
Periodic Survey Evaluation: Ocean View Beach

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Table of Contents

1. Executive Summary	1
2. Objective	4
3. Data Sources	5
4. Methods.....	7
5. Discussion of Periodic Surveying Evaluation.....	9
5.1. Differences in Survey Comparisons	9
5.2. Key Events During the Reporting Period	9
5.2.1. Storm Events	9
5.2.2. Engineering Activities.....	12
5.3. General Shoreline Trends	12
5.4. Regional Shoreline Trends	14
5.4.1. Willoughby Spit	14
5.4.2. 800 Block Breakwaters	15
5.4.3. West Ocean View	16
5.4.4. Central Ocean View Breakwaters	16
5.4.5. Central Ocean View	17
5.4.6. East Ocean View	18
5.5. East Ocean View Beach Nourishment Project (2009).....	23
5.6. Central Ocean View Dune Restoration Project (2005)	27
6. Summary	31

Appendices

Appendix A: VIMS Aerial Photography and Digitized Shorelines

Appendix B: Survey Comparison Plots

Appendix C: Summary of Shoreline Change and Volume Change Tables

Appendix D: Engineering Activities Log

List of Figures

Figure 3-1: Survey Baseline and Transects	6
Figure 5-1: April 16, 2014 Storm.....	10
Figure 5-2: July 4, 2014 Storm.....	11
Figure 5-3: September 8, 2014 Storm	11
Figure 5-4: September 24, 2014 Storm	12
Figure 5-6: Shoreline Change Rate (ft/yr) at Mean High Water (+0.98 ft NAVD88) for October 2013 to October 2014 (Note: Positive = Accretion, Negative = Erosion)	19
Figure 5-7: Volume Change Above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft) for October 2013 to October 2014 (Note: Positive = Accretion, Negative = Erosion)	20
Figure 5-8: Shoreline Change (ft) at Mean High Water (+0.98 ft NAVD88) for March 2014 to October 2014 (Note: Positive = Accretion, Negative = Erosion)	21
Figure 5-9: Volume Change Above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft) for March 2014 to October 2014 (Note: Positive = Accretion, Negative = Erosion)	22
Figure 5-10: Net Volume Change Since the East Ocean View Nourishment Project (March 2009) ..	25
Figure 5-11: Shoreline Position Difference (ft) at MHW Between 2003 Pre-Fill and October 2014 Shorelines for East Ocean View.....	26
Figure 5-12: Net Volume Change Since the Willoughby Spit to Central Ocean View Dune Restoration Project (March 2005)	29
Figure 5-13: Shoreline Position Difference (ft) at MHW Between 2003 Pre-Fill and October 2014 Shorelines for Central Ocean View	30

List of Tables

Table 2-1: Surveyors and Collection Dates.....	4
Table 5-1: Monthly Wave Statistics Summary	12
Table 5-2: Regional Shoreline and Volume Change Statistics (October 2013 to October 2014).....	13
Table 5-3: Regional Shoreline and Volume Change Statistics (March 2014 to October 2014)	14
Table 5-4: Average Shoreline and Volume Change Rates for Willoughby Spit	14

Table 5-5: Average Shoreline and Volume Change Rates for 800 Block Breakwaters.....	15
Table 5-6: Average Shoreline and Volume Change Rates for West Ocean View	16
Table 5-7: Average Shoreline and Volume Change Rates for Central Ocean View Breakwaters	17
Table 5-8: Average Shoreline and Volume Change Rates for Central Ocean View	17
Table 5-9: Average Shoreline and Volume Change Rates for East Ocean View	18
Table 5-10: Overall Shoreline and Volume Change Statistics – East Ocean View Nourishment Project (March 2009 Post-Fill – October 2014 Comparison).....	23
Table 5-11: Regional and Overall Shoreline and Volume Change Statistics for Central Ocean View Nourishment Project (March 2005 Post-Fill – October 2014 Comparison)	27

1. Executive Summary

In October 2014 Geodynamics, LLC conducted the nineteenth survey of the Ocean View shoreline. The study area extends from the western end of Willoughby Spit to the western edge of the Little Creek Inlet in East Ocean View. The periodic surveys are collected bi-annually in March/April and September/October to assess the condition of the shoreline and the state of existing shore protection projects. A baseline and transects were established with the first survey in September 2005 and have been used for each subsequent survey. Shoreline changes at Mean High Water (MHW) and volumetric changes above 0 feet NAVD88 and -15 feet NAVD88 are calculated at each transect. Differences in the region above 0 feet NAVD88 are indicative of changes to the dune and subaerial beach berm, while the differences above -15 feet NAVD88 indicate changes in the nearshore zone. Comparison of seasonal surveys (i.e. October 2013 to October 2014) eliminates seasonal variation of profiles in volumetric change analyses. Consecutive survey comparisons are useful to assess the direct impact of extreme events which may occur during the six month period between surveys. This report documents the data sources, methods, and results of a periodic surveying evaluation performed to compare the October 2014 survey data with previous surveys taken in October 2013 (fall to fall comparison) and March 2014 (most recent periodic survey comparison) in the Ocean View Beach area between Willoughby Spit and Little Creek Inlet.

Comparison	Parameter	Quantity
October 2013 vs. October 2014	Average Shoreline Change Rate at MHW (+0.98 ft NAVD88)	1.51 ft/yr
	Cumulative Volume Change Rate Above 0 ft NAVD88	107,029 cy/yr
	Cumulative Volume Change Rate Above -15 ft NAVD88	12,759 cy/yr
March 2014 vs. October 2014	Average Shoreline Change at MHW (+0.98 ft NAVD88)	4.41 ft
	Cumulative Volume Change Above 0 ft NAVD88	52,496 cy
	Cumulative Volume Change Above -15 ft NAVD88	-47,411 cy

The Ocean View shoreline experienced an overall gain in material above 0 ft NAVD88 and -15 ft NAVD88 over the past year (October 2013 to October 2014). The average shoreline change over the past year shows accretion of the MHW shoreline over the entire beach with a majority of the accretion occurring during the most recent survey period (March 2014 – October 2014). Over the most recent survey period, the Ocean View shoreline experienced a gain in material above 0 ft NAVD88; however, there was a loss above -15 feet NAVD88. This indicates material was transported from above the closure depth to the subaerial beach, which is typical during a quiescent wave climate and confirmed by the profiles in Appendix B.

While the shoreline showed overall volume gain for the year, there was variability within the various regions. The Willoughby Spit region is still equilibrating from the Willoughby Spit Shoreline Improvement Project, which finished construction in December 2013. The nourishment placed at the eastern end of this reach has continued moving westward and is staying in the nearshore system due to the seven newly constructed breakwaters. Overall, this reach experienced accretion of the MHW shoreline, and volumetric gains above both 0 feet NAVD88 and -15 feet NAVD88 over the past year.

In the 800 Block region, there has been an erosion of the MHW shoreline, a negligible volumetric change above 0 feet NAVD88, and moderate volumetric loss above -15 feet NAVD88. The majority

of the volume loss above -15 ft NAVD88 occurred during the most recent survey period. The tombolo located at the realigned breakwater has remained detached allowing sand to transport freely through this reach.

The West Ocean View region was characterized by the shoreline improvement project that took place during the previous survey period. This project included the removal of timber groins, the reconstruction of the rock groin at Station 129+17, and placement of 73,600 cy of material adjacent to the newly reconstructed groin. Station 129+17 was removed from analysis between March 2014 and October 2014 for this report because it could not be surveyed due to the presence of construction equipment. The October 2013 to October 2014 analysis includes Station 129+17 in the calculations and the effects of the shoreline improvement project can be seen. The yearly analysis shows overall volumetric gains above both 0 ft NAVD88 and -15 ft NAVD88. The yearly period also showed an accretion of the MHW shoreline.

The Central Ocean View Breakwaters region showed gains in the MHW shoreline position and minor volumetric gains above 0 feet NAVD88 and -15 feet NAVD88 over the past year. The current survey period showed a gain in the MHW shoreline and in the volume above 0 ft NAVD88; however, there was a minor volumetric loss above -15 ft NAVD88.

Typically a very stable region, Central Ocean View has experienced minor erosion of the MHW shoreline, with a significant volumetric gain above 0 feet NAVD88 and slight loss above -15 feet NAVD88 over the past year. A majority of the volumetric gain above 0 ft NAVD88 and the volumetric loss above -15 ft NAVD88 occurred during the current monitoring period. The MHW shoreline experienced accretion over the current monitoring period. These trends can be explained by the typical quiescent wave climate during this season which transports sand from the offshore bar onshore and deposits it on the subaerial beach and berm.

Due to the normal direction of sediment movement, there is an erosion of the MHW shoreline and minor volumetric losses above both 0 ft NAVD88 and -15 ft NAVD88 in the East Ocean View region over the entire year. During the most recent survey period there were more significant volumetric losses above 0 feet NAVD88 and -15 feet NAVD88. The Bay Oaks breakwaters are continuing to perform well, trapping sediment and eliminating the hotspot at this location. The east end of the region, adjacent to the jetty, is more erosive than most areas west in this region due to the lack of a sediment source.

In addition to regional assessments, comparison of the October 2014 survey was made against post-fill surveys from the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration which took place in March 2009 and January-March 2005 respectively.

Comparison	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
East Ocean View Nourishment vs. October 2014 Comparison	-101.84 ft	-18.37 cy/ft	-95,496 cy	-32.32 cy/ft	-167,628 cy
Central Ocean View Nourishment vs. October 2014	-24.06 ft	-9.92 cy/ft	-182,625 cy	-6.91 cy/ft	-120,828 cy

Since the East Ocean View Nourishment project in 2009, roughly 85% of the placed material above 0 feet NAVD88 has been lost. Since the Central Ocean View Nourishment project in 2005, roughly 57% of the placed material above 0 feet NAVD88 has been lost. The Willoughby Spit Shoreline Improvement Project has alleviated a majority of the areas of concern in this reach. The West Ocean View Shoreline Improvement Project completed construction and has alleviated the hotspot between the 200 Block and Sarah Constant Shrine Park. Future surveys will show the performance of this project. East Ocean View will need renourishment in the next 1-2 years.

2. Objective

The City of Norfolk, Virginia has maintained a program of periodic surveying of the Ocean View shoreline since 2005. The periodic surveying data collection dates are shown in Table 2-1. This report documents the data sources, methods, and results of a periodic surveying evaluation performed to compare the October 2014 survey data with previous surveys taken in October 2013 (fall to fall comparison) and March 2014 (most recent periodic survey comparison) in the Ocean View Beach area between Willoughby Spit and Little Creek Inlet. In addition, comparison of the most recent survey (October 2014) was made to pre-fill and post-fill surveys from the Central Ocean View beach nourishment project that took place in January-March 2005 and the most recent East Ocean View beach nourishment project which took place in March 2009.

Table 2-1: Surveyors and Collection Dates

Data Collection Date	Surveyor
September 2005	McKim & Creed
March 2006	McKim & Creed
October 2006	McKim & Creed
March 2007	McKim & Creed
October 2007	McKim & Creed
March 2008	McKim & Creed
October 2008	McKim & Creed
April 2009	McKim & Creed
October 2009	Geodynamics, LLC
March 2010	Geodynamics, LLC
October 2010	Geodynamics, LLC
April 2011	Geodynamics, LLC
October 2011	Geodynamics, LLC
March 2012	Geodynamics, LLC
September 2012	Geodynamics, LLC
April 2013	Geodynamics, LLC
October 2013	Geodynamics, LLC
March 2014	Geodynamics, LLC
October 2014	Geodynamics, LLC

3. Data Sources

Geodynamics, LLC, conducted the most recent survey of Ocean View Beach in October 2014. The baseline and transects established for the September 2005 survey were used for the most recent survey. Figure 3-1 shows the location of the baseline, transects and the stationing applied by Geodynamics for the surveying. As shown in Figure 3-1, transects were stationed from west to east along the Ocean View shoreline. The survey data were provided in xyz and shapefile formats allowing for compatibility with multiple programs.

Geodynamics noted that typical survey accuracy along the hydrographic portions of the profiles is approximately ± 1 cm. This ‘margin of error’, if applied over the entire length of the hydrographic profiles can potentially result in significant volumetric differences, in particular on the shallow and long profiles near Willoughby Spit. Therefore, volumetric changes discussed herein are analyzed with regard to potential volumetric margins of error.

Also in October 2014, the Virginia Institute of Marine Science (VIMS) flew aerial photography of the Ocean View shoreline, georectified the images, and digitized a shoreline position from the images. The October 2014 aerial photos with the digitized shoreline positions from October 2014, March 2014, and October 2013 are presented in Appendix A. Since these photos cover a limited portion of area landward and seaward of the shoreline, a previous image (2009) is underlain, for presentation purposes.

Pre- and post-fill survey data from the East Ocean View beach nourishment, collected in June 2003 and March 2009, respectively, were used as baseline data for assessing the current state of that nourishment project. Similarly, pre- and post-fill survey data from the Willoughby Spit to Central Ocean View dune restoration were utilized; these surveys were collected in December 2004 – February 2005 and March 2005, respectively. Pre-fill and post-fill data were available in xyz format from previous studies of these projects by Moffatt & Nichol.



Figure 3-1: Survey Baseline and Transects

4. Methods

Survey comparisons and respective analysis were performed using a combination of Autodesk Civil 3D 2014 (Civil 3D), Microsoft Excel (Excel), Surfer and the USACE's Beach Morphology Analysis Package (BMAP). Civil 3D is an AutoCAD based program which allows the user to create and analyze Digital Terrain Models (DTMs). Surfer is a contouring and 3D surface mapping program utilized to create 3D surfaces for analysis. BMAP is a program developed by the USACE to analyze morphologic and dynamic properties of beach profiles.

All pertinent survey data were imported into Civil 3D in xyz format. The horizontal coordinate system used was Virginia South State Plane NAD 1983 (HARN), US Survey feet with a vertical datum of NAVD88. DTMs were created for each set of survey data, and a beach profile was extracted at each survey transect in station-elevation format. Individual profile plates showing the extracted profile at each transect for each date are presented in Appendix B. From the profiles, shoreline change and volumetric change were then calculated at each transect for the following time periods:

1. October 2013 to October 2014 (Entire Shoreline)
2. March 2014 to October 2014 (Entire Shoreline)
3. March 2009 (East Ocean View post-fill) to October 2014 (Sta 329+63 through Sta 383+58)
4. March 2005 (Central Ocean View post-fill) to October 2014 (Sta 15+00 through Sta 195+63)
5. December 2004-February 2005 (Central Ocean View pre-fill) to October 2014 (Sta 15+00 through Sta 195+63)
6. June 2003 (East Ocean View pre-fill) to October 2014 (Sta 329+63 through Sta 383+58)

First, the change in shoreline based on the profiles extracted from Civil 3D at mean high water (MHW) was calculated at each transect for each time period mentioned. MHW along Ocean View beaches is defined as +0.98 feet NAVD88 based on NOAA tidal benchmark at Sewells Point. The resulting value represents the shoreline change (feet) over the time period between surveys. The shoreline change rate (ft/yr) was then calculated by dividing by the amount of time between survey dates.

Representative volume changes were also calculated at each transect for all time periods. Volume changes were calculated for two different extents in order to better understand the processes occurring onshore and offshore of the Ocean View beach area. Calculations included volume change above -15 feet NAVD88 and volume change above 0 feet NAVD88. The results represent volume change per linear foot of shoreline (cy/ft) over the period of time between surveys. The volume change rate (cy/ft/yr) was then calculated by dividing by the amount of time between survey dates. In addition, the volume changes were converted to cumulative changes over the entire shoreline. This was done by applying the average end area method to the unit volume changes (cy/ft) and unit volume change rates (cy/ft/yr) computed at each transect and summing the total volume changes over the entire shoreline. The resulting value indicated the total loss or gain of material (cy) between surveys based on the applicable profile extents.

Volume changes calculated for portions of the profiles above 0 feet NAVD88 are representative of changes in the amount of material in the dune system and on the subaerial beach. These areas are highly influenced by the performance of coastal structures and the impact of storm activity. Volume changes calculated for portions of the profiles above -15 feet NAVD88 allow for the tracking of sand movement offshore while reducing the amount of uncertainty associated with hydrographic data beyond this depth.

5. Discussion of Periodic Surveying Evaluation

This section discusses differences observed between the noted surveys, overall shoreline trends, regional shoreline trends and the East Ocean View and Central Ocean View nourishment projects. The computed shoreline changes and volume changes at each individual transect for the time periods covered are tabulated in Appendix C.

5.1. Differences in Survey Comparisons

Profile variations in the surveys taken as part of the ongoing program of periodic surveying of the Ocean View shoreline (October 2013, March 2014, and October 2014) were minimal in the topographic portion of the survey due to use of the same baseline and transects put in place for the initial survey in September 2005. Profile extents and alignment were virtually the same when comparing the survey data. The only discrepancy which impacted calculations was the vertical margin of error in the hydrographic portion of the survey as mentioned in Section 3.

The pre-fill and post-fill surveys taken for the East Ocean View and Central Ocean View nourishment projects did not use the same baseline and transects or cover the same extents as the periodic surveys. Therefore, the profiles extracted from the DTMs in Civil 3D at the periodic surveying transects are interpolations between the actual pre- and post-fill data points. In addition, the surveys did not extend as far offshore as the periodic surveys, limiting computations and the ability to track the offshore movement of sand.

5.2. Key Events During the Reporting Period

Beach processes are greatly influenced by natural and engineering processes. This section describes key events that happened during the reporting period which likely had an impact on the changes in shoreline position as well as profile volume gains and losses.

5.2.1. Storm Events

Understanding of the wave climate immediately offshore of the Norfolk shoreline is vital for the design, monitoring, and understanding of projects along the shoreline and the behavior of the beach. The data used were collected from the City's AWAC (Acoustic Wave and Current) gage, which was deployed in 2006 directly offshore of the Norfolk Shoreline in approximately 23 feet of water. The dates that the wave data were collected during this survey period were between March 20, 2014 and October 2, 2014.

A summary of the observed conditions during this deployment period yields the following general observations:

- The average significant wave height and peak period over this measurement period was approximately 1.2 feet and 4.9 seconds.
- The typical direction of the waves was from the northeast to southeast.

- The largest significant wave height observed during this deployment was approximately 7.1 feet with a corresponding peak period of approximately 4.5 seconds and mean direction of 354 degrees (April 16, 2014).

The overall wave climate was quiescent, which is typical between March 2014 and October 2014 for this region. Four storm events occurred during this time where significant wave heights reached or exceeded 4.9 feet (1.5 m). These events occurred on April 16, 2014, July 4, 2014, September 8, 2014, and September 24, 2014 and are shown in, Figure 5-1 through Figure 5-4.

The overall trends remained consistent with prior measurement periods with waves during calm periods being predominantly swell traveling into the bay from the ocean and having longer wave periods and lower wave heights. Typically, the larger wave height events are driven by northerly storm winds within the bay and tend to have shorter wave periods. There were four storm events during this period and, as observed in the prior measurement periods, the wind data indicate that for large and sustained wind events there is a corresponding increase in significant wave height. A summary of wave statistics by month during this deployment is given in Table 5-1.

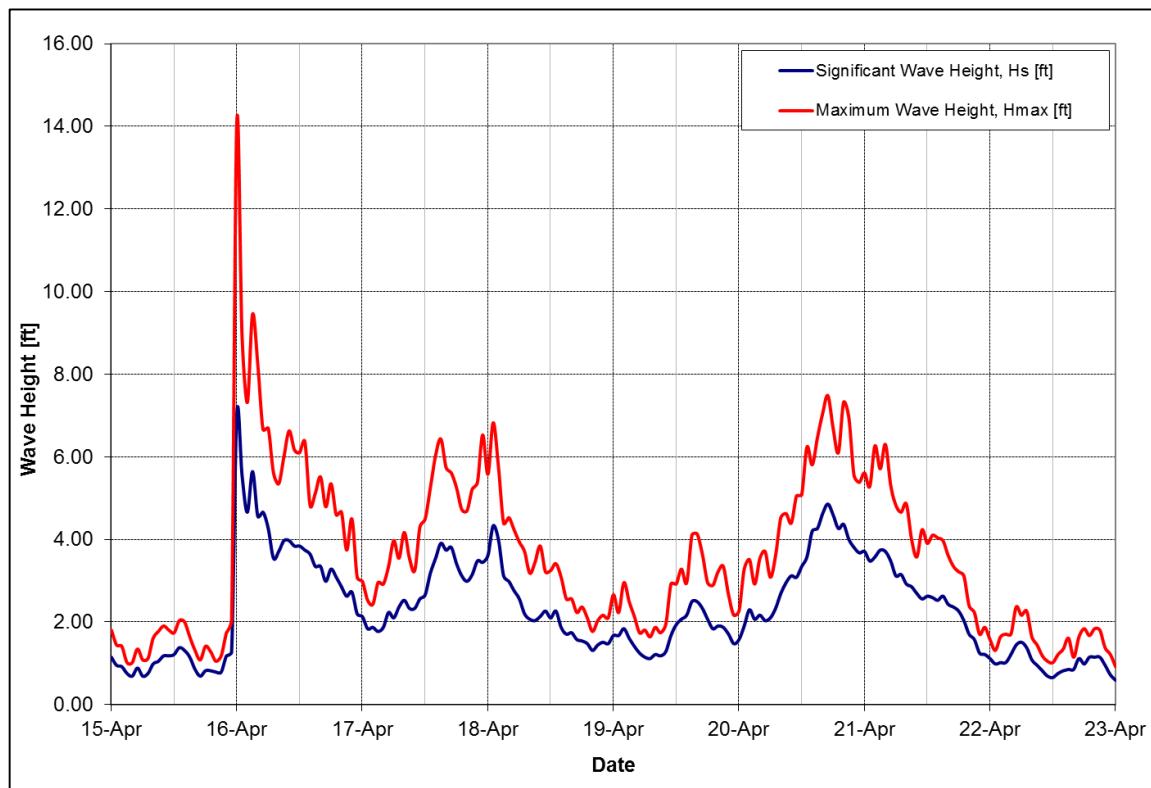


Figure 5-1: April 16, 2014 Storm

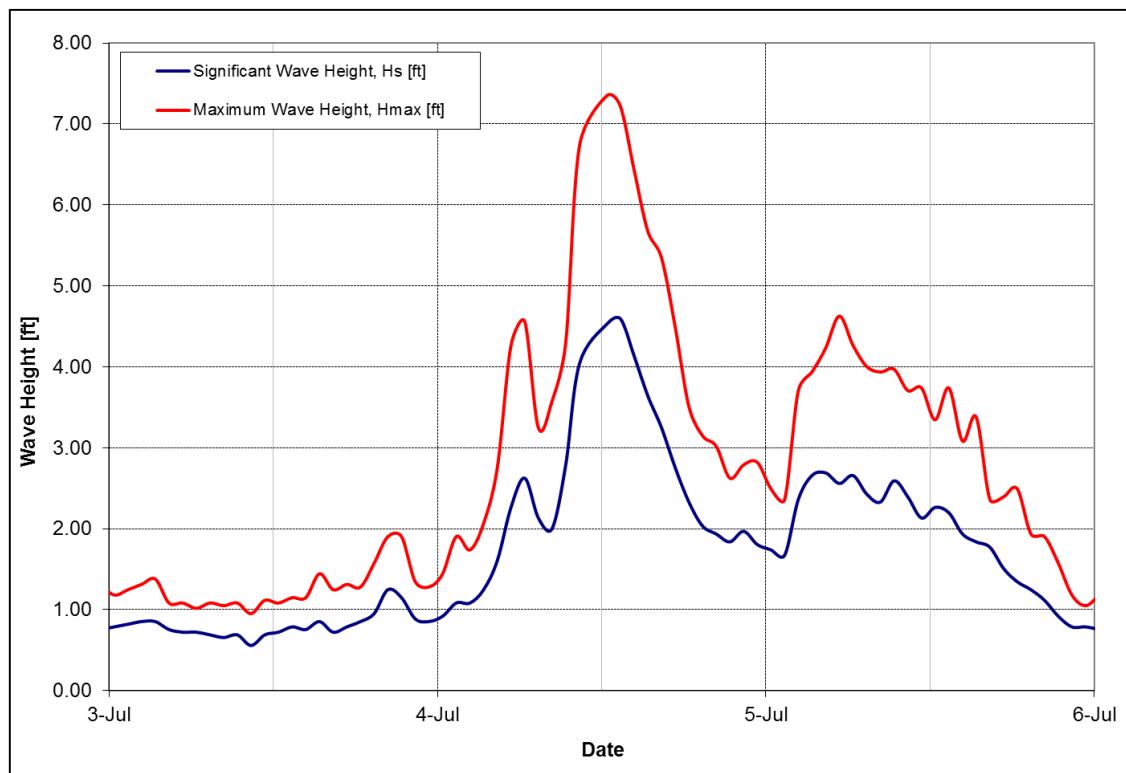


Figure 5-2: July 4, 2014 Storm

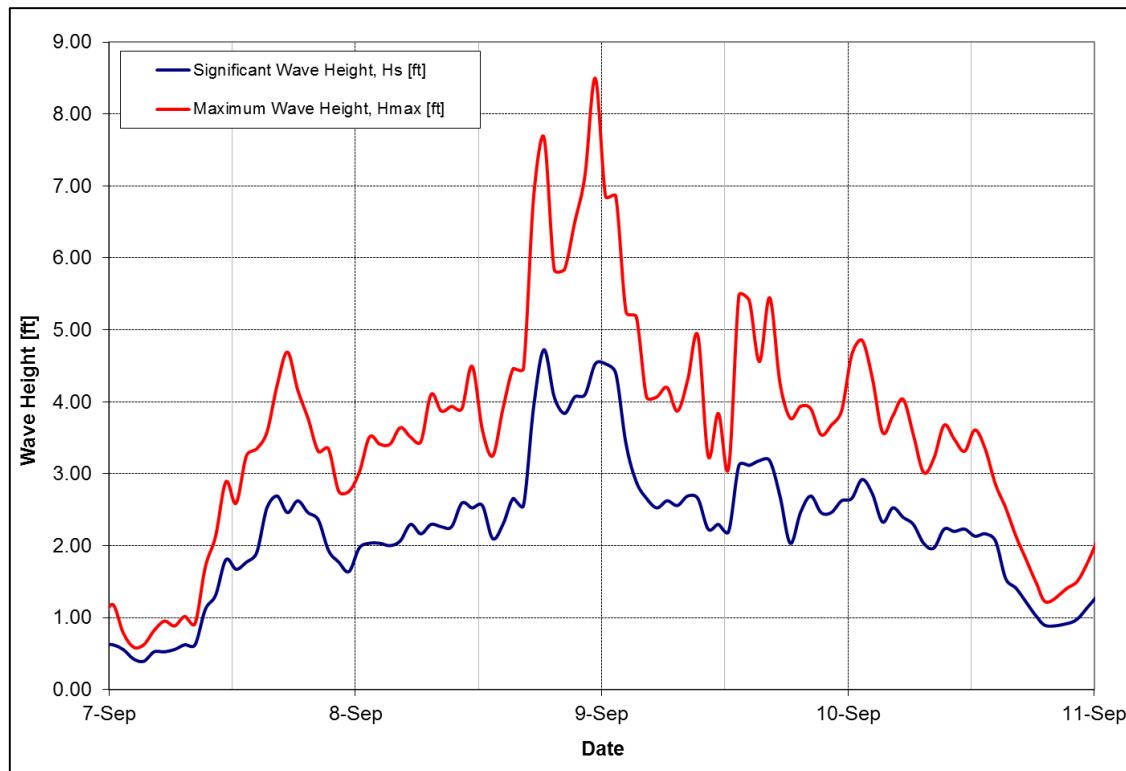
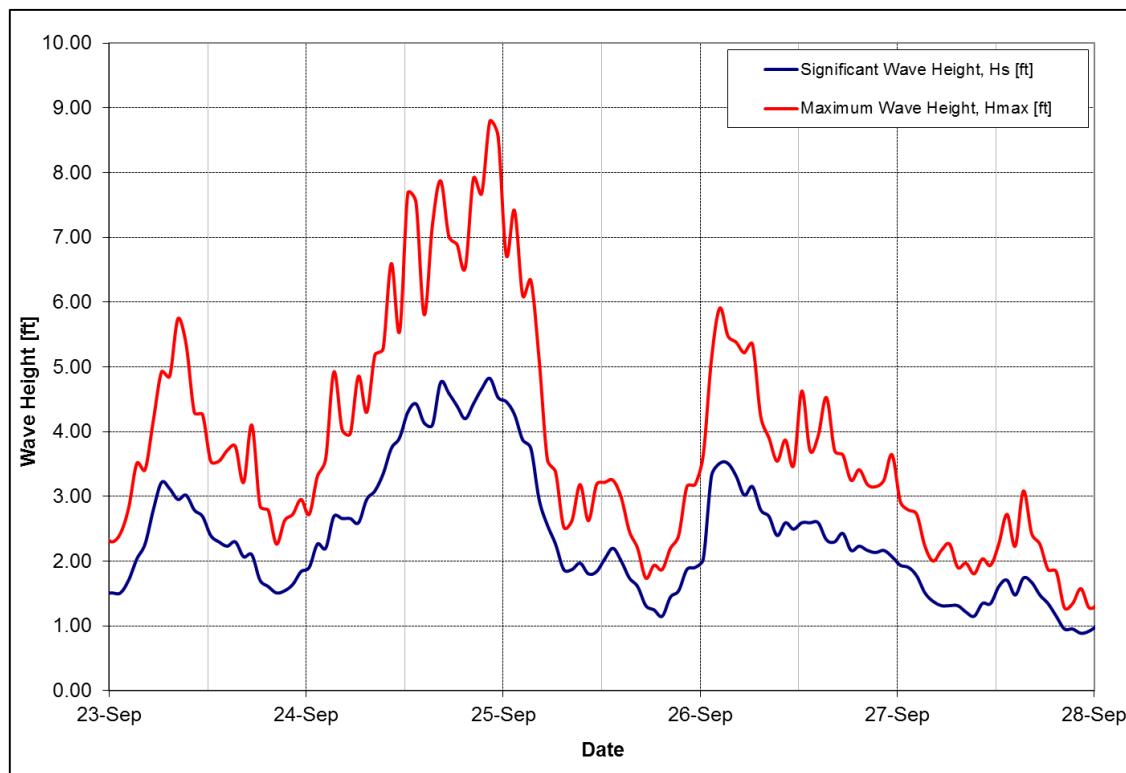


Figure 5-3: September 8, 2014 Storm

**Figure 5-4: September 24, 2014 Storm****Table 5-1: Monthly Wave Statistics Summary**

Wave Statistic	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sept-14
Average Significant Wave Height, H_s (ft)	1.80	1.45	0.93	1.01	0.98	1.11	1.48
Average Wave Period, T_m (s)	2.75	2.67	2.40	2.48	2.27	2.58	2.66
Average Peak Wave Period, T_p (s)	5.01	5.02	4.92	4.72	4.22	5.11	5.18
Maximum Observed Significant Wave Height, H_s (ft)	5.20	7.05	3.12	2.69	4.59	3.51	4.82
Maximum Observed Wave Height, H_{max} (ft)	8.40	14.11	5.05	4.46	7.35	5.45	8.79

5.2.2. Engineering Activities

No new engineering activities took place along the Ocean View Shoreline over the most recent monitoring period (March 2014 – October 2014). Construction of the West Ocean View Shoreline Improvement Project was completed during the previous monitoring period (October 2013 – March 2014). See Section 5.7 for a detailed analysis of this project.

5.3. General Shoreline Trends

Key statistics were calculated to describe the average shoreline and volume changes over the entire shoreline as well as for each region of the shoreline as defined in Figure 3-1. The computed statistics

include average shoreline change, average volume change, and cumulative volume change (e.g. total volume of material lost or gained along a section of shoreline). A summary of the resulting statistics for the October 2013 to October 2014 comparison are presented in Table 5-2. A summary of the resulting statistics for the March 2014 to October 2014 comparison are presented in Table 5-3. Evaluation of the computed statistics took into account volume changes computed for portions of the profile above 0 feet NAVD88 and above -15 feet NAVD88 in order to better understand onshore and offshore processes.

According to Table 5-2, the Ocean View shoreline has experienced overall gains at MHW over the past year with a change rate of 1.51 feet per year. While the beach gained a significant amount of material above 0 feet NAVD88, the gain above -15 ft NAVD88 was minor with a change rate of 12,759 cy/yr overall. The overall MHW shoreline showed accretion over the most recent survey of 4.41 ft, as shown in Table 5-3. The volumetric change over the past survey showed gains above 0 ft NAVD88 and loss above -15 ft NAVD88.

While the overall trends over the past year show shoreline accretion and volumetric gain of the system, patterns vary within each region of the shoreline as defined in Figure 3-1. The calculated statistics with respect to each region will be discussed in more detail in the following section.

Table 5-2: Regional Shoreline and Volume Change Statistics (October 2013 to October 2014)

Region	Average Shoreline Change	Average Volume Change Rate Above 0 ft NAVD88	Cumulative Volume Change Rate Above 0 ft NAVD88	Average Volume Change Rate Above -15 ft NAVD88	Cumulative Volume Change Rate Above -15 ft NAVD88
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	10.77	4.32	20,737	3.15	14,310
800 Block Breakwaters (45+25 to 87+62)	-4.12	-0.16	37	-5.28	-20,969
West Ocean View (93+41 to 163+49)	12.30	2.91	23,543	3.72	34,246
Central Ocean View Breakwaters (169+63 to 195+63)	6.12	1.92	5,840	2.39	3,064
Central Ocean View (206+86 to 323+09)	-1.80	4.64	57,025	-1.01	-9,212
East Ocean View (329+63 to 383+58)	-11.24	-0.14	-154	-1.89	-8,679
OVERALL	Weighted Avg (ft/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)
	1.51	2.73	107,029	0.09	12,759

Table 5-3: Regional Shoreline and Volume Change Statistics (March 2014 to October 2014)

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	5.62	1.74	8,561	-2.99	-12,822
800 Block Breakwaters (45+25 to 87+62)	-2.71	-0.30	-950	-4.33	-19,411
West Ocean View (93+41 to 163+49)	4.97	1.51	13,483	3.07	28,198
Central Ocean View Breakwaters (169+63 to 195+63)	-0.52	0.42	2,154	-1.43	-2,452
Central Ocean View (206+86 to 323+09)	11.35	2.81	34,009	-1.21	-10,525
East Ocean View (329+63 to 383+58)	-3.84	-0.86	-4,761	-5.30	-30,399
OVERALL	Weighted Avg (ft)	Weighted Avg (cy/ft)	Total (cy)	Weighted Avg (cy/ft)	Total (cy)
	4.41	1.29	52,496	-1.57	-47,411

5.4. Regional Shoreline Trends

Regional shoreline trends are discussed below for the defined regions between Willoughby Spit and Little Creek Inlet (see Figure 3-1). A summary of the information in Table 5-2 and Table 5-3 has been created for each region of study. Figure 5-5 through Figure 5-8, following the discussion of regional shoreline trends, present the shoreline and volume change at each transect within the defined regions.

5.4.1. Willoughby Spit

The Willoughby Spit region (Sta 0+00 to Sta 45+00) previously included two offshore breakwaters, timber groins and has historically been a stable and accreting region. This region is still continuing to adjust due to the completion of the Willoughby Spit Shoreline Improvement Project in December 2013, which included the removal of the existing groin field and connected the 800 Block breakwater field with the existing Willoughby Spit breakwaters by adding seven new breakwaters. A summary of average shoreline and volume change rates for the Willoughby Spit region between October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-4.

Table 5-4: Average Shoreline and Volume Change Rates for Willoughby Spit

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
Willoughby Spit (0+00 to 45+00)	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
March 2014 vs. October 2014 Comparison					
Willoughby Spit (0+00 to 45+00)	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)

The information shown in Table 5-4 is still influenced by the recent Willoughby Spit Shoreline Improvement Project on this region over the last year. The shoreline at MHW as well as the volume change above 0 feet NAVD88 and -15 feet NAVD88 was highly variable throughout this reach. For

the year between the spring surveys (October 2013 and October 2014), this region experienced overall accretion of the MHW shoreline as well as an overall gain of sediment above 0 ft NAVD88 and above -15 ft NAVD88. This reach now has a total of 9 nearshore breakwaters, which connects the two existing breakwaters near the terminal groin to the 800 block breakwater field. The shoreline improvement project has continued to perform as designed, holding the sand in the system as it moves west through the reach as shown in Figure 5-6 and Figure 5-8. The nourishment that was placed along the eastern end of the reach has continued to equilibrate moving to the west as shown in Figure 5-8. As the sand moves west, the new breakwater field is holding the sand in the system. The cumulative volume change over the year shows a gain above 0 ft NAVD88 and -15 ft NAVD88 of 20,737 cy and 14,310 cy respectively. This correlates well to the accretion of the MHW shoreline in the western section of the reach and the erosion of the MHW shoreline in the eastern section of the reach as shown in Figure 5-5. Overall this reach has experienced an accretion of the MHW shoreline of 10.77 ft/yr.

5.4.2. 800 Block Breakwaters

The 800 Block Breakwaters region (Sta 45+25 to Sta 87+62) is characterized by a field of eight breakwaters. The easternmost breakwater was relocated in February 2006 along with removal of the pre-existing groin spur and toe extension. This new breakwater was built further offshore since the previous structural configuration caused the beach to fill out and impair natural sediment transport to the west. In conjunction with the Willoughby Spit Project, the second easternmost breakwater, has been relocated further offshore to enhance natural sediment transport in the region. A summary of average shoreline and volume change rates for the 800 Block Breakwaters region between October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-5.

Table 5-5: Average Shoreline and Volume Change Rates for 800 Block Breakwaters

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
800 Block Breakwaters (45+25 to 87+62)	-4.12	-0.16	37	-5.28	-20,969
March 2014 vs. October 2014 Comparison					
800 Block Breakwaters (45+25 to 87+62)	-2.71	-0.30	-950	-4.33	-19,411

Over the past year (October 2013 – October 2014), the 800 block has shown a minimal overall volume gain above 0 ft NAVD88 of 37 cy and a volumetric loss above -15 ft NAVD88 of 20,969 cy. Across the reach, there were gains located in the central section with losses located on the eastern and western end as shown in Figure 5-6. The majority of the loss above -15 ft NAVD88 occurred during the most recent survey period (March 2014 – October 2014) and is located in the western end of the reach, as shown in Figure 5-8. This was most likely due to the continued equilibration of the nourishment placed from the Willoughby Spit Shoreline Improvement Project. The MHW shoreline has shown an overall erosion rate of -4.12 ft/yr over the past year (October 2013 – October 2014). This loss is primarily due to the continued equilibration of the nourishment placed in the western end of the reach as well as the end effects on both ends of the breakwater field in this reach, as shown in Figure 5-5. Also, over the past survey period (March 2014 – October 2014), the MHW shoreline located behind the realigned

breakwater has begun to accrete as shown in Figure 5-7; however, a tombolo has not formed at this point.

5.4.3. West Ocean View

The West Ocean View area (Sta 93+41 to Sta 163+49), between the 800 Block and Central Ocean View breakwaters, is characterized by a series of timber groins. The West Ocean View Shoreline Improvement Project that took place during the previous survey period (October 2013 – March 2014). This project included the removal of all timber groins located between the Ocean View Fishing Pier and Station 141+98, the reconstruction of the rock groin at station 129+17, and 73,600 cy of nourishment placed in front of Sarah Shrine Constant Park. A summary of average shoreline and volume change rates for the West Ocean View region October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-6.

Table 5-6: Average Shoreline and Volume Change Rates for West Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
West Ocean View (93+41 to 163+49)	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
	12.30	2.91	23,543	3.72	34,246
March 2014 vs. October 2014 Comparison					
West Ocean View (93+41 to 163+49)	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
	4.97	1.51	13,483	3.07	28,198

The changes within this region were controlled by the West Ocean View Shoreline Improvement Project, which took place during the previous survey period. At the time of the March 2014 survey, there was construction equipment located at Station 129+17; therefore, no data were recorded at this station. This station was removed from analysis for the survey comparison between March 2014 and October 2014; therefore, the calculated volume change does not account for the nourishment placed for the project. The yearly survey comparison (October 2013 - October 2014) showed the MHW shoreline change rate of +12.3 ft/yr, and a volumetric gain above elevation 0 feet NAVD88 and -15 feet NAVD88 of 25,543 cy/yr and 34,246 cy/yr respectively. Figure 5-5 and Figure 5-6 show the effects of the West Ocean View Shoreline Improvement Project on the MHW shoreline and volume change above 0 ft NAVD88 and -15 ft NAVD88 respectively. The

5.4.4. Central Ocean View Breakwaters

The Central Ocean View breakwater region covers the four offshore breakwaters at Central Ocean View and approximately 800 feet westward (Sta 169+63 to Sta 195+63). A summary of average shoreline and volume change rates for the Central Ocean View Breakwaters region between October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-7.

Table 5-7: Average Shoreline and Volume Change Rates for Central Ocean View Breakwaters

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
Central Ocean View Breakwaters (169+63 to 195+63)	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
March 2014 vs. October 2014 Comparison					
Central Ocean View Breakwaters (169+63 to 195+63)	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)

The Central Ocean View Breakwaters reach has continued to be fairly stable. It showed an overall gain in the MHW shoreline position and an overall volume gain above 0 feet NAVD88 and -15 feet NAVD88 over the past year. The MHW shoreline in this reach accreted at a rate of 6.12 ft/yr. The volumetric gain rate above 0 ft NAVD88 and -15 ft NAVD88 over the past year was 5,840 cy/yr and 3,064 cy/yr respectively. Over the current survey period (March 2014 – October 2014), this reach experienced minor erosion of the MHW shoreline, minor volumetric gain above 0 ft NAVD88, and minor volumetric loss above -15 ft NAVD88 overall. Assessment of Figure 5-7 and Figure 5-8 show the eastern end of the reach accreted, while the western end eroded. Overall, this reach has fared well over the past few monitoring periods.

5.4.5. Central Ocean View

Central Ocean View (Sta 206+86 to Sta 323+09) is historically a stable region with slight accretion despite the absence of engineering interventions (e.g. beach fill or structures). A summary of average shoreline and volume change rates for the Central Ocean View region between October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-8.

Table 5-8: Average Shoreline and Volume Change Rates for Central Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
Central Ocean View (206+86 to 323+09)	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
March 2014 vs. October 2014 Comparison					
Central Ocean View (206+86 to 323+09)	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)

As shown in Table 5-8, Central Ocean View has experienced minor erosion of the MHW shoreline of -1.80 ft/yr, a significant volumetric gain in sediment above 0 ft NAVD88 of 57,025 cy and a minor volumetric loss in sediment above -15 ft NAVD88 of -9,212 cy over the past year. The majority of the volumetric gain above 0 ft NAVD88 and volumetric loss above -15 ft NAVD88 occurred during the current survey period (March 2014 to October 2014). All but one transect showed a volumetric gain above 0 ft NAVD88 across the whole reach and the volume change above -15 ft NAVD88 was minimal and oscillated between positive and negative, as shown in Figure 5-8. The volume gain above 0 ft

NAVD88 was primarily located within the berm as can be seen in Appendix B. This correlates to an overall accretion of the MHW shoreline as shown in Figure 5-7.

5.4.6. East Ocean View

The East Ocean View region (Sta 329+63 to Sta 383+58) is characterized by 15 breakwaters of which the 5 westernmost were built in August of 2009. Prior to the breakwater construction, a beach renourishment project took place in March 2009, adding approximately 196,000 cy of material to the beach. A summary of average shoreline and volume change rates for the East Ocean View region between October 2013 and October 2014 and between March 2014 and October 2014 are presented in Table 5-9.

Table 5-9: Average Shoreline and Volume Change Rates for East Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
October 2013 vs. October 2014 Comparison					
East Ocean View (329+63 to 383+58)	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
March 2014 vs. October 2014 Comparison					
East Ocean View (329+63 to 383+58)	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)

This region is normally characterized by a consistent erosional pattern due to sediment movement along the shoreline from east to west with no sand source due to the terminal groin at Little Creek Inlet. Over the past year, there was an overall loss of the MHW shoreline of 11.24 ft, as well as minor volume losses above 0 feet NAVD88 and -15 feet NAVD88 of 154 cy and 8,679 cy respectively. It is important to note that at new beach access was opened through the dune at Station 344+05, which can be seen in Figure 5-6 and Figure 5-8. Since this feature occurs over one transect, it does not significantly affect the overall results for this reach. During the current monitoring period (March 2014 – October 2014), there was overall minor erosion of the MHW shoreline of 3.84 ft as well as volumetric losses above both 0 feet NAVD88 and -15 feet NAVD88 of 4,761 cy and 30,399 cy respectively. The volumetric gain that was observed within this reach over the previous survey period (October 2013 – March 2014) was an isolated occurrence and a majority of the material was most likely transported alongshore and out of the reach. The Bay Oaks breakwaters have continued to be very successful at retaining sand that may be eroding from the beach and eliminating the previous hotspot. Typically, the east end of the region, adjacent to the jetty, is more erosive than most areas west in this region due to the lack of a sediment source and the littoral sediment movement in this region going from east to west. Also, this region has a fairly steady pattern of accretion on the profiles behind the breakwaters and erosion on the profiles between the breakwaters. This indicates the influence of the breakwaters on decreasing the wave heights and retaining sediment along the shore.

