APPENDIX H

UMAM ANALYSIS

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SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT UMAM ANALYSIS

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1.0 INTRODUCTION

The area of impact determined from the Engineering Analysis and Numerical Modeling Study (provided as Appendix G to the EIS) was used to complete a Uniform Mitigation Assessment Method (UMAM) evaluation (Chapter 62-345, F.A.C.) for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project. UMAM assesses the functions and services of the hardbottom resources predicted to be impacted, and determines the amount of appropriate mitigation to compensate for these impacts. The UMAM evaluation presented herein was developed to specifically assess the anticipated loss of nearshore hardbottom function attributed to the construction of the Applicants' Preferred Alternative as well as to Alternatives 2-7b evaluated in the EIS. Impacts to hardbottom include two general categories:

- *Direct* = burial resulting from direct placement of sand at time of project construction (within construction toe of fill (CTOF)).
- *Indirect* = impacts resulting from the spreading of sand following project construction (outside CTOF).

While the impacts can be described generally as direct or indirect, more detailed description is necessary to accurately account for anticipated project related impacts to the nearshore intertidal and subtidal hardbottom. The hardbottom habitat adjacent to the Project Area is shown to be highly ephemeral. The constant burial and re-exposure of hardbottom in this area facilitates the development of an opportunistic community dominated by turf and macroalgae species that recruit quickly when substrate is available. Between 2003 and 2014, the amount of exposed hardbottom in the project area ranged between 1.5 ac in 2009 and 36.6 ac in 2006. Because of the variability observed from year to year, the USACE determined that a time-average analysis of the amount of hardbottom exposed over 10 years would best represent the habitat since it smooths out short-term fluctuations and provides longer-term trends by averaging a function over iterations of time. The 2014 dataset was added during updates to the EIS extending the time-average analysis over 11 years. In this case, the average amount of exposed hardbottom (ac) between two surveys is multiplied by the number of days between those two surveys (ac-days). The sum of ac-days is divided by the total number of days between the first survey and the last survey. This provides the time-averaged amount of hardbottom in an area. In order to determine the area of potential impact due to project construction, the amount of exposed hardbottom from each hardbottom delineation (2003 – 2014) that fell within the impact polygons generated by the Delft3D modeling was determined in GIS and these areas were input into the time-average calculation. For each alternative (and each grain size modeled), these impact areas were input into UMAM to determine potential mitigation requirements.

In order to appropriately mitigate for impacts to this highly ephemeral habitat, it is important to distinguish permanent impacts from temporary impacts. Numerical Delft 3D modeling estimated the movement of sand for 3 years following construction of the Project. The Delft 3D modeling results indicate that a portion of the sand placed below mean high water (MHW) will remain within the CTOF for all 3 years following construction, while the remainder of the sand will be transported offshore and/or updrift and downdrift of the placement area as the beach equilibrates. As stated by the applicants, the Town of Palm Beach and the County anticipate maintenance approximately every 3 to 4 years. Therefore, some direct impacts are considered permanent (i.e. buried for all 3 years post-construction), while some will be temporary (covered less than 3 years). Indirect impacts will be incurred as hardbottom outside the CTOF is buried for a period of time as sand moves offshore and/or updrift and downdrift from the Project Area. Modeling has estimated the locations of sediment accumulation at 1, 2 and 3 years post construction in the form of polygons that were plotted in GIS (Figures 4-1 through 4-3). At 3 years post-construction, it is assumed that the project may be reconstructed, and the impacts will be repeated. Permanent and temporary impacts are defined as follows.

- *Permanent* = Permanent impacts are those that, following placement of fill, will result in hardbottom burial for at least 3 years, at which time the project may be constructed again. Based on modeling results, these are areas which were shown to have sand accumulation present at 1, 2 and 3 years post-construction and are not expected to become re-exposed for the duration of the project. These areas are considered to have lost most, but not all, of their ecological function. While these areas will be subject to increased sand cover, this habitat is already ephemeral in nature; therefore, the habitat will continue to provide ecological function to motile species such as fish, sea turtles and crabs. Impacts will be mitigated through construction of an artificial reef. Permanent impacts may be located within the CTOF and in areas beyond the CTOF (offshore and/or updrift and downdrift).

- *Temporary* = Temporary impacts are those that, following placement of fill, are expected to be buried for less than 3 years, which allows these resources to regain ecological function for the period of time when they are re-exposed. These temporary impacts will be repeated following construction of each project, potentially every 3-4 years. Based on previous guidance provided by Florida Department of Environmental Protection (FDEP), temporary impacts can be considered as partially self-mitigating; when conducting UMAM analyses on areas of temporary impact, minimum risk is used and once the total mitigation is initially calculated, then the temporary impact acreage is subtracted from this total in order to determine the additional mitigation required to offset the temporary impact (L. Edwards and V. Kosmynin, pers. comm., 2013).

In addition to the modeling results predicting the movement of sand following project construction, an equilibrium toe of fill (ETOF) analysis was performed. While the Delft3D modeling results include both offshore, updrift, and downdrift movement, a traditionally-used ETOF analysis (profile translation) included an area that encompassed a larger cross-shore area; therefore, in order to conservatively assess potential impacts, it is assumed that temporary impacts may also occur to this area. This area was used to quantify the Indirect Temporary ETOF impact area (Figures 4-1 through 4-3 – each varies based on grain size modeled). These impacts are considered as a degradation of a community, but not a total loss of function, that could result from increased sedimentation (L. Edwards and V. Kosmynin, pers. comm., 2013).

2.0 SEVEN HARDBOTTOM IMPACT TYPES

Based on the modeling and ETOF analyses, seven (7) types of impacts to hardbottom were defined for the purpose of this UMAM evaluation. These seven impact types and the associated mitigation determined by UMAM are summarized below and in Table 2-1:

1. *Permanent* = Permanent impacts include areas where the sand is expected to remain for at least 3 years. This includes areas within the CTOF following direct placement during construction and areas offshore and/or updrift and downdrift which, although outside the CTOF and not directly impacted at the time of fill placement, are expected to become buried by 1-year post-construction and remain buried through 3 years post-construction. These impacts are considered permanent since the project may be reconstructed every 3-4 years. Permanent impacts were calculated by summing the areas shown to have overlapping sediment accumulation polygons at 1, 2 and 3 years post-construction based on the modeling results. These areas are considered to have lost most, but not all, of their ecological function. Based on the UMAM analysis, this type of impact will be mitigated at a ratio of approximately 1 ac impact:1.16 ac of mitigation (1:1.20 ac using FDEP time lag).

2. *Direct Temporary (<1 Year)* = This area will be impacted within the CTOF by direct placement of fill at the time of construction, but is expected to become re-exposed within the first year following construction and will remain exposed until the project is reconstructed. This impact area was calculated by taking the total area of exposed hardbottom within the CTOF and subtracting areas shown to have sediment accumulation polygons at 1, 2 and/or 3 years post-construction based on the modeling results. The difference represented an area where sand was directly placed but did not remain in the project area by 1-year post-construction. This type of impact is partly self-mitigating (i.e. will become re-exposed), and based on the UMAM analysis, will likely require mitigation at a ratio of approximately 1 ac impact:0.03 ac of mitigation (1:0.07 ac using FDEP time lag).

3. *Direct Temporary (>1 Year)* = This area will be impacted within the CTOF by direct placement of fill at the time of construction, but is expected to become re-exposed within the second year following construction and will become re-exposed until the project is reconstructed. This impact area was calculated by summing the area within the CTOF shown to have sediment accumulation polygons at 1, 2 or 3 years post-construction (with no overlap between years) based on the modeling results. This type of impact is partly self-mitigating, and based on the UMAM analysis, will likely require additional mitigation at a ratio of approximately 1 ac impact:0.32 ac of mitigation (1:0.38 ac using FDEP time lag).

4. *Direct Temporary (>2 Years)* = This area will be impacted within the CTOF by direct placement of fill at the time of construction, but is expected to become re-exposed within the third year following construction and will become re-exposed until the project is reconstructed. This impact area was calculated by summing the area within the CTOF shown to have sediment accumulation polygons that overlap for two years based on the modeling results. This type of impact is partly self-mitigating, and based on the UMAM analysis, will likely require additional mitigation at a ratio of approximately 1 ac impact:0.85 ac mitigation (1:0.93 ac using FDEP time lag).

5. *Indirect Temporary (1 Year)* = This area, located outside the CTOF, will be temporarily impacted for 1 year by spreading of sand, but will become re-exposed prior to project reconstruction. This impact area was calculated by summing the area beyond the CTOF shown to have sediment accumulation polygons during 1, 2 or 3 years post-construction (with no overlap between years) based on the modeling results. This type of impact is partly self-mitigating, and based on the UMAM analysis, will likely require additional mitigation at a ratio of approximately 1 ac impact:0.16 ac mitigation (1:0.20 ac using FDEP time lag).

6. *Indirect Temporary (2 Years)* = This area, located outside the CTOF, will be temporarily impacted for 2 years by spreading of sand, but will become re-exposed prior to project reconstruction. This impact area was calculated by summing the

area beyond the CTOF shown to have sediment accumulation polygons that overlap for two years (e.g. overlap of 1- and 2-year, 2- and 3-year, or 1- and 3-year post-construction) based on the modeling results. This type of impact is partly self-mitigating, and based on the UMAM analysis, will likely require additional mitigation at a ratio of approximately 1 ac impact: 0.55 ac mitigation (1:0.61 ac using FDEP time lag).

7. *Indirect Temporary (ETOF)* = This area represents an impact area associated with the traditional equilibrium toe of fill (ETOF) (profile translation) and was not entirely predicted to be impacted based on modeling results. Although the project was modeled to account for direct and indirect impacts as discussed above, the ETOF was used to quantify the area where impacts may occur due to increased sedimentation. This provides a conservative estimate of total impacts by including both cross-shore (ETOF and modeling results) and updrift/downdrift estimates (modeling results). The areas that were already accounted for from the modeling polygons were subtracted from the area of the ETOF so as not to “double dip”. Areas of hardbottom that may experience these impacts are not expected to become buried, but effects may include slightly impaired ecological function. Based on the UMAM analysis, these impacts will likely require mitigation at a ratio of approximately 1 ac impact:0.13 ac mitigation (also 1:0.13 ac using FDEP time lag).

Table 2-1. Summary of seven hardbottom impact types, before and after mitigation UMAM scores, and mitigation required per 1 acre of impact using the USACE and FDEP time lag values. The USACE time lag values will be used for the Project. The FDEP time lag values are presented for reference and comparison.

Impact Type	Before and after mitigation			Mitigation required for 1 acre impact (assuming 3 years for artificial reef to function as impact area)		
	Without Impact	With Impact	With Mitigation (artificial reef and/or re-exposure)	Risk Factor	USACE Time Lag = 1.03	FDEP Time Lag = 1.07
1. Permanent	10	1	10	1.25	1.16	1.20
2. Direct Temporary (< 1 year)	10	1	9	1.00	0.03	0.07
3. Direct Temporary (> 1 years)	10	1	7	1.00	0.32	0.38
4. Direct Temporary (> 2 years)	10	1	5	1.00	0.85	0.93
5. Indirect Temporary (1 year)	10	1	8	1.00	0.16	0.20
6. Indirect Temporary (2 years)	10	1	6	1.00	0.55	0.61
7. Indirect Temporary (ETOF)	10	9	10	1.25	0.13	0.13

3.0 DETAILS OF INPUT FOR UMAM EVALUATION AND ASSOCIATED MITIGATION REQUIRED FOR EACH IMPACT TYPE

Each of the seven types of hardbottom impact received a separate UMAM evaluation which accounted for the nature of the impact (direct and indirect) and the duration of the impact (permanent and temporary). It is assumed that mitigation for hardbottom impacts will be in the form of an artificial reef comprised of limestone boulders. Based on the ephemeral nature of the nearshore hardbottom in the impact area (low complexity, dominated by turf and macroalgae), it is expected that the artificial reef will completely resemble the hardbottom habitat within 3 years. Therefore, the time lag (t-factor) was set to 1.03 for all evaluations based on USACE time lag guidelines (the FDEP uses a t-factor of 1.07 for 3 years).

The UMAM forms for each impact type and grain size modeled associated with the Applicants' Preferred Alternative are attached. Sub-Appendices H-1a through H-1c provides the UMAM evaluation for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project using Delft 3D modeling and engineering results for both the Town of Palm Beach and County projects considered together. In order to assist with the permitting of the projects, which must be permitted separately for the Town of Palm Beach and the County, the projects were also modeled as standalone projects. Based on these results, separate UMAM evaluations were conducted and are provided as Sub-Appendices H-2a through H-2c (for Town of Palm Beach project) and H-3 (for County project). It should be noted that the sum of the impacts (and thus the calculated mitigation) from each standalone project (presented in Appendix H-2 and H-3) does not equal the combined impacts (and mitigation) from the combined project (Appendix H-1) since the larger combined project responds differently than two smaller standalone projects. For each of the three attached UMAM evaluations, Part I – Qualitative Descriptions are provided for the impact and mitigation areas, followed by Part II – Qualification of Assessment Areas for the impact and mitigation areas associated with each of the seven impact types. The final page of each evaluation shows the formulas used to calculate the mitigation acreage required for each impact type and the total mitigation required for each project. The parameters used for each UMAM evaluation are summarized below and in

Table 2-1. Figures 4-1 through 4-3 illustrates the seven impact types determined for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project.

It is important to note that although permanent and temporary impacts to the nearshore hardbottom resources are anticipated, not all functional value will be lost. The expected remaining functional value is represented by the assigned value of one (1) for the “with project” natural hardbottom resources in the (a) Location and Landscape Support and the (c) Benthic Community for impact types 1 through 6. The softbottom habitat and marine water column above this substrate could still provide functions and services to the nearshore environment. The marine water column will continue to serve as a medium of transport for nutrients, migrating organisms and larvae of crustacean and fish species (SAFMC, 1998) and the sand substrate provides habitat for several fish, benthic and infaunal species; therefore, it is not a complete loss.

1. ***Permanent:***

Impact Area: The “without project” natural hardbottom resources were assigned a value of 10 and the “with project” value was reduced to one (1) in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: To determine the required mitigation, a “without mitigation” value of 0 and “with mitigation” value of 10 were assigned to (a) Location and Landscape Support and (c) Benthic Community ((b) Water Environment was unchanged). The risk factor was set at 1.25, accounting for the slight uncertainty that the artificial reef will successfully mimic the impact area.

Mitigation Required: 1 acre of permanent impact will require 1.16 ac of mitigation based on the federal requirement (1.20 ac using FDEP time lag).

2. *Direct Temporary (< 1 Year):*

Impact Area: The "without project" natural hardbottom resources were assigned a value of 10 and the "with project" was reduced to one in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: This area of hardbottom will be directly impacted due to sand placement but will remain buried for less than 1 year, therefore it is designated as a temporary impact and considered partially self-mitigating. The impacted ephemeral hardbottom community will be re-exposed, but may not return to the exact same condition; therefore, the "with mitigation" value was set at 9, indicating that less than 1 year of burial may leave the re-exposed habitat functioning slightly (1 unit) below its pre-impact state. Because this area is considered partially self-mitigating, the UMAM output is subtracted from the original impact area and the remaining area represents the acreage of artificial reef required to offset the temporary impact. Unlike the "direct permanent" impact parameters, the risk factor for less than 1 year of temporary impacts is set to 1.00 to account for the re-exposure (temporary impact) that will occur in this area.

Mitigation Required: 1 acre of less than 1 year of direct temporary impact will require 0.03 ac of mitigation based on the federal requirement (0.07 ac using FDEP time lag).

3. *Direct Temporary (>1 Year):*

Impact Area: The "without project" natural hardbottom resources were assigned a value of 10 and the "with project" was reduced to one in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: This area of hardbottom will be directly impacted due to sand placement but will remain buried for more than 1 year (but less than 2 years), thus it is designated as a temporary impact and considered partially self-mitigating. The impacted ephemeral hardbottom community will be re-exposed, but may not return to the exact same condition; therefore, the “with mitigation” value was set at 7 to account for more than 1 year of burial. Because this area is considered self-mitigating, the UMAM output is subtracted from the original impact area and the remaining area represents the acreage of artificial reef required to offset the temporary impact. The risk factor for temporary impacts is set to 1.00 to account for the re-exposure that will occur in this area.

Mitigation Required: 1 acre of more than 1 year of direct temporary impact will require 0.32 ac of mitigation based on the federal requirement (0.38 ac using FDEP time lag).

4. *Direct Temporary (>2 Years):*

Impact Area: The “without project” natural hardbottom resources were assigned a value of 10 and the “with project” was reduced to one in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: This area of hardbottom will be directly impacted due to sand placement but will remain buried for more than 2 years (but less than 3 years), thus it is designated as a temporary impact and considered partially self-mitigating. The impacted ephemeral hardbottom community will be re-exposed, but may not return to the exact same condition; therefore, the “with mitigation” value was set at 5 to account for more than 2 years of burial. Because this area is considered self-mitigating, the UMAM output is subtracted from the original impact area and the remaining area represents the acreage of artificial reef required to offset the temporary impact. The risk factor for temporary impacts is set to 1.00 to account for the re-exposure that will occur in this area.

Mitigation Required: 1 acre of more than 2 years of direct temporary impact will require 0.85 ac of mitigation based on the federal requirement (0.93 ac using FDEP time lag).

5. *Indirect Temporary (1 Year):*

Impact Area: The "without project" natural hardbottom resources were assigned a value of 10 and the "with project" was reduced to one in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: This area of hardbottom will be impacted due to sand spreading after initial placement and it is assumed that this area will remain buried for 1 year, thus it is designated as a temporary impact and considered self-mitigating. The impacted ephemeral hardbottom community will be re-exposed, but may not return to the exact same condition; therefore, the "with mitigation" value was set at 8, indicating that 1 year of burial may leave the habitat functioning two units below its pre-impact state. Because this area is considered partially self-mitigating, the UMAM output is subtracted from the original impact area and the remaining area represents the acreage of artificial reef required to offset the temporary impact. The risk factor for temporary impacts is set to 1.00 to account for the re-exposure that will occur in this area.

Mitigation Required: 1 acre of 1 year of indirect temporary impact will require 0.16 ac of mitigation based on the federal requirement (0.20 ac using FDEP time lag).

6. *Indirect Temporary (2 Years):*

Impact Area: The "without project" natural hardbottom resources were assigned a value of 10 and the "with project" was reduced to one in the (a) Location and Landscape Support and the (c) Benthic Community to account for the loss of most, but not all, function ((b) Water Environment was unchanged).

Mitigation: This area of hardbottom will be impacted due to sand spreading after initial placement and it is assumed that this area will remain buried for 2 years, thus it is designated as a temporary impact and considered self-mitigating. The impacted ephemeral hardbottom community will be re-exposed, but may not return to the exact same condition; therefore, the "with mitigation" value was set at 6 to account for 2 years of burial. Because this area is considered partially self-mitigating, the UMAM output is subtracted from the original impact area and the remaining area represents the acreage of artificial reef required to offset the temporary impact. The risk factor for temporary impacts is set to 1.00 to account for the re-exposure that will occur in this area.

Mitigation Required: 1 acre of 2 years of indirect temporary impact will require 0.55 ac of mitigation based on the federal requirement (0.61 ac using FDEP time lag).

7. ***Indirect Temporary (ETOF):***

Impact Area: In UMAM, the "without project" natural hardbottom resources were assigned a value of 10 and the "with project" value was reduced to 9 in the (a) Location and Landscape Support and the (c) Benthic Community to account for the potential reduction in ecological function of the hardbottom which may occur as a result of increased sedimentation over the ephemeral hardbottom ((b) Water Environment was unchanged).

Mitigation: It is anticipated that indirect temporary ETOF impacts will result in a minimal reduction in function to the ephemeral hardbottom; therefore, the "with mitigation" value was set at 10 for (a) Location and Landscape Support and (c) Benthic Community ((b) Water Environment was unchanged). The risk factor was set at 1.25, accounting for the slight uncertainty that the artificial reef will successfully mimic the impact area.

Mitigation Required: 1 acre of indirect temporary ETOF impact will require 0.13 ac of mitigation based on the federal requirement (also 0.13 ac using FDEP time lag).

4.0 SUMMARY

The UMAM methodology described herein was applied to Alternatives 2 through 7b for evaluation within the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Draft EIS. Impact acreages and associated mitigation required for each impact type for each alternative are presented in Tables 4-1 through 4-3. The sediment accumulation polygons and the ETOF that represent the seven impact types are presented in Figures 4-1 through 4-3.

Table 4-1. Summary of anticipated impact acreages and mitigation associated with Alternatives 2-7b using 0.25 mm grain size in the Town of Palm Beach and 0.36 mm grain size in the County. Acreages are based on a time-average of exposed hardbottom between 2003 and 2014.

Anticipated Impacts and Associated Mitigation (ac)	Alt 2		Alt 3		Alt 4		Alt 5		Alt 6		Alt 7b	
	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig
1. Permanent	3.86	4.48	2.70	3.13	6.51	7.54	3.45	4.00	6.07	7.04	5.74	6.66
2. Direct Temporary (<1 yr)	0.87	0.03	1.43	0.04	0.38	0.01	0.82	0.02	0.26	0.01	1.75	0.05
3. Direct Temporary (>1 yr)	0.31	0.10	0.37	0.12	0.63	0.20	0.55	0.18	0.70	0.23	1.06	0.34
4. Direct Temporary (>2 yrs)	0.19	0.16	0.06	0.05	0.43	0.37	0.14	0.12	0.87	0.75	0.90	0.77
5. Indirect Temporary (1 yr)	3.35	0.53	3.91	0.62	5.06	0.80	3.89	0.62	5.92	0.94	5.51	0.88
6. Indirect Temporary (2 yrs)	1.42	0.77	1.38	0.75	2.55	1.39	1.47	0.80	2.52	1.37	3.30	1.80
7. Indirect Temporary (ETOF)	3.79	0.49	5.04	0.65	4.12	0.53	8.73	1.12	8.08	1.04	1.80	0.23
Required Mitigation	**6.55**		**5.36**		**10.84**		**6.86**		**11.37**		**10.72**	

Table 4-2. Summary of impact and mitigation acreages associated with Alternatives 2-7b using 0.36 mm grain size in the Town of Palm Beach and the County. Acreages are based on a time-average of exposed hardbottom between 2003 and 2014.

Anticipated Impacts and Associated Mitigation (ac)	Alt 2		Alt 3		Alt 4		Alt 5		Alt 6		Alt 7b	
	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig
1. Permanent	3.97	4.60	2.87	3.32	6.71	7.77	3.97	4.60	6.81	7.89	11.25	13.04
2. Direct Temporary (<1 yr)	0.83	0.03	1.38	0.04	0.34	0.01	0.71	0.02	0.17	0.01	0.53	0.02
3. Direct Temporary (>1 yr)	0.33	0.11	0.39	0.13	0.33	0.11	0.35	0.11	0.61	0.20	0.35	0.11
4. Direct Temporary (>2 yrs)	0.19	0.16	0.07	0.06	0.67	0.57	0.29	0.25	0.53	0.45	0.72	0.61
5. Indirect Temporary (1 yr)	3.24	0.51	3.72	0.59	5.42	0.86	4.14	0.66	6.19	0.98	4.88	0.78
6. Indirect Temporary (2 yrs)	1.44	0.78	1.57	0.85	2.50	1.36	1.52	0.83	2.62	1.43	2.50	1.36
7. Indirect Temporary (ETOF)	3.65	0.47	5.00	0.64	3.94	0.51	7.97	1.03	7.44	0.96	0.47	0.06
Required Mitigation	**6.66**		**5.64**		**11.19**		**7.49**		**11.91**		**15.98**	

Table 4-3. Summary of impact and mitigation acreages associated with Alternatives 2-7b using 0.60 mm grain size in the Town of Palm Beach and the 0.36 mm grain size in the County. Acreages are based on a time-average of exposed hardbottom between 2003 and 2014.

Anticipated Impacts and Associated Mitigation (ac)	Alt 2		Alt 3		Alt 4		Alt 5		Alt 6		Alt 7b	
	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig	Impact	Mitig
1. Permanent	3.99	4.62	2.87	3.32	6.63	7.68	4.23	4.90	6.92	8.02	8.49	9.83
2. Direct Temporary (<1 yr)	0.79	0.02	1.26	0.04	0.33	0.01	0.56	0.02	0.09	0.00	4.32	0.13
3. Direct Temporary (>1 yr)	0.28	0.09	0.48	0.16	0.31	0.10	0.23	0.07	0.24	0.08	0.21	0.07
4. Direct Temporary (>2 yrs)	0.19	0.16	0.07	0.06	0.66	0.56	0.21	0.18	0.75	0.64	0.62	0.53
5. Indirect Temporary (1 yr)	3.46	0.55	3.92	0.62	5.71	0.91	4.31	0.68	5.98	0.95	4.86	0.77
6. Indirect Temporary (2 yrs)	1.33	0.73	1.54	0.84	2.80	1.52	1.36	0.74	2.90	1.58	2.16	1.17
7. Indirect Temporary (ETOF)	3.47	0.45	5.15	0.66	3.76	0.48	7.68	0.99	7.47	0.96	6.63	0.85
Required Mitigation	**6.63**		**5.70**		**11.27**		**7.59**		**12.23**		**13.36**	

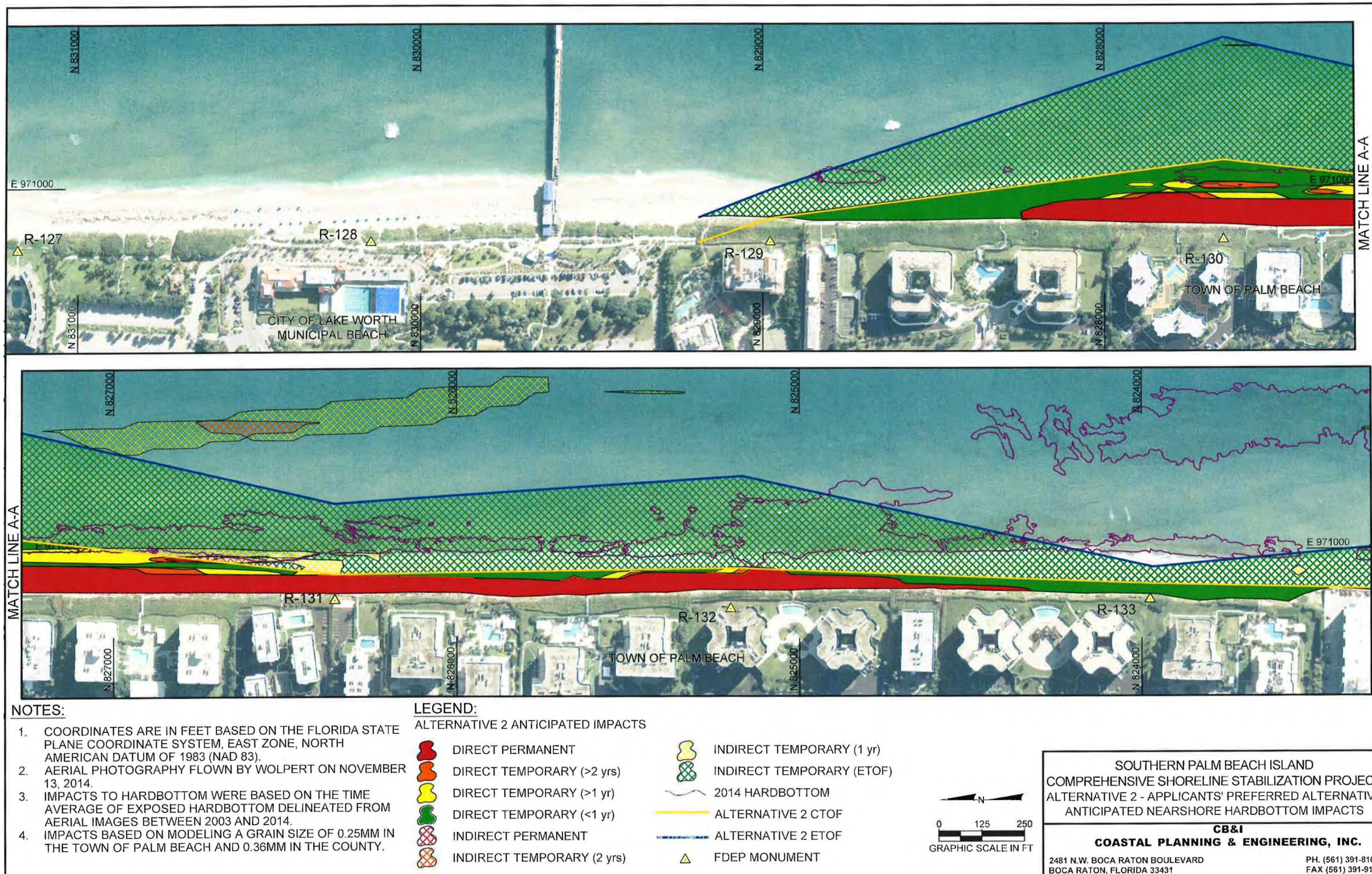

Figure 4-1. Anticipated nearshore hardbottom impacts from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.25 mm in the Town of Palm Beach and 0.36 mm in the County.

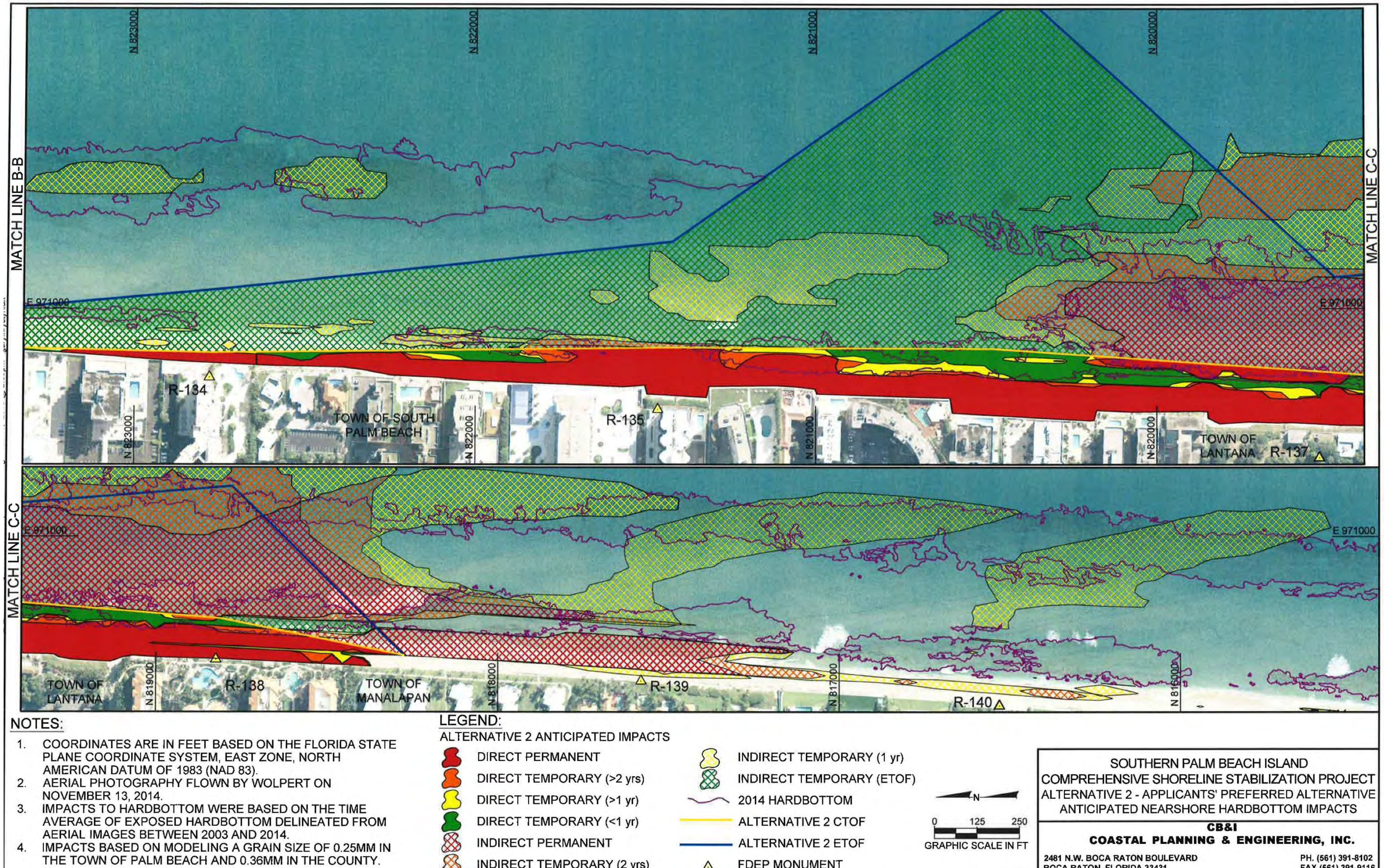

Figure 4-1 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.25 mm in the Town of Palm Beach and 0.36 mm in the County.

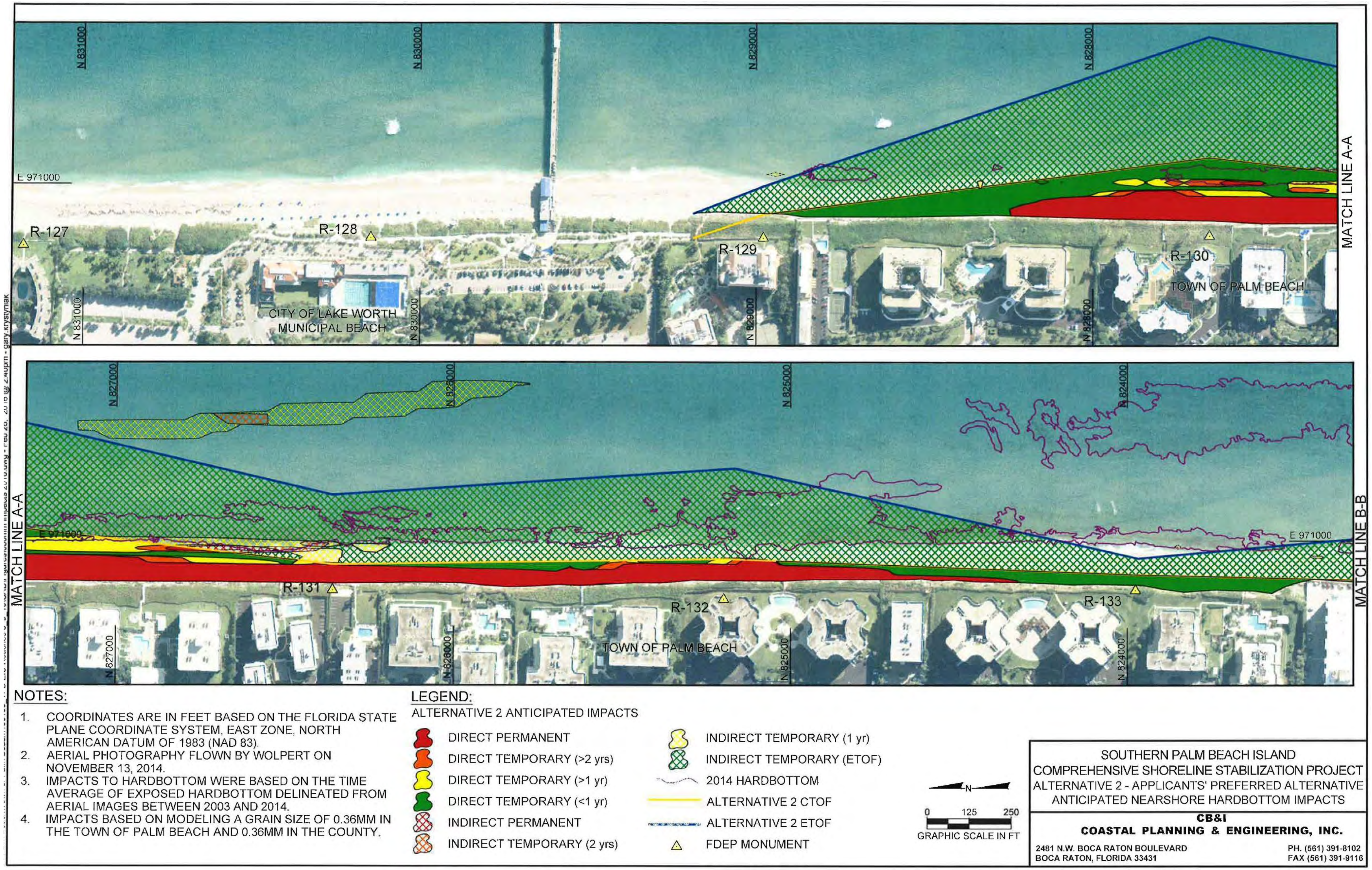

Figure 4-2. Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.36 mm in the Town of Palm Beach and 0.36 mm in the County.

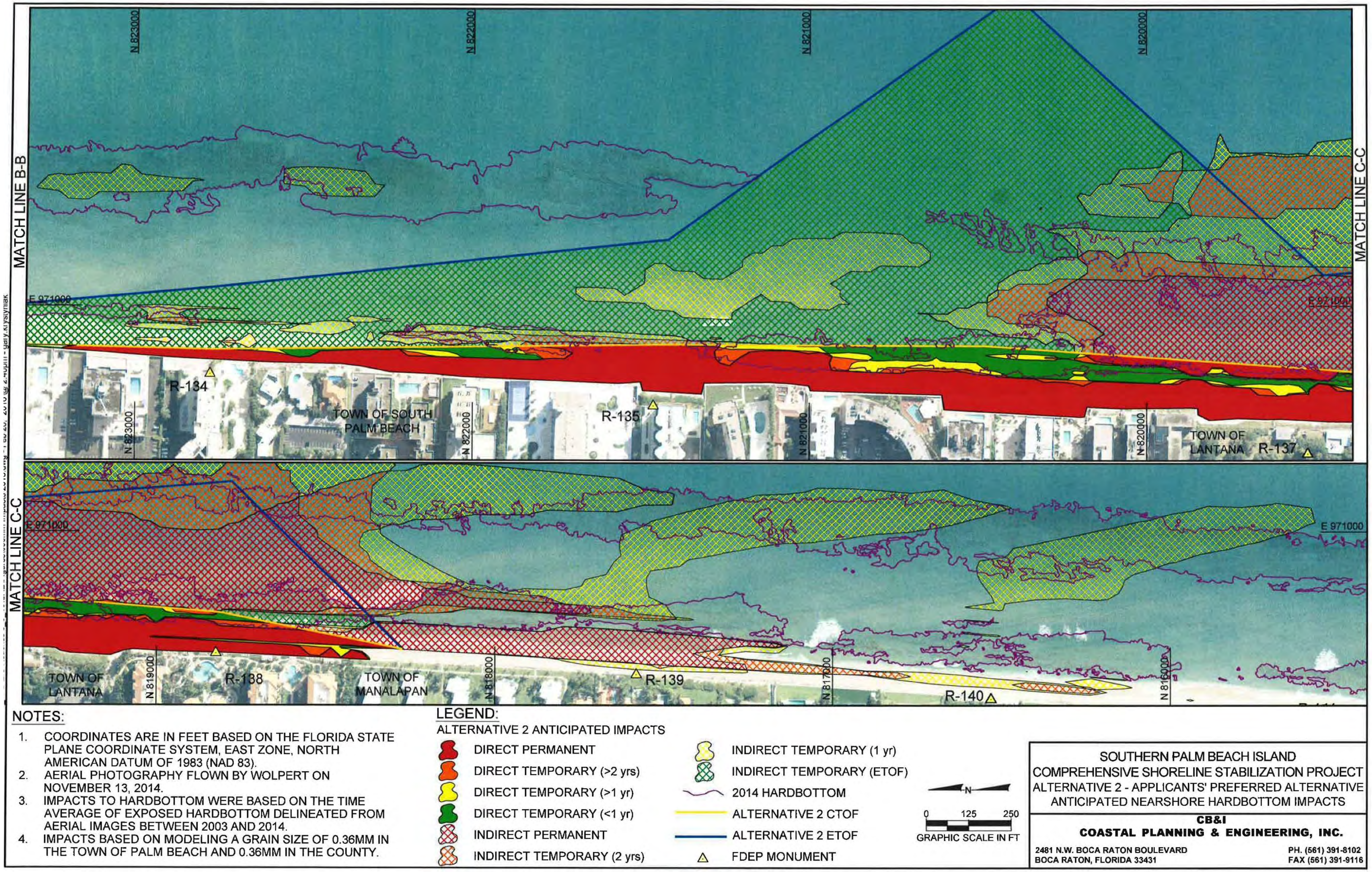

Figure 4-2 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.36 mm in the Town of Palm Beach and 0.36 mm in the County.

