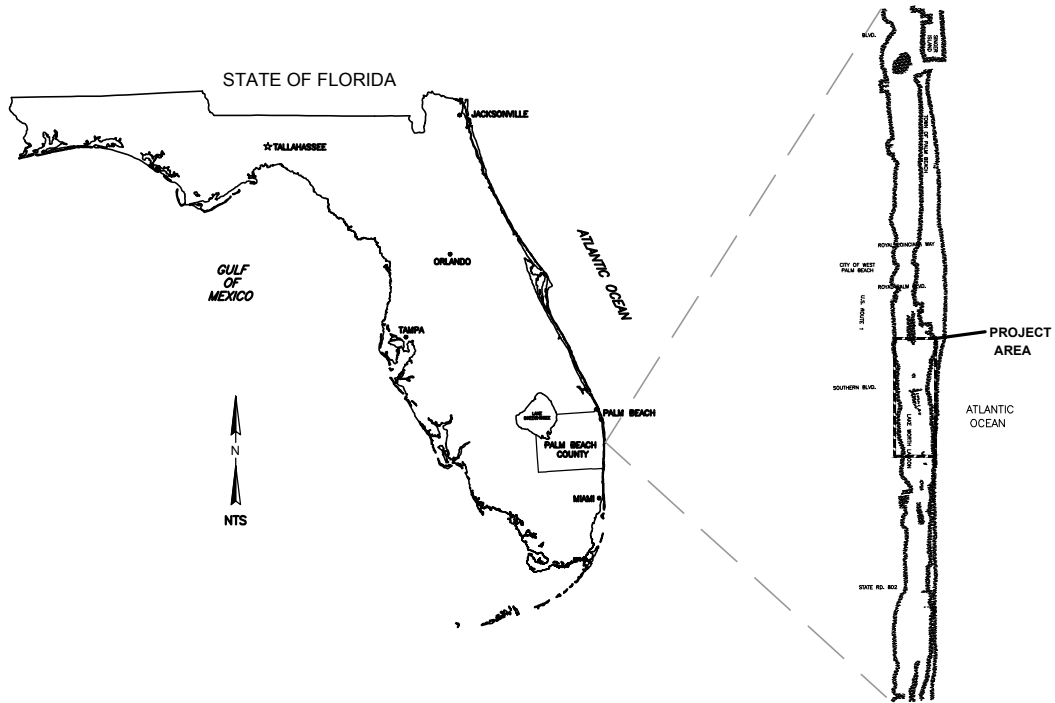


Lake Worth Lagoon Waterways Town of Palm Beach, Florida North Waterway



LOCATION: \\PB\BOP\5001\GROUPS\WESTPALMBEACH_SHARES\DRAWINGS\PROJECTS\13-2453_TOPB_WATERWAY_LAKE_WORTH_LAGOON\X\PERMIT-N\LOC_MAP.DWG

ATMSM
APPLIED TECHNOLOGY & MANAGEMENT
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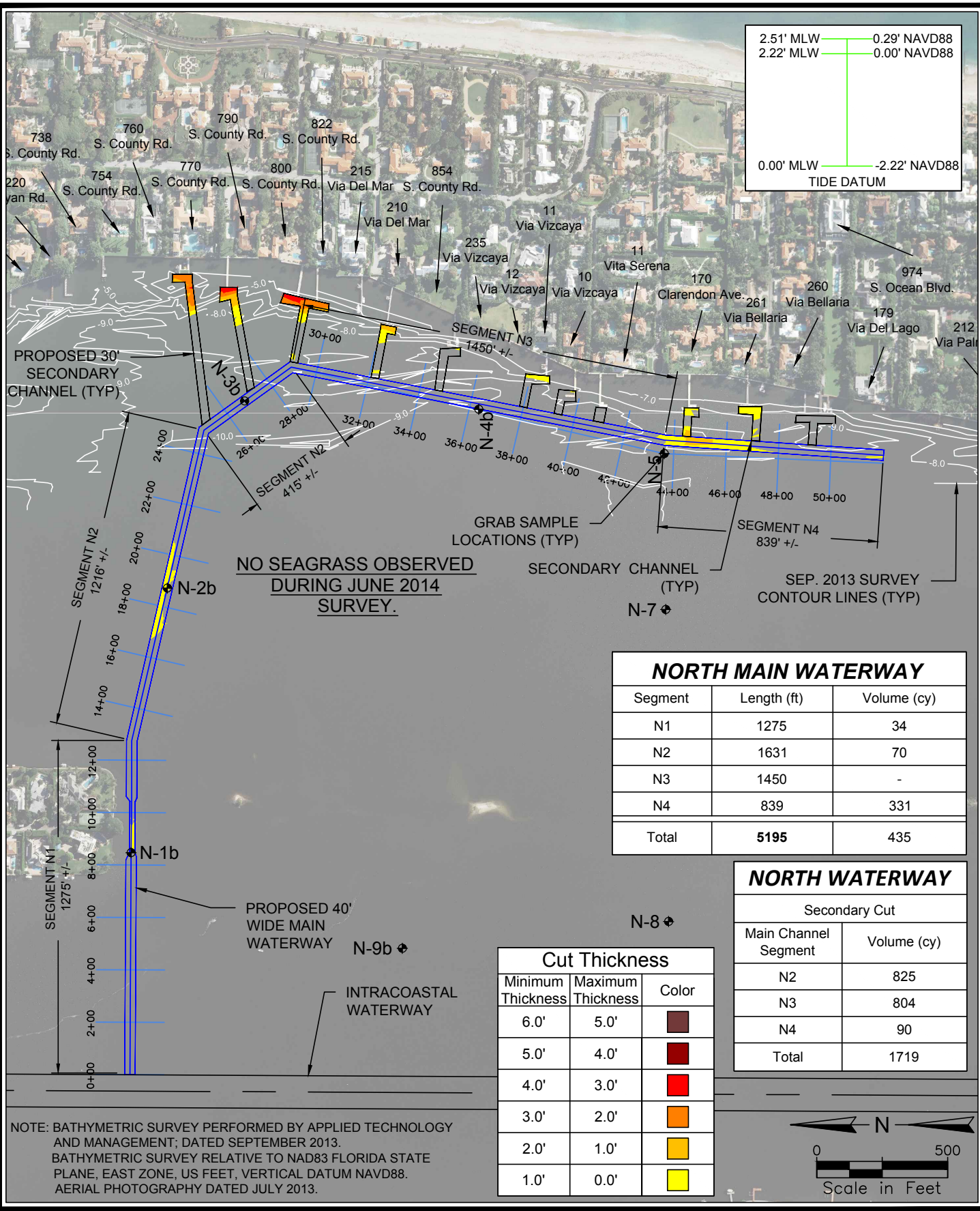
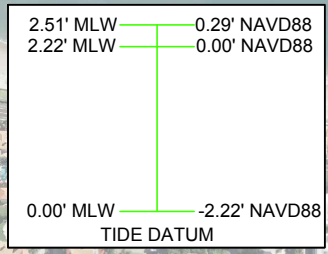
Location Map