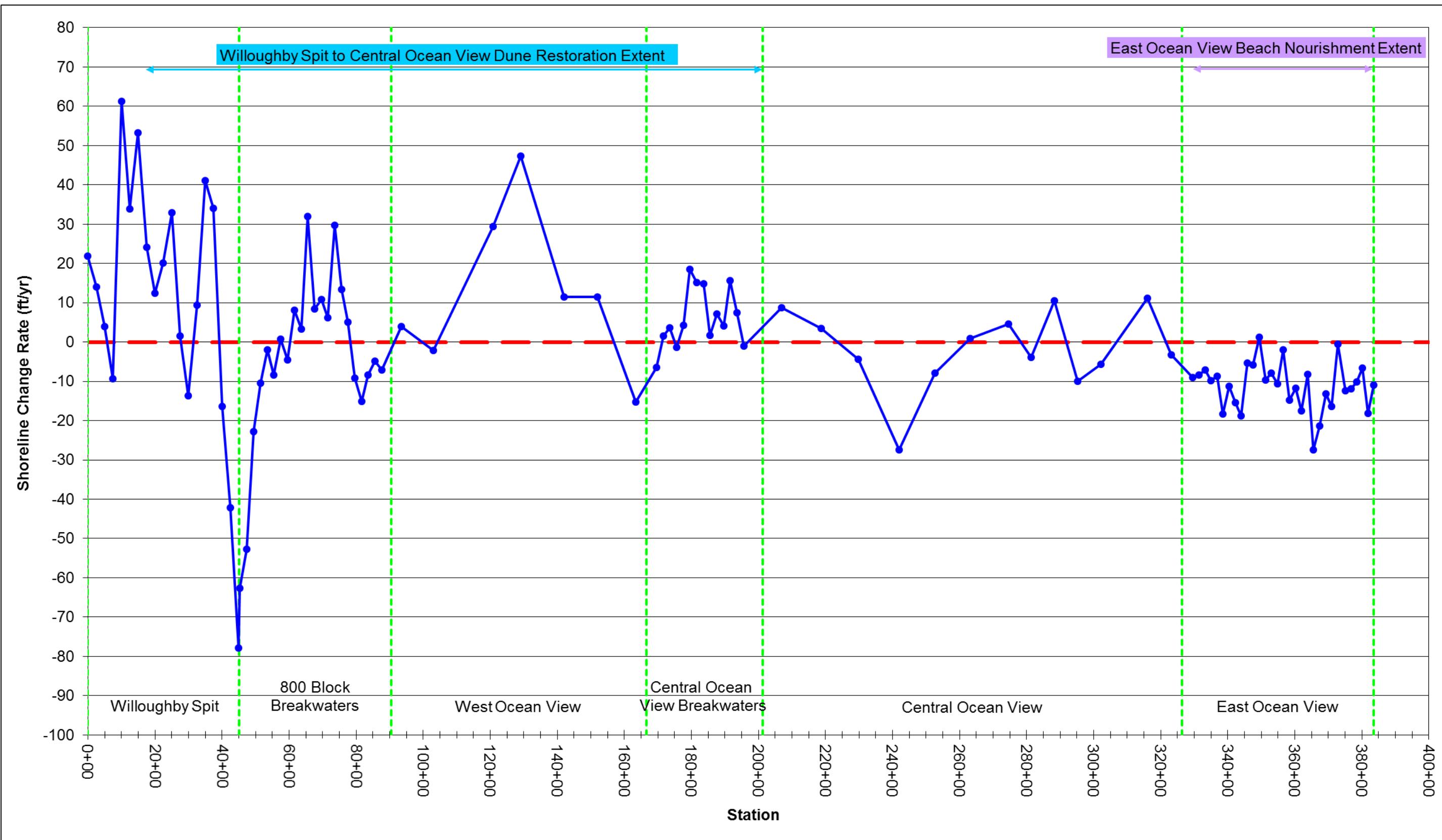


Figure 5-5: Shoreline Change Rate (ft/yr) at Mean High Water (+0.98 ft NAVD88) for October 2013 to October 2014 (Note: Positive = Accretion, Negative = Erosion)

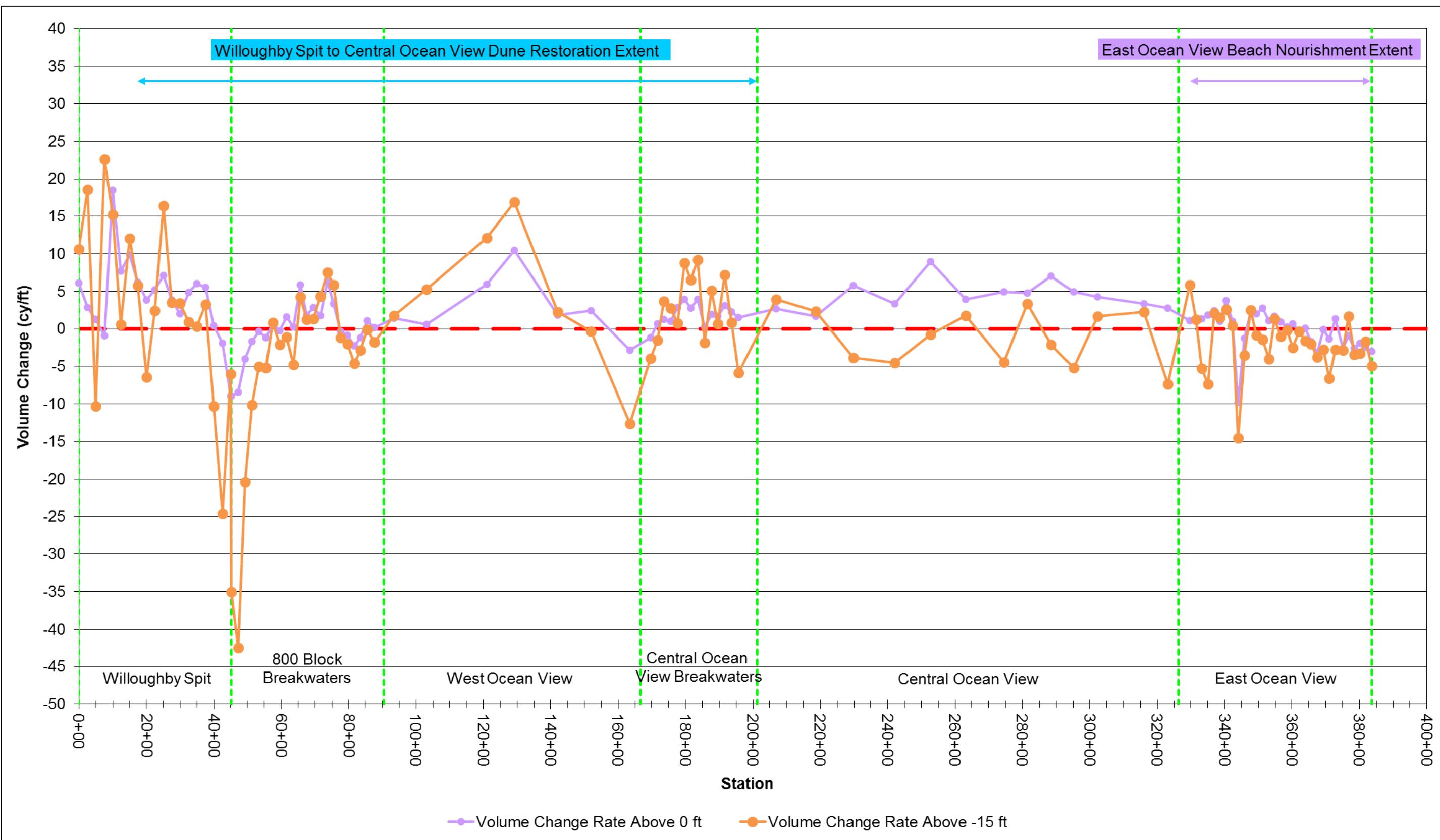


Figure 5-6: Volume Change Above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft) for October 2013 to October 2014 (Note: Positive = Accretion, Negative = Erosion)

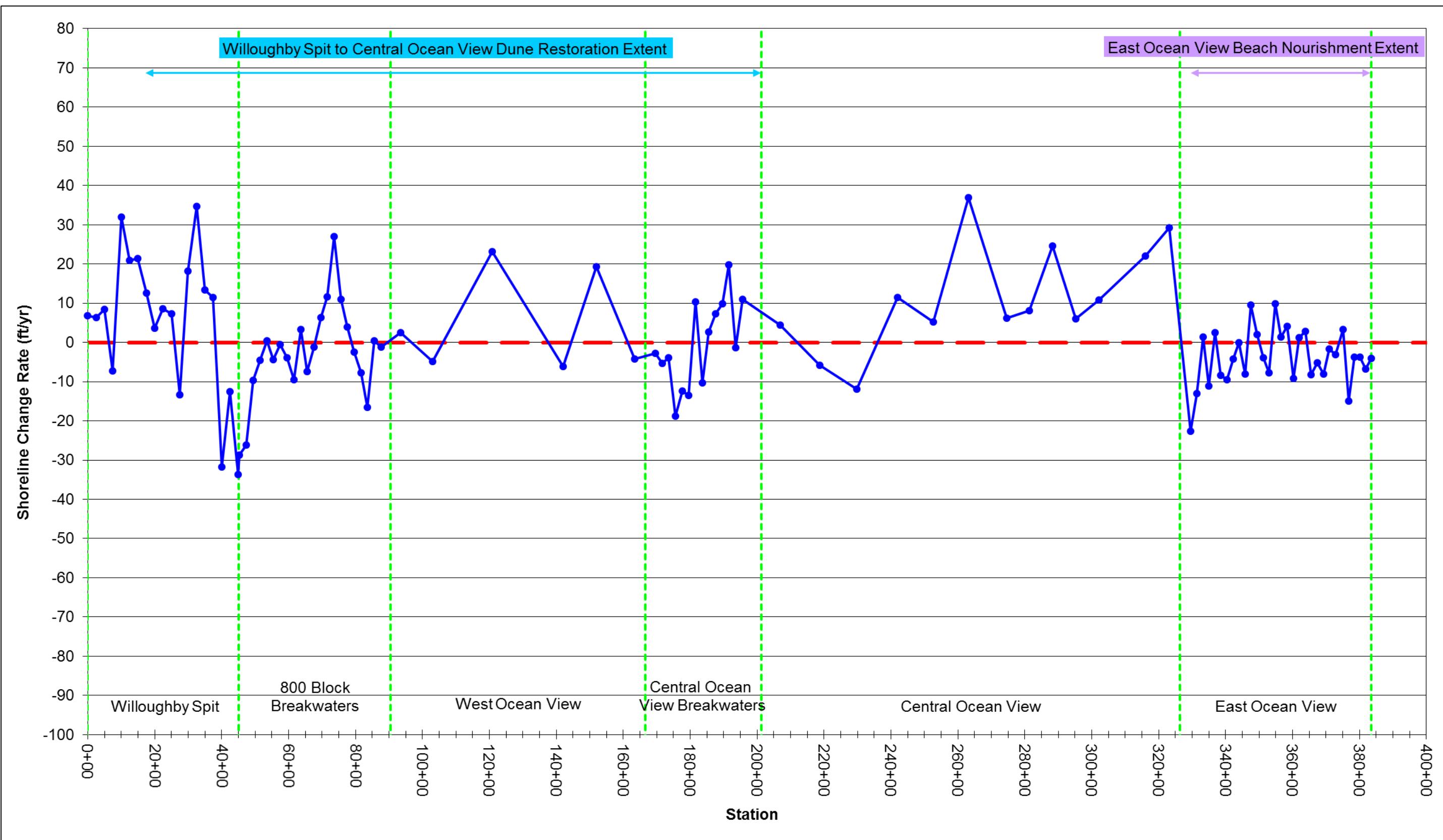


Figure 5-7: Shoreline Change (ft) at Mean High Water (+0.98 ft NAVD88) for March 2014 to October 2014 (Note: Positive = Accretion, Negative = Erosion)

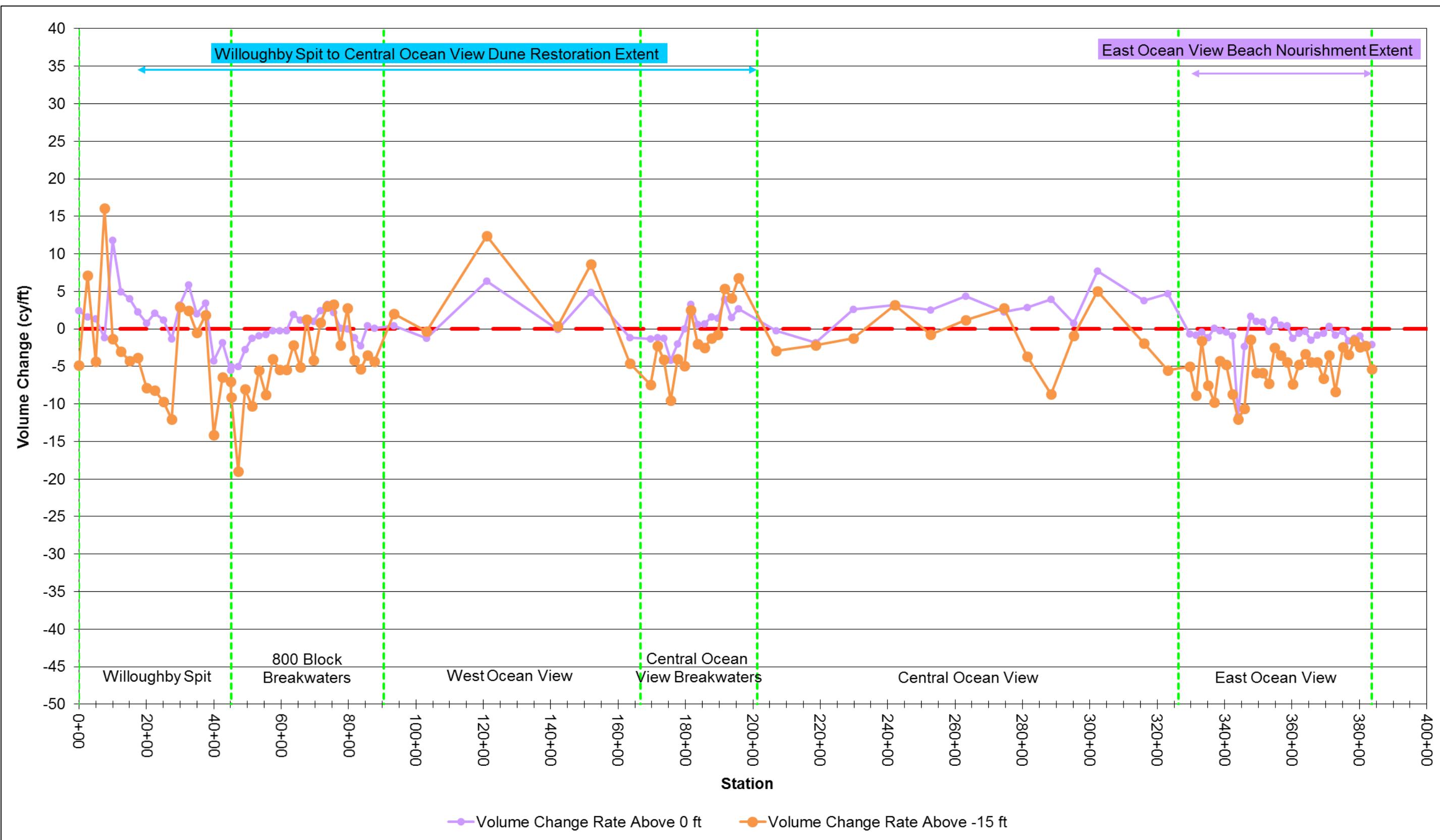


Figure 5-8: Volume Change Above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft) for March 2014 to October 2014 (Note: Positive = Accretion, Negative = Erosion)

5.5. East Ocean View Beach Nourishment Project (2009)

An initial beach nourishment project took place along the East Ocean View shoreline in November 2003. Approximately 359,000 cy of material was placed on the beach between Station 329+63 and Station 383+58. More recently, the East Ocean View shoreline was renourished with approximately 196,000 cy of material in March 2009. The most recent periodic survey, taken in October 2014, was compared to the post-fill survey taken in March 2009. Table 5-10 presents the shoreline and volume change statistics comparing the two surveys.

Table 5-10: Overall Shoreline and Volume Change Statistics – East Ocean View Nourishment Project (March 2009 Post-Fill – October 2014 Comparison)

Region		Average Shoreline Change (ft)	Average Volume Change Above 0 ft NAVD88 (cy/ft)	Cumulative Volume Change Above 0 ft NAVD88 (cy)	Average Volume Change Above -15 ft NAVD88 (cy/ft)	Cumulative Volume Change Above -15 ft NAVD88 (cy)
East Ocean View (329+63 to 383+58)	Rate per Year	-18.34	-3.31	-17,196	-5.82	-30,185
	Total	-101.84	-18.37	-95,496	-32.32	-167,628

Results indicate that the East Ocean View shoreline has remained fairly constant at MHW. Roughly 95,500 cy of material has been lost above 0 feet NAVD88, or approximately 85% of the 113,000 cy originally placed above 0 feet NAVD88. This was a slight increase from the previous survey period where the percentage loss was 82%, which indicates there was not significant loss of additional sediment over the most recent survey period. This loss of sediment is the result of the expected erosion due to design life of the nourishment project combined with storm activity. Previous experience from the 2003 nourishment project indicates that the design life of projects in this area is limited to 4-5 years due to storm impact and lack of sediment source to the east. Therefore, it is anticipated that renourishment will be needed within the next 1 to 2 years.

Figure 5-9 shows areas of elevation change between the post-fill survey and the October 2014 survey. As depicted in the figure, there has been erosion of the beach face and nearshore in-between the breakwaters with some of that sediment being trapped behind each of the breakwaters. The magnitude of the loss is much larger to the east, which is to be expected since this shoreline is cut off from a sediment source by the jetty. Some of the sediment eroded from the beach face and nearshore appears to be caught offshore in the vicinity of the Bay Oaks breakwaters. At Station 329+63, there seems to be some slight end effects from the Bay Oaks breakwaters. These breakwaters have continued to be very successful eliminating the previous hotspot and providing a transition into the Central Ocean View region. There has also been an increase in the dune area, which may partially be attributed to the annual dune planting project providing a mechanism for sand accumulation.

In addition, the October 2014 MHW shoreline was compared to the MHW shoreline from June 2003, before the first nourishment project in November 2003, as another way to measure the amount of protection being supplied by the March 2009 nourishment project. Areas where the current shoreline is within 20 feet of the June 2003 shoreline need to be targeted for nourishment. Figure 5-10 shows the MHW shoreline position difference between the June 2003 pre-fill and October 2014 shorelines. As can be seen, the MHW shoreline at all transects along the East Ocean View Breakwaters have retreated within 20 feet of the pre-fill shoreline. A majority of the stations within the Bay Oaks

Breakwaters have remained outside of the 20 ft buffer for the pre-fill shoreline; however, they have receded closer to this mark. One new station (335+03) has receded within 20 ft of the pre-fill shoreline. Two stations (331+43 and 347+63) continue to recede beyond the pre-fill shoreline; however, no new stations have receded beyond this mark. As for the East Ocean View Breakwaters, all stations within this reach are either within 20 ft of the pre-fill shoreline, or have receded beyond the pre-fill shoreline. Also, eight new stations have receded beyond the pre-fill shoreline over the most recent monitoring cycle. These stations are as follows: Station 353+03, 354+86, 358+43, 365+63, 369+23, 376+78, 381+88, and 383+58. Previously, only three stations (351+23, 362+03, and 363+83) have receded beyond the pre-fill shoreline. It will be important to monitor this portion of shoreline for planning purposes of future nourishment projects.

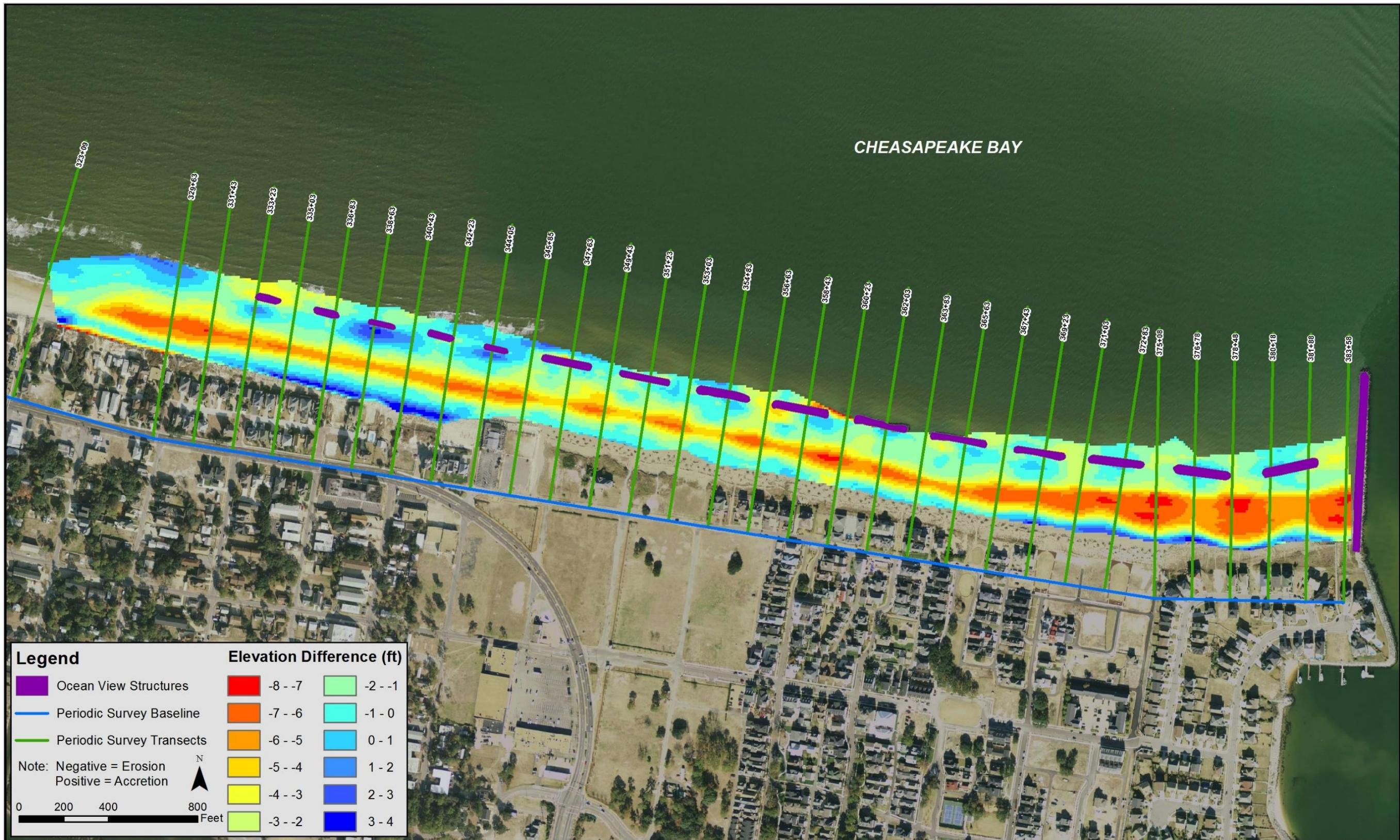


Figure 5.9: Net Volume Change Since the East Ocean View Nourishment Project (March 2009)

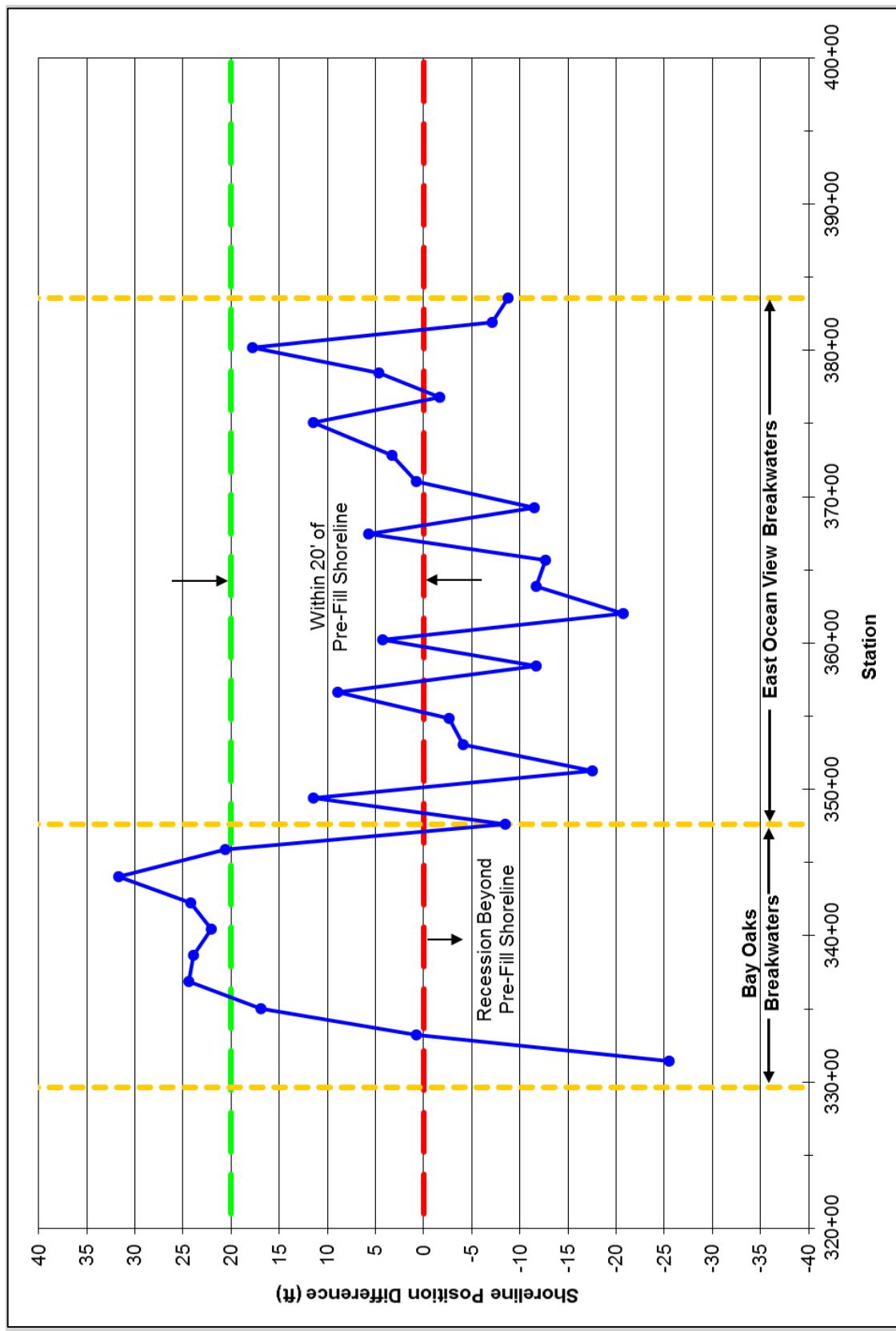


Figure 5-10: Shoreline Position Difference (ft) at MHW Between 2003 Pre-Fill and October 2014 Shorelines for East Ocean View

5.6. Central Ocean View Dune Restoration Project (2005)

The most recent periodic survey, taken in October 2014, was also compared to the post-fill survey taken in March 2005 after completion of the Willoughby Spit to Central Ocean View Dune Restoration project. A total of 504,300 cy of sand was placed from Station 15+00 to Station 195+63. Table 5-11 presents the shoreline and volume change statistics comparing the two surveys.

Table 5-11: Regional and Overall Shoreline and Volume Change Statistics for Central Ocean View Nourishment Project (March 2005 Post-Fill – October 2014 Comparison)

Region		Average Shoreline Change (ft)	Average Volume Change Above 0 ft NAVD88 (cy/ft)	Cumulative Volume Change Above 0 ft NAVD88 (cy)	Average Volume Change Above -15 ft NAVD88 (cy/ft)	Cumulative Volume Change Above -15 ft NAVD88 (cy)
Willoughby Spit (0+00 to 45+00)	Rate per Year	0.39	-0.74	-2,091	-0.41	-936
	Total	3.75	-7.07	-20,011	-3.88	-8,960
800 Block Breakwaters (45+25 to 87+62)	Rate per Year	-5.50	-1.16	-5,037	-1.81	-7,889
	Total	-52.66	-11.12	-48,204	-17.37	-75,498
West Ocean View (93+41 to 163+49)	Rate per Year	-2.69	-1.50	-11,650	-0.92	-6,442
	Total	-25.77	-14.38	-111,490	-8.76	-61,647
Central Ocean View Breakwaters (169+63 to 195+63)	Rate per Year	-0.84	-0.12	-305	0.85	2,641
	Total	-8.02	-1.15	-2,919	8.10	25,276
OVERALL		Weighted Average	Total	Weighted Average	Total	Weighted Average
Rate per Year		-2.51	-1.04	-19,083	-0.72	-13,870
Total		-24.06	-9.92	-182,625	-6.91	-132,730

It is important to consider changes above the 0 feet contour since the project was primarily a dune restoration, placing the majority of sand above the intertidal zone. Table 5-11 shows that there has been significant loss of material in the dune system and subaerial beach above 0 feet NAVD88 since the project was completed. Roughly 182,600 cy of material has been lost above 0 feet NAVD88, or approximately 57% of the 320,700 cy originally placed above 0 feet NAVD88 which was a decrease from the previous monitoring period (March 2014), which was 60%. The percentage of material loss recorded from the October 2013 survey was 69%. Over the past year, this percentage dropped from 69% due to the influence of the Willoughby Spit and West Ocean View Shoreline Improvement Projects. The current survey is the first survey performed after the completion of this project, which includes Station 129+17 in the analysis.

Figure 5-11 shows areas of elevation change between the post-fill survey and the October 2014 survey. As depicted in the figure, there has been erosion of the beach face and nearshore in-between the Willoughby Spit breakwaters, the 800 Block breakwaters, and the Central Ocean View breakwaters. These losses are less in the Central Ocean View breakwaters than in the 800 Block breakwaters and Willoughby Spit breakwaters. The losses due to the end effects from the 800 Block breakwaters can also be seen between Stations 42+50 and 47+30.

In addition, the October 2014 MHW shoreline was compared to the pre-fill MHW shoreline as another way to measure the amount of protection still being supplied by the January-March 2005 nourishment (dune restoration) project. The design life of the nourishment project was outlined in the M&N Willoughby Spit to Central Ocean View Dune Restoration Project Performance Analysis from October 2004. The study anticipated a project design life of 5 to 6 years with no major storm activity and 2 to 3 years at hot spot areas if there were impacts to this reach of shoreline from storms. The nourishment project is in its ninth year and has been impacted by several storms since its construction, e.g. October 2006 and November 2009 nor'easters, and Hurricane Irene in August 2011. Areas where the current shoreline is within 20 feet of the pre-fill shoreline need to be targeted for nourishment. Figure 5-12 shows the MHW shoreline position difference between the pre-fill and October 2014 shorelines. As can be seen, the October 2014 Willoughby Spit to Central Ocean View MHW shoreline comes within 20 feet of the pre-fill shoreline in many locations and has even receded past the pre-fill shoreline at several locations. Areas of concern include the shoreline to the west of the 800 Block breakwater field as well as portions of the breakwater field itself which exist at Stations 45+00 through 57+57. The breakwaters are most likely inhibiting the transport of sand to the western portion of the field and shoreline beyond. Due to the most recent nourishment along the eastern section of Willoughby Spit, the MHW shoreline between Stations 35+00 and 45+00, which was of concern have remained greater than 20 feet from the pre-fill shoreline. Station 32+50, which was within 20 ft of the prefill shoreline during the previous monitoring period (October 2013 – March 2014), accreted beyond this line during the current monitoring period. The western end of the West Ocean View shoreline remains an area of concern with Stations 79+62 through 103+08 showing recession either beyond the pre-fill shoreline or within 20 feet of the pre-fill shoreline. The conditions in the central section of this reach have improved due to the West Ocean View shoreline improvement project. This location, between Stations 120+93 to 141+98, was of most concern having the largest recession beyond the pre-fill shoreline. Stations 120+93 and 129+17 have accreted either close to the 20 ft mark or beyond the 20 ft mark. Stations 141+98 through 169+63 have remained beyond the prefill shoreline or within 20 ft of the pre-fill shoreline over the current monitoring period. The eastern end of West Ocean View as well as the entire Central Ocean View Breakwaters reach remain stable. This shoreline historically has suffered significant impacts from the November 2009 nor'easter which were further exacerbated by Hurricane Irene in August 2011. Targeted nourishment projects should continue to be planned for problem areas in the future.

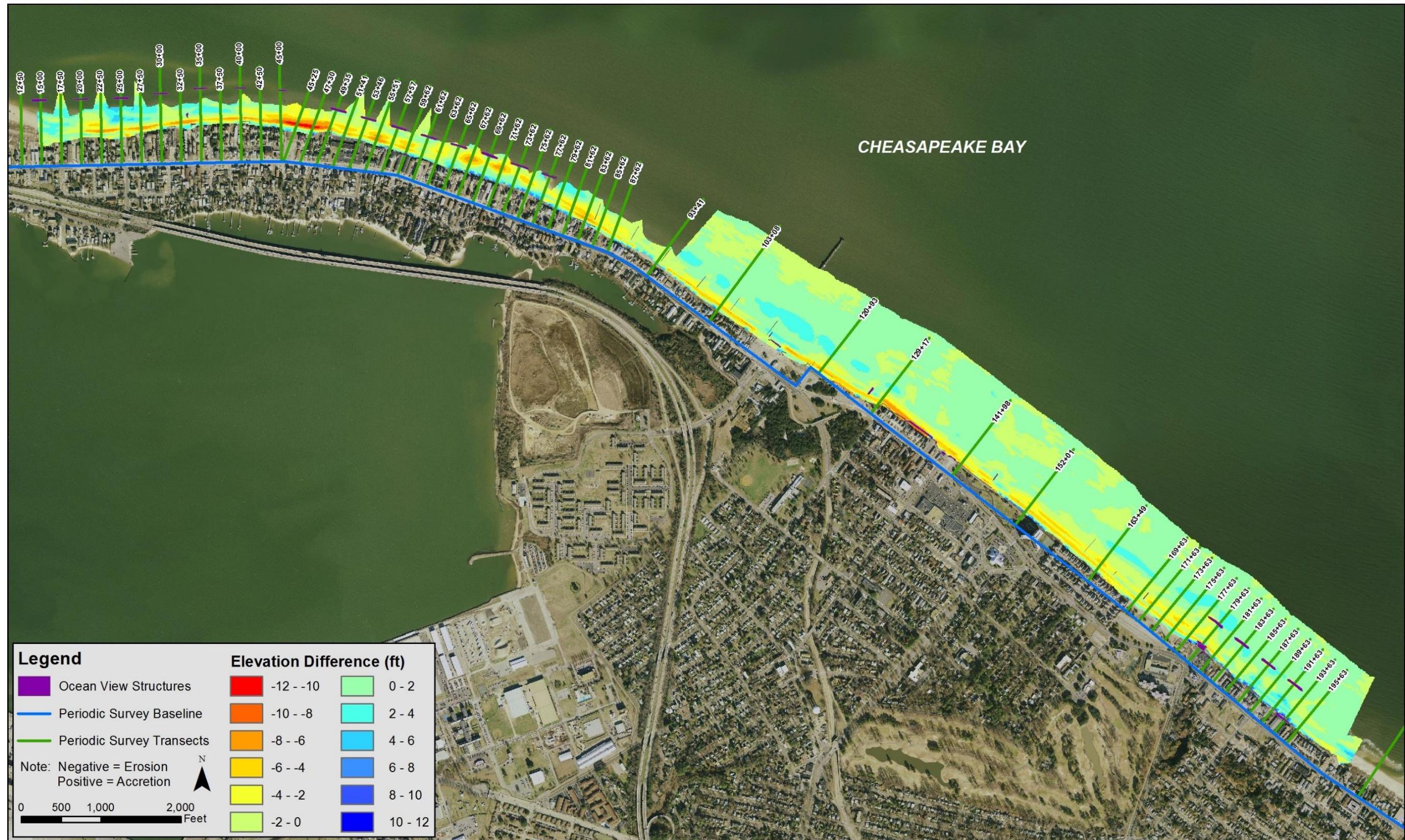


Figure 5-11: Net Volume Change Since the Willoughby Spit to Central Ocean View Dune Restoration Project (March 2005)

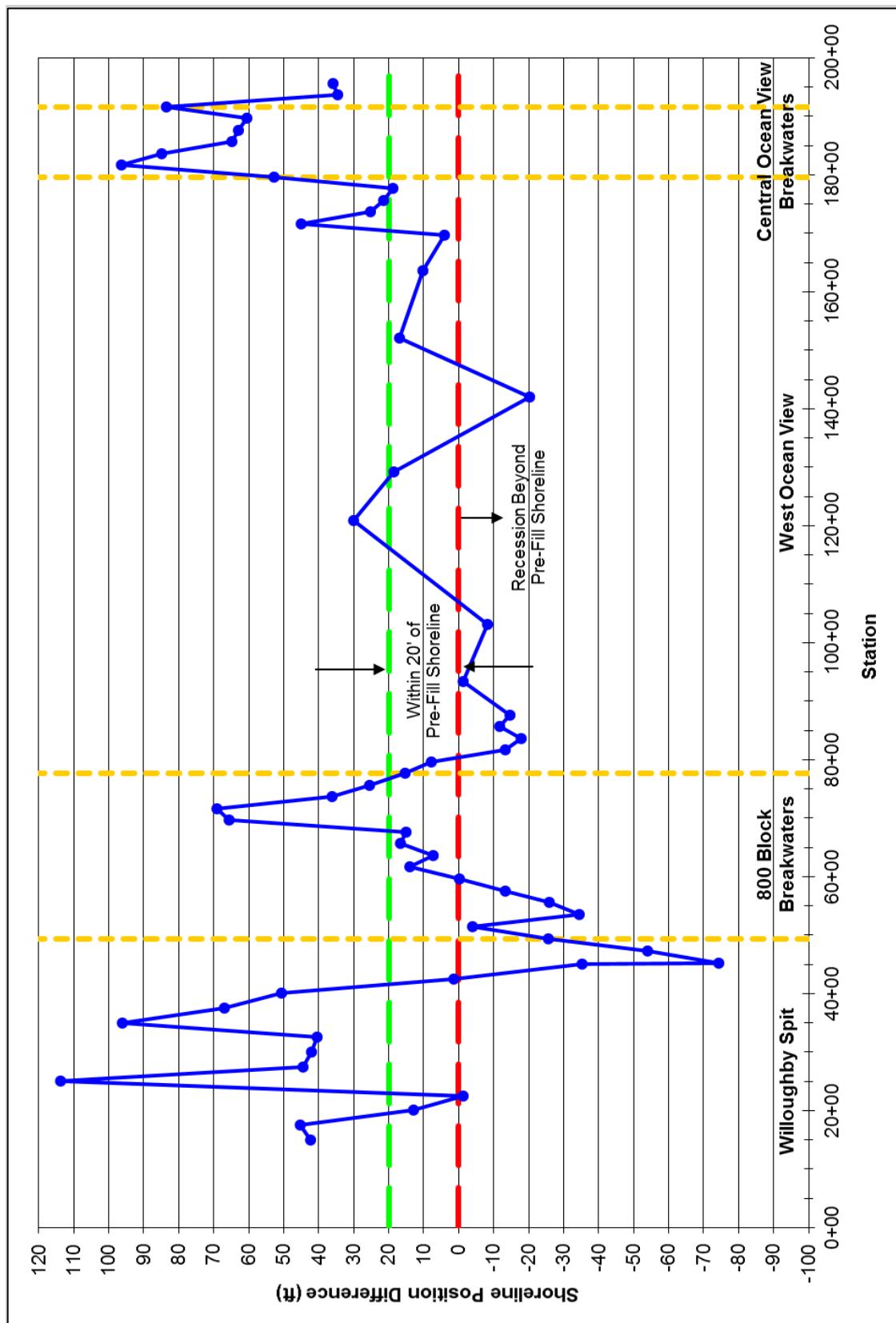


Figure 5-12: Shoreline Position Difference (ft) at MHW Between 2003 Pre-Fill and October 2014 Shorelines for Central Ocean View

5.7. West Ocean View Shoreline Improvement Project

The most recent periodic survey, taken in October 2014, was also compared to the October 2013 survey prior to the completion of the West Ocean View Shoreline Improvement Project. A total of 73,600 cy of sand was placed from Station 103+08 to Station 152+01.

Table 5-12: Overall Shoreline and Volume Change Statistics for West Ocean View shoreline Improvement Project (October 2013 – October 2014 Comparison)

Region		Average Shoreline Change (ft)	Average Volume Change Above 0 ft NAVD88 (cy/ft)	Cumulative Volume Change Above 0 ft NAVD88 (cy)	Average Volume Change Above -15 ft NAVD88 (cy/ft)	Cumulative Volume Change Above -15 ft NAVD88 (cy)
West Ocean View (103+08 to 152+01)	Rate per Year	19.50	4.38	24,315	7.45	44,307
	Total	18.97	4.26	25,000	7.25	43,093

Construction of the West Ocean View Shoreline Improvement Project was completed during the previous monitoring period. This project included the removal of the existing groin field east of the pier, reconstruction of a groin in between the 200 Block and Sarah Constant Shrine Park, and a 73,600 cy nourishment project, as shown in Figure 5-13. The new groin was designed to be shorter and tighter than the previous groins, helping to maintain the beach width in front of the 200 Block adequately for vehicle access. The 73,600 cy nourishment project added 30 feet of berm width in front of Sarah Constant Shrine Park, on the downdrift side of the groin.

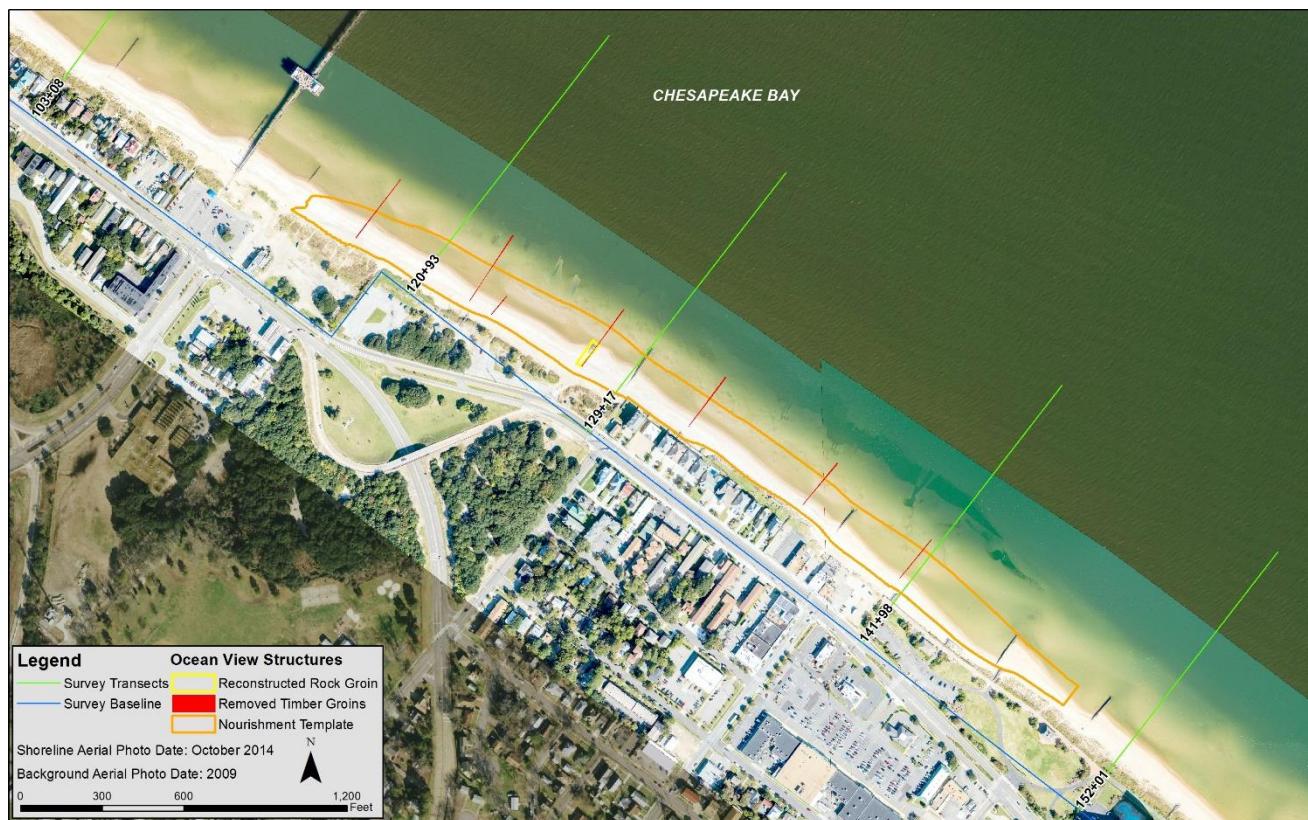


Figure 5-13: West Ocean View Shoreline Improvement Project Area

West Ocean View has continued to equilibrate from this project during the current monitoring period. A majority of the material placed within this subreach was placed above -3 ft NAVD88; therefore, the volume change above -15 ft NAVD88 was examined to capture as much of the remaining material as possible. Roughly 43,100 cy of material is remaining above -15 ft NAVD88, or approximately 59% of the 73,600 cy originally placed above -15 ft NAVD88.

In addition, the October 2014 MHW shoreline was compared to the MHW shoreline from October 2013, before the shoreline improvement project was completed in April 2014, as another way to measure the amount of protection being supplied by this nourishment project. Areas where the current shoreline is within 10 feet of the October 2013 shoreline need to be targeted for nourishment. Figure 5-14 shows the MHW shoreline position difference between the October 2013 and October 2014 shorelines. As can be seen, the MHW shoreline at all transects along the project area are greater than 10 feet of the pre-fill shoreline. Stations 120+93 through 152+01 have gained an average of 24 ft of shoreline as a result of this project. This is an indication of the newly constructed groin performing well. The only station that has recessed beyond the October 2013 shoreline is station 103+08. This station was outside of the nourishment template as well as downdrift of the newly constructed groin. This area will continue to be monitored for further recession in the coming survey period for further recession and future nourishment projects.