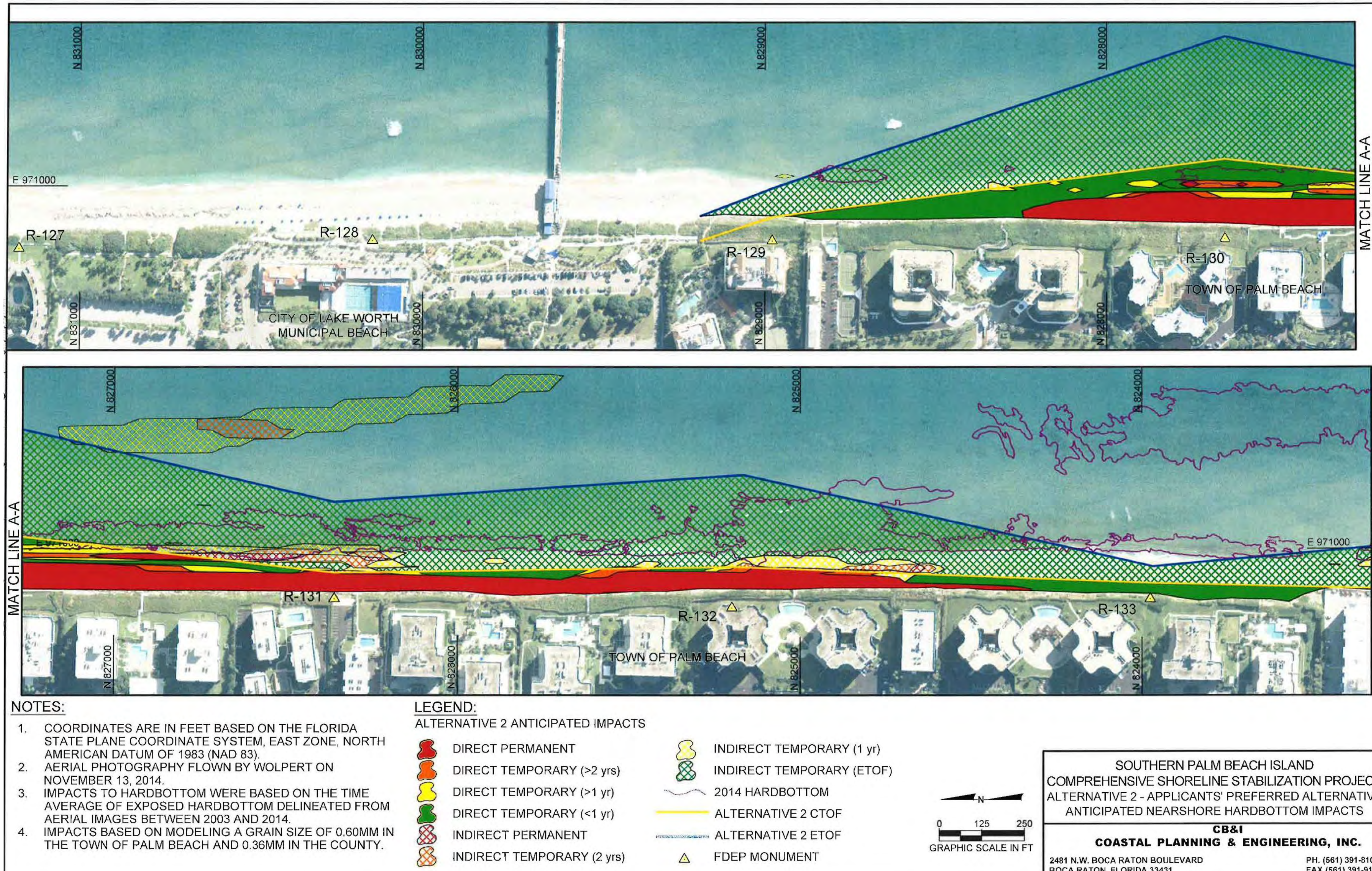

Figure 4-3. Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.60 mm in the Town of Palm Beach and 0.36 mm in the County.

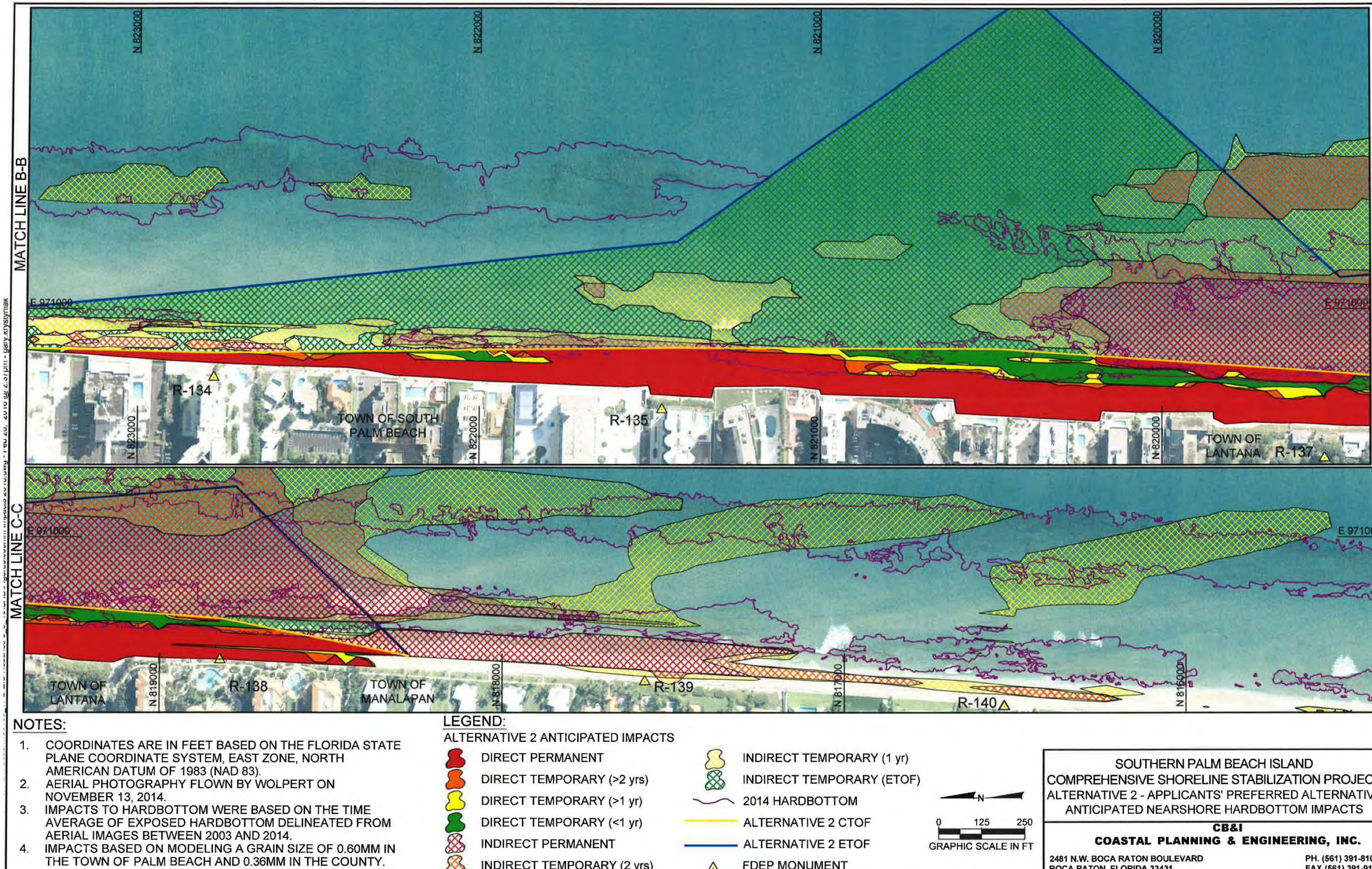

Figure 4-3 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.60 mm in the Town of Palm Beach and 0.36 mm in the County.

5.0 LITERATURE CITED

Edwards, L. and V. Kosmynin. 2013. Personal communication between Lainie Edwards and Vladimir Kosmynin (FDEP) and Stacy Buck (CB&I) regarding temporary and secondary impacts in the UMAM analyses.

South Atlantic Fishery Management Council (SAFMC). 1998. Final habitat plan for the South Atlantic region: Essential Fish Habitat requirements for fishery management plans of the South Atlantic Fishery Management Council. 457 p.

SUB-APPENDIX H-1A

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.25 MM) & PALM BEACH COUNTY (0.36 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	12.16 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	6.55 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Permanent Impacts
Impact or Mitigation Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 3.86

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 2.317158596

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Permanent Impacts
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.867

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.317159		0.52		4.48
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (<1 year)
Impact or Mitigation: Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.87

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.523914018

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]

0.600

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.523914		0.58		0.90
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (>1 year)
Impact or Mitigation Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.31

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.188641514

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.188642		0.45		0.42
a.a.2					
total					

Ac of mitigation - impact acres
0.10

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (> 2 years)
Impact or Mitigation Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.19

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.111689149

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.533

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.333

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.111689		0.32		0.35
a.a.2					
total					

Ac of mitigation - impact acres
0.16

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Impacts (1 year)
Impact or Mitigation Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 3.35

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 2.010373433

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.733

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]

0.533

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.010373		0.52		3.88
a.a.2					
total					

Ac of mitigation - impact acres
0.53

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary Impacts (2 years)
Impact or Mitigation: Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 1.42

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.850104767

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:

(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:

(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.850105		0.39		2.19
a.a.2					
total					

Ac of mitigation - impact acres
0.77

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 3.79

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.252468

Delta = [with - current]
0.067

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.867

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.252468		0.52		0.49
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	2.317159		0.52		4.48
2	Direct Temporary (< 1 Year)	0.523914		0.58		0.03
3	Direct Temporary (>1 year)	0.188642		0.45		0.10
4	Direct Temporary (>2 year)	0.111689		0.32		0.16
5	Indirect Temporary (1 year)	2.010373		0.52		0.53
6	Indirect Temporary (2 years)	0.850105		0.39		0.77
7	Indirect Temporary (ETOF)	0.252468		0.52		0.49
	total					6.55

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-1B

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.36 MM) & PALM BEACH COUNTY (0.36 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	12.16 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	6.66 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Permanent Impacts
Impact or Mitigation Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 3.97

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 2.381221171

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Permanent Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.381221		0.52		4.60
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (<1 year)
Impact or Mitigation Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.83

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.500789333

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.600

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.500789		0.58		0.86
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (>1 year)
Impact or Mitigation Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.33

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.195551986

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.195552		0.45		0.43
a.a.2					
total					

Ac of mitigation - impact acres
0.11

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (> 2 years)
Impact or Mitigation: Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.19

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.111650971

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.533

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]

0.333

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.111651		0.32		0.35
a.a.2					
total					

Ac of mitigation - impact acres
0.16

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Impacts (1 year)
Impact or Mitigation Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 3.24

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 1.9460126

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.733

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.533

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:

(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:

(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	1.946013		0.52		3.76
a.a.2					
total					

Ac of mitigation - impact acres
0.51

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary Impacts (2 years)
Impact or Mitigation: Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 1.44

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.86146998

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.86147		0.39		2.22
a.a.2					
total					

Ac of mitigation - impact acres
0.78

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 3.65

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.243492248

Delta = [with - current]

0.067

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.243492		0.52		0.47
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	2.381221		0.52		4.60
2	Direct Temporary (< 1 Year)	0.500789		0.58		0.03
3	Direct Temporary (>1 year)	0.195552		0.45		0.11
4	Direct Temporary (>2 year)	0.111651		0.32		0.16
5	Indirect Temporary (1 year)	1.946013		0.52		0.51
6	Indirect Temporary (2 years)	0.86147		0.39		0.78
7	Indirect Temporary (ETOF)	0.243492		0.52		0.47
	total					6.66

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-1C

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.60 MM) & PALM BEACH COUNTY (0.36 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	12.16 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach and Palm Beach County combined)	Town of Palm Beach SAJ-2005-07908; Palm Beach County SAJ-2008-04086	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	6.63 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Permanent Impacts
Impact or Mitigation Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 3.99

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 2.394770134

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Permanent Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed

Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.867

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.39477		0.52		4.62
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (<1 year)
Impact or Mitigation: Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.79

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.473761229

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.600

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.473761		0.58		0.81
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (>1 year)
Impact or Mitigation Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.28

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.169541731

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.169542		0.45		0.37
a.a.2					
total					

Ac of mitigation - impact acres
0.09

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Direct Temporary Impacts (> 2 years)
Impact or Mitigation Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.19

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.115713658

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.533

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.333

If mitigation

Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.115714		0.32		0.36
a.a.2					
total					

Ac of mitigation - impact acres
0.16

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Impacts (1 year)
Impact or Mitigation Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 3.46

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 2.077237733

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.733

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.533

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.077238		0.52		4.01
a.a.2					
total					

Ac of mitigation - impact acres
0.55

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary Impacts (2 years)
Impact or Mitigation Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 1.33

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.798282747

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:

(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:

(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.798283		0.39		2.06
a.a.2					
total					

Ac of mitigation - impact acres
0.73

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 3.47

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.231422443

Delta = [with - current]
0.067

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
SPBICSSP - Town of Palm Beach and County	Town SAJ-2005-07908; County SAJ-2008-04086	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation

Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.231422		0.52		0.45
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	2.39477		0.52		4.62
2	Direct Temporary (< 1 Year)	0.473761		0.58		0.02
3	Direct Temporary (>1 year)	0.169542		0.45		0.09
4	Direct Temporary (>2 year)	0.115714		0.32		0.16
5	Indirect Temporary (1 year)	2.077238		0.52		0.55
6	Indirect Temporary (2 years)	0.798283		0.39		0.73
7	Indirect Temporary (ETOF)	0.231422		0.52		0.45
	total					6.63

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-2A

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.25 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	2.99 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features

The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.

Uniqueness (considering the relative rarity in relation to the regional landscape.)

Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions

Provides cover, substrate, refuge and food resources for benthic and motile marine species.

Mitigation for previous permit/other historic use

N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)

Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .

Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)

Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	0.53 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features

The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.

Uniqueness (considering the relative rarity in relation to the regional landscape.)

The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions

The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.

Mitigation for previous permit/other historic use

N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)

The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.

Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)

Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Permanent Impacts
Impact or Mitigation: Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 0.01

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.005654098

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Permanent Impacts
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.005654		0.52		0.01
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (<1 year)
Impact or Mitigation: Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.30

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.182620234

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.18262		0.58		0.31
a.a.2					
total					

Ac of mitigation - impact acres
0.01

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (>1 year)
Impact or Mitigation Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.05

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.030669008

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:

(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:

(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.030669		0.45		0.07
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (> 2 years)
Impact or Mitigation Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.017878362

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.533

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.333

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.017878		0.32		0.06
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Impacts (1 year)
Impact or Mitigation Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 0.59

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	Description
.500(6)(a) Location and Landscape Support w/o pres or current: 10 — with: 1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands) w/o pres or current: 6 — with: 6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community w/o pres or current: 10 — with: 1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.351845036

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.733

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.533

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.351845		0.52		0.68
a.a.2					
total					

Ac of mitigation - impact acres
0.09

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary Impacts (2 years)
Impact or Mitigation Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 0.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.017159131

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.017159		0.39		0.04
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 2.80

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.186946403

Delta = [with - current]
0.067

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation

Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.186946		0.52		0.36
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	0.005654		0.52		0.01
2	Direct Temporary (< 1 Year)	0.18262		0.58		0.01
3	Direct Temporary (>1 year)	0.030669		0.45		0.02
4	Direct Temporary (>2 year)	0.017878		0.32		0.03
5	Indirect Temporary (1 year)	0.351845		0.52		0.09
6	Indirect Temporary (2 years)	0.017159		0.39		0.02
7	Indirect Temporary (ETOF)	0.186946		0.52		0.36
	total					0.53

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-2B

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.36 MM)

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	2.99 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	0.49 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Permanent Impacts
Impact or Mitigation Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 0.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.016529494

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Permanent Impacts
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.016529		0.52		0.03
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (<1 year)
Impact or Mitigation Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.28

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.168895505

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.168896		0.58		0.29
a.a.2					
total					

Ac of mitigation - impact acres
0.01

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (>1 year)
Impact or Mitigation: Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.06

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.038753517

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.038754		0.45		0.09
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (> 2 years)
Impact or Mitigation: Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.016704295

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.533

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.333

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.016704		0.32		0.05
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Impacts (1 year)
Impact or Mitigation: Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 0.14

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.086554914

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.733

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.533

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.086555		0.52		0.17
a.a.2					
total					

Ac of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary Impacts (2 years)
Impact or Mitigation Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 0.05

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.030236986

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.030237		0.39		0.08
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 2.79

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.185700156

Delta = [with - current]
0.067

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.1857		0.52		0.36
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	0.016529		0.52		0.03
2	Direct Temporary (< 1 Year)	0.168896		0.58		0.01
3	Direct Temporary (>1 year)	0.038754		0.45		0.02
4	Direct Temporary (>2 year)	0.016704		0.32		0.02
5	Indirect Temporary (1 year)	0.086555		0.52		0.02
6	Indirect Temporary (2 years)	0.030237		0.39		0.03
7	Indirect Temporary (ETOF)	0.1857		0.52		0.36
	total					0.49

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-2C

DRAFT UMAM ANALYSIS

TOWN OF PALM BEACH (0.60 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	2.99 acres (includes 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	0.57 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Permanent Impacts
Impact or Mitigation Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 0.05

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.029744402

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Permanent Impacts
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.867

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.029744		0.52		0.06
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (<1 year)
Impact or Mitigation	Assessment conducted by:	
Impact (Direct Temporary <1 year)	CB&I	Area (acres) 0.26

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.153462536

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.153463		0.58		0.26
a.a.2					
total					

Ac of mitigation - impact acres
0.01

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (>1 year)
Impact or Mitigation: Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.08

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.047822281

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.467

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.047822		0.45		0.11
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Direct Temporary Impacts (> 2 years)
Impact or Mitigation: Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.01978519

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.533

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.333

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.019785		0.32		0.06
a.a.2					
total					

Ac of mitigation - impact acres
0.03

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Impacts (1 year)
Impact or Mitigation Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 0.39

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.234192263

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.733

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.533

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.234192		0.52		0.45
a.a.2					
total					

Ac of mitigation - impact acres
0.06

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary Impacts (2 years)
Impact or Mitigation Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 0.08

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.049950337

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.04995		0.39		0.13
a.a.2					
total					

Ac of mitigation - impact acres
0.05

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 2.70

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.179740288

Delta = [with - current]
0.067

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Town of Palm Beach portion)	SAJ-2005-07908	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.17974		0.52		0.35
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	0.029744		0.52		0.06
2	Direct Temporary (< 1 Year)	0.153463		0.58		0.01
3	Direct Temporary (>1 year)	0.047822		0.45		0.03
4	Direct Temporary (>2 year)	0.019785		0.32		0.03
5	Indirect Temporary (1 year)	0.234192		0.52		0.06
6	Indirect Temporary (2 years)	0.04995		0.39		0.05
7	Indirect Temporary (ETOF)	0.17974		0.52		0.35
	total					0.57

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

Form 62-345.900(3), F.A.C. [effective date]

SUB-APPENDIX H-3

DRAFT UMAM ANALYSIS

PALM BEACH COUNTY (0.36 MM)

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PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Numbers	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Intertidal and Nearshore Subtidal Hardbottom Resources

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Impact Site	7.14 acres (includes 7 impact types, see Part II forms for

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

The hardbottom environment adjacent to the project area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef (beyond the impact area) is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	Somewhat unique; the intertidal portion of the hardbottom ridge terminates to the north of the project area.

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, refuge and food resources for benthic and motile marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae. Wormrock, sponges, tunicates, octocorals, bryozoans, and zoanthids were also present. Common macroalgal taxa are *Dictyota* , P*adina, Hypnea, Dasycladus, Halimeda,* and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom and include *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia* , *Muricea* , and *Eunicea* . Motile species such as fish, sea turtles and crabs also utitilize this habitat. Species are accustomed to the ephemeral nature of the habitat .	Loggerhead (*Caretta caretta)* (T)*,* Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine) . The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above.

Additional relevant factors:

The hardbottom in highly ephemeral. Based on delineation of aerials, there has been a time-averaged 23.85 ac of exposed hardbottom between R-127 and R-141 from January 2003 to July 2013, including a minimum of 2.71 ac in January 2009 and a maximum of 48.78 ac in January 2006. Line intercept data collected on transects immediately offshore of the project area on the nearshore hardbottom adjacent to R-130 to R-141 revealed this area to have a hardbottom to sand ratio of 24:76 (24% of the area east of the hardbottom edge is hardbottom and 76% is sand) (CBI, 2014). HB edge and benthic characterization surveys were conducted in 2005, 2006, 2007, 2011, and 2014.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation Reef

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
571	N/A	Mitigation Site	6.15 acres (mitigation for 7 impact types, see Part II forms for each)

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of importance)
Atlantic Ocean	Class III	N/A

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Open waters of the Atlantic Ocean. The project area is located approximately 11 miles south of Lake Worth Inlet and approximately 2.5 miles north of South Lake Worth Inlet.

Assessment area description

Subtidal limestone boulder artificial reefs are proposed to be deployed in the same general vicinity and water depth as the impact area in a location devoid of hardbottom habitat in water depths similar to the natural nearshore hardbottom. Additional surveys will be conducted to determine the location of the mitigative reefs.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
The outer reef is located east of the nearshore natural hardbottom habitat in 40-70 ft water depth.	The artificial reefs will be placed in similar water depths as the impacted hardbottom in order to mimic the lost function of the habitat.

Functions	Mitigation for previous permit/other historic use
The artificial reef habitat is intended to closely mimic the characteristics of adjacent nearshore habitat, which is typically low relief limestone pavement. It will provide cover, substrate, refuge and food resources for marine species.	N/A

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
The artificial reef is intented to replicate the physical appearance, texture, relief and ecological function of the habitat it is meant to replace.	Loggerhead (*Caretta caretta)* (T), Green *(Chelonia mydas)* (E), and leatherback (*Dermochelys coriacea)* (E) sea turtles regularly nest in the project area. The project area is also loggerhead critical habitat (terrestrial and marine). The Florida manatee (*Trichechus manatus latirostris*) (E) is common in Palm Beach County. Smalltooth sawfish (*Pristis pectinata*) (E) has the potential to occur in the project area. Threatened coral species which have the potential to occur in the project area but which have not been observed during recent benthic survyes include: staghorn coral (*Acropora cervicornis),* elkhorn coral *(A. palmata),* boulder star coral *(Orbicella annularis),* mountainous star coral *(O. faveolata),* star coral complex (*O. franski),* pillar coral *(Dendrogyra cylindrus),* and rough cactus coral *(Mycetophyllia ferox).*

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Characterization surveys documented the biota listed above for natural nearshore hardbottom. Utilization of artificial reef is expected to be similar to that of natural hardbottom.

Additional relevant factors:

Limestone is a natural material and will provide a suitable replacement for the impacted nearshore reef substrate. Limestone boulder artificial reefs have been documented to offset impacts associated with beach nourishment projects in southeast Florida.

Assessment conducted by:	Assessment date(s):
CB&I Coastal Planning & Engineering, Inc.	October 2014

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Permanent Impacts
Impact or Mitigation: Impact (Permanent)	Assessment conducted by: CB&I	Area (acres) 3.93

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 2.357942064

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Permanent Impacts
Impact or Mitigation: Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed

Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:

(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:

(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	2.357942		0.52		4.55
a.a.2					
total					

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Direct Temporary Impacts (<1 year)
Impact or Mitigation Impact (Direct Temporary <1 year)	Assessment conducted by: CB&I	Area (acres) 0.57

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.34170478

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Direct Temp Impacts (<1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	9	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	9	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.800

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.600

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.58

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.341705		0.58		0.59
a.a.2					
total					

Acres of mitigation - impact acres
0.02

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Direct Temporary Impacts (>1 year)
Impact or Mitigation Impact (Direct Temporary > 1 yr)	Assessment conducted by: CB&I	Area (acres) 0.25

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
FL=delta x acres=	0.149267671

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Direct Temp Impacts (>1 yr)
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	7	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	7	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.667

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.467

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.45

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.149268		0.45		0.33
a.a.2					
total					

Ac of mitigation - impact acres
0.08

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Direct Temporary Impacts (> 2 years)
Impact or Mitigation: Impact (Direct Temporary > 2 years)	Assessment conducted by: CB&I	Area (acres) 0.17

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

.500(6)(a) Location and Landscape Support

w/o pres or current	with
10	1

The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.

.500(6)(b) Water Environment (n/a for uplands)

w/o pres or current	with
6	6

The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.

.500(6)(c) Community structure

1. Vegetation and/or
2. Benthic Community

w/o pres or current	with
10	1

The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.099882556

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Direct Temp Impacts (>2 yr)
Impact or Mitigation Mitigation	Assessment conducted by: CB&I	Assessment date: Oct. 2014

Scoring Guidance
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed

Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	5	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	5	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.533

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.333

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas	
RFG=delta/(t-factor x risk)=	0.32

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.099883		0.32		0.31
a.a.2					
total					

Ac of mitigation - impact acres
0.14

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Indirect Impacts (1 year)
Impact or Mitigation: Impact (Indirect Temporary 1 year)	Assessment conducted by: CPE	Area (acres) 3.03

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.267

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 1.816490243

Delta = [with - current]
0.600

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Indirect Temp Impacts (1 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	8	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	8	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.733

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.533

If mitigation

Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	1.81649		0.52		3.51
a.a.2					
total					

Ac of mitigation - impact acres
0.48

Form 62-345.900(3), F.A.C. [effective date]

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Indirect Temporary Impacts (2 years)
Impact or Mitigation: Impact (Indirect Temporary 2 years)	Assessment conducted by: CB&I	Area (acres) 1.42

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	1	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	1	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.867	0.267

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres= 0.849542557

Delta = [with - current]

0.600

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Indirect Temp Impacts (2 yr)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	6	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	6	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.200	0.600

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres=

Delta = [with - current]
0.400

If mitigation	
Time lag (t-factor) =	1.03
Risk factor =	1.00

For mitigation assessment areas
RFG=delta/(t-factor x risk)= 0.39

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.849543		0.39		2.19
a.a.2					
total					

Ac of mitigation - impact acres
0.77

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PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Indirect Temporary (ETOF) Impacts
Impact or Mitigation Impact (Indirect Temporary (ETOF))	Assessment conducted by: CB&I	Area (acres) 0.78

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	10	9	The assessment area is a wide exposure of nearshore hardbottom carbonate rock with primarily low relief areas and colonized pavement. Benthic characterization surveys within the project area revealed the dominant components of the epibenthic communities to be turf and macroalgae, and also supporting wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. Common macroalgal taxa are *Dictyota, Padina, Hypnea, Dasycladus, Halimeda* , and *Laurencia* . Small (<3 cm) colonies of scleractinian corals have been documented on the nearshore hardbottom, including *Siderastrea* spp. and *Solenastrea bournoni* . Common octocorals are *Pterogorigia, Muricea* , and *Eunicea* . The nearshore hardbottom provides an important settlement and nursery habitat for immigrating larvae of many important fisheries species. It is also provides foraging habitat for juvenile green sea turtles and the beach provides nesting habitat for loggerhead, green and leatherback sea turtles.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	10	9	The community structure is a high stress (low relief) to sub-climax (moderate relief) community, with some benthic organisms thriving in this habitat for many years (scleractinians, large sponges). It supports a multi-species macroalgae assemblage and a diverse invertebrate community in the form of wormrock, sponges, tunicates, scleractinian corals, octocorals, bryozoans, and zoanthids. The most abundant scleractinian species are *Siderastrea* spp. and *Solenastrea bournoni* . Size distribution indicates recruitment, but repeated burial of habitat limits succession and colony growth.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.867	0.800

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL=delta x acres= 0.052064131

Delta = [with - current]
0.067

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG=delta/(t-factor x risk)=

PART II – Qualification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Southern Palm Beach Island Comprehensive Shore Stabilization Project (Palm Beach County portion)	SAJ-2008-04086	Mitigation for Indirect Temporary (ETOF) Impacts
Impact or Mitigation	Assessment conducted by:	Assessment date:
Mitigation	CB&I	Oct. 2014

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetlands/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface water functions	Minimal level of support of wetland /surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	0	10	The mitigation area is shallow water nearshore habitat of unconsolidated sandy substrate in similar water depth as the impact area. Nearshore hardbottom resources exist in the adjacent area to facilitate recruitment to the proposed mitigative artificial reef.
.500(6)(b) Water Environment (n/a for uplands)	6	6	The assessment area is in the nearshore habitat of the Atlantic Ocean with open circulation. It is often exposed to high wave energy with generally clear water. Water quality will not be not altered.
.500(6)(c) Community structure 1. Vegetation and/or 2. Benthic Community	0	10	An artificial reef will provide substrate for benthic recruitment of macroalgae and sessile invertebrates and will create a refuge for fish and other motile marine organisms. It will create a foraging resource for sea turtles since preferred macroalgae have been documented to grow on artificial reefs in the nearshore habitat of Southeast Florida.

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.200	0.867

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL=delta x acres=

Delta = [with - current]
0.667

If mitigation

Time lag (t-factor) = 1.03

Risk factor = 1.25

For mitigation assessment areas

RFG=delta/(t-factor x risk)= 0.52

Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area scored

Bank Assessment Area	RFG	X	Acres	=	Credits
example					
a.a.1					
a.a.2					
total					

(b) Mitigation needed to offset impacts, when using a mitigation bank

The number of mitigation bank credits needed, when the bank or regional offsite mitigation area is assesses in accordance with this rule, is equal to the summation of the calculated functional loss for each impact assessment area.

Impact Assessment Area	FL	=	Credits needed
example			
a.a.1			
a.a.2			
total			

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	FL	/	RFG	=	Acres of Mitigation
example					
a.a.1	0.052064		0.52		0.10
a.a.2					
total					

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Mitigation Determination Formulas
(See Section 62-345.600(3), F.A.C.)

For each impact assessment area:
(FL) Functional Loss = Impact Delta X Impact acres

For each mitigation assessment area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable/((t-factor)(risk))

(a) Mitigation Bank Credit Determination

(b) Mitigation needed to offset impacts, when using a mitigation bank

(c) Mitigation needed to offset impacts, when not using a bank

To determine the acres of mitigation needed to offset impacts when not using a bank or a regional offsite mitigation area as mitigation, divide functional loss (FL) by relative functional gain (RFG). If there are more than one impact assessment area or more than one mitigation assessment area, the total functional loss and the total relative functional gain is determined by summation of the functional loss (FL) and relative functional gain (RFG) for each assessment area.

	Impact Types	FL	/	RFG	=	Acres of Mitigation
1	Permanent	2.36		0.52		4.55
2	Direct Temporary (< 1 Year)	0.34		0.58		0.02
3	Direct Temporary (>1 year)	0.15		0.45		0.08
4	Direct Temporary (>2 year)	0.10		0.32		0.14
5	Indirect Temporary (1 year)	1.82		0.52		0.48
6	Indirect Temporary (2 years)	0.85		0.39		0.77
7	Indirect Temporary (ETOF)	0.05		0.52		0.10
	total					6.15

*Note: for temporary impacts, *Mitigation = (FL/RFG) - Impact Area*

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APPENDIX I

MITIGATION PLAN

SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT MITIGATION PLAN

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1.0 GOALS AND OBJECTIVES

The proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (the Project) (designated as Alternative 2 - the Applicants' Preferred Project Alternative) would use a combination of beach nourishment, dune reconstruction and coastal structures between R-129-210 and R-138+551 on Palm Beach Island, Palm Beach County, Florida (Figure 1-1). The Project includes two projects which will be constructed by two separate Applicants: the Town of Palm Beach (project area extending from R-129-210 to R-134+135) and Palm Beach County (County) (project area extending from R-134+135 to R-138+551).

The Applicants' goals and objectives for both beach nourishment projects are to provide more sand to the littoral system, create a stable beach and dune profile that will buffer the effects of storm surge and wave action, provide wildlife habitat, allow for recreational use and protect upland infrastructure. Approximately 142,800 cubic yards (cy) of fill will be placed along the shoreline within the Project Area from R-129-210 to R-138+551 (approximately 3.33 km (2.07 mi)). The fill volume will be split between the two Applicants' separate project areas – 65,200 cy of sand in the Town of Palm Beach and 77,600 cy in the County project area within South Palm Beach, Lantana and Manalapan. From north to south, the project would place dune nourishment only from R-129-210 to R-129+150, dune and beach nourishment from R-129+150 to R-131, dune nourishment only from R-131 to R-134+135 (Town of Palm Beach southern limit), and beach nourishment with seven low-profile groins from R-134+135 to R-138+551 (Figure 1-2).

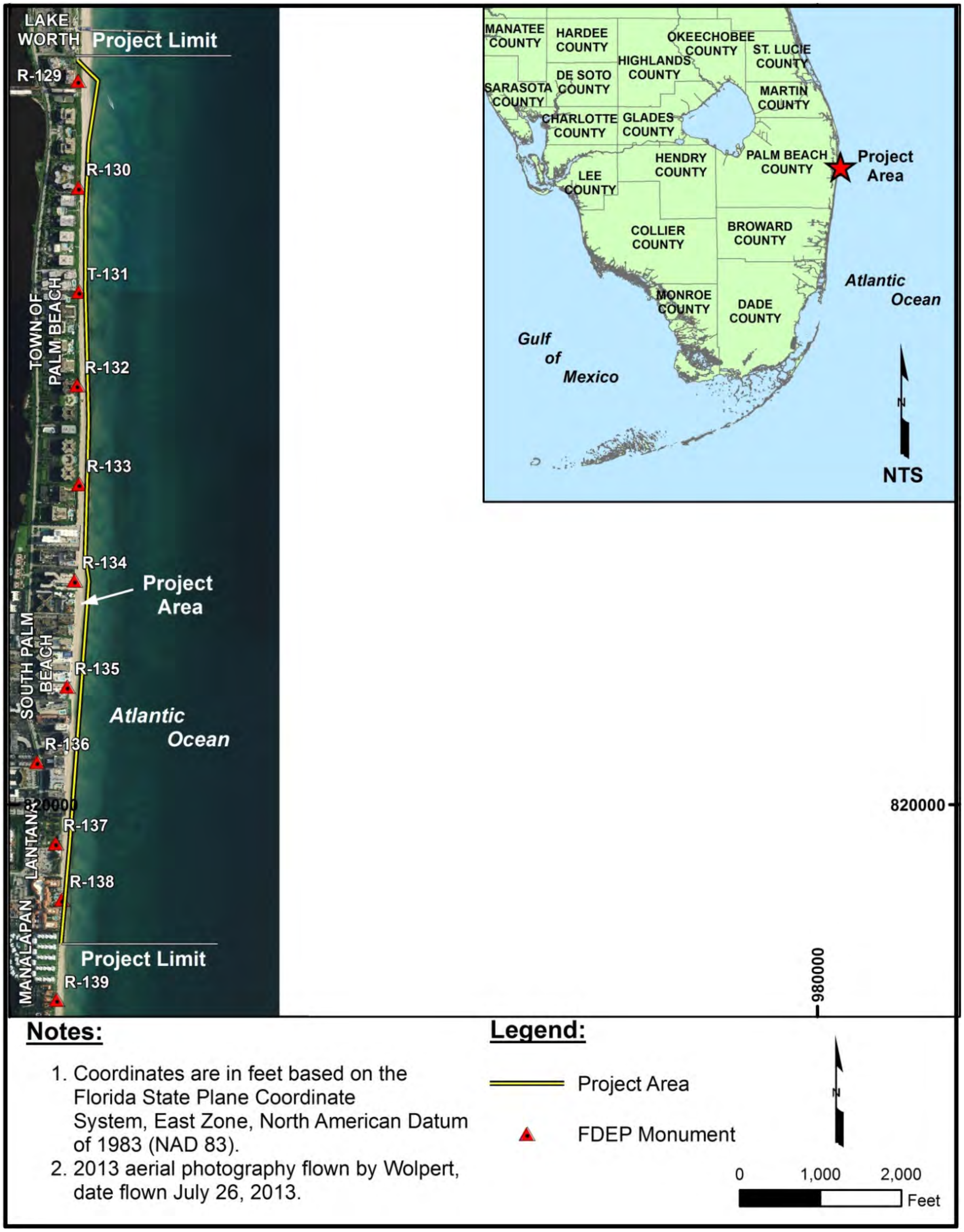


Figure 1-1. Southern Palm Beach Island Comprehensive Shoreline Stabilization Project location map.

It is anticipated that the delivery mechanism for the nourishment will be a truck-haul operation. The sand source would be a combination of stockpiled dredge material from the Reach 7 Phipps Ocean Park Beach Restoration Project (Phipps) or the Mid-Town Beach Restoration Project (Mid-Town) for placement within the Town of Palm Beach project limits (R-129-210 to R-134+135) and upland sand for placement within the County project limits in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). For the initial construction of the proposed Project, the Town of Palm Beach proposes to utilize an offshore sand stockpile which will be located within the permitted Phipps template, as authorized by USACE Permit No. SAJ-2000-00380 and authorized by FDEP under the Palm Beach Island Beach Management Agreement (BMA) (FDEP, 2013). For subsequent maintenance of the Project, the Town of Palm Beach plans to alternate between utilizing the Phipps stockpile and an offshore sand stockpile within the permitted Mid-Town template as authorized by USACE under Permit No. SAJ-1995-03779 and authorized by FDEP under the BMA (FDEP, 2013). If the project schedules do not coincide, the Town of Palm Beach may truck in sand from upland mines. The County only proposes upland sand for construction of its portion of the project.

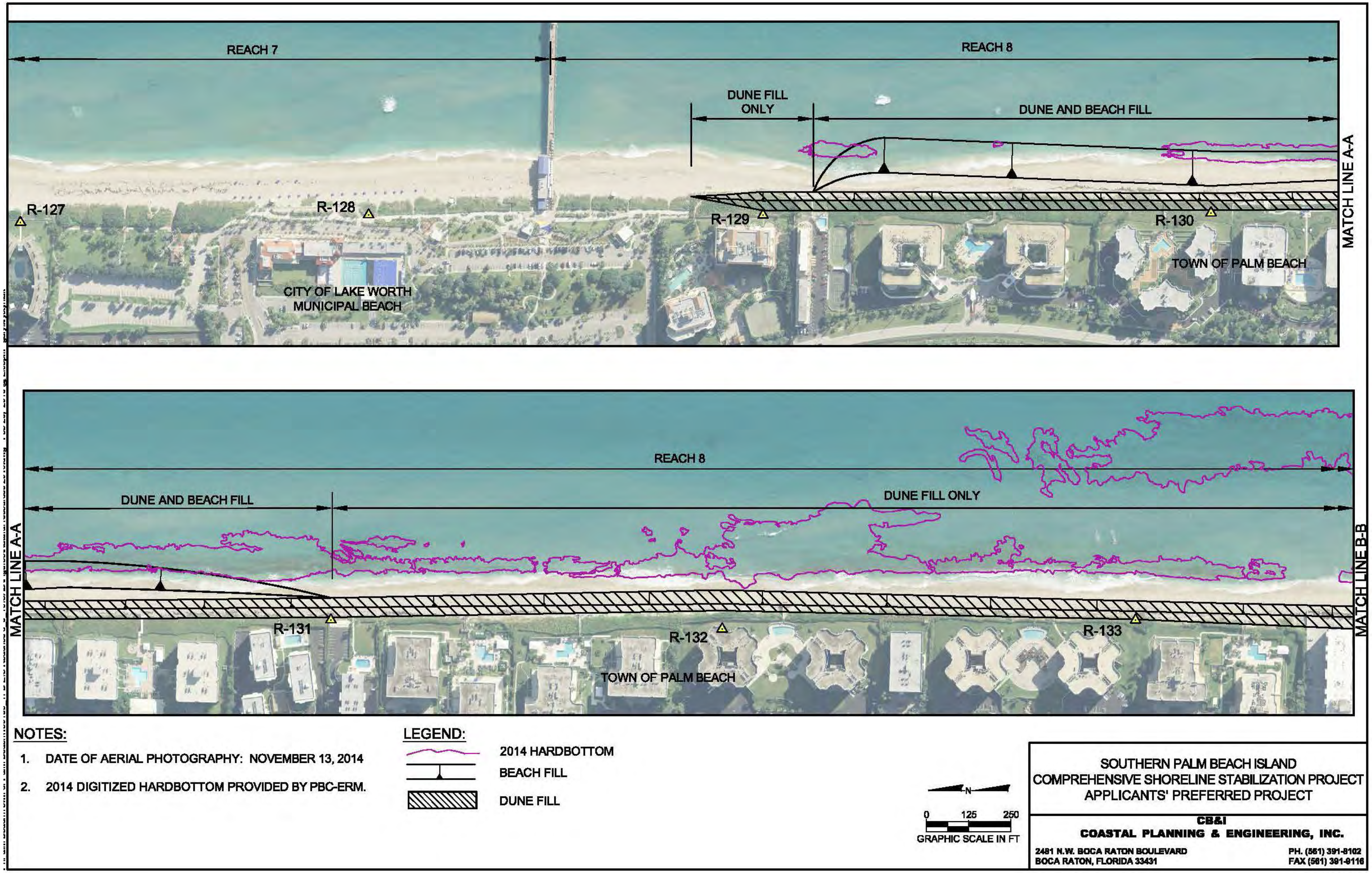


Figure 1-2. Proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Alternative 2 – Applicants' Preferred Alternative).