Lake Worth Lagoon Waterways
 Town of Palm Beach, Florida
 North Waterway

Sheet: 1 of 5

Job Number: 13-2453

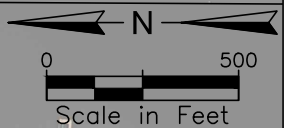
Issue Date: 06-26-2014



| NORTH MAIN WATERWAY | | |
|---------------------|-------------|-------------|
| Segment | Length (ft) | Volume (cy) |
| N1 | 1275 | 34 |
| N2 | 1631 | 70 |
| N3 | 1450 | - |
| N4 | 839 | 331 |
| Total | 5195 | 435 |

| NORTH WATERWAY | |
|----------------------|-------------|
| Secondary Cut | |
| Main Channel Segment | Volume (cy) |
| N2 | 825 |
| N3 | 804 |
| N4 | 90 |
| Total | 1719 |

| Cut Thickness | | |
|-------------------|-------------------|-------|
| Minimum Thickness | Maximum Thickness | Color |
| 6.0' | 5.0' | |
| 5.0' | 4.0' | |
| 4.0' | 3.0' | |
| 3.0' | 2.0' | |
| 2.0' | 1.0' | |
| 1.0' | 0.0' | |



NOTE: BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013. BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET, VERTICAL DATUM NAVD88. AERIAL PHOTOGRAPHY DATED JULY 2013.

LOCATION: \\PBIBOPF5001\GROUPS\WESTPALMBEACH_SHARES\DRAWINGS\PROJECTS\13-2453_TOPB_WATERWAY_LAKE_WORTH_LAGOON\PERMIT-N NORTH_PLAN.DWG

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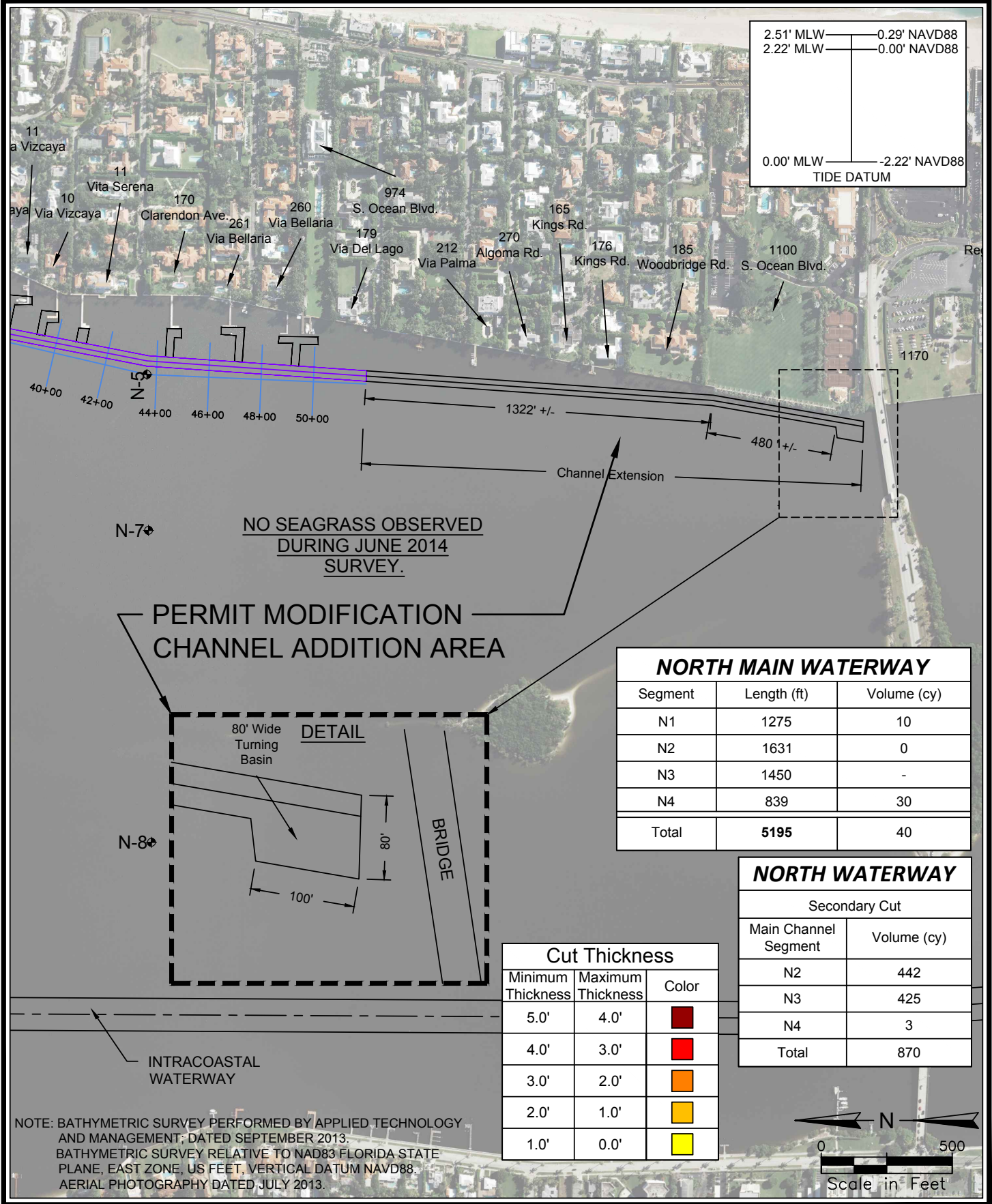
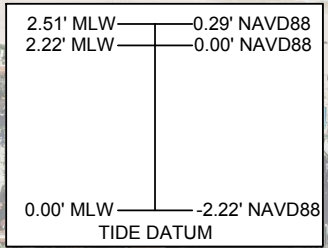
North Waterway - Plan View