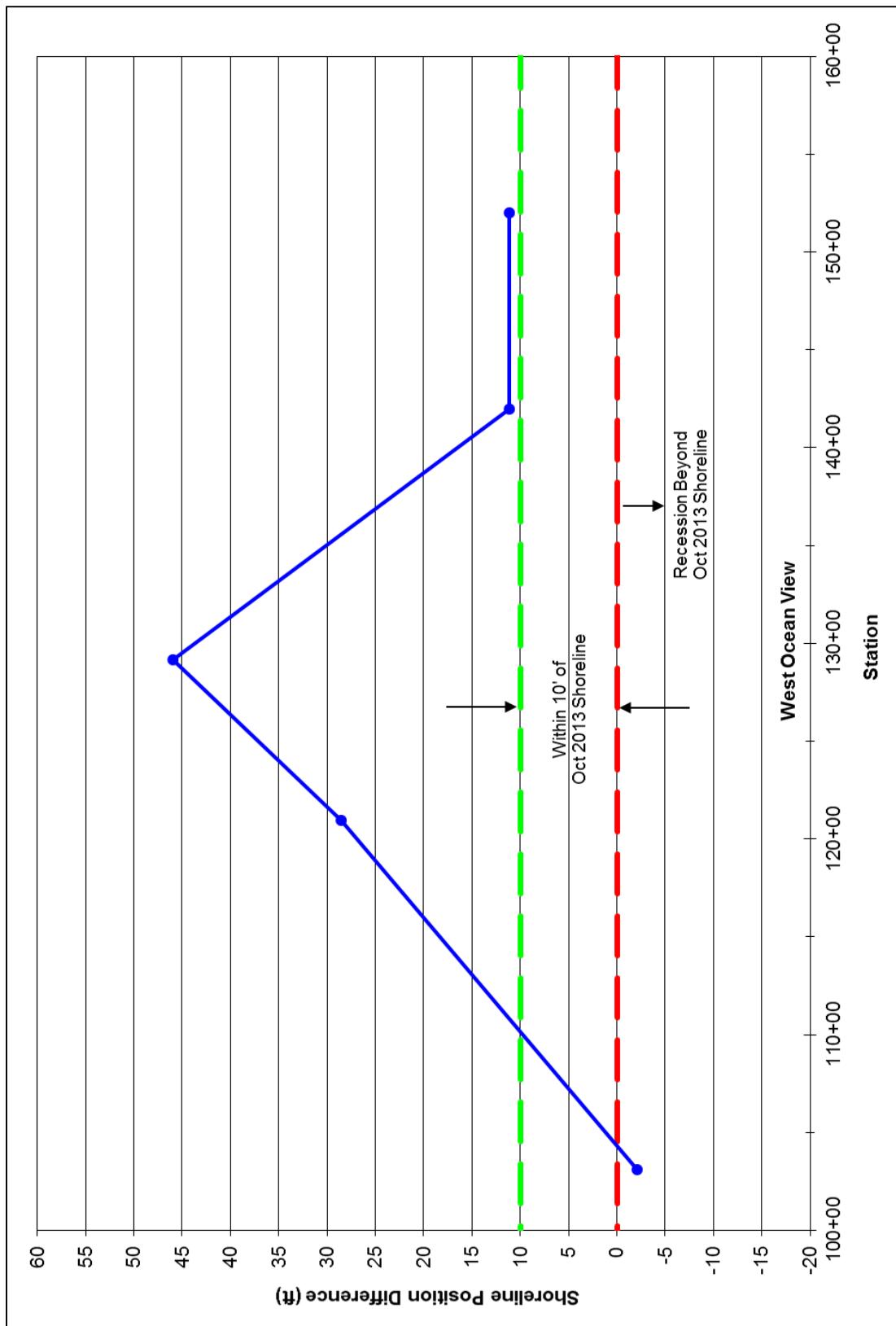


Figure 5-14: Shoreline Position Difference (ft) at MHW Between October 2013 and October 2014 Shorelines for West Ocean View

6. Summary

Comprehensive periodic surveying of the entire Ocean View shoreline began with an initial survey in September 2005. The most recent survey was completed in October 2014. Subsequent surveys are planned to be conducted and evaluated every six months, in March/April and September/October. The beach and bathymetric surveys performed by Geodynamics, utilized baseline and transect positions established in September 2005 which are used for all periodic surveys. For this periodic evaluation, the October 2014 survey was compared with both the March 2014 and October 2013 surveys. The surveys were used to compute shoreline change at MHW and volume change above 0 feet NAVD88 and above -15 feet NAVD88.

In addition, the most recent survey in October 2014 was compared to pre- and post-fill surveys taken after the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration projects in March 2009 and January-March 2005 respectively. This was done to quantify the amount of material loss since the projects were completed and condition of the shoreline with respect to pre-fill conditions.

Key statistics were computed for defined regions along Ocean View and the entire shoreline for the time period between both the October 2013 and October 2014 surveys and the March 2014 and October 2014 surveys.

Comparison	Parameter	Quantity
October 2013 vs. October 2014	Average Shoreline Change Rate at MHW (+0.98 ft NAVD88)	1.51 ft/yr
	Cumulative Volume Change Rate Above 0 ft NAVD88	107,029 cy/yr
	Cumulative Volume Change Rate Above -15 ft NAVD88	12,759 cy/yr
March 2014 vs. October 2014	Average Shoreline Change at MHW (+0.98 ft NAVD88)	4.41 ft
	Cumulative Volume Change Above 0 ft NAVD88	52,496 cy
	Cumulative Volume Change Above -15 ft NAVD88	-47,411 cy

The average shoreline change rate for the entire shoreline at MHW between the October 2013 and October 2014 surveys was 1.51 ft/yr, and the cumulative volume change above 0 feet NAVD88 was approximately 107,029 cy/yr. This indicates an overall volumetric gain in the dune and subaerial beach over the past year. This gain is primarily due to the West Ocean View Shoreline Improvement Project which placed 73,600 cy within the West Ocean View region. The overall gain above -15 feet NAVD88 of 12,759 cy/yr indicates that there was an overall gain across the nearshore system. The most recent period of comparison (March 2014 - October 2014) depicts an overall gain at the MHW line of 4.41 feet. The cumulative volume change above 0 feet NAVD88 indicates a sediment gain to the subaerial beach of 52,496 cy; however, this does not account for the nourishment placed at Station 129+17. There was also a loss of sediment in the nearshore system above -15 feet NAVD88 of 47,411 cy. This can be attributed primarily to the quiescent wave climate which transported sand from the offshore bar to the subaerial beach.

Willoughby Spit

The Willoughby Spit region is still equilibrating from the Willoughby Spit Shoreline Improvement Project, which finished construction in December 2013. The nourishment placed at the eastern end of this reach has continued moving westward and is staying in the nearshore system due to the seven newly constructed breakwaters. Overall, this reach experienced accretion of the MHW shoreline, and volumetric gains above both 0 feet NAVD88 and -15 feet NAVD88 over the past year.

800 Block Breakwaters

In the 800 Block region, there has been an erosion of the MHW shoreline, a negligible volumetric change above 0 feet NAVD88, and moderate volumetric loss above -15 feet NAVD88. The majority of the volume loss above -15 ft NAVD88 occurred during the most recent survey period. The tombolo located at the realigned breakwater has remained detached allowing sand to transport freely through this reach.

West Ocean View

The West Ocean View region was characterized by the shoreline improvement project that took place during the previous survey period. This project included the removal of timber groins, the reconstruction of the rock groin at Station 129+17, and placement of 73,600 cy of material adjacent to the newly reconstructed groin. Station 129+17 was removed from analysis between March 2014 and October 2014 for this report because it could not be surveyed due to the presence of construction equipment. The October 2013 to October 2014 analysis includes Station 129+17 in the calculations and the effects of the shoreline improvement project can be seen. The yearly analysis shows overall volumetric gains above both 0 ft NAVD88 and -15 ft NAVD88. The yearly period also showed an accretion of the MHW shoreline.

Central Ocean View Breakwaters

The Central Ocean View Breakwaters region showed gains in the MHW shoreline position and minor volumetric gains above 0 feet NAVD88 and -15 feet NAVD88 over the past year. The current survey period showed a gain in the MHW shoreline and in the volume above 0 ft NAVD88; however, there was a minor volumetric loss above -15 ft NAVD88.

Central Ocean View

Typically a very stable region, Central Ocean View has experienced minor erosion of the MHW shoreline, with a significant volumetric gain above 0 feet NAVD88 and slight loss above -15 feet NAVD88 over the past year. A majority of the volumetric gain above 0 ft NAVD88 and the volumetric loss above -15 ft NAVD88 occurred during the current monitoring period. The MHW shoreline experienced accretion over the current monitoring period. These trends can be explained by the typical quiescent wave climate during this season which transports sand from the offshore bar onshore and deposits it on the subaerial beach and berm.

East Ocean View

Due to the normal direction of sediment movement, there is an erosion of the MHW shoreline and minor volumetric losses above both 0 ft NAVD88 and -15 ft NAVD88 in the East Ocean View region over the entire year. During the most recent survey period there were more significant volumetric losses above 0 feet NAVD88 and -15 feet NAVD88. The Bay Oaks breakwaters are continuing to perform well, trapping sediment and eliminating the hotspot at this location. The east end of the region, adjacent to the jetty, is more erosive than most areas west in this region due to the lack of a sediment source.

In addition to regional assessments, comparison of the October 2014 survey was made against post-fill surveys from the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration which took place in March 2009 and January-March 2005 respectively.

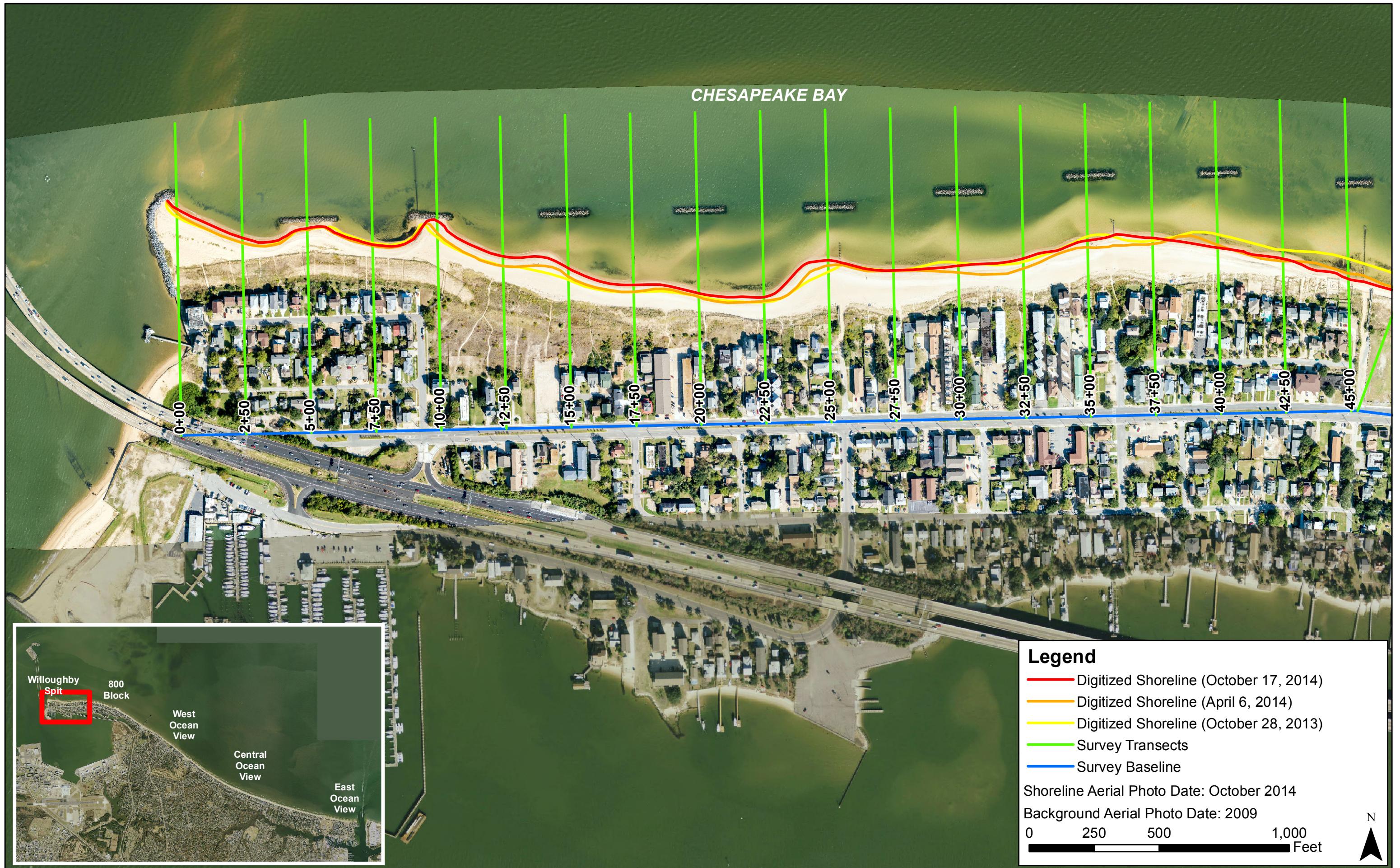
Comparison	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
East Ocean View Nourishment vs. October 2014 Comparison	-101.84 ft	-18.37 cy/ft	-95,496 cy	-32.32 cy/ft	-167,628 cy
Central Ocean View Nourishment vs. October 2014	-24.06 ft	-9.92 cy/ft	-182,625 cy	-6.91 cy/ft	-120,828 cy

The approximately 95,500 cy volumetric loss above 0 feet NAVD88 from the East Ocean View project is roughly 85% of the original amount placed in this dune and subaerial beach area while the approximately 182,600 cy loss above 0 feet NAVD88 in the Central Ocean View project area is roughly 57% of the original amount placed above 0 feet NAVD88. Due to storm impacts and background erosion that has occurred, as anticipated, over the projects' design life, there are areas in both of these shoreline regions that should be targeted for nourishment. The completed Willoughby Spit project and the West Ocean View project have alleviated the concerns with these hot spots and have provided additional protection in vulnerable areas; however, there are still other areas that may require nourishment to provide adequate storm protection. The East Ocean View project may also require a renourishment in the next 1 to 2 years.

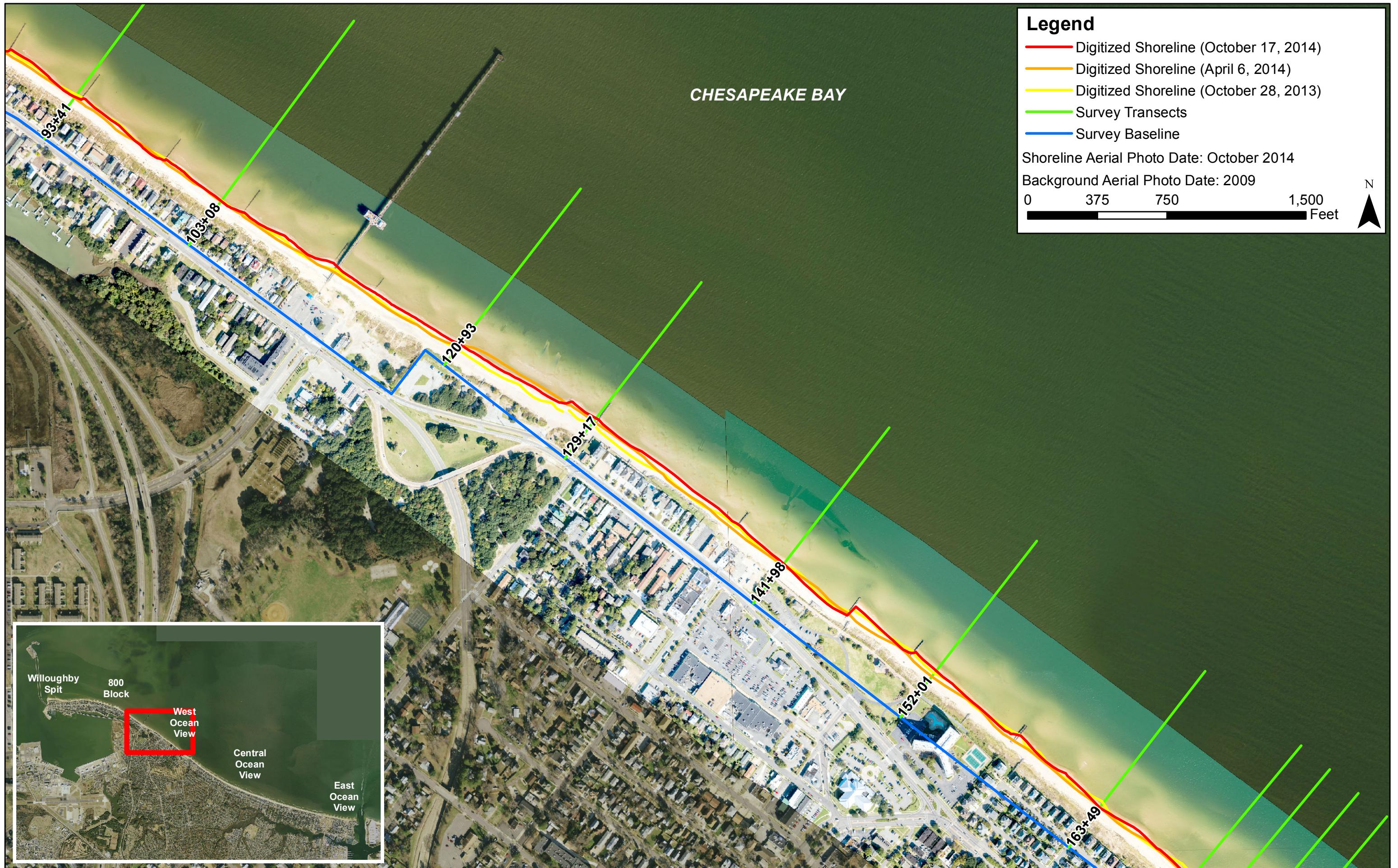
As another measure of the protection being supplied by the East Ocean View and Central Ocean View nourishment projects, the projects' pre-fill and October 2014 MHW shoreline positions were compared. Areas where the current shoreline has receded beyond or eroded within 20 feet of the pre-fill shoreline may need to be targeted for immediate nourishment. Results of this analysis indicate that the East Ocean View nourishment project has provided ample shoreline protection for the majority of the shoreline with only slight end effects immediately west of the most recently constructed breakwaters; however, the November 2009 Nor'easter and Hurricane Irene have impacted the design life with all of the stations within the East Ocean View Breakwaters receding to within 20 ft of the pre-fill shoreline or beyond the pre-fill shoreline. Again, renourishment of this area will be required in the next 1 to 2 years. The Willoughby Spit to Central Ocean View shoreline has improved from the recent shoreline improvement projects that have been constructed; however, there continues to be various problem spots. The eastern section of the shoreline in the Willoughby Spit groin field and the majority of the

shoreline behind the 800 Block breakwaters has eroded to within 20 feet of the pre-fill shoreline or receded beyond the pre-fill shoreline. This project had an anticipated design life of 5 to 6 years, with no storm activity, with hot spot areas anticipated to require nourishment after 2 to 3 years if storm activity impacted this region. The project is at the end of the anticipated design life and has been impacted by storm activity. As the Willoughby Spit and West Ocean View shorelines equilibrate, these areas of concern in this reach should continue to improve. Targeted nourishment projects should continue to be planned for problem areas in the future.

This is the nineteenth periodic survey report completed to date, and eighteenth evaluation of a consistent survey period utilizing beach and bathymetric surveys. As noted, there are inevitable margins of error associated with the survey data that may reduce the accuracy of volumetric change analyses. Therefore, it is essential to thoroughly review the beach and bathymetric profiles using various analytical techniques and general engineering judgment to assure that results are not falsely interpreted. Comparison of seasonal surveys (i.e. October 2013 to October 2014) eliminates seasonal variation of profiles in volumetric change analyses. Consecutive survey comparisons are useful to assess the direct impact of extreme events which may occur during the six month period between surveys. Future periodic survey evaluations will continue to improve on analysis techniques so that the rich survey data sets are best utilized.

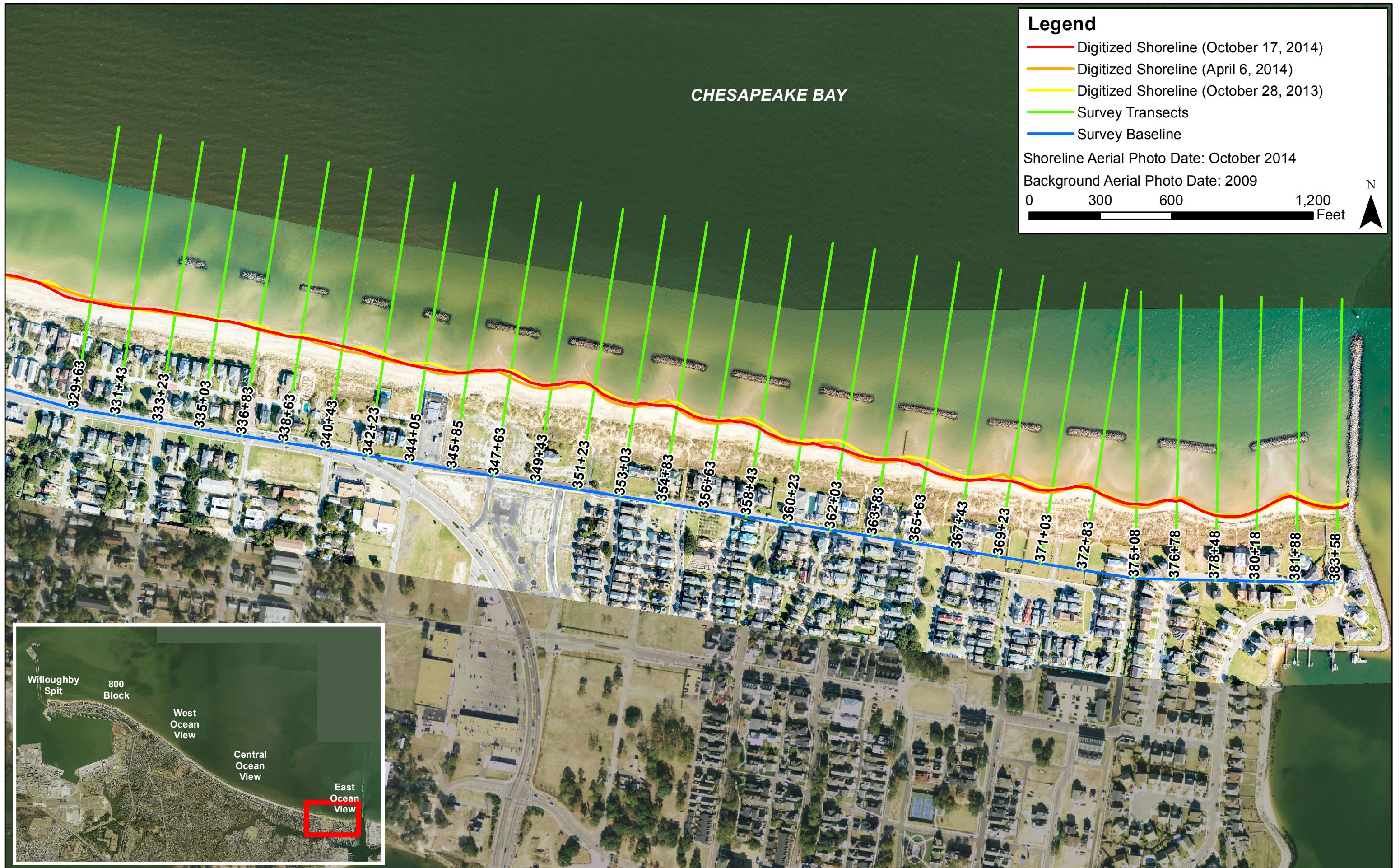


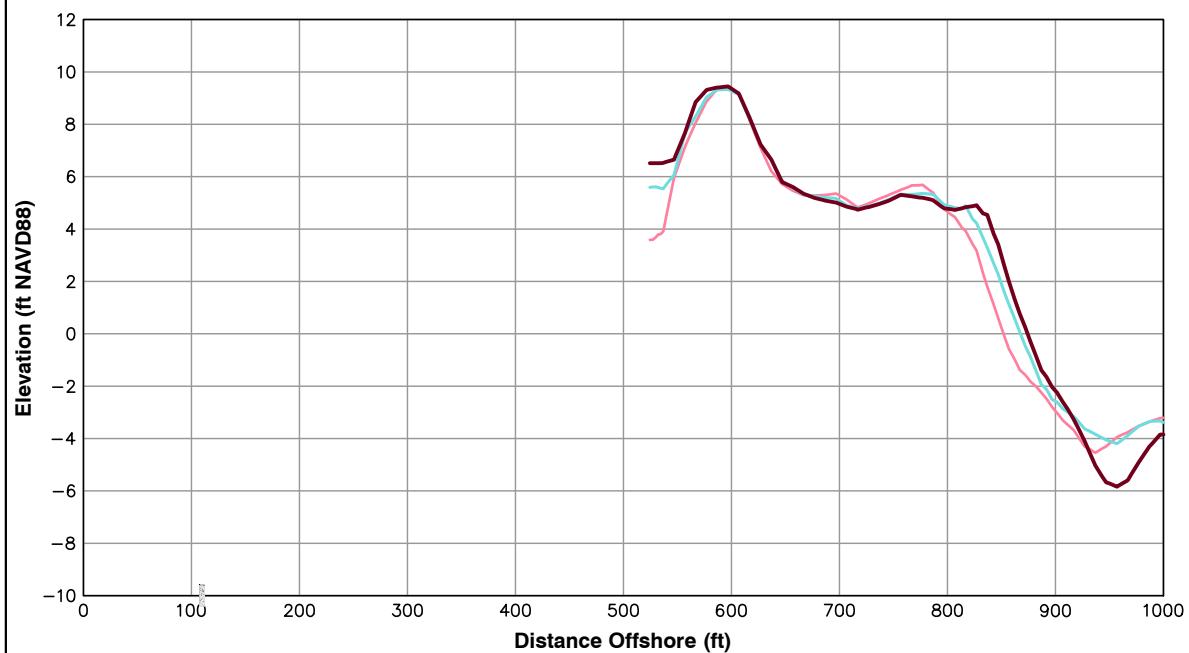
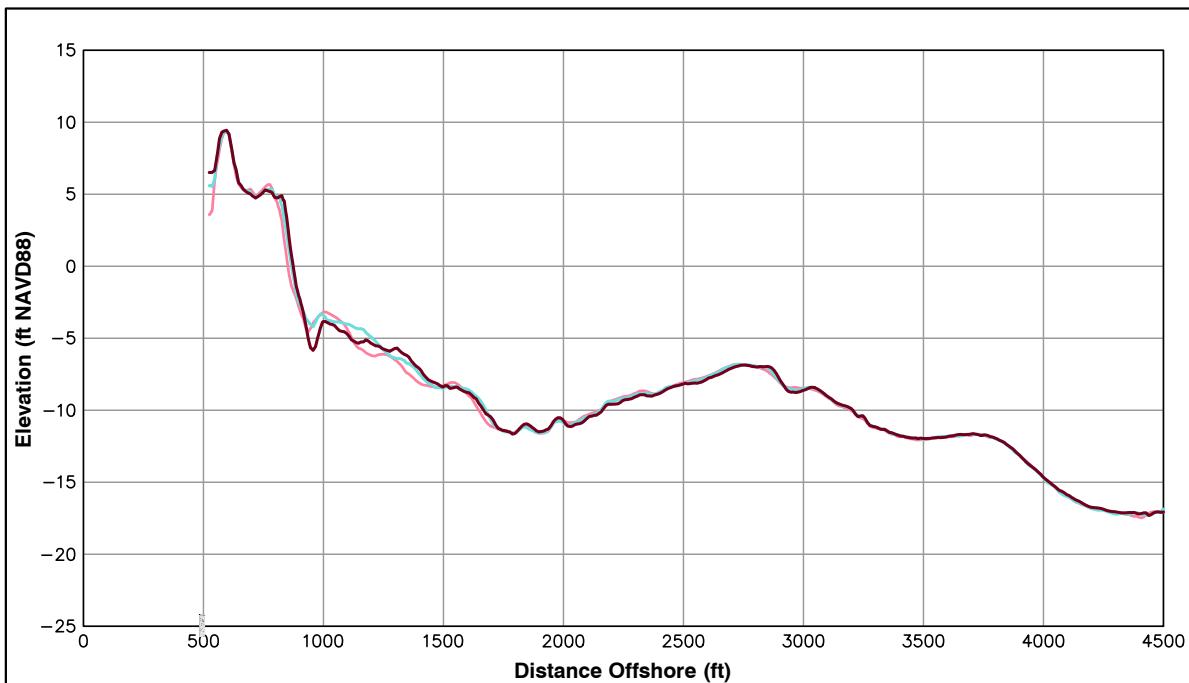












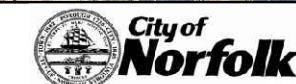
Survey Transect 0+00	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	21.86 ft/yr	6.75 ft
Volume Change Above -15 ft NAVD88	10.91 cy/ft/yr	-4.83 cy/ft
Volume Change Above 0 ft NAVD88	6.32 cy/ft/yr	2.47 cy/ft

LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

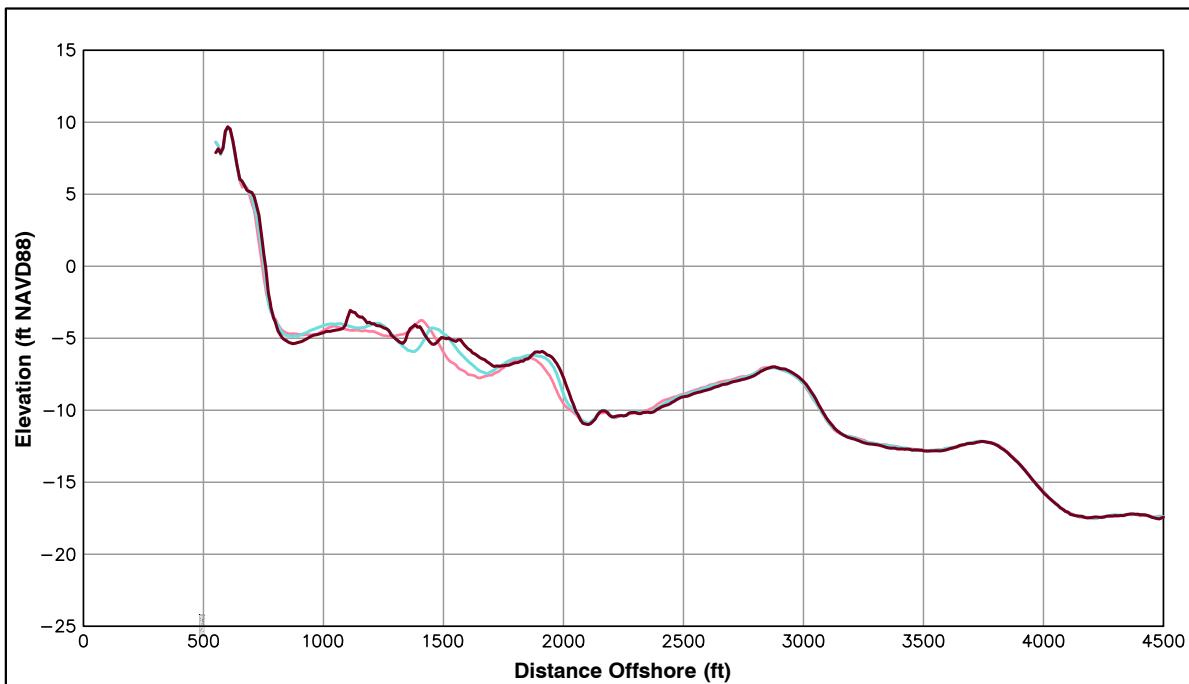
Notes:

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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

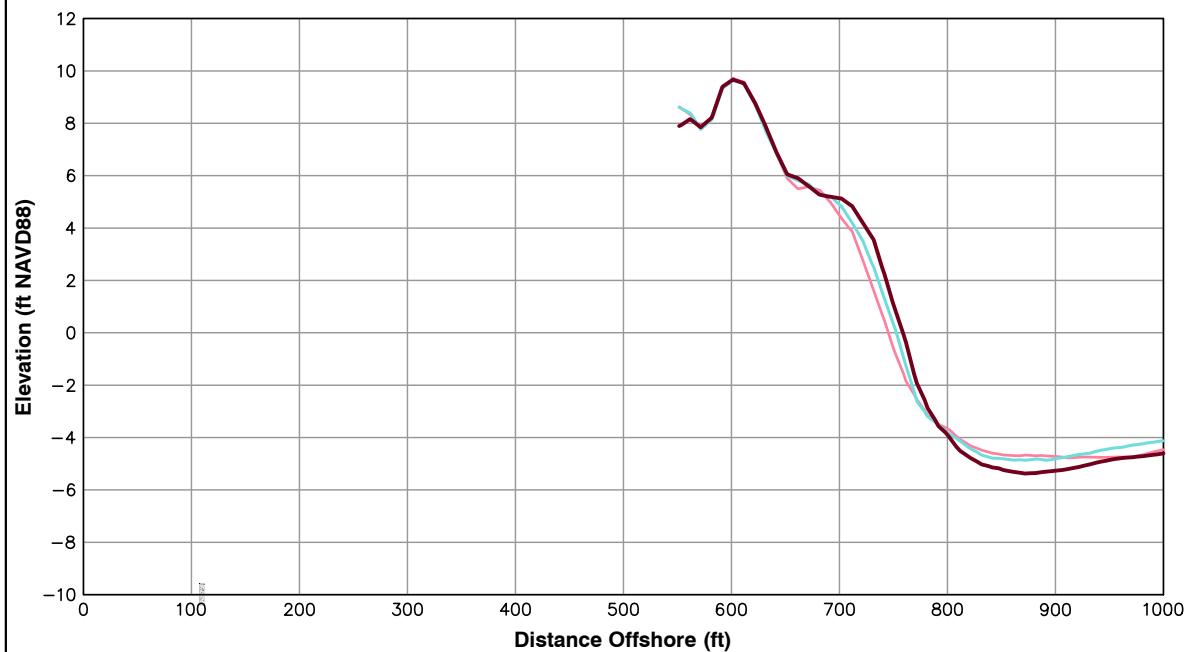


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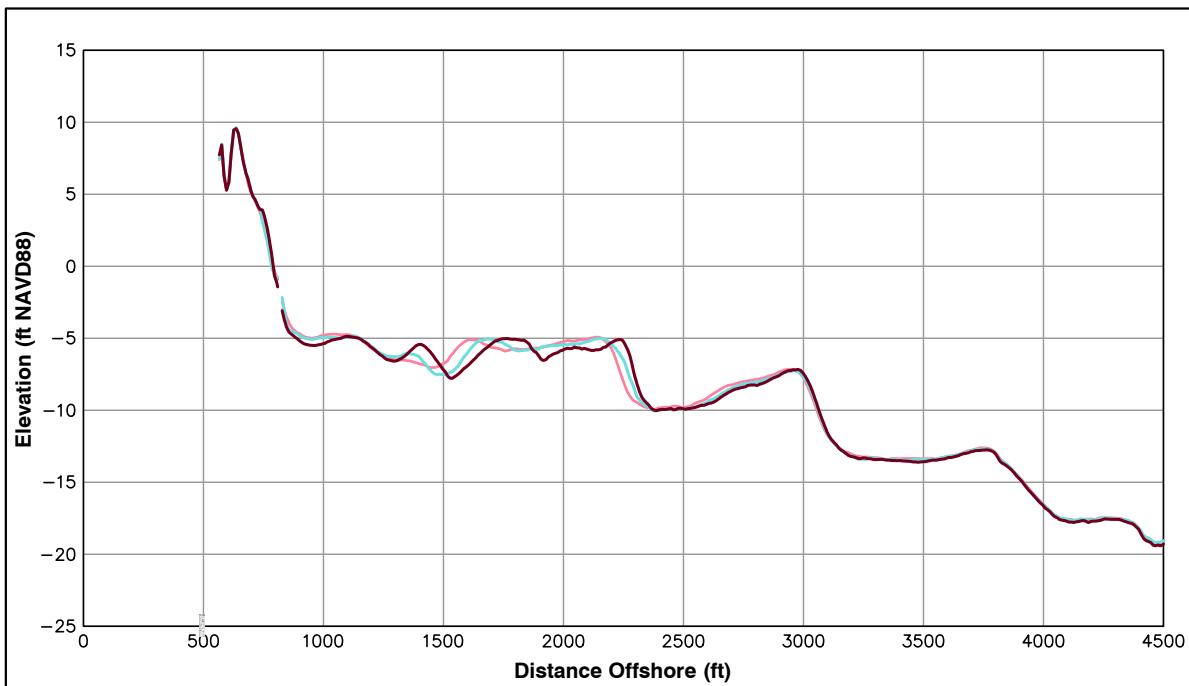
- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

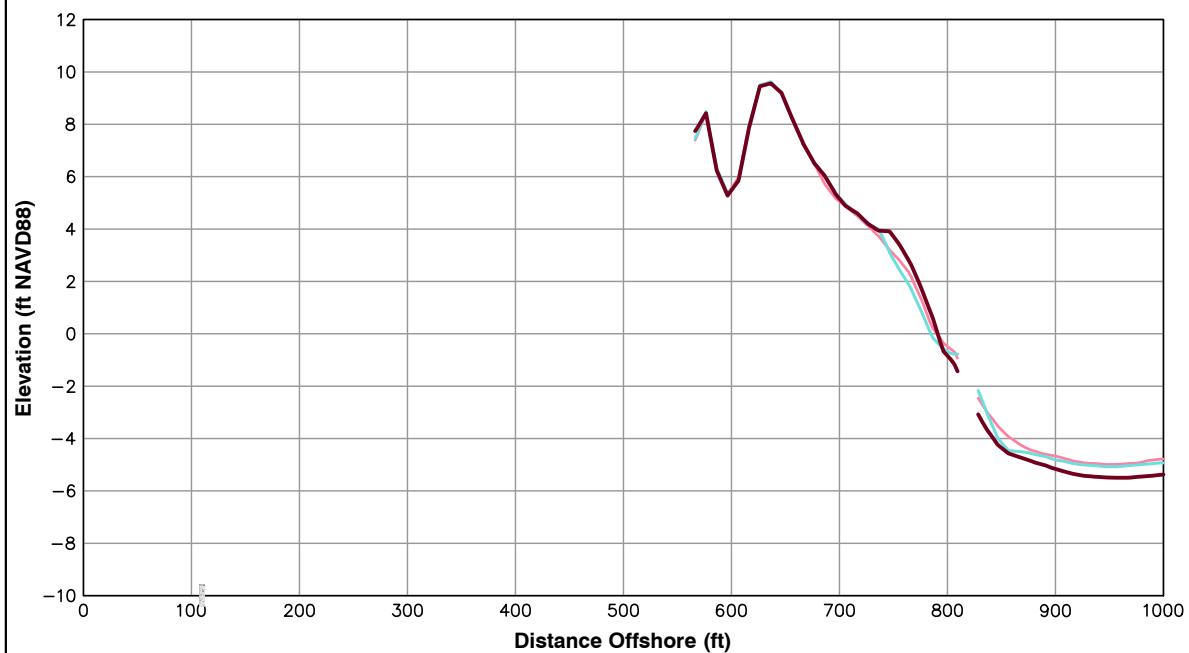


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	4.01 ft/yr	8.41 ft
Volume Change Above -15 ft NAVD88	-10.61 cy/ft/yr	-4.35 cy/ft
Volume Change Above 0 ft NAVD88	1.27 cy/ft/yr	1.36 cy/ft

LEGEND:
2014 OCT —
2014 MAR —
2013 OCT —

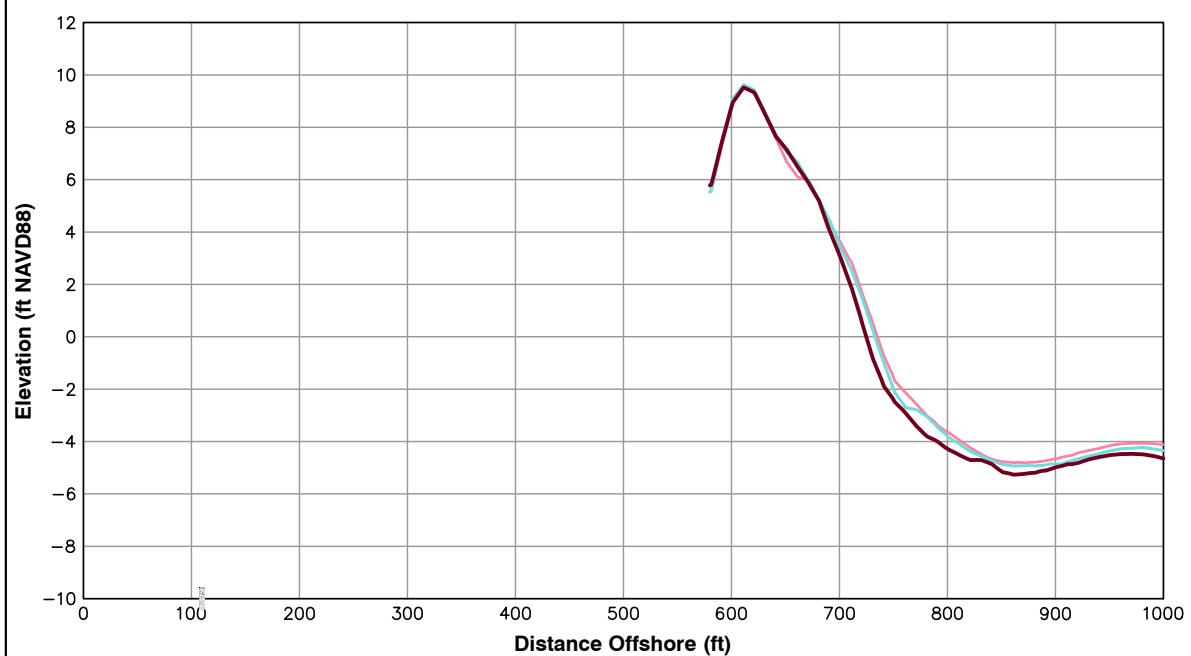
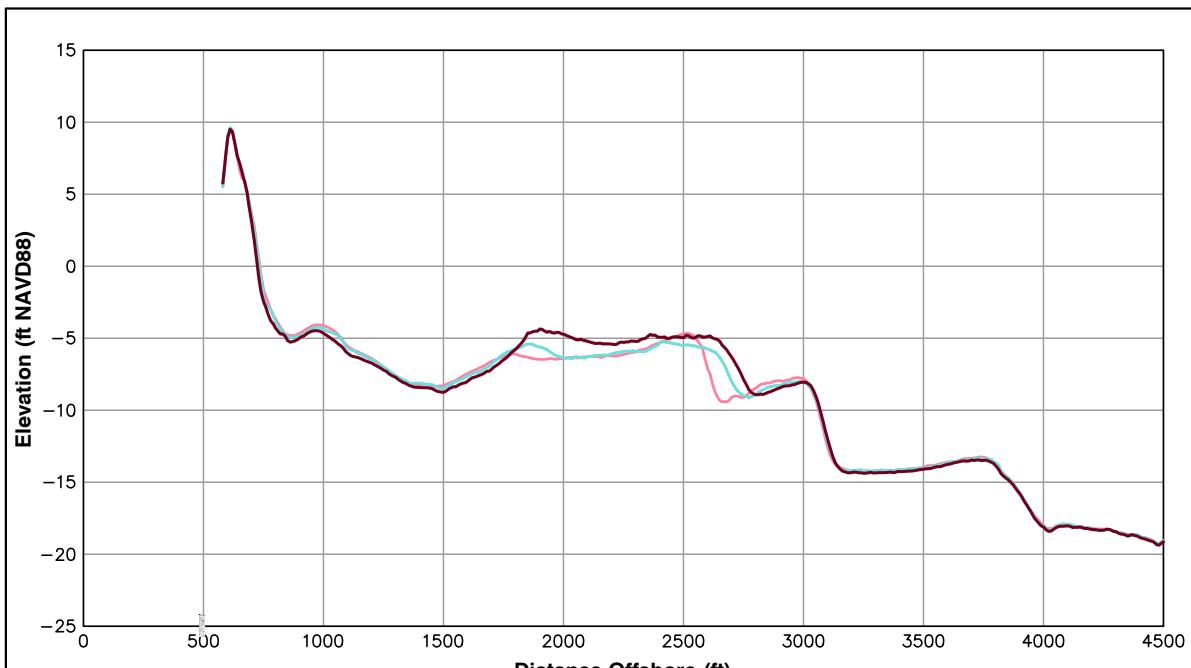
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect 7+50	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-9.41 ft/yr	-7.25 ft
Volume Change Above -15 ft NAVD88	23.20 cy/ft/yr	16.07 cy/ft
Volume Change Above 0 ft NAVD88	-0.91 cy/ft/yr	-1.17 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—