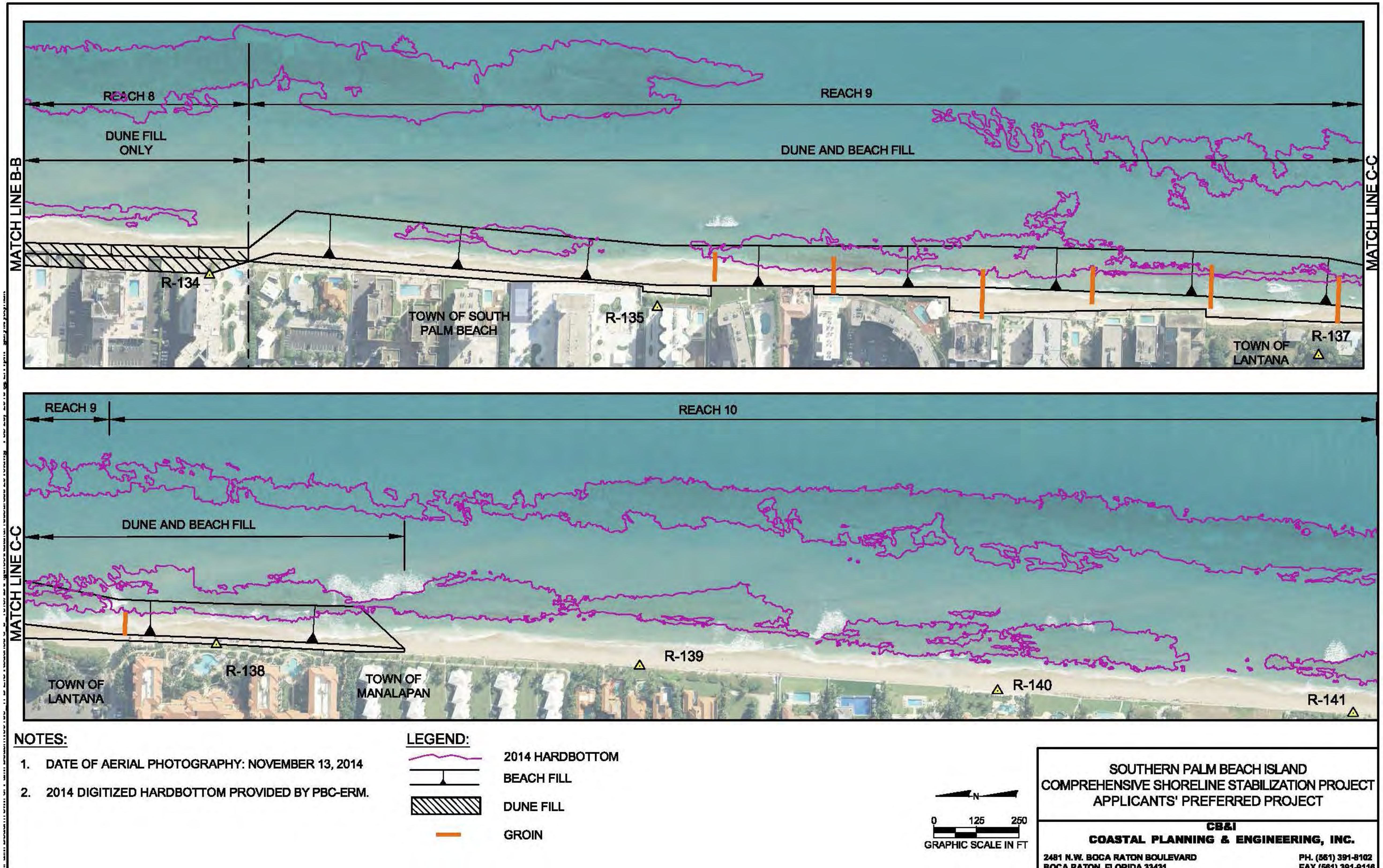


Figure 1-2 (cont.). Proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Alternative 2 – Applicants' Preferred Alternative).

This Project has been designed to avoid and minimize impacts to nearshore hardbottom to the maximum extent practicable, including reducing the volume of sand placed below mean high water (MHW) and constructing the Project using a truck haul approach instead of dredging an offshore borrow area and hydraulically pumping the sand through a pipeline to the Project Area. The dredging and hydraulic pumping of sand will be authorized under the Phipps and Mid-Town projects as described above. The Project is anticipated to impact nearshore hardbottom through direct placement of sand during project construction and due to beach profile equilibration (spreading) following construction. Based on engineering and Delft 3D modeling results (Appendix G to the EIS), it is anticipated that the Project would permanently impact between 3.86 and 3.99 ac and temporarily impact between 9.53 and 9.93 ac of intertidal and subtidal hardbottom. Figure 1-3 presents the sediment accumulation polygons that result in hardbottom impacts based on the Delft3D modeling using a 0.36 mm grain size (see Figures 4-1 and 4-3 in the EIS for results of 0.25 mm and 0.60 mm grain size). Impacts to hardbottom were based on a time-average of exposed hardbottom delineated from aerial images between 2003 and 2014 (the time-average methodology is described below in Section 4.1.). Using the engineering and Delft 3D modeling results, historic exposed hardbottom acreage, and recent benthic characterization data, a preliminary Uniform Mitigation Assessment Method (UMAM) evaluation was conducted (provided as Appendix H to the EIS). This draft UMAM analysis determined that between 6.55 and 6.66 ac of mitigation may be required to offset these impacts to intertidal and subtidal hardbottom.

The USACE would also consider assessing impacts based on a more traditional equilibrium toe of fill (ETOF) analysis such as profile translation. The ETOF is presented on the plan view figures of the alternatives in Chapter 2 of the EIS. This type of assessment would consider all impacts to hardbottom within the ETOF as permanent and require mitigation to compensate for those impacts. This analysis has not been completed for the EIS but remains a potential means for determining impacts and mitigation requirements. The USACE will determine which method to apply prior to permit decision

This Mitigation Plan (MP), prepared under guidance provided in the Mitigation Rule (33 CFR 332.4(c)), outlines the Applicants' plan to provide compensatory mitigation for adverse impacts to nearshore hardbottom. This section describes the nearshore hardbottom resources that will be impacted, the proposed mitigation sites and specifications, and the manner in which the mitigation will restore the ecological functions lost due to anticipated project impacts to the nearshore hardbottom habitat.

Based on the Applicants' Preferred Alternative, the specific goals of the MP are:

1. To provide compensatory mitigation to offset between 3.86 and 3.99 ac of permanent impacts and between 9.53 and 9.93 ac of temporary impacts to hardbottom due to construction of the Project.

2. To create between 6.55 and 6.66 ac of mitigation in the form of low relief artificial reefs designed to mimic the ecological function of the nearshore hardbottom habitat that will be impacted. The reef shall:

    a. Include similar physical features as the nearshore hardbottom - low relief modules or boulders spaced at the same ratio of sand to hardbottom as the nearshore hardbottom;

    b. Include similar substrate as the nearshore hardbottom - limestone surface that facilitates recruitment of organisms found on the natural hardbottom;

    c. Be placed in a similar water depth as the nearshore hardbottom that will be impacted;

    d. Include a benthic habitat with interstitial spaces that provides refuge for benthic organisms; and

    e. Create a habitat that fully offsets the functional loss of the impacted hardbottom.

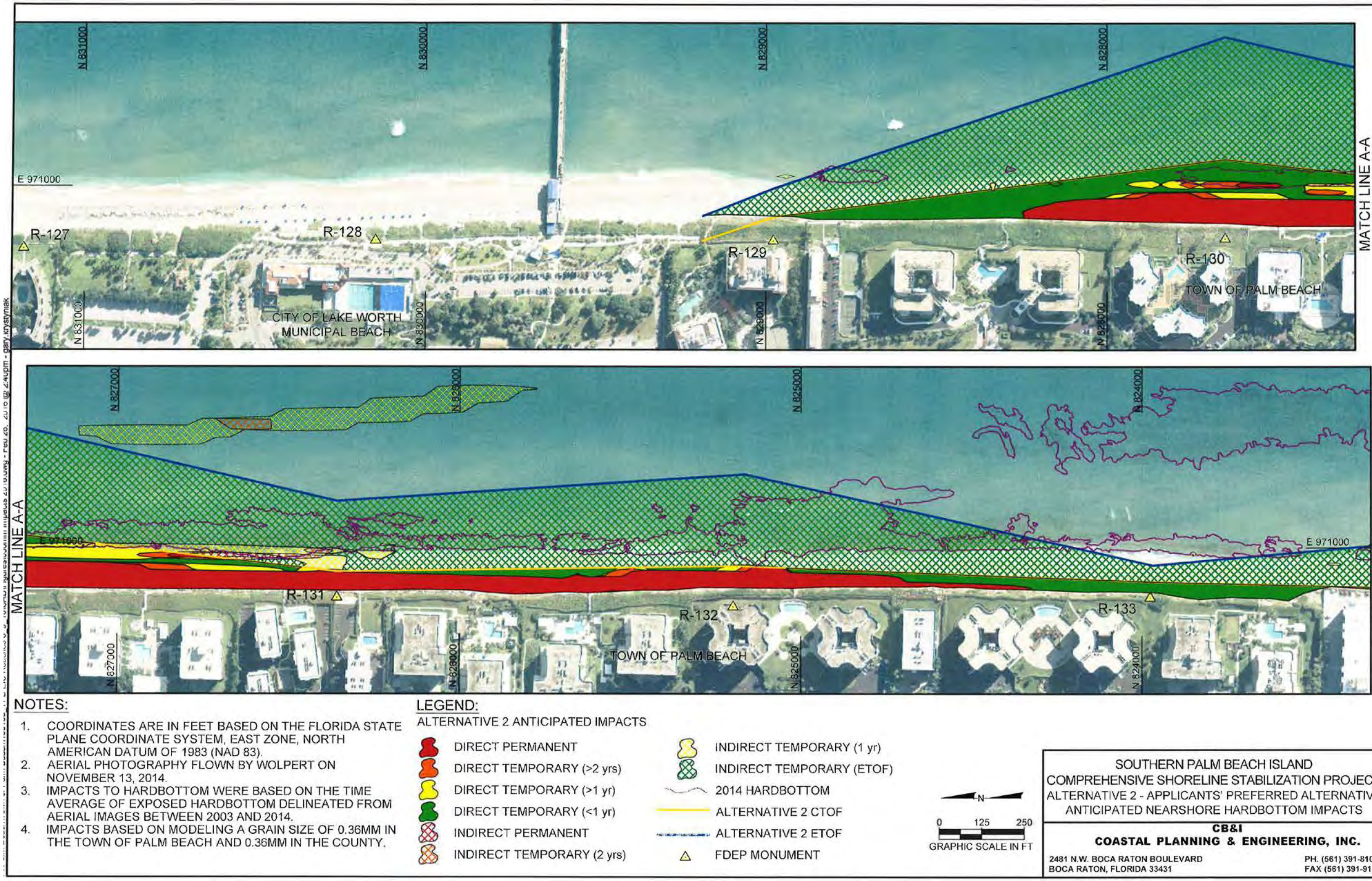


Figure 1-3. Anticipated nearshore hardbottom impacts from Alternative 2 – Applicants' Preferred Alternative based on Delft3D modeling using 0.36 mm grain size.

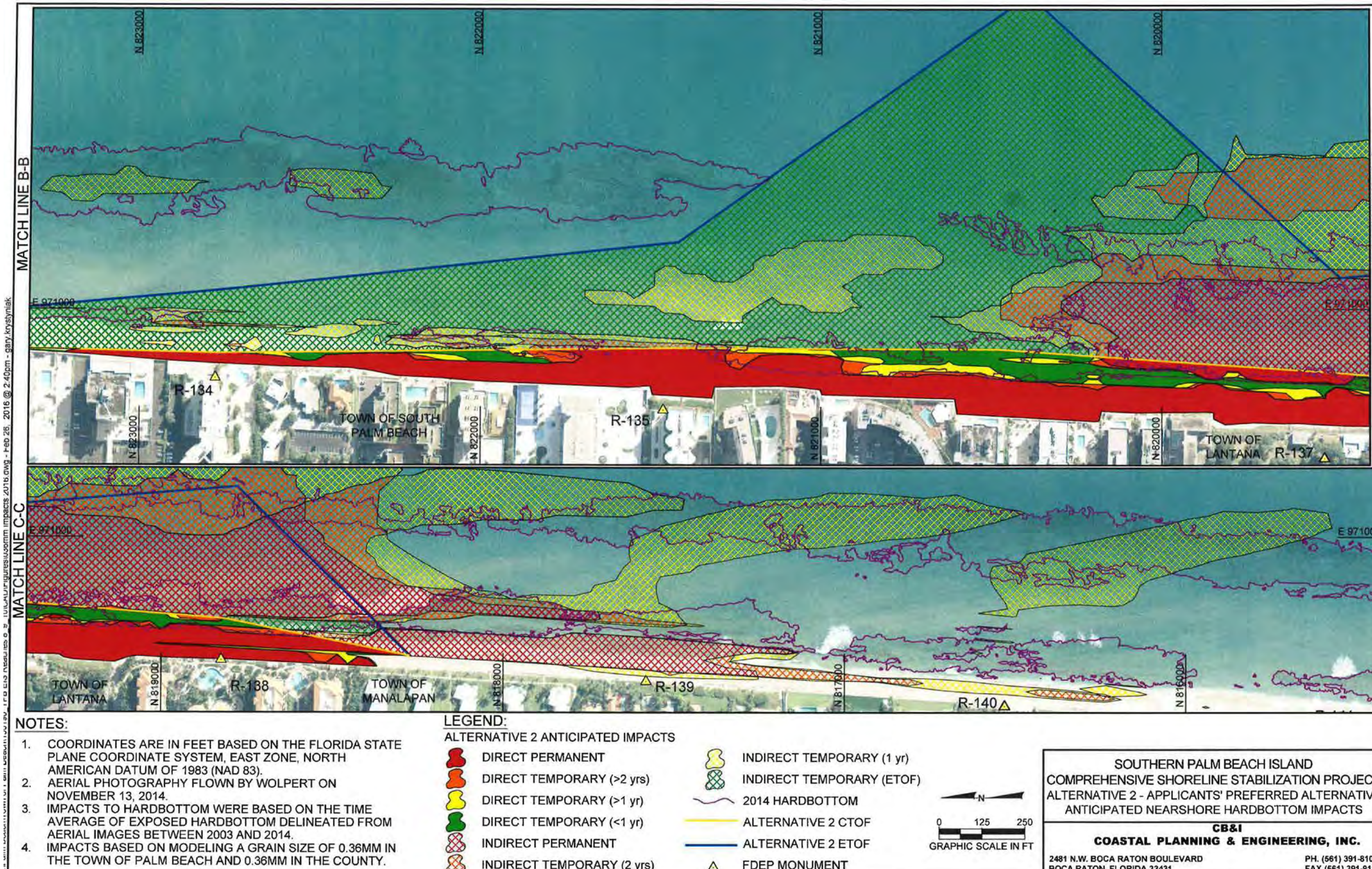


Figure 1-3 (cont.). Anticipated nearshore hardbottom impacts from Alternative 2 – Applicants' Preferred Alternative based on Delft3D modeling using 0.36 mm grain size.

1.1. IMPACT SITE

Due to direct sand placement and subsequent spreading (equilibration) of sand, it is anticipated that the Project may permanently impact between 3.86 and 3.99 ac and temporarily impact between 9.53 and 9.93 ac of intertidal and subtidal hardbottom (Figure 1-3). A benthic characterization survey was conducted in the fall of 2013 to assess the habitat adjacent to the Project Area (R-127 to R-141), including intertidal and subtidal hardbottom (CB&I, 2014, provided as Appendix D to the EIS). This included a quadrat-based assessment to quantify the benthos as well as shore-perpendicular transects to determine sediment conditions. During this survey, maximum relief measurements were taken within each quadrat: the mean maximum vertical relief of the intertidal area was 7.0 cm (SD 10.5) and the mean maximum vertical relief for the subtidal area was 9.3 cm (SD 8.8). Based on these results, the impact site is characterized as low relief (≤ 30 cm).

The benthic community located in the impact area is dominated by turf algae, sediment and macroalgae (CB&I, 2014). A total of 14 macroalgae genera were identified during the 2013 characterization survey, five of which are known to be preferred food items of *C. mydas*. These included *Dictyota, Dictyopteris, Bryothamnion, Dasycladus,* and *Jania.* Of all macroalgae genera recorded, *Dictyota*, *Gelidiella* and *Dasycladus* dominated the macroalgae cover in the Study Area and were also the most frequently occurring genera. In 2013, 20 scleractinian colonies (0.5 colonies m^{-2}) and 225 octocoral colonies (6.1 colonies m^{-2}) were documented on the same 12 transects. *Oculina diffusa* added to the scleractinian species diversity in 2013; however, only one 1-cm colony of this species was observed on R-139. The octocoral community was made up of four genera (*Eunicea, Muricea, Pseudopterogorgia* and *Pterogorgia*), all of which occurred in the subtidal portion of the sampling area Average size was 2.6 cm for all observed scleractinian corals and 5.3 cm for all observed octocorals. No *Acropora* coral species and none of the five coral species listed as threatened in August 2014 were observed during the survey, or during an *Acropora* survey conducted by Palm Beach County's Department of Environmental Resources Management (PBC-ERM) in October 2013 (provided as Appendix C to the EIS).

A total of 56 fish taxa from 29 families were recorded along the natural hardbottom during this survey, including 18 predatory species and 11 species of the snapper/grouper management complex.

2.0 MITIGATION SITE SELECTION CRITERIA

In order to offset lost ecological functions from the burial of hardbottom from the Project, the Town of Palm Beach and the County propose to provide in-kind mitigation through construction of artificial reef substrate within the vicinity of and similar depths to the impact area. The mitigation will be located in Palm Beach County and extend into the Atlantic Ocean, Class III Waters. The Applicants determined that suitable mitigation sites should be located near the proposed impact site in similar water depths as the impacted hardbottom (less than 20 ft). Further, to avoid impacts from the mitigation structures themselves, the mitigation sites must be located on sandy seafloor where there are no hardbottom resources. These areas must also have a relatively thin sand layer, covering subsurface rock and or consolidated rubble that will prevent and or minimize settlement of the mitigation units. The general artificial reef citing criteria being used by the Town of Palm Beach and the County are as follows:

1. Offshore of the predicted ETOF, beyond the anticipated impact area;
2. Similar water depth to impacted hardbottom resources;
3. Maintain a protective buffer of at least 7.6 m (25 ft) from all nearshore hardbottom;
4. Underlying sediment thickness between 0.3 and 1.2 m (1 and 4 ft).

The criteria listed above place the artificial reef outside the anticipated project impact area and protect the existing natural hardbottom during construction of the mitigative reef while placing the reef within the vicinity of these resources. These locations maintain proximity and connectivity to aquatic resources, which will allow recruitment of organisms from adjacent hardbottom onto the artificial reef, thereby increasing the likelihood that the artificial reef will succeed at developing a natural community similar to that found on the impacted nearshore hardbottom.

2.1. SITE SELECTION PROCESS

The Town of Palm Beach has conducted field surveys in August 2014 to support mitigation reef siting for the Mid-Town Project. These surveys were based on the most recent site information including probe measurements of nominal sand depth. A minimum of 0.5 acres is available and identified. Additional viable acreage is potentially available within the vicinity, though site specific investigations of additional areas have not been conducted. No additional surveys are planned at this time; however, additional surveys will be required to support the full mitigation acreage that will be required and to finalize design and construction.

In order to determine potential sites for the County's mitigative artificial reef, a time series of aerials was analyzed in August 2014 to identify areas where hardbottom has not historically been exposed. A sub-bottom profile and hydrographic survey was completed in October 2014 between R-134 and R-139 (provided in Sub-Appendix I-2). The investigation was completed in order to map the vertical extent of sand overlying hardbottom and to verify the feasibility of the proposed area (described in Section 2.2) to support an artificial reef based on the depth of sand over bedrock.

2.2. PROPOSED MITIGATION SITES

Based on the selection criteria and surveys conducted to date, the Town of Palm Beach and the County have identified potential locations for their respective mitigative artificial reefs (Figure 2-1). However, the final site determinations will be based on additional surveys and on final mitigation conditions which will be required by project permits.

The preferred location for the Town of Palm Beach's mitigation reef is in the nearshore zone in the vicinity of R-104.5, approximately 244 m (800 ft) seaward of the MHWL in approximately 4.6 m (15 ft) water depth (Figure 2-1), located about 7.7 km (4.8 mi) north of the Project Area. Field surveys of the area have been conducted to support mitigation reef siting for the Mid-Town Project. These were completed in August 2014 and are based on the most recent site information including probe measurements of nominal sand depth. The proposed mitigation reef dimensions would be approximately 91 m x 23 m (300 ft x 75 ft) and will consist of one layer of limestone boulders providing 0.3-1.2 m (1-4 ft) vertical relief with a maximum of 1.8 m (6 ft) vertical relief. Sketches of the typical layout and cross-section of the proposed artificial reef are included in Sub-Appendix I-1.

The preferred location for the County's mitigation reef is in the nearshore zone between R-137-330 and R-137+400 (Lantana Public Beach) (Figure 2-1). The mitigation reef will consist of a single layer of limestone boulders clusters in approximately -6 ft to -20 ft NGVD and will be placed on substrate that is approximately 0.3-0.9 m (1-3 ft) of sand over bedrock. To minimize potential impacts to sediment transport, the spacing between the clusters will be similar to those of the mitigation built for the Juno Beach Renourishment Project. The clusters will likely have a dimension of 6 m x 12 m (20 ft x 40 ft) and space between each cluster will likely be 11 m (35 ft) laterally and 9 m (30 ft) longitudinally. The limestone boulders will likely have a minimum weight of 998 kg (2,200 lbs) and shall not exceed 2,722 kg (6,000 lbs) with at least 95% of the boulders between 998 kg (2,200 lbs) and 2,631 kg (5,800 lbs). Sketches of the typical layout and cross-section of the proposed artificial reef designed by Palm Beach County Department of Environmental Resources Management (PBC-ERM) are included in Sub-Appendix I-2. Construction will be similar to the FDEP approved mitigation for the Juno Beach re-nourishment (FDEP Permit No. 0267415-001-JC).

Based on the observed performance of other mitigative artificial reefs constructed in southeast Florida, the proposed mitigation structures are expected to provide the intended mitigating effect. Given the nature of the rock and consolidated rubble beneath the proposed mitigation area, the likelihood of unanticipated settlement is minimal. The mitigation units themselves will be sized such that they will be individually stable under the influence of tide, current, and wave conditions that are reasonably likely to occur for storm events with a return period of at least 25 years. Thus, movement due to such conditions is unlikely.

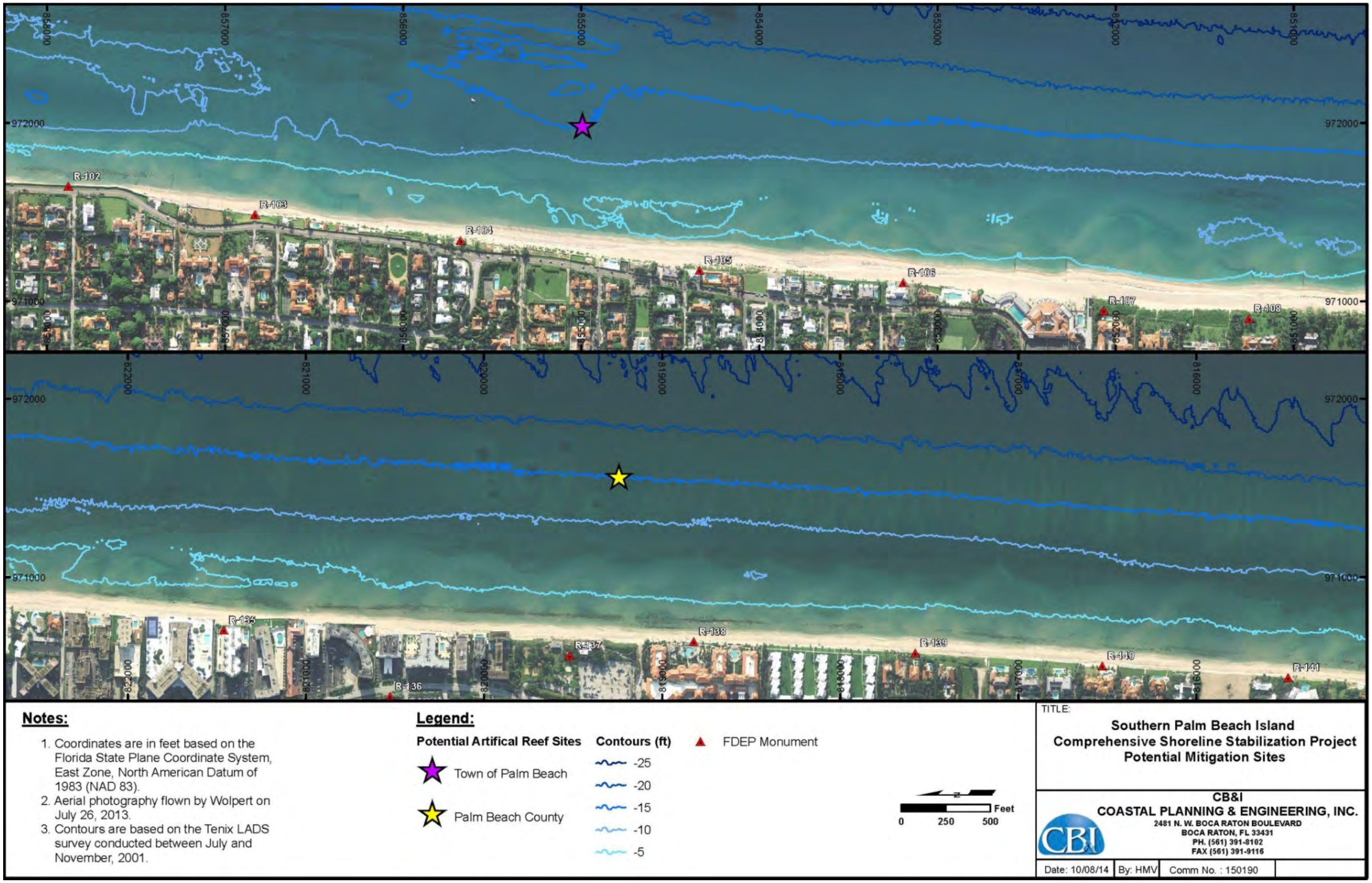


Figure 2-1. Potential mitigation sites.

3.0 SITE PROTECTION INSTRUMENT

The mitigation will be constructed on sovereign submerged lands of the State of Florida. This mitigation will be authorized by the State of Florida under FDEP permits for the Town of Palm Beach and the County projects. The Town of Palm Beach and the County will be responsible for the construction and management of their respective artificial reefs. The USACE will have access to the mitigation site subsequent to the issuance of a Department of the Army permit.

4.0 BASELINE INFORMATION

This section describes the baseline conditions found at the impact site and the proposed mitigation sites.

4.1. IMPACT SITE

The results of the engineering and Delft 3D modeling study (Appendix G) provided polygons that represented sand accumulation in the nearshore habitat over three years due to project implementation for each alternative and for each grain size modeled. These polygons were overlaid onto aerial delineations of exposed hardbottom digitized in GIS from 2003 through 2014 to determine potential impacts to this resource. From these polygons, seven levels of potential impact to hardbottom were developed based on temporal and spatial factors. These impact types are described in greater detail in Appendix H of the EIS. Initial investigation of the hardbottom habitat in the project area revealed a resource that is very dynamic and ephemeral in nature. The constant burial and re-exposure of hardbottom in this area facilitates the development of an opportunistic community dominated by turf and macroalgae species that recruit quickly when substrate is available. Between 2003 and 2014, the amount of exposed hardbottom in the Project Area varied widely ranging between 1.51 ac (2009) to 36.61 ac (2006). Because of the variability observed from year to year, the USACE determined that a time-average analysis of the amount of hardbottom exposed would best represent the habitat since it smooths out short-term fluctuations and provides longer-term trends by averaging a function over iterations of time. In this case, the average amount of exposed hardbottom (ac) between two surveys is multiplied by the number of days between those two surveys (ac-days). The sum of ac-days is divided by the total number of days between the first survey and the last survey. This provides the time-averaged amount of hardbottom in an area. For each alternative, a UMAM was conducted for each type of impact to determine potential mitigation requirements.

Based on engineering and Delft 3D modeling results, it is anticipated that the Project may result in permanent impacts to between 3.86 and 3.99 ac of hardbottom as well as temporary impacts to between 9.53 and 9.93 ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand (Figure 1-3). Impacts to hardbottom were based on a time-average of exposed hardbottom delineated from aerial images between 2003 and 2014. The hardbottom environment within the project impact area is highly ephemeral, consisting primarily of low-relief intertidal and subtidal hardbottom habitat, located in less than 15 ft water depth. Surveys have shown a benthic community dominated by turf algae and macroalgae, but also supporting wormrock, tunicates, sponges, bryozoans and small coral colonies. Motile species such as fish, sea turtles and crabs also utilize this habitat. Species are accustomed to the ephemeral nature of the habitat which is subject to frequent burial and re-exposure. Figure 4-1 presents a selection of hardbottom delineations between 2003 and 2014 to represent the ephemeral nature of the hardbottom.

Section 1.1 of this mitigation plan describes the benthic community found in this habitat and summarizes the results of the 2013 benthic characterization survey (CB&I, 2014). The nearshore marine habitat may be utilized by listed species, including sea turtles, manatees, smalltooth sawfish, *Acropora* spp. corals, as well as five coral species recently listed as threatened under the ESA. The Project Area is also designated as loggerhead critical habitat (terrestrial and marine). The USACE will coordinate with NMFS and USFWS for potential project impacts to federally listed species, loggerhead critical habitat and Essential Fish Habitat (EFH).

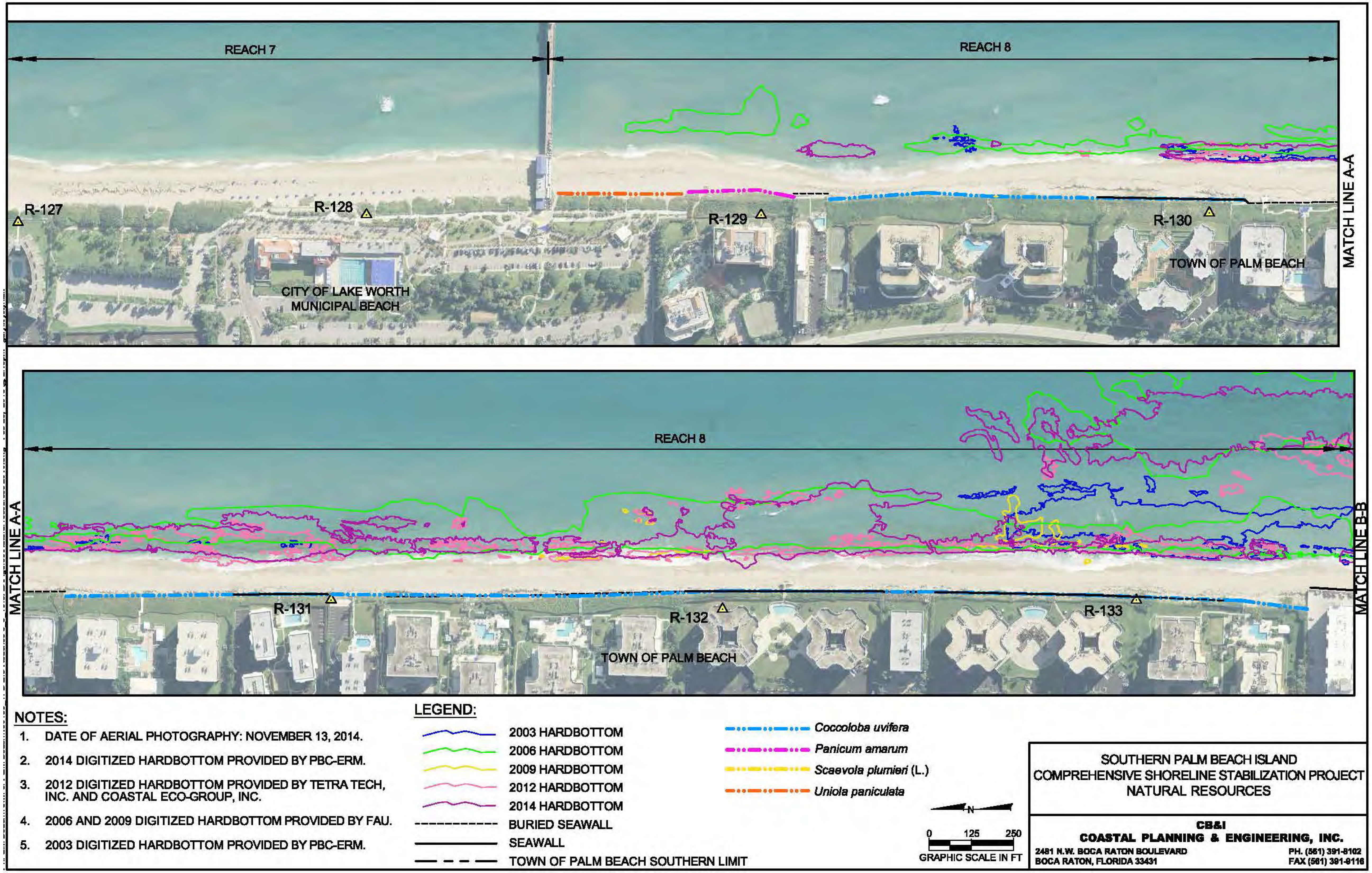


Figure 4-1. Nearshore hardbottom and dune resources within the Study Area (R-127 to R-141+586).

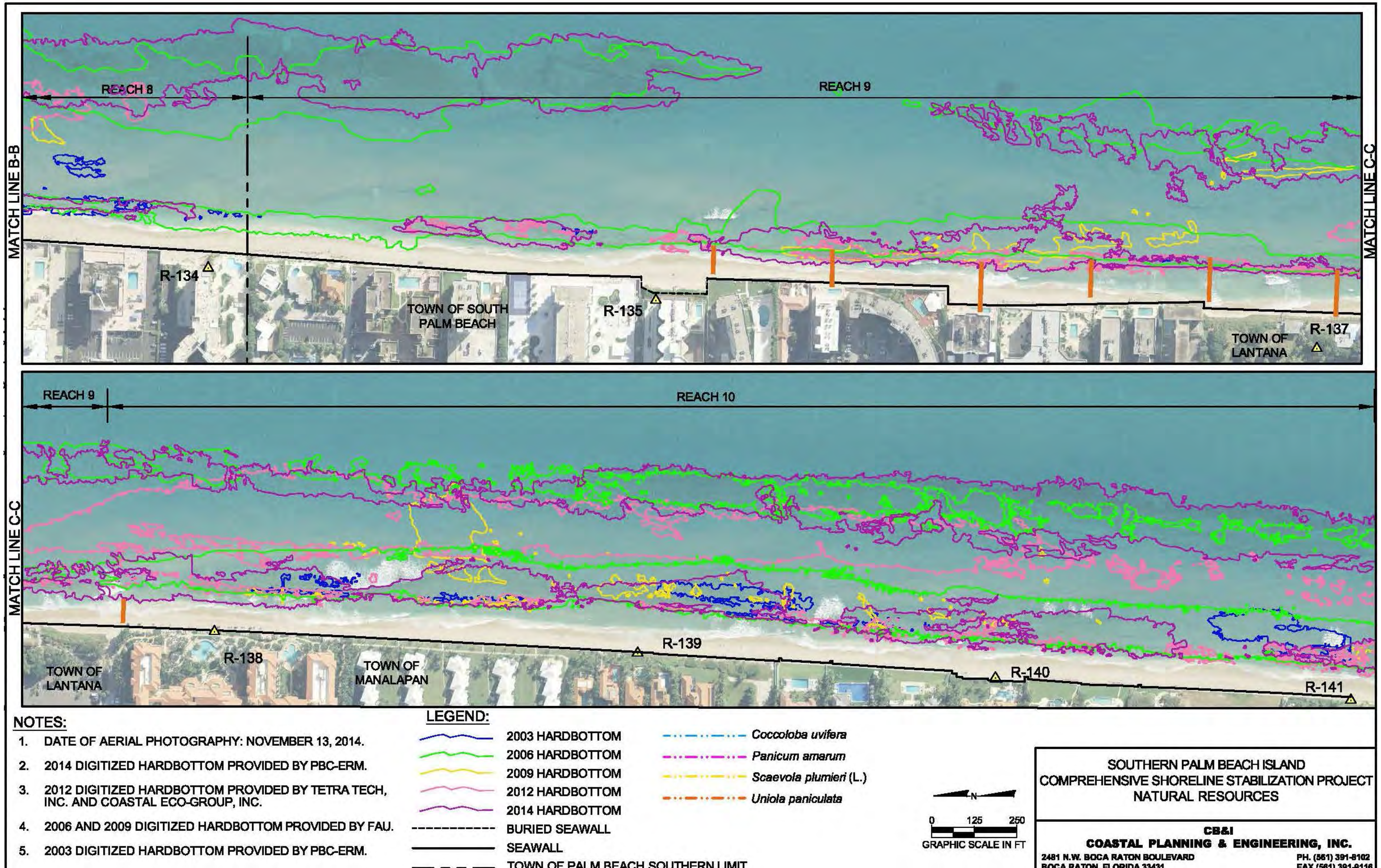


Figure 4-1 (cont.). Nearshore hardbottom and dune resources within the Study Area (R-127 to R-141+586).

4.2. MITIGATION SITES

Based on the results the UMAM evaluation (Appendix H of the EIS), between 6.55 and 6.66 ac of mitigation will be required to offset impacts to between 3.86 and 3.99ac of hardbottom as well as temporary impacts to between 9.53 and 9.93ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand (Figure 1-3). The Applicants will construct artificial reefs to offset these impacts, and will place these reefs in similar depths as the impacted resources. The artificial reefs will be spaced so as to replicate the spacing of the natural nearshore hardbottom habitat.

The preferred location for the Town of Palm Beach's mitigation reef is in the nearshore zone in the vicinity of R-104.5, approximately 244 m (800 ft) seaward of the MHWL in approximately 4.6 m (15 ft) water depth (Figure 2-1). The proposed mitigation reef dimensions would be approximately 91 m x 23 m (300 ft x 75 ft) and will consist of one layer of limestone boulders providing 0.3-1.2 m (1-4 ft) vertical relief with a maximum of 1.8 m (6 ft) vertical relief. The preferred location for the County's mitigation reef is in the nearshore zone between R-137-330 and R-137+400 (Lantana Public Beach) (Figure 2-1). The mitigation reef will consist of a single layer of limestone boulders clusters in approximately -2 m to -6 m (-6 ft to -20 ft) NGVD and will be placed on substrate that is approximately 0.3-0.9 m (1-3 ft) of sand over bedrock. Both areas are currently sandy bottom areas of the nearshore region which contain thin layers of sand over rock or rubble. The nearshore areas are located within designated loggerhead critical habitat. Final mitigation sites will be determined based on historic aerial analysis of exposed hardbottom and the potential of any nourishment projects in the vicinity that may impact the artificial reef.

5.0 DETERMINATION OF CREDITS

The area of impact determined from the engineering analysis and Delft 3D modeling study (provided as Appendix G to the EIS) was used to complete a Uniform Mitigation Assessment Method (UMAM) evaluation (Chapter 62-345, F.A.C.) for the Project. UMAM assesses the functions and services of the hardbottom resources predicted to be impacted, and determines the amount of appropriate mitigation to compensate for impacts to these resources. Time lag and risk are incorporated into the calculations to ensure the appropriate amount of compensatory mitigation is identified that will effectively offset the loss of ecological functions and services due to hardbottom impacts. Time lag refers to the period of time between when the functions are lost at an impact site and when those functions are replaced by the mitigation. Mitigation risk accounts for the degree of uncertainty that the proposed mitigation will succeed at offsetting project impacts.

In UMAM, the input factors that determine mitigation requirements are:

1. The area (ac) of impact;
2. The parameters of the impact area without and with the project;
3. The parameters of the mitigation area without and with the project;
4. The risk factor; and
5. The time lag (t-factor).

The UMAM Analysis provided as Appendix H to the EIS details the input factors used to determine mitigation for the Project. The UMAM evaluation was developed to specifically assess the anticipated loss of nearshore hardbottom function attributed to the construction of the Applicants' Preferred Alternative, as well as to all proposed alternatives evaluated in the EIS. Based on the Delft 3D modeling and ETOF analyses, seven types of impacts to hardbottom were defined for the purpose of this UMAM evaluation. These impact types are described in the UMAM Analysis, provided as Appendix H. Tables 4-1 through 4-3 in Chapter 4 of the EIS summarize the estimated impact acreage for each impact type and each grain size and the associated mitigation which may be required for each alternative. For the Applicants' Preferred Alternative (Alternative 2), the UMAM assessment determined that between 6.55 and 6.66 ac of mitigative artificial reef would be required to offset between 3.86 and 3.99 ac of permanent hardbottom and between 9.53 and 9.93 ac of temporary hardbottom impacts due to direct sand placement and subsequent spreading (equilibration) of sand.

It is noted that the federal and state requirements regarding time lag are slightly different. This results in a slightly higher mitigation area required by FDEP compared to USACE.

Table 2-1 in Appendix H - UMAM Analysis provides the difference in the ratio of impact to mitigation between the two agencies.