Lake Worth Lagoon Waterways
Town of Palm Beach, Florida
North Waterway

Sheet: 2 of 5

Job Number: 13-2453

Issue Date: 06-26-2014



| NORTH MAIN WATERWAY | | |
|---------------------|-------------|-------------|
| Segment | Length (ft) | Volume (cy) |
| N1 | 1275 | 10 |
| N2 | 1631 | 0 |
| N3 | 1450 | - |
| N4 | 839 | 30 |
| Total | 5195 | 40 |

| NORTH WATERWAY | |
|----------------------|-------------|
| Secondary Cut | |
| Main Channel Segment | Volume (cy) |
| N2 | 442 |
| N3 | 425 |
| N4 | 3 |
| Total | 870 |

| Cut Thickness | | |
|-------------------|-------------------|-------|
| Minimum Thickness | Maximum Thickness | Color |
| 5.0' | 4.0' | |
| 4.0' | 3.0' | |
| 3.0' | 2.0' | |
| 2.0' | 1.0' | |
| 1.0' | 0.0' | |

NOTE: BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013. BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET, VERTICAL DATUM NAVD88. AERIAL PHOTOGRAPHY DATED JULY 2013.



LOCATION: G:\WESTPALMBEACH\SHAKES\DRAWINGS\PROJECTS\13-2453- TOPS WATERWAY LAKE WORTH LAGOON\PERMIT_2016\PERMIT-N\NORTH PLAN EXTENSION_JTW.DWG

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North Waterway - Plan View
Channel Extension
Lake Worth Lagoon Waterways
Town of Palm Beach, Florida
North Waterway

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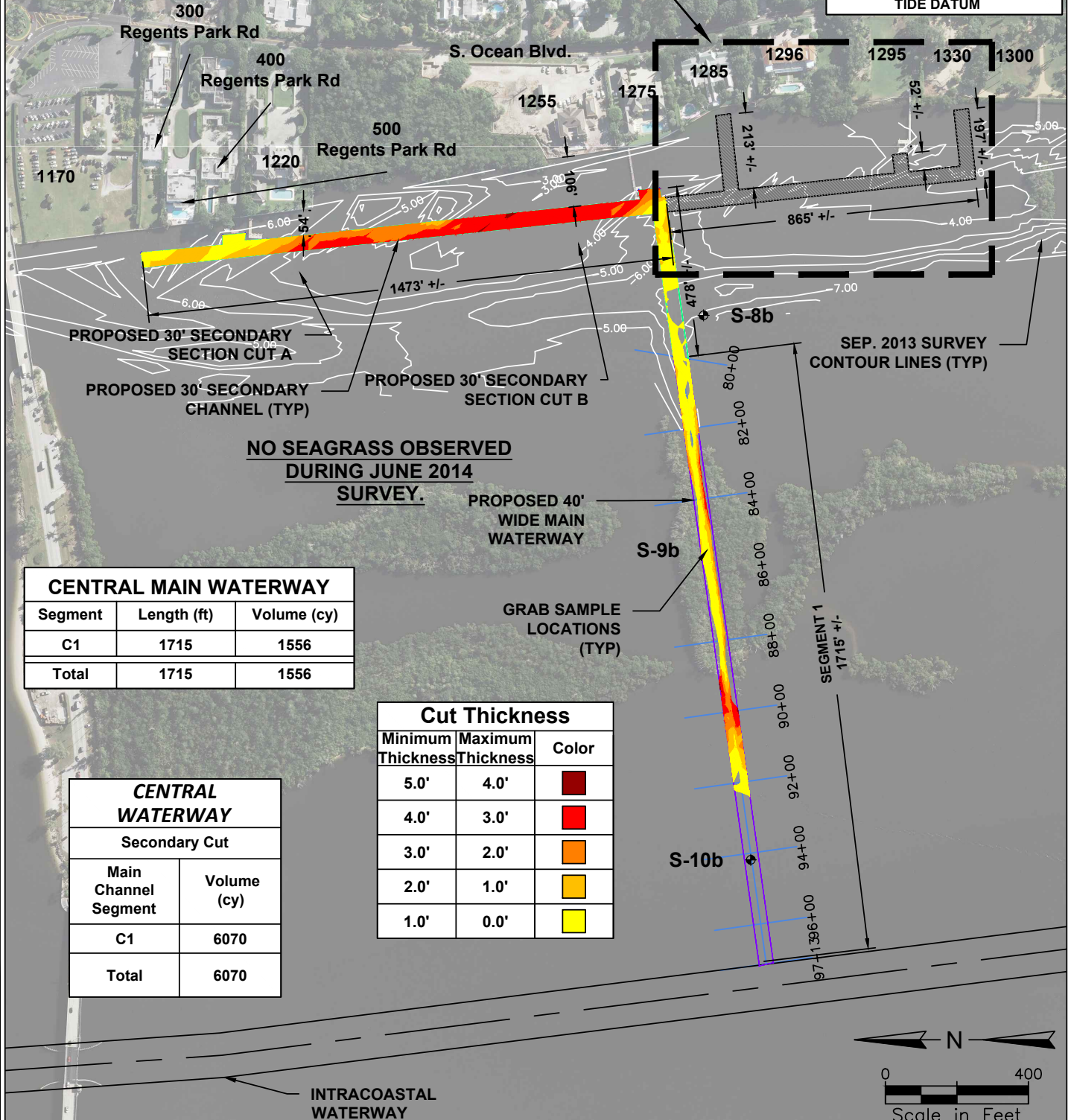
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NOTE: 1. BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT;
 DATED SEPTEMBER 2013.
 BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET
 2. AERIAL PHOTOGRAPHY DATED JULY 2013.

| | |
|-----------|---------------|
| 2.51' MLW | 0.29' NAVD88 |
| 2.22' MLW | 0.00' NAVD88 |
| 0.00' MLW | -2.22' NAVD88 |

TIDE DATUM

PERMIT MODIFICATION CHANNEL ADDITION AREA



PROPOSED 30' SECONDARY SECTION CUT A

PROPOSED 30' SECONDARY CHANNEL (TYP)