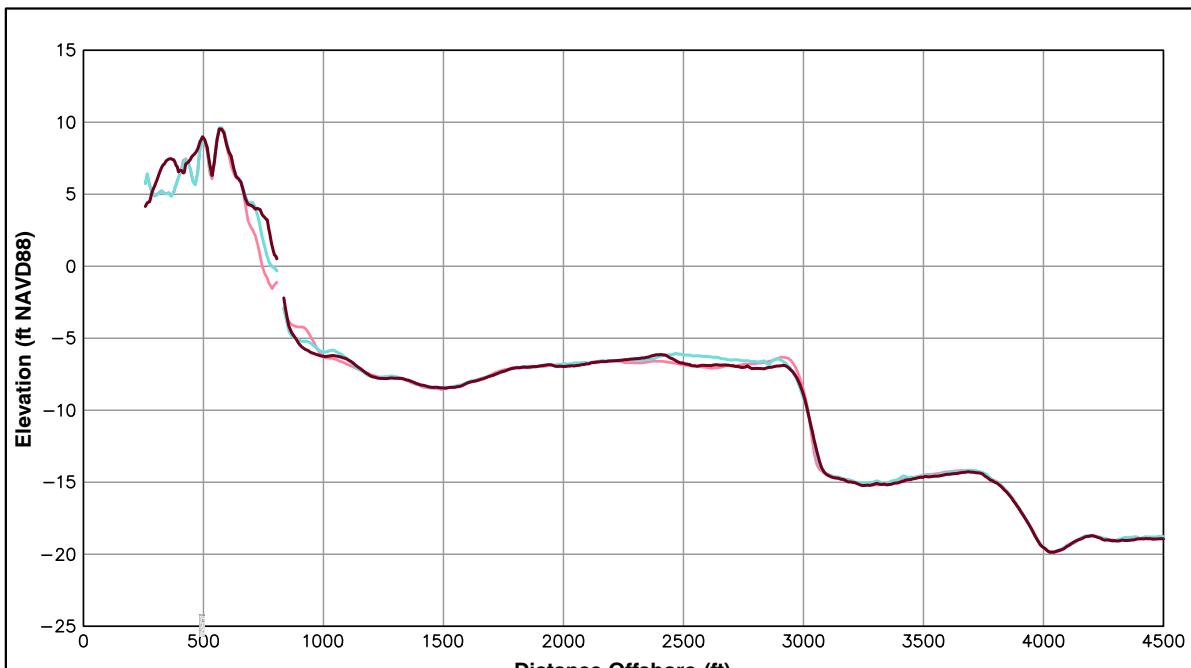
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

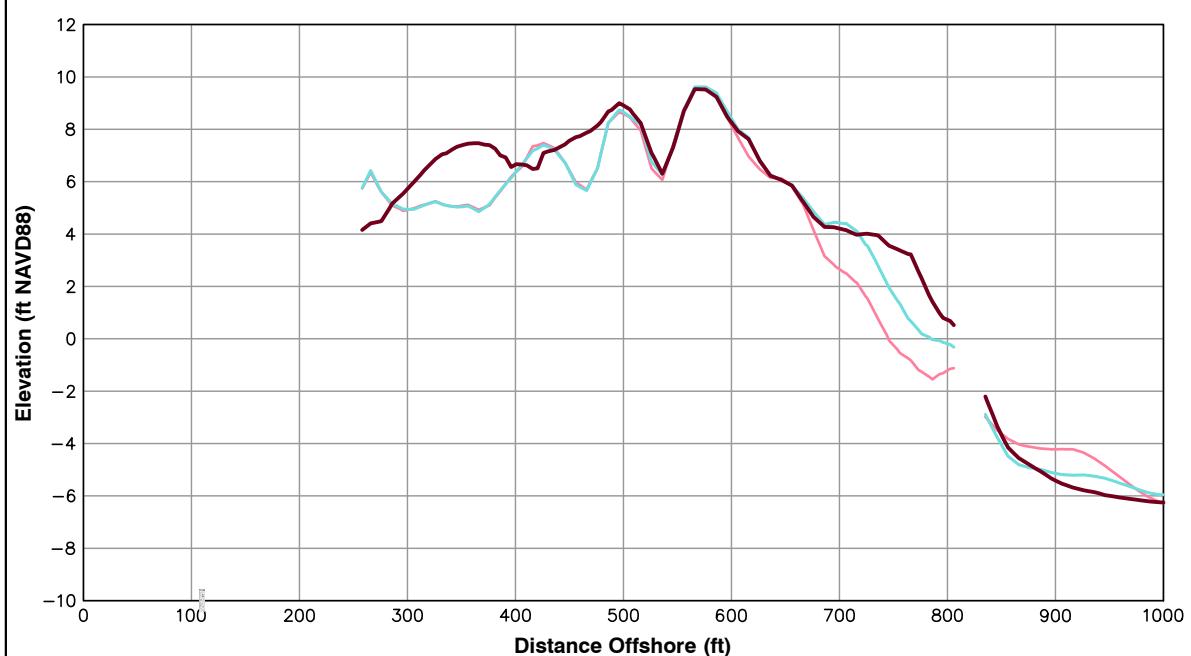


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	61.32 ft/yr	31.91 ft
Volume Change Above -15 ft NAVD88	15.68 cy/ft/yr	-1.30 cy/ft
Volume Change Above 0 ft NAVD88	19.06 cy/ft/yr	11.79 cy/ft

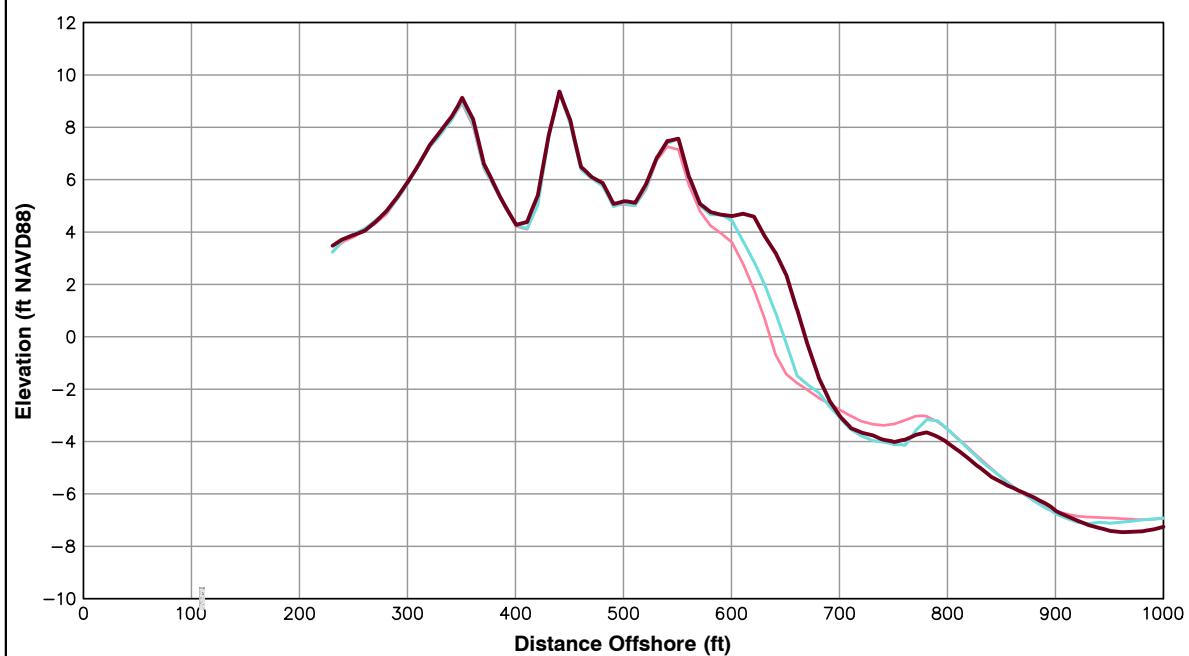
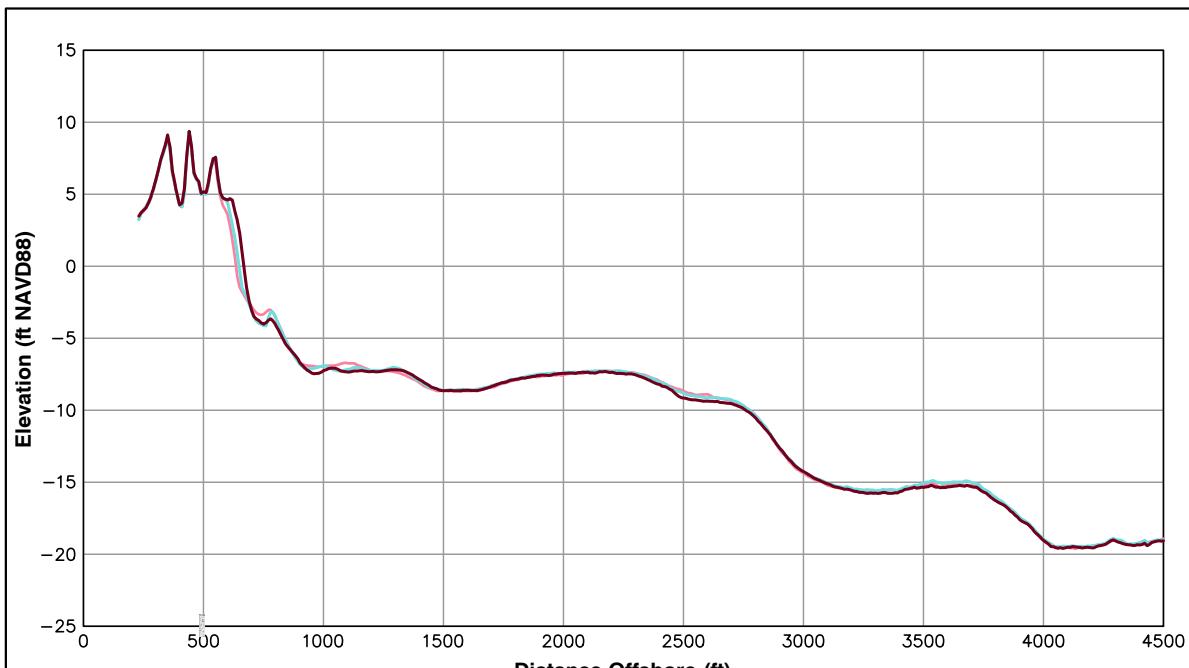
LEGEND:
2014 OCT
2014 MAR
2013 OCT

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



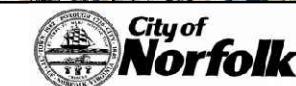
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
12+50		
Shoreline Change at MHW (0.98 ft NAVD88)	33.94 ft/yr	20.97 ft
Volume Change Above -15 ft NAVD88	0.65 cy/ft/yr	-2.98 cy/ft
Volume Change Above 0 ft NAVD88	7.95 cy/ft/yr	4.96 cy/ft

LEGEND:

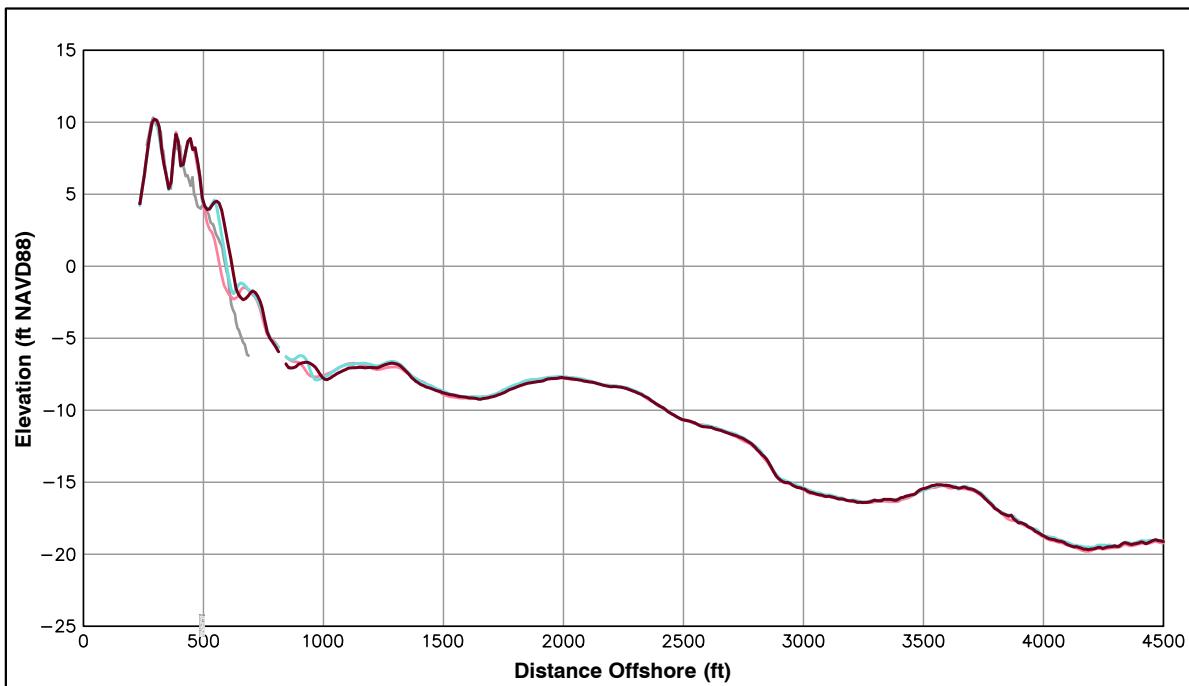
2014 OCT ——
2014 MAR ——
2013 OCT ——

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

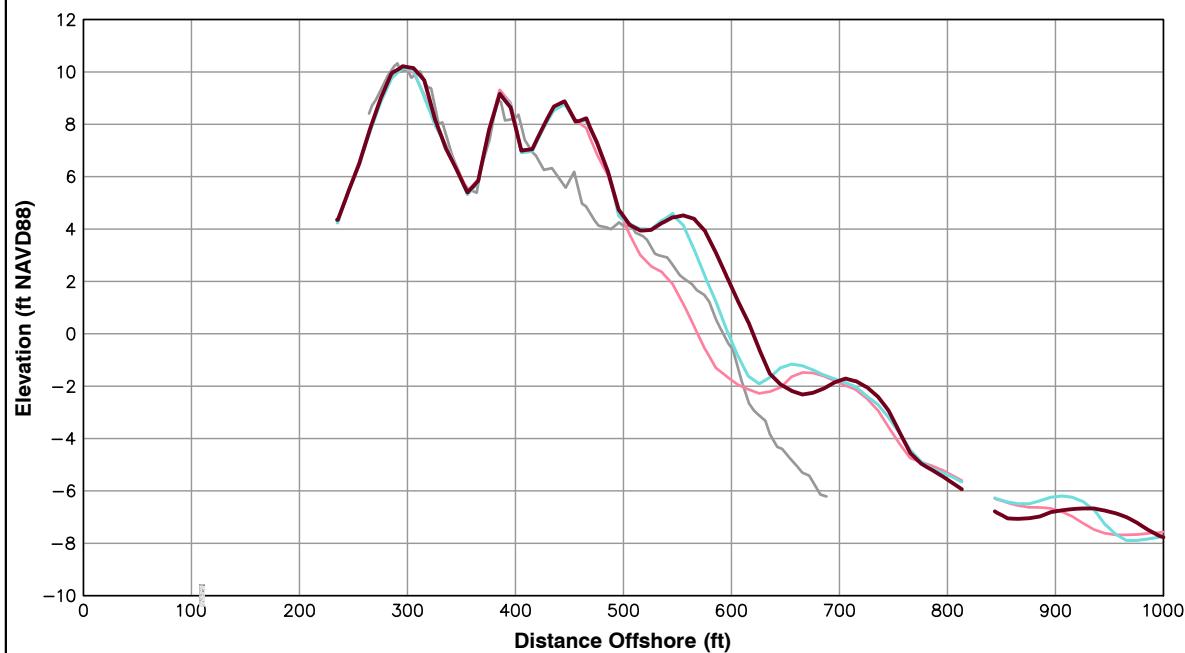


Survey Transect 15+00	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	53.27 ft/yr	21.33 ft
Volume Change Above -15 ft NAVD88	12.40 cy/ft/yr	-4.24 cy/ft
Volume Change Above 0 ft NAVD88	10.13 cy/ft/yr	3.99 cy/ft

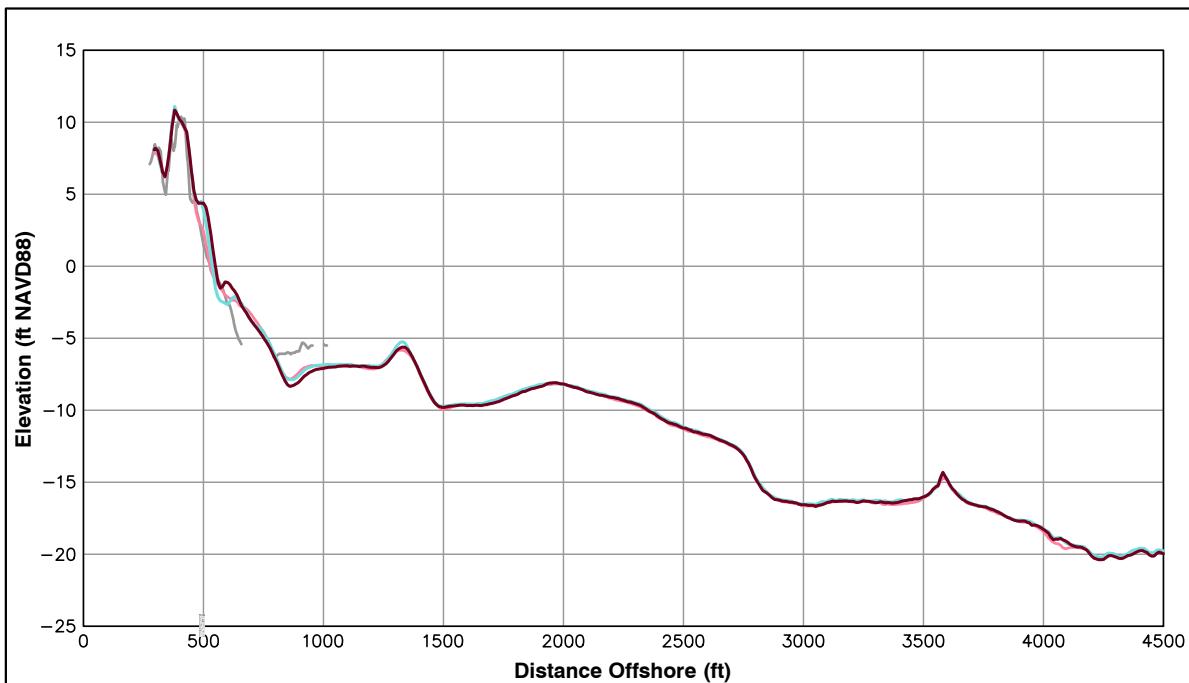
LEGEND:
2014 OCT —
2014 MAR —
2013 OCT —
POST-FILL —

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OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



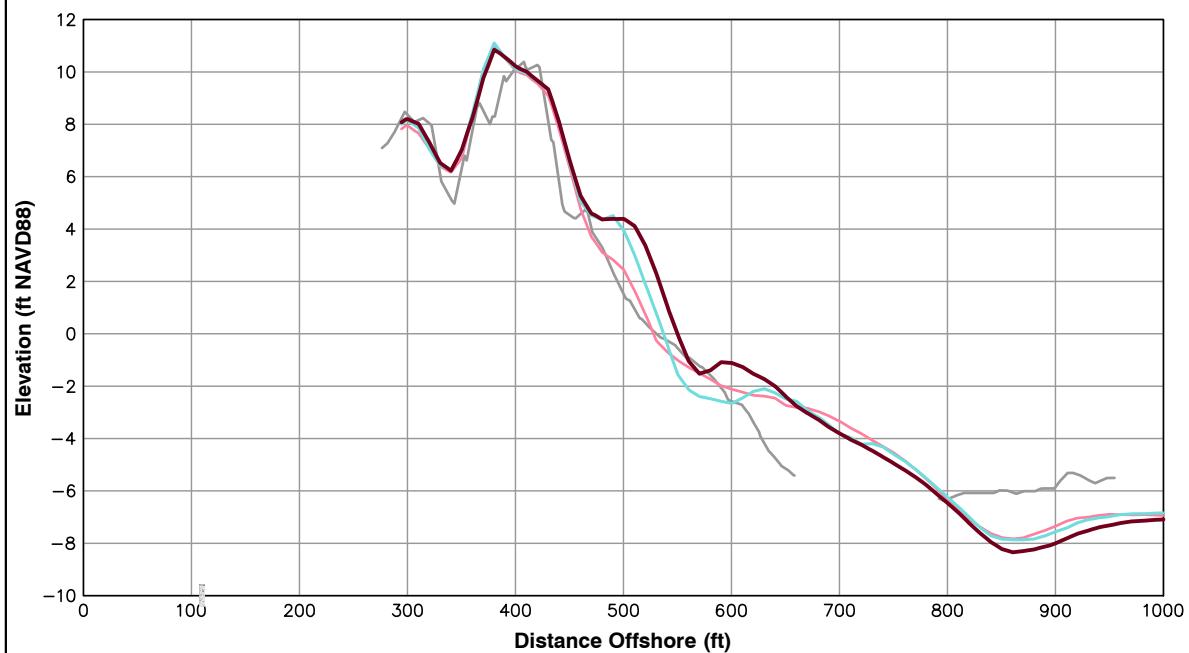
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	24.16 ft/yr	12.59 ft
Volume Change Above -15 ft NAVD88	5.96 cy/ft/yr	-3.81 cy/ft
Volume Change Above 0 ft NAVD88	6.40 cy/ft/yr	2.29 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

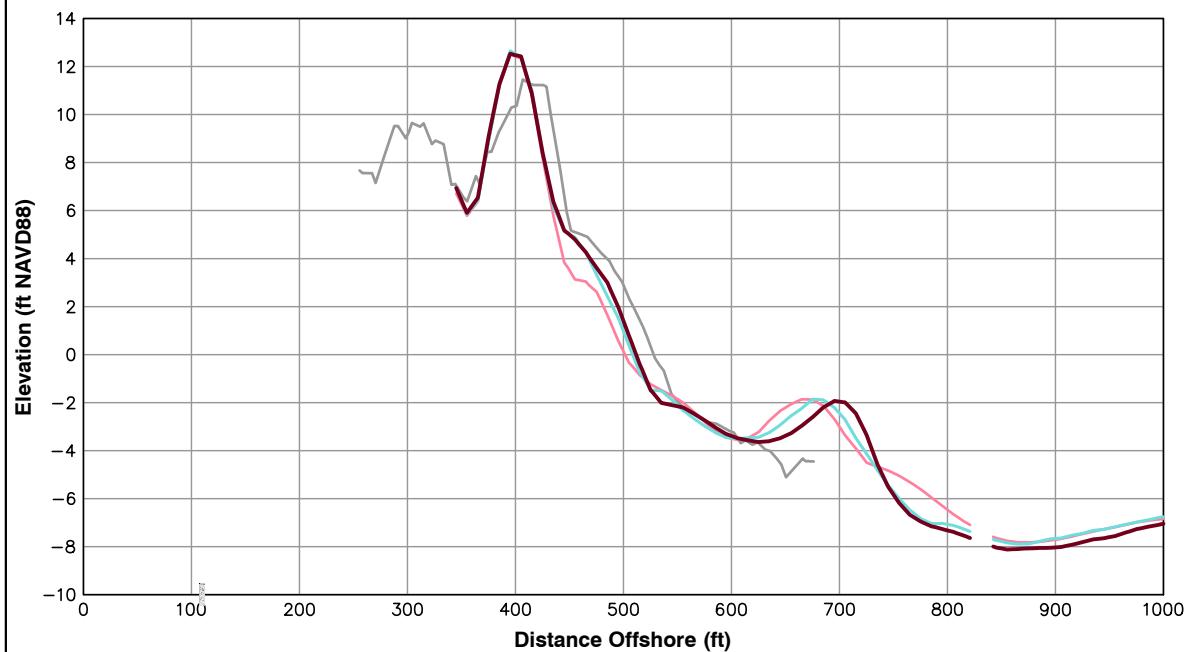
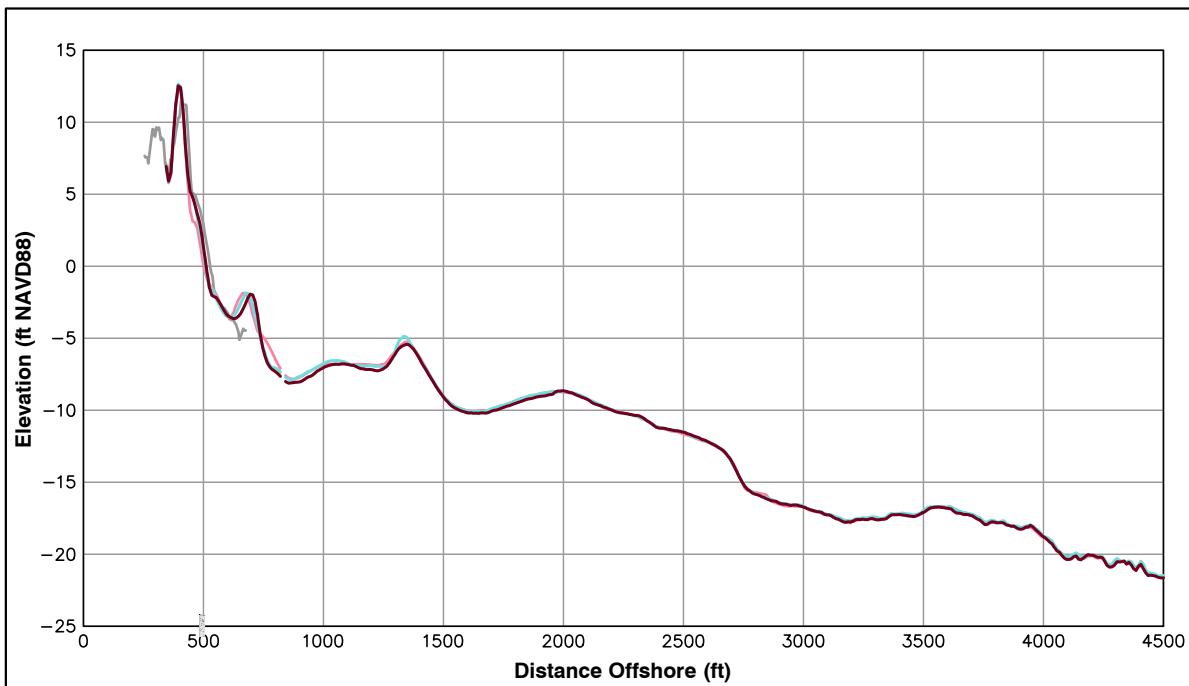
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect 20+00	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	12.41 ft/yr	3.56 ft
Volume Change Above -15 ft NAVD88	-6.60 cy/ft/yr	-7.85 cy/ft
Volume Change Above 0 ft NAVD88	3.94 cy/ft/yr	0.75 cy/ft

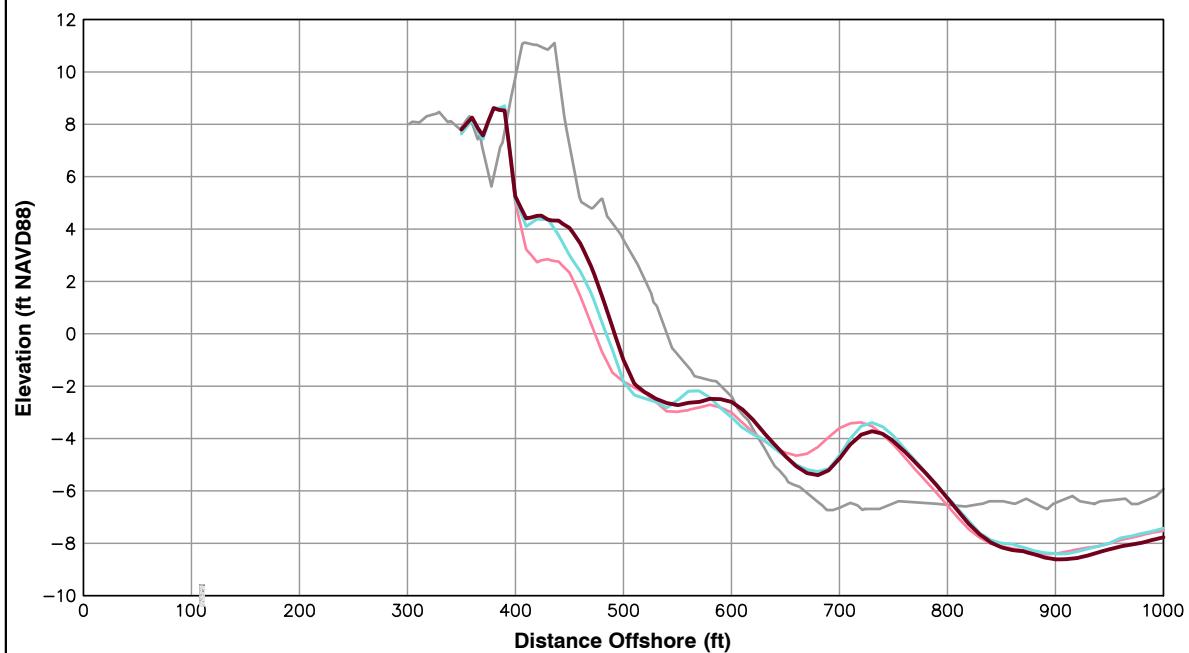
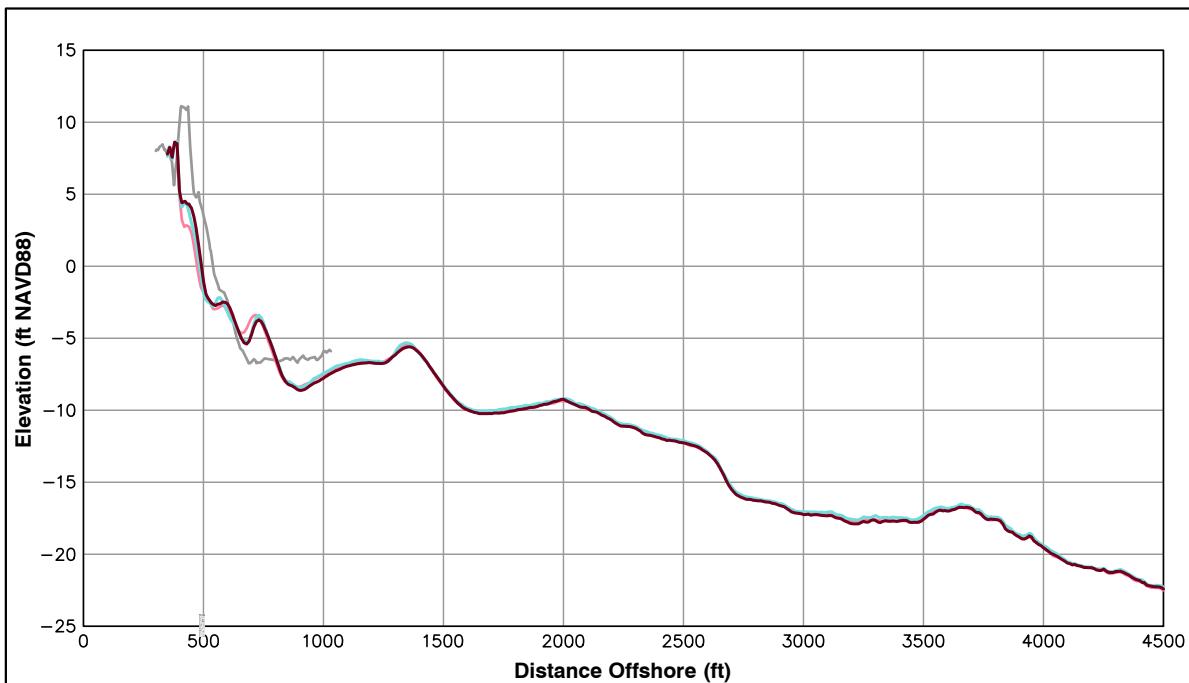
LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

Notes:

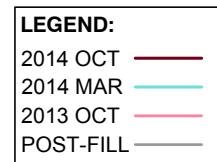
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OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
22+50	20.14 ft/yr	8.64 ft
Shoreline Change at MHW (0.98 ft NAVD88)	2.52 cy/ft/yr	-8.16 cy/ft
Volume Change Above -15 ft NAVD88	5.33 cy/ft/yr	2.11 cy/ft
Volume Change Above 0 ft NAVD88		



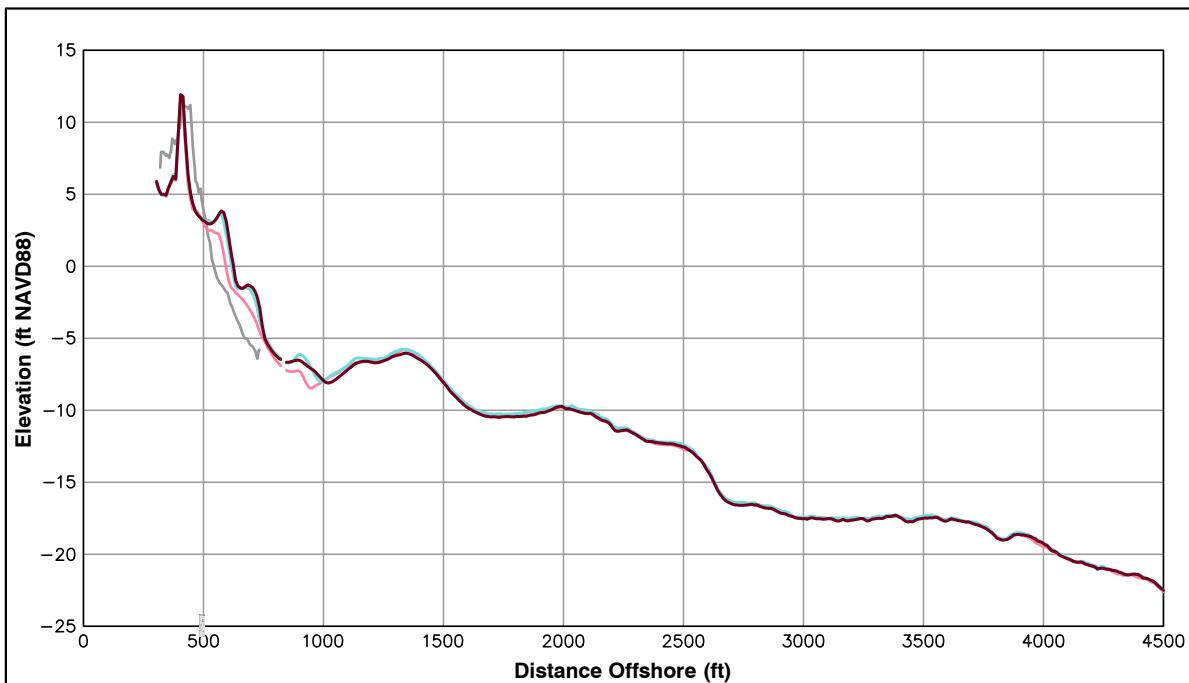
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

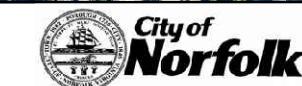
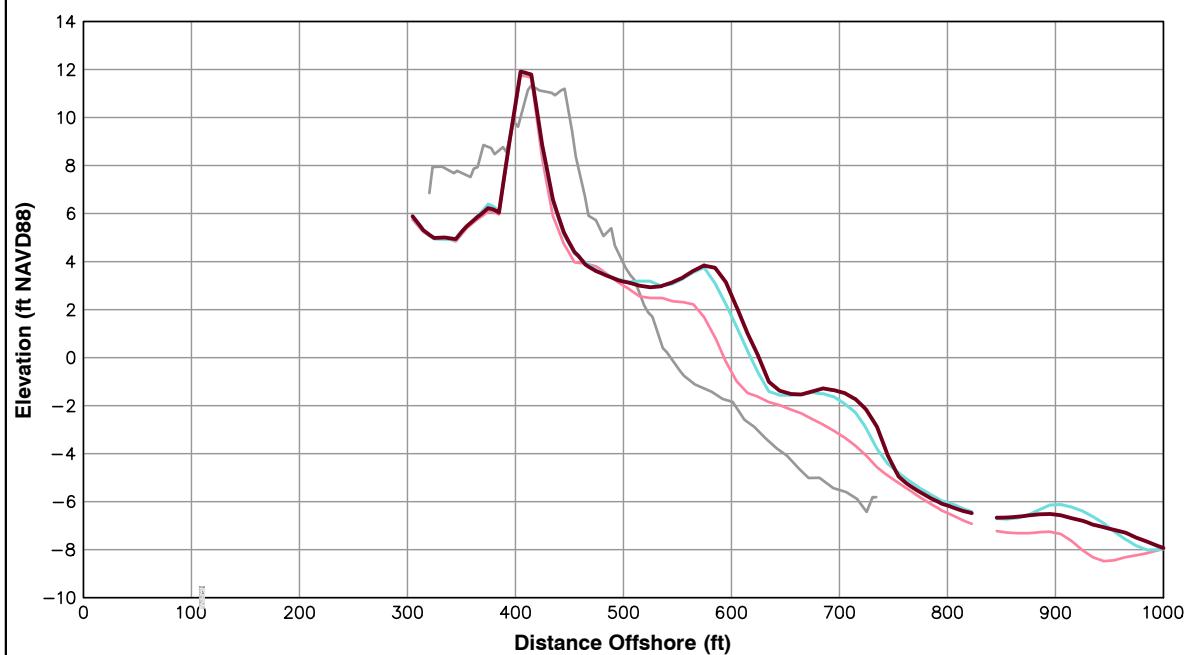


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
25+00		
Shoreline Change at MHW (0.98 ft NAVD88)	32.91 ft/yr	7.36 ft
Volume Change Above -15 ft NAVD88	16.88 cy/ft/yr	-9.68 cy/ft
Volume Change Above 0 ft NAVD88	7.35 cy/ft/yr	1.22 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

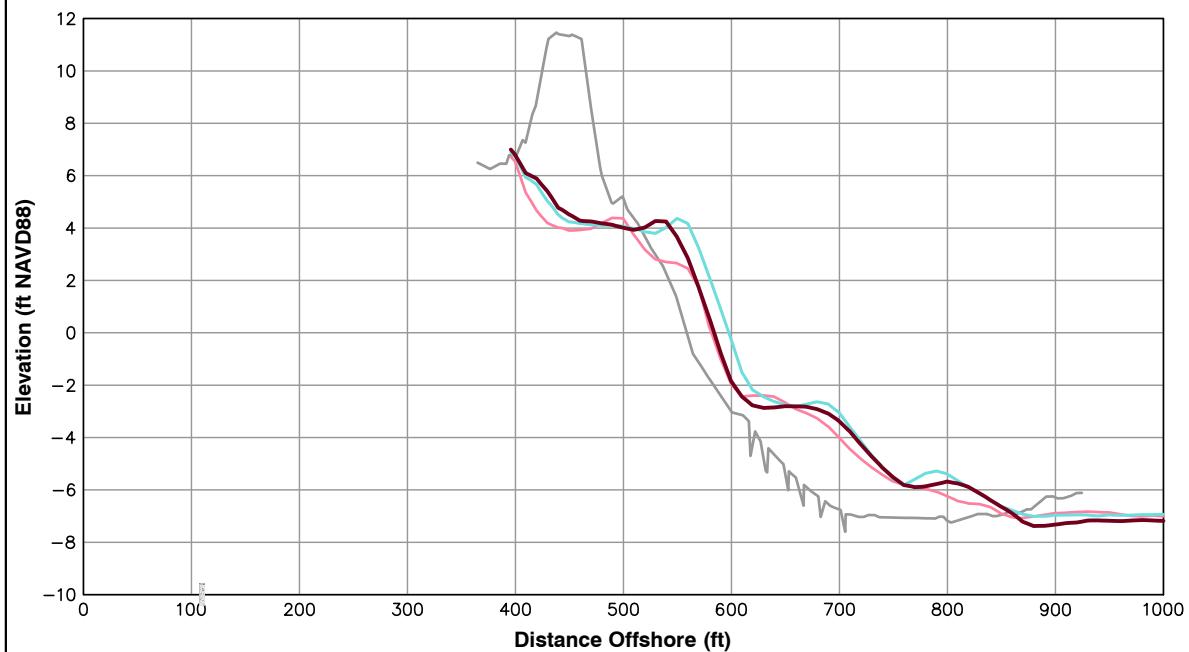
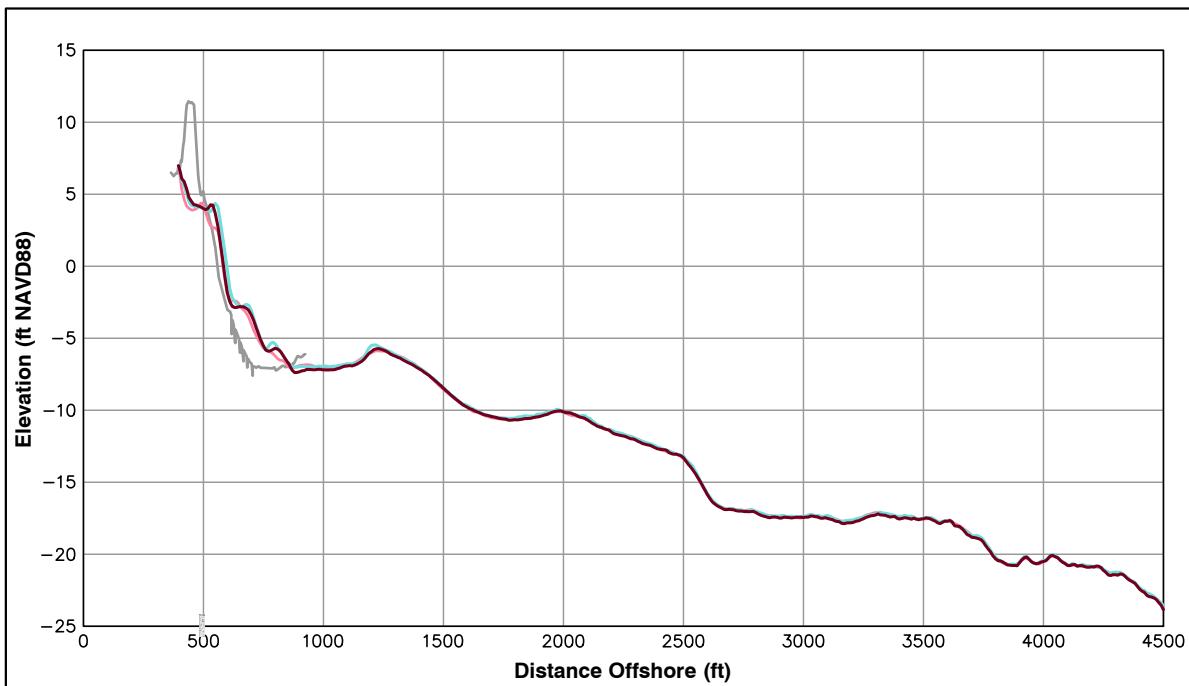
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
27+50		
Shoreline Change at MHW (0.98 ft NAVD88)	1.48 ft/yr	-13.41 ft
Volume Change Above -15 ft NAVD88	3.65 cy/ft/yr	-12.03 cy/ft
Volume Change Above 0 ft NAVD88	4.00 cy/ft/yr	-1.36 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