6.0 MITIGATION WORK PLAN

Based on the UMAM analysis for the Applicants' Preferred Project (Alternative 2), between 6.55 and 6.66 acres of mitigative artificial reef will be required to offset between 3.86 and 3.99 ac of permanent hardbottom and between 9.53 and 9.93 ac of temporary hardbottom impacts due to direct sand placement and subsequent spreading (equilibration) of sand (see Section 2.0 and Figure 1-3). The UMAM approach is provided in Appendix H to the EIS and the UMAM evaluation for Alternative 2 is provided as Sub-Appendices H-1a through H-1c. The Project is comprised of a Town of Palm Beach project and a County project. The EIS is intended to evaluate the impacts of the two similar actions; therefore, the alternatives evaluated in the EIS consist of various combinations of three potential Town of Palm Beach projects with three potential County projects. However, since the Applicants must obtain separate permits, the Town of Palm Beach and County projects were also modeled as standalone projects. Additional UMAM evaluations were conducted based on the results for the separated Town of Palm Beach and County projects. UMAM forms for the Preferred Alternative (Alternative 2) for the Town of Palm Beach and County are provided as Sub-Appendices H-2a through H-2c and H-3, respectively.

6.1. TIMING OF MITIGATION

The construction of the nourishment projects and mitigative reefs will be constructed as separate projects. The Town of Palm Beach artificial reef is expected to be constructed within the same year as the nourishment project and the County intends to construct the artificial reef prior to Project construction.

6.2. CONSTRUCTION SCHEDULE

The amount of mitigation required for the Town of Palm Beach and County projects will be finalized during the permitting process for the Project. Mitigation unit deployment of the mitigation modules and/or limestone boulders will likely occur during late-spring, summer, and early fall months when sea conditions are most favorable for working offshore of Palm Beach County. The total time to complete the mitigation project is not known at this time given uncertainties with fabrication and deployment rates, as well as the unknown final amount of mitigation that will be required. Time required to deploy the mitigation units will be highly dependent upon the amount of suitable working conditions during the summer months.

6.3. MITIGATIVE REEF DESIGN AND CONSTRUCTION METHODS

The Town of Palm Beach's proposed mitigation reef will consist of one layer of limestone boulders. The Town of Palm Beach's proposed mitigation reef layout and reef specifications are provided as Sub-Appendix I-1. Palm Beach County's mitigation reef will consist of a single layer of limestone boulders clusters. To minimize potential impacts to sediment transport, the spacing between the clusters will be similar with those of the mitigation built for the Juno Beach Renourishment Project (FDEP Permit No. 0267415-001-JC). The clusters will likely have a dimension of 6 m x 12 m (20 ft x 40 ft) and space between each cluster shall be 11 m (35 ft) laterally and 9 m (30 ft) longitudinally. The limestone boulders will likely have a minimum weight of 998 kg (2,200 lbs) and shall not exceed 2,722 kg (6,000 lbs) with at least 95% of the boulders between 998 kg (2,200 lbs) and 2,631 kg (5,800 lbs). Construction will likely be consistent with the FDEP approved mitigation for the Juno Beach re-nourishment. Details of the County's proposed mitigation are provided in Sub-Appendix I-2.

7.0 MAINTENANCE PLAN

The Town of Palm Beach and the County will conduct mid-construction observations and an immediate post-construction as-built survey to ensure their respective mitigative reefs are constructed properly. A line-intercept survey will be conducted on the artificial reefs as part of the as-built in order to estimate percent of net reef cover. The goal of this is to ensure that the artificial reef site reflects a similar hardbottom to sand ratio as the pre-construction natural hardbottom. Annual surveys will also be conducted for three years post-construction to document that the reef is providing appropriate mitigation for hardbottom impacts. During the third (and final) annual mitigation monitoring, the edge of the artificial reef will be delineated to quantify the total acreage of functional artificial reef.

8.0 PERFORMANCE STANDARDS

Success of the compensatory mitigation project will be achieved when the benthic community and colonization of the mitigation reef have been documented to be comparable to the benthic community and species composition which were observed in the impact area during pre-construction. The monitoring and reporting requirements are described in Section 9.0. Based on permit requirements for similar projects, the mitigation success criteria may include:

1. An obvious trend toward similarity in the benthic community between the artificial reef and the natural hardbottom by the completion of the monitoring period;

2. Percent cover by each of the major groups of organisms (functional groups) in the mitigation site shall be no less than it was in the impact site (difference shall be statistically insignificant);

3. 90% of the functional groups, octocoral genera and scleractinian coral species shall be present on the artificial reef compared to the natural hardbottom; and

4. A line-intercept survey shall demonstrate that net amount of reef versus sand did not change from the time of construction due to subsidence (not more than 5% buried from results of initial survey).

9.0 MONITORING REQUIREMENTS

The mitigative artificial reef monitoring is described below. Nearshore hardbottom biological monitoring will also be required, and will be designed to supplement the protocol detailed in the Beach Management Agreement (BMA) (see EIS Section 5.2.3. for details on natural hardbottom monitoring).

9.1. MITIGATIVE ARTIFICIAL REEF MONITORING

The Town of Palm Beach and the County will monitor the artificial reefs for benthic colonization and succession in order to detect whether the success criteria (defined in Section 8.0) have been met. Monitoring of the mitigation reefs will be conducted in the summer, likely beginning approximately one year after construction and repeated annually for five years post-construction (five events), or until data from biological monitoring show the reefs are trending towards success at offsetting project impacts to natural hardbottom.

The functional success of the artificial reefs will be tracked through a biological monitoring program coordinated with state and federal agencies. Depending on the layout of the reefs, transects will be likely be spaced throughout the reef and quadrats will be sampled along these transects to quantify the benthic habitat. Additionally, video and photo-documentation will be collected. Line-intercept may also be conducted to ensure the correct rock to sand ratio is installed within the mitigation reef footprint. This monitoring will determine trends toward success or failure. If the benthic communities on the artificial reefs are not similar to the impacted hardbottom resources after three years of monitoring, the Applicants will conduct additional monitoring, if required. The Applicants will coordinate with state and federal agencies to determine a path forward if the mitigation does not succeed at offsetting hardbottom impacts.

The boundaries of the artificial reefs shall be mapped one time during the third annual survey to document potential subsidence of the boulders. The mapping survey is conducted *in situ* by biologists following outer boundary of the artificial reef. A buoy with a Differential Global Positioning System (DGPS) antenna linked to a topside laptop computer running HYPACK navigational software is towed along reef edge to record the position of the reef boundary. The reef edge will be presented on a map within the 3-year post-mitigation annual monitoring report and a shapefile will be provided as well.

Monitoring reports shall be completed after each annual post-deployment surveys of the artificial reef and shall be provided within 90 days after completion of each annual monitoring event. The FDEP JCP Compliance Officer and the USACE shall be notified at the commencement and completion of each monitoring event, along with weekly progress updates throughout monitoring. Each annual report shall document the colonization of the artificial reef and compare the species composition on this reef to that documented in the impact area during the pre-construction survey.

10.0 LONG-TERM MANAGEMENT PLAN

Based on previous performance of artificial reefs in southeast Florida, including Palm Beach County, it is anticipated that the proposed mitigative artificial reef substrate will succeed at offsetting project impacts to the nearshore natural hardbottom. The Applicants will implement Biological Monitoring Plans (see Section 9.0) that include monitoring the mitigative artificial reef to ensure the colonization and development of the reef proceeds as anticipated. However, if the benthic communities on the artificial reefs are not similar to the impacted hardbottom resources after five years of monitoring, the Applicants will conduct additional monitoring, if required. The Applicants will coordinate with state and federal agencies to determine a path forward if the mitigation does not succeed at offsetting hardbottom impacts.

11.0 ADAPTIVE MANAGEMENT PLAN

As stated above in Section 10.0, if the benthic communities on the artificial reefs are not similar to the impacted hardbottom resources after three years of monitoring, the Applicants will conduct additional monitoring, if required. The Applicants will coordinate with state and federal agencies to determine a path forward if the mitigation does not succeed at offsetting hardbottom impacts. Impacts to the artificial reefs as a result of a hurricane (or other storm events) or sea level rise are considered acts of nature. The Applicants will not be responsible for reparations due to acts of nature.

12.0 FINANCIAL ASSURANCES

The Town of Palm Beach and the County will be responsible for their share of the costs associated with construction and monitoring of their respective artificial reefs. The Applicants will provide the USACE with financial assurances prior to a permit decision/

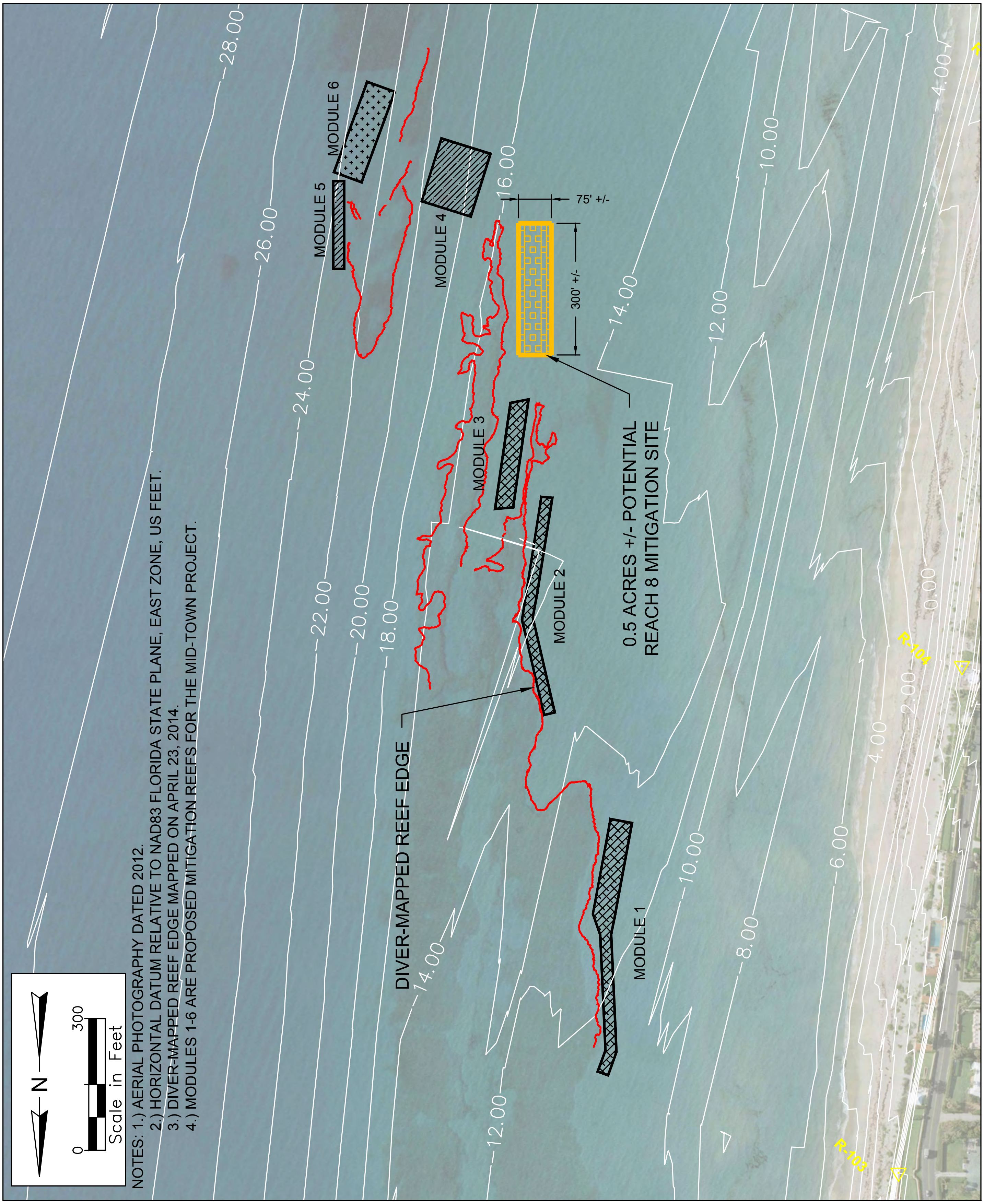
13.0 LITERATURE CITED

CB&I (Coastal Planning & Engineering, Inc., a CB&I Company). 2014. Southern Palm Beach Island Comprehensive Shoreline Stabilization Project, 2013 characterization report. Prepared for The Town of Palm Beach. January 2014.

Florida Department of Environmental Protection (FDEP). 2013. Palm Beach Island Beach Management Agreement (BMA). http://www.dep.state.fl.us/beaches/pb-bma/docs/BMA-MainAgreement.pdf. Prepared by Florida Department of Protection.

SUB-APPENDIX I-1

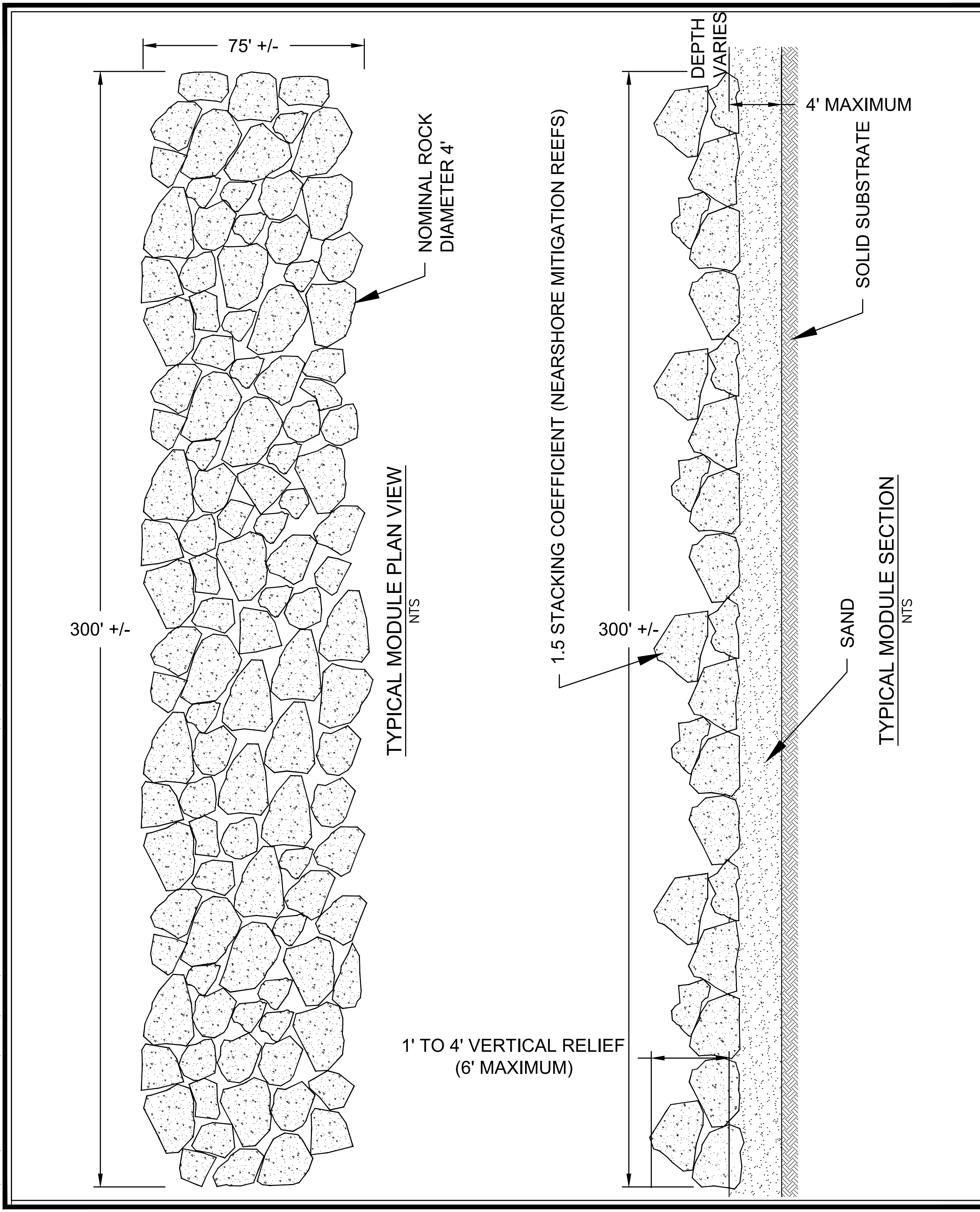
TOWN OF PALM BEACH PROPOSED MITIGATION



LOCATION \\PBIBOFPS001\GROUPS\WESTPALMBEACH SHARES\DRAWINGS\PROJECTS\13-2534 TOPB 2013 MITIGATION REEF DES PERMITTING & CONST\X\FIGURES\REACH 8 MIT SITE.DWG

JEAKIN

ATM[SM] APPLIED TECHNOLOGY & MANAGEMENT 2047 Vista Parkway, Suite 201 West Palm Beach, FL 33411 (561) 659-0041 Certificate of Authorization #4669	Potential Reach 8 Mitigation Site Town of Palm Beach	FIGURE 1 JOB NUMBER: 13-2534 ISSUE DATE: 10-09-2014	xxxxx x xxxxx Professional Engineer Florida License Number xxxxx



LOCATION \\PBIBOFPS001\GROUPS\WESTPALMBEACH SHARES\DRAWINGS\PROJECTS\13-2534 TOPB 2013 MITIGATION REEF DES PERMITTING & CONST\X\FIGURES\REACH 8 MIT SITE DETAIL.DWG

JEAKIN

APPLIED TECHNOLOGY & MANAGEMENT
2047 Vista Parkway, Suite 201
West Palm Beach, FL 33411
(561) 659-0041
Certificate of Authorization #4669

Potential Reach 8 Mitigation Site - Details

Town of Palm Beach

FIGURE 2

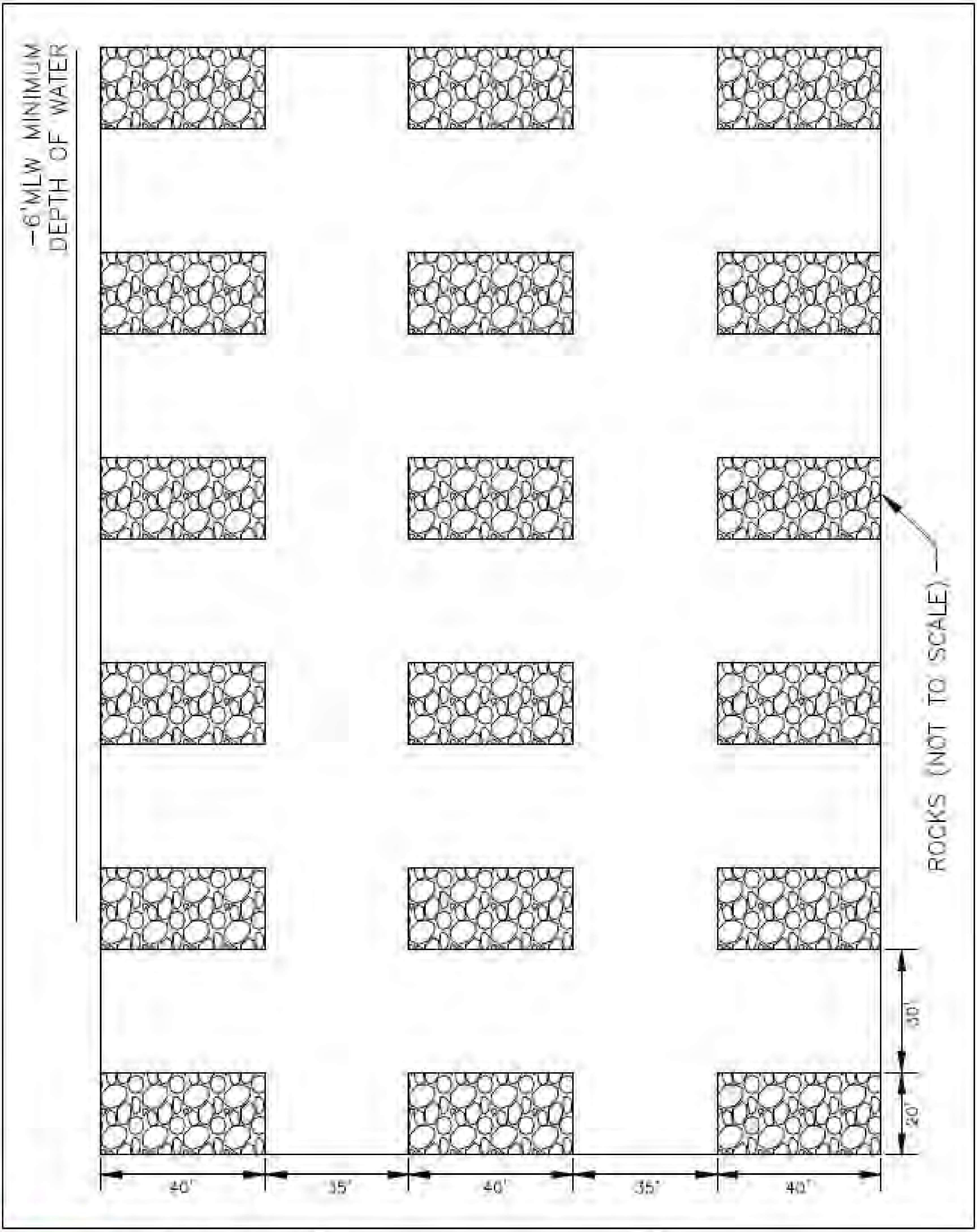
JOB NUMBER: 13-2534

ISSUE DATE: 10-09-2014

xxxxx x xxxxx
Professional Engineer
Florida License Number xxxxx

SUB-APPENDIX I-2

PALM BEACH COUNTY PROPOSED MITIGATION



PALM BEACH COUNTY
DEPARTMENT OF
ENVIRONMENTAL
RESOURCES
MANAGEMENT

TYPICAL
ARTIFICIAL REEF LAYOUT
FOR
MITIGATION REEFS

NTS

SEPARATION DISTANCES MAY VARY WHEN FIELD ADJUSTED

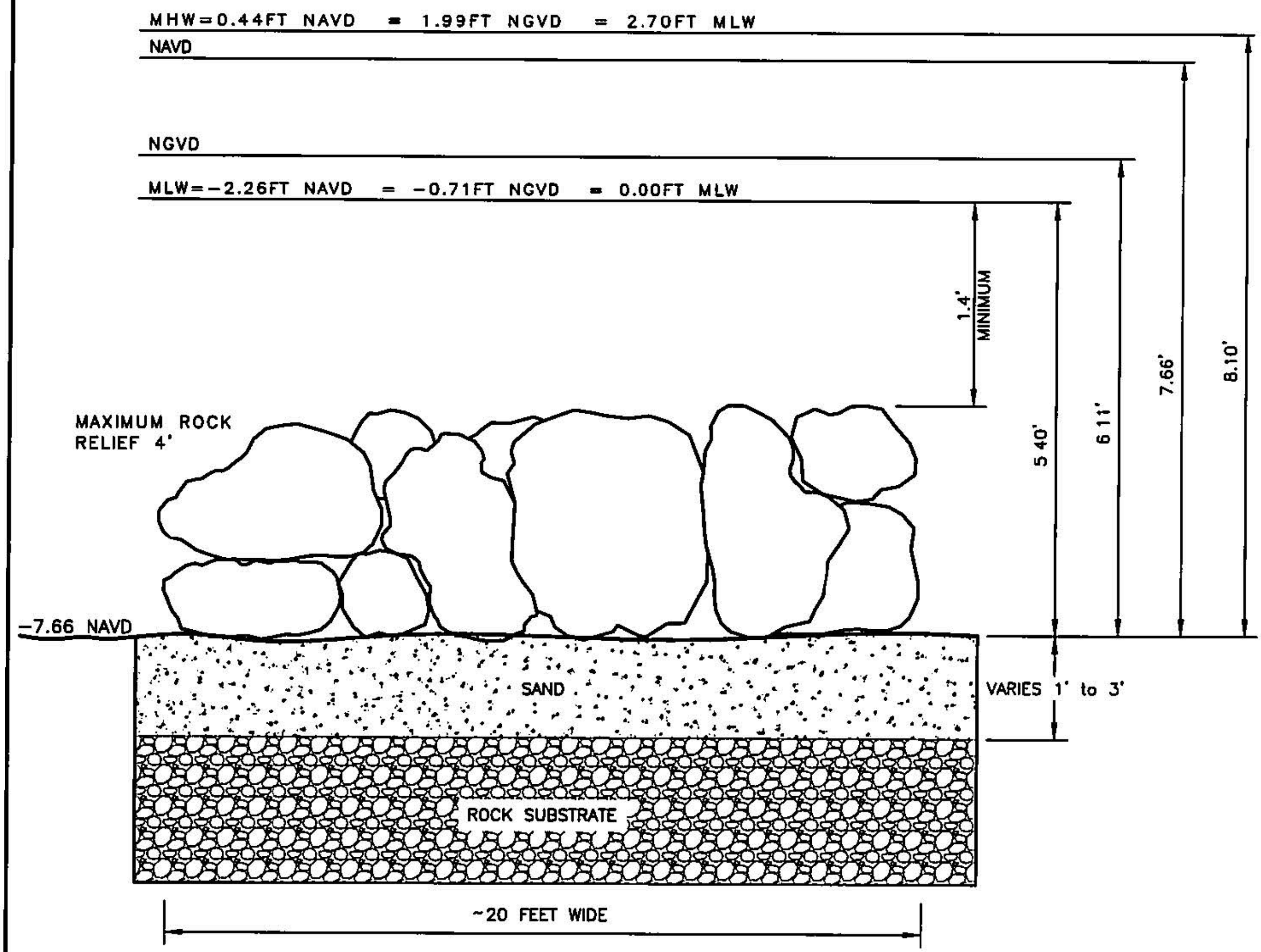
Figure 1

02/08

SHALLOW REEF

CONSTRUCTION NOTES:

BOULDERS SHOULD HAVE A MINIMUM WEIGHT OF 2200 LB. UP TO 6000 LB. WITH AT LEAST 95% OF THE BOULDERS 2200 to 5800 LB. ALL ROCK PLACEMENT WILL BE BELOW MLW



D:\The Pit\2010 Projects\BROCK\6a thru 6d_20100915_Mitigation Reef Const_02.dwg

NOTE: SUBSIDENCE TO BEDROCK IS ANTICIPATED

PALM BEACH COUNTY FLORIDA

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT

TYP CAL CROSS SECTION MITIGATION REEFS CONSTRUCTION

Figure 2

DRN BY: MLB	DWG NO.		REV 1
SHEET: FIG. #6A	DATE: 09/15/2010	SCALE: NOT TO SCALE	

PALM BEACH COUNTY

SUB-BOTTOM PROFILE INVESTIGATION AND HYDROGRAPHIC SURVEY

SUB-BOTTOM PROFILE INVESTIGATION AND HYDROGRAPHIC SURVEY

R134-R139
SOUTH PALM BEACH COUNTY / MANALAPAN
PALM BEACH COUNTY, FLORIDA

LOCATION MAP

VICINITY SKETCH

SHEET INDEX	
SHEET NAME	DESCRIPTION
1	COVER
2	ISOPACH CONTOURS
3	BATHYMETRIC CONTOURS
4-7	PROFILES

EAST / WEST PROFILE CONTROL

NAME	DATE	NORTHING FEET NAD83/90	EASTING FEET NAD83/90	AZ.	ELEV. FEET NAVD88
EW1	N / A	822515.66	970921.43	95°	N / A
EW2	N / A	822265.88	970907.96	95°	N / A
EW3	N / A	822016.10	970984.50	95°	N / A
EW4	N / A	821766.33	970881.04	95°	N / A
EW5	N / A	821198.77	970850.45	95°	N / A
EW6	N / A	820949.00	970836.99	95°	N / A
EW7	N / A	820699.22	970823.53	95°	N / A
EW8	N / A	820236.20	970798.58	95°	N / A
EW9	N / A	819986.43	970785.12	95°	N / A
EW10	N / A	819736.65	970771.66	95°	N / A
EW11	N / A	819254.25	970745.66	95°	N / A
EW12	N / A	819004.47	970732.20	95°	N / A
EW13	N / A	818565.88	970708.56	95°	N / A
EW14	N / A	818316.10	970965.10	95°	N / A
EW15	N / A	818066.33	970681.64	95°	N / A
EW16	N / A	817816.55	970688.18	95°	N / A
R-134	JUN1989	822779.18	970798.50	95°	18.64
R-135	JUN1989	821464.34	970704.20	95°	19.87
R-136	JUN1989	820529.79	820529.79	95°	3.26
R-137	JUN1989	819523.04	970562.42	95°	9.03
R-138	JUN1989	818824.69	818824.69	95°	12.51
R-139	JUN1989	817581.85	970576.31	95°	12.42

NORTH / SOUTH PROFILE CONTROL

NAME	DATE	NORTHING FEET NAD83/90	EASTING FEET NAD83/90	AZ.	ELEV. FEET NAVD88
NS1	N / A	822765.43	970934.89	183°	N / A
NS2	N / A	822756.71	971034.56	183°	N / A
NS3	N / A	822747.99	971134.24	183°	N / A
NS4	N / A	822739.27	971233.91	183°	N / A
NS5	N / A	822730.55	971333.59	183°	N / A
NS6	N / A	822721.83	971433.26	183°	N / A
NS7	N / A	822713.11	971532.94	183°	N / A
NS8	N / A	822704.39	971632.61	183°	N / A
NS9	N / A	822695.67	971732.29	183°	N / A
NS10	N / A	822686.95	971831.96	183°	N / A
NS11	N / A	822678.23	971931.64	183°	N / A

LEGEND

	APPROXIMATE LOCATION OF TIDE STAFF
	DEP RANGE MONUMENT
	SURVEY CONTROL
	PROFILE CONTROL

ABBREVIATIONS

AZ.	AZIMUTH
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
EL / ELEV	ELEVATION
GPS	GLOBAL POSITIONING SYSTEM
N/A	NOT APPLICABLE
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
RTK	REAL TIME KINEMATIC

SURVEY CONTROL

NAME	NORTHING FEET NAD83/90	EASTING FEET NAD83/90	ELEV. FEET NAVD88	DESCRIPTION
R137	819523.04	970562.42	9.03	DNR BRASS DISK "R137 PM BH 1989"

SURVEY NOTES:

1. REFER TO SEA DIVERSIFIED INC. PROJECT NUMBER 14-2224.
2. SURVEY WAS CONDUCTED FOR APPLIED TECHNOLOGY AND MANAGEMENT, INC. UNDER CONTRACT WITH PALM BEACH COUNTY, DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT (DERM).
3. THIS HYDROGRAPHIC SURVEY AND SUB-BOTTOM PROFILE INVESTIGATION WAS CONDUCTED TO DETERMINE THE EXTENT OF SAND OVERLYING HARDBOTTOM FROM R134 - R139, SOUTH PALM BEACH COUNTY, MANALAPAN, FLORIDA. THE INVESTIGATION FOCUSED ON THE NEARSHORE REGION OF THE AREA EXTENDING FROM AS CLOSE TO THE SHORELINE AS PRACTICABLE SEAWARD TO THE +/- 20-FOOT, NAVD 88 CONTOUR. THE OBJECTIVE WAS TO MAP AREAS WITH MINIMAL SAND COVER OVER SUBSURFACE ROCK OR HARDBOTTOM.

   DATA WERE COLLECTED ON THE FOLLOWING DATES:

   HYDROGRAPHIC DATA COLLECTION: OCTOBER 31, 2014
   SUB-BOTTOM PROFILE INVESTIGATION: OCTOBER 30-31, 2014
4. THE ELEVATIONS SHOWN HEREON ARE IN FEET AND RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM, 1988 (NAVD88).
5. THE HORIZONTAL COORDINATES ARE IN FEET AND RELATIVE TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE (0901) AND REFERENCED TO THE NORTH AMERICAN DATUM, 1983/90 ADJUSTMENT (NAD83/90).
6. SOUNDINGS WERE COLLECTED USING AN ODOM SINGLE-BEAM SOUNDER, MODEL CV-100 WITH 200kHz NARROW BEAM TRANSDUCER WITH VESSEL POSITIONING PROVIDED BY TRIMBLE CODE BASED DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) USING THE U.S. NAVBEACON SYSTEM FOR CORRECTIONS.
7. SUB-BOTTOM DATA WAS COLLECTED BY SONOGRAPHICS INC. USING AN EDGETECH FULL SPECTRUM SUB-BOTTOM PROFILE SYSTEM (MODEL SB-424) OPERATING AT LOW FREQUENCY RANGE (4-24 kHz).
8. SOUNDING DATA WERE REDUCED TO THE PROJECT DATUM (NAVD 88) BASED ON TIDE OBSERVATIONS RECORDED DURING THE CONDUCT OF THE SURVEY. TIDES WERE RECORDED BASED ON A TIDE STAFF SET NEAR AND RELATIVE TO FDEP MONUMENT: "R-137" HAVING A PUBLISHED ELEVATION OF 9.03 FEET NAVD 88.
9. HORIZONTAL AND VERTICAL CONTROL WAS PROVIDED BY THE FDEP. CONTROL WAS VERIFIED VIA RTK METHODS DURING THE COURSE OF THE SURVEY.
10. THIS SURVEY IS NOT VALID UNLESS SIGNED AND SEALED BY A FLORIDA LICENSED SURVEYOR AND MAPPER.
11. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF THE SURVEY ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
12. AZIMUTHS SHOWN HEREON ARE GRID AND RECKONED CLOCKWISE FROM NORTH.
13. THE MAP ON SHEET 1 IS INTENDED TO BE DISPLAYED AT A SCALE OF 1" = 500'. THE MAP ON SHEET 2 AND 3 ARE INTENDED TO BE DISPLAYED AT A SCALE OF 1" = 200'.
14. AERIAL PHOTOGRAPHY IS SHOWN FOR GRAPHICAL PURPOSES ONLY AND WAS PROVIDED BY PALM BEACH COUNTY, DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT (PBC ERM). THE FLIGHT DATE OF THE AERIALS SHOWN ON PLAN VIEW SHEETS WAS JANUARY, 2013.

I HEREBY CERTIFY THAT THE HYDROGRAPHIC SURVEY SHOWN HEREON IS BASED ON A RECENT FIELD SURVEY CONDUCTED UNDER MY PERSONAL DIRECTION AND IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF AND MEETS THE MINIMUM TECHNICAL STANDARDS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, STATUTES.

WILLIAM T. SADLER JR., P.E., P.S.M.
FLORIDA PROFESSIONAL SURVEYOR AND MAPPER
FLORIDA REGISTRATION NO. 5859
L.B. NO. 7342

1/22/15
DATE:

STATE OF FLORIDA

REVISIONS:

NO.:	DATE:	DESCRIPTION:

PROJECT: SUB-BOTTOM PROFILE INVESTIGATION AND HYDROGRAPHIC SURVEY R134-R139 SOUTH PALM BEACH COUNTY / MANALAPAN PALM BEACH COUNTY, FLORIDA

SHEET TITLE: PLAN VIEW / COVER

PREPARED FOR:
APPLIED TECHNOLOGY & MANAGEMENT
2047 Vista Parkway, Suite 201
West Palm Beach, FL 33411

PREPARED FOR:
PALM BEACH COUNTY
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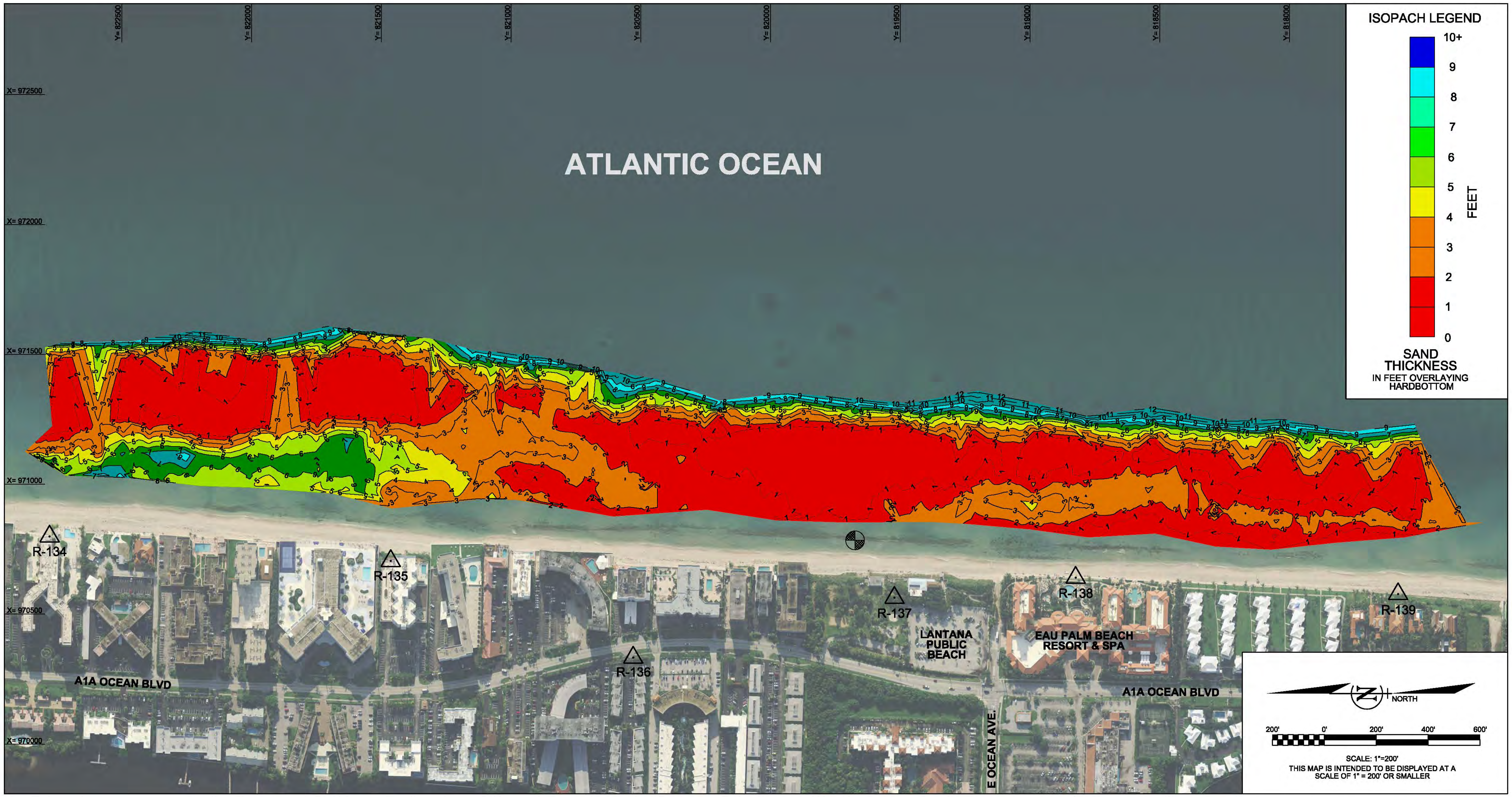

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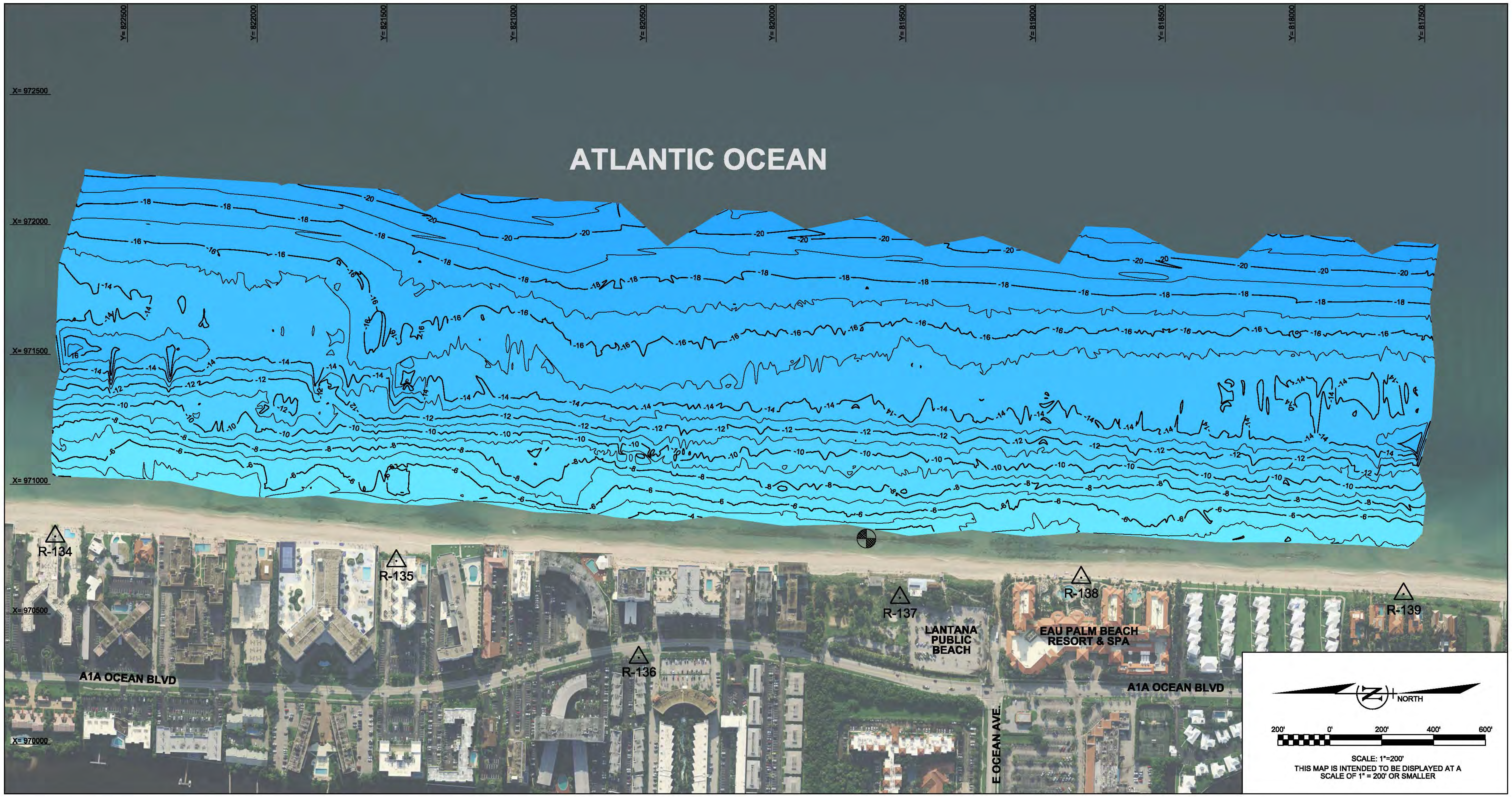