PROPOSED 30' SECONDARY SECTION CUT B

**NO SEAGRASS OBSERVED
 DURING JUNE 2014
 SURVEY.**

PROPOSED 40' WIDE MAIN WATERWAY

GRAB SAMPLE LOCATIONS (TYP)

| CENTRAL MAIN WATERWAY | | |
|-----------------------|-------------|-------------|
| Segment | Length (ft) | Volume (cy) |
| C1 | 1715 | 1556 |
| Total | 1715 | 1556 |

| CENTRAL WATERWAY | |
|----------------------|-------------|
| Secondary Cut | |
| Main Channel Segment | Volume (cy) |
| C1 | 6070 |
| Total | 6070 |

| Cut Thickness | | |
|-------------------|-------------------|-------|
| Minimum Thickness | Maximum Thickness | Color |
| 5.0' | 4.0' | |
| 4.0' | 3.0' | |
| 3.0' | 2.0' | |
| 2.0' | 1.0' | |
| 1.0' | 0.0' | |

LOCATION: G:\WESTPALMBEACH\SHARES\DRAWINGS\PROJECTS\13-2453- TOPS WATERWAY LAKE WORTH LAGOON\A\PERMIT_2013\PERMIT-C\CENTRAL_W-PLAN.DWG



Central Waterway - Plan View

Lake Worth Lagoon Waterways
 Town of Palm Beach, Florida
 Central Waterway

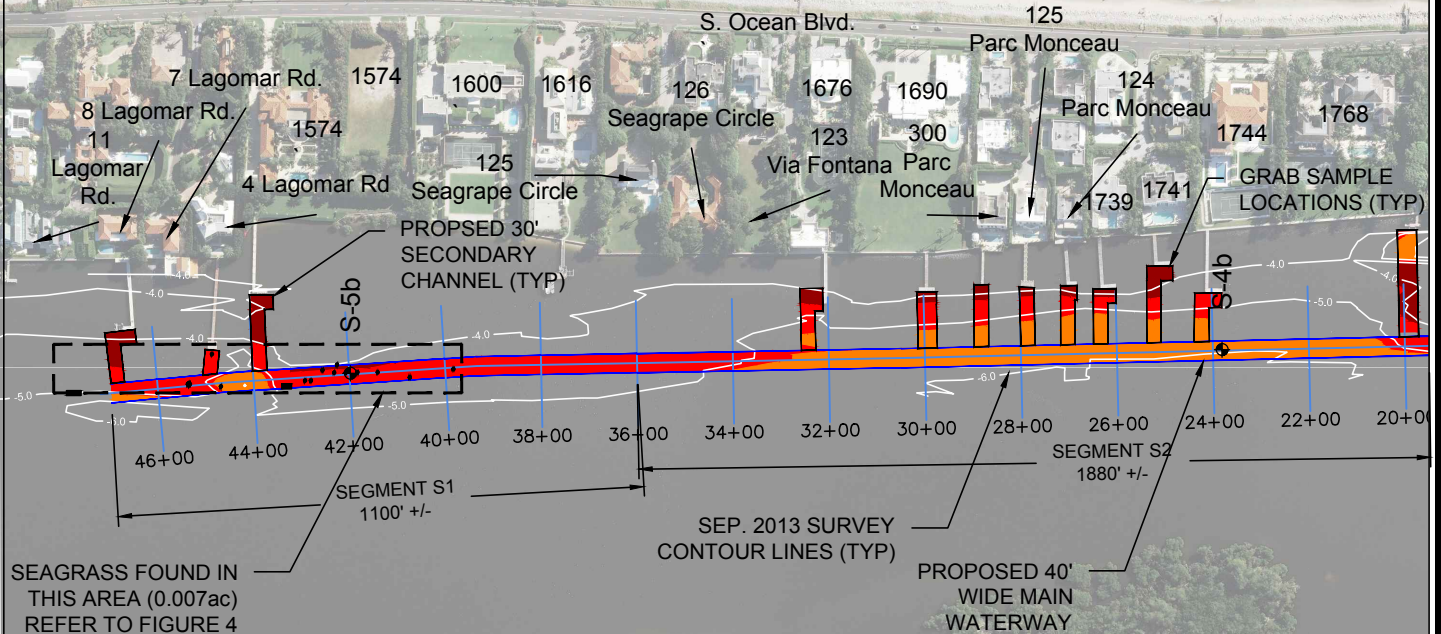
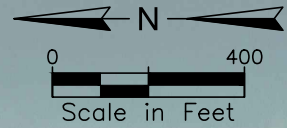
Sheet: 2 of 7

Job Number: 13-2453

Issue Date: 06-26-2014



NOTE: 1. BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013.
 BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET
 2. AERIAL PHOTOGRAPHY DATED JULY 2013.
 3. SEAGRASS SURVEY CONDUCTED JUNE 12 & 13, 2014.



SEAGRASS FOUND IN THIS AREA (0.007ac) REFER TO FIGURE 4

| SOUTH WATERWAY | |
|----------------------|-------------|
| Secondary Cut | |
| Main Channel Segment | Volume (cy) |
| S1 | 1639 |
| S2 | 5479 |
| S3 | 1684 |
| S4 | 4184 |
| Total | 8927 |

| Cut Thickness | | |
|-------------------|-------------------|-------|
| Minimum Thickness | Maximum Thickness | Color |
| 6.0' | 5.0' | |
| 5.0' | 4.0' | |
| 4.0' | 3.0' | |
| 3.0' | 2.0' | |
| 2.0' | 1.0' | |
| 1.0' | 0.0' | |

| SOUTH MAIN WATERWAY | | |
|---------------------|-------------|--------------|
| Segment | Length (ft) | Volume (cy) |
| S1 | 1120 | 5688 |
| S2 | 1880 | 7611 |
| S3 | 500 | 1392 |
| S4 | 1680 | 9062 |
| S5 | 1445 | 4343 |
| Total | 6625 | 28096 |

INTRACOASTAL WATERWAY

NOTE: 1. BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013.
 BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET
 2. AERIAL PHOTOGRAPHY DATED JULY 2013.
 3. SEAGRASS SURVEY CONDUCTED JUNE 12 & 13, 2014.



