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September 26, 2014

Massachusetts Department of Environmental Protection
Wetlands and Waterways Program
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

**RE: Water Quality Certification Transmittal No. X254090
MassDEP Wetlands File No. 61-0633**

Dear Sir/Madam:

On behalf of KHB Venture, LLC and in accordance with Conditions 15 and 17 of the Water Quality Certification dated June 4, 2013, attached is the second vegetation monitoring report for 2014 for the Oak Island RAM Mitigation Project.

Sincerely,

Thor Helgason

Cc: Paul Sneeringer – USACE
Eric Hutchins – NOAA
Georgeann Keer – MADEP
Ed Reiner - USEPA
Frank Stringi – City of Revere Planning Dept.
City of Revere Conservation Commission

MEMO

To:
Thor Helgason
de maximis, inc.

Copies:
Jeff Holden

From:
Anthony Esposito

Date:
September 24, 2014

ARCADIS Project No.:
B0038878.0000

Subject:
Summer 2014 Vegetation Monitoring Report
Oak Island RAM Area Salt Marsh Restoration
KHB Venture, LLC
Revere, Massachusetts

1. PURPOSE AND SCOPE

This report summarizes the results of monitoring tasks performed in summer 2014 at the Release Abatement Measure (RAM) Mitigation project area (the Site) in Revere, Massachusetts. The mitigation project involved excavation and offsite disposal of sediment within the project area to restore salt marsh habitat and increase flood storage capacity, provide feeder creeks through the marsh to increase tidal flow and flushing through the wetland, and eliminate existing *Phragmites australis* (Common Reed) to reduce fire hazards and improve habitat quality. No soil amendments or seeding/planting were required as part of the salt marsh restoration project.

Vegetation monitoring efforts were performed by ARCADIS on behalf of KHB Venture, LLC, in accordance with the requirements included in Condition 15 of the Water Quality Certification (WQC) issued by the Massachusetts Department of Environmental Protection (MassDEP) for the RAM Mitigation project. Per the WQC, a 5-year monitoring and reporting program are required to track the development and success of the restoration effort, and document the level of attainment of habitat restoration goals. The 5-year monitoring program is to include measuring of tide height, a qualitative assessment of erosion and creek stability, a qualitative assessment of the extent of invasive weed populations, a spring inspection to evaluate winter damage, vegetation field sampling and data collection from permanent plots during the peak growing season (summer), and the quarterly collection of photographs from fixed photo locations. The quantitative vegetation assessment during the growing season is to be based on a comparison to baseline vegetation characteristics, which were identified during a field effort conducted prior to Site disturbance and summarized in a memorandum dated July 3, 2014 (ARCADIS, 2014).

Note that the tide height measurements were collected as part of Condition 6 of the WQC, which requires one full year of continuous water surface elevation data collection upon completion of construction activities in the RAM Mitigation Area. Two reports have been generated to date transmitting the water level data. The tide height data support visual observations and photographs (Attachment A) that tidal flow has been restored to the RAM Mitigation Area, as intended by the mitigation project.

The summer 2014 monitoring event was performed to inspect the Site for signs of erosion or bank instability, quantify the ground cover of the restoration area, evaluate the extent of weed populations, and to perform the third quarterly photo-documentation of Site conditions. The field activities and results of these activities are described in Sections 2 and 3, respectively.

2. 2014 SUMMER MONITORING METHODOLOGIES

The summer monitoring event was performed on August 26, 2014. As part of the inspection, the entire RAM Mitigation Area was walked and observations of significant soil erosion or bank instability, if any, were noted and documented. To assess vegetation status, quantitative vegetation data were collected from 20 randomly-located vegetation monitoring plots that were staked at recorded coordinates using a hand-held GPS. Plot quadrats of 1-square meter in size were centered around each stake and all plant species within the quadrat were identified, the percent cover by each species in the quadrat was visually estimated, and the total percent ground in the quadrat were recorded to evaluate percent cover, percent weed cover, and vegetative diversity. Evaluation of the ability of the restored wetland to meet the objectives of the restoration effort will be based on improvement of the plant community from previous Site data and baseline conditions over time. Improvement will be concluded when vegetative diversity increases and percent weed cover decreases from previous Site or baseline conditions.

