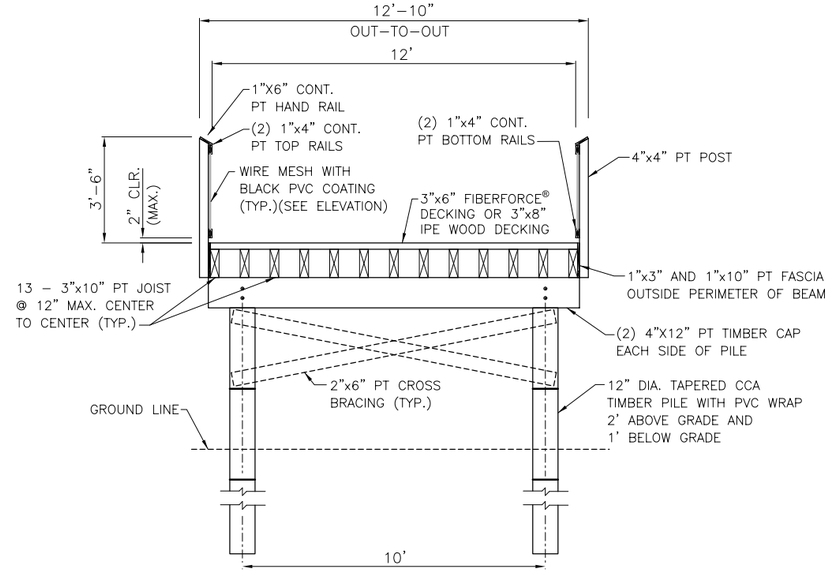

FIGURE 5-8
WEST BOARDWALK TYPICAL SECTION

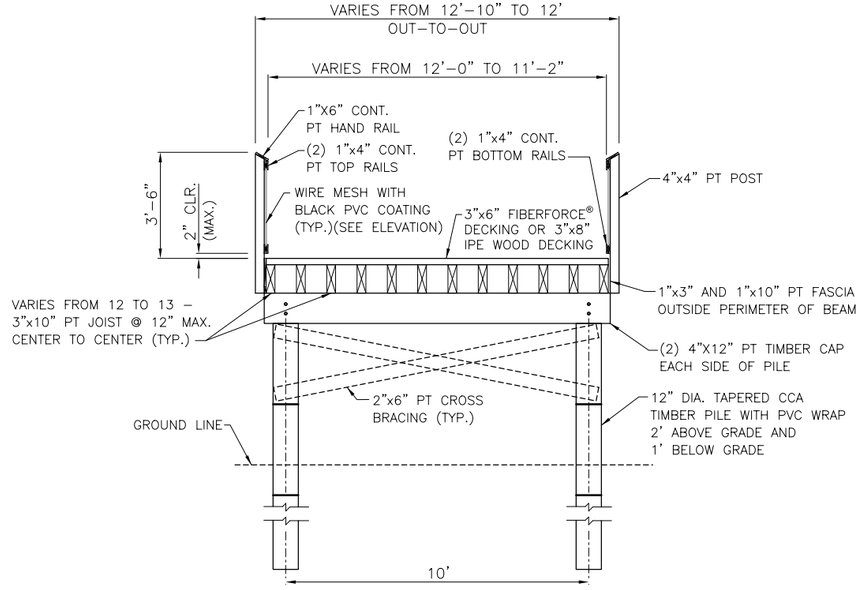

FIGURE 5-9
BRIDGE/EAST BOARDWALK
TRANSITION TYPICAL SECTION

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. DAWSON
DRAWN BY: D. PICKEL
SHEET CHK'D BY: F. BALE
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2014

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FL COA No. EB-0000020

CITY OF NAPLES

JAY AND PATTY BAKER PARK

GORDON RIVER GREENWAY CONNECTOR
BRIDGE AND BOARDWALK
TYPICAL SECTIONS

PROJECT NO. 6680–104728
FILE NAME:

SHEET NO.
FIGURES
5-6 to 5-9

NOT FOR CONSTRUCTION

Appendix E

Rendering of Alternative F

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: N. CHARNAS
DRAWN BY: C.SCOTT
SHEET CHK'D BY: N. CHARNAS
CROSS CHK'D BY:
APPROVED BY: J. LADNER
DATE: OCTOBER 2014

CDM Smith
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Fort Myers, FL 33901
Tel: (239) 938-9600
FL COA No. EB-0000020

CITY OF NAPLES

JAY AND PATTY BAKER PARK

RFP SITE PLAN
ALTERNATIVE "F"

PROJECT NO. 6680-104728
FILE NAME:
SHEET NO.

NOT FOR CONSTRUCTION