South Waterway - Plan View

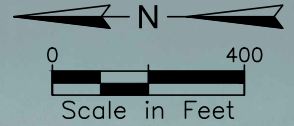
Lake Worth Lagoon Waterways
 Town of Palm Beach, Florida
 South Waterway

Sheet: 2 of 7

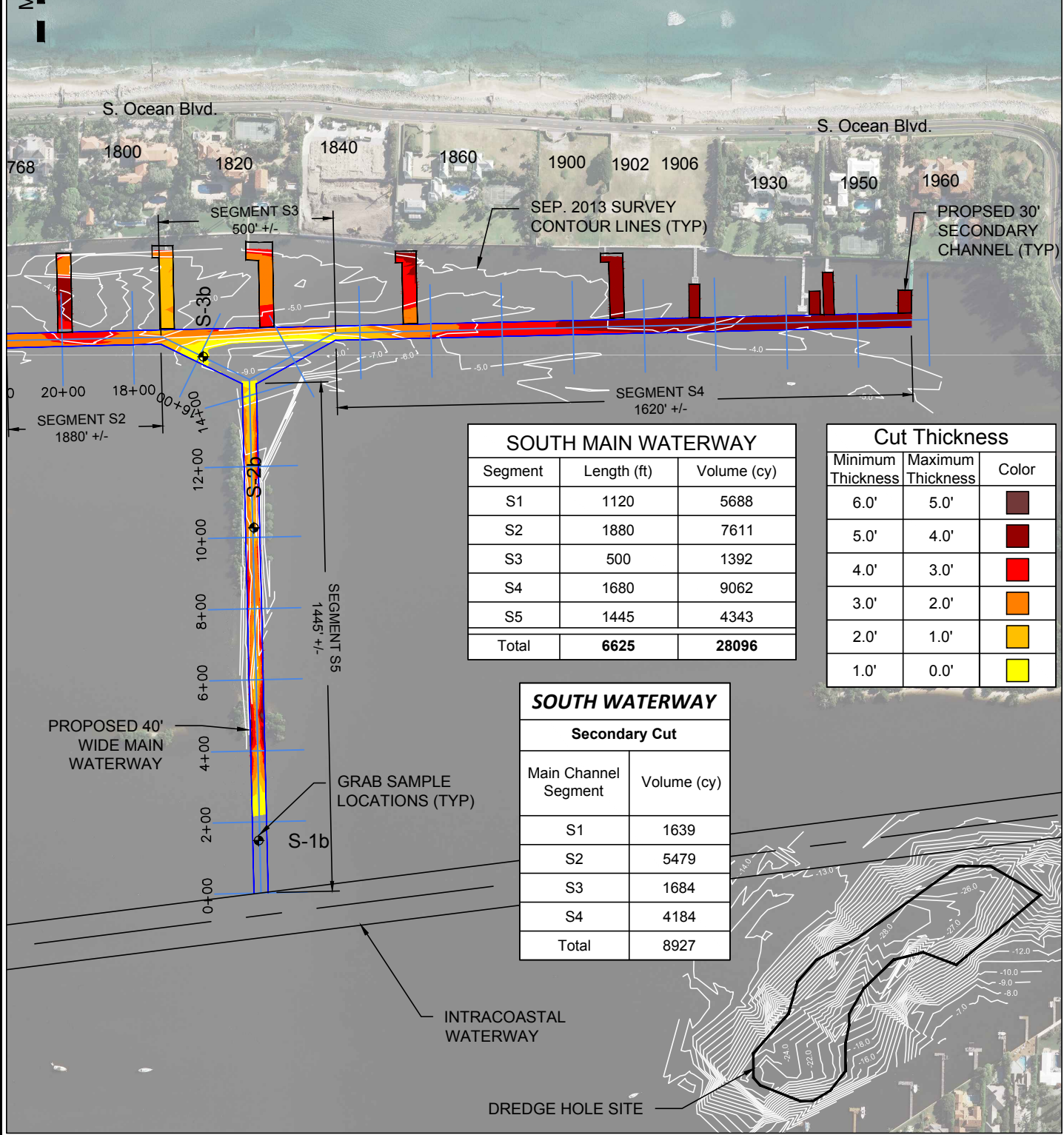
Job Number: 13-2453

Issue Date: 06-26-2014

NOTE: 1. BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013.
 BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET
 2. AERIAL PHOTOGRAPHY DATED JULY 2013.
 3. SEAGRASS SURVEY CONDUCTED JUNE 12 & 13, 2014.



MATCHLINE



| SOUTH MAIN WATERWAY | | |
|---------------------|-------------|--------------|
| Segment | Length (ft) | Volume (cy) |
| S1 | 1120 | 5688 |
| S2 | 1880 | 7611 |
| S3 | 500 | 1392 |
| S4 | 1680 | 9062 |
| S5 | 1445 | 4343 |
| Total | 6625 | 28096 |

| Cut Thickness | | |
|-------------------|-------------------|-------|
| Minimum Thickness | Maximum Thickness | Color |
| 6.0' | 5.0' | |
| 5.0' | 4.0' | |
| 4.0' | 3.0' | |
| 3.0' | 2.0' | |
| 2.0' | 1.0' | |
| 1.0' | 0.0' | |

| SOUTH WATERWAY | |
|----------------------|-------------|
| Secondary Cut | |
| Main Channel Segment | Volume (cy) |
| S1 | 1639 |
| S2 | 5479 |
| S3 | 1684 |
| S4 | 4184 |
| Total | 8927 |

LOCATION: \\PB\BOP\5001\GROUPS\WESTPALMBEACH\SHARES\DRAWINGS\PROJECTS\13-2453\TOPB\WATERWAY LAKE WORTH LAGOON\X\PERMIT-S\ SOUTH WATERWAY.DWG