The spatial limits of significant stands of invasive weeds were surveyed with a hand-held GPS to document their locations and for future evaluations of their response to changing Site conditions over time. Weed stands identified during the survey were recorded and photographs of the current conditions were taken for documentation purposes. These vegetation data will be used to evaluate changes in the extent and density of weed stands in the restored wetland during future monitoring activities.

Condition 15.f of the WQC requires that photographs be taken quarterly from fixed photo locations to assist in the documentation of restored wetland conditions and development throughout the growing season and over the 5-year monitoring period. The first quarter photo-documentation event was performed on March 27, 2014 and the second event was performed on June 3, 2014. During this August 26, 2014 summer monitoring event, the third quarterly photographs were taken. Photographs of the developing wetlands were taken from the same directions from each photograph point as the previous photographs. Photo locations, weed communities, and unstable locations, if present, were marked on the site plan.

3. 2014 SUMMER MONITORING RESULTS

The following sections summarize the results of the third quarter photo-documentation event and summer vegetation monitoring in the RAM Mitigation Area.

3.1 Third Quarter Photo-Documentation Event

The third quarter photo-documentation event was performed at low tide on August 26, 2014. The fixed photo locations and directions of the photographs are indicated on Figure 1 and the photographs are presented in Attachment A. No signs of bank erosion or bank instability were observed in the feeder streams constructed in the RAM Mitigation Area. The photographs indicate the sparse ground cover during the summer inspection, and also indicate a reduction in the density and extent of *Phragmites* present on the Site. The RAM Mitigation Area is dominated by algae covered mud that contains the remnants of *Phragmites* shoots and roots in many areas. Although the majority of the Site was not vegetated, a few pockets of the desirable tidal wetland plant species Smooth Cordgrass (*Spartina alterniflora*) and Virginia Glasswort (*Salicornia depressa*) were observed in the northeast and central portions of the restoration area (See photos 5 and 32-36 in Attachment A). A few individual *Phragmites* plants were observed along the western bank of Diamond Creek in the southern portion of the Site where a larger and denser stand of *Phragmites* was observed during the spring monitoring event (See Figure 1 and photos 25 and 26 in Attachment A). A comparison of the spring and summer photographs indicates a significant reduction in size and density of the *Phragmites* at this location.

3.2 Summer Vegetation Monitoring

The vegetation assessment was performed during low tide to enable safe access and observation of soil conditions and vegetation. Very little vegetation was present in the RAM Mitigation Area at the time of the summer monitoring inspection, but the majority of the Site was covered with a thin mat of green algae. A meander survey of the RAM Mitigation Area noted the presence of *Spartina alterniflora* and *Salicornia depressa*. Although they currently constitute a low percentage of Site cover, they are the dominant plant species of the Site. A few live individual *Phragmites* plants were observed scattered throughout the restoration area. Live *Phragmites* were also observed up to and above the top of the north and west banks of Diamond Creek at the south end of the RAM Mitigation Area. *Phragmites* observed on the upper banks of Diamond Creek provided a visually-estimated cover of less than 2%. The sparse presence of the *Phragmites* and small area of cover did not warrant mapping its limits and its presence is concluded to be minimal in summer 2014.

The 20 randomly located vegetation monitoring plot locations on the Site and 6 monitoring locations in reference wetlands are shown on Figure 1 and the vegetation monitoring results are summarized in Table 1. The quantitative vegetation plot monitoring effort on the Site provided no useful data due to the absence of emergent vegetation in any of the plot locations. The presence of algae was noted in all 20

monitoring plots, but no emergent plant species were present in any of the 20 plots (Table 1). The 6 vegetation monitoring plot locations established in reference wetlands southwest of the Site, opposite the tide gate, exhibited 100% ground cover of either *Spartina alterniflora* or Saltmeadow Cordgrass (*Spartina patens*) or a combination of both species (Table 1). Although not observed in the plots, a few Virginia Glasswort were also observed in the reference wetland.