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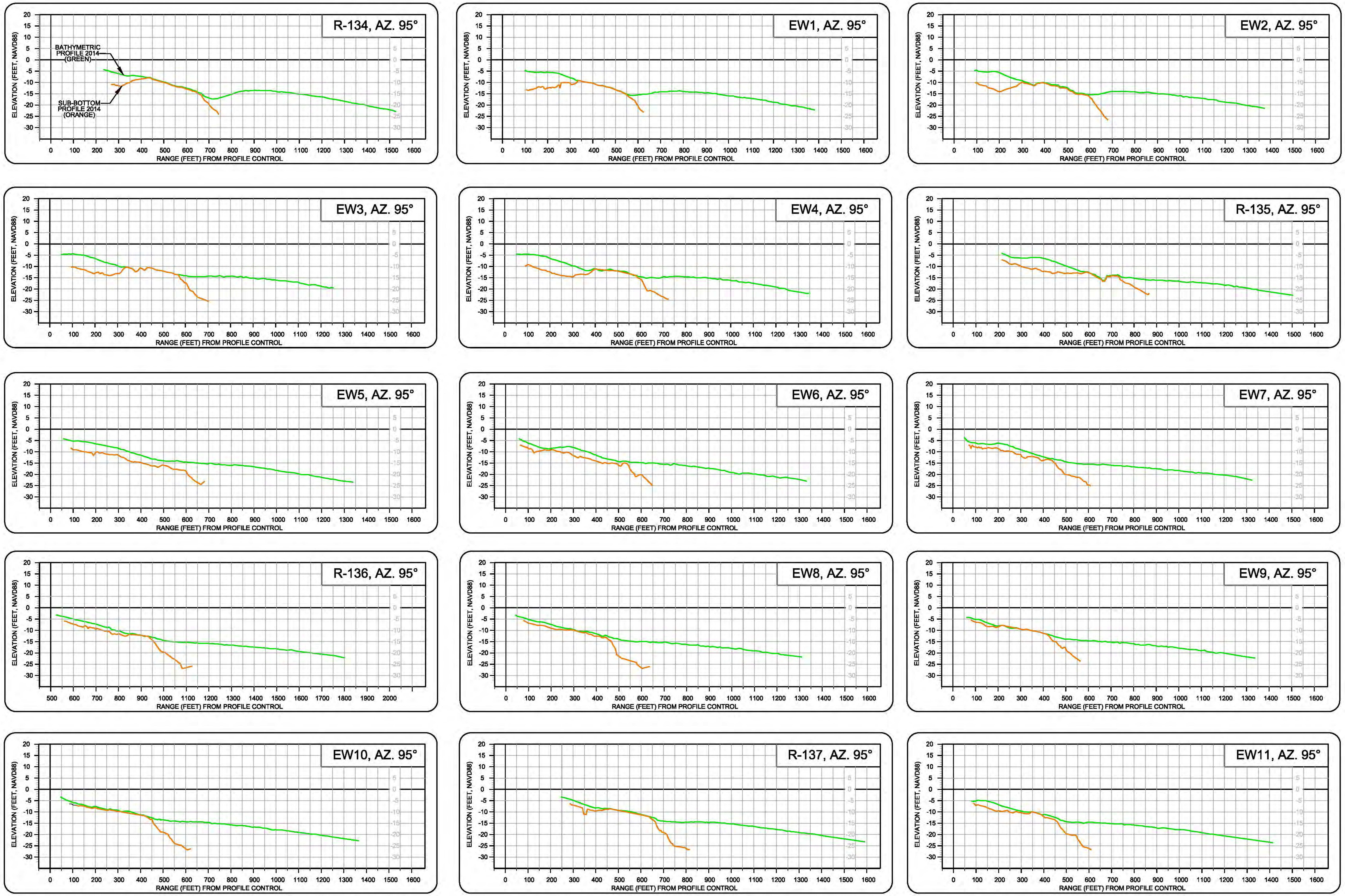

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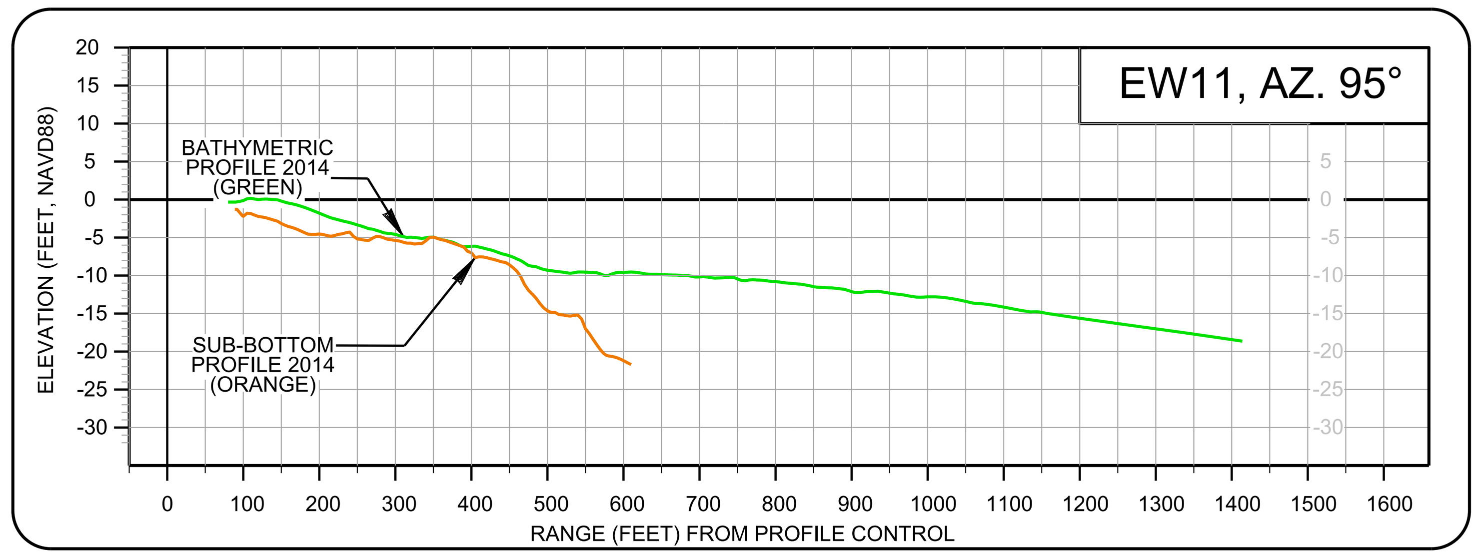

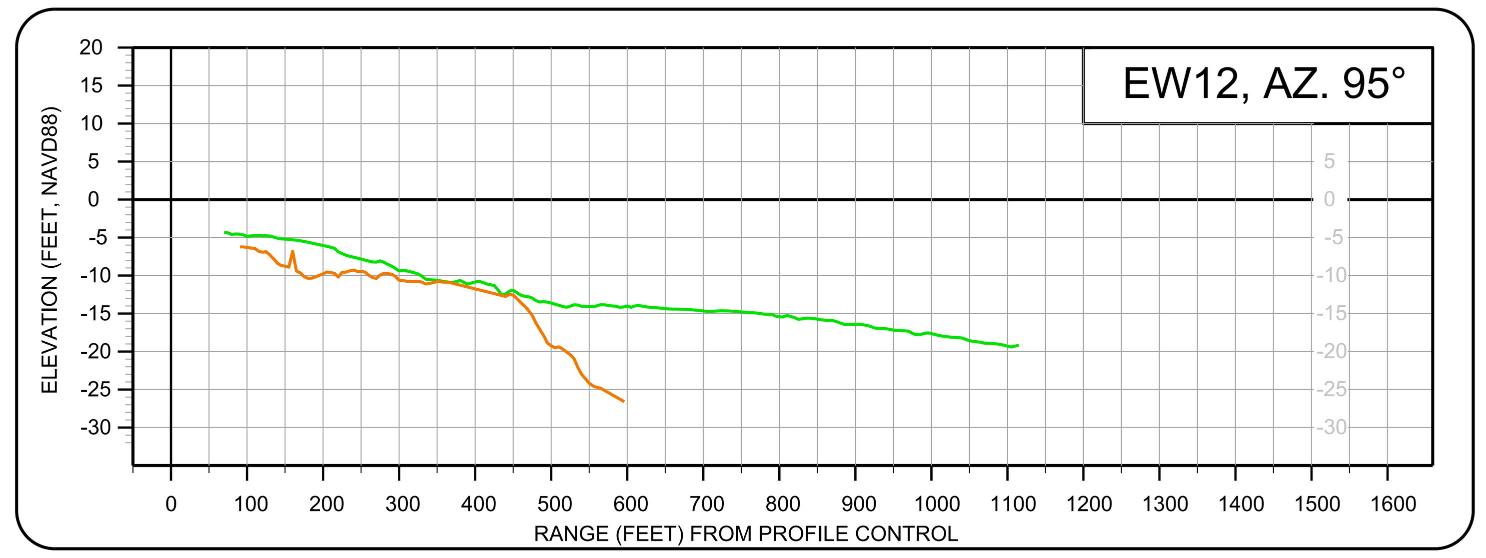

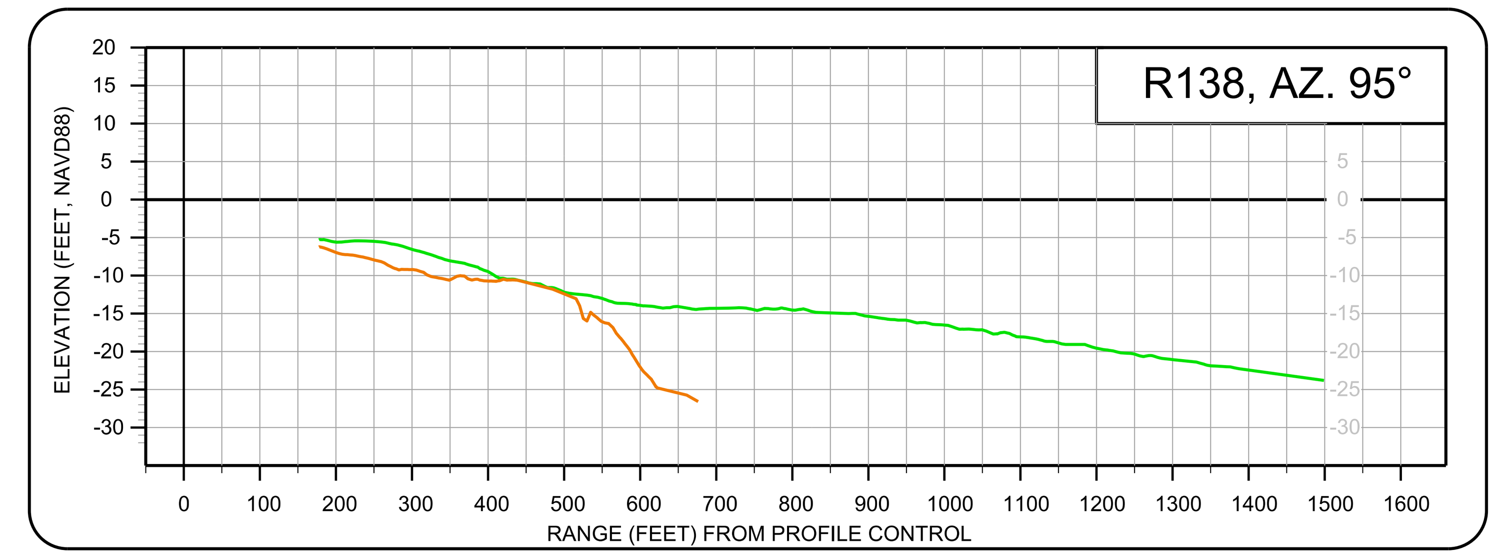

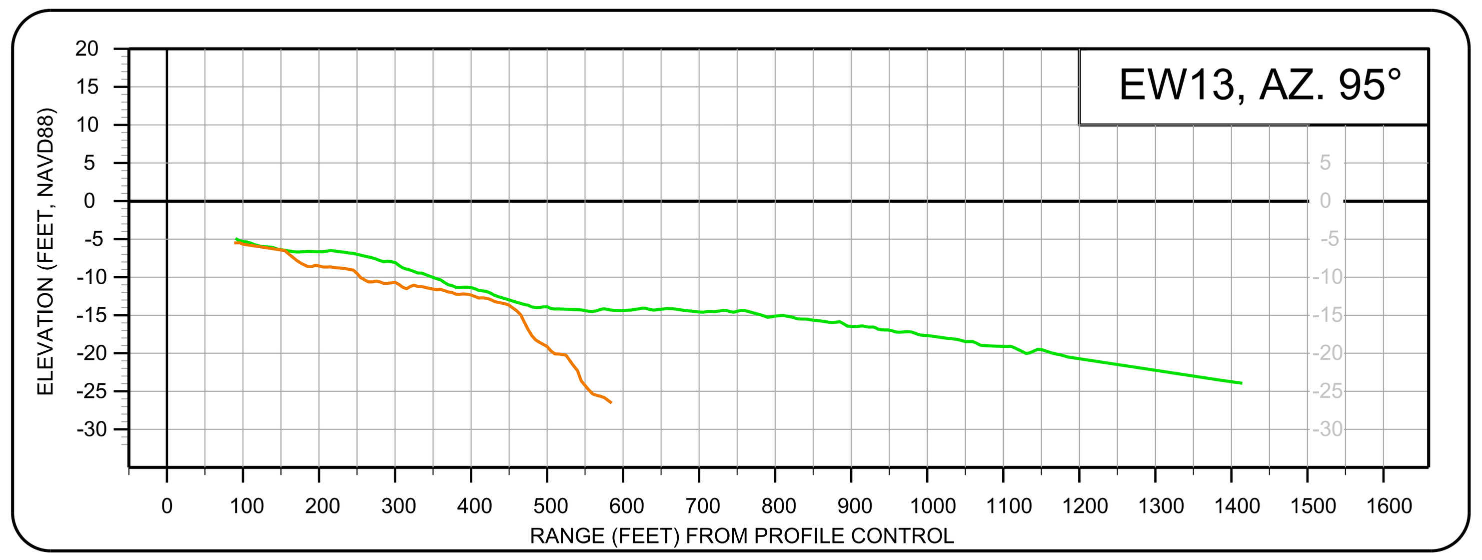

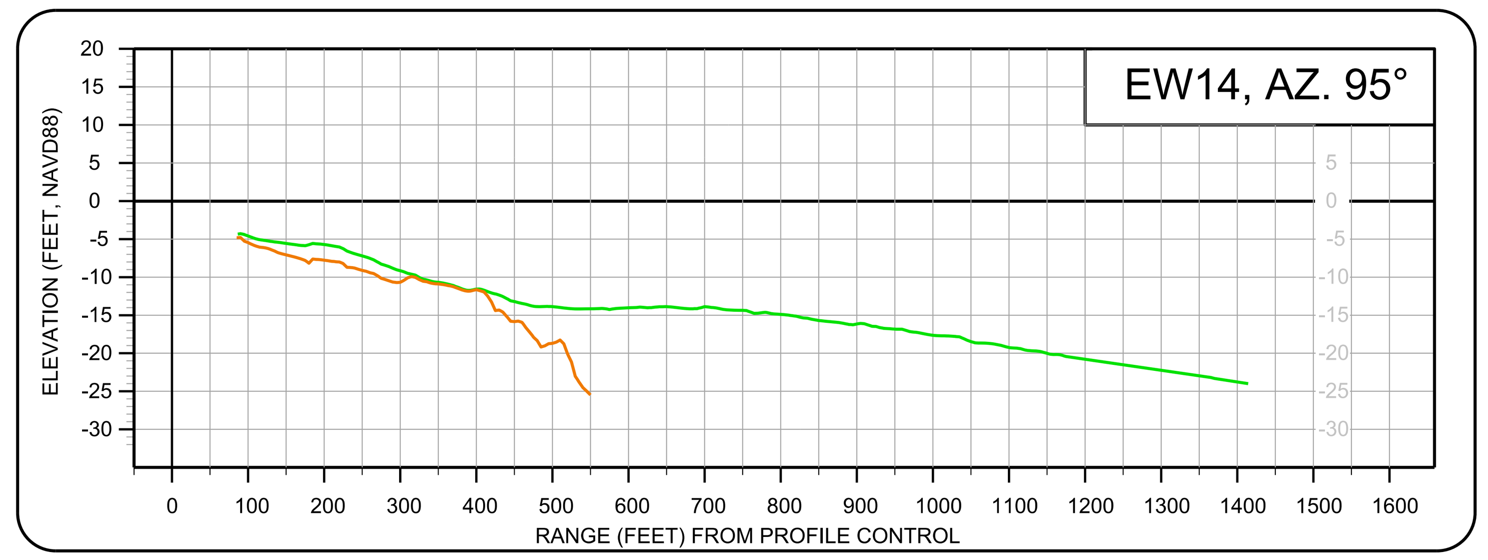

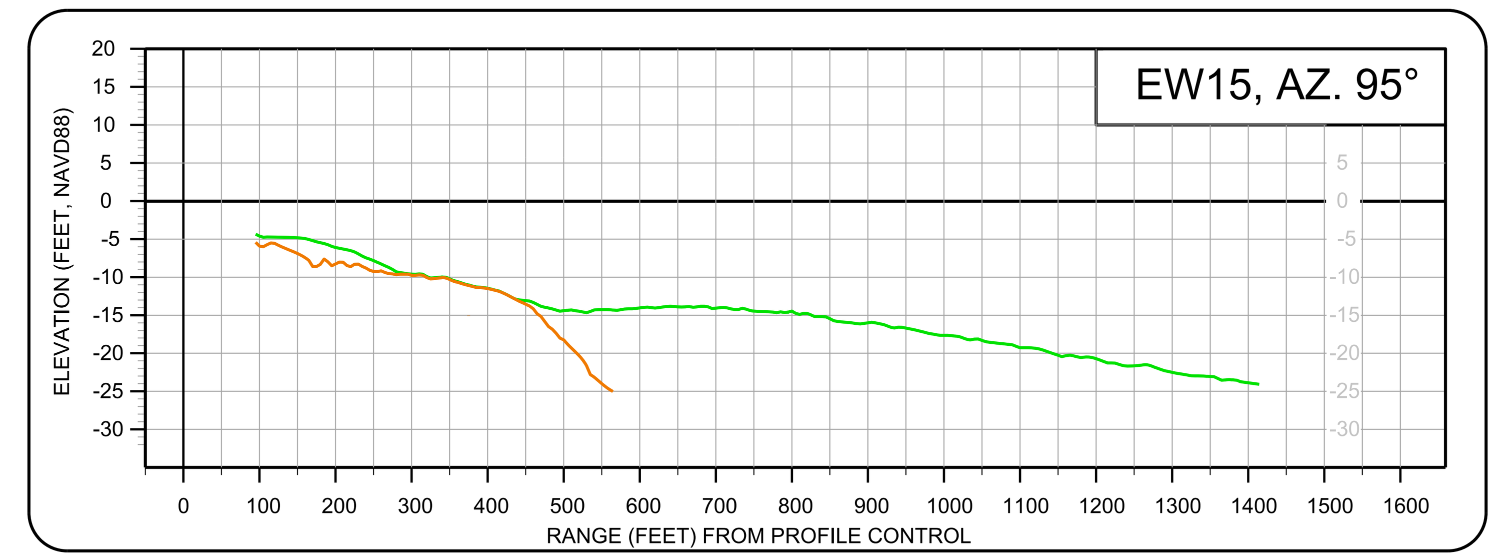

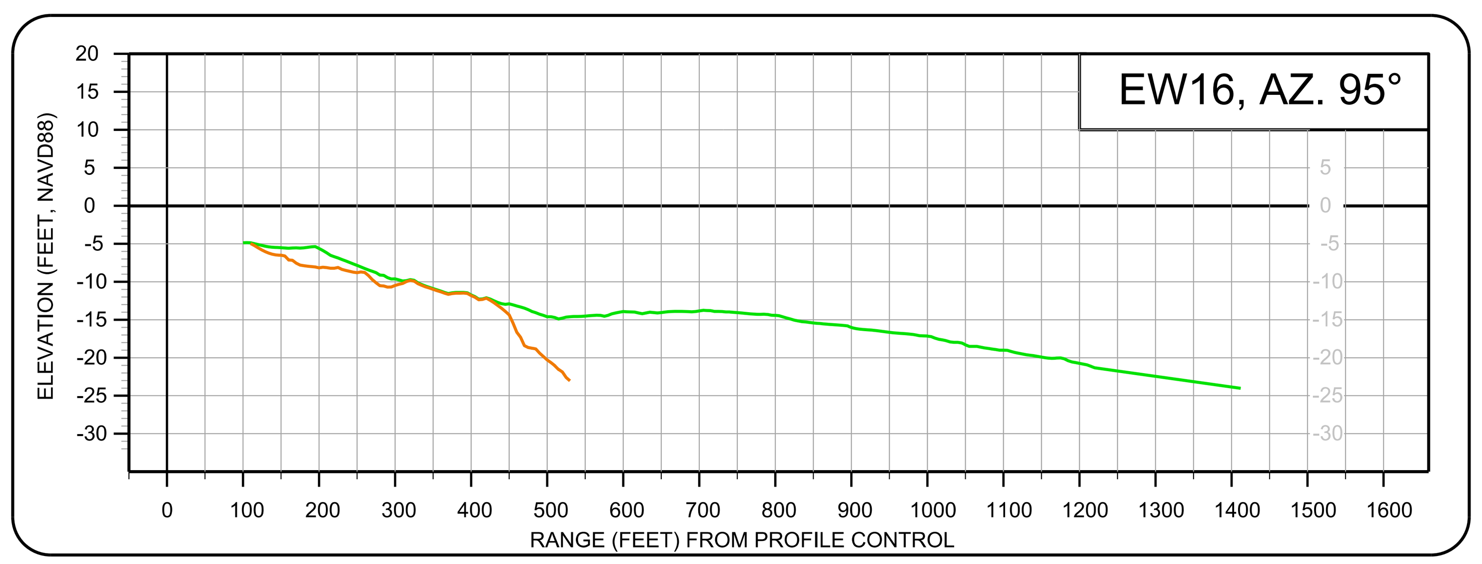

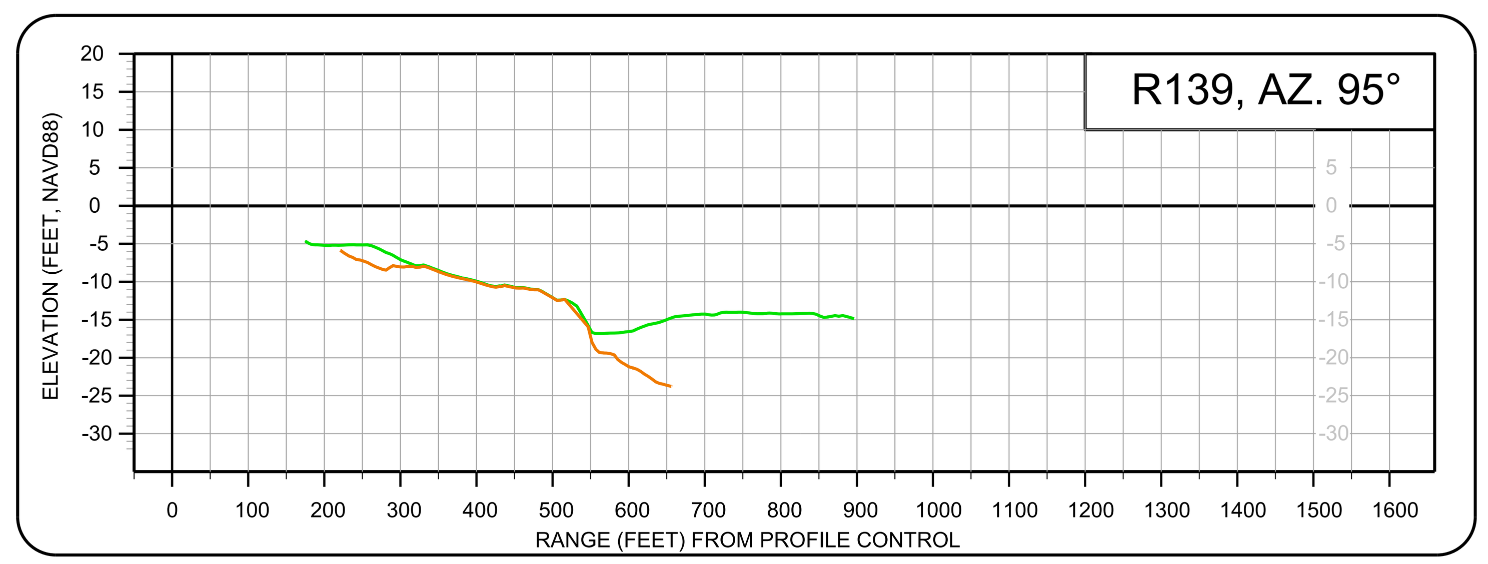

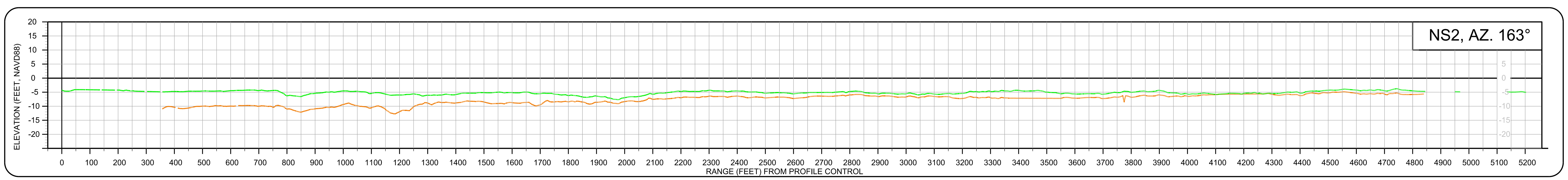

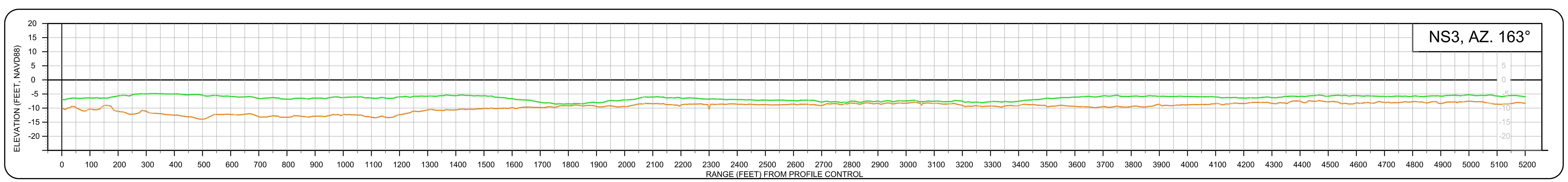

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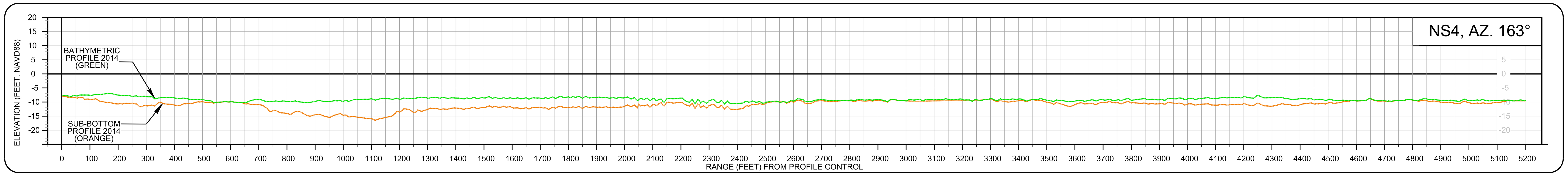

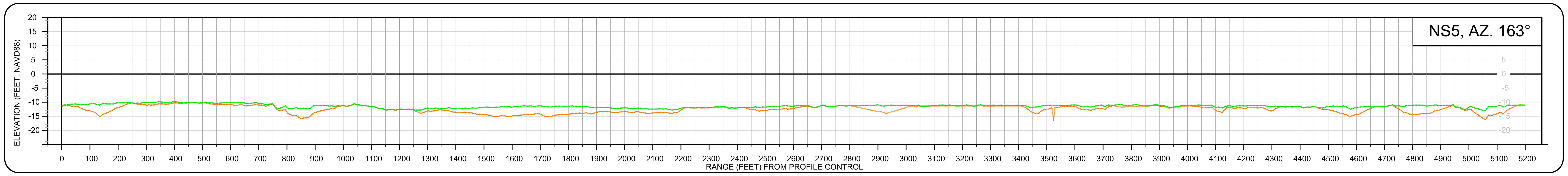

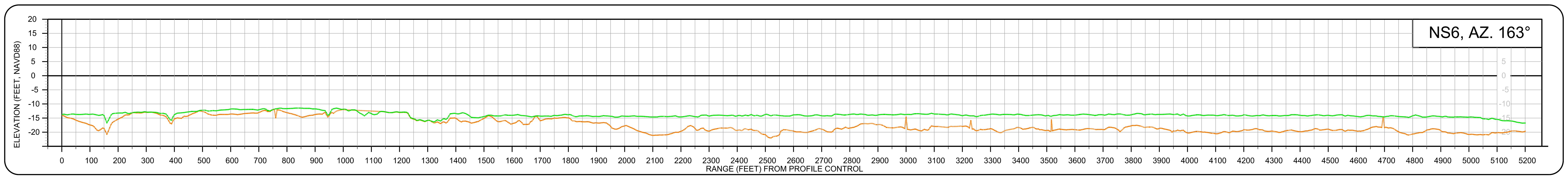

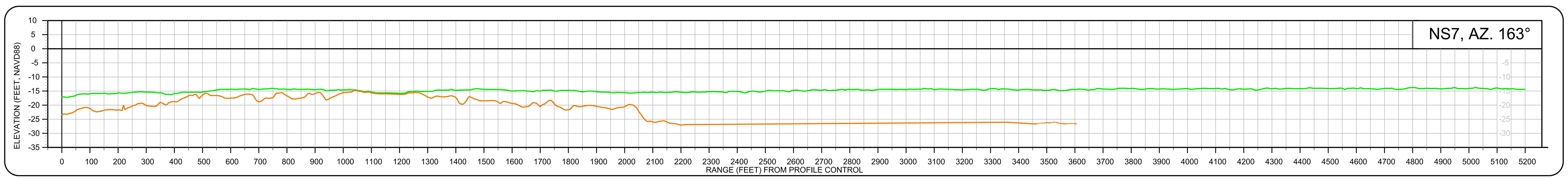

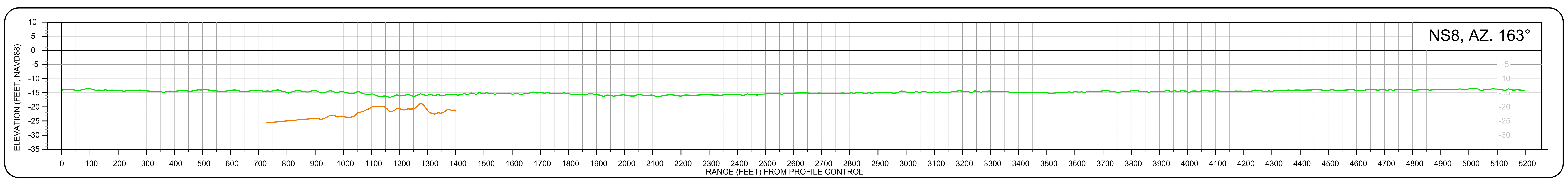

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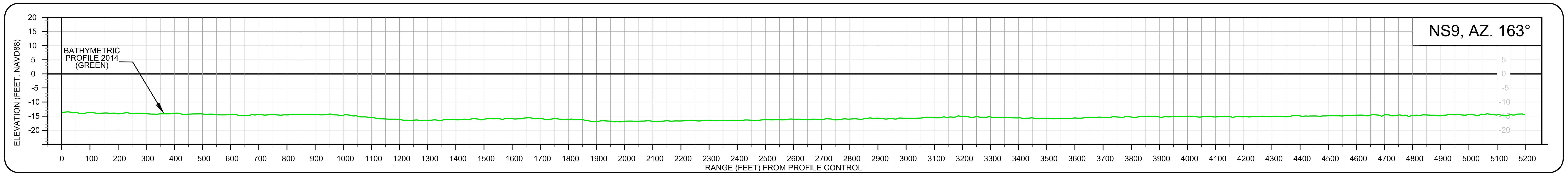

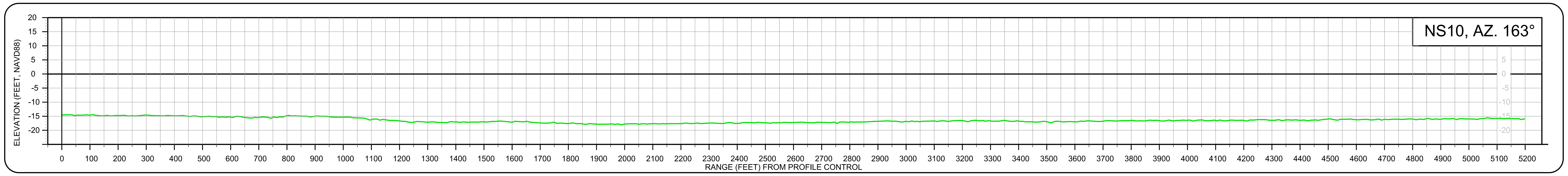

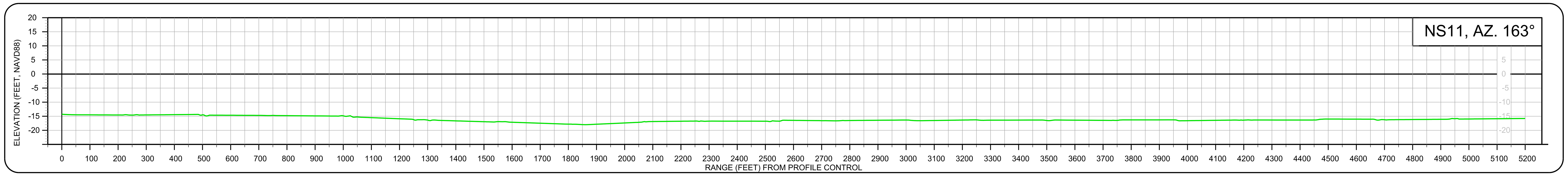

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APPENDIX J

CUMULATIVE IMPACT ANALYSIS

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SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT DRAFT CUMULATIVE IMPACT ANALYSIS

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1.0 INTRODUCTION

This Cumulative Impact Analysis (CIA) has been prepared to support the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (the Project) Final Environmental Impact Statement (EIS). The combined, incremental effects of human activity, referred to as cumulative impacts, may pose a serious threat to the environment. While they may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources, and can result in the degradation of important resources. Because federal projects cause or are affected by cumulative impacts, this type of impact must be assessed in documents prepared under the National Environmental Policy Act (NEPA). The NEPA definition of a cumulative impact comes from the Council on Environmental Quality (CEQ), which defines a cumulative impact as:

> …the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7.).

Cumulative effects analysis is an iterative process in which consequences are assessed repeatedly following incorporation of avoidance, minimization, and mitigation measures into the alternatives. Monitoring is the last step in determining the cumulative effects that ultimately result from the action. The significance of cumulative effects depends upon the ecosystem, resource baseline conditions, and relevant resource stress thresholds (CEQ, 1997). CEQ regulations require all federal agencies to consider the cumulative effects of all proposed agency actions. A cumulative impact analysis is required whenever an environmental document is prepared (i.e., an Environmental Assessment or Environmental Impact Statement). A cumulative impact is defined in both spatial (geographic) and temporal terms (i.e., timeframes in which to identify past, present, and reasonably foreseeable actions) and results from spatial and temporal crowding of environmental perturbations. "The effects of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the effect of the first perturbation" (CEQ, 1997). Chapter 4 of the EIS – Environmental Consequences considers direct, indirect and cumulative effects anticipated to result from construction of each of the alternatives and construction of the mitigative artificial reefs which will be required to offset impacts to nearshore hardbottom resources. The Biological Assessment (BA) (provided as Appendix E to the EIS), prepared in accordance with Section 7 of the Endangered Species Act, also considers direct effects, indirect effects, interrelated or interdependent actions, and cumulative effects to listed and proposed species and critical habitat.

While the EIS is assessing the proposed Town of Palm Beach and Palm Beach County (County) projects (and alternatives) as similar actions under the combined project name of "Southern Palm Beach Island Comprehensive Shoreline Stabilization Project", it is understood that these projects are located within the same coastal cell as other past, present and future coastal projects. Therefore, this CIA has been prepared to assess the scope of impact from the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project as well as from other coastal projects on Palm Beach Island which have occurred, and which are expected to be constructed again, in the vicinity of the Project Area.

The principal goal of this assessment is to identify, avoid, minimize, and mitigate adverse environmental impacts associated with the project objective of providing storm protection along the project shoreline, with particular emphasis upon potential cumulative impacts to the nearshore hardbottom resources and the sand beach habitat along the projects and adjacent shorelines.

1.1. PROJECT DESCRIPTION

The Applicants' Preferred Project Alternative (Alternative 2) for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (the Project) proposes a combination of beach nourishment, dune reconstruction and coastal structures between R-129-210 and R-138+551 on Palm Beach Island, Palm Beach County, Florida (Figure 1-1). The Project includes two projects which will be constructed by two separate

Applicants: the Town of Palm Beach (project area extending from R-129-210 to R-134+135) and the County (project area extending from R-134+135 to R-138+551). Both applicants intend to construct artificial reefs as compensatory mitigation for unavoidable impacts due to project implementation.

The Applicants' goals and objectives for both nourishment projects are to provide more sand to the littoral system, create a stable beach and dune profile that will buffer the effects of storm surge and wave action, provide wildlife habitat, allow for recreational use and protect upland infrastructure. The total volume of sand needed to construct the Project will be dependent on the results from surveys conducted immediately prior to construction; however, based on 2014 survey conditions, approximately 142,800 cubic yards (cy) of fill is required to fill the design template within the Project Area from R-129-210 to R-138+551 (approximately 3.33 km [2.07 mi]). The fill volume will be split between the two Applicants' separate project areas – 65,200 cy of sand in the Town of Palm Beach and 77,600 cy in the County project area (South Palm Beach, Lantana and Manalapan). From north to south, the Project would place dune nourishment only from R-129-210 to R-129+150, dune and beach nourishment from R-129+150 to T-131, dune nourishment only from T-131 to R-134+135 (Town of Palm Beach southern limit), and beach nourishment with seven low-profile groins from R-134+135 to R-138+551 (Figure 1-2). As compensatory mitigation for unavoidable impacts, the Applicants propose to create between 6.55 and 6.66 ac of low relief artificial reefs designed to mimic the ecological function of the nearshore hardbottom habitat that will be impacted.

The two separate public entities proposing projects may utilize sand originating from different sources. The proposal by the Town of Palm Beach includes transportation of dredged fill material originating from the Reach 7 Phipps Ocean Park Beach Restoration Project (Phipps) and/or the Mid-Town Beach Nourishment Project (Mid-Town) or an upland sand mine. These projects have both recently occurred and material was dredged under authorization by USACE Permit Nos. SAJ-2000-00380 (Phipps) and SAJ-1995-03779 (Mid-Town), and both projects are authorized by FDEP under the Palm Beach Island Beach Management Agreement (BMA) (FDEP, 2013). If timing permits, and these projects are constructed in the future, the dredged material would be stockpiled within the

Phipps and/or Mid-Town project areas and actively transported by truck using the local network of roadways for placement within the Town of Palm Beach project limits (R-129-210 to R-134+135). The County has proposed to utilize sand originating from an upland sand mine to be placed within the County project limits along South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). The Town of Palm Beach plans to time future beach nourishment projects so that the sand source alternates between stockpiled sand excavated in excess during dredging for Phipps and Mid-Town projects. If the project schedules do not coincide, the Town of Palm Beach may truck in sand from upland mines. The County only proposes upland sand for construction of its portion of the Project.