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South Waterway - Plan View

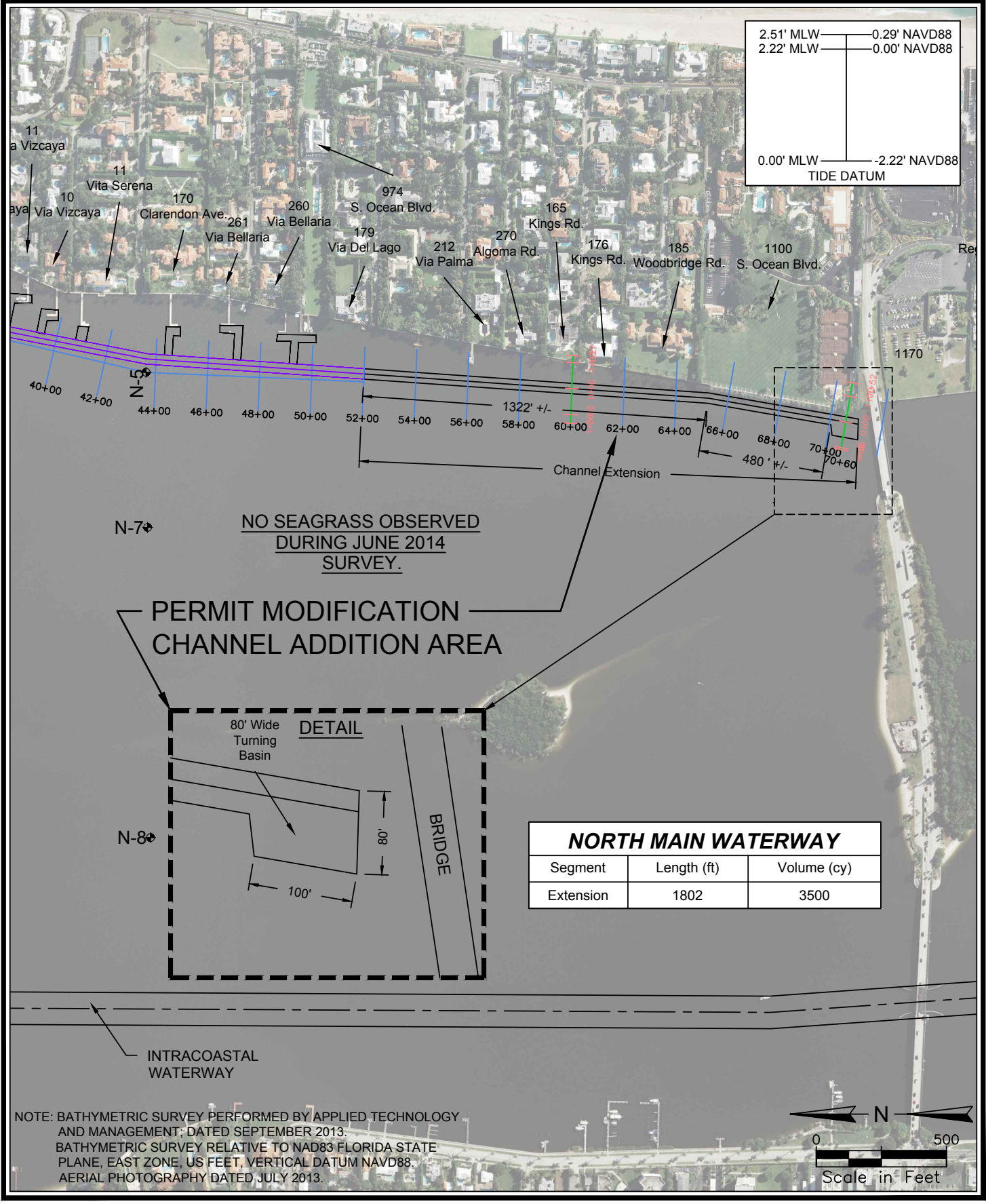
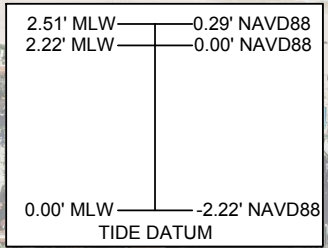
Lake Worth Lagoon Waterways
 Town of Palm Beach, Florida
 South Waterway

Sheet: 3 of 7

Job Number: 13-2453

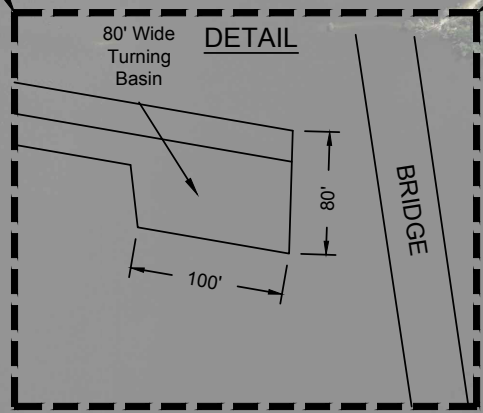
Issue Date: 06-26-2014





N-7
**NO SEAGRASS OBSERVED
 DURING JUNE 2014
 SURVEY.**

**PERMIT MODIFICATION
 CHANNEL ADDITION AREA**



| NORTH MAIN WATERWAY | | |
|----------------------------|-------------|-------------|
| Segment | Length (ft) | Volume (cy) |
| Extension | 1802 | 3500 |

NOTE: BATHYMETRIC SURVEY PERFORMED BY APPLIED TECHNOLOGY AND MANAGEMENT; DATED SEPTEMBER 2013.
 BATHYMETRIC SURVEY RELATIVE TO NAD83 FLORIDA STATE PLANE, EAST ZONE, US FEET, VERTICAL DATUM NAVD88.
 AERIAL PHOTOGRAPHY DATED JULY 2013.



LOCATION: G:\WESTPALMBEACH\SHAKES\DRAWINGS\PROJECTS\13-2453- TOPB WATERWAY LAKE WORTH LAGOON\PERMIT_2016\PERMIT-N\NORTH PLAN EXTENSION_JTW.DWG

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North Waterway - Plan View
 Channel Extension
 Lake Worth Lagoon Waterways
 Town of Palm Beach, Florida
 North Waterway

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**BONEFISH COVE
PLACEMENT LOCATION**

**TOE OF FILL
PERIMETER COORDINATES**

NW CORNER
26 36 30.0 N
80 02 34.6 W

NE CORNER
26 36 30.0 N
80 02 30.2 W

SE CORNER
26 36 16.9 N
80 02 30.2 W

SW CORNER
26 36 16.9 N
80 02 34.6 W

Toe of Fill (47.55 ac.)