4. CONCLUSIONS

Observations during the summer 2014 RAM Mitigation Area monitoring event indicated an overall improvement in Site conditions since the spring monitoring event. The dense Phragmites stand that was establishing along Diamond Creek in the southern portion of the Site was reduced in size and plant density. The presence of the algal mat can likely be attributed to a response to the release of nutrients from the newly exposed soils and is not expected to impact the establishment of desirable vegetation on the Site. Although sparsely represented, two of the three plant species (*Spartina alterniflora*) and *Salicornia depressa*) observed in the reference wetlands are present in the RAM Mitigation Area. The extent and density of these species is expected to increase over time as additional seed stock emerges from Site soils or is tidally transported to the Site. The observed presence of desirable species and noted reduction in the extent and density of *Phragmites* relative to prior inspections indicates progress has been made toward the restoration goals. This trend is anticipated to continue provided that the City of Revere continues to operate the tide gate in accordance with USACE Permit No. 200002158.

The fourth quarter photo-documentation of Site conditions will be performed in October 2014 (with photos to be submitted with the spring 2015 monitoring report). In accordance with the requirements of the WQC, monitoring is to continue on the Site for four more years.

REFERENCES

ARCADIS. 2014. Memorandum to Thor Helgason (de maximis, inc.) from Anthony Esposito (ARCADIS). Summer 2014 Vegetation Monitoring Report, Oak Island RAM Area Salt Marsh Restoration, KHB Venture, LLC, Revere, Massachusetts. July 3, 2014.

Massachusetts Department of Environmental Protection (MassDEP). 2013. Section 401 Water Quality Certification. June 4, 2013.



Table

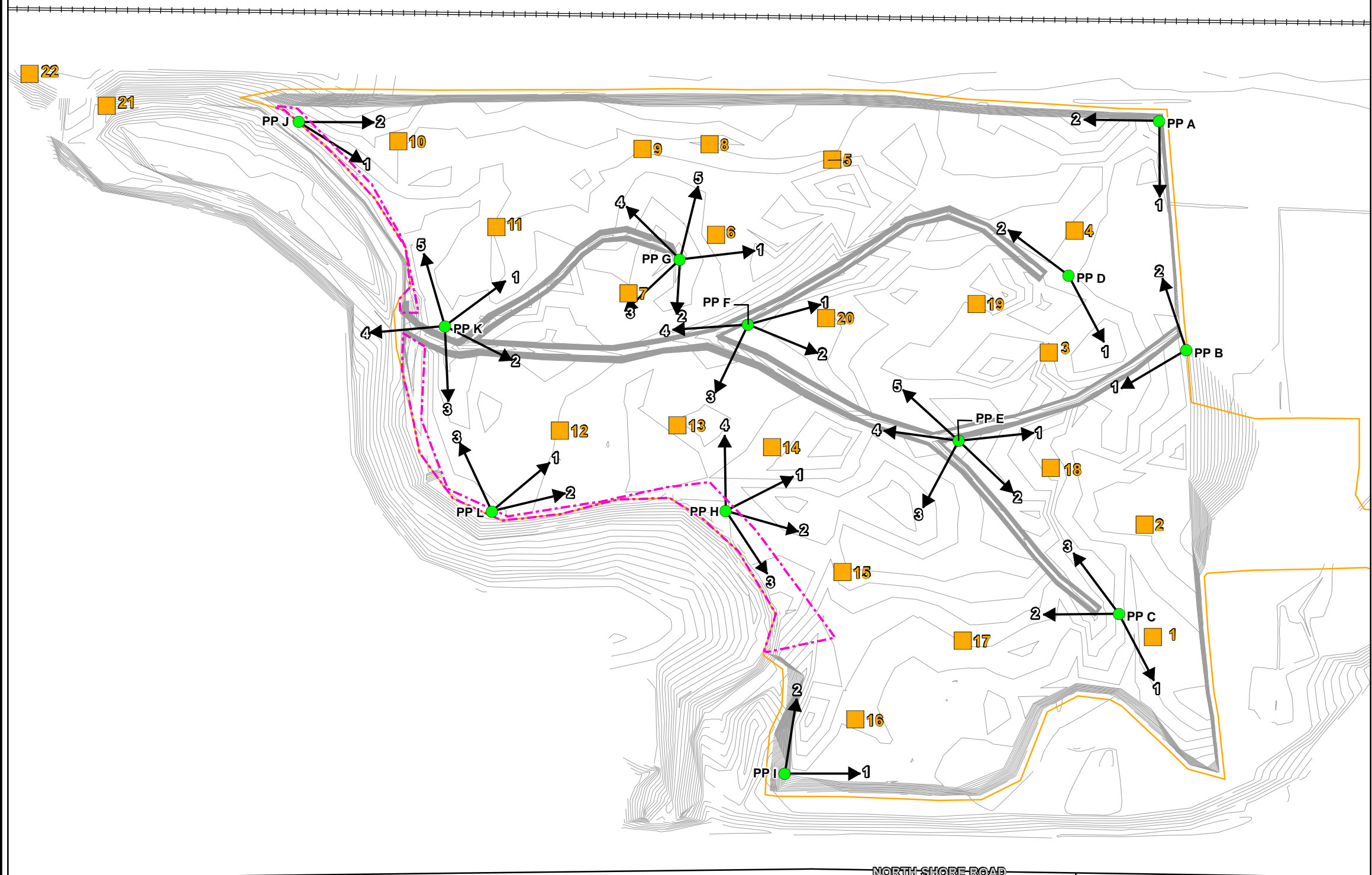
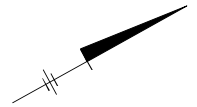
Table 1
Vegetation Monitoring Plot Results