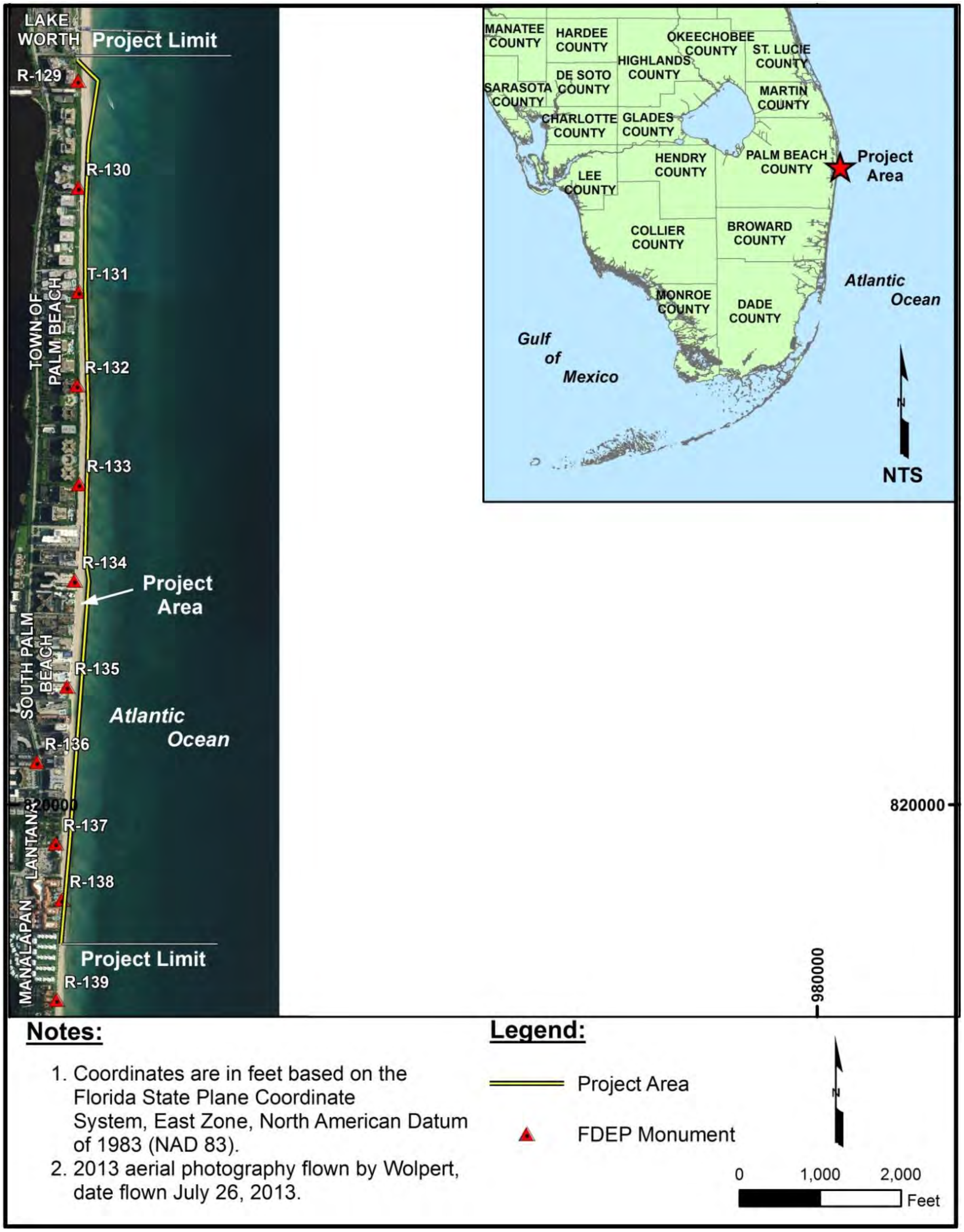


Figure 1-1. Southern Palm Beach Island Comprehensive Shoreline Stabilization Project location map.

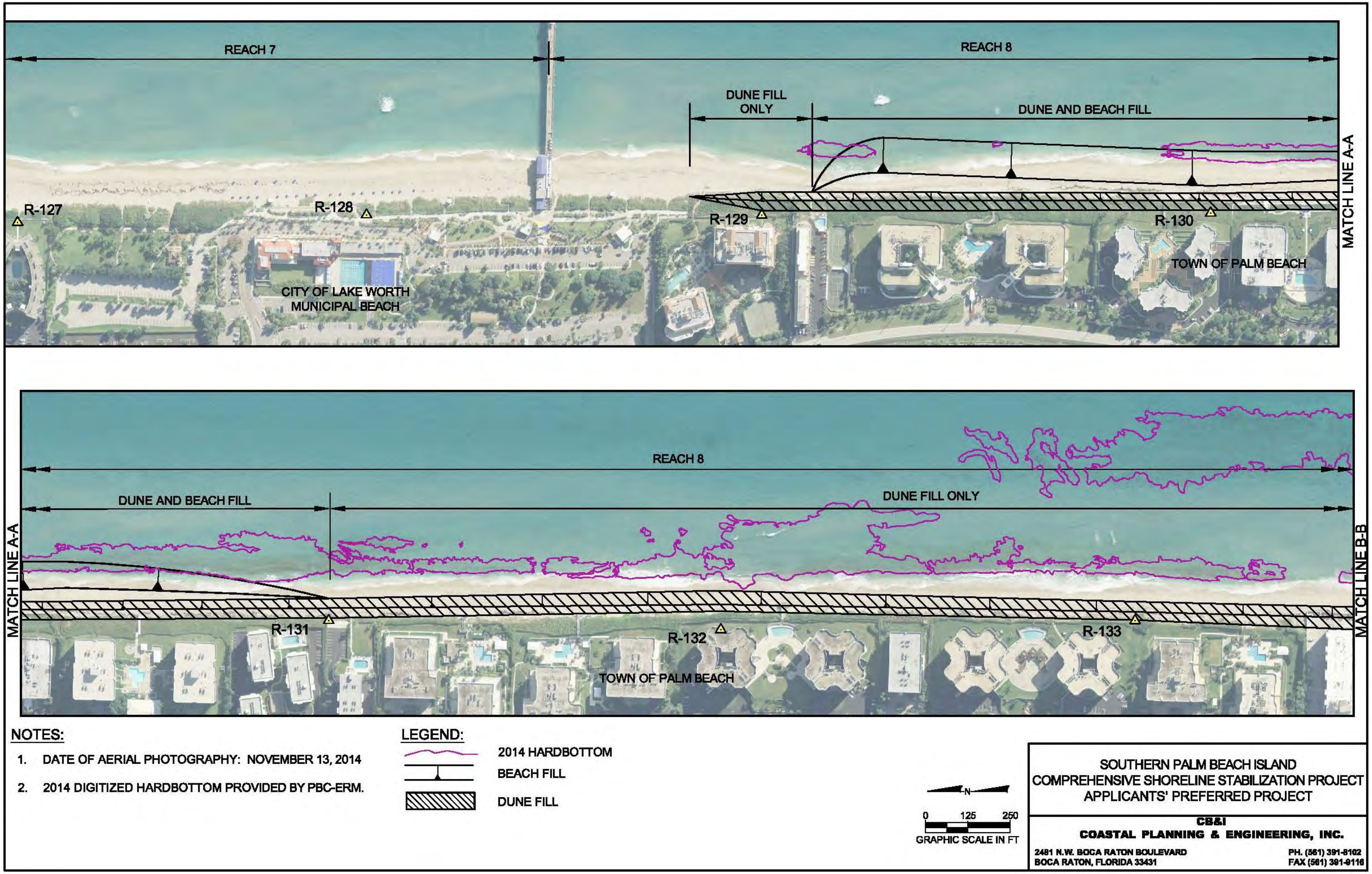


Figure 1-2. Proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Alternative 2 – Applicants' Preferred Alternative).

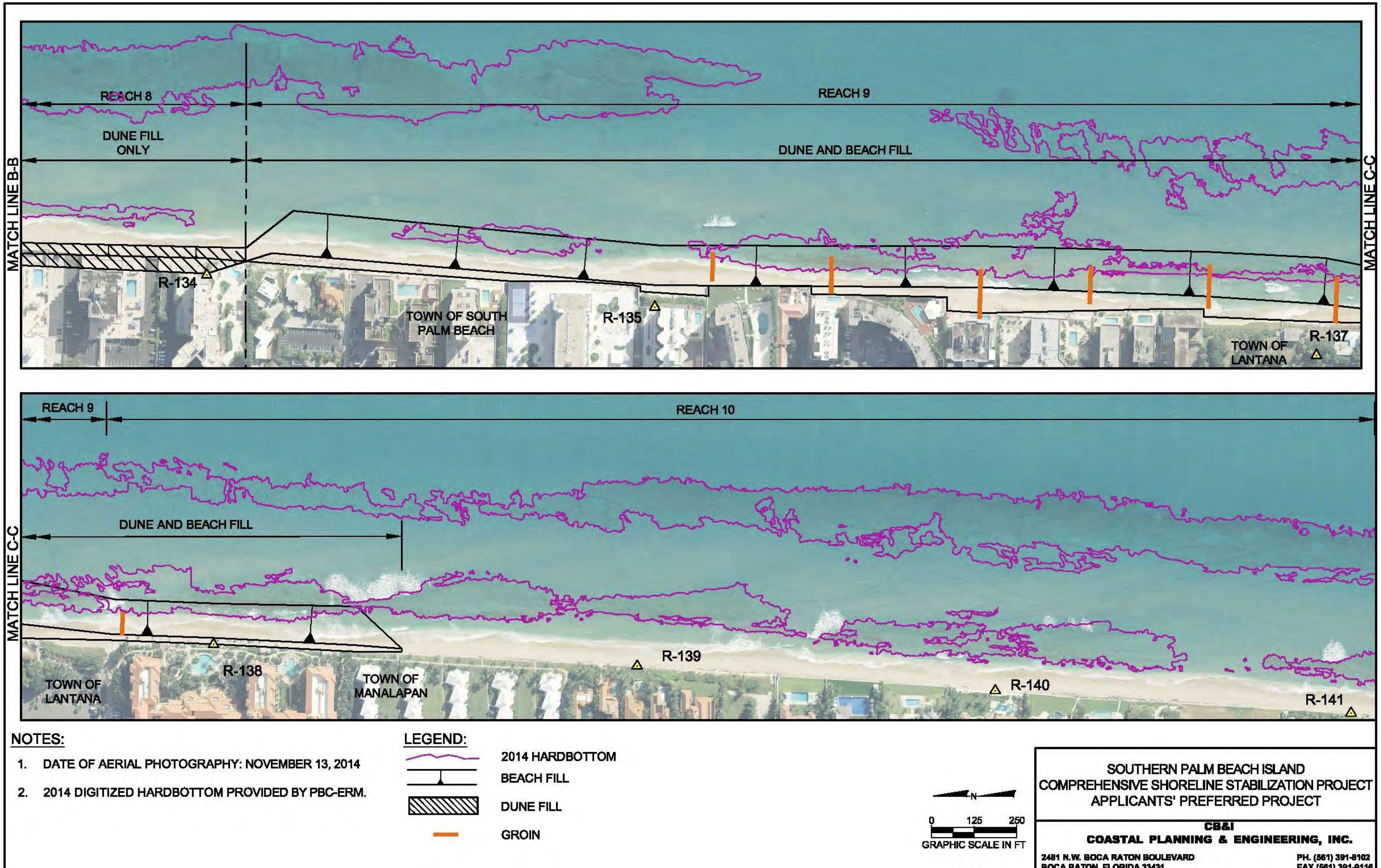


Figure 1-2 (cont.). Proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Alternative 2 – Applicants' Preferred Alternative).

This Project has been designed to avoid and minimize impacts to nearshore hardbottom to the maximum extent practicable, including reducing the volume of sand placed below mean high water (MHW) and by avoiding mobilization of a separate dredging operation offshore and hydraulic pumping of sand through a pipeline to the Project Area. However, the Project is anticipated to result in adverse effects to nearshore hardbottom through direct placement of sand during construction and equilibration (spreading) following construction.

The results of the engineering and Delft3D modeling study (EIS Appendix G) provided polygons that represented sand accumulation in the nearshore habitat over three years due to project implementation for each alternative and for each grain size modeled. These polygons were overlaid onto aerial delineations of exposed hardbottom digitized in GIS from 2003 through 2014 to determine potential impacts to this resource. From these polygons, seven levels of potential impact to hardbottom were developed based on temporal and spatial factors. These impact types are described in greater detail in Appendix H of the EIS. Initial investigation of the hardbottom habitat in the project area revealed a resource that is very dynamic and ephemeral in nature. The constant burial and re-exposure of hardbottom in this area facilitates the development of an opportunistic community dominated by turf and macroalgae species that recruit quickly when substrate is available. Between 2003 and 2014, the amount of exposed hardbottom in the Project Area varied widely ranging between 1.5 ac at the lowest (2009) and 36.6 ac at the highest (2006). Because of the variability observed from year to year, the USACE determined that a time-average analysis of the amount of hardbottom exposed over 10 years would best represent the habitat since it smooths out short-term fluctuations and provides longer-term trends by averaging a function over iterations of time. The 2014 dataset was added during updates to the EIS extending the time-average analysis over 11 years. To determine a time-averaged amount of exposed hardbottom, the average amount of exposed hardbottom (ac) between two surveys is multiplied by the number of days between those two surveys (ac-days). The sum of ac-days from a series of surveys is divided by the total number of days between the first survey and the last survey. This provides the time-averaged amount of hardbottom in an area. In order to determine the area of potential impact due to project construction, the amount of exposed hardbottom from each hardbottom delineation (2003 – 2014) that fell within the impact polygons generated by the Delft3D modeling was determined in GIS and these areas were input into the time-average calculation. For each alternative (and each grain size modeled), these impact areas were input into Uniform Mitigation Assessment Method (UMAM) to determine potential mitigation requirements.

Based on this analysis, it is anticipated that the Project may result in permanent impacts to between 3.86 and 3.99 acres of hardbottom, and temporary impacts to between 9.53 and 9.93 acres of hardbottom due to direct sand placement and subsequent equilibration (Figure 1-3 through 1-5). Using the engineering and modeling results, historic exposed hardbottom acreage, and recent benthic characterization data, a preliminary UMAM evaluation was conducted (provided as Appendix H to the EIS). This draft UMAM analysis determined that between 6.55 and 6.66 acres of mitigation may be required to offset these impacts to intertidal and subtidal hardbottom. The County and Town of Palm Beach propose to offset the unavoidable impacts in the form of low relief artificial reefs designed to mimic the ecological function of the nearshore hardbottom habitat that will be impacted. The mitigation will be located in Palm Beach County and extend into the Atlantic Ocean, Class III Waters. The Applicants determined that suitable mitigation sites should be located near the proposed impact site in similar water depths as the impacted hardbottom (less than 20 ft). Further, to avoid impacts from the mitigation structures themselves, the mitigation sites must be located on sandy seafloor where there are no hardbottom resources.

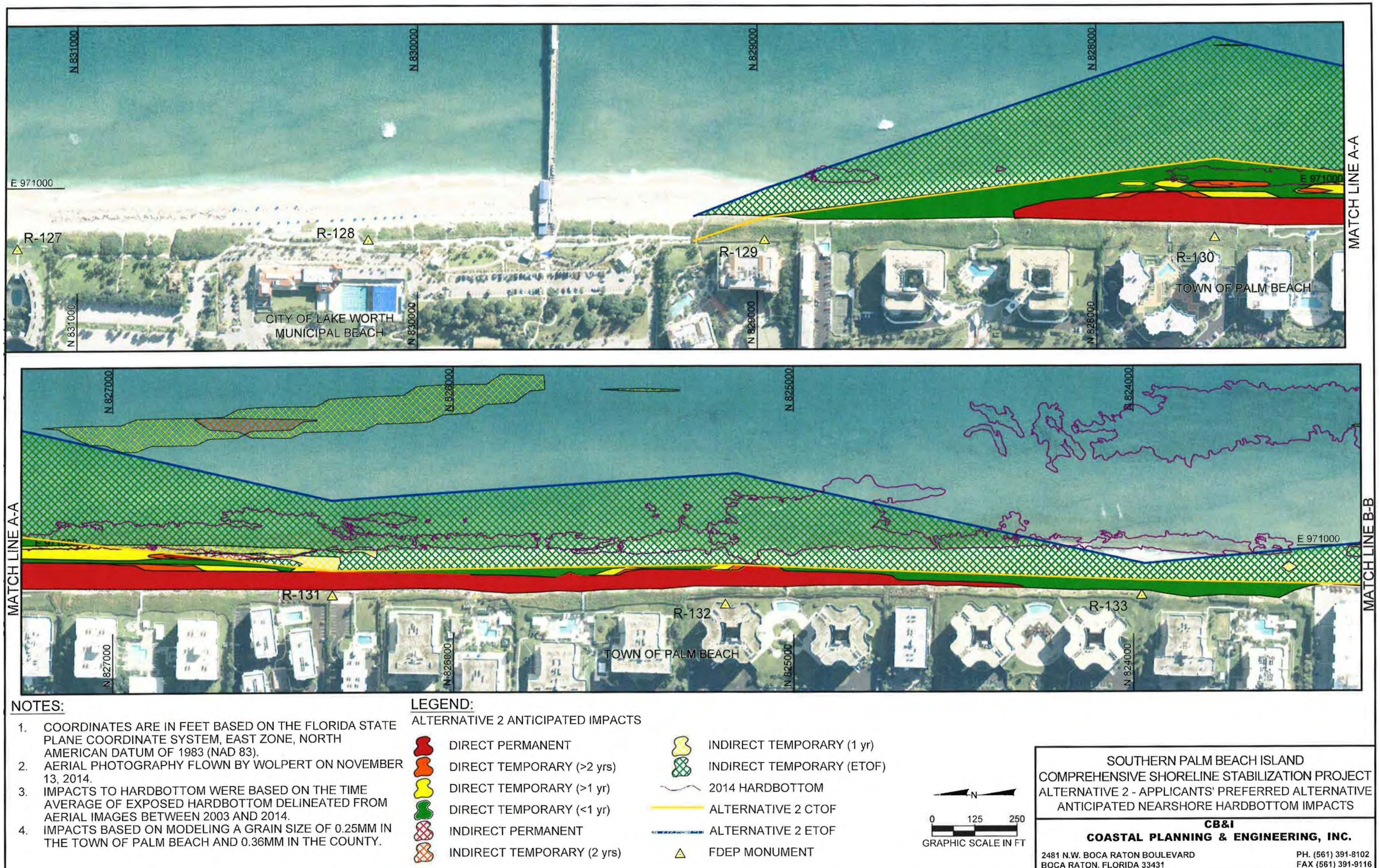


Figure 1-3. Anticipated nearshore hardbottom impacts from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.25 mm in the Town of Palm Beach and 0.36 mm in the County.

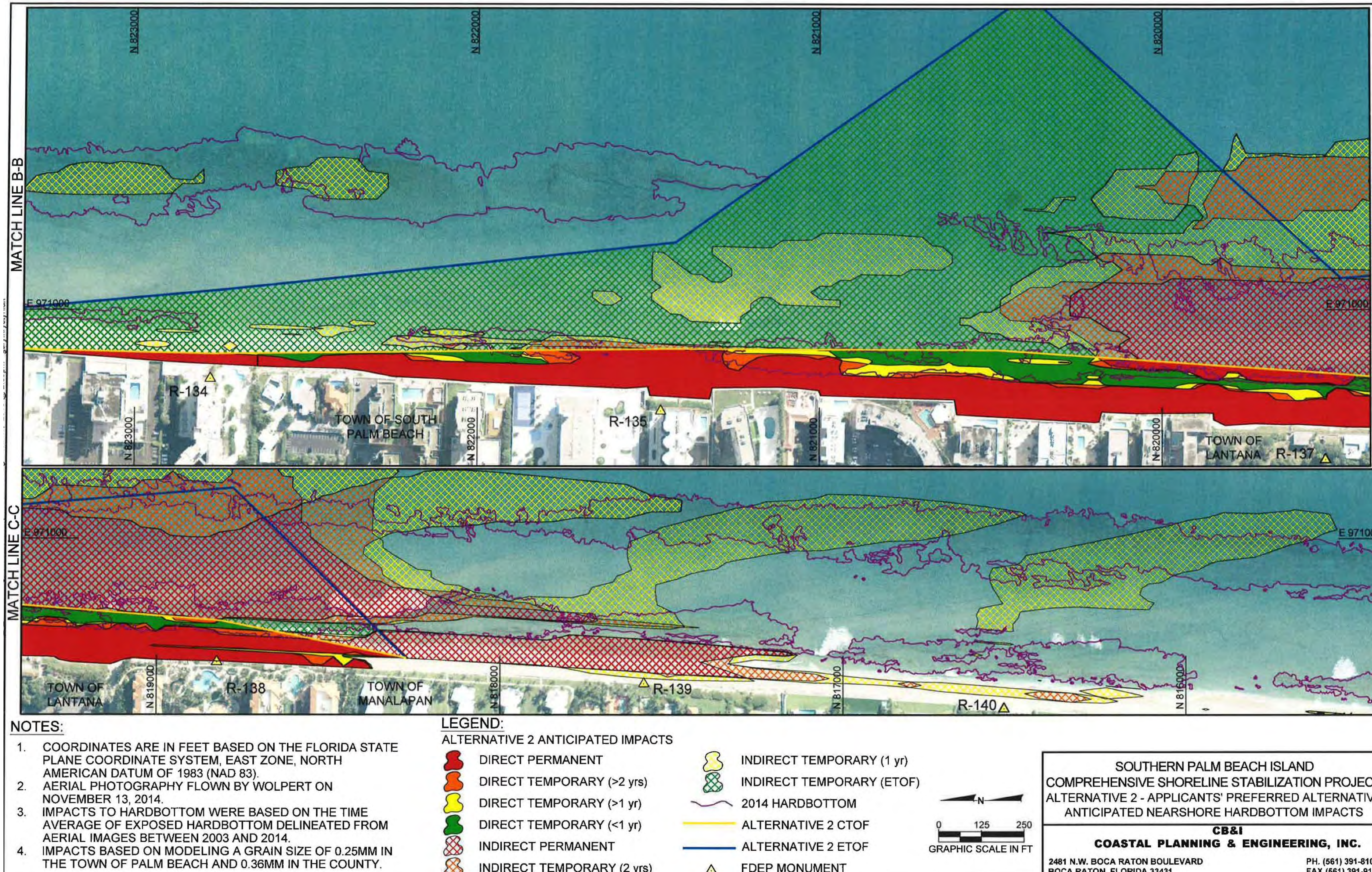


Figure 1-3 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.25 mm in the Town of Palm Beach and 0.36 mm in the County.

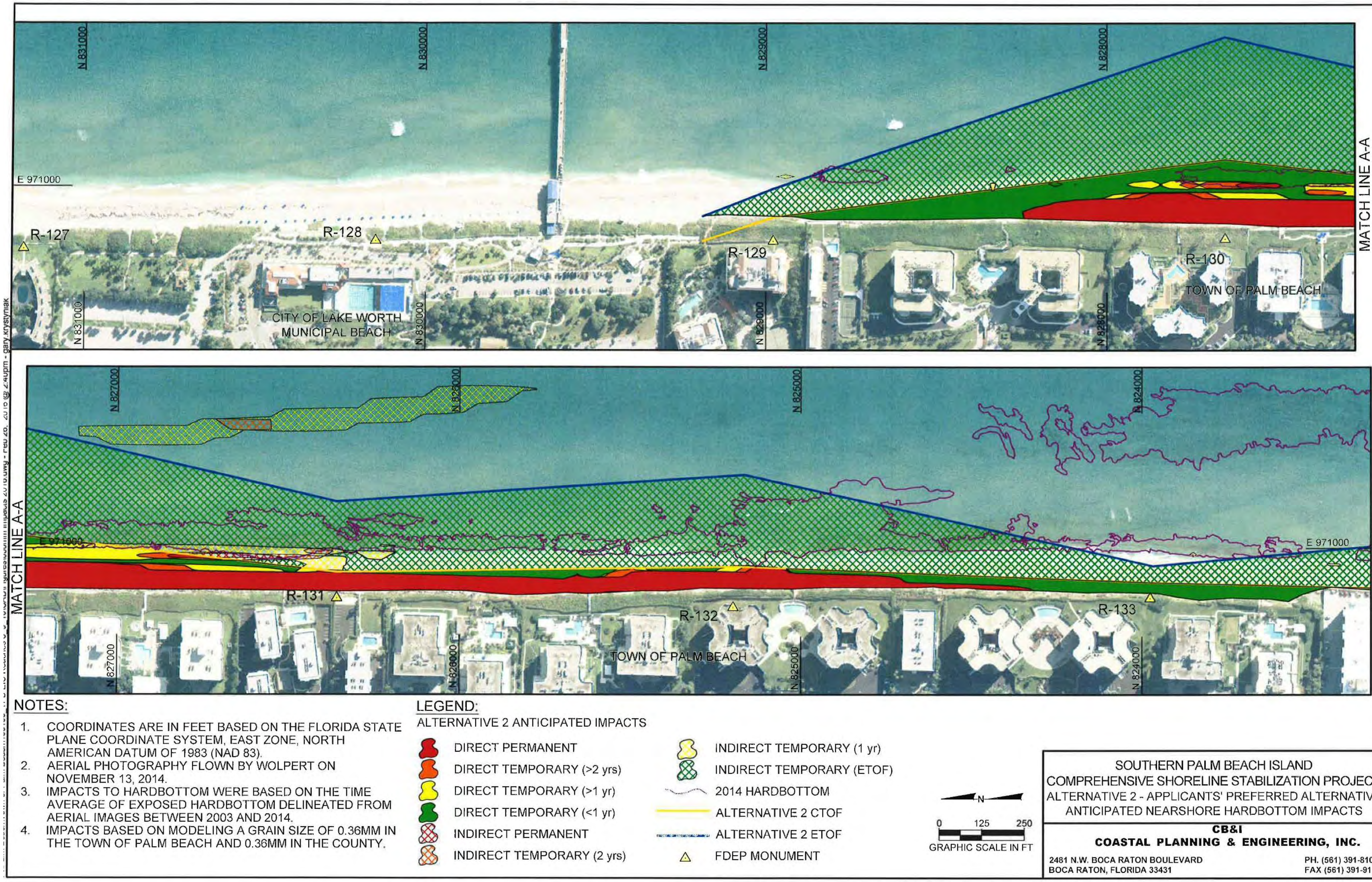


Figure 1-4. Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.36 mm in the Town of Palm Beach and 0.36 mm in the County.

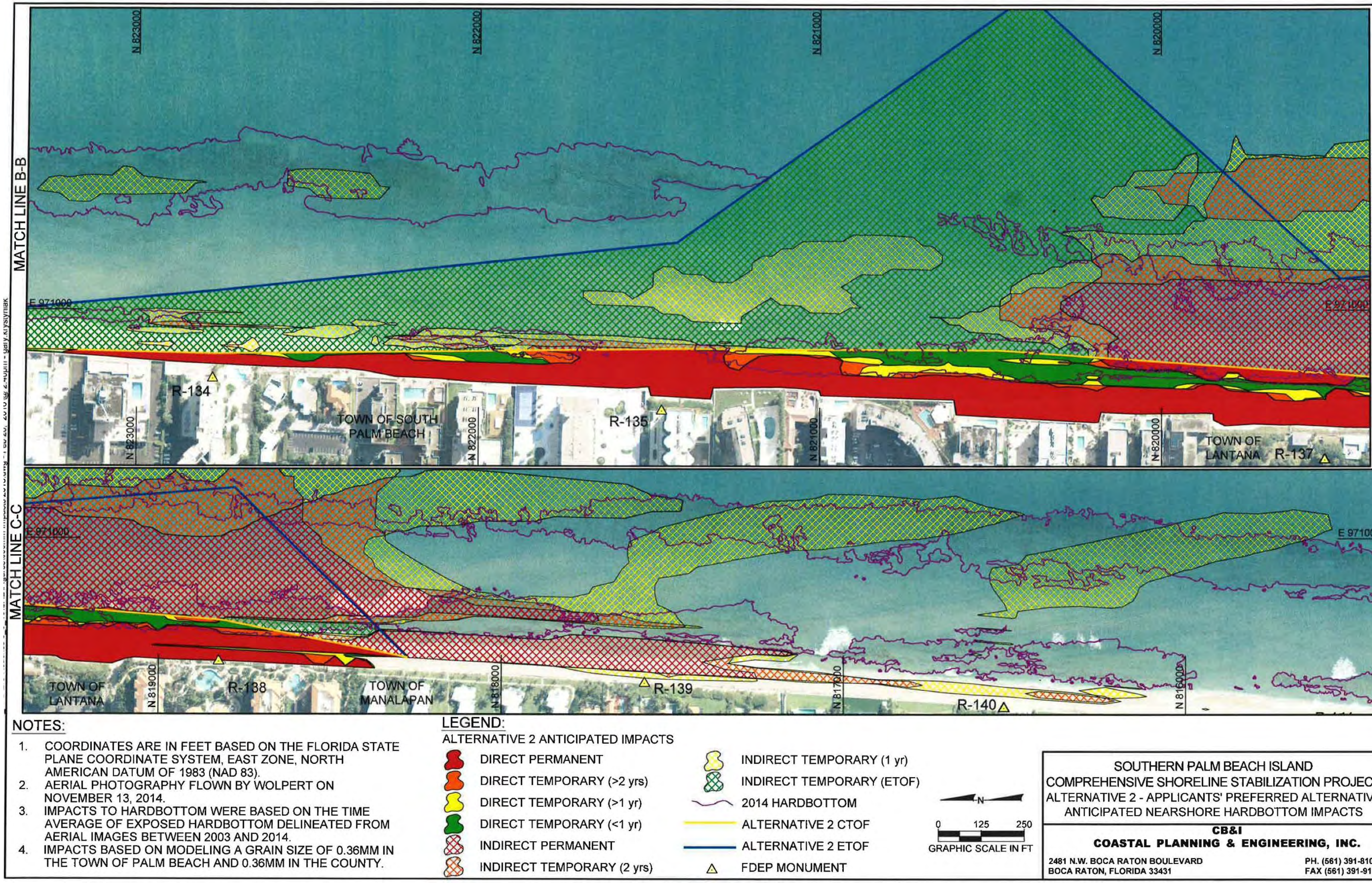


Figure 1-4 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.36 mm in the Town of Palm Beach and 0.36 mm in the County.

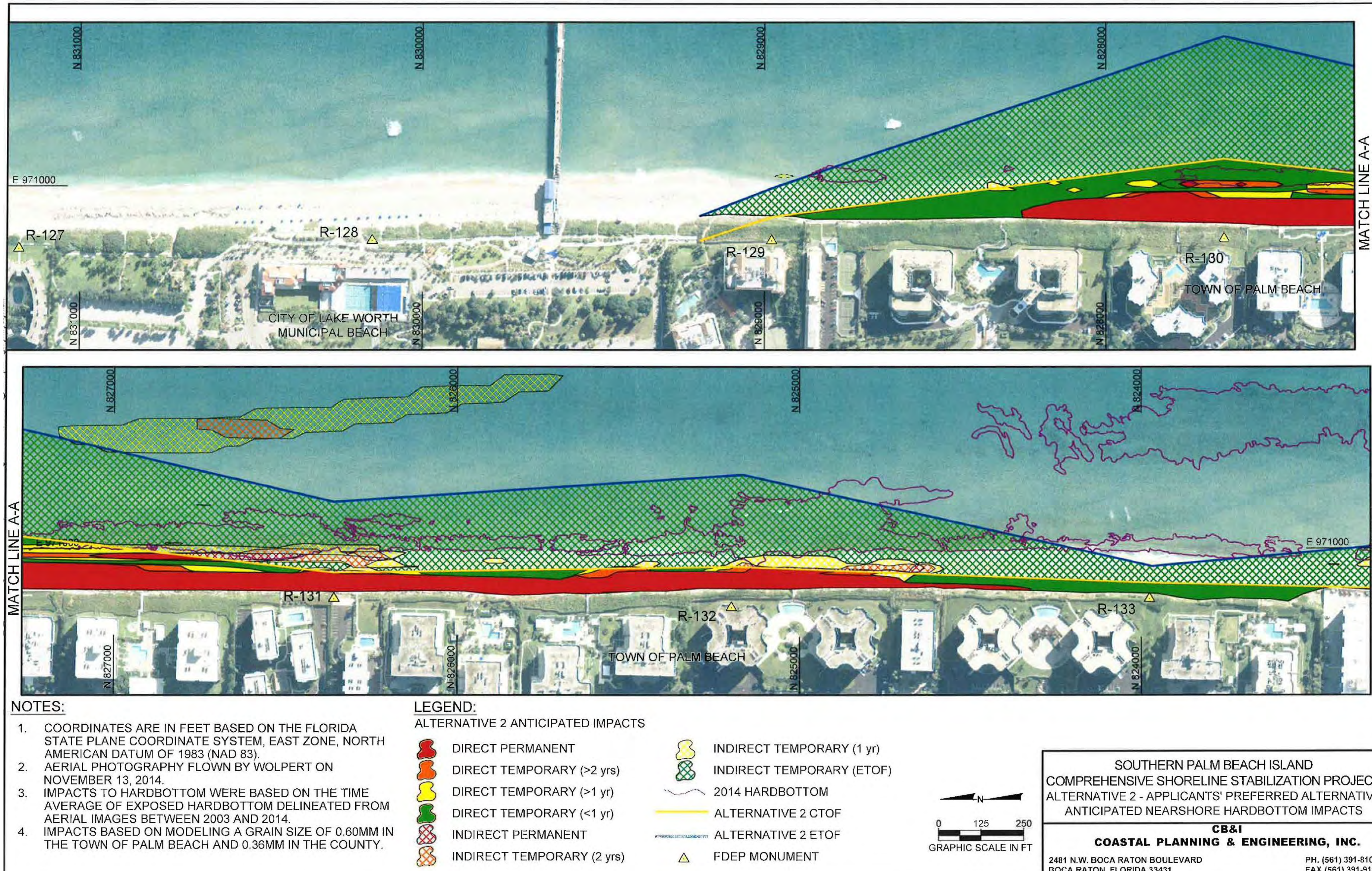


Figure 1-5. Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.60 mm in the Town of Palm Beach and 0.36 mm in the County.

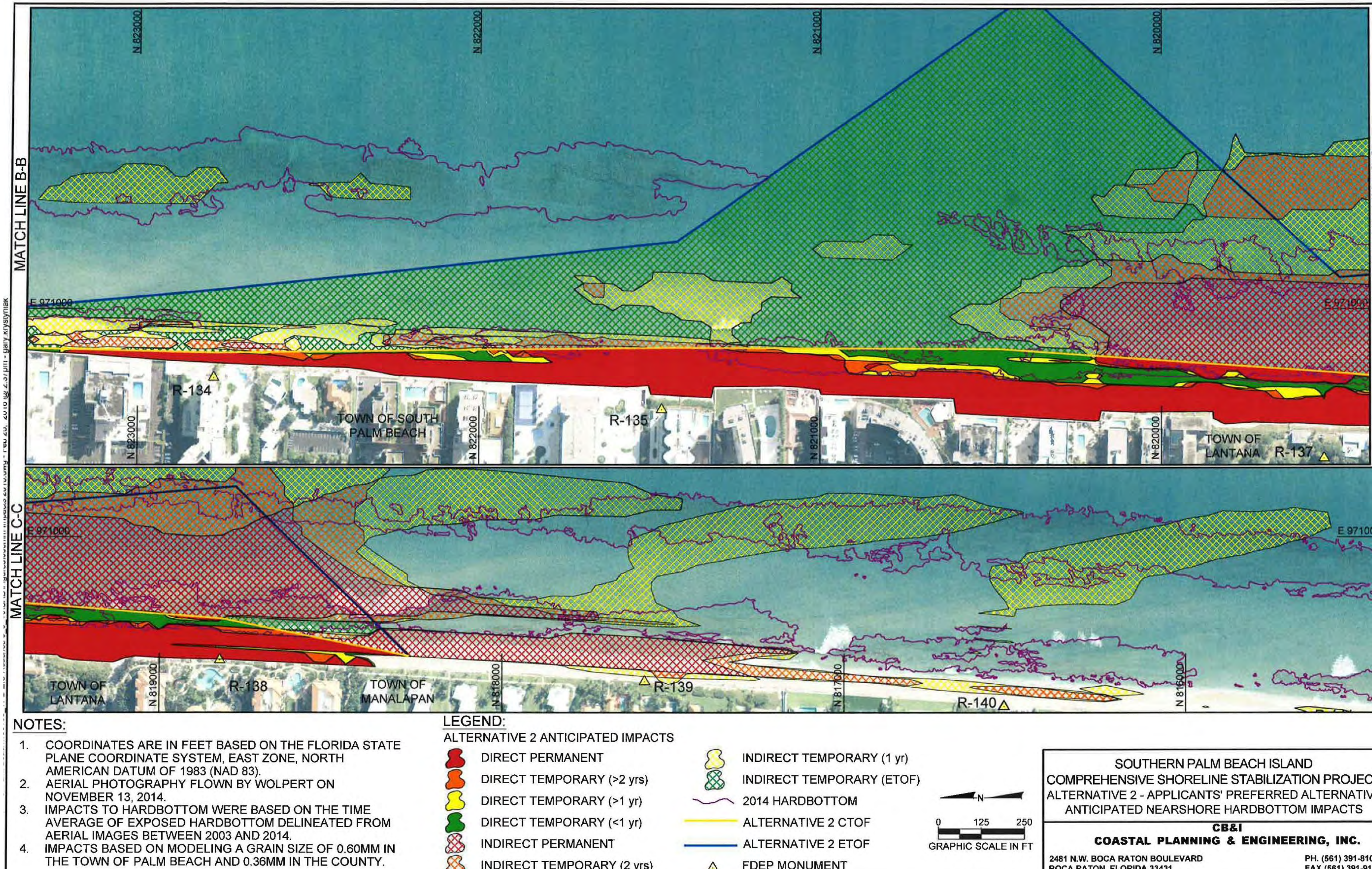
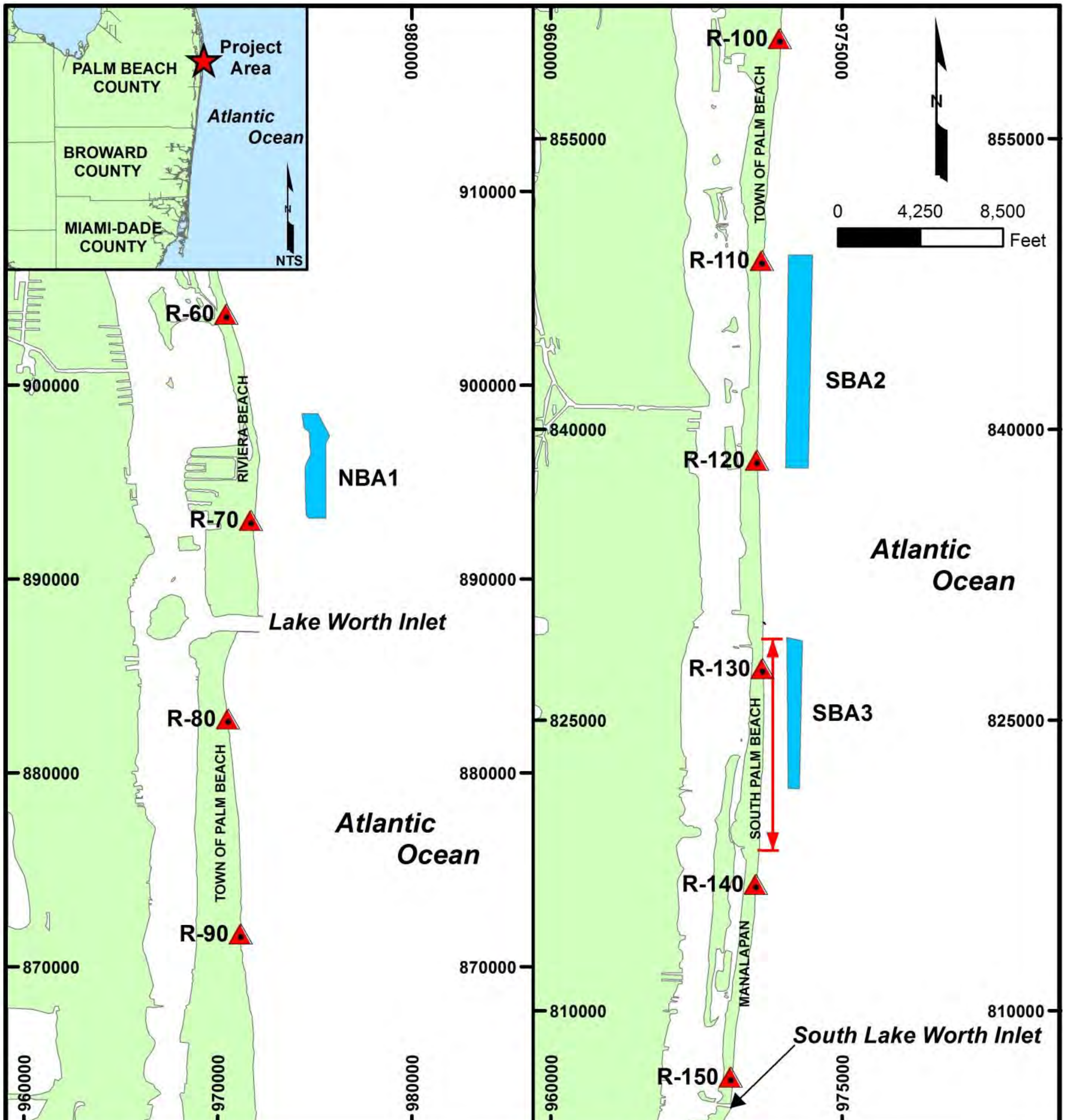


Figure 1-5 (cont.). Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Alternative. Impacts based on modeling a grain size of 0.60 mm in the Town of Palm Beach and 0.36 mm in the County.