-5.5 Contour

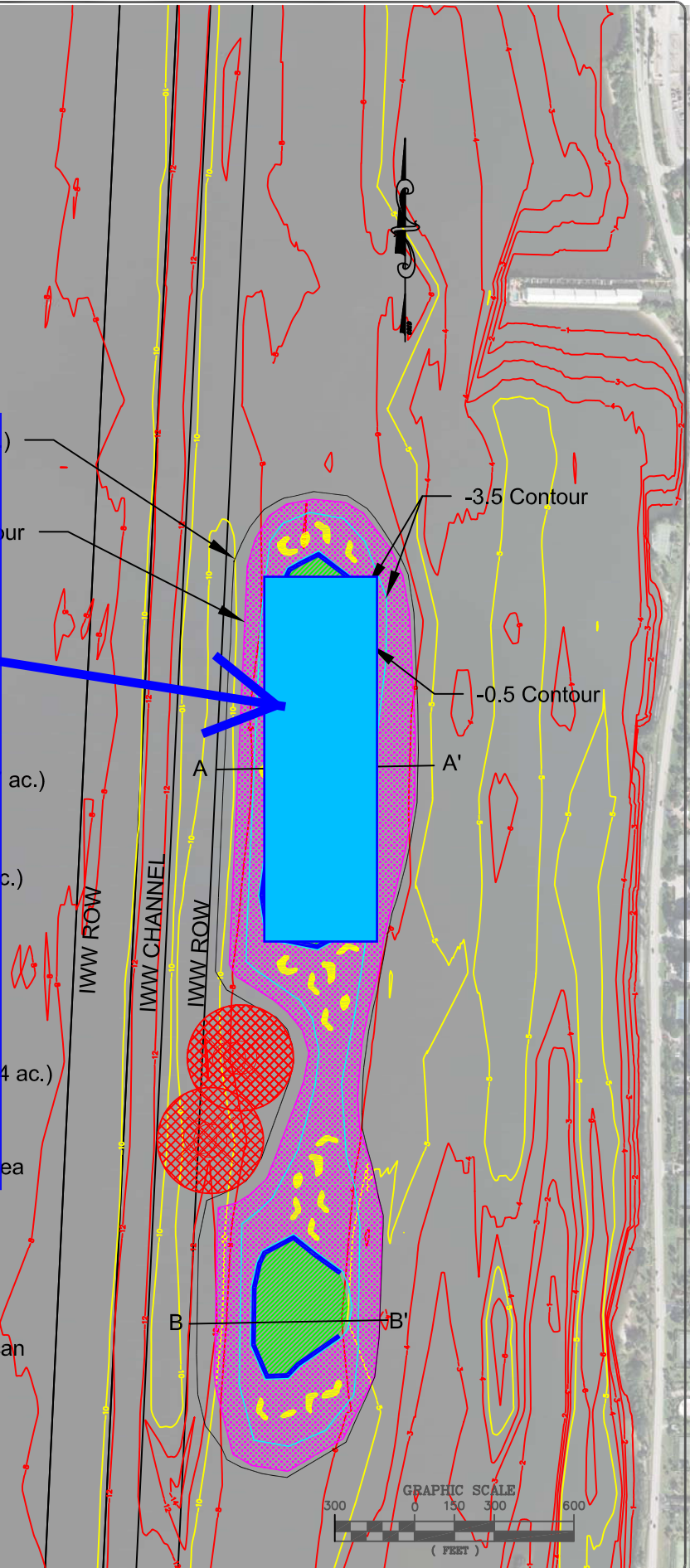
Mangrove Area (9.31 ac.)

Oyster Reefs (1.51 ac.)

Riprap Wavebreak

Seagrass Area (33.14 ac.)

Cultural Resource Area



Notes:

- 1) Existing bathymetric contours are referenced to the National Geodetic Vertical Datum of 1927 (NGVD).
- 2) Proposed elevations are reference to the North American Vertical Datum of 1988, 1990 adjustment (NAVD88).
- 3) Mean High Water = +0.25 NAVD88.
- 4) Mean Low Water = -2.25 NAVD88.
- 5) Fill quantity = approx. 374,306 cu. yds.
- 6) Wavebreak rock quantity = approx. 5,416 tons.
- 7) Oyster reef rock quantity = approx. 9,778 tons.
- 8) See drawings 2 and 3 for cross-sections.

| |
|-----------------------|
| Sheet 01: 1 |
|-----------------------|

**Bonefish Cove
Conceptual Plan view**

SEAL

| Scale | As NOTED | Wc | Revised | By | Date |
|------------------------------------|----------|----|---------|----|------|
| Approved: <input type="checkbox"/> | DT | | | | |
| Drawn: <input type="checkbox"/> | DCS | | | | |
| Checked: <input type="checkbox"/> | CHJ | | | | |
| Date: <input type="checkbox"/> | SSS | | | | |
| File/Book No: | | | | | |

PALM BEACH COUNTY
DEPARTMENT OF
ENVIRONMENTAL RESOURCES MANAGEMENT
2300 N. Jog Road, 4th Floor
WEST PALM BEACH, FLORIDA
(561) 233-2400

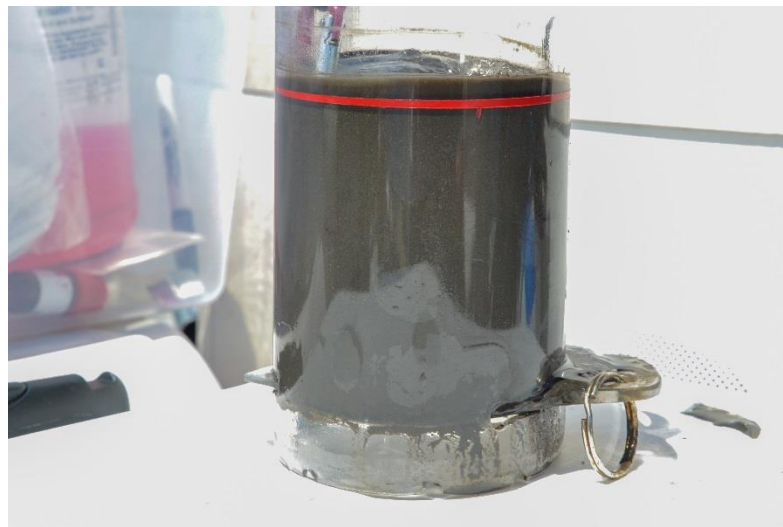
The proposed Mar-A-Lago channel was inspected on March 30, 2016. A marine scientist on snorkel swam a transect through the centerline of the dredge area; water depths were between 4 and 6 ft. during the inspection. No seagrass was observed, and the substrate was silty sand with shell hash. Water depths during the inspection were deeper than the mean depths at which seagrass was found in the central segment of the lagoon during the 2013 Lake Worth Lagoon Mapping Project (CEG, 2014).