FCTPF Oak Island Salt Marsh Restoration
Revere, Massachusetts
Summer 2014 Vegetation Monitoring Report

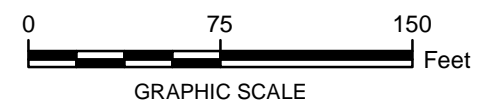
Plot	Algae % Cover	Emergent Plant Species	% Cover	Total Emergent Plants % Cover
1	100		0	0
2	100		0	0
3	100		0	0
4	100		0	0
5	100		0	0
6	100		0	0
7	100		0	0
8	100		0	0
9	100		0	0
10	100		0	0
11	100		0	0
12	100		0	0
13	100		0	0
14	100		0	0
15	100		0	0
16	100		0	0
17	100		0	0
18	100		0	0
19	100		0	0
20	100		0	0
21	0	<i>S. alterniflora</i>	100	100
22	0	<i>S. alterniflora</i>	100	100
23	0	<i>S. alterniflora</i>	65	100
		<i>S. patens</i>	35	
24	0	<i>S. alterniflora</i>	15	100
		<i>S. patens</i>	85	
25	0	<i>S. alterniflora</i>	100	100
26	0	<i>S. patens</i>	100	100

Figure

23 ■ 25
24 ■ 26



- LEGEND:**
- APPROXIMATE VEGETATION PLOT MONITORING LOCATION
 - PERMANENT PHOTO LOCATION
 - - - LIMITS OF PHRAGMITES STANDS OBSERVED IN SPRING 2014 BUT NOT PRESENT IN SUMMER 2014
 - ➔ PHOTO DIRECTION
 - SITE BOUNDARY
 - CONTOUR
 - ROAD
 - RAILROAD
 - BUILDING



- NOTES:**
1. CONTOUR DATA OBTAINED FROM AS-BUILT SURVEY PREPARED BY WELCH ASSOCIATES LAND SURVEYORS, INC (JANAUARY 2014).
 2. ROAD, RAILROAD AND BUILDING FEATURES OBTAINED FROM THE OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS) AT: <http://www.mass.gov>

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
SUMMER 2014 VEGETATION MONITORING REPORT
SITE PLAN WITH PHOTO AND VEGETATION PLOT LOCATIONS



FIGURE
1

City:SYR Div/Group: SWG Created By: J.RAPP Last Saved By: jrapp
Beazer Revere MA (B0036878.0000.00044)
C:\Beazer\RevereMA\PhotoSurvey\mxd\PhotoLocationsandVegMonitoringLocations.mxd 9/24/2014 11:07:39 AM



Photolog



Photo #1: Photo Survey A-1, looking east - August 2014.