1.1.1. SAND SOURCES FOR PROPOSED PROJECT

Offshore sand source. A stockpile of dredged material from the Phipps Project (USACE permit number SAJ-2000-00380) and/or the Mid-Town Project (USACE permit number SAJ-1995-03779) is the preferred sand source for the Project Area within the Town of Palm Beach limits. Phipps and Mid-Town projects dredged sand from South Borrow Area 2 (SBA2) and North Borrow Area 1 (NBA1), respectively (Figure 1-6). The sand would be transported to the beach by truck and placed on the beach mechanically. Based on the 2014 conditions, the total proposed volume for placement within the Town of Palm Beach is approximately 65,200 cy, 3,400 cy of which will be placed below Mean High Water (MHW). For subsequent maintenance of the Project, the Town of Palm Beach plans to alternate between utilizing dredged sand stockpiled during Phipps or Mid-Town construction. Both projects have recently been constructed (Mid-Town in winter 2014-2015 and Phipps in winter 2015-2016) and dredged sand was transported by truck and placed on the dunes in Reach 8 (approximately 40,000 cy from Mid-Town and approximately 10,000 cy from Phipps). If the timing of Project construction does not coincide with future Mid-Town or Phipps construction projects, the Town would consider using upland sand. The County only proposes upland sand for construction of its portion of the project. Based on the 2014 conditions, the total proposed volume for placement within the County is approximately 77,600 cy, 26,600 cy of which will be placed below Mean High Water (MHW). Additional information about the offshore borrow areas is provided in Section 6.0.



Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).

Legend:

Southern Palm Beach Island Comprehensive Shoreline Stabilization Project

- Project Limits
- Borrow Area
- FDEP Monuments

Figure 1-6. Potential borrow areas to be used during Phipps and Mid-Town projects that may supply the sand for the proposed Project within the Town of Palm Beach limits (R-129-210 to R-134+135).

Upland sand source. Upland sand mines and other upland sources (such as publicly owned land with available sand resources) have provided sand for beach and dune restoration projects in Florida for over a decade. Upland sand has historically been used for small projects (less than 50,000 cy) (USACE, 2001), but upland sand has recently been utilized for larger projects in Indian River County, Broward County, and Brevard County. Within Palm Beach County, upland sand has been used for restoration efforts in Coral Cove Park in Tequesta, Singer Island, Jupiter/Carlin Beach, Town of Palm Beach, South Palm Beach, Lantana, and Delray Beach. Specifically within the Project Area, there have been dune restorations completed in the Towns of South Palm Beach and Lantana since 2003 (Miranda, pers. comm., 2013, see Chapter 1, Table 1-1 in the EIS) and one dune restoration in Reach 8 in the Town of Palm Beach in 2011 using upland sand.

The sand source for the County project area within the limits of the Towns of South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551) is sand from domestic upland sand quarries within the State of Florida. The sand would be transported to the beach and placed on the beach mechanically, rather than hydraulically. A study conducted in Broward County found that due to a larger mean grain size and smaller fines content, upland sand is expected to be more stable and produce less turbidity in the nearshore environment than sand obtained from offshore borrow areas (OAI and CPE, 2013).

Each mine would be evaluated based on compliance with the F.A.C., Rule 62B-41.007(2)(j), the BMA cell-wide sediment quality specifications (presented in Chapter 2, Table 2-8 in the EIS), the County's technical sand specifications outlined in the County’s Annual Dune and Wetlands Restoration contract (Table 2-2; Appendix B), sediment characteristics, location relative to the Project Area, compliance with state and federal laws and method of transport available. Previous County projects have utilized sand from E.R. Jahna Industries, Inc. Ortona Sand Mine (Ortona) and Stewart Mining Industries in Ft. Pierce, as well as from local County preserves. The Town of Palm Beach identified Ortona as their preferred upland sand mine, which has been previously utilized within the Town of Palm Beach, as well as Stewart Mining Industries, Inc. in Ft. Pierce. The County has also proposed to utilize sand from Ortona and/or Stewart Mining Industries. The location of the upland mines and their approximate distances to the Project Area are provided in Table 1-1 and Figure 1-7.

Table 1-1. Potential upland sand sources.

Company	Mine Name	Distance from Project Area (km)*	Distance from Project Area (mi)*
E.R. Jahna Industries, Inc.	Ortona	154	96
Stewart Mining Industries	Ft. Pierce	127	79

*Distance is the shortest driving distance (km/miles) between each mine and Lantana Municipal Beach Park; actual distance will depend on routes selected by contractor.

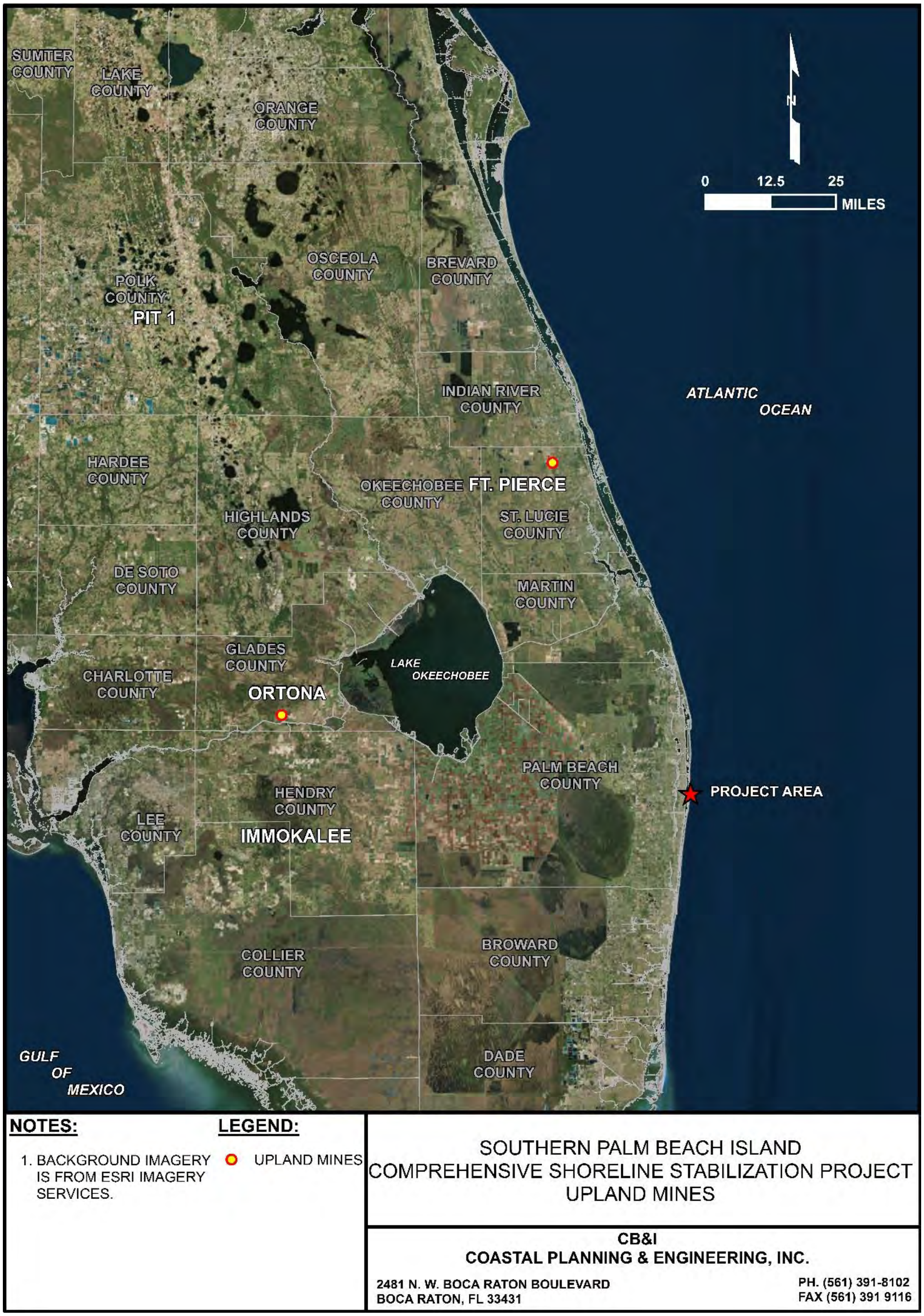


Figure 1-7. Upland sand mines with potentially feasible sources of material that could be considered for a truck-haul project for placement in the proposed Project Area.

One consideration involved with selecting upland sand sources is the availability of sand resources within the mines, as this can affect overall construction rate of the project. The mine(s) selected must have sufficient total and daily production capacity to meet the project needs. Sand mines can stockpile some of the material to ensure that they can keep pace with required delivery rates. Other considerations that affect project efficiency include the distance from the mine to the project, the number of trucks and other machinery at the staging and beach nourishment areas, as well as the number of active access points. In the event that delivery rate exceeds handling time on the beach, the utilization of offsite truck waiting areas may be required in order to avoid congestion at the access points. The Town of Palm Beach and the County would consider mines that can provide suitable sand material based on the state and county sediment guidelines, the cost per cubic yard, as well as having sufficient production capacity and a reasonable trucking distance from the Project Area.

1.1.2. GROIN CONSTRUCTION

The County portion of this Project includes the construction of seven (7) groins placed perpendicular to the shoreline extending from the existing seawalls to the post-construction (beach fill) shoreline in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). The groins are proposed to be low-profile, meaning that they are designed to be level with the height of the existing berm and are intended to be concealed by sand most of the time. The construction materials potentially include concrete king pile and panel groins with 18 inch (+/-) wide H-piles spaced every 8 to 10 ft. Exact location and length of the groins would depend on the presence of nearshore hardbottom resources at the time of construction. The proposed Project includes a series of approximately 90 ft long walls spaced approximately 300 ft apart. As the sand naturally erodes from the beach, the groins would gradually become exposed until the next nourishment. The groins act to hold the sand within the littoral system which results in a disruption of the natural littoral sand transport system along the beach. Typically sand accretion/sediment deposition occurs on the updrift side and erosion would be expected on the downdrift side. Groin construction will require the use of heavy equipment with a land-based or water-based operation or a combination thereof. Depending on site conditions, the contractor's means and methods, and site access, construction of the groins will likely require but is not limited to clamshells, cranes, excavators, front end loaders, bulldozers, barges, temporary trestles, and/or pile drivers.

2.0 SCOPE OF ANALYSIS

The "Scope of Analysis" was discussed in Section 1.7.1 in Chapter 1 of the EIS. For the proposed Project, the regulated activities include placement of sand below MHW, construction of seven low-profile groins that extend perpendicular to shore into the Atlantic Ocean, and construction of artificial reefs.

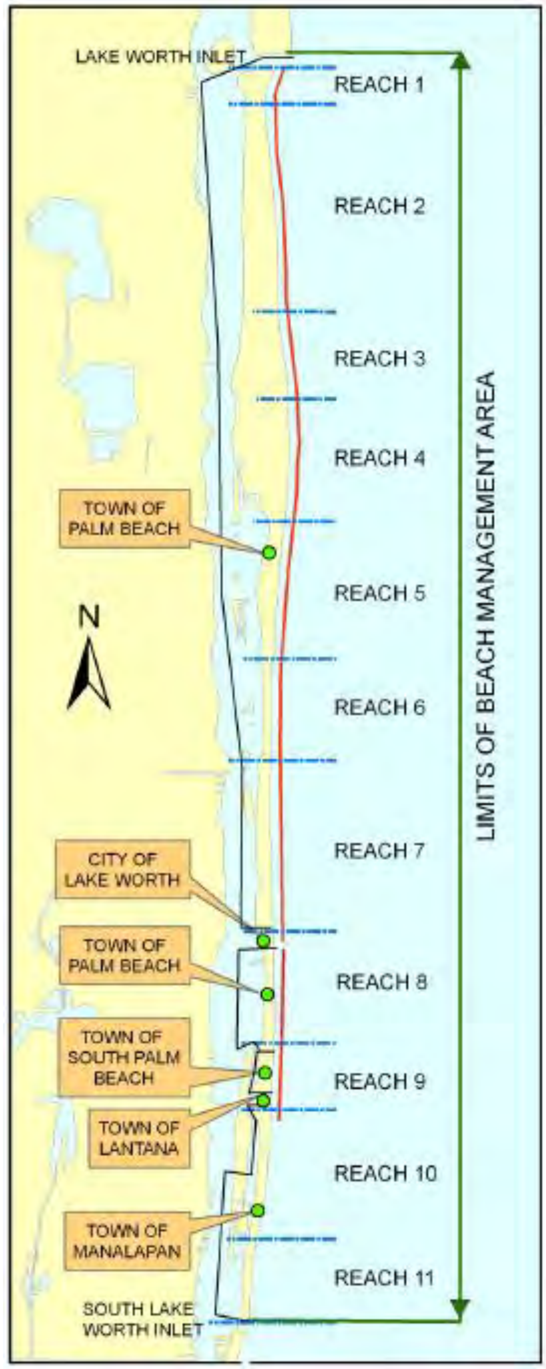


Figure 2-1. Limits of Beach Management Agreement Area (FDEP, 2013).

Historically, beach erosion control and inlet management activities have been regulated by the FDEP and USACE on a project-by-project basis. In an effort to adopt a more holistic approach to ecosystem management that could address the full scope of Palm Beach Island's shoreline erosion problems, the Town of Palm Beach and the County requested that FDEP enter into a binding Beach Management Agreement (BMA) for beach nourishment, inlet sand bypassing, and dune restoration projects along the Palm Beach Island shoreline in 2012. A primary goal of the BMA is to develop a coordinated, long-term process that facilitates predictable approval of qualifying coastal erosion control and inlet management activities within the Palm Beach Island coastal cell

(Lake Worth Inlet to the South Lake Worth Inlet), encompassing 15.7 miles of Atlantic Ocean shoreline, and covering 34.5% of the Palm Beach County Shoreline (Figure 2-1) (FDEP, 2013).

The final BMA, executed on September 26, 2013, includes authorization from FDEP for maintenance dredging of the Lake Worth Inlet with placement on downdrift beaches, construction of an improved sand transfer plant at Lake Worth Inlet, repair and removal of groins throughout the cell, nourishment of the Mid-Town Project, nourishment of the Phipps Project, and dune restoration (FDEP, 2013).

The BMA's approach to authorizing projects and activities is centered on regional management of the coastal system rather than the conventional project-by-project permitting process. In addition, the BMA is expected to generate a more cost-effective and efficient permitting process that will reduce the BMA Participants' costs, time delays, and permitting uncertainty.

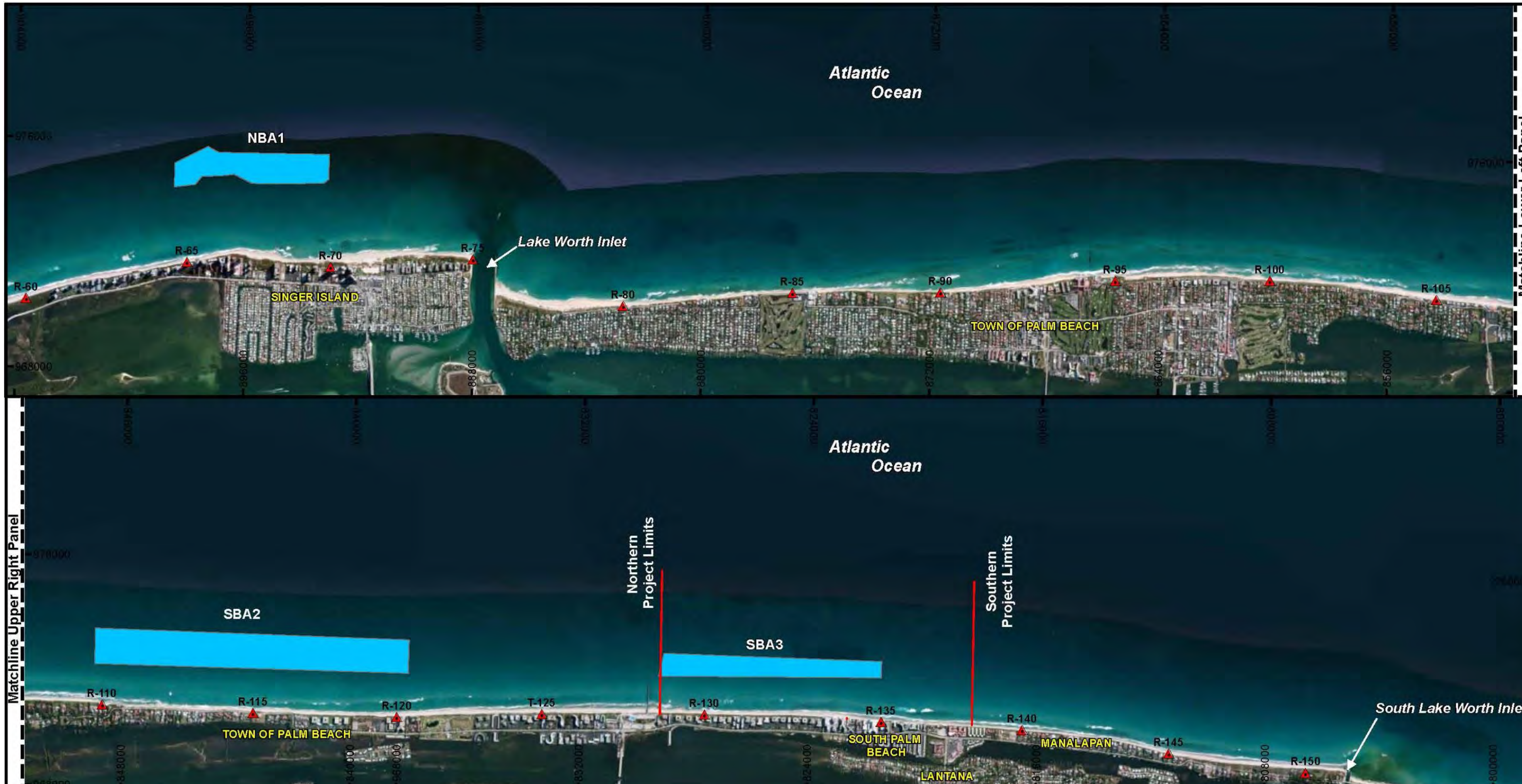
A summary of projects authorized under the BMA is provided in Section 5.0. These projects are located in the vicinity of the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project; therefore, these actions and the proposed Project are considered in the cumulative impacts assessment.

2.1. GEOGRAPHIC SCOPE

Palm Beach County is located on the southeastern coast of Florida and includes approximately 45 miles of Atlantic Ocean coastline. There are four ocean inlets within Palm Beach County. The geographic scope of the proposed Project is comprised of: 1) the northern limit of North Borrow Area 1 (NBA1), approximately 3.2 kilometers (2 miles) north of Lake Worth Inlet; 2) the eastern edge of NBA1, in water depths between 12 and 18 meters (40 and 60 feet), approximately 762 meters (2,500 feet) offshore of Singer Island; 3) the South Lake Worth Inlet (R-151), located approximately 3.2 kilometers (2.5 miles) south of the Project Area, and 4) the westernmost boundary of the potential upland mines in order to encompass the truck routes to the Project Area (see Figures 1-7 and 2-2).

The Project Area extends from R-129-210 to R-138+551, which includes the majority of Reach 8, all of Reach 9, and the northern portion of Reach 10 (Figure 1-2). Potential impacts from project construction are expected to occur updrift and downdrift of the Project Area, therefore, resources were assessed within the Study Area which extends from R-127 to R-141+586. This area includes the shoreline from the dune seaward out to a distance of approximately 400 meters (1,312 feet) in order to include all areas of nearshore hardbottom habitat that have been exposed between 2003 and 2014. Nearshore hardbottom habitat is classified by FDEP to include the “200-400 meter-wide strip from the shoreline, ranging from the supralittoral zone to the depth of -4 meters”, intermediate hardbottom exists “from the depth of -4 meters to the depth of closure (approximately -8 meters)”, and offshore hardbottom is located in “water depths deeper than -8 meters, beyond the depth of closure to -12 meters” (FDEP, 2013). The nearshore environment of Palm Beach Island is characterized by a generally discontinuous swath of nearshore hardbottom resources along the entire 16-mile island, which is also present throughout most of the remaining shoreline in Palm Beach County. Other known exposed nearshore hardbottom resources are higher functioning reefs in deeper water (9 m or deeper) that have older classes of benthic species (e.g. corals, sponges, and algae) and tend to be persistent. It is anticipated that the nearshore hardbottom habitat is the only hardbottom resource that may be affected by direct, indirect and cumulative impacts due to project construction.

In addition to the Proposed Action, past, present, and future actions on Palm Beach Island that would contribute to cumulative impacts principally include beach management activities conducted within the littoral zone of Palm Beach Island. Beach management activities within this zone include sand bypassing and inlet sand management at Lake Worth Inlet (Port of Palm Beach) and South Lake Worth Inlet (Boynton), beach nourishments projects, and coastal structure rehabilitation/construction. Just north of the Project Area, the Lake Worth Pier provides an impediment, or littoral barrier, that interrupts sediment transport. At the south end of the Project Area, the natural shoreline has been stable with no requests to stabilize the beach.



Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. Background imagery is from ESRI's Imagery Service.The data source is Microsoft, dated December 12, 2010.

Legend:

Project Limits

Borrow Area

FDEP Monument

Feet
0 1,750 3,500
1 inch = 3,500 feet

TITLE:

Regional Location Map
Southern Palm Beach Island Comprehensive Shoreline Stabilization Project

CB&I
Coastal Planning & Engineering, Inc.
2481 N. W. Boca Raton Boulevard
Boca Raton, FL 33431
Ph. (561) 391-8102 Fax (561) 391-9116

Date: 12/2/2014 | By: ALS | Comm No. : 150190

Figure 2-2. Regional map of Palm Beach Island.

2.2. TEMPORAL SCOPE

Planning for the Project was formulated to include a 50-year horizon considering sand resource utilization and project life-spans of approximately three to four years. The proposed projects may be authorized under a 10-year permit and would allow for initial project construction and maintenance (renourishment) for up to three renourishments. Assessment of the mitigation requirements for impacts to nearshore hardbottom was computed over an indefinite (perpetual) horizon, i.e., presuming perpetual impacts to resources. If the projects were constructed on a regular basis, the anticipated impacts assume that the actions presented will be repeated for a period of at least 50 years. The anticipated project construction start date is 2016. Initial construction is anticipated to occur between November and April 30 to avoid peak sea turtle nesting season, and includes transporting sand from an upland mine(s) or from a stockpile of dredged sand located near the Phipps or Mid-Town projects. The preferred construction window for deployment of the mitigation reef is during late-spring, summer, and early fall months when sea conditions are most favorable for working offshore of Palm Beach County.

2.3. RESOURCES WITHIN THE CUMULATIVE IMPACT ANALYSIS AREA

Priority resources within the project impact area are subject to potential cumulative effects. The proposed Project, in addition to past projects and future actions, primarily affects those resources related to the nearshore hardbottom, offshore sand borrow areas, water column, dry beach and dune, dredged sand stockpile area, and upland infrastructure.

Nearshore Hardbottom. The nearshore hardbottom habitat in particular is generally considered by the U.S. Fish and Wildlife Service (USFWS) as Resource Category 2, and no net loss of in-kind habitat value is recommended. Resource Category 1 habitats include those that would be considered unique resources which cannot be replaced; however, these resources are not known to exist within this area.The amount of exposed nearshore hardbottom along Palm Beach Island fluctuates annually (FDEP, 2013). As the shorelines within the Town of Palm Beach and the County (Towns of South Palm Beach, Lantana, and Manalapan) are eroded, hardbottom may, depending on the location, become exposed or buried. From 2000 to 2012, the total amount of exposed nearshore hardbottom along Palm Beach Island (Reaches 1-11), as determined by aerial analysis, ranged from 171 ac to 266 ac (FDEP, 2013). This range represents the highest and lowest exposed hardbottom acreages for individual years during that time period. Based on FDEP's evaluation of the Palm Beach Island projects authorized by the BMA (see Section 5.0 below) it was determined that the Town of Palm Beach has avoided and minimized impacts to the nearshore hardbottom resulting from the projects to the greatest extent practicable. FDEP also does not anticipate direct or secondary impacts associated with the projects beyond those impacts that have occurred and have been or are being mitigated for in previously permitted projects. For example, in 2004 the Town of Palm Beach constructed a 3.1 ac artificial reef to mitigate for anticipated nearshore hardbottom impacts as part of the 2006 Phipps Project. The Town of Palm Beach also constructed a 0.8 artificial reef in 2007 to comply with the federal mitigation requirement even though FDEP determined that the 3.1 ac mitigative artificial reef completely offset nearshore hardbottom project impacts (FDEP, 2013).

For the proposed Project, the anticipated permanent impacts would account for approximately 1.5%-2.3% of the historic range of exposed hardbottom acreage and the temporary impacts would account for approximately 3.6%-5.8% of the historic range of exposed hardbottom acreage along Palm Beach Island as described above. Based on time-average analysis of the amount of hardbottom exposed from 2003-2014 (described in Section 1.1), it is predicted that the Applicants' Preferred Alternative may result in permanent impacts to between 3.86 and 3.99 ac of hardbottom as well as temporary impacts to between 9.53 and 9.93 ac of hardbottom (Figures 1-3 through 1-5). The impacts acreages were used to complete a UMAM evaluation, which determined that between 6.55 and 6.66 acres of mitigative artificial reef would be required to offset these impacts to intertidal and subtidal hardbottom. Every future project in Palm Beach Island that impacts new hardbottom areas is likely to require similar mitigation to avoid unacceptable cumulative losses attributable to shoreline stabilization projects.

Offshore Sand Borrow Areas. There are three previously authorized borrow areas that have approximately 6 million cubic yards of beach compatible sand. The amount of sand is anticipated to provide approximately 23 years of sand for all of the Town of Palm Beach's future shoreline stabilization projects based on a consumption rate of approximately 270,000 cubic yards per year. The rate was calculated by dividing the anticipated amount of sand needed to build the Phipps, Mid-Town and the Preferred Alternative Project and dividing those volumes by the life expectancy of each project. Once the previously authorized borrow areas are depleted of beach compatible sand, the Town of Palm Beach would possibly seek other borrow areas or utilize upland sand sources.

Water Column. As of September 2013, the Town of Palm Beach has identified 67 public and 103 private outfalls/discharges that currently direct stormwater onto the beach and dune system. Water discharges can cause localized scour/erosion of the adjacent beach and dune system, may affect water quality of the Atlantic Ocean, may negatively influence sea turtle nests on the beach as a result of scour or modification of the local water table, or may affect natural resources in the nearshore area. The Town of Palm Beach plans to implement a ten-year program (starting at the effective date of the BMA) to remove or divert all 67 of the public outfalls/discharges. It also plans to implement an annual education campaign targeting all residents with outfalls/discharges on the beach and dune system to consider actions to reduce or eliminate any influences. Improvements in this regard may berequired by the State of Florida as part of its permit issuance for the Proposed Action. As such, the proposed action may provide a stimulus for the non-federal interests to improve urban storm water runoff.

Water quality associated with the Project may be influenced by placement of both upland sand and stockpiled dredged sand. The placement of fill would produce a temporary increase in turbidity at the fill site and adjacent waters; however, the use of a truck haul approach minimizes these impacts. It is anticipated that water quality would return to ambient conditions with regard to turbidity shortly after completion of construction. Additionally, turbidity monitoring will be required throughout construction activities, and implementation of proper design and best management practices (BMPs) can minimize impacts due to the potential for elevated turbidity. The grain size of the sand material determines the amount of impact on organisms; elevated amounts of fine grained material can lead to long term effects, whereas smaller amounts will diminish quickly. Sand from either source must meet FDEP requirements for beach sand compatibility as per Florida Administrative Code, Rule 62B-41.007(2)(j). For the specific Project Area, any sand source must be consistent with the BMA cell-wide sediment quality specifications (FDEP, 2013). The sand source used for the County project must also meet the County's technical sand specifications outlined in the County's Annual Dune and Wetlands Restoration contract (Appendix B to the EIS). Utilizing fill material that meets the above specifications will minimize the potential project impacts to water quality.

Dry Beach and Dune. Within the Project Area (R-129-210 to R-138+551), there is currently 8.52 ac of dune area, 4.83 ac of beach area above (landward) of the berm crest and 16.34 ac of beach area below (seaward) of the berm crest. The dry beach is located between the toe of dune or scarp and the MHW line and extends along the entire Study Area, both updrift and downdrift of the Project Area. The dry beach in the Study Area is composed of carbonate-rich sediments formed from the remains of marine flora and fauna (FDEP, 1994). This area does not support much vegetation and is susceptible to wind and storm surge. It also provides recreational areas for human activities and nesting grounds for sea turtles and various species of shorebirds.

Much of the native dune system within the Study Area has been lost to beach erosion and upland development. In November 2013, a dune vegetation investigation was performed within the Study Area. The 2013 Habitat Characterization Report (CB&I, 2014) is provided as Appendix D. Areas of interest (where vegetation was identified based on aerial photography) were ground-truthed by biologists. Exposed and buried seawalls are intermittently spaced along the shoreline from R-129 to just south of R-133. Dune vegetation exists on the seaward side of buried seawalls in this area. The shoreline includes exposed seawalls south of R-133 to R-141. The dune located immediately south of Lake Worth Pier was dominated by sea oats while the dune located immediately north of the seawall at R-129 was dominated by bitter panicum grass. Seagrapes were the dominant dune vegetation identified throughout the remainder of the survey area, which terminated at R-133+500 where dune habitat ended and upland properties were bordered by seawalls instead of dunes. One exception, near R-133, was observed where dune vegetation was sparse. Overall, just less than half of the Project Area is fronted by dunes. The endangered plant species beach jacquemontia (*Jacquemontia reclinata*) was not present within the surveyed area (CB&I, 2014).

Dredged Sand Stockpile Area. The upland stockpile areas within the limits of the Mid-Town Project and the Phipps Project proposed for interim staging of the dredged material are already developed and designated as dredged-material temporary staging areas and their boundaries and function will remain unchanged. With monitoring for nesting sea turtles, shorebirds, and other species of concern proximate to the stockpile areas, no singular or cumulative significant adverse environmental impacts are anticipated from the stockpile activity. The transport of sand from the borrow area to the temporary staging area (within Mid-Town and/or Phipps) will increase vessel traffic near the Lake Worth Inlet. Transport of fill sand from the Mid-Town and/or Phipps stockpile areas to the beach site will increase truck traffic within local upland roadways during the construction period. These activities are not continuous but would occur for several months every few years. Both activities increase air pollution and carbon emissions. Equivalent activities have occurred in the past, and will continue through the present and future. Vessel and truck activities at the Inlet and stockpile area are all within existing, developed areas with similar purposes. Transport of the sand on the public roads cumulatively increases traffic and related impacts on these roads. Thus, there are no significant cumulative impacts associated with these factors.

Upland Infrastructure. The shoreline of the Study Area is comprised of hotels, condominiums, homes, and public parks, most of which are armored with seawalls (USACE, 2013; PBC-ERM, 2013). The proposed Project will increase the length of shoreline where sand is placed to mitigate beach erosion and decrease the potential for public and private property losses. Because the upland shorefront property along the

Project Area and adjacent shores is more or less fully developed, and because the proposed beach fill and level of storm protection is relatively small, the action is not anticipated to significantly alter (increase) the density of nature of upland development – when viewed in the cumulative context of past, present and future related activities. In the absence of the Proposed Action, and/or the absence of continued or future, similar beach fill actions in the overall area, it is not reasonably anticipated that development will decrease. Instead, in the absence of the Proposed Action and other beach fill actions, it is likely that property values may decrease and maintenance of the existing properties could increase, and seawalls and shoreline armoring may increase. Thus, in regard to upland development and related trends, there are no significant adverse cumulative effects anticipated with implementation of the project. Instead, adverse impacts are more likely associated with the No Action Alternative and/or the cumulative effects of discontinuing existing and future active beach management activities.

See Table 7-1 for a summary of the cumulative impacts to resources expected from future Palm Beach Island projects and project-related activities.

2.4 ACTIONS AFFECTING THE RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES OF CONCERN

Other significant actions that could potentially affect the resources of concern identified in this analysis (nearshore hardbottom, offshore sand borrow areas, water column, dry beach and dune, dredged sand stockpile area, and upland infrastructure) principally include adjacent beach restoration and related activities, beach lighting and urban storm water runoff (outfalls).

There are no other direct mechanical (e.g., pipeline) impacts to the hardbottom associated with the Proposed Action or other, adjacent actions. Beach fill placement along the Project Area shall be from the upland and a dredged sand stockpile (truck-haul) originating from the Phipps or Mid-Town project areas. Elsewhere in the region, where pipeline (hydraulic) delivery of beach fill material is implemented, there are no anticipated new hardbottom resource impacts. There are no other regional beach restoration activities that result in direct impact to hardbottom that have not or will not be reviewed by the USACE.

Sand fill placement within the project impact area has previously included dune restoration to partially restore sand eroded from the dune, above MHW. These activities have not advanced the beach or shoreline relative to pre-storm conditions. The sand fill for the previous activities has been from permitted upland sources or as a result of dredging offshore borrow areas. No adverse environmental effects have been identified from these activities. The Proposed Action would serve to enhance and partially replace ongoing non-federal actions for post-storm dune restoration. It would fulfill future requirements for dune restoration (in terms of both maintenance and storm protection) using high-quality, beach compatible sand from upland or offshore sources.

The historical and future placement of beach nourishment material adjacent to the project impact area can potentially result in cumulative impacts to the nearshore hardbottom and beach habitat.

An increased elevation of the beach berm combined with a loss of dune/coastal hammock vegetation may increase the exposure of the sea turtle nesting beach to artificial lighting. This lighting can lead to disorientation of nesting females as well as hatchlings, impeding their timely entry from the nest to the sea. To address this impact, to date, all beach nourishment activities along the Palm Beach County shoreline have incorporated beach lighting surveys and follow-up measures to reduce lighting impacts. The slopes, elevations and widths of the beach fill placement in the Project Area are likewise designed to minimize impacts to sea turtles. Beach lighting will be in accordance with local ordinances.

Urban storm water outfalls and discharges can cause localized scour/erosion of the adjacent beach and dune system, may affect water quality of the Atlantic Ocean, may negatively influence sea turtle nests on the beach as a result of scour or modification of the local water table, or may affect natural resources in the nearshore area.

3.0 AFFECTED ENVIRONMENT

3.1. RESPONSES BY RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES TO CHANGE AND THEIR CAPACITY TO WITHSTAND STRESSES

The nearshore hardbottom adjacent to the Project Area exists in a shallow, turbulent, highly dynamic, energetic and sedimentary environment. The hardbottom resources are subject to frequent burial and exposure by sand, turbidity, and abrasion. The nearshore environment where direct, indirect and cumulative impacts are anticipated is defined as the Study Area and extends from R-127 to R-141+586. Within the Study Area, aerial delineation of hardbottom resources between 2003 and 2014 revealed a highly variable range of exposed hardbottom acreage between 3.06 acres (2009) and 51.20 acres (2006). The time average amount of exposed hardbottom in this time period is 28.43 acres. The most recent delineation from 2014 aerials revealed approximately 49.77 acres of hardbottom in this area.

The natural physical stresses of the nearshore habitat limit the biodiversity and survivability of epibenthic species. Due to these conditions, some of the nearshore hardbottom within the intertidal zone is bare scoured rock or may be colonized primarily by turf algae. However, several sessile organisms are well adapted to the prevailing conditions and often cover high portions of the exposed rock. One such organism is the sabellarid polychaete *Phragmatopoma lapidosa*, which forms large gregarious colonies commonly referred to as worm rock or worm reefs (Kirtley and Tanner, 1968; McCarthy et al., 2003). The worm reef colonies are composed of sand grains cemented together to form rugose structures that add relief and structural complexity to existing natural and artificial hard bottom. The growth of worm reef depends on a combination of available hard substrate, wave energy, sediment availability, and larval supply (McCarthy et al., 2003). Wave impacts from fairly frequent to severe storms can dislodge and destroy much or almost all of the worm reef colonies that have formed upon the nearshore coquina rock outcrops. The colonies are typically reformed within a few summers thereafter (McCarthy et al., 2003). Worm reefs support fish species and associated assemblages of organisms, such as decapod crustaceans (Gore et al., 1978); however, the 2013 characterization of the Study Area documented average wormrock cover of less than 1%. This survey did document 56 species of fish, 2 species of scleractinian corals, 4 genera of octocorals, 14 genera of macroalgae and other functional group organisms such as sponges, tunicates, hydroids, bivalves, barnacles, turf algae, anemones, bryozoans, and zoanthids.

Beach nourishment and construction of shore protection structures can introduce increased turbidity and sedimentation to the nearshore habitat. Turbidity can affect feeding, movements, and respiration in fishes. High concentrations of suspended or fine sediments can clog or abrade gills. The ability of these biota specific to the existing hardbottom resources to survive within this dynamic and turbulent environment indicates their tolerance to high levels of sedimentation, turbidity and periodic burial. Additional sediment may directly or indirectly affect the nearshore hardbottom resources. The degree to which this sediment will impart change or stress to the system is in large part associated with the amount and quality (grain size, compatibility) of the sediment, and the lines, grades and slopes to which the sediment is placed. As previously mentioned, it is anticipated that the mechanical placement of beach compatible sand will minimize these impacts.

While nesting marine turtles are adapted to a dynamic, energetic, sandy environment, non-nesting emergences may result on beaches that are overly compact due to recent beach nourishment activities. Additionally, hatching success may be adversely impacted by nests established on sand beaches with poor gas exchange, or which are subject to physical erosion or frequent inundation.

The human community (i.e. upland infrastructure) response to stresses such as erosion and storm damage have been to construct seawalls and to nourish and restore dunes within the Project Area. The No Action Alternative will not increase the capacity of the human community to withstand those stresses. The Applicants' Preferred Alternative will increase the current level of storm protection in the Project Area by adding sand to the beach and dune and will add to the resistance of the human communities against future stresses with future maintenance in the form of renourishment.

3.2. STRESSES AFFECTING RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES AND THEIR RELATION TO REGULATORY THRESHOLDS

Critical levels of sedimentation (in terms of thickness and temporal length of sand burial) and sedimentary abrasion affecting the survival or growth of macroalgae, wormrock, infauna and other biota associated with the nearshore hardbottom are likely cross-dependent on numerous other factors and vary with the biota, and are otherwise not definitive. Sand bars have been observed to move in and out of the nearshore habitat along the Project Area very quickly (over the course of days) making the change in volume difficult to measure..

Relevant State of Florida turbidity thresholds require that activities maintain less than 29 NTU above background levels within the mixing zone. The use of a turbidity mixing zone would be done in accordance with the 401 WQC and Rule 62-4.244(5)(c), F.A.C. It is not anticipated that the Proposed Action will result in turbidity that reaches or approaches this level due to the nature of the proposed beach fill sediment with low (<2%-3%) fines fraction, and a truck haul approach will be utilized where the sand will be placed mechanically rather than hydraulically.

Beach nourishment may affect sea turtle nesting activity if sand compaction inhibits the turtles from being able to dig and lay their nests. Standards developed by the USFWS require that measured beach compaction be less than 500 cone penetrometer units at 6 inches, 12 inches, and 18 inches below beach grade, in order that the beach be compliant with marine turtle nesting activity (else, the beach must be tilled). Monitoring for beach compaction, and subsequent tilling when required, is undertaken for all beach restoration activities in the County. The standards developed and followed in this regard have thus far appeared to be appropriate relative to their objectives.

Physical stresses affecting the human community (i.e. upland infrastructure) include waves, currents, and storms. Waves and currents transport sediments in the parallel (longshore) and perpendicular (cross-shore) directions within the littoral zone. Erosion, accretion or stabilization of the shoreline are primarily affected by this longshore transport of sediments. (USACE, 2006). The seasonal variability of storms and waves results in two distinct classes of waves, storm waves and swell waves, which have completely different effects on the beach profile (USACE, 2006). In general, storm waves erode the beach berm moving sediments to the offshore portion of the profile. Swell waves replace sediments back onshore resulting in beach accretion (Silvester and Hsu, 1993).

As of June 2015, the FDEP has classified this entire Project shoreline as “critically eroded”, (FDEP, 2015); additional areas were designated within the Project Area due to the effects of Hurricane Sandy in 2012. According to FDEP (2015), “A critically eroded area is a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects”.

3.3. BASELINE CONDITIONS FOR RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES

Nearshore Hardbottom. The general occurrence of nearshore hardbottom along the project impact area was described during the baseline characterization (CB&I, 2014). Aerial delineation of the nearshore hardbottom identified 49.77 acres along the Study Area shoreline (R-127 to R-141+586) in 2014.

A collection of aerial photography with sufficient clarity (in terms of water clarity, surf and turbulence, cloud cover, etc.) can assist with accurately identifying and quantifying the amount of exposed nearshore hardbottom along this coastline, and is included in the analysis. The 2014 results represent the most recent, delineation of the hardbottom. However, a time-averaged series of aerial photographs from 2003 to 2014 were used to identify and assess impacts since there is a substantial disparity among multiple years, ranging from a high of 51.20 acres of exposed hardbottom in 2006 to a low of 3.06 acres in 2009. Persistent hardbottom is that which is constantly exposed over a given timeframe. A very small area (0.000392 acres [17.1 ft^2]) of hardbottom was identified between 2003 and 2014 located approximately 350 feet north of R-133.