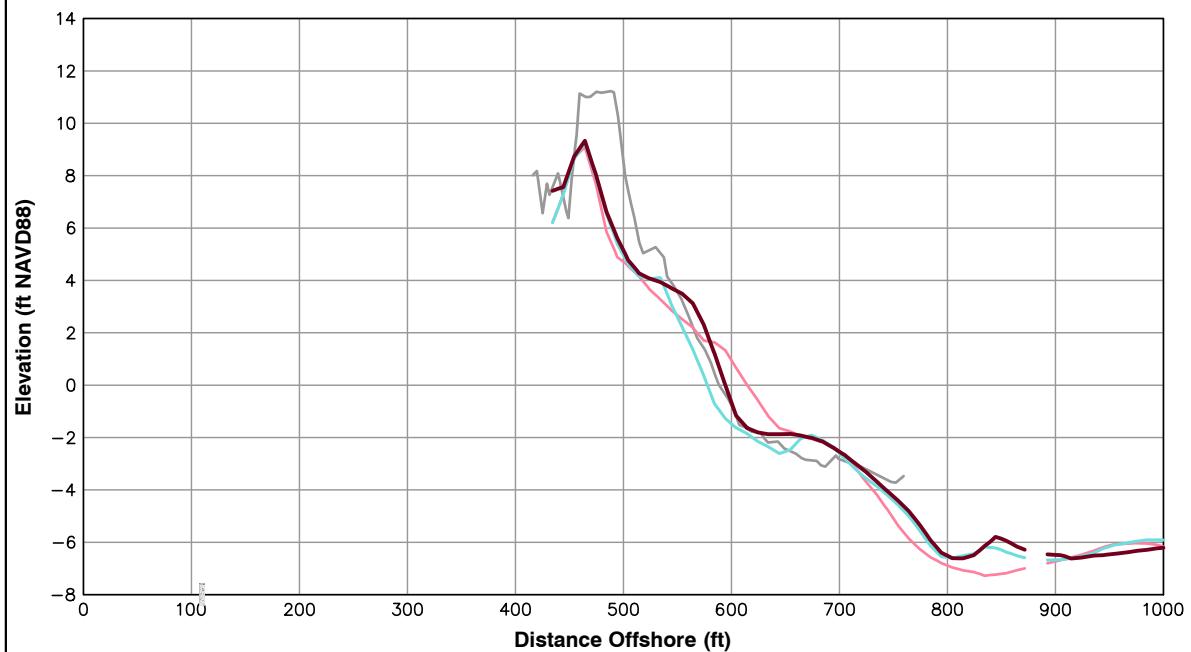
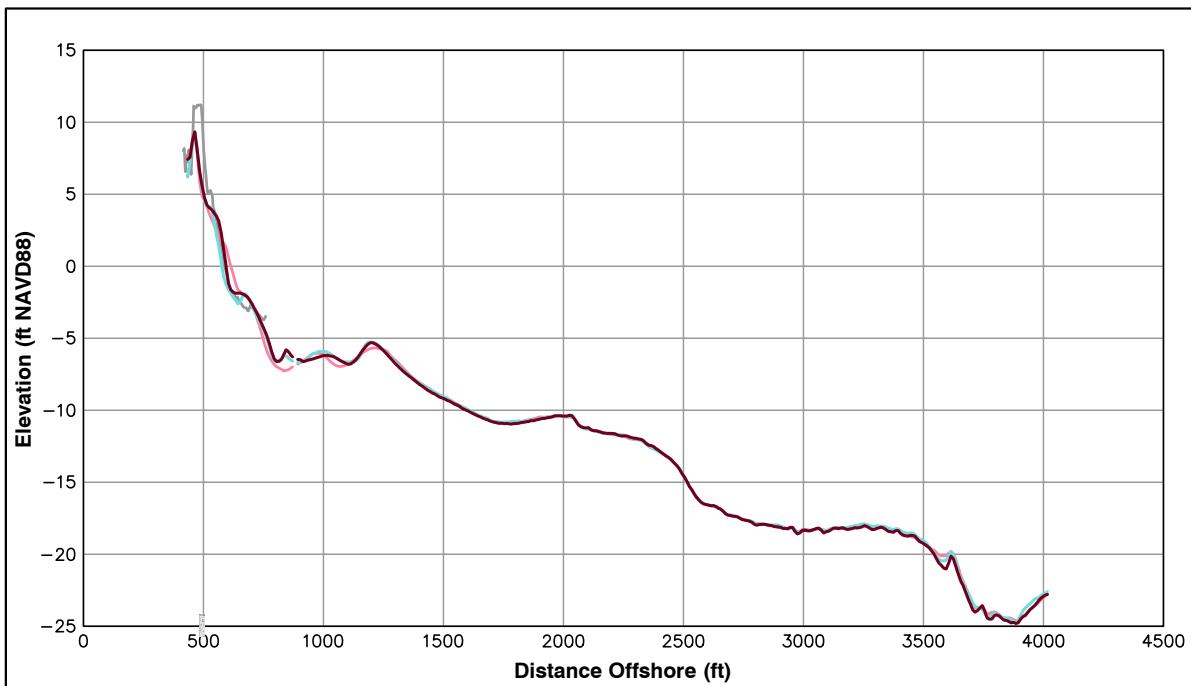
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
30+00		
Shoreline Change at MHW (0.98 ft NAVD88)	-13.72 ft/yr	18.17 ft
Volume Change Above -15 ft NAVD88	3.54 cy/ft/yr	2.96 cy/ft
Volume Change Above 0 ft NAVD88	2.04 cy/ft/yr	3.17 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

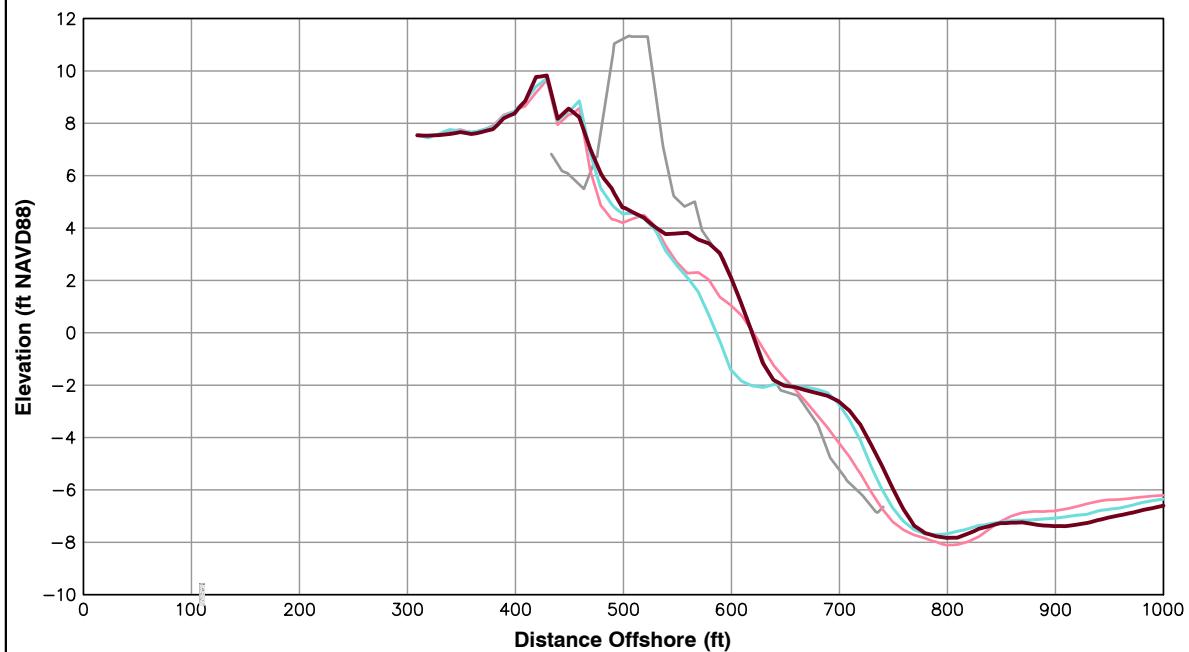
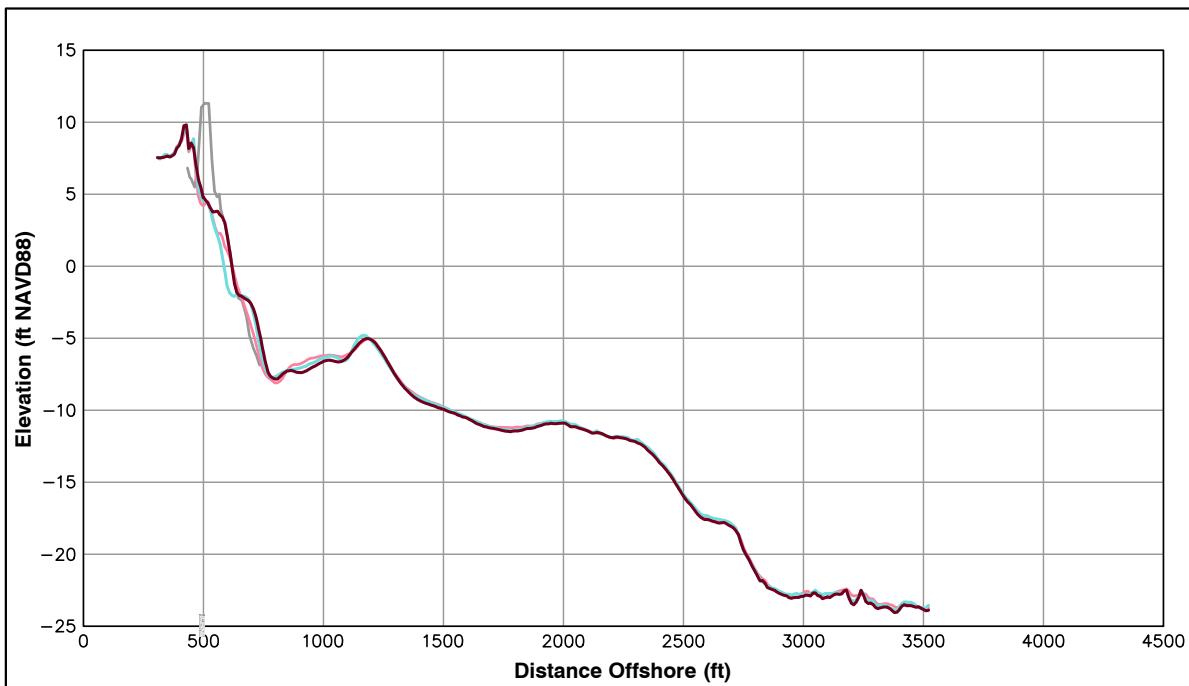
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
32+50		
Shoreline Change at MHW (0.98 ft NAVD88)	9.35 ft/yr	34.64 ft
Volume Change Above -15 ft NAVD88	0.94 cy/ft/yr	2.43 cy/ft
Volume Change Above 0 ft NAVD88	5.02 cy/ft/yr	5.88 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

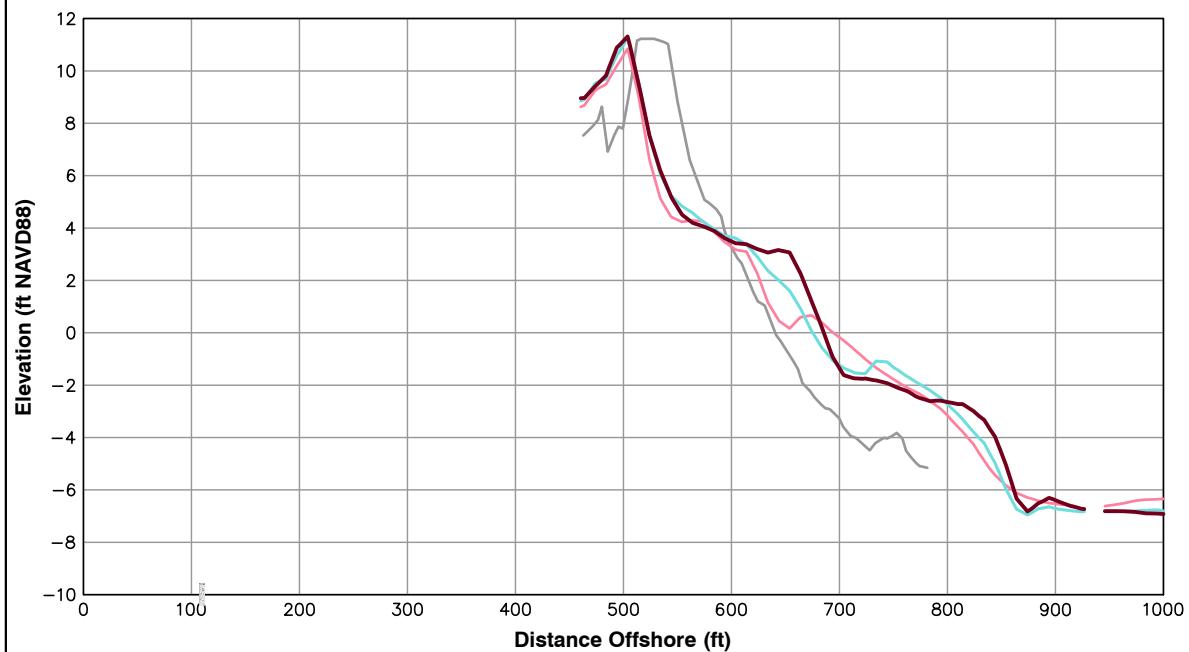
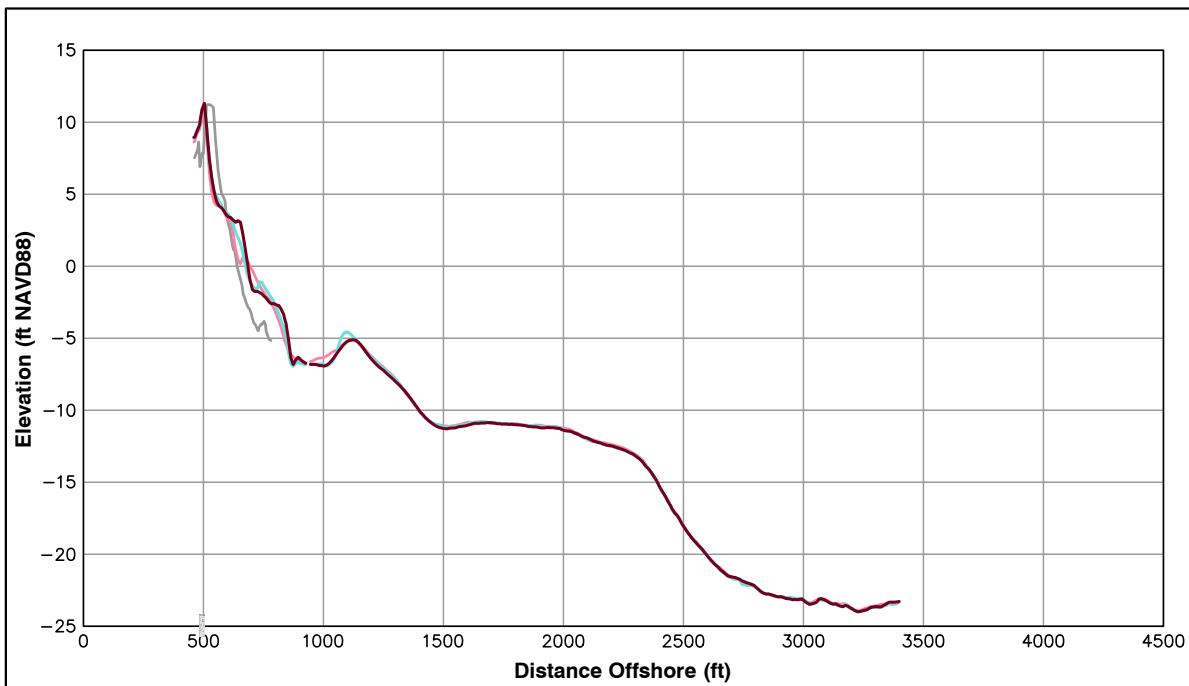
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect 35+00	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	41.13 ft/yr	13.32 ft
Volume Change Above -15 ft NAVD88	0.39 cy/ft/yr	-0.46 cy/ft
Volume Change Above 0 ft NAVD88	6.20 cy/ft/yr	2.05 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

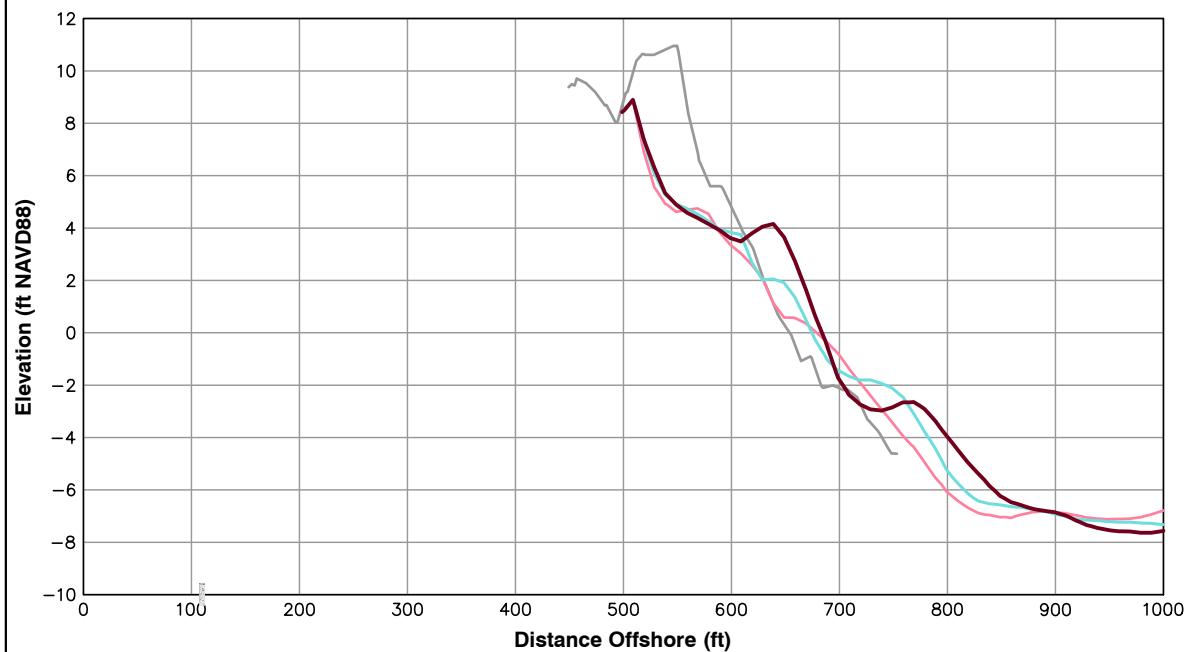
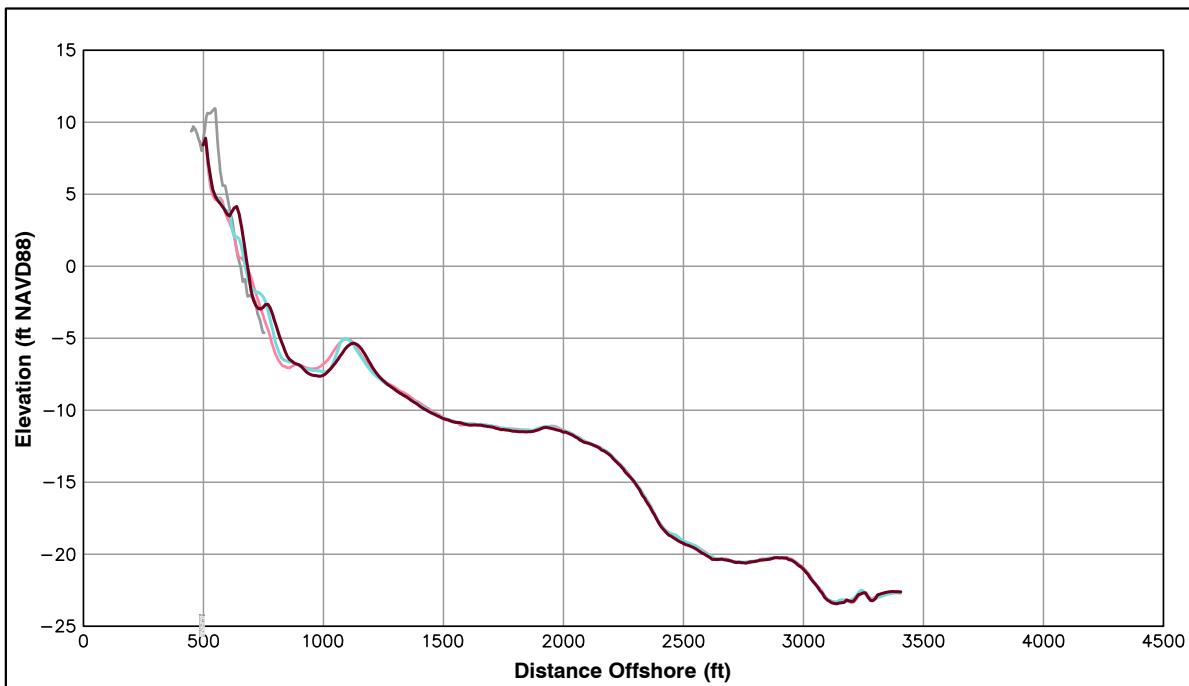
Notes:

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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
37+50	34.07 ft/yr	11.43 ft
Shoreline Change at MHW (0.98 ft NAVD88)	3.36 cy/ft/yr	1.83 cy/ft
Volume Change Above -15 ft NAVD88	5.69 cy/ft/yr	3.48 cy/ft

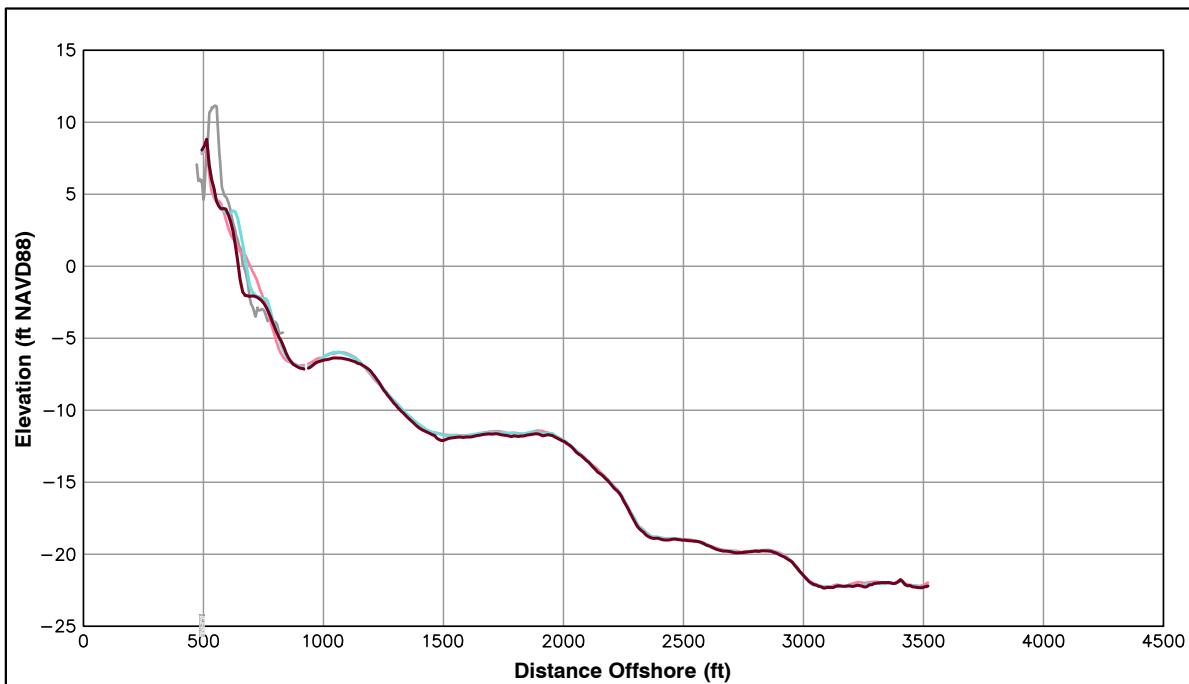
LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



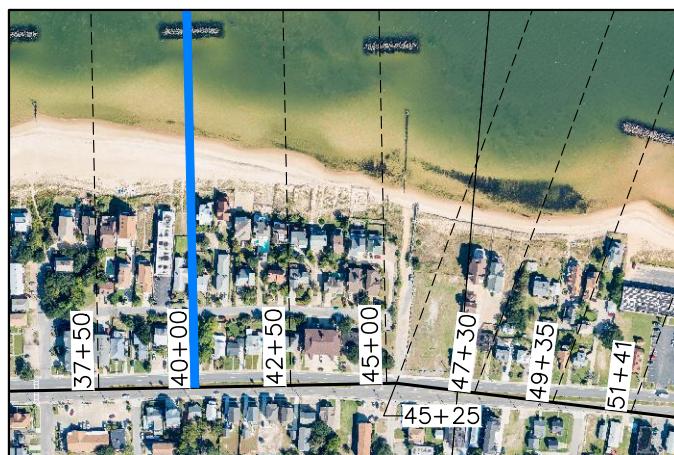
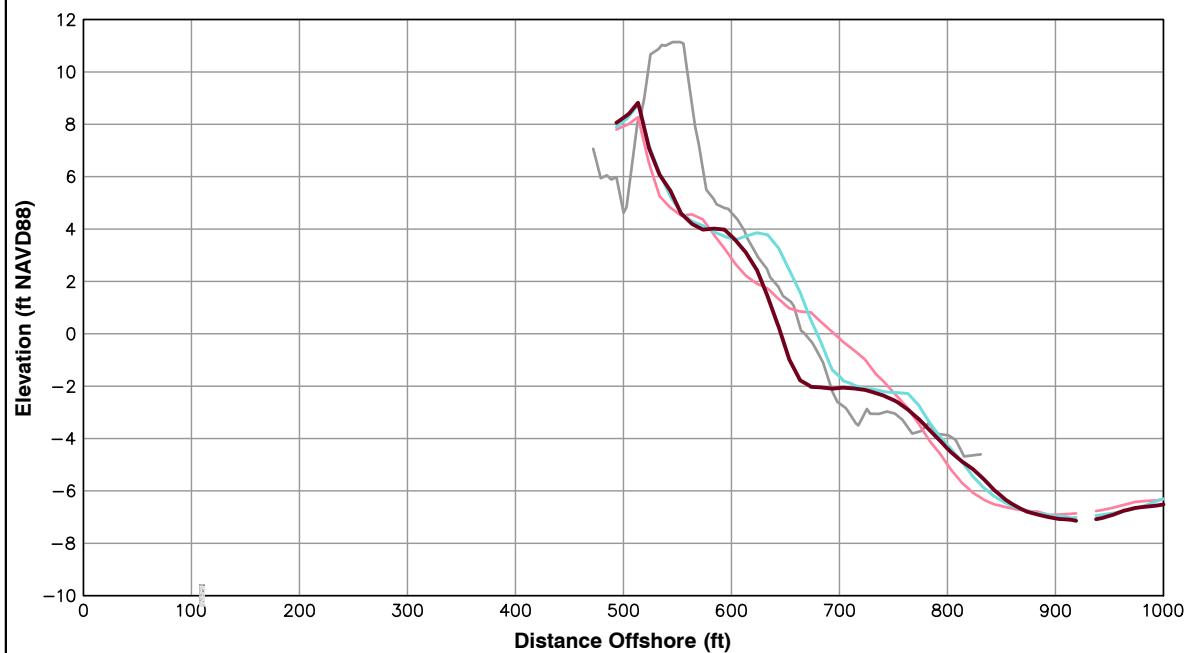
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-16.37 ft/yr	-31.73 ft
Volume Change Above -15 ft NAVD88	-10.56 cy/ft/yr	-14.15 cy/ft
Volume Change Above 0 ft NAVD88	0.41 cy/ft/yr	-4.27 cy/ft

LEGEND:

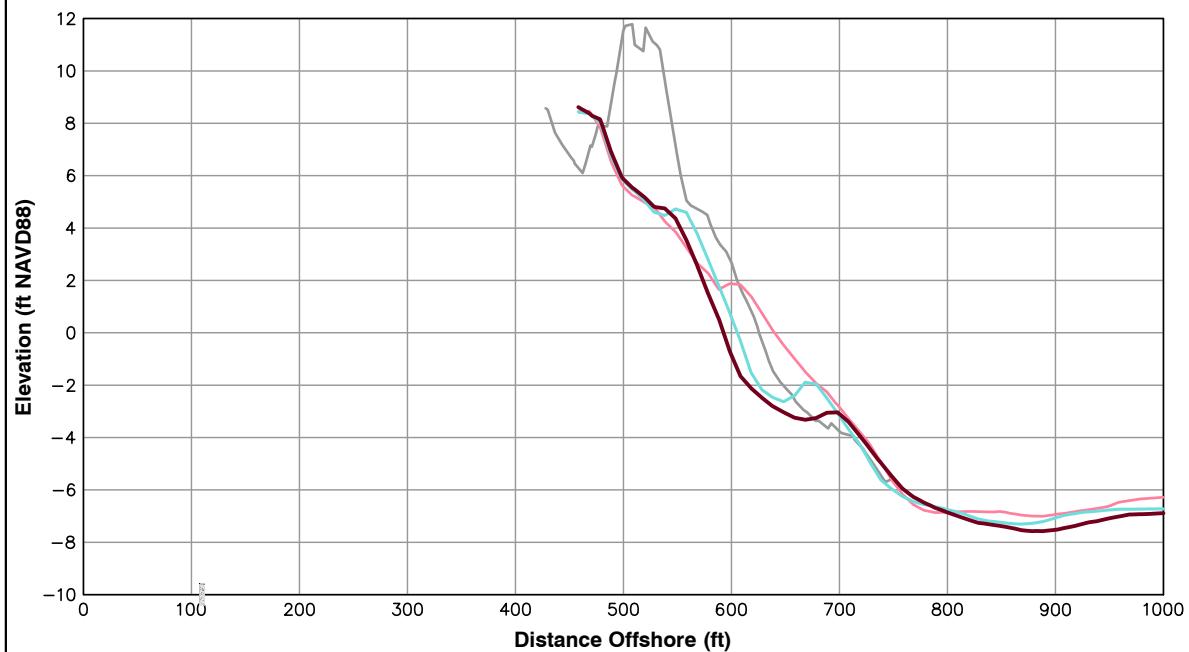
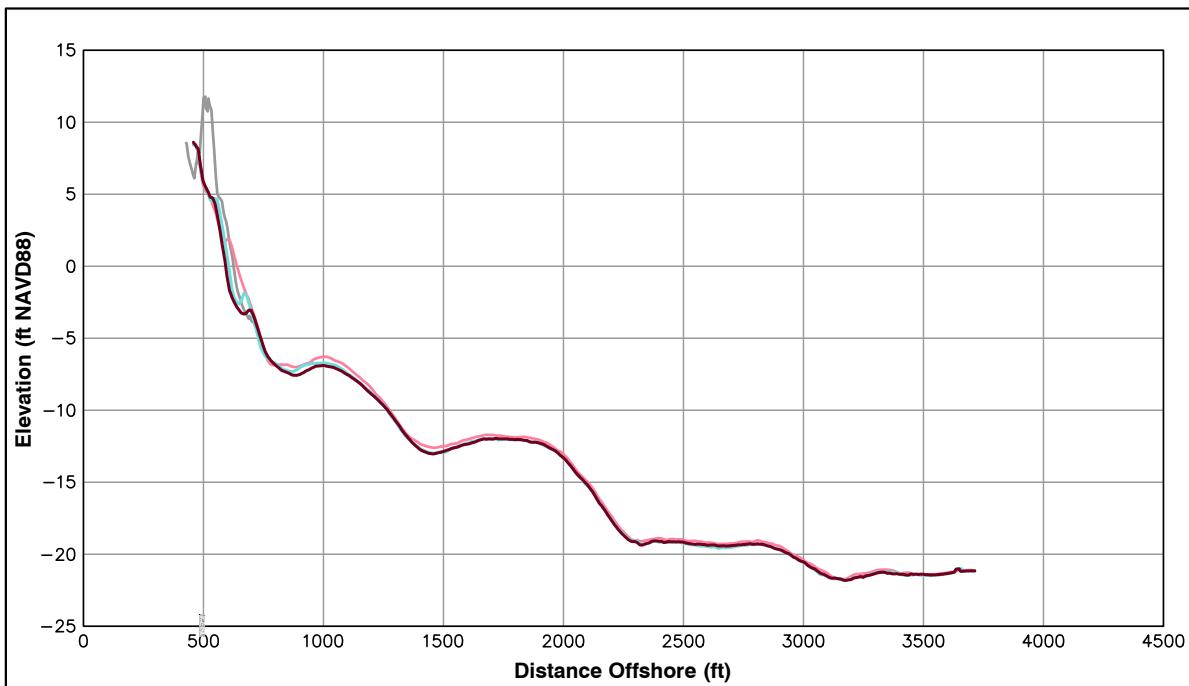
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

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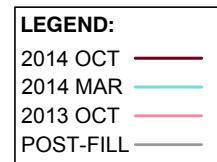
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CITY OF NORFOLK
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
42+50		
Shoreline Change at MHW (0.98 ft NAVD88)	-42.14 ft/yr	-12.60 ft
Volume Change Above -15 ft NAVD88	-25.25 cy/ft/yr	-6.39 cy/ft
Volume Change Above 0 ft NAVD88	-2.01 cy/ft/yr	-1.80 cy/ft



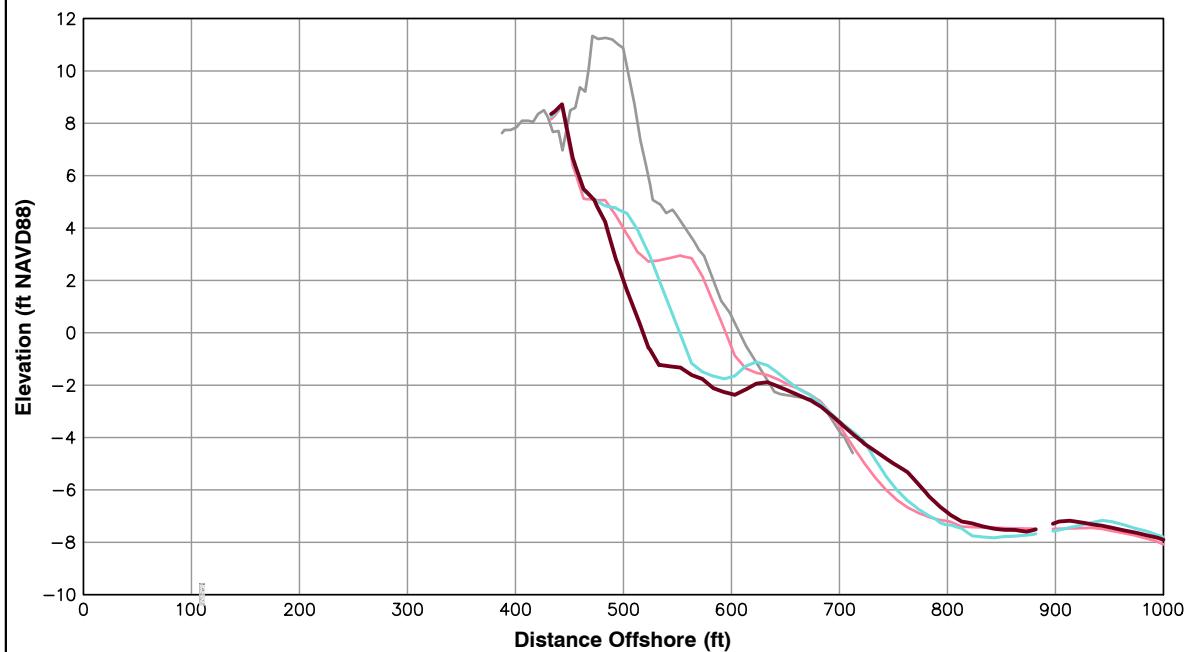
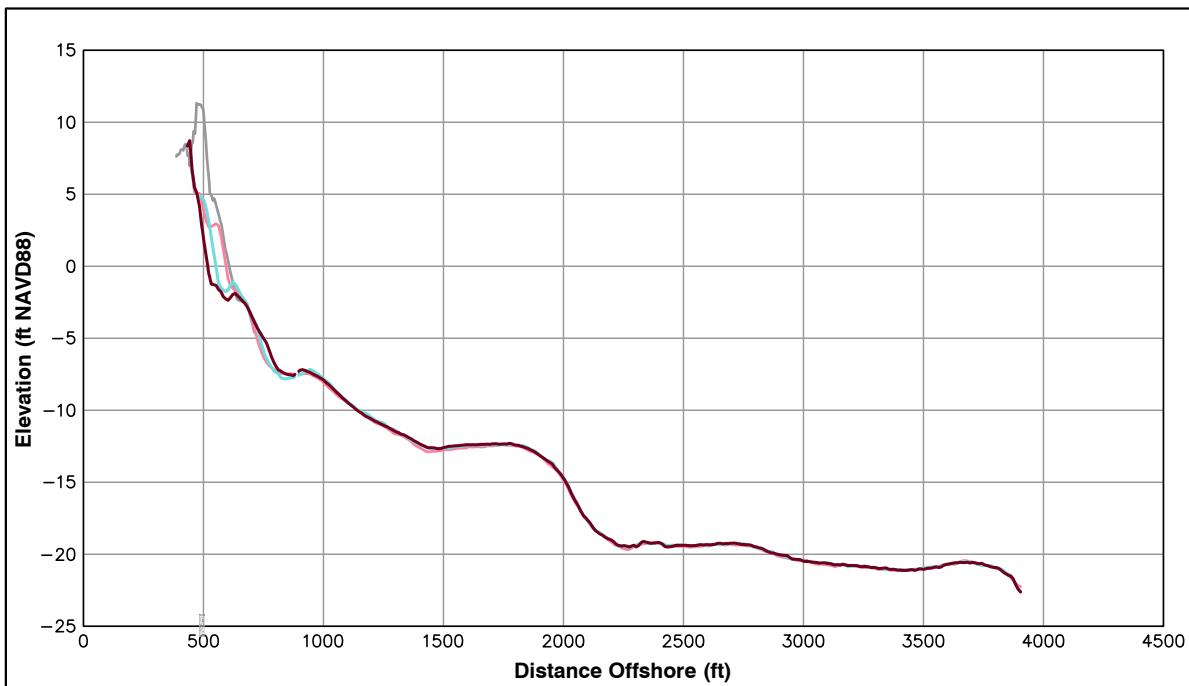
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



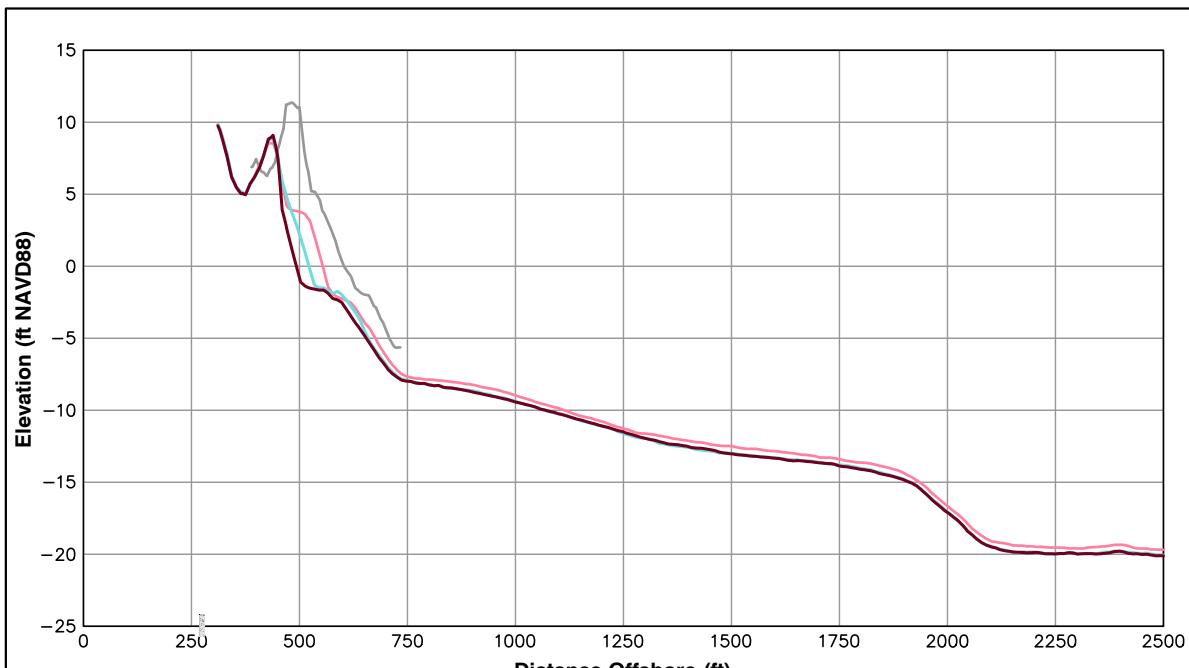
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
45+00		
Shoreline Change at MHW (0.98 ft NAVD88)	-77.86 ft/yr	-33.62 ft
Volume Change Above -15 ft NAVD88	-6.21 cy/ft/yr	-7.01 cy/ft
Volume Change Above 0 ft NAVD88	-9.16 cy/ft/yr	-5.47 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

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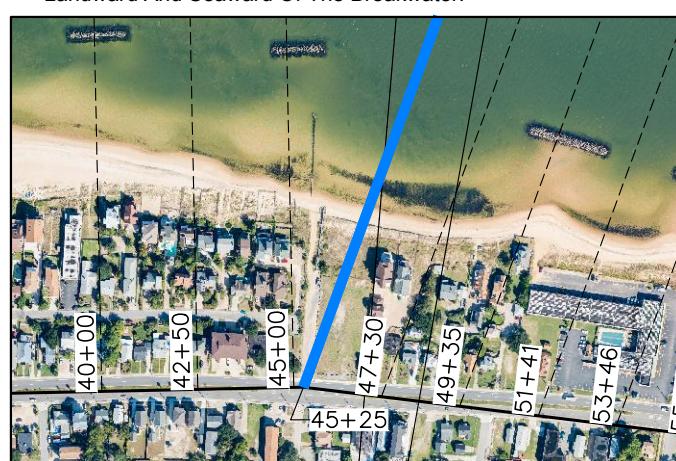
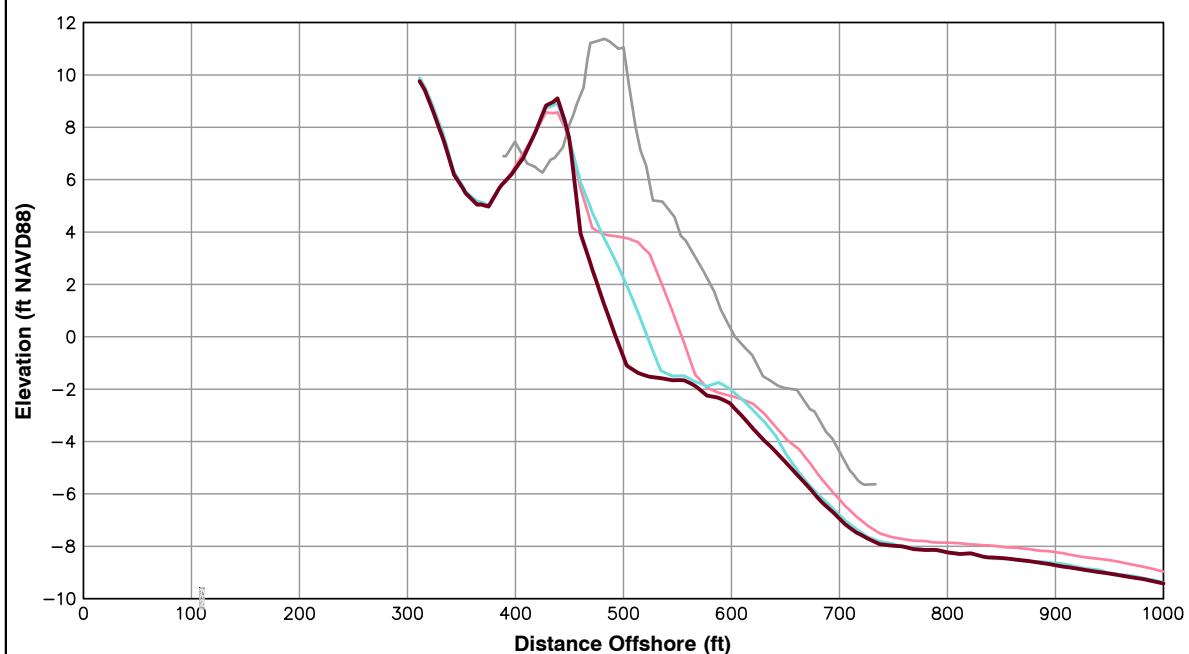


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- 2014 MAR ——
- 2013 OCT ——
- POST-FILL ——

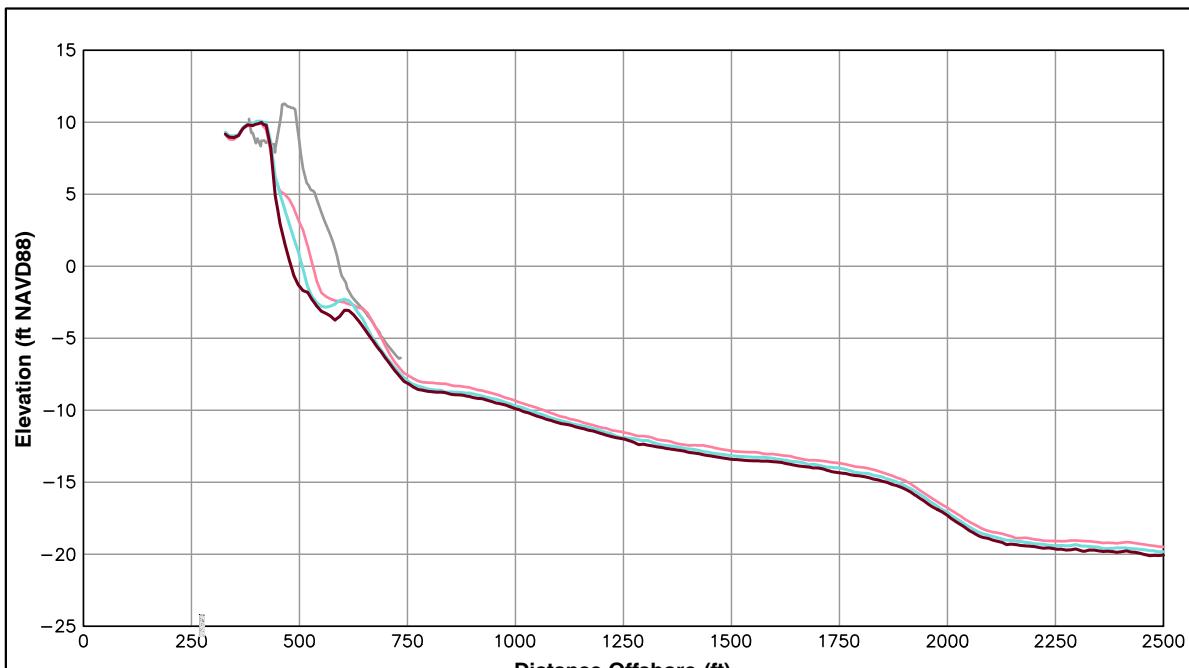
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



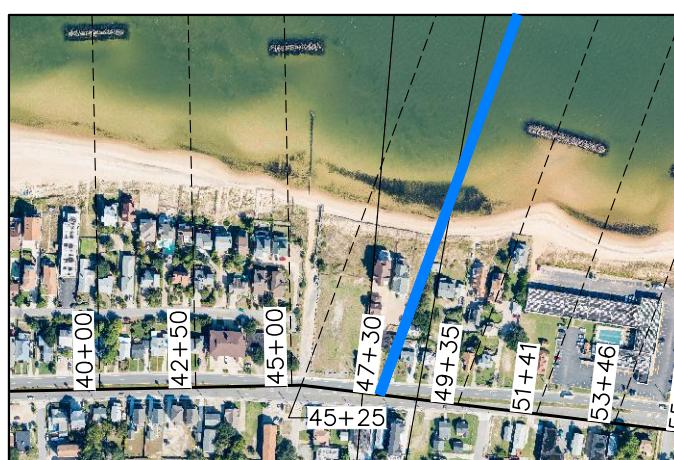
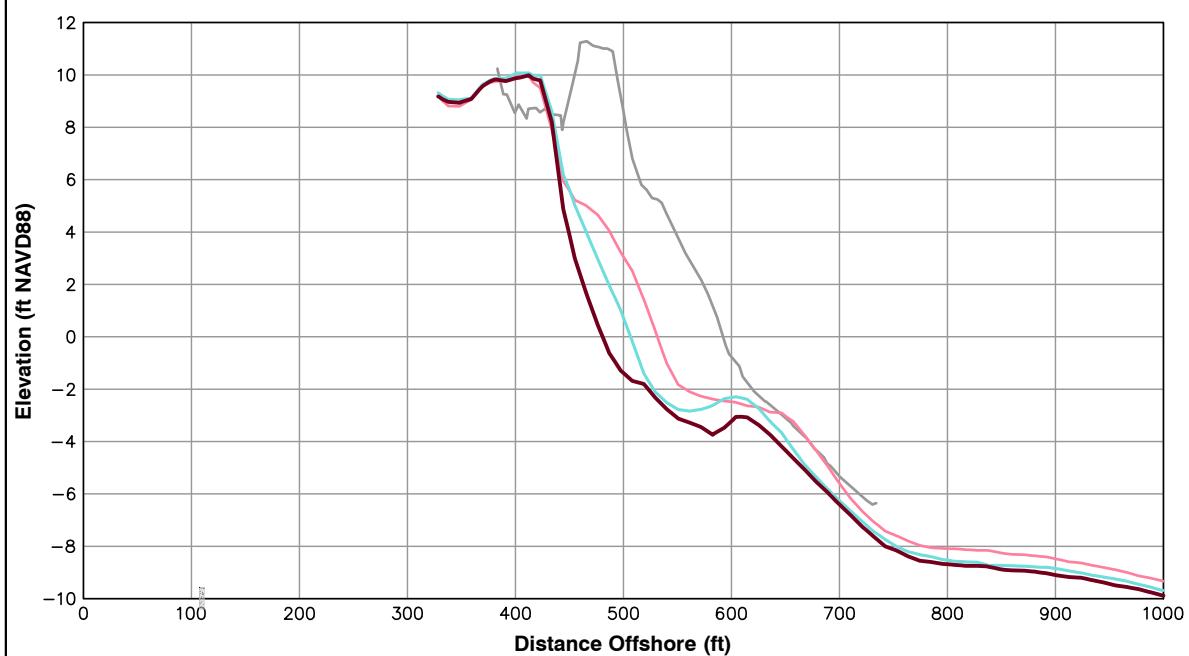
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-52.74 ft/yr	-26.23 ft
Volume Change Above -15 ft NAVD88	-43.66 cy/ft/yr	-18.97 cy/ft
Volume Change Above 0 ft NAVD88	-8.68 cy/ft/yr	-4.98 cy/ft

LEGEND:

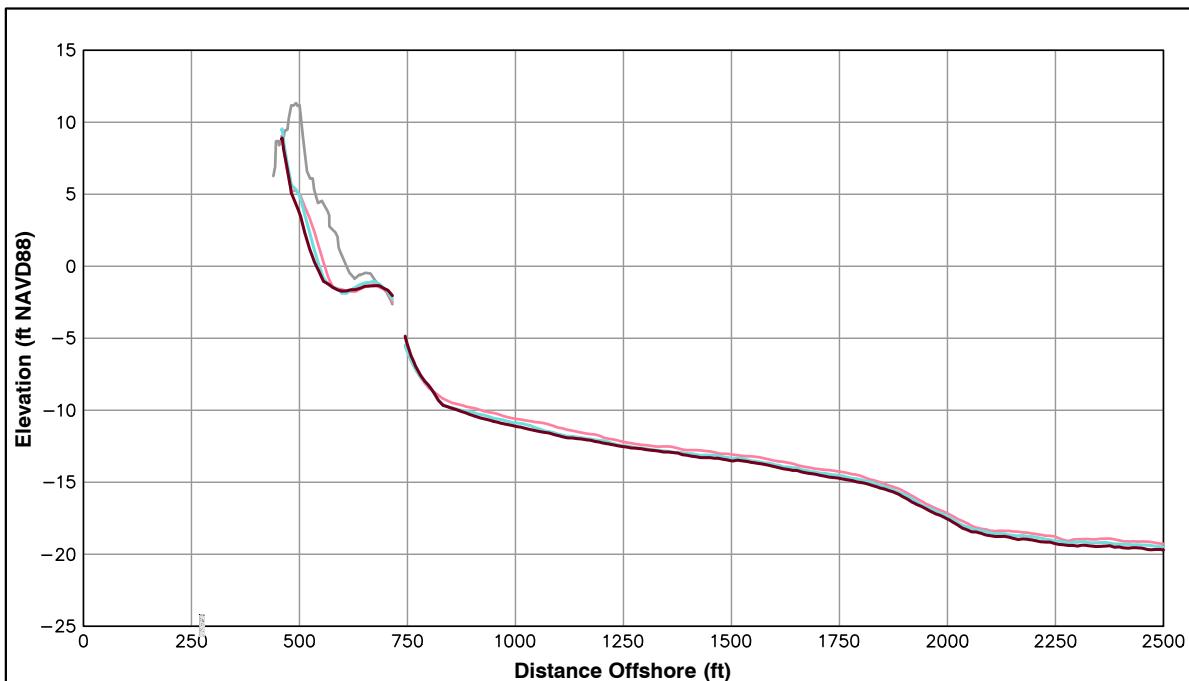
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

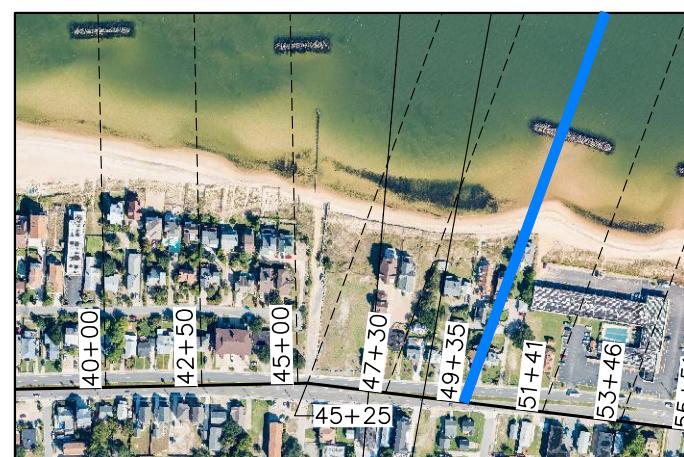
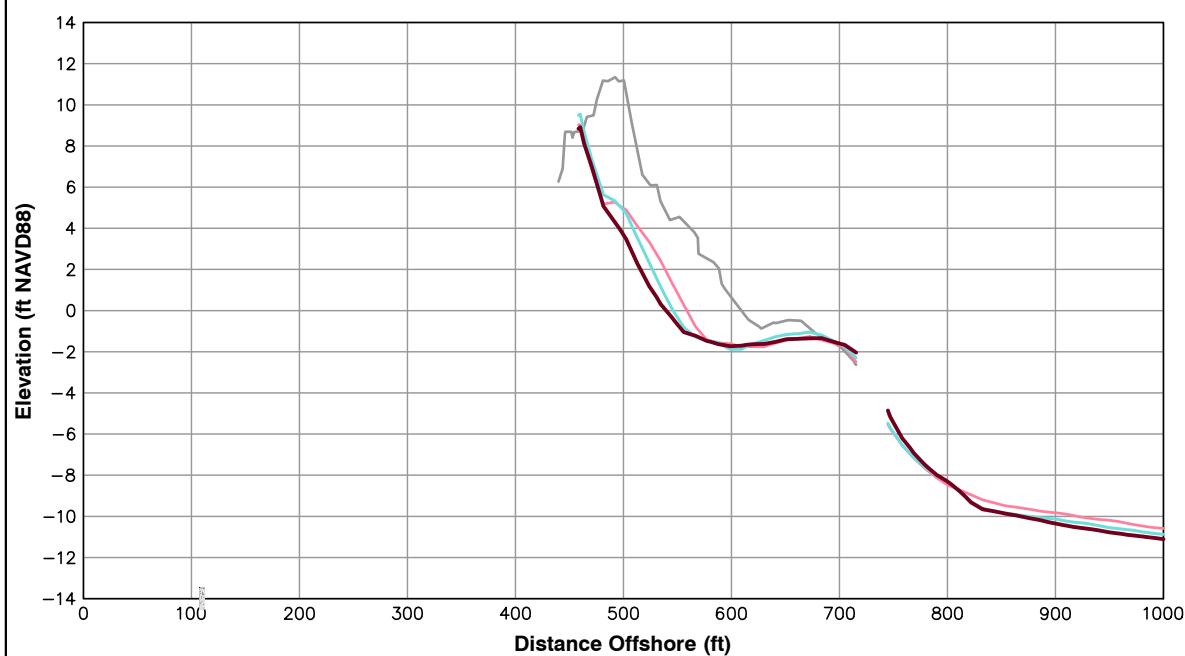


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
49+35		
Shoreline Change at MHW (0.98 ft NAVD88)	-22.78 ft/yr	-9.66 ft
Volume Change Above -15 ft NAVD88	-20.97 cy/ft/yr	-8.01 cy/ft
Volume Change Above 0 ft NAVD88	-4.08 cy/ft/yr	-2.73 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

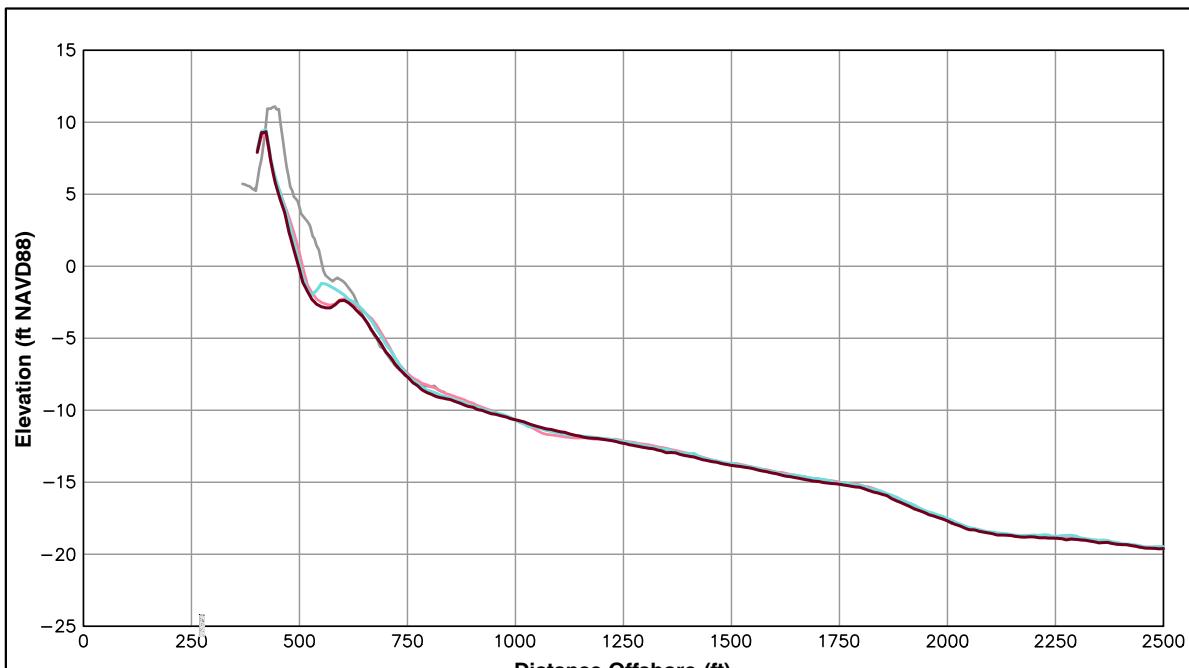
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**



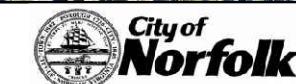
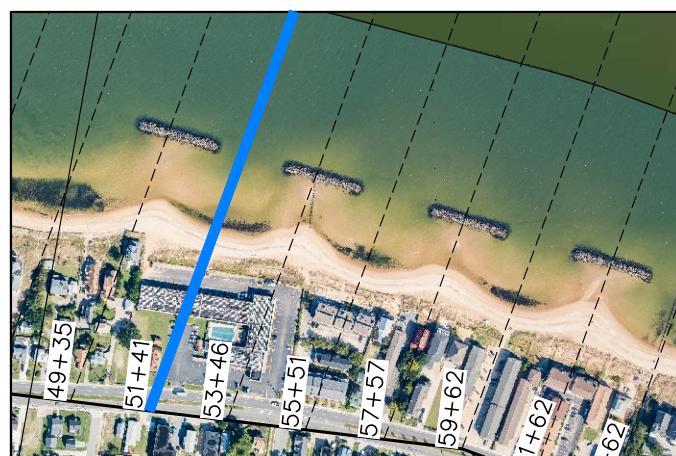
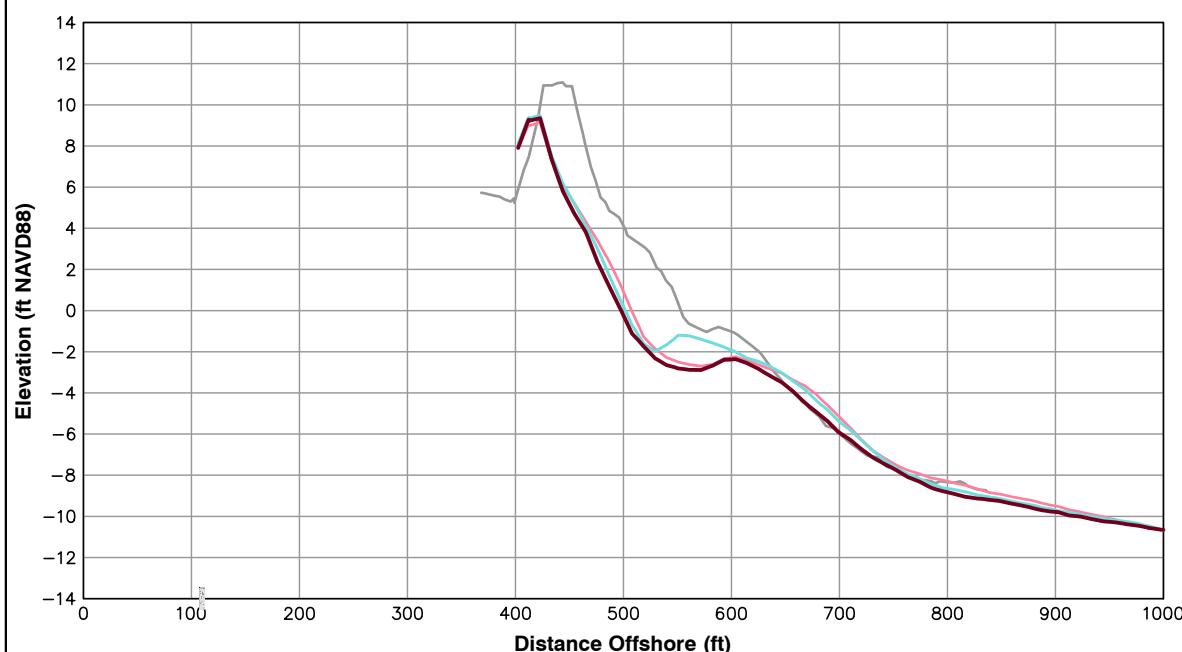
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-10.50 ft/yr	-4.49 ft
Volume Change Above -15 ft NAVD88	-10.38 cy/ft/yr	-10.27 cy/ft
Volume Change Above 0 ft NAVD88	-1.70 cy/ft/yr	-1.25 cy/ft

LEGEND:

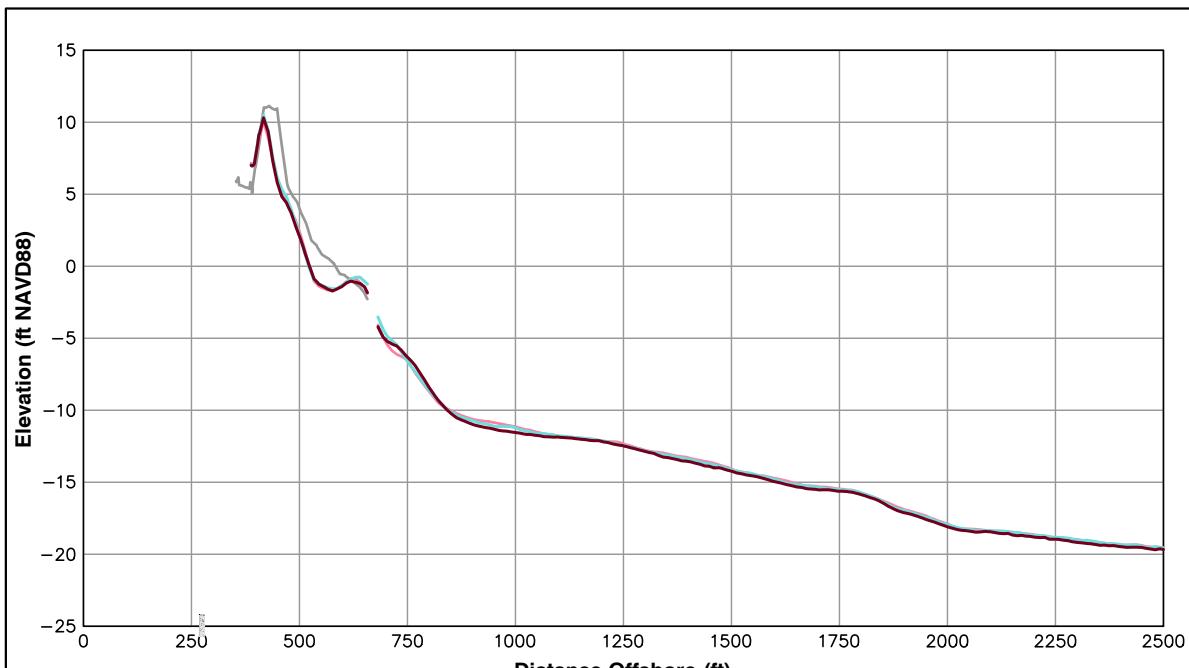
2014 OCT	—
2014 MAR	—
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



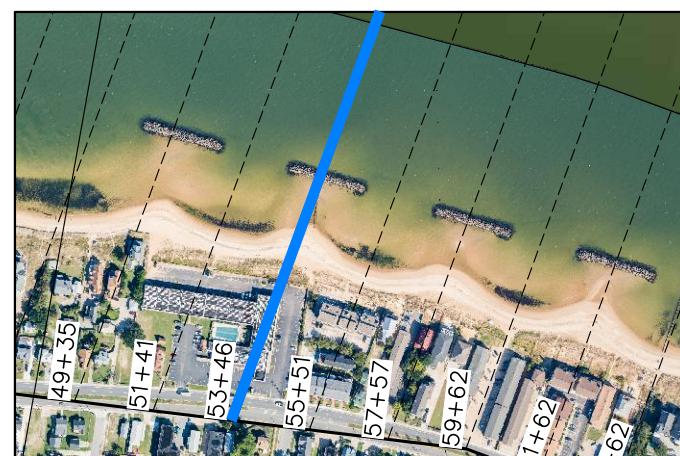
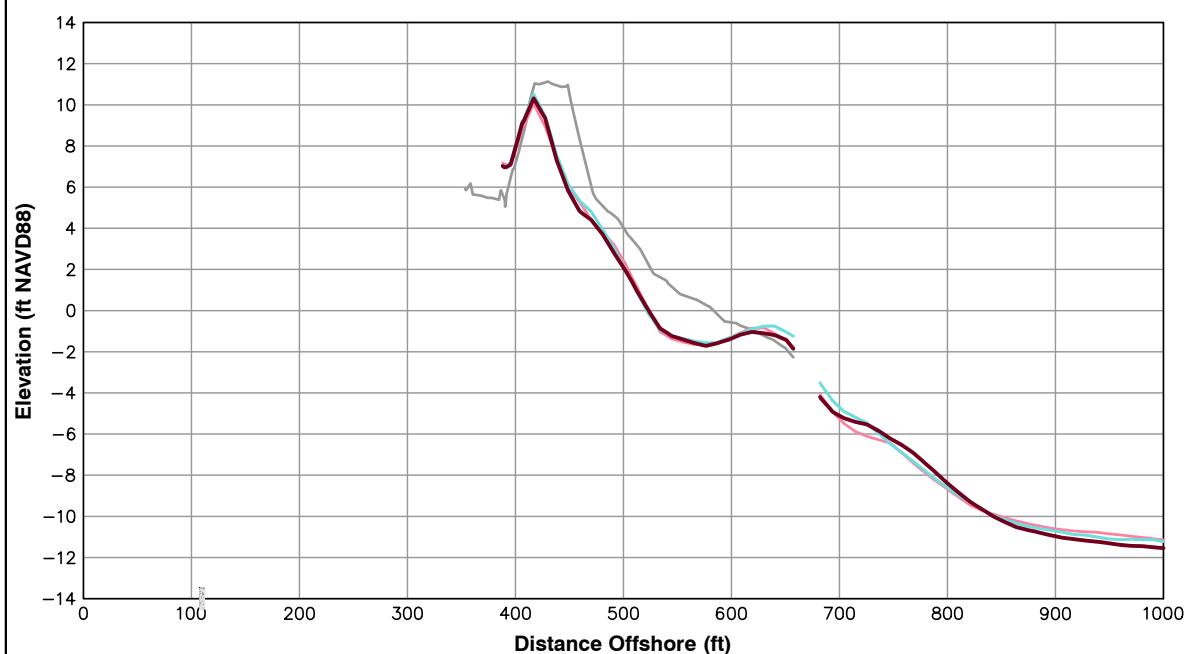
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-1.94	0.48
Volume Change Above -15 ft NAVD88	-5.14	-5.52
Volume Change Above 0 ft NAVD88	-0.33	-0.91

LEGEND:

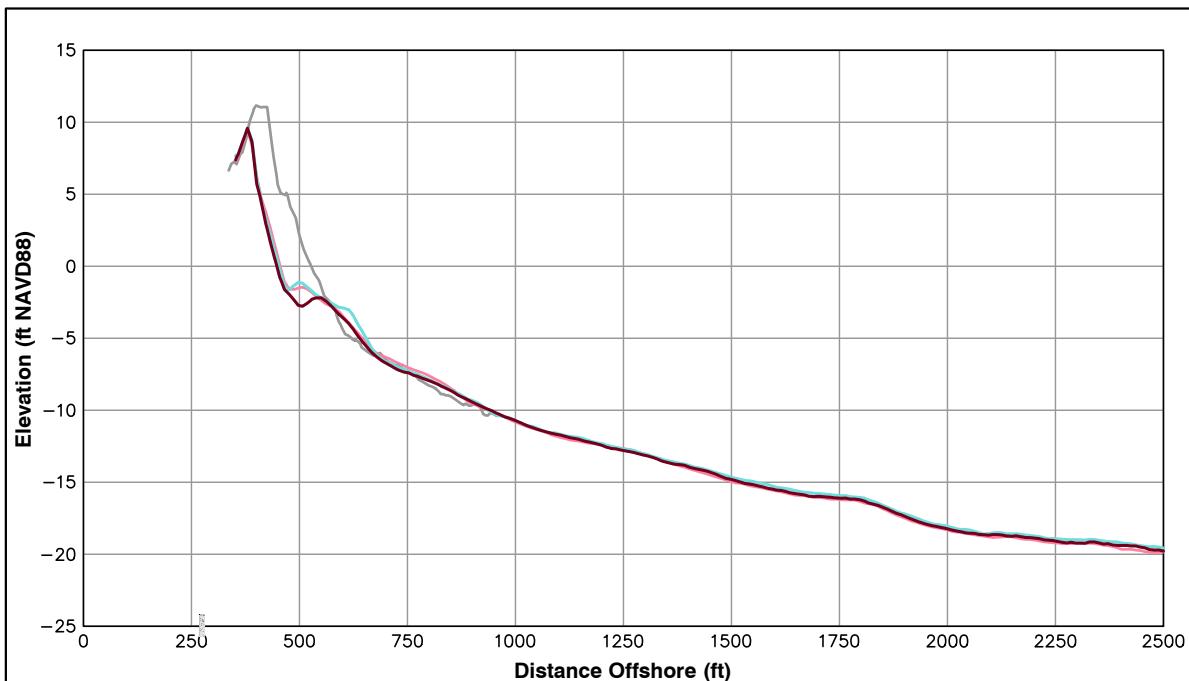
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

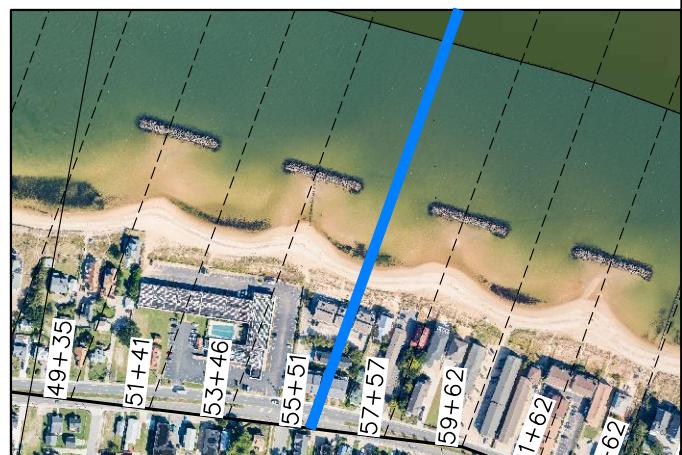
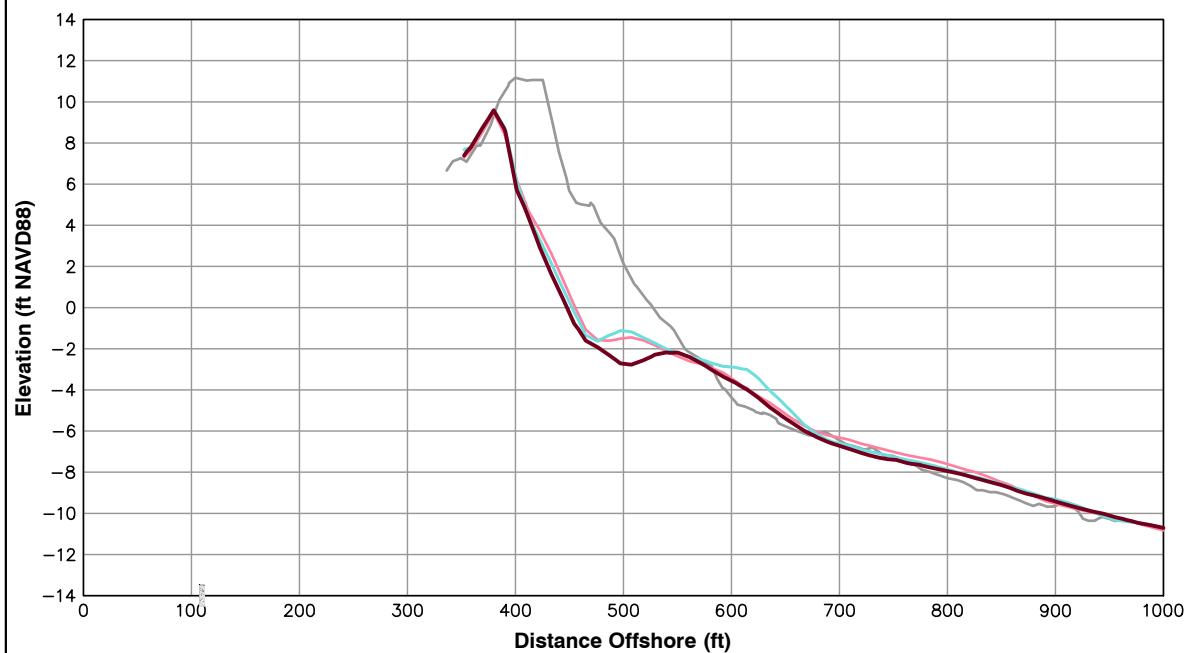


LEGEND:

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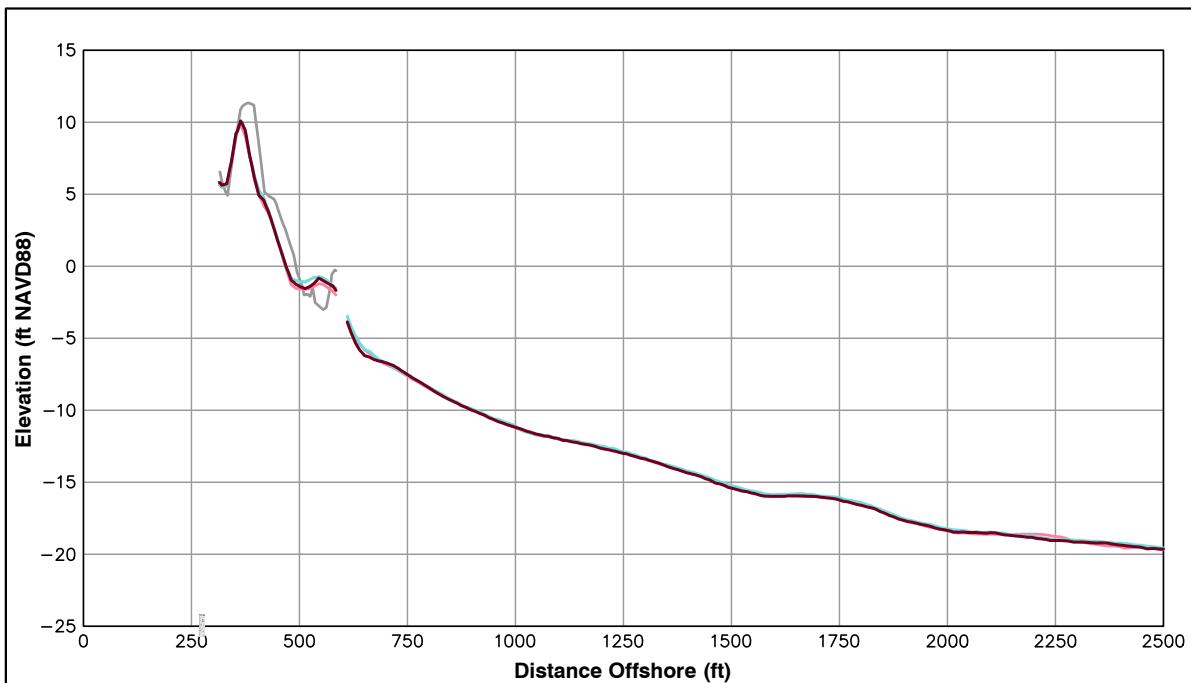
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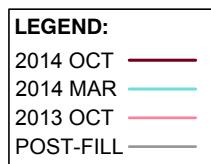


City of
Norfolk

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

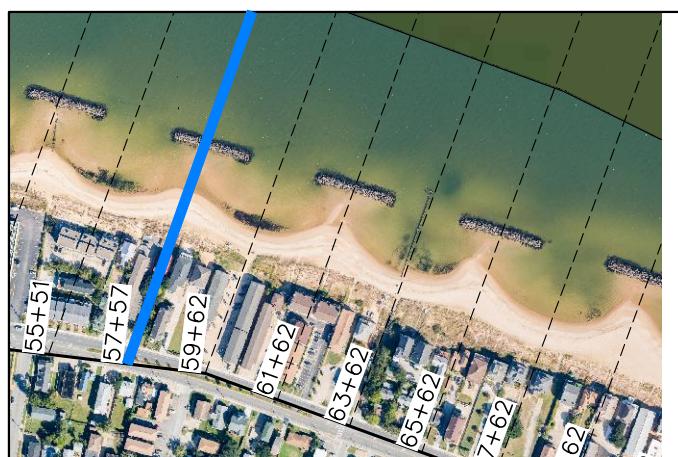
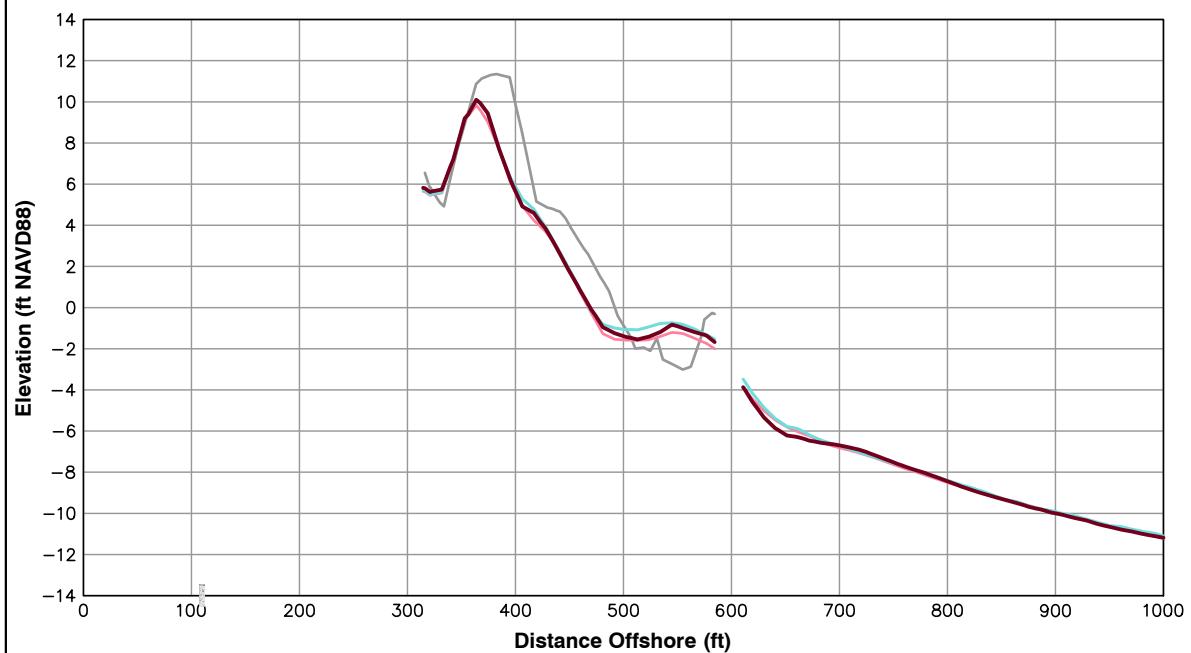


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	0.74 ft/yr	-0.47 ft
Volume Change Above -15 ft NAVD88	0.91 cy/ft/yr	-4.03 cy/ft
Volume Change Above 0 ft NAVD88	0.71 cy/ft/yr	-0.24 cy/ft

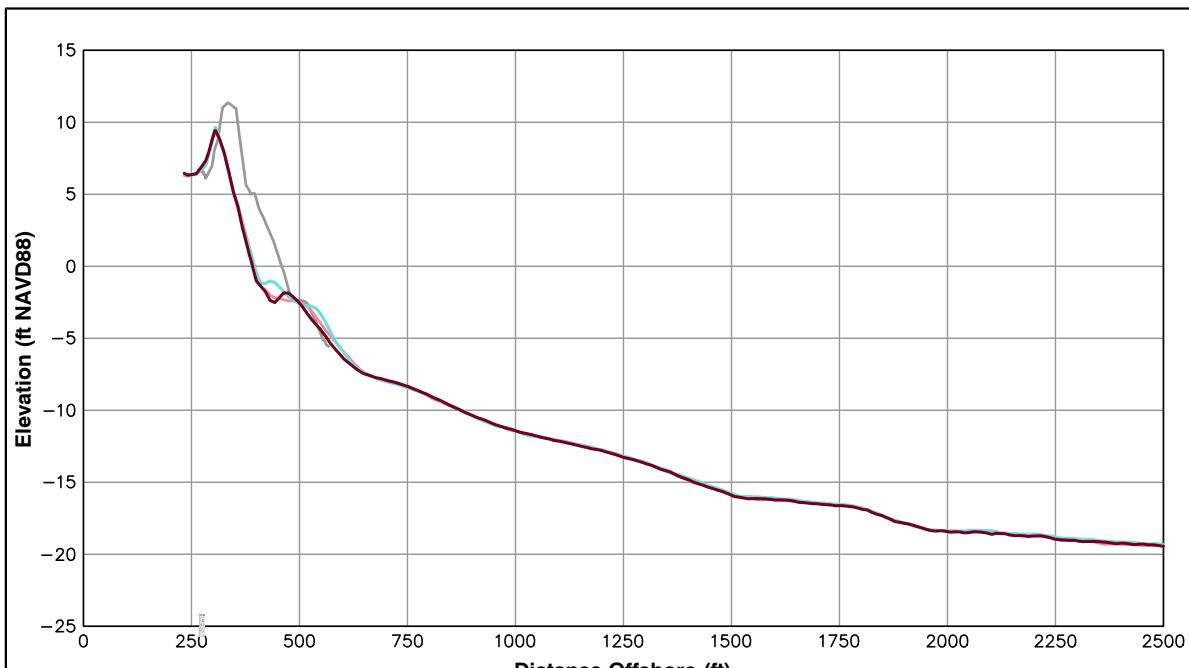


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



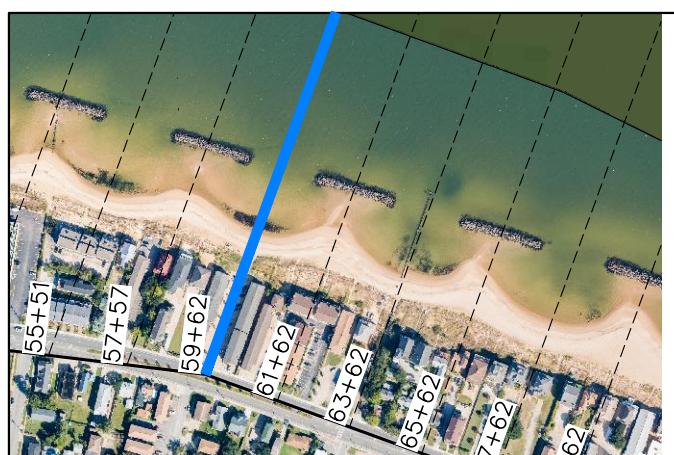
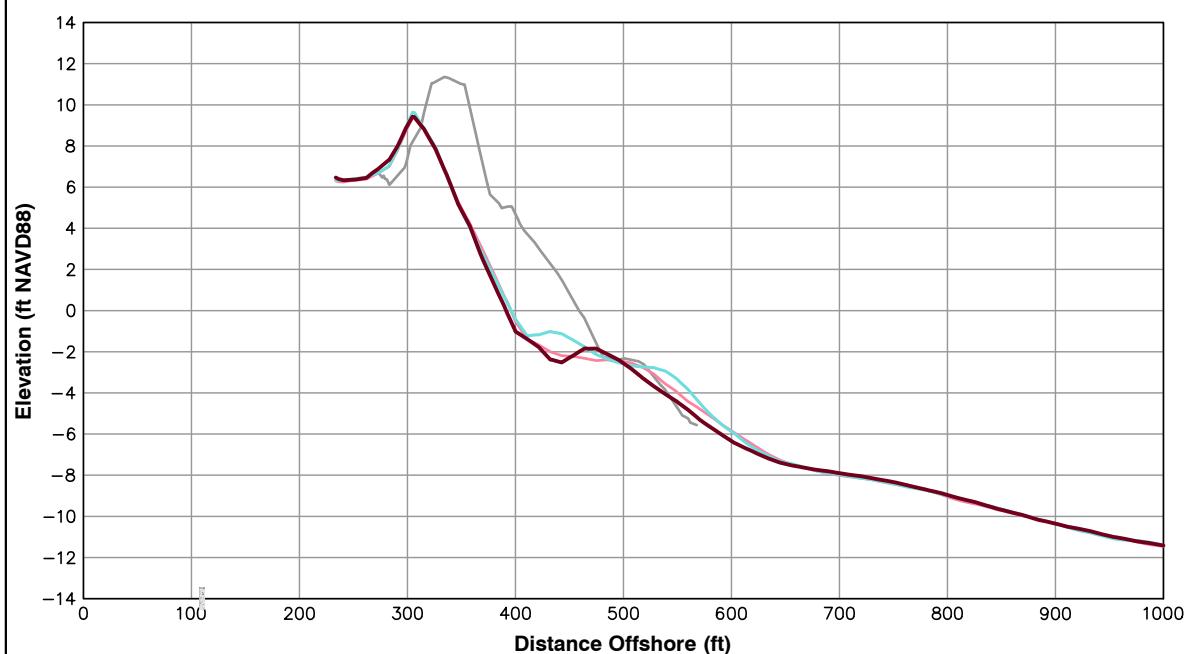
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-4.60 ft/yr	-3.83 ft
Volume Change Above -15 ft NAVD88	-2.17 cy/ft/yr	-5.42 cy/ft
Volume Change Above 0 ft NAVD88	-0.21 cy/ft/yr	-0.27 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

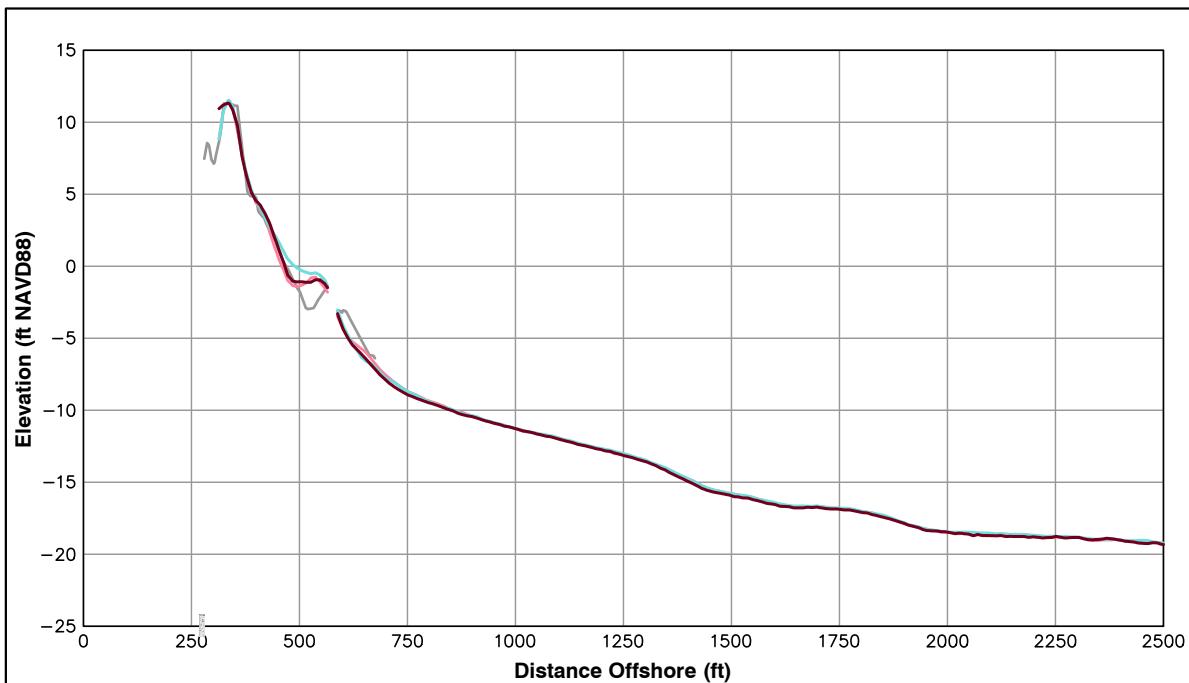
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Norfolk**

**OCEAN VIEW PERIODIC
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ANALYSIS**



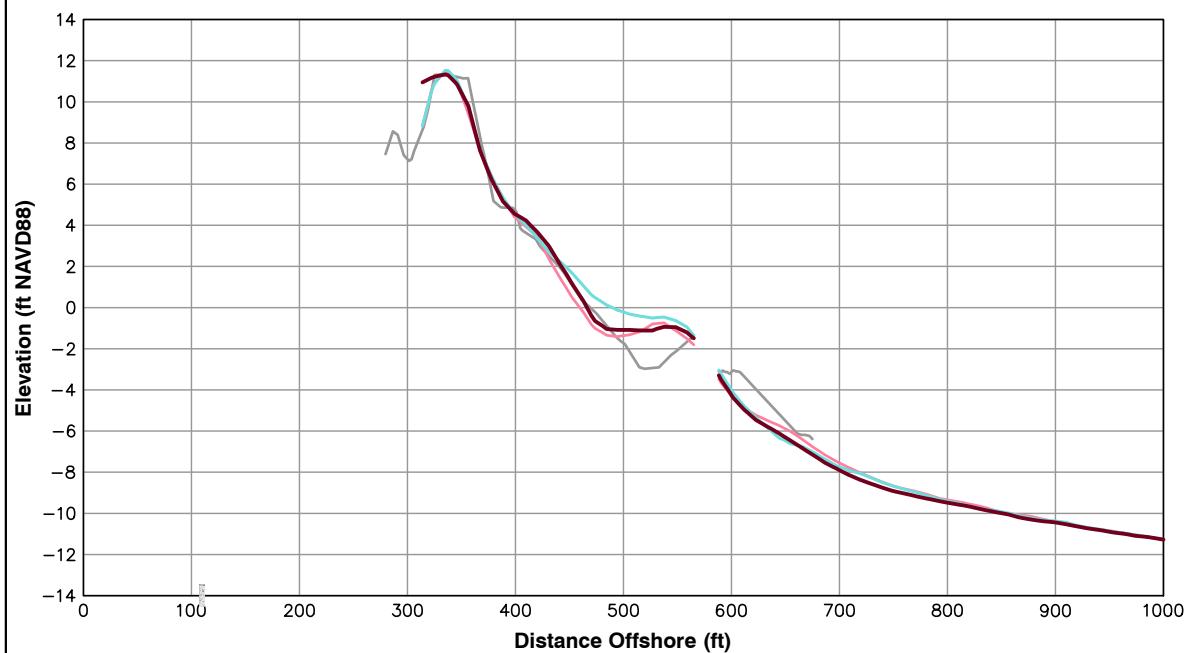
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	8.10	-9.52
Volume Change Above -15 ft NAVD88	-1.12	-5.39
Volume Change Above 0 ft NAVD88	1.66	-0.25

LEGEND:

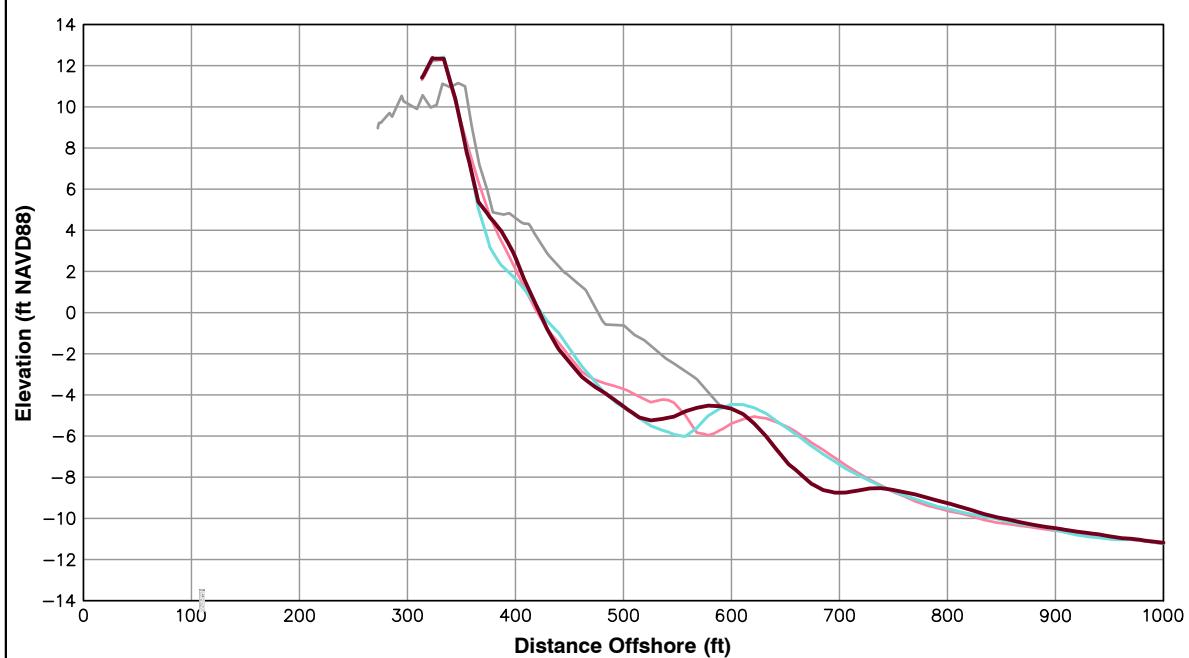
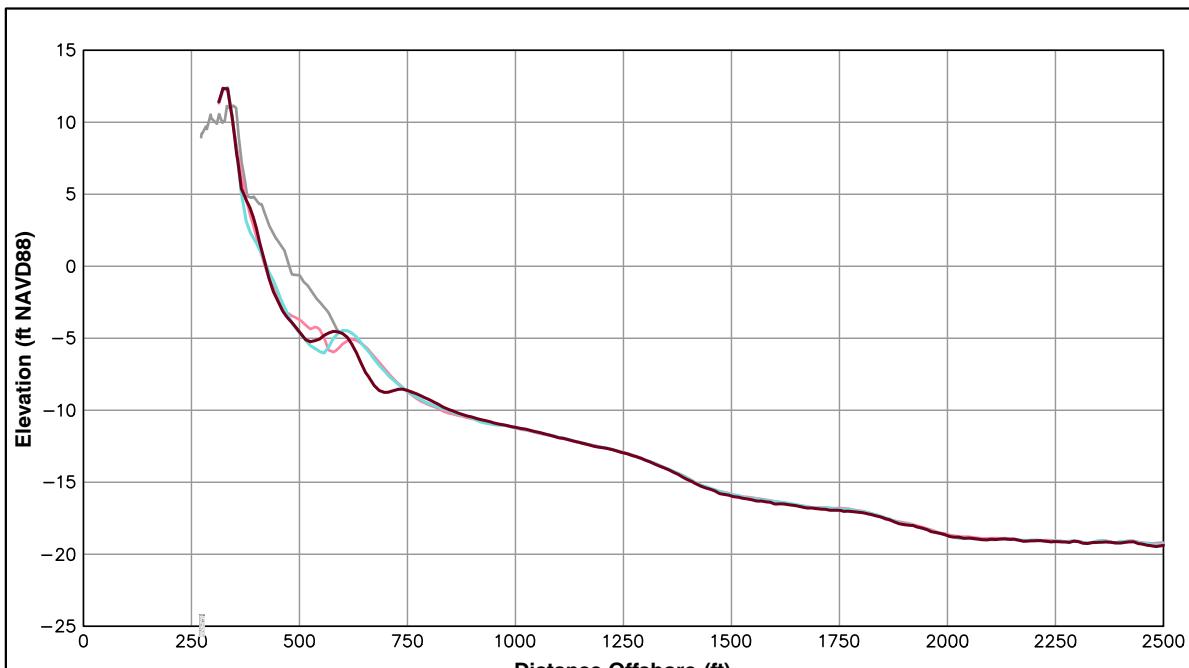
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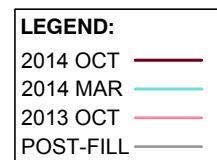
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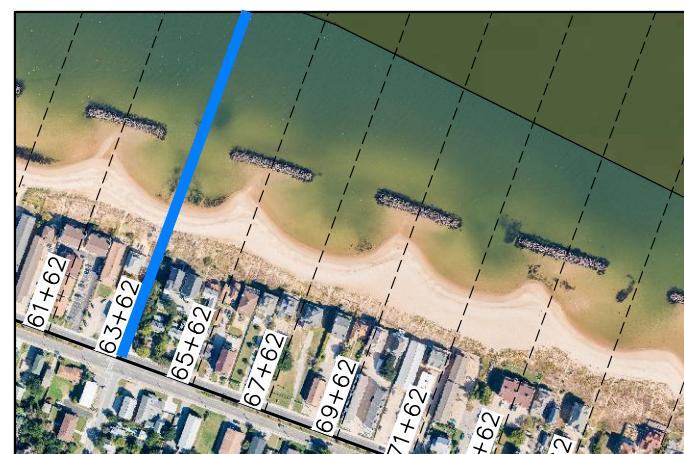


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
63+62		
Shoreline Change at MHW (0.98 ft NAVD88)	3.35 ft/yr	3.30 ft
Volume Change Above -15 ft NAVD88	-4.90 cy/ft/yr	-2.14 cy/ft
Volume Change Above 0 ft NAVD88	0.23 cy/ft/yr	1.95 cy/ft

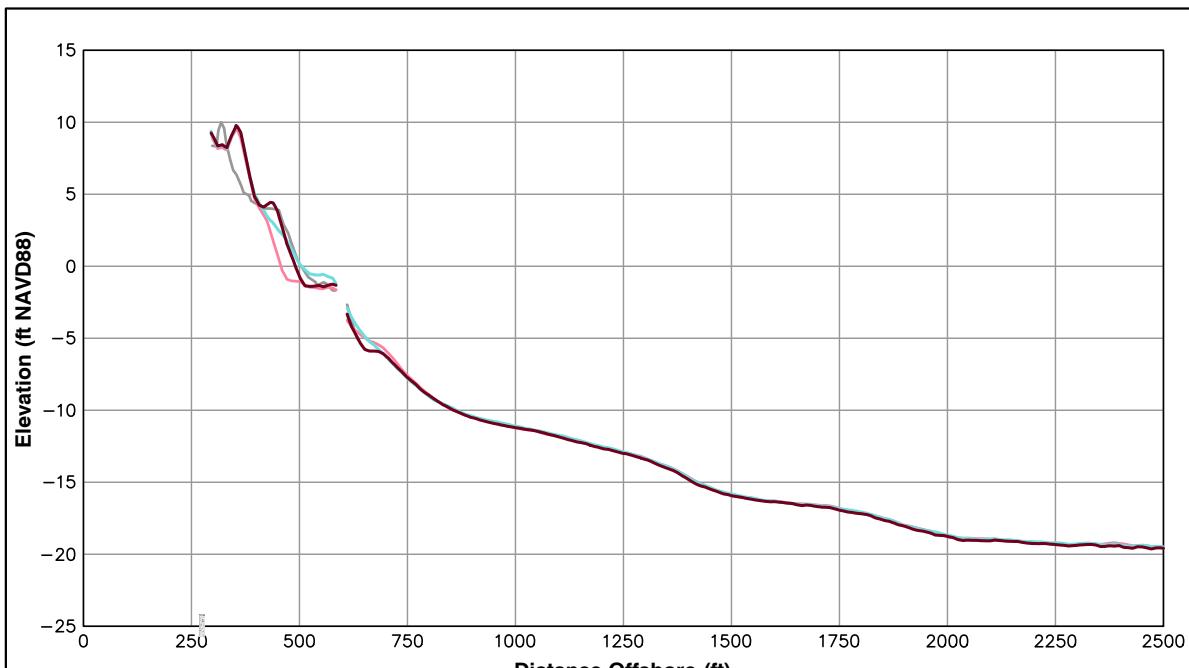


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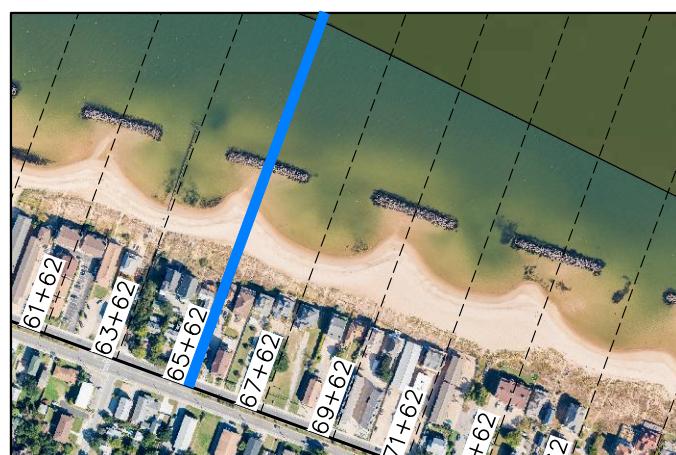
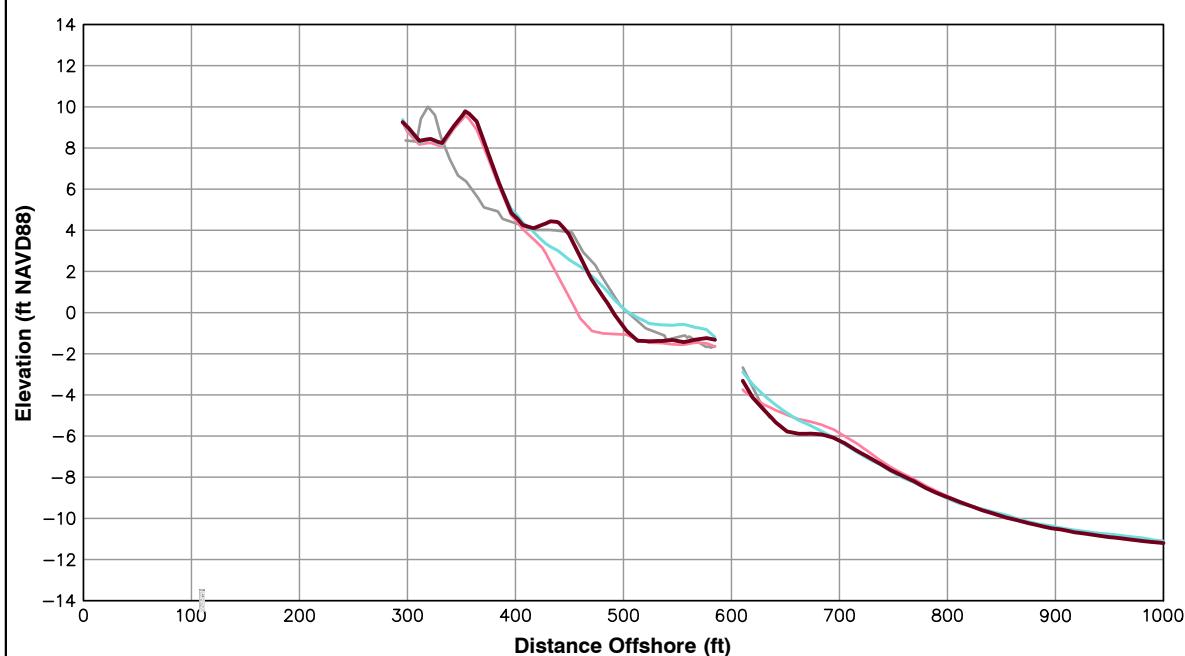


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	31.89 ft/yr	-7.36 ft
Volume Change Above -15 ft NAVD88	4.40 cy/ft/yr	-5.06 cy/ft
Volume Change Above 0 ft NAVD88	6.07 cy/ft/yr	1.18 cy/ft

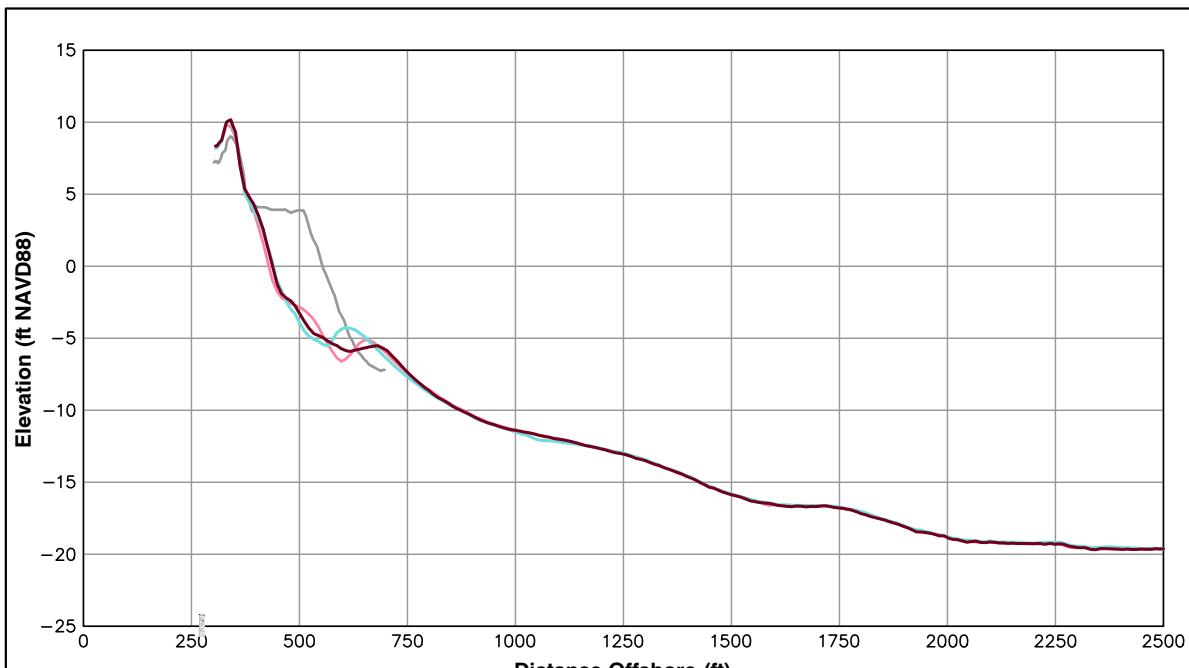
LEGEND:	
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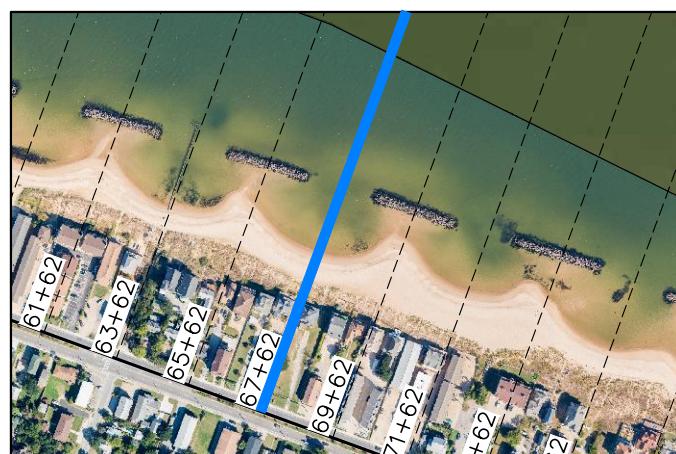
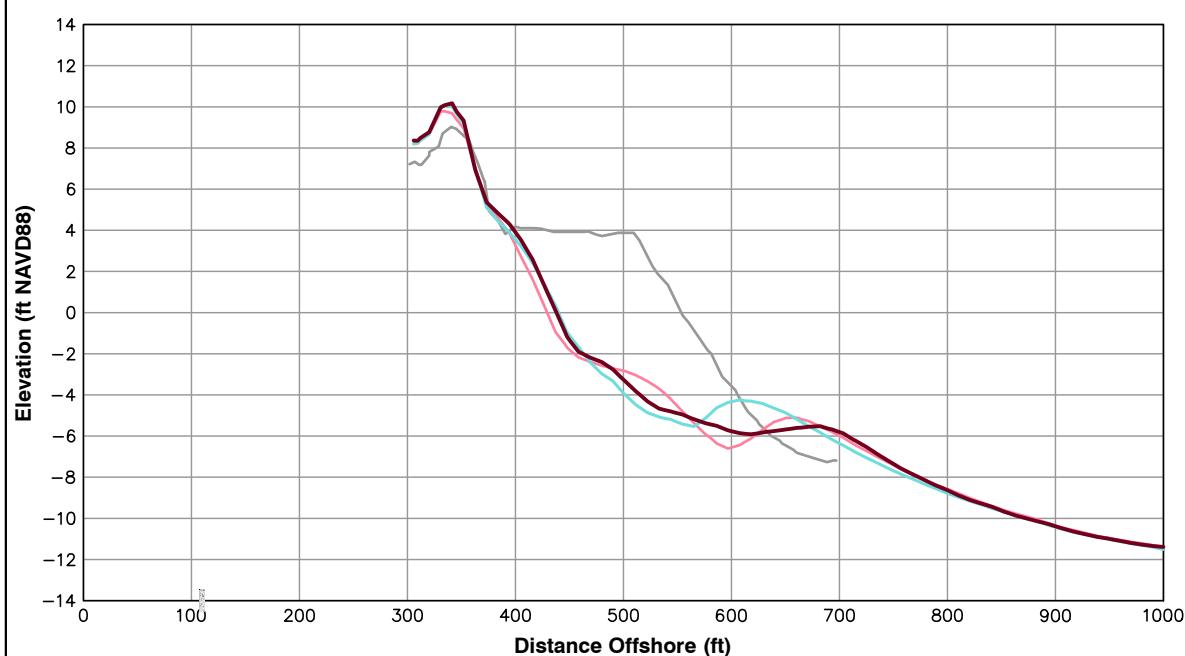


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	8.49 ft/yr	-1.14 ft
Volume Change Above -15 ft NAVD88	1.29 cy/ft/yr	1.23 cy/ft
Volume Change Above 0 ft NAVD88	1.93 cy/ft/yr	0.65 cy/ft

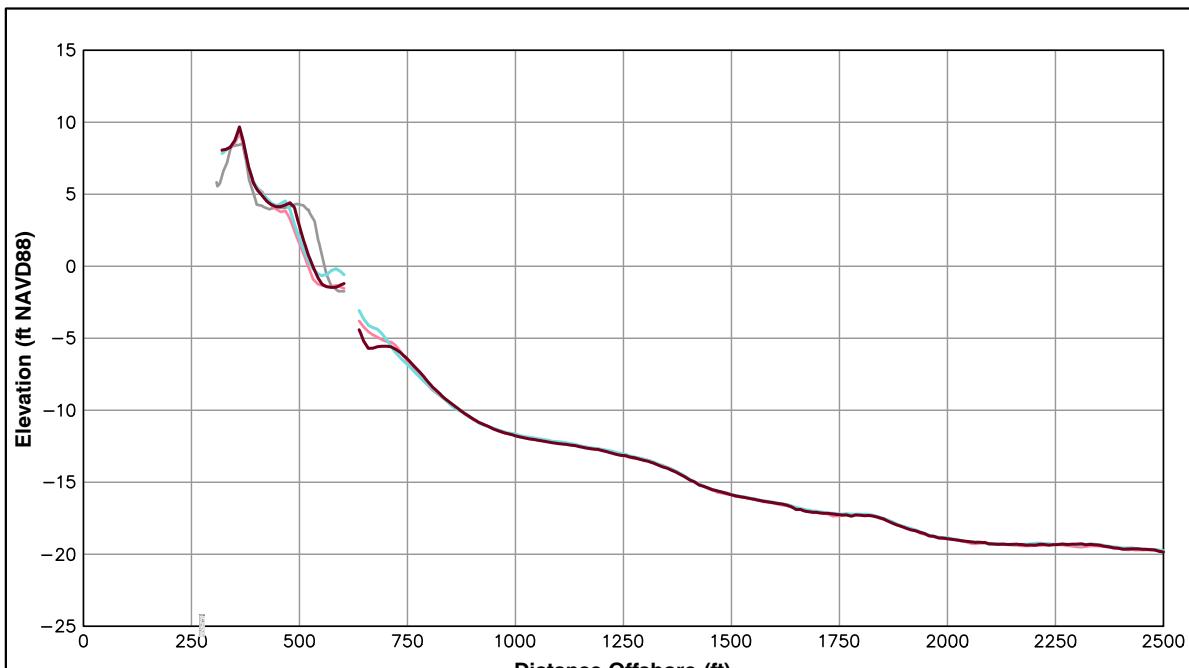
LEGEND:	
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

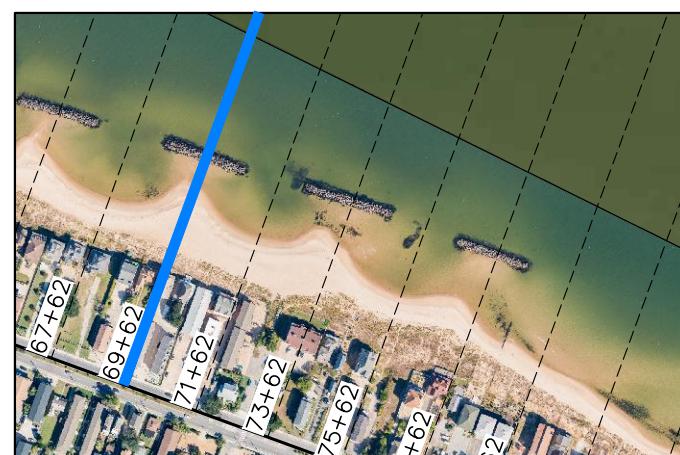
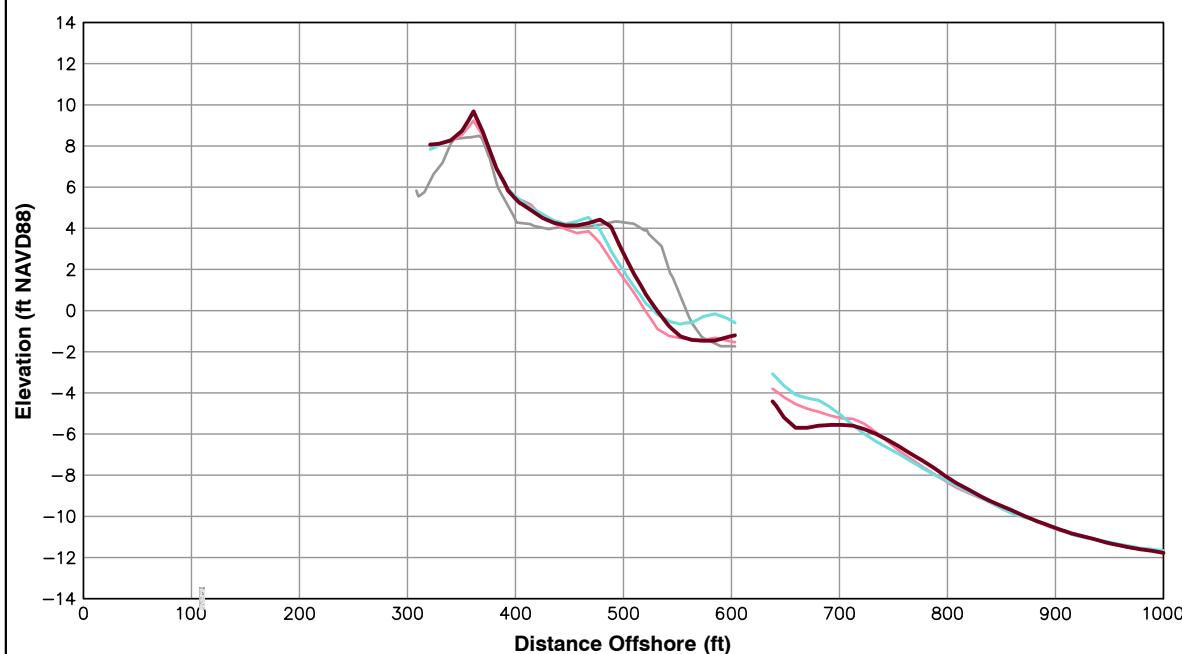


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
69+62		
Shoreline Change at MHW (0.98 ft NAVD88)	10.82 ft/yr	6.32 ft
Volume Change Above -15 ft NAVD88	1.41 cy/ft/yr	-4.14 cy/ft
Volume Change Above 0 ft NAVD88	2.91 cy/ft/yr	1.04 cy/ft

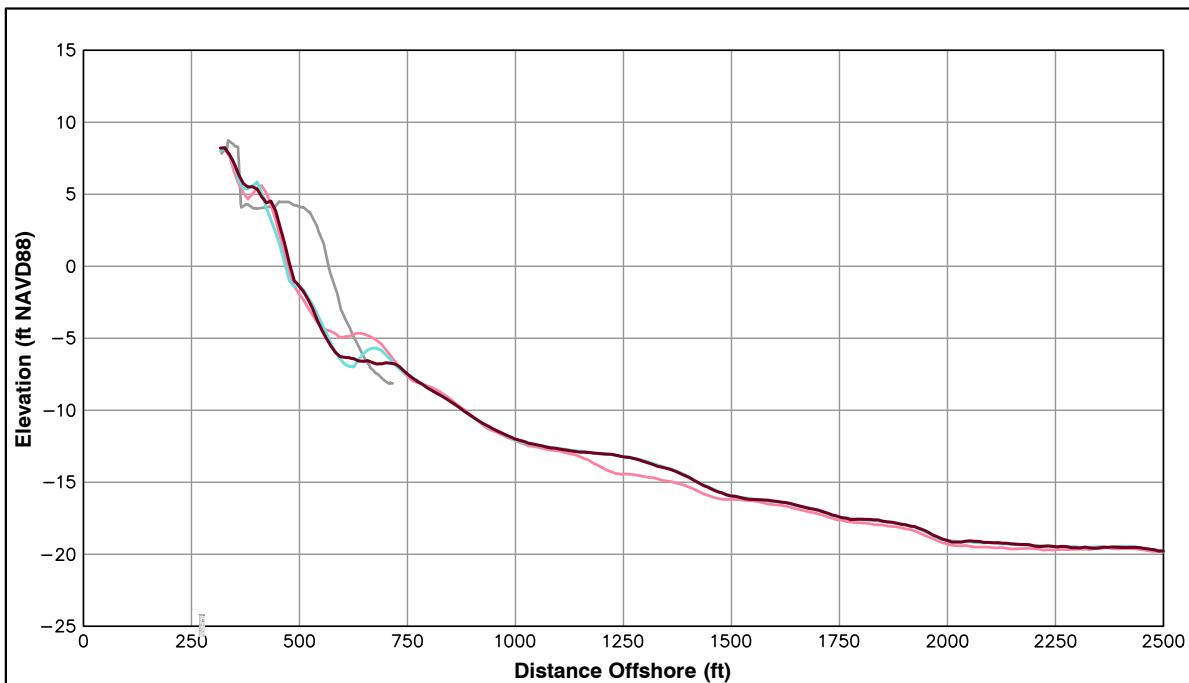
LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

Notes:

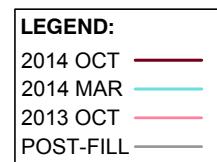
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

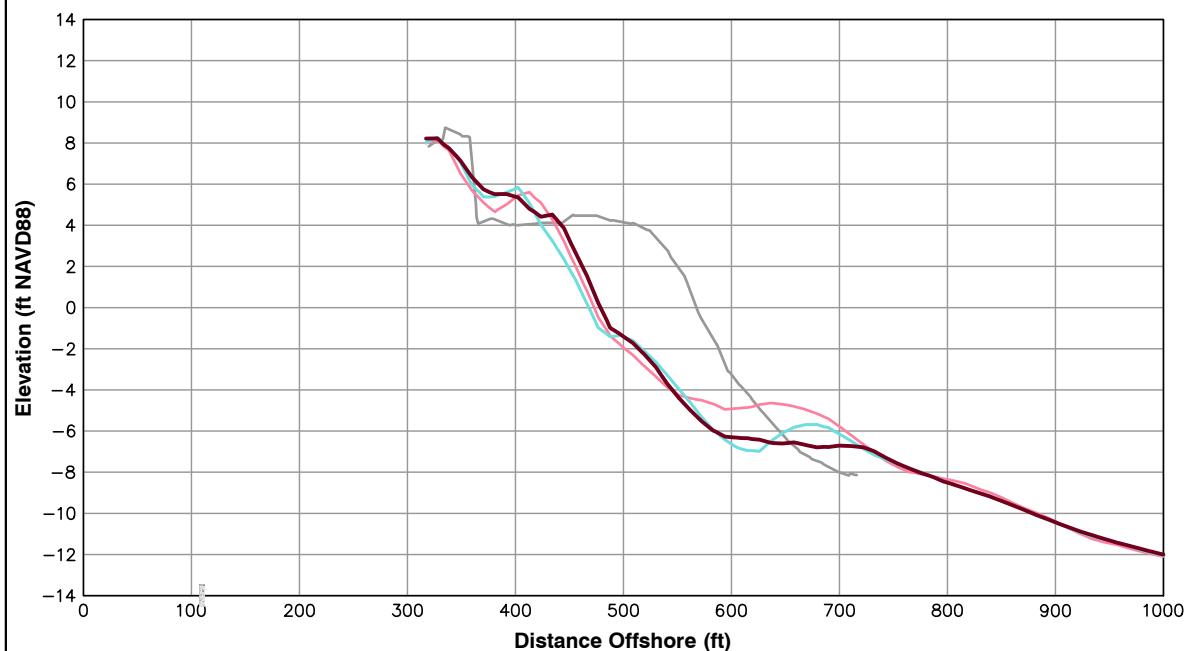


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
71+62		
Shoreline Change at MHW (0.98 ft NAVD88)	6.16 ft/yr	11.66 ft
Volume Change Above -15 ft NAVD88	4.48 cy/ft/yr	0.87 cy/ft
Volume Change Above 0 ft NAVD88	1.84 cy/ft/yr	2.44 cy/ft

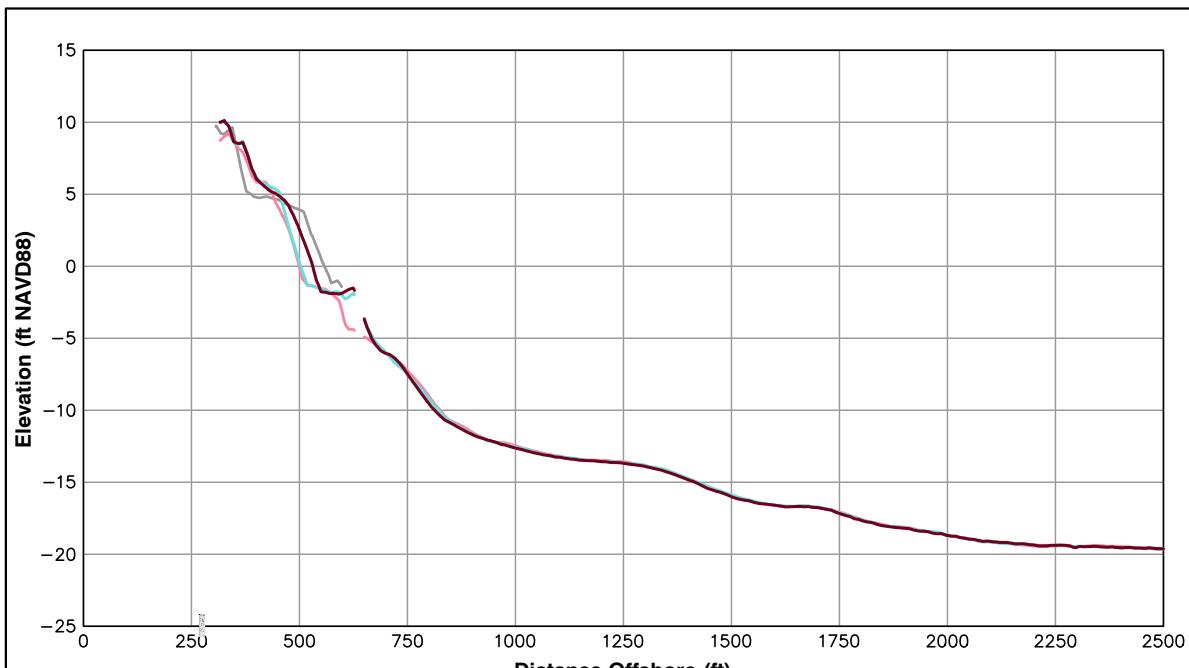


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

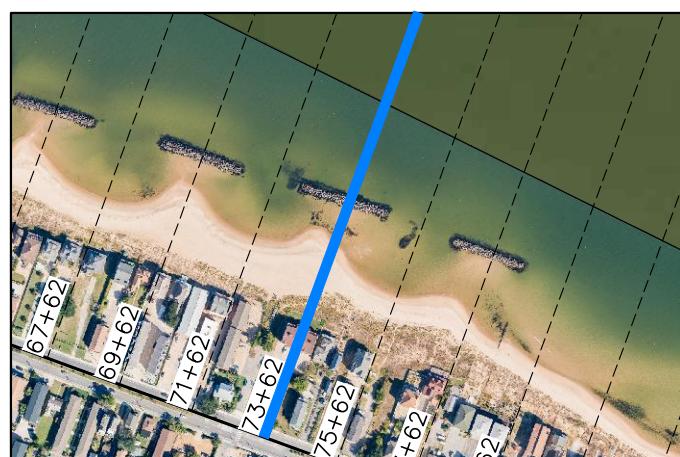
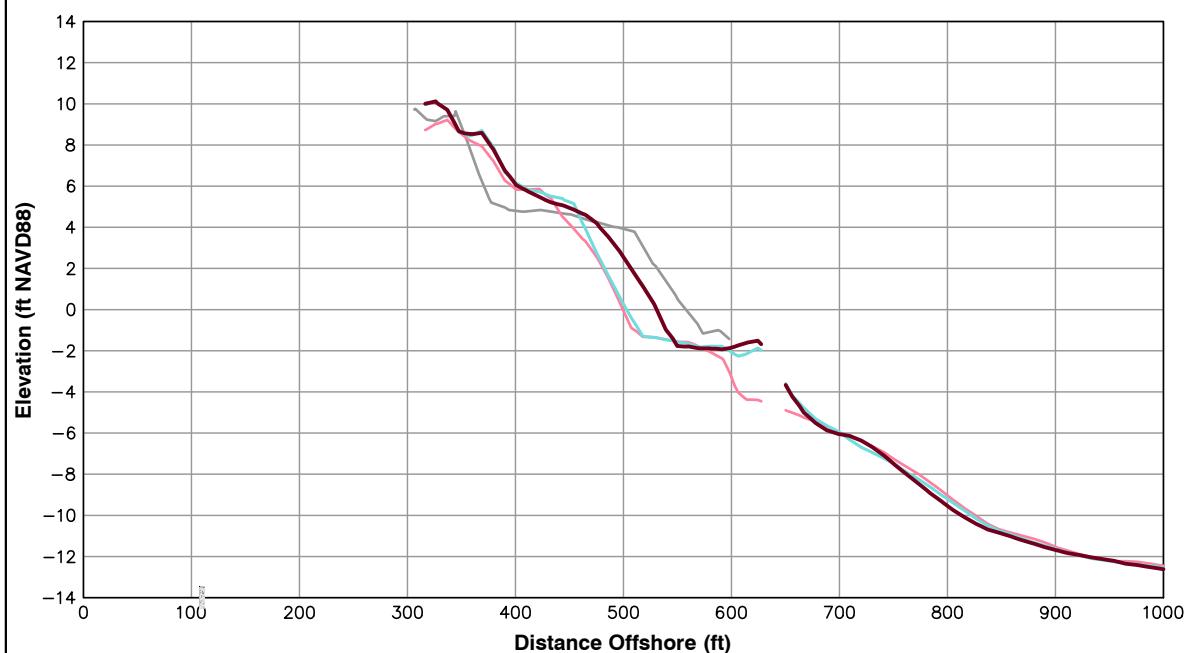


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——
- POST-FILL ——

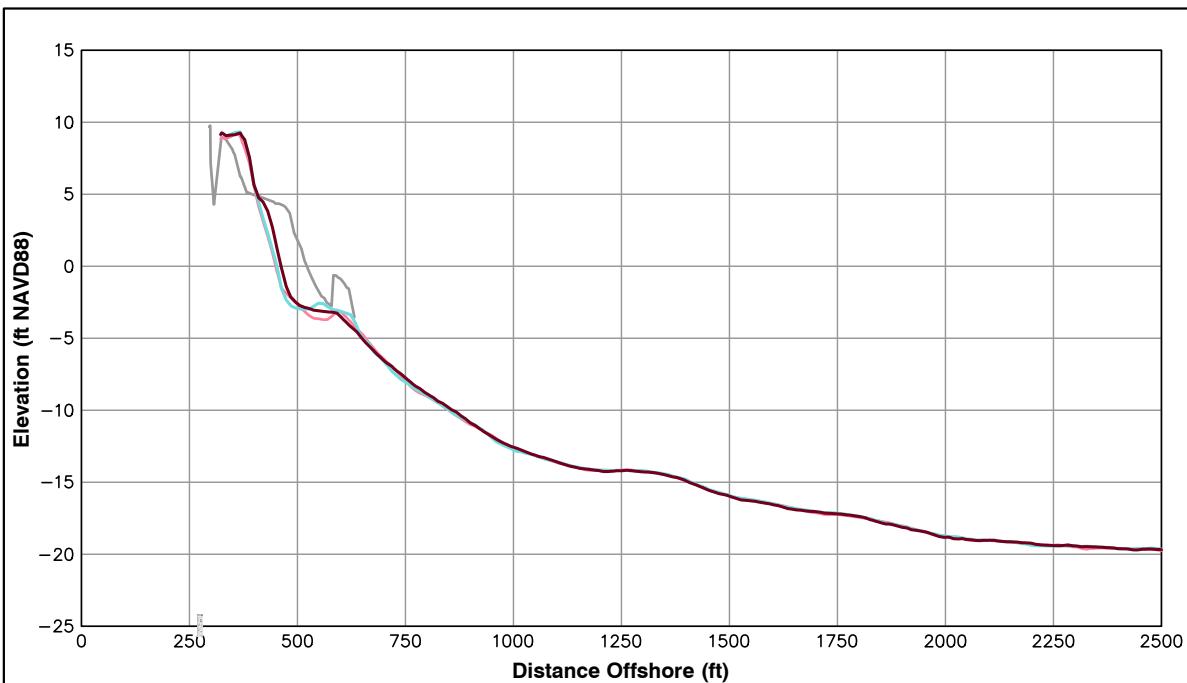
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**



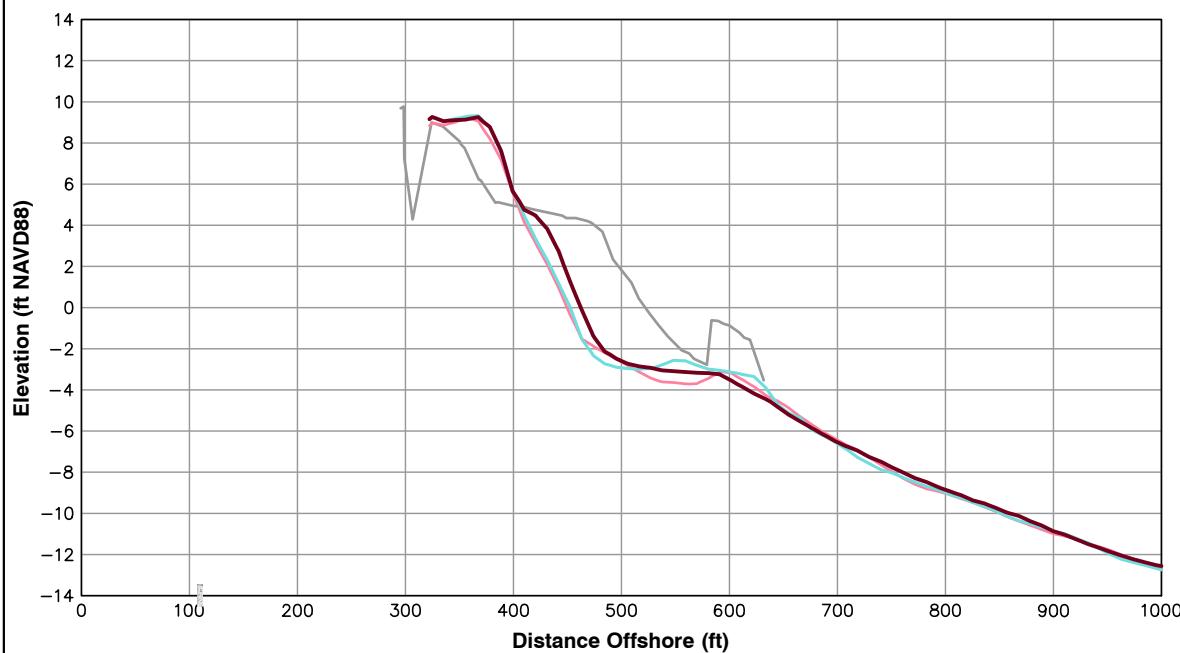
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)		
Volume Change Above -15 ft NAVD88	6.01 cy/ft/yr	2.16 cy/ft
Volume Change Above 0 ft NAVD88	3.45 cy/ft/yr	2.16 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

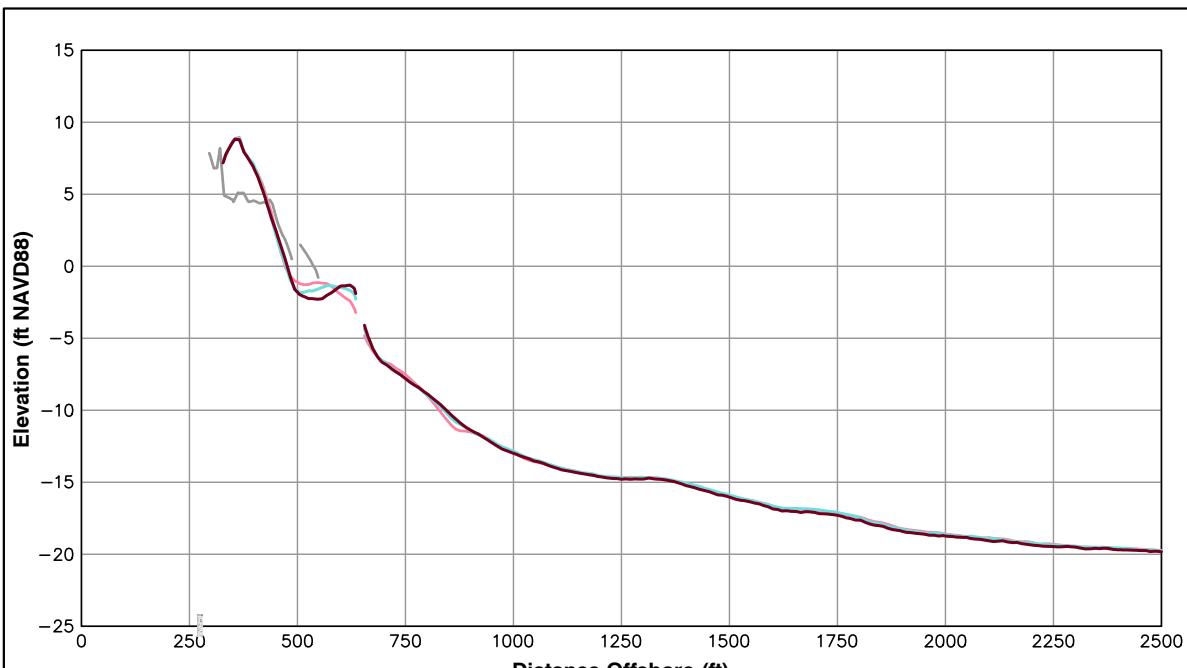
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**