Photo #2: Photo Survey A-2, looking southwest - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-1



Photo #3: Photo Survey B-1, looking south - August 2014.



Photo #4: Photo Survey B-2, looking west - August 2014.

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 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-2



Photo #5: Photo Survey C-1, looking east - August 2014.



Photo #6: Photo Survey C-2, looking southwest - August 2014.

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REVERE, MASSACHUSETTS
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SITE PHOTOGRAPHS



FIGURE
A-3



Photo #7: Photo Survey C-3, looking west - August 2014.



Photo #8: Photo Survey D-1, looking east - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT	
SITE PHOTOGRAPHS	
	FIGURE A-4



Photo #9: Photo Survey D-2, looking west - August 2014.



Photo #10: Photo Survey E-1, looking north - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-5</p>



Photo #11: Photo Survey E-2, looking east - August 2014.



Photo #12: Photo Survey E-3, looking southeast - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-6</p>



Photo #13: Photo Survey E-4, looking southwest - August 2014.



Photo #14: Photo Survey E-5, looking west - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-7</p>



Photo #15: Photo Survey F-1, looking north - August 2014.



Photo #16: Photo Survey F-2, looking northeast - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-8</p>



Photo #17: Photo Survey F-3, looking southwest - August 2014.



Photo #18: Photo Survey F-4, looking south - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-9</p>



Photo #19: Photo Survey G-1, looking north - August 2014.



Photo #20: Photo Survey G-2, looking east - August 2014.

<p>FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT</p>	
<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-10</p>



Photo #21: Photo Survey G-3, looking southeast - August 2014.



Photo #22: Photo Survey G-4, looking west - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-11



Photo #23: Photo Survey G-5, looking northwest - August 2014.



Photo #24: Photo Survey H-1, looking north - August 2014.

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SITE PHOTOGRAPHS	
	FIGURE A-12



Photo #25: Photo Survey H-2, looking northeast - August 2014.



Photo #26: Photo Survey H-3, looking east - August 2014.

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REVERE, MASSACHUSETTS
SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-13



Photo #27: Photo Survey H-4, looking west - August 2014.



Photo #28: Photo Survey I-1, looking northeast - August 2014.

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 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-14



Photo #29: Photo Survey I-2, looking west - August 2014.



Photo #30: Photo Survey J-1, looking northeast - August 2014.

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SITE PHOTOGRAPHS	
	FIGURE A-15



Photo #31: Photo Survey J-2, looking north - August 2014.



Photo #32: Photo Survey K-1, looking northwest - August 2014.

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 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-16



Photo #33: Photo Survey K-2, looking east - August 2014.



Photo #34: Photo Survey K-3, looking east - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-17



Photo #35: Photo Survey K-4, looking south - August 2014.



Photo #36: Photo Survey K-5, looking west - August 2014.

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<p>SITE PHOTOGRAPHS</p>	
	<p>FIGURE A-18</p>



Photo #37: Photo Survey L-1, looking north - August 2014.



Photo #38: Photo Survey L-2, looking northeast - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
 REVERE, MASSACHUSETTS
 SUMMER 2014 VEGETATION MONITORING REPORT

SITE PHOTOGRAPHS



FIGURE
A-19



Photo #39: Photo Survey L-3, looking west - August 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION REVERE, MASSACHUSETTS SUMMER 2014 VEGETATION MONITORING REPORT	
SITE PHOTOGRAPHS	
	FIGURE A-20