Sea Turtles. Baseline conditions for marine turtle nesting activities have been previously established through mostly annual monitoring conducted in Palm Beach County since before 1980. Palm Beach County beaches serve as important nesting habitat for threatened and endangered sea turtle species. Although Palm Beach County beaches comprise only 3% of the State's ocean shore length, the County accounted for 26.7% of the nesting in the State in 2015 (FWC, 2015; Palm Beach County, 2014; U.S. Census Bureau, 2012). In the same year, loggerhead, green and leatherback sea turtles accounted for 70.7%, 27.9% and 1.4%, respectively, of the nesting in the County (FWC, 2015). These three species are known to regularly nest on Palm Beach County beaches.

Water Column. Palm Beach County is one of the more heavily urbanized areas within the State of Florida. The rapid population growth is a suspected contributor to the noticeable environmental degradation of water quality along this area. These declines in water quality have been brought about mainly through the discharge of nutrient-laden sewage and storm water runoff into canals (FDEP, Division of Water Resource Management, 2003). Three major drainage canals of eastern Palm Beach County discharge into Lake Worth Lagoon (LWL). From LWL and the Atlantic Intracoastal Waterway (AICW), two maintained inlets (Lake Worth Inlet and South Lake Worth Inlet) provide access to the Atlantic Ocean; therefore, discharges and inflows eventually reach coastal waters. According to the FDEP, Division of Water Resource Management (2003), this runoff may carry bacteria, viruses, oil and grease, toxic metals, and pesticides into urban canals and eventually coastal waters.

Both Lake Worth Inlet and South Lake Worth Inlet provide a mechanism for natural flushing and exchange between LWL and the Class III oceanic waters off the coast of Palm Beach County. Class III waters are defined as areas suitable for recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife (FDEP, Division of Water Resource Management, 2003). One of the major impediments to coastal water quality within the County is high turbidity. Turbidity, measured in Nephelometric Turbidity Units (NTU), is a measure of the loss in water clarity due to the presence if suspended particulates. The turbidity within this region is generally lowest in the summer months and highest in the winter months in relation to the frequency of storm events. This storm-induced high turbidity is caused by the re-suspension of organic matter and sediments by wave action during these storm events. High turbidity events are temporary in nature and return to lower levels within several days to several weeks following a storm, depending on the duration of the storm event.

Offshore Sand Borrow Areas. None of the alternatives being considered includes dredging directly from an offshore borrow area; however, the Town of Palm beach proposes to utilize a stockpile of dredged sand from the Phipps Project and/or the Mid-Town Project for the Project Area within the Town of Palm Beach limits. These projects dredged sand from North Borrow Area 1 (NBA1), South Borrow Area 2 (SBA2). Section 6.1 below describes the conditions of NBA1 and SBA2 in detail.

Birds. Piping plovers have been observed within the Study Area (near the Lake Worth Pier), indicating the area is utilized by this species (e-Bird, 2015a). Rufa red knots have not been documented in the Project Area but have been documented in Palm Beach County (e-Bird, 2015b). Florida sandhill cranes have been observed in Palm Beach County (e-bird, 2015c); however, the closest observation was approximately three miles west of the Project Area. Wading birds have been observed in Palm Beach County (e-bird, 2015d; 2015e; 2105f; 2015g). Sightings of the reddish egret and roseate spoonbill are sparse near the Project Area, while the little blue heron and tricolored heron are more common.

Human Communities. The upland developments along the shoreline in the Study Area are comprised of hotels, condominiums, homes, and public parks, most of which are armored with seawalls (USACE, 2013; PBC-ERM, 2013a).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1. CAUSE-AND-EFFECT RELATIONSHIPS BETWEEN HUMAN ACTIVITIES AND RESOURCES, ECOSYSTEMS, AND HUMAN COMMUNITIES

Anthropogenic factors that may principally, and potentially, result in substantial effects to the nearshore hardbottom communities in the project impact area would be shore protection, pollution, mechanical destruction, and overfishing. Of these, only shore protection activities are pragmatically relevant. A source of pollution may be stormwater outfalls upon the beaches, and these outfalls (67 public and 103 private outfalls/discharges) could be modified by non-federal actions in the future, particularly as the Proposed Action may be implemented. Mechanical destruction of the hardbottom (by dredging or displacement, etc.) is not known to occur or likely to occur at this location. Recreational fishing occurs along the nearshore hardbottom, from the beach and Lake Worth Pier, but is not known to be unusually frequent or abundant in the quantity of catch.

Shore protection activities can affect the nearshore hardbottom by: (1) direct burial/sedimentation by sand placement: (2) indirect burial/sedimentation by alongshore or cross-shore diffusion (transport) of sand across the hardbottom; (3) increased turbidity; (4) accumulation of sand by the construction of groins intended to entrap or stabilize sand movement; and (5) beach erosion exacerbated by seawalls and armoring.

Mechanical activities and artificial lighting along the beach can adversely impact marine turtle nesting by: (1) physical impact; (2) burial, inundation and/or exposure of nests; (3) establishment of beach sediment that is not compatible with nesting; and (4) disorientation of adults and hatchlings. Permit conditions and construction BMPs have been developed to avoid these potential adverse impacts to nesting sea turtles.

Direct burial of nearshore hardbottom may result in mortality of macroalgae and faunal epibenthic species, as well direct burial of newly settled life stages of fishes. Suspension of sediment may cause mortality to eggs and larvae of marine and estuarine fish, and a reduction in feeding in juvenile and adult fish. Settlement and shelter of juvenile fish may be reduced by the gradual burial of nearshore hardbottom habitat. Foraging sea turtles and fish could be displaced to adjacent areas of hardbottom. It is anticipated that reduced feeding success may influence survival, year-class strength, and recruitment of juvenile fish that inhabit nearshore hardbottom. For these reasons, the Proposed Action includes compensatory mitigation to serve towards replacing ecological functions potentially lost with the permanent and temporary burial of existing nearshore hardbottom in the Project Area.

4.2. MAGNITUDE AND SIGNIFICANCE OF CUMULATIVE EFFECTS

The Proposed Action is anticipated to permanently impact between 3.86 and 3.99 ac of hardbottom and temporarily impact between 9.53 and 9.93 acres of nearshore intertidal and subtidal hardbottom. Through a detailed assessment based upon field prototype investigations and related analysis, the proposed mitigation in the form of an artificial reef has been evaluated and developed in terms of its likely ability to replace ecological functions lost due to implementation of the Proposed Action. Mitigation reefs cannot be assumed to replace all ecological functions for the same suite of species or life stages that exist on natural reefs in shallower water. There are likely species-specific differences in sensory perception to water depth, wave energy, light penetration, turbidity, and other factors that may be different at the proposed mitigation site. In addition to these deterministic factors, there is an element of uncertainty associated with the colonization of newly available substrate by marine organisms that leads to variability and unpredictability. Nevertheless, over time the mitigative artificial reefs will lessen the significance of the initial adverse impact affected by direct burial of the landward edge of the nearshore hardbottom. Detailed discussion of the anticipated functional loss and functional gain associated with the biotic community and habitat at the impacted (nearshore hardbottom) and mitigation reef features is presented in the UMAM analysis in Appendix H of the EIS and details of the mitigation plan are provided in Appendix I of the EIS.

Annual monitoring of marine turtle nesting success on Palm Beach County beaches have indicated no significant adverse impacts associated with prior or ongoing renourishment activities. The Proposed Action will utilize sand from the same sources utilized for these other activities and shall adopt similar fill placement geometries, construction restrictions and monitoring protocols.

The Proposed Action may result in a cumulative increase in sand placement along the project impact area, as it will replace dune restoration that has been periodically required by the Applicants in response to dune erosion effected by severe storms. The Town of Palm Beach has previously placed 56,000 cy of dredeged sand along the dune in Reach 8 between R-129 and R-133 trucked from the 2011 Phipps Ocean Park Beach and Dune Restoration Project. The County has placed upland sand along the dune between R-135+460 and R-137+410 as part of the South Palm Beach/Lantana Dune Restoration project which was constructed six times between 2003 and 2009. The amount of sand placed ranged from 1,000 to 11,000 cy. The Applicants' Preferred Alternative proposes to place a total of 142,800 cy of sand on the dune and the beach as opposed to only on the dune. This would include 65,200 cy of dredged sand to be placed along the Town of Palm Beach shoreline, of which 61,800 cy would be placed above MHW and 77,600 cy of upland sand to be placed along the County shoreline, of which 51,000 cy would be placed above MHW. The Proposed Action should act to ensure the beach-compatible quality of the placed sand through the placement of high-quality sand from either upland or offshore sand sources that has been successfully used on the adjacent shorelines.

4.3. MODIFICATION OR ADDITION OF ALTERNATIVES TO AVOID, MINIMIZE, OR MITIGATE SIGNIFICANT CUMULATIVE EFFECTS

Special conditions of any authorization for the proposed projects would reduce the potential for significant cumulative effects to environmentally sensitive nearshore resources from turbidity and sedimentation through turbidity monitoring and protocols to stop all activities if the limits are exceeded.

This EIS considered eight beach-fill project alternatives, which includes the No Action Alternative. The proposed projects sought to avoid and minimize project-related impacts to the greatest extent possible while maintaining the project objectives and to likewise implement mitigation for unavoidable impacts. Development of the Projects' mitigation reef structures has been proposed and should provide probable success of the reef in replicating displaced ecological function of the impacted nearshore hardbottom, by better emulating the physical nature of the impacted resource and decreasing the possibility of subsidence of the structure.

4.4. MONITORING OF THE CUMULATIVE EFFECTS OF THE SELECTED ALTERNATIVE AND ADAPTIVE MANAGEMENT

A physical and biological monitoring program will be implemented to evaluate the pre- and post-construction conditions, performance and effects of the proposed beach fill placement, nearshore hardbottom, and mitigation reef. Details of this program are described in Chapter 5 (Mitigation) of the EIS. This use of adaptive management actions shall be taken based on the results of pre- and post-construction monitoring efforts.

In the present instance, the Proposed Action and its predicted effects are relatively small and reversible. The resources of the nearshore hardbottom that will be affected by the proposed sand placement exist in a dynamic environment and are adapted to naturally high sedimentation, sand abrasion, turbidity, and cyclical sand burial and exposure. The physical and temporal scales of the sand placement and resultant impacts to the beach and nearshore hardbottom are relatively small. The scale of the Project can be readily adapted to respond to the monitored effects of the Project's action, relative to the predicted effects described herein.

The project shall likewise implement monitoring during construction attendant to threatened and endangered species protection, turbidity, cultural resources, beach compaction, beach lighting and marine turtle nesting and success, and sediment-quality assurance. These monitoring activities are described in Section 5.1 of the EIS (Environmental Commitments). Each activity includes prescribed measures for monitoring and real-time response (adaptive management) to the monitoring observations. Identical or analogous monitoring protocols and measures have been successfully utilized in the past for projects constructed within the affected region and elsewhere throughout the State of Florida.

5.0 PALM BEACH ISLAND PROJECTS AUTHORIZED BY THE BMA

The following sections describe the Palm Beach Island projects currently authorized by the Beach Management Agreement (BMA) (FDEP, 2013).

5.1. LAKE WORTH INLET MAINTENANCE DREDGING

The permitted activity is periodic maintenance dredging (202,000 cy average annual volume [FDEP, 2013]) by USACE Permit No. 0216012-001-JC of the entire navigation-related complex at Palm Beach Harbor/Lake Worth Inlet. The BMA authorizes the Town of Palm Beach to become a co-applicant with the U.S. Army Corps of Engineers (USACE) for the placement of beach quality sand from the dredging activity and to use the sand placement sites identified below. Dredged material will be placed within the beach-nearshore template. The berm will have an elevation of approximately +8.7 feet (MLW), with a 1V:20H seaward slope. Placement of material may begin immediately south of the south jetty, and proceed in a southerly direction approximately 3,450 feet near FDEP R-monument R-79. If the authorized beach placement area immediately south of the Lake Worth Inlet is filled, then beach-quality sand may be placed within the Mid-Town Beach or the Phipps nourishment template. Within the entrance channel (between USACE Stations 25.0 and 56.0), shoals of less than 5,000 cubic yards may be transferred to deeper parts of the channel to temporarily alleviate navigational hazards. The construction activity will adhere to a Sediment Quality Control/Quality Assurance Plan that was approved by the Department on July 20, 2006.

5.2. LAKE WORTH INLET SAND TRANSFER PLANT

Under the BMA, the FDEP authorizes improvements to the sand transfer plant owned by the Town of Palm Beach at Lake Worth Inlet and authorizes the operation and maintenance of the sand transfer plant. Construction improvements include a new pump house facility immediately adjacent to the existing bypass plant on the north jetty of the Lake Worth Inlet and the construction of an additional discharge pipeline. The new facility will also house a booster pump for a second pipeline to transport material from the north jetty approximately 4,500 feet south to an alternate discharge point near R-79 within Reach 2 in the Town of Palm Beach. The BMA authorizes the new pipeline to be directionally drilled beneath the inlet channel and remain below the sea bottom until it reaches a beach discharge structure anchored to pilings and enclosed in architectural formwork on the beach.

During the operation phase, the FDEP authorizes the bypassing of approximately 162,000 cubic yards of beach-quality sand per year to the beach on the south side of the inlet. Material discharge rates from the bypassing plant will be less than 5,000 cubic yards per day and on an intermittent basis as coastal littoral transport processes move sand to the intake pipe of the bypassing plant on the north jetty. The Town of Palm Beach will utilize the two discharge pipelines as needed to maintain the beach in Reach 1 and Reach 2, and protect the shore-based discharge pipeline structure located immediately south of the inlet.

5.3. MID-TOWN BEACH NOURISHMENT PROJECT

The BMA authorizes periodic beach nourishment to maintain the beach restoration project located in the central portion of the Town of Palm Beach between R-89 and R-102 (Reaches 3 and 4), and maintenance repairs to the eleven existing groins. In conjunction with this activity, the FDEP authorizes the construction and maintenance of one additional groin located at R-99.3.

The beach fill design consists of a 25-foot wide design berm plus advance beach nourishment placed seaward of the design berm at an elevation of +9 feet NGVD for an average construction berm width of 180 feet. The beach construction berm is designed to a 1V:10H (vertical; horizontal) slope. The volumetric amount will be based on existing site conditions at the time of construction, but will not exceed the permitted template. The Department authorizes the Town of Palm Beach to obtain beach compatible sand from offshore borrow areas (see Section 6.0). Alternatively, the Town of Palm Beach may obtain beach compatible sand from an approved upland source consistent with the cell-wide sand specifications outlined in Article D-2 and truck-hauled to the beach through designated beach maintenance access sites. If beach compatible sand becomes available from the maintenance dredging of Lake Worth Inlet by the USACE, it may also be used as fill material for the portion of this beach template located between R-monuments R-95+108 feet and R-101.4.

The Department authorizes repairs and maintenance to the eleven groins constructed in conjunction with the 1995 beach restoration (FDEP File No. 50-273953-9 and DBS9A0352-PB) not to exceed the parameters of the original design as shown in the approved plans and specifications. The groins are spaced approximately 325 feet apart on average and vary in length from 88 feet to 167 feet with a crest elevation at +6.0 feet NGVD, toe at approximately -1.0 feet NGVD at the landward end and approximately -4.0 feet at the seaward end. In addition, the construction and maintenance of one additional groin is authorized near the south limits of the project area at R-99.3. The authorized groin will be 98 feet long in the shore-normal direction and 12 feet wide at the crest. The sand placement described above will completely cover the groin.

5.4. PHIPPS OCEAN PARK BEACH RESTORATION PROJECT

The BMA authorizes periodic beach nourishment to maintain the beach restoration project located in the south portion of the Town of Palm Beach (Reach 7) between R-119 and R-125 and periodic placement of sand to maintain the restored dune in the northern portion of Reach 7, from R-116 to R-119. In addition, the FDEP authorizes beach restoration and periodic beach nourishment between R-monument R-125 and the northern boundary of the Lake Worth Municipal Park at R-monument R-127 (previously the northern segment of Reach 8). Construction and maintenance of these three contiguous segments may be conducted separately or together and material may be stockpiled on the berm between R-119 and R-126 to replenish the restored dune.

The beach fill design from R-119 to R-127, consists of a +9 feet NGVD berm elevation with an average construction berm width varying from 190 feet to 455 feet. The restored dune has a typical crest width of 25 feet at an elevation of +16 feet NGVD, with a 1V:3H slope down to the beach berm, except north of R-119 where the dune crest is +10 feet. The volumetric amount will be based on existing site conditions at the time of construction, but will not exceed the permitted template.

The BMA authorizes the Town of Palm Beach to obtain beach compatible sand from offshore borrow areas (see Section 6.0), or any offshore source consistent with the cell-wide sand specifications in Article D-2 of the BMA. Alternatively, the Town of Palm Beach may obtain beach compatible sand from an approved upland source consistent with the cell-wide sand specifications and truck-hauled to the beach through designated beach maintenance access sites, including the proposed Project Area in Reach 8. The Phipps Project includes periodic dune restoration south of the Lake Worth Pier in Reach 8. The dune-only portion, from R-129 to R-134 (within Reach 8), will be constructed to an elevation of +10 feet NAVD with a 1V:3H slope.

5.5. PALM BEACH GROIN REHABILITATION

The BMA authorizes repair, rehabilitation, or removal of existing groins within the Reaches 2, 4, 5, and 6, as described in the 2011 Coastal Structures Plan for the Town of Palm Beach. The adaptive management strategy for this authorization includes revising the list of groins needing repair, rehabilitation, or removal, and updating the list of groins provided in Table 4 of the BMA .

In August 2015, a BMA Individual Project Approval (IPA) permit application was submitted to FDEP which included a total of 124 groin structures that have been identified within

Reaches 2 through 6 of the Town of Palm Beach. Of the 124 groins identified, it is anticipated that 75 of them will require some level of work. Thirty-four (34) groins are expected to be removed to the greatest extent practicable based on the condition of the beach at the time of construction. Forty-one (41) groins are expected to be removed and replaced with a concrete king pile and panel groin (Table 5-1). The modular nature of the pile and panel groin allows the structure to be adjusted and customized to resemble the size and dimensions of the groins to be replaced. The pile and panel groins also allows for the structure to be adjusted following construction if needed.

Table 5-1. List of groins that have been repaired, rehabilitated, or removed.

Reach	Structure ID	Approximate Structure Length (feet)
Reach 2	G82084	160
	G80897	120
	G76093	150
	G74650	100
	G73655	200
	G73376	210
	G73073	220
	G72800	240
	G72426	190
	G72010	170
	G71633	150
Reach 3	G71208	120
	G70910	230
	G70651	210
	G70451	230
	G70027	90
	G69813	180
	G68412	240
Reach 4	G60352	230
	G59940	240
	G59451	240
	G59002	230
	G58554	200
Reach 5	G57512	70
	G57312	140
	G57136	170
	G56253	170
	G54947	200
	G54602	200
	G51896	160
	G51225	240
	G50946	230
	G50601	230
	G50249	180
	G49866	210
	G49583	210
	G49351	210
	G49088	200
	G48818	190
	G48015	70
Total	**41**	**7,530**

5.6. DUNE AND BACKSHORE BERM RESTORATION AND MAINTENANCE

The BMA authorizes the BMA Participants to construct artificial dunes within the Agreement Area as described below. Artificial dunes constructed in the Agreement Area are intended to protect upland properties and to protect and enhance habitat. The FDEP identified segments of shoreline within the Agreement Area with conditions suitable for the construction of sustainable dune features and developed procedures the BMA Participants must follow to construct dunes on those shorelines. Implementation of this Article will not only meet the goals stated above, but also provide more efficient and predictable permitting of artificial dunes in the Agreement Area.

The FDEP identified four dune conditions, permittable by the BMA, based on aerial and visual inspection of existing dunes, armoring, beach widths and elevations within the Agreement Area. These areas are identified in BMA Appendix A-4. Condition 1 is excellent for dune restoration projects, having a wide and elevated back beach berm. Condition 1 shorelines contain the island’s best existing dune features. Condition 2 is good or appropriate for dune projects, having a sufficiently wide back beach berm on which fill can be placed. These shorelines are often steep and armored and, for this reason, the sustainability of the dune feature is lower. Condition 2 dunes could be considered sacrificial, meaning dunes constructed in these locations will likely provide temporary relief from coastal erosion until persistent wave activity transports material from the template. Condition 3 is poor for dunes, as constructed dunes are likely not sustainable and are subject to erosion from high frequency storms. Condition 4 includes the dune and backshore berm designs for the Mid-Town and Phipps projects.

The BMA Participant may use an offshore borrow area to obtain beach compatible sand that is stockpiled during beach nourishment and then transported to the dune restoration site. Alternatively, beach compatible sand may be obtained from an approved upland sand source consistent with Article D-2 of the BMA. This would allow the placement of artificial dunes in new locations or the restriction of dune placement in others. Changes in areas authorized for dune placement will require a formal amendment of the Agreement. BMA Participants wishing to construct a dune must meet the criteria set forth in Appendix D of BMA, and submit the information required in Appendix F-1. Before constructing a dune, the BMA Participant must follow the authorization procedures in Article I.

6.0 PREVIOUSLY AUTHORIZED OFFSHORE BORROW AREAS

Based upon the information and analysis provided by the Applicant, the material to be excavated from the proposed borrow areas for placement in the beach project areas is expected to maintain the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system pursuant to Rule 62B41.007(2)(j), F.A.C. The proposed borrow areas include at least a 1000-foot buffer between the borrow area and any adjacent hardbottom. Potential borrow areas are shown in Figure 1-6. The 2016 nourishment of Phipps and Mid-Town dredged sand from offshore borrow areas NBA1 and SBA2; however, SBA3 is also included in the description below because the Town may use it for future nourishment events.

6.1. OFFSHORE BORROW AREAS NBA1, SBA2 AND SBA3

6.1.1. NORTH BORROW AREA 1 (NBA1)

North Borrow Area 1 is a southward extension of the borrow area used for the 2009 Juno Beach Restoration Project and is located 1 to 2 miles north of Lake Worth Inlet in water depths between 40 and 60 feet approximately 2,500 feet offshore of Singer Island (Figure 1-6). The coarsest material within this borrow area occurs along the offshore boundary. In general, the coarser material is a subsurface layer 5-10 feet thick under several feet of fine sand. The estimated 2.8 million cubic yards of material within NBA1 is based on a nominal cut thickness of 15 feet. Core composite values range from 0.25 to 0.31 mm with a composite value for NBA1 of 0.276 mm and silt content of less than 2%. Based on the data provided, the selected regions of the North Borrow Area 1 contain beach compatible material (FDEP, 2013).

6.1.2. SOUTH BORROW AREA 2 (SBA2)

South Borrow Area 2 is adjacent to Reach 7 and Phipps Ocean Park between R-110 and R-120 in water depths of 24-36 feet between the first and second reef (Figure 1-6). The estimated volume of 1.68 million cubic yards is based on a nominal cut thickness of 10 feet. The cores collected show a mix of fine sand and shell fragments. Some of the cores contain coral or rock fragments. Although a few scattered rock fragments were found in the cores, the occurrence of the rock fragments was not extensive enough to identify continuous lenses or layers of rock rubble. Core composite values range from 0.21 to 0.36 mm with a composite value for SBA2 of 0.29 mm and silt content of approximately 1% (FDEP, 2013).

6.1.3. SOUTH BORROW AREA 3 (SBA3)

South Borrow Area 3 is adjacent to Reach 8 from Lake Worth Pier (South of R-128) to the city limits of the Town of Palm Beach (R-134) in water depths of 20-35 feet (Figure 1-6). SBA3 is located landward of Borrow Area III (R-127 to R-130) and immediately adjacent to Borrow Area IV (R-132 to S of R-134) used for the Phipps permit. SBA3 is same location as Borrow Area V proposed for Reach 8, only with slightly modified boundaries. The estimated volume of 1.83 million cubic yards is based on a nominal cut depth of greater than 10 feet. The cores show a mix of fine sand and shell fragments, and some contain rock and coral fragments. Core composite values range from 0.17 to 0.33 mm with a composite value for SBA3 of 0.25 mm and silt content of approximately 1%. Based on the data provided, the majority of the South Borrow Area 3 study area contains beach compatible material (FDEP, 2013).

6.2. APPROVED MIXING ZONES

Relevant State of Florida turbidity thresholds require that activities create less than 29 NTU above background levels within the approved mixing zone. The use of a turbidity mixing zone would be done in accordance with the 401 WQC and Rule 62-4.244(5)(c), F.A.C. Temporary mixing zones for each of the two beach nourishment projects already authorized (Mid-Town and Phipps) would be implemented in order to construct the projects. A mixing zone of 150 meters offshore and downdrift would be implemented in accordance with state water quality standards for the Mid-Town beach nourishment activities. A mixing zone of 1000 meters downdrift and 300 meters offshore for the nearshore and beach placement site for the Phipps Project beach nourishment activity would be implemented in accordance with state water quality standards. This mixing zone shall only be valid during the construction period of the proposed activities. The Applicants have not requested a variance to the standard mixing zone at this time for the proposed project. In any event, they would be required to monitor the waters within the Project Area to avoid water quality degradation (FDEP, 2013).

7.0 CUMULATIVE IMPACTS TO RESOURCES

Table 7-1 summarizes cumulative impacts, both positive and negative, that are expected to result from continued construction of coastal projects on Palm Beach Island, including all activities associated with those projects authorized by the BMA (see Section 5.0) and with the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project. Impacts to wildlife, habitat, and the human environment are considered. These resources were identified during the scoping process and EIS preparation. As stated in Section 2.2, the temporal scope of this analysis is 50 years, The proposed projects may be authorized under a 10-year permit and would allow for initial project construction and maintenance (renourishment) for up to three renourishments. If the projects were constructed on a regular basis, the anticipated impacts summarized in Table 7-1 assume that the actions presented will be repeated for a period of at least 50 years.

Table 7-1. Cumulative impacts expected from Palm Beach Island projects and project-related activities.

Impacts to Resources	Dredging of Borrow Areas and Inlets	Lake Worth Inlet Sand Bypassing	Transport of Sand from Mines	Placement of Sand on Beach and Dune (Above MHW) (excludes inlet bypassing)	Placement of Sand in Nearshore Marine Habitat (Below MHW)	Groin Construction/Rehabilitation	Construction of Artificial Reefs
Nesting Sea Turtles and Loggerhead Terrestrial Critical Habitat Unit LOGG-T-FL-12	NA	Bypassing activities may occur during turtle nesting season. Construction of two additional discharge pipelines as proposed in the BMA would expand the impact area affected by bypassing. Compaction or other physical and chemical changes may impact nesting. Continued bypassing activities mean repeated disturbance to the habitat, but also maintain the stability of nesting beaches on Palm Beach Island.	NA	Construction will avoid peak nesting season and will use compatible sand. However, compaction or other physical and chemical changes may impact nesting. Compaction will be mitigated by annual testing and tilling. Artificial lighting could lead to disorientation of nesting females and hatchlings. Lighting will be in accordance with local ordinances and permit conditions. Continued projects mean repeated disturbance to the habitat, but also maintain the stability of nesting beaches on Palm Beach Island.	Construction will avoid peak nesting season.	Construction will avoid peak nesting season. Post-construction, groins may impede access to/from the beach for nesting/hatchling sea turtles. Groins may also cause downdrift erosion to sea turtle nesting habitat. However, the structures also help to stabilize beach habitat. Artificial lighting could lead to disorientation of nesting females and hatchlings. Lighting will be in accordance with local ordinances and permit conditions.	NA
Swimming Sea Turtles and Loggerhead Marine Critical Habitat Unit LOGG-N-19	Hopper dredging, and sometimes cutterhead dredging, occasionally results in sea turtle entrainment and death. The noise generated during dredging may also deter swimming sea turtles from the borrow and nearshore area. Turtle trawling for hopper dredging may be required by permits and or the NMFS Biological Opinion thus minimizing the impact to turtles.	NA	NA	NA	Burial of nearshore hardbottom could prove to have detrimental effects for juvenile green sea turtles by reducing the available foraging haibtat. However, it is estimated that this will be only a minor adverse effect and these impacts will be mitigated for through artificial reefs. Sea turtles may also be negatively impacted by turbidity and/or noise during the construction period.	In-water construction for the Project is unlikely due to the location of the nearshore hardbottom formations which will prevent barges from approaching the shoreline. However, the Palm Beach Groin Rehabiliation project may require in-water construction activities. All vessels will comply with NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006) in order to minimize direct impacts to swimming sea turtles during construction or maintenance of groins.	All vessels will comply with NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006) in order to minimize direct impacts to swimming sea turtles during construction of artificial reefs. Noise during construction may deter sea turtles from the area.
Florida Manatee	Manatees are rarely observed in water depths associated with the offshore borrow areas, so impacts from dredging the borrow areas are negligible. Dredging in the authorized channel may increase the potential for impacts to manatees. All vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) to reduce the potential for manatee impacts.	NA	NA	NA	There exists the possibility of increased turbidity and noise disturbing the animals during construction. These small disturbances are not anticipated to have major impacts. However more frequent nourishment projects may result in larger impacts.	If the groins are installed or repaired using in-water methods, direct impacts to manatees include the possibility of vessel strike. However, all vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) to reduce the potential for manatee impacts.	During construction of artificial reefs, direct impacts to manatees include the possibility of vessel strike. However, all vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) to reduce the potential for manatee impacts.

Table 7-1 (cont.). Cumulative impacts expected from Palm Beach Island projects and project-related activities.

Impacts to Resources	Dredging of Borrow Areas and Inlets	Lake Worth Inlet Sand Bypassing	Transport of Sand from Mines	Placement of Sand on Beach and Dune (Above MHW) (excludes inlet bypassing)	Placement of Sand in Nearshore Marine Habitat (Below MHW)	Groin Construction/Rehabilitation	Construction of Artificial Reefs
Smalltooth Sawfish	Dredging an offshore borrow or inlet increases potential for impacts with smalltooth sawfish, however NMFS has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge (NMFS, 1997). All vessels will comply with NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006).	Sand placed from bypassing may be transported into the marine environment. Potentially increased turbidity levels during bypassing activities are unlikely to impact sawfish, due to the rarity of their occurrence over nearshore hardbottom adjacent to Palm Beach Island.	NA	NA	Construction related turbidity and noise may disturb smalltooth sawfish. With mitigation measures in place, however, it is believed that the potential for smalltooth sawfish “take” will be greatly reduced (NMFS, 2006). Smalltooth sawfish are expected to avoid the small habitat area used during construction. However more frequent nourishment projects may result in larger impacts.	If the groins are constructed or rehabilitated using in-water methods, direct impacts to smalltooth sawfish include the possibility of vessel strike. However, all vessels will comply with NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006) in order to minimize impacts.	All vessels will comply with NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006) in order to minimize direct impacts to smalltooth sawfish during construction of artificial reefs. Noise during construction may deter smalltooth sawfish from the area.
Coral and Hardbottom	All BMA-approved borrow areas (FDEP, 2013) include at least a 1000 ft buffer between the offshore borrow areas and hardbottom habitat. Turbidity and biological monitoring will also be conducted as required.	Sand placed from bypassing may be transported into the marine environment. Sand bypassing activities may eliminate need for larger scale renourishments in Reaches 1 and 2.	NA	Sand placed above MHW may be transported into the marine environment at low rates.	With each nourishment project, sand is repeatedly placed on areas of intertidal and nearshore habitat, and spreading impacts areas farther offshore. Mitigative artificial reefs have been constructed for previous BMA projects, and will be constructed to offset hardbottom impacts from the proposed Project.	Project Groins will be placed with a buffer between the structures and hardbottom. BMA groins will be placed with a buffer between the structures and hardbottom to the maximum extent practicable. If impacts are caused, mitigation will be required.	Artificial reef sites have been/will be determined to avoid placement over hardbottom and will maintain at least a 25 ft buffer from adjacent hardbottom. Artificial reefs replace ecological function lost when hardbottom is buried.
Birds	No known effects.	Bypassing activities cause temporary disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend additional energy reserves to seek available habitat elsewhere, but may offset the need for larger scale episodic nourishments.	NA	Construction causes temporary disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend additional energy reserves to seek available habitat elsewhere.	Burial of infauna temporarily decreases the available food source for some shorebirds, forcing them to move to another area.	Construction causes temporary disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend additional energy reserves to seek available habitat elsewhere.	NA
Florida Panther	NA	NA	Increased traffic and noise disturbance may impact the Florida panther along the truck routes (FWC, 2012). As offshore sand is depleted, upland mines may be used more often, leading to greater cumulative impacts.	NA	NA	NA	NA

Table 7-1 (cont.). Cumulative impacts expected from Palm Beach Island projects and project-related activities.

Impacts to Resources	Dredging of Borrow Areas and Inlets	Lake Worth Inlet Sand Bypassing	Transport of Sand from Mines	Placement of Sand on Beach and Dune (Above MHW) (excludes inlet bypassing)	Placement of Sand in Nearshore Marine Habitat (Below MHW)	Groin Construction/Rehabilitation	Construction of Artificial Reefs
Dune Vegetation	NA	Sand placement from bypassing activities will provide more sand to the dry beach in the permitted fill templates. This may increase the overall sand available to the dune vegetation system in those areas.	NA	Construction of beach and dune projects will aim to enhance dune habitat with minimum impacts to existing dune vegetation. Dune vegetation plans may be implemented to enhance dune projects.	NA	Groin construction will avoid impacting dune vegetation. If impacts occur,they will be mitigated for.	NA
Recreation	Potential for temporary decreased water clarity due to elevated turbidity during construction; potential to affect fishing conditions.	Increased area for recreational use though the bypassing area has limited access for the general public. There will be a temporary disturbance during bypassing activities near the discharge pipes on the dry beach.	Heavy truck use along State Road A1A may deter bicycling temporarily.	Increased area for recreational use; temporary disturbance during construction activities due to limited site access.	Potential for temporary decreased water clarity due to elevated turbidity during construction; potential to affect fishing conditions.	Increased area for recreational use of the beach; temporary disturbance during construction activities due to limited site access.	Potential for decreased water clarity due to elevated turbidity during construction; potential to affect fishing conditions. Artificial reefs provide recreational opportunities for diving, snorkeling and fishing.
Aesthetics	Temporary impact due to presence of offshore dredge and support vessels and pipelines to shore.	No known effects.	Increased traffic and noise disturbance may impact aesthetics located along truck routes.	Temporary impact due to construction equipment on the beach; long-term improvement due to wider beach.	Temporary impact due to construction equipment on the beach; long-term improvement due to wider beach.	Temporary impact due to construction equipment on the beach; long-term improvement due to wider beach.	Temporary impact due to presence of offshore vessels.
Water Column	Temporary, localized increase in turbidity during dredging activities; turbidity monitoring will ensure water quality standards are maintained.	Temporary, localized increase in turbidity during bypassing activities. No known impact to water quality.	NA	NA	Temporary, localized increase in turbidity during sand placement; turbidity monitoring will ensure water quality standards are maintained.	Temporary, localized increase in turbidity during groin construction; turbidity monitoring will ensure water quality standards are maintained.	Temporary, localized increase in turbidity during artificial reef construction; turbidity monitoring will ensure water quality standards are maintained.

8.0 CONCLUSION

The impacts presented in Table 7-1 include temporary and/or permanent impacts to resources. Compensatory mitigation has been or will be provided due to anticipated impacts to nearshore hardbottom resources. When considering cumulative impacts from all Palm Beach Island projects for the next fifty years, these temporary impacts will be repeated regularly within the system. The Town of Palm Beach and the County have already taken the forward thinking approach of managing and planning their coastal projects with a more holistic approach, rather than treat their projects on a separate standalone basis. The BMA was implemented to develop a coordinated, long-term process that facilitates predictable approval of qualifying coastal erosion control and inlet management activities within the Palm Beach Island coastal cell (Lake Worth Inlet to the South Lake Worth Inlet). The BMA is enabling the Town of Palm Beach, the County, and state and federal agencies to plan, authorize and monitor coastal projects in this area with a regional approach. The monitoring required by the BMA as well as monitoring required for the proposed Project should provide a vehicle to gain a better understanding of the cumulative impacts from these projects, and may improve the way these projects (or similar ones in the state) are implemented in the future.

9.0 LITERATURE CITED

CB&I (Coastal Planning & Engineering, Inc., a CB&I Company). 2014. Southern Palm Beach Island Comprehensive Shoreline Stabilization Project, 2013 characterization report. Prepared for The Town of Palm Beach. January 2014.

Council on Environmental Quality (CEQ), 1997. "Considering Cumulative Effects Under the National Environmental Policy Act." Council on Environmental Quality. Executive Office of the President. 722 Jackson Place NW. Washington DC 20503. January 1997.

e-Bird. 2015a. eBird: An online database of bird distribution and abundance: piping plover [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015b. eBird: An online database of bird distribution and abundance: red knot [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015c. eBird: An online database of bird distribution and abundance: Florida sandhill crane [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015d. eBird: An online database of bird distribution and abundance: little blue heron [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015e. eBird: An online database of bird distribution and abundance: reddish egret [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015f. eBird: An online database of bird distribution and abundance: roseate spoonbill [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

e-Bird. 2015g. eBird: An online database of bird distribution and abundance: tricolored heron [web application]. eBird, Ithaca, New York. Online at: http://www.ebird.org. Last accessed: December 7, 2015.

Florida Department of Environmental Protection (FDEP). 1994. Approach to the assessment of sediment quality in Florida coastal waters. Office of Water Policy, FDEP.126 p.

Florida Department of Environmental Protection (FDEP). 2013. Palm Beach Island Beach Management Agreement (BMA). http://www.dep.state.fl.us/beaches/pb-bma/docs/BMA-MainAgreement.pdf. Prepared by Florida Department of Protection.

Florida Department of Environmental Protection (FDEP). 2015. Critically eroded beaches in Florida. Division of Water Resource Management. Updated June, 2015. 87 p.

Florida Fish and Wildlife Conservation Commission (FWC). 2015. Florida statewide nesting beach survey data – 2015 season. Online at: http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/. Last accessed: March 4, 2016.

Gore, R.H., L.E. Scotto and L.J. Becker. 1978. Community composition, stability and trophic partitioning in decapod crustaceans inhabiting some subtropical sabellariid wormreefs. Bulletin Marine Science 28(2):221-248.

Kirtley, D. W. & W.F. Tanner. 1968. Sabellariid worms: builders of a major reef type. J. Sed. Petr. 38(1):73-78.

Miranda, K. 2013. Personal communication between Robert Baron (CB&I) and Kimberley Miranda (Palm Beach County's Department of Environmental Resources Management) via email regarding previous beach projects completed in the Town of Palm Beach, South Palm Beach, Lantana and Manalapan. October 15, 2013.

McCarthy, D.A., C.M. Young, and R.H. Emson. 2003. Influence of wave-induced disturbance on seasonal spawning patterns in the Sabellariid Polychaete *Phragmatopoma lapidosa*. Marine Ecology Progress Series 256:123-133.

National Marine Fisheries Service (NMFS). 1997. South Atlantic Regional Biological Opinion (SARBO) on Hopper Dredging of Channels and Borrow Areas along the Southeast U.S. Atlantic Coast. NOAA Fisheries, Southeast Regional Office, St. Petersburg, Florida. Issued October 29, 1997. 20 p.

National Marine Fisheries Service (NMFS). 2006. Sea turtle and smalltooth sawfish construction conditions. National Marine Fisheries Service (NMFS), U.S. Department of Commerce.

Olsen Associates, Inc. (OAI) and Coastal Planning & Engineering, Inc. (CPE). 2013. Environmental assessment, Broward County shore protection project, segment II. Prepared for Broward County and the U.S. Army Corps of Engineers. October 2013. 122 p.

Palm Beach County. 2014. Palm Beach County Interesting Facts and Figures Website. Online at: http://www.pbcgov.com/publicaffairs/facts.htm#Geography. Last accessed: December 1, 2014.

Palm Beach County's Department of Environmental Resources Management (PBC-ERM). 2013. About our beaches. Parks and Recreation. http://www.pbcgov.com/parks/aquatics/beaches/about.htm. Last accessed: October 1, 2013.

Silvester, R. and Hsu, J. R. 1993. Coastal stabilization - innovative concepts. Prentice Hall, Inc., Englewood Cliffs, NJ.

U.S. Army Corps of Engineers (USACE). 2001. Dade County, Florida, beach erosion control and hurricane protection project, evaluation report. Prepared by the Department of the Army, U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

U.S. Army Corps of Engineers (USACE). 2006. Coastal Engineering Manual. Engineer Manual 1110-2-1100, U.S. Army Corps of Engineers, Washington, D.C. (in 6 volumes).

U.S Army Corps of Engineers (USACE). 2013. Public notice: SAJ 2008-04086. Southern Palm Beach Island comprehensive shoreline stabilization project public scoping meeting. U.S. Army Corp of Engineers. Jacksonville, FL. 4 p.

U.S. Census Bureau. 2012. Statistical Abstract of the United States: 2012 (131st Edition). Washington, DC, 2011. Online at: http://www.census.gov/compendia/statab/. Last accessed: December 1, 2014.