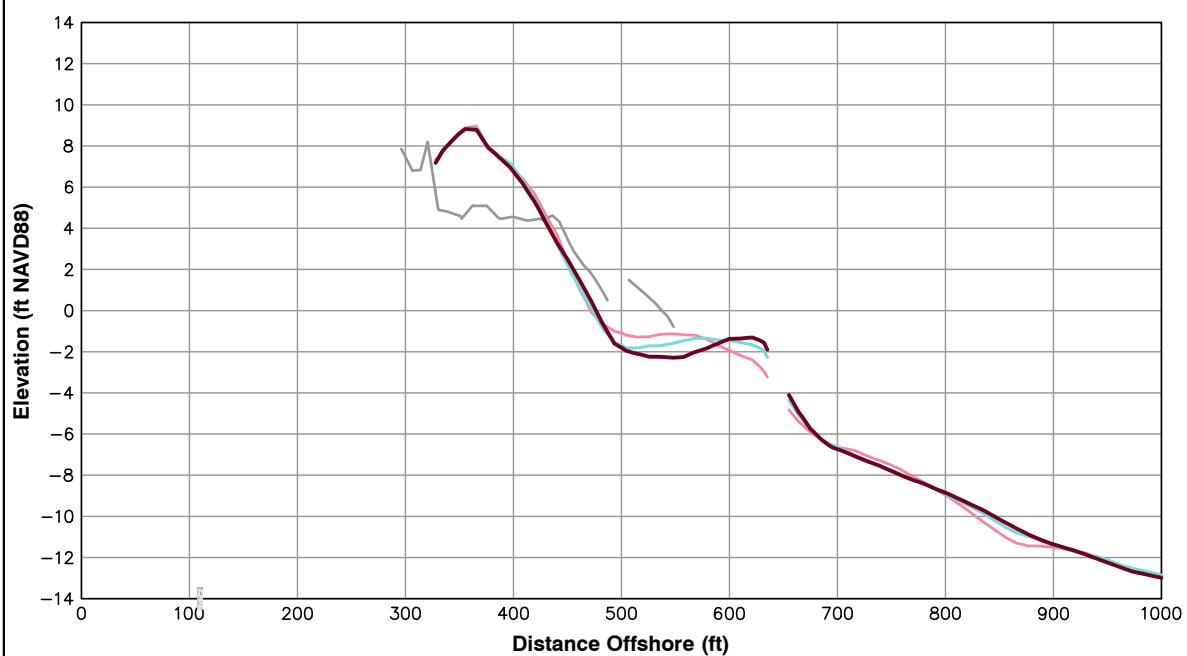
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
77+62		
Shoreline Change at MHW (0.98 ft NAVD88)	5.09 ft/yr	3.98 ft
Volume Change Above -15 ft NAVD88	-1.20 cy/ft/yr	-2.13 cy/ft
Volume Change Above 0 ft NAVD88	-0.31 cy/ft/yr	0.07 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

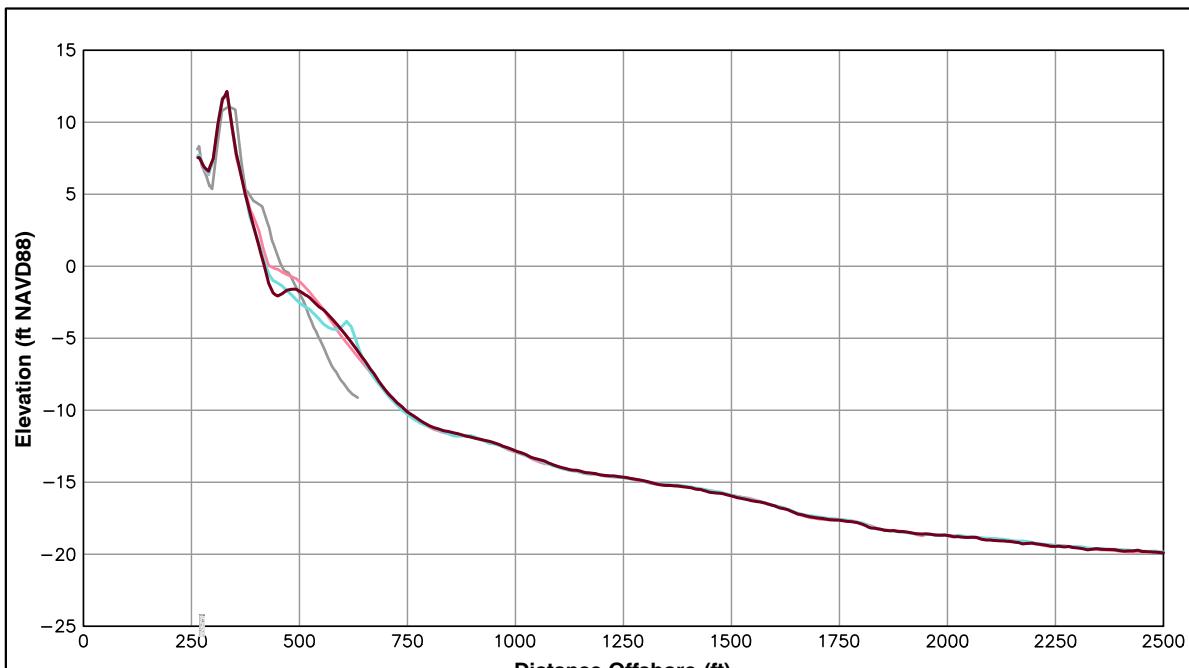
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



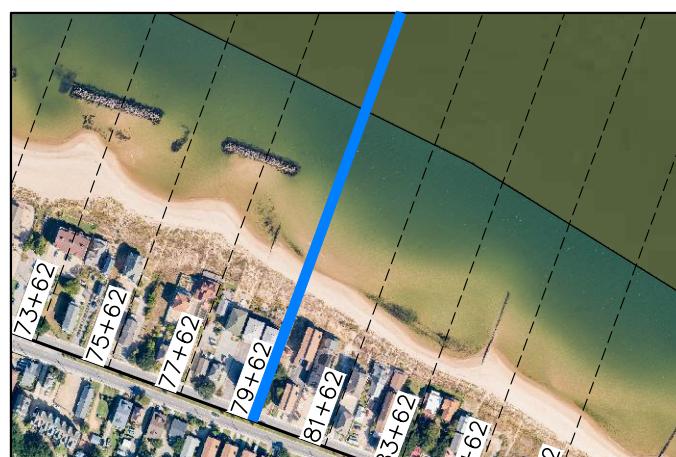
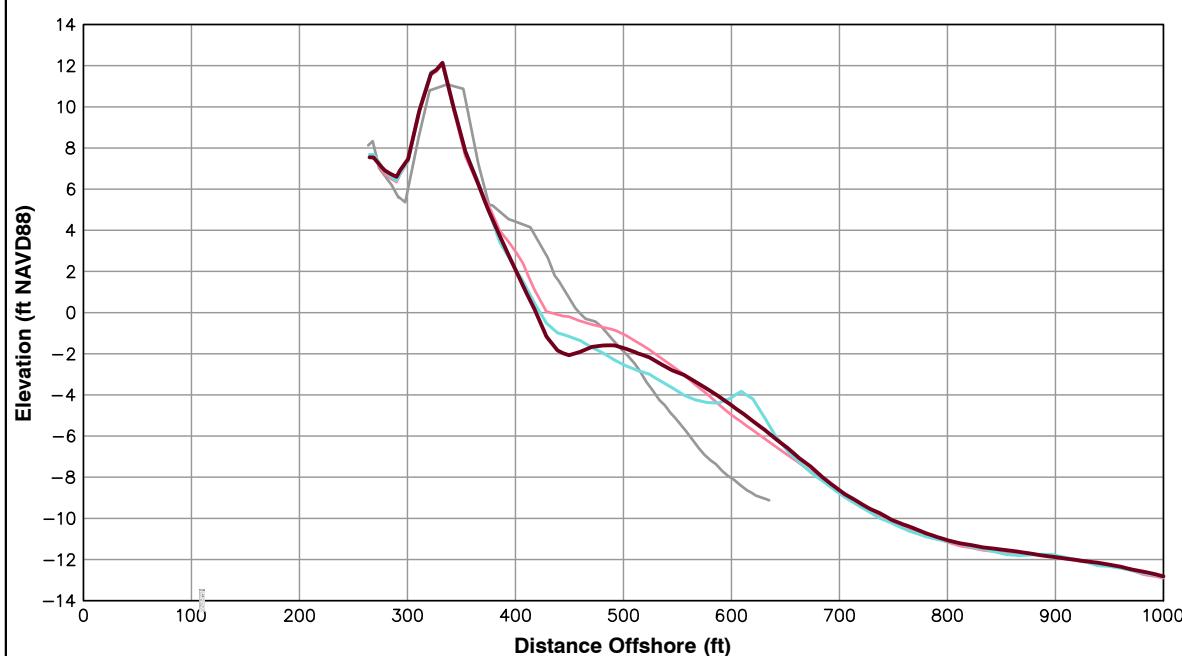
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-9.26 ft/yr	-2.48 ft
Volume Change Above -15 ft NAVD88	-2.04 cy/ft/yr	2.77 cy/ft
Volume Change Above 0 ft NAVD88	-0.88 cy/ft/yr	-0.03 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

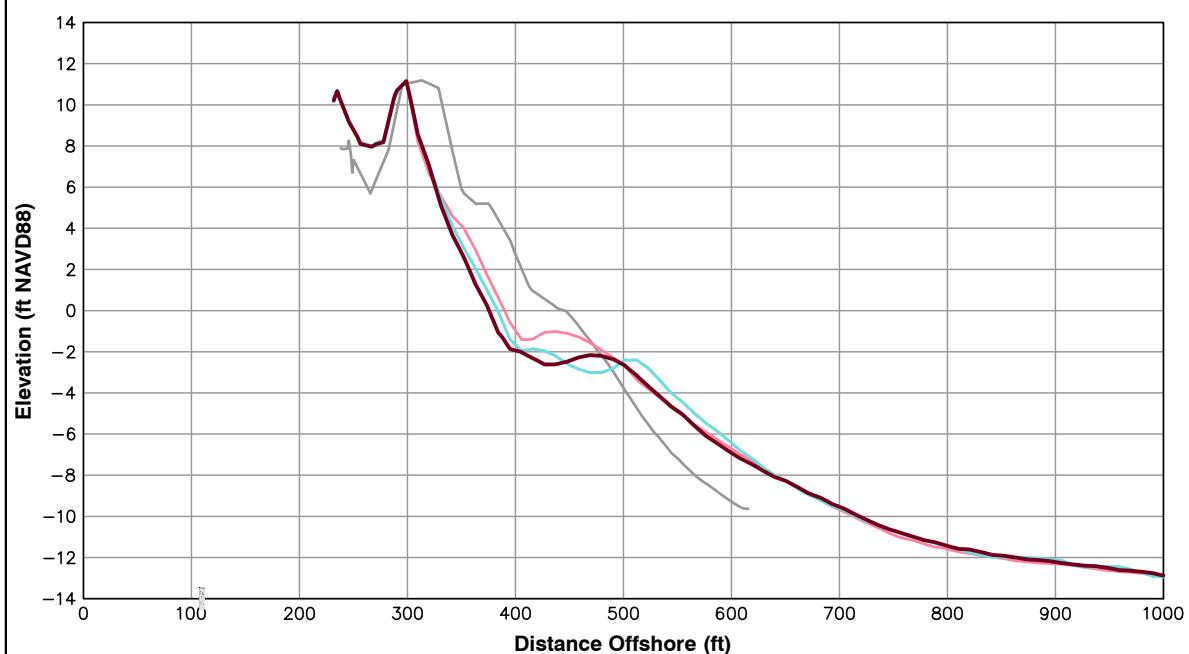
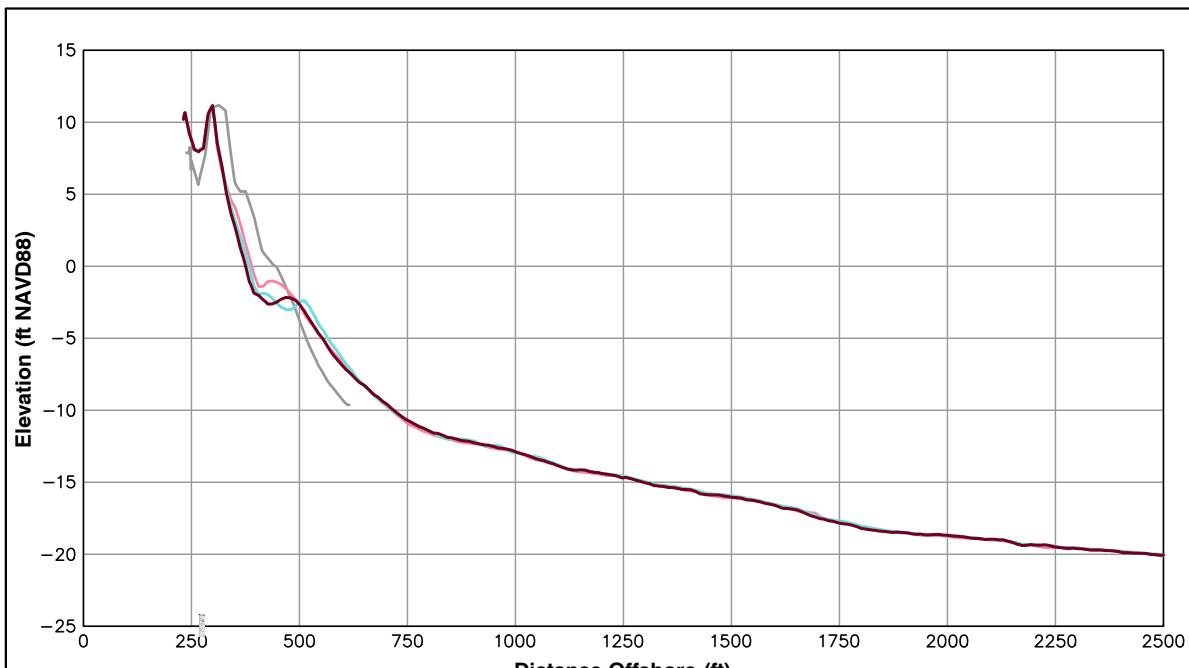
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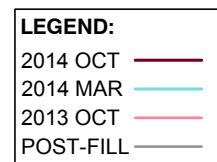


**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**



Survey Transect 81+62	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-15.10 ft/yr	-7.70 ft
Volume Change Above -15 ft NAVD88	-4.73 cy/ft/yr	-4.18 cy/ft
Volume Change Above 0 ft NAVD88	-2.33 cy/ft/yr	-1.14 cy/ft

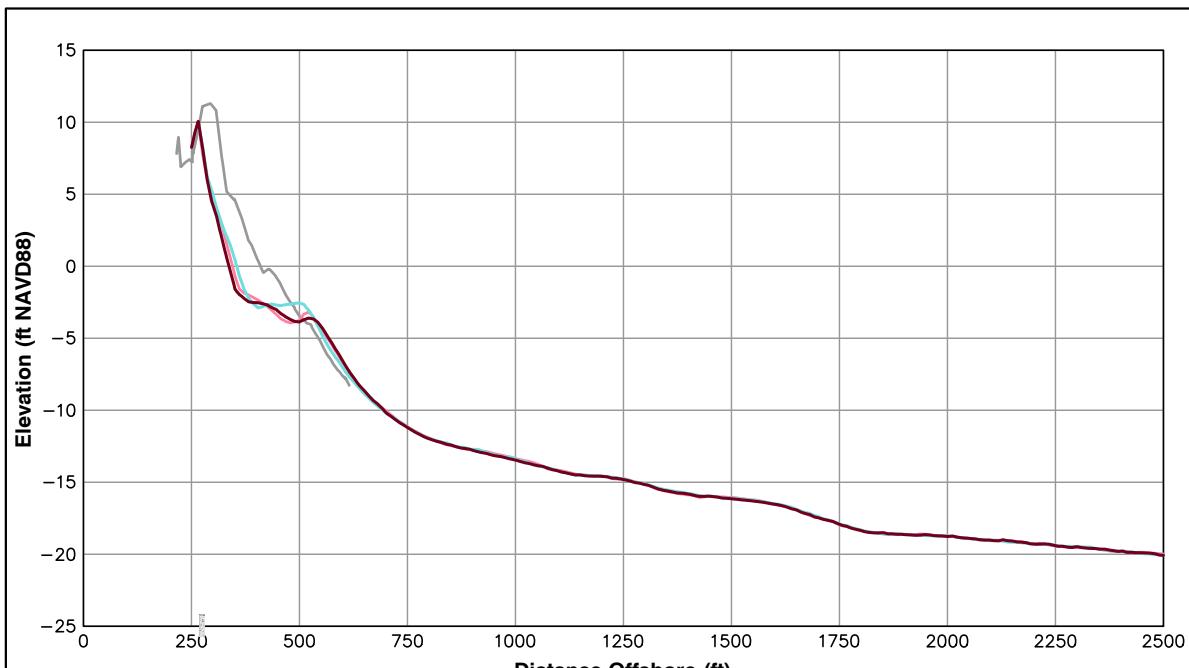


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



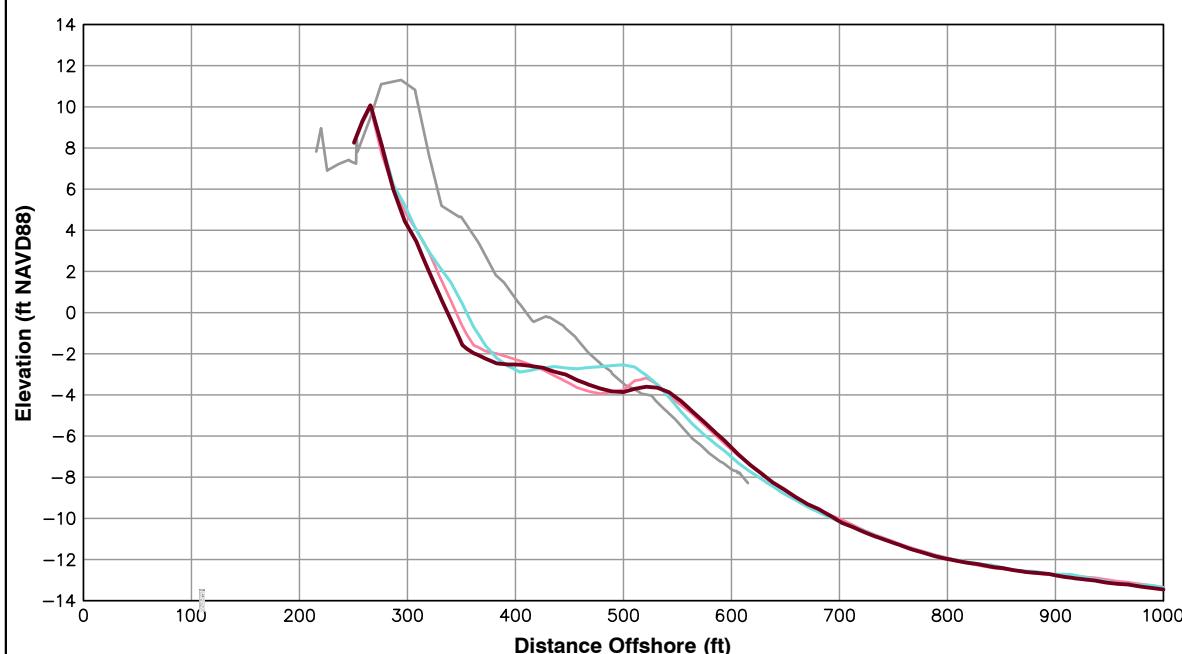
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-8.35 ft/yr	-16.59 ft
Volume Change Above -15 ft NAVD88	-2.91 cy/ft/yr	-5.34 cy/ft
Volume Change Above 0 ft NAVD88	-1.16 cy/ft/yr	-2.26 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

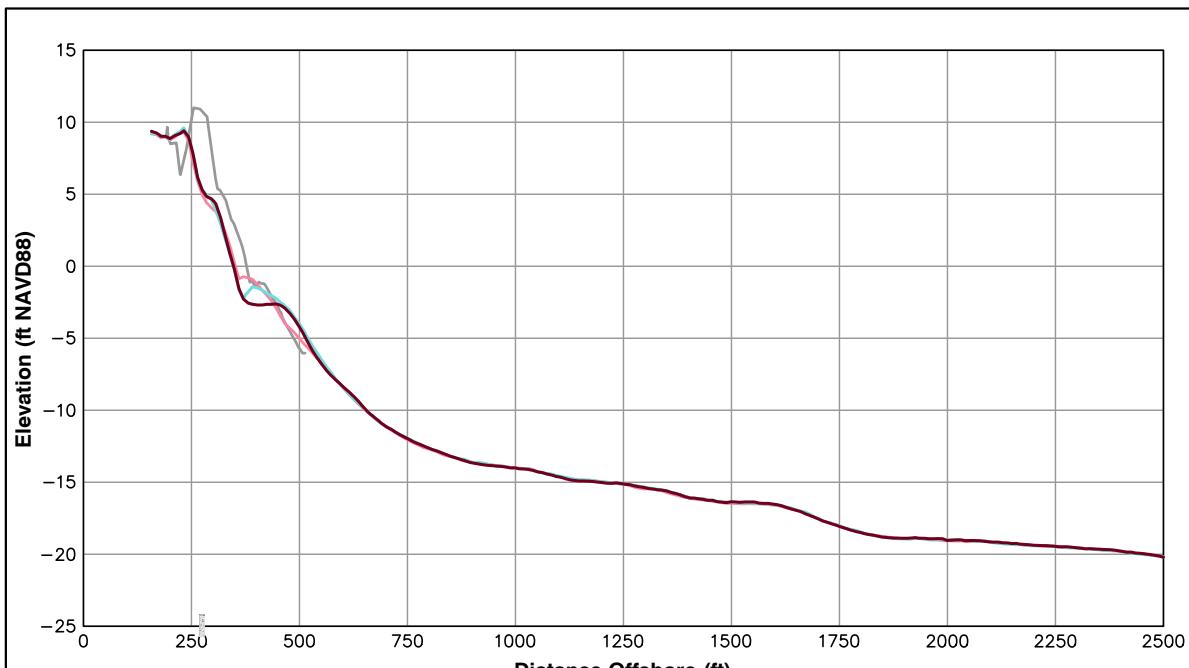
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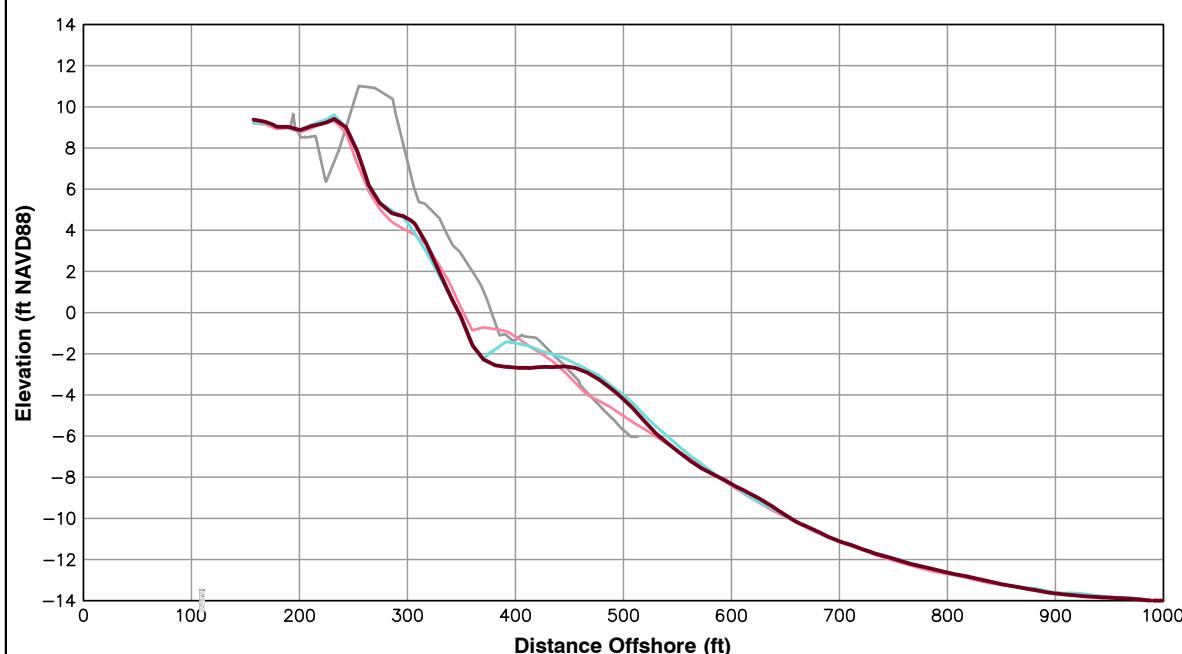


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

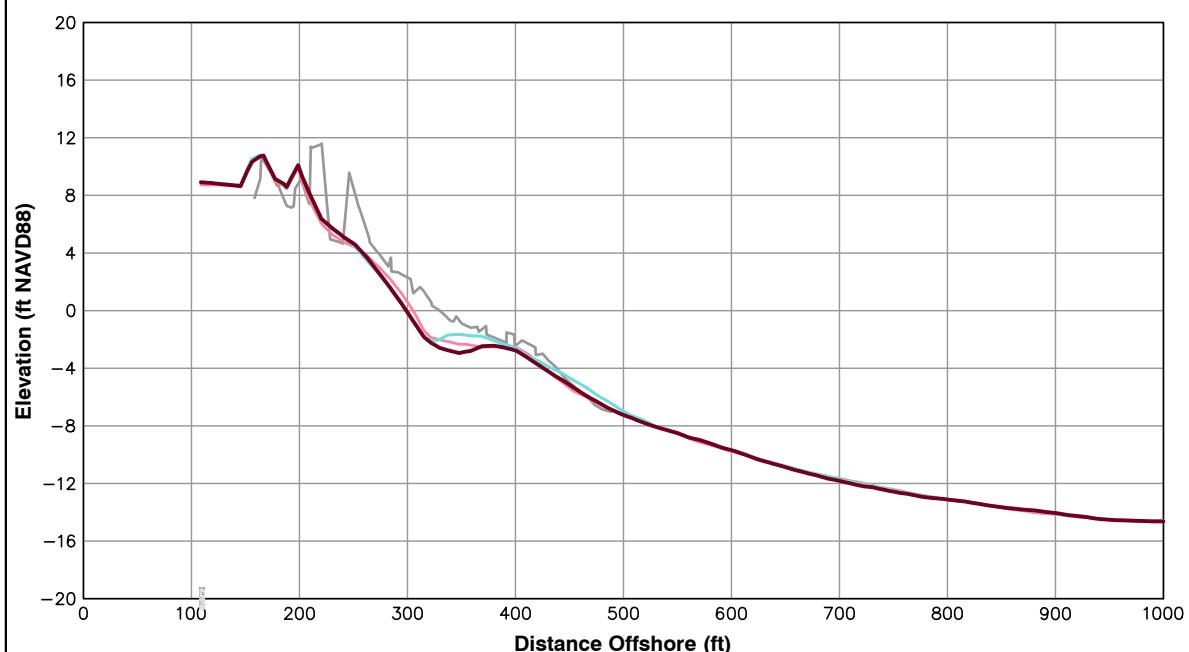
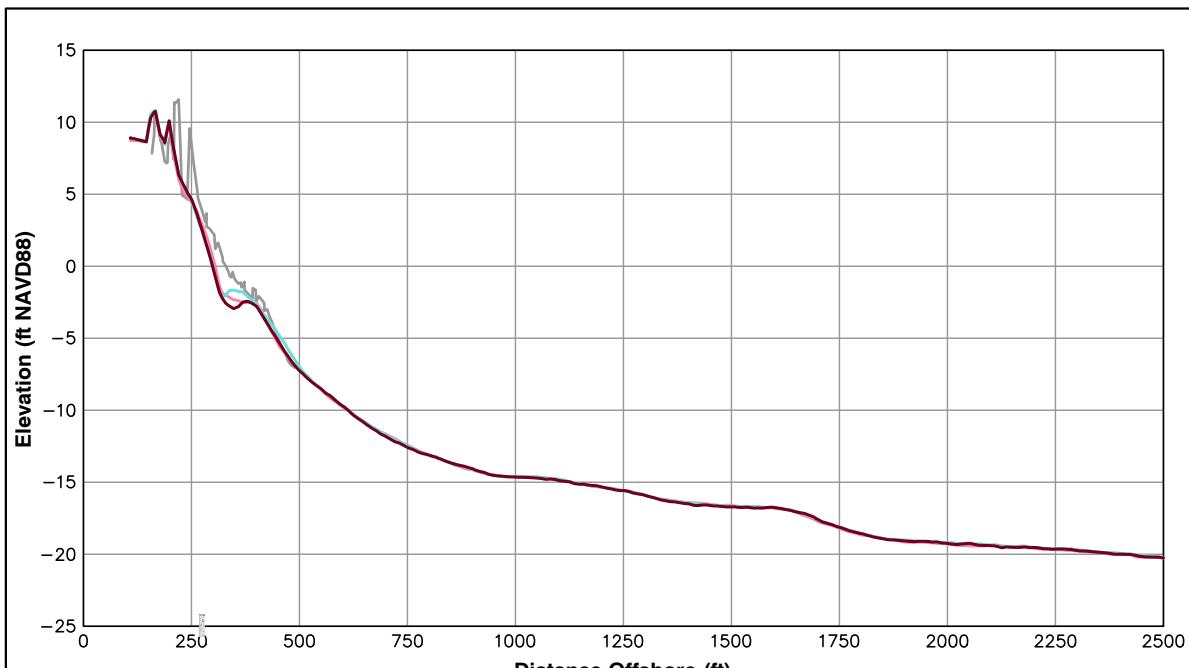


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
85+62		
Shoreline Change at MHW (0.98 ft NAVD88)	-4.91 ft/yr	0.49 ft
Volume Change Above -15 ft NAVD88	-0.05 cy/ft/yr	-3.49 cy/ft
Volume Change Above 0 ft NAVD88	1.10 cy/ft/yr	0.41 cy/ft

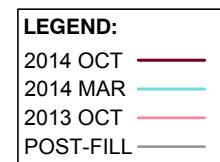


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect 87+62	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-7.03 ft/yr	-1.22 ft
Volume Change Above -15 ft NAVD88	-1.81 cy/ft/yr	-4.36 cy/ft
Volume Change Above 0 ft NAVD88	0.18 cy/ft/yr	0.06 cy/ft



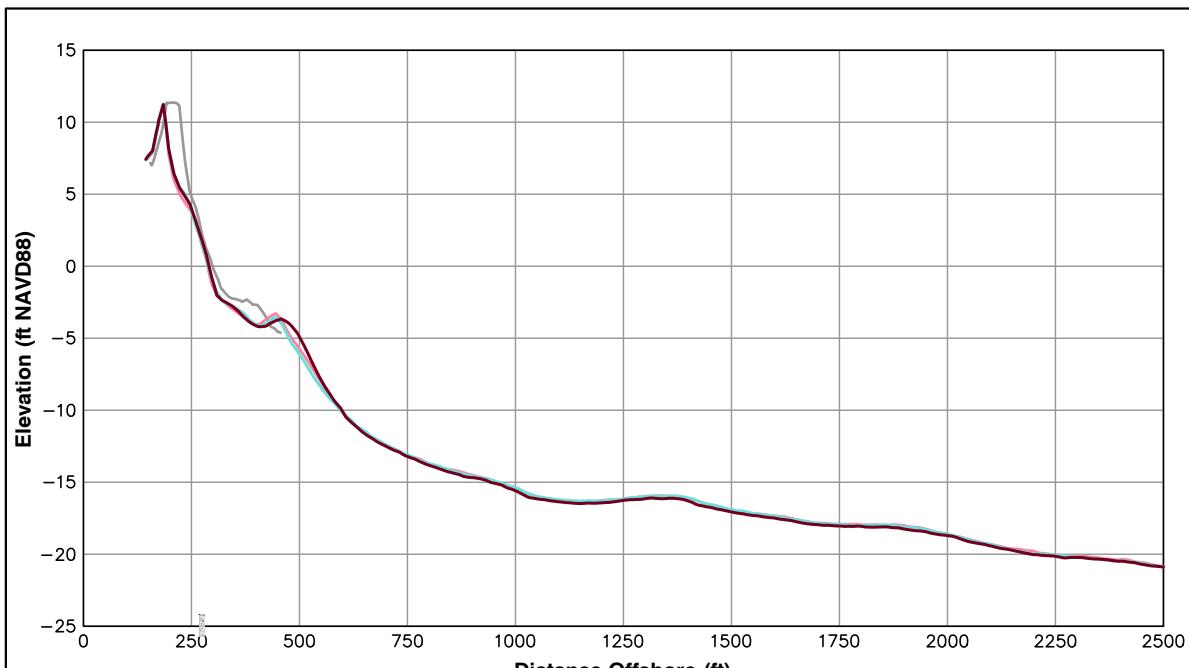
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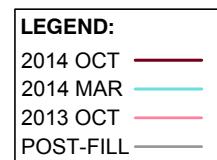


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

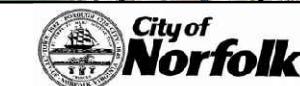
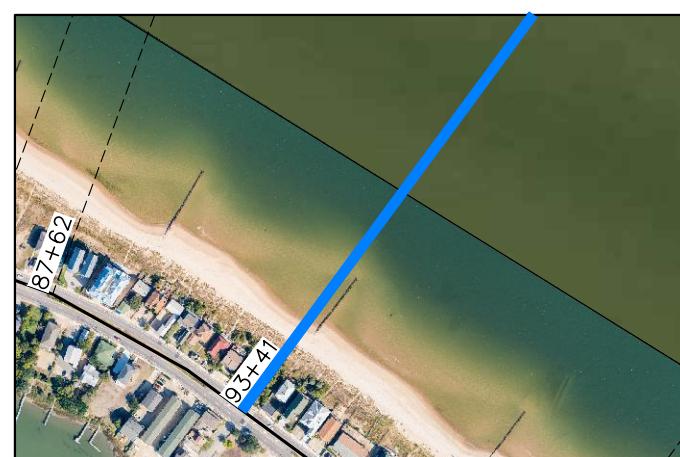
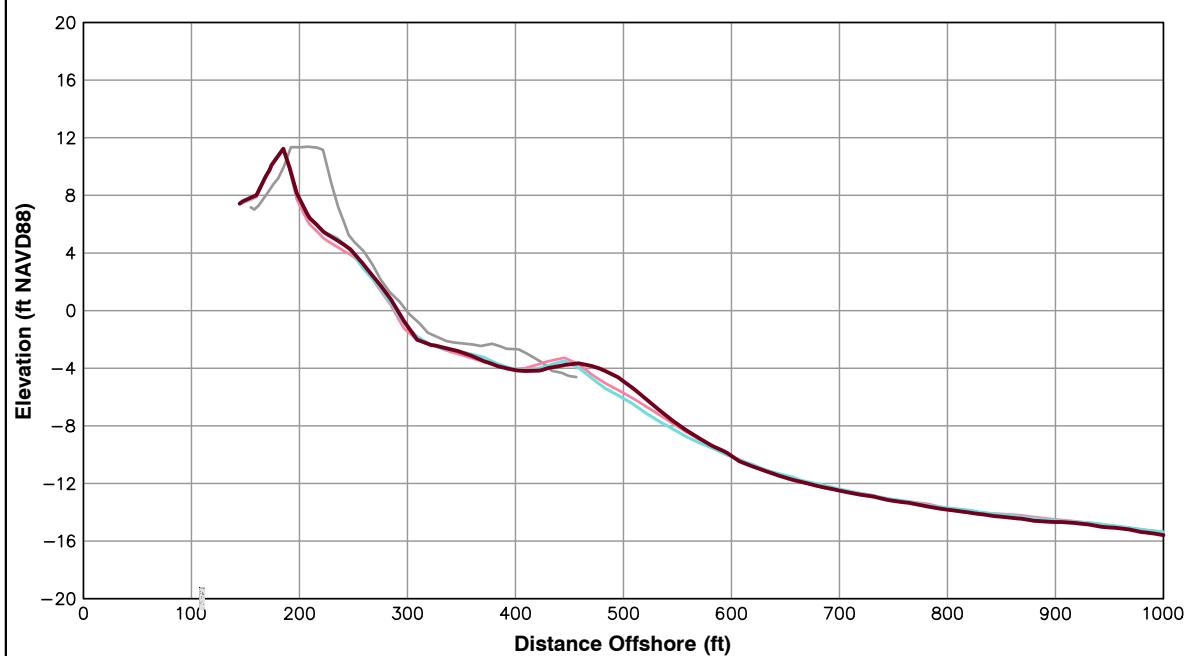


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
93+41		
Shoreline Change at MHW (0.98 ft NAVD88)	3.87 ft/yr	2.54 ft
Volume Change Above -15 ft NAVD88	1.79 cy/ft/yr	1.98 cy/ft
Volume Change Above 0 ft NAVD88	1.43 cy/ft/yr	0.40 cy/ft

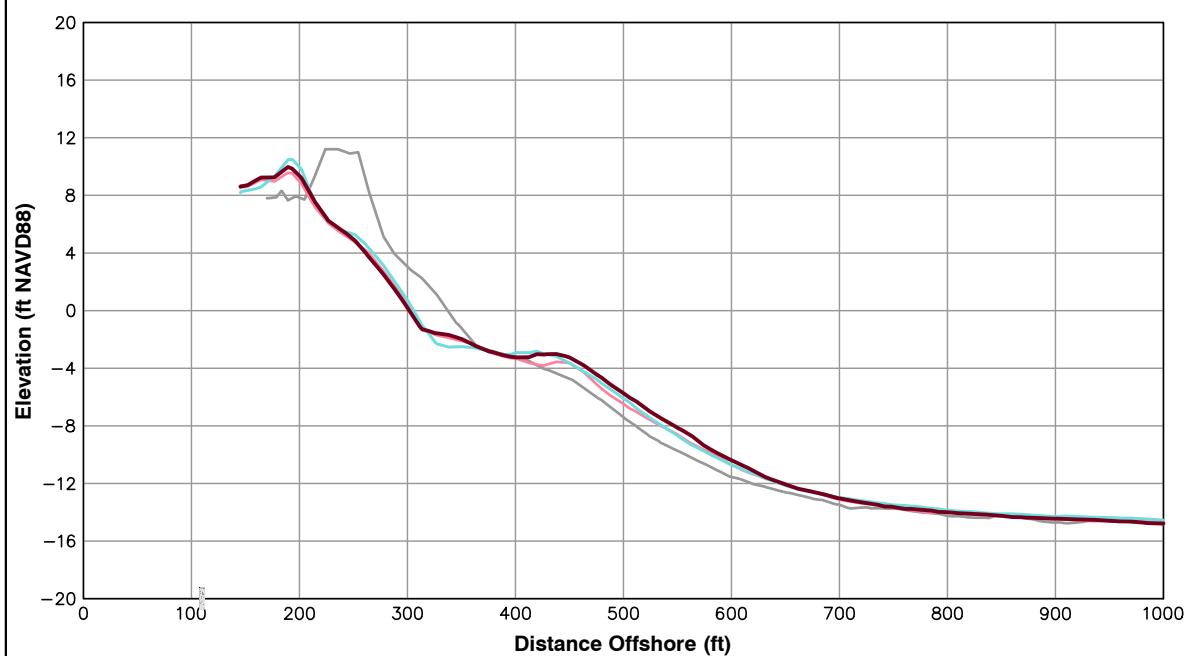
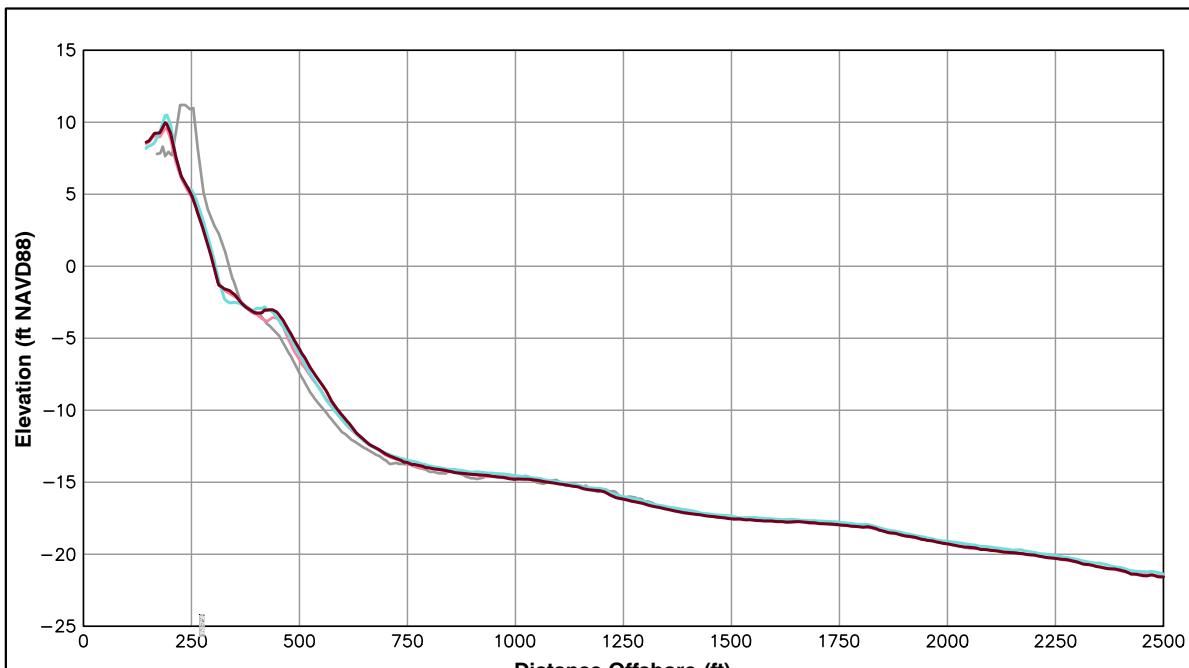


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

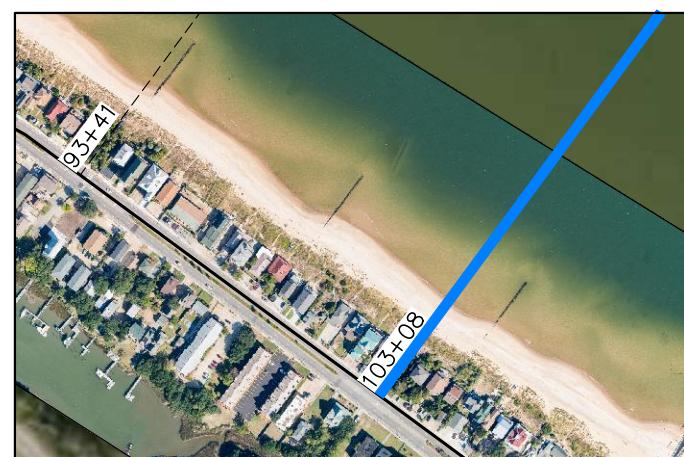


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
103+08		
Shoreline Change at MHW (0.98 ft NAVD88)	-2.11 ft/yr	-4.79 ft
Volume Change Above -15 ft NAVD88	5.39 cy/ft/yr	-0.32 cy/ft
Volume Change Above 0 ft NAVD88	0.62 cy/ft/yr	-1.21 cy/ft

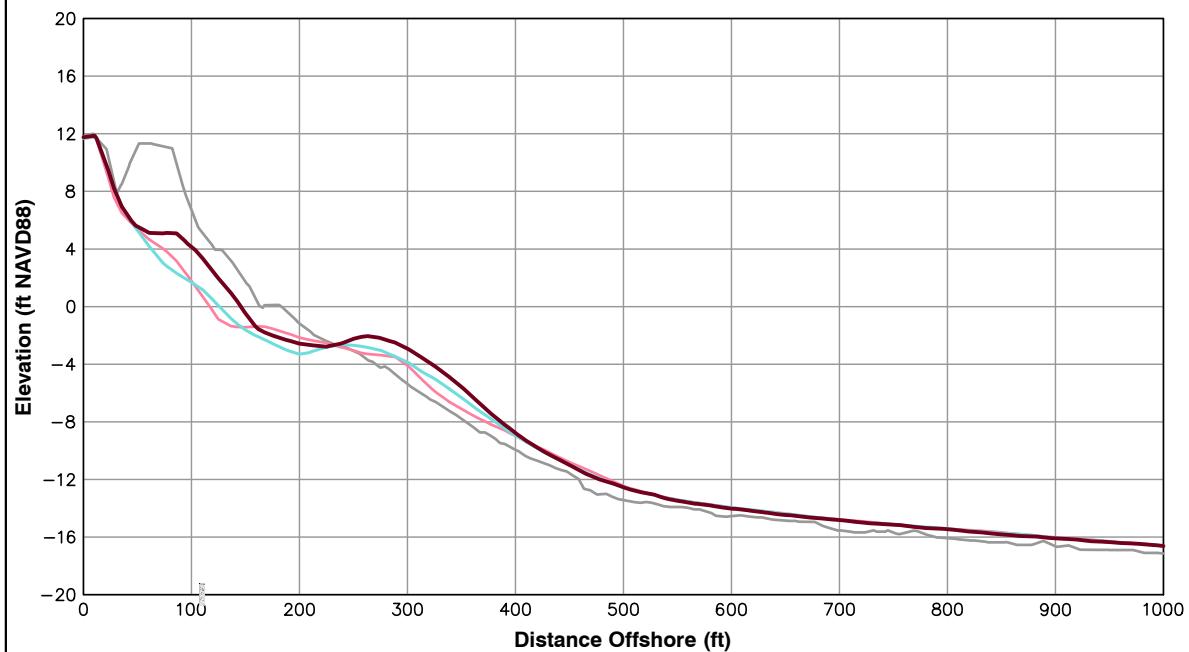