The lower water clarity in the central segment of the lagoon has resulted in a retreat of seagrass to shallower depths in recent years. During the 2013 mapping project, the central segment was the only segment with a mean Secchi depth of less than 1.0 m. The mean depth of all sites where seagrass was present was -3.5 ft NAVD while the mean depth of sites where seagrass was absent was substantially deeper at -5.3 ft NAVD (CEG, 2014).

Transect 4 of the Palm Beach County's Lake Worth Lagoon Fixed Transect Monitoring Program is located just north of the Southern Blvd Bridge on the east side of the lagoon in the vicinity of Mar-a-Lago. Since 2013, the deepest occurrence of seagrass at Transect 4 has been 3.3 ft MLW, and no seagrass was found in the permanent monitoring stations at Station 4 in July 2016.

Multiple surveys of the Mar-a-Lago Channel have not found seagrass in the proposed dredge area. The shoal area inside the Mar-A-Lago channel was sampled during the 2013 Lake Worth Lagoon Seagrass Mapping Project. Seagrass was not found at the three ground-truthing sites in 2013; and the area was classified as unvegetated softbottom -potential seagrass habitat based on 2007 bathymetry. The current water depths in the proposed dredge area appear to limit the potential for seagrass establishment.






Bonefish Cove was sampled on September 14, 2016 as part of Palm Beach County's CAP 1135 benthic macroinvertebrate study to compare five restoration sites within the Lake Worth Lagoon with five areas proposed for restoration projects. The benthic community was sampled at two sites within Bonefish Cove to characterize the biological community and sediment environment. A total of 10 cores samples and 10 grab samples were collected for quantification of the benthic community, and two sediment cores were analyzed. The sediment at Bonefish Cove was black muck (100% silt/clay), and muck depth exceeded 1.7 m. Bonefish Cove also had the highest organic content of the 10 study locations at 38.9%. One of the Bonefish Cove sample sites had the lowest overall macrofaunal abundance and diversity of all study sites.



Bonefish Cove sediment cores, sampled on September 14, 2016, showing dark muck sediment.

2013 Lake Worth Lagoon Seagrass Habitat Map

Central Segment

-  Low Density/Patchy Seagrass Habitat
-  Zone of Seagrass Occurrence
-  Unvegetated Potential Seagrass Habitat
-  Unvegetated Softbottom (Central LWL)
-  Not Surveyed

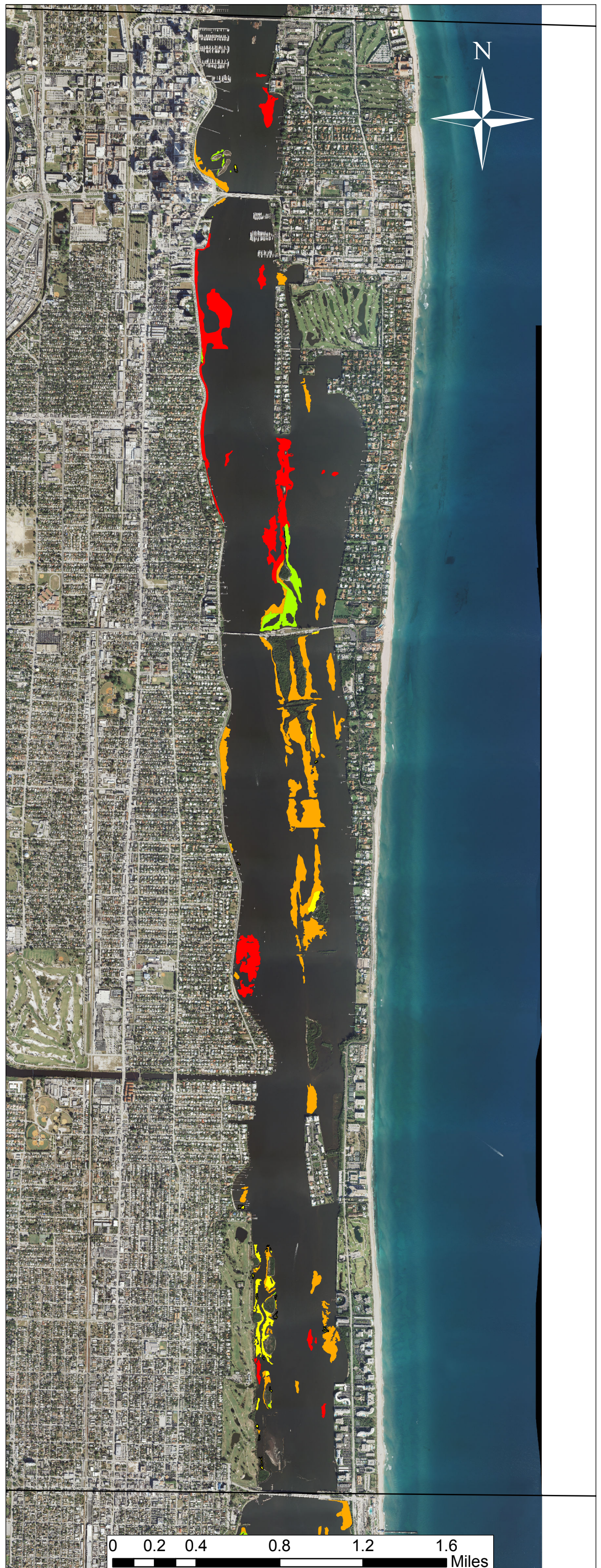
Use Limitations: The 2007 seagrass polygons were delineated from June, July, and August 2007 aerial photography by Avineon Inc. with limited ground-truthing. The 2013 polygons must be interpreted as a ground-truthing verification of the 2007 map and not as an exhaustive coverage of seagrass cover in the Lake Worth Lagoon.

Credits: Seagrass bed ground-truthing surveys and bed edge delineation were completed from July 2, 2013 to January 10, 2014 by Coastal Eco-Group Inc. Work was performed through a sub-contract agreement with Coast and Harbor Engineering Inc. for Palm Beach County Department of Environmental Resource Management. July 2013 Aerials were provided by Palm Beach County Department of Environmental Resource Management.

For a complete description of 2013 seagrass ground-truthing map creation methods, results, and habitat classification definitions, refer to the associated '2013 Lake Worth Lagoon Seagrass Mapping Report' (CEG, 2014).



Coastal Eco-Group Inc.



Transect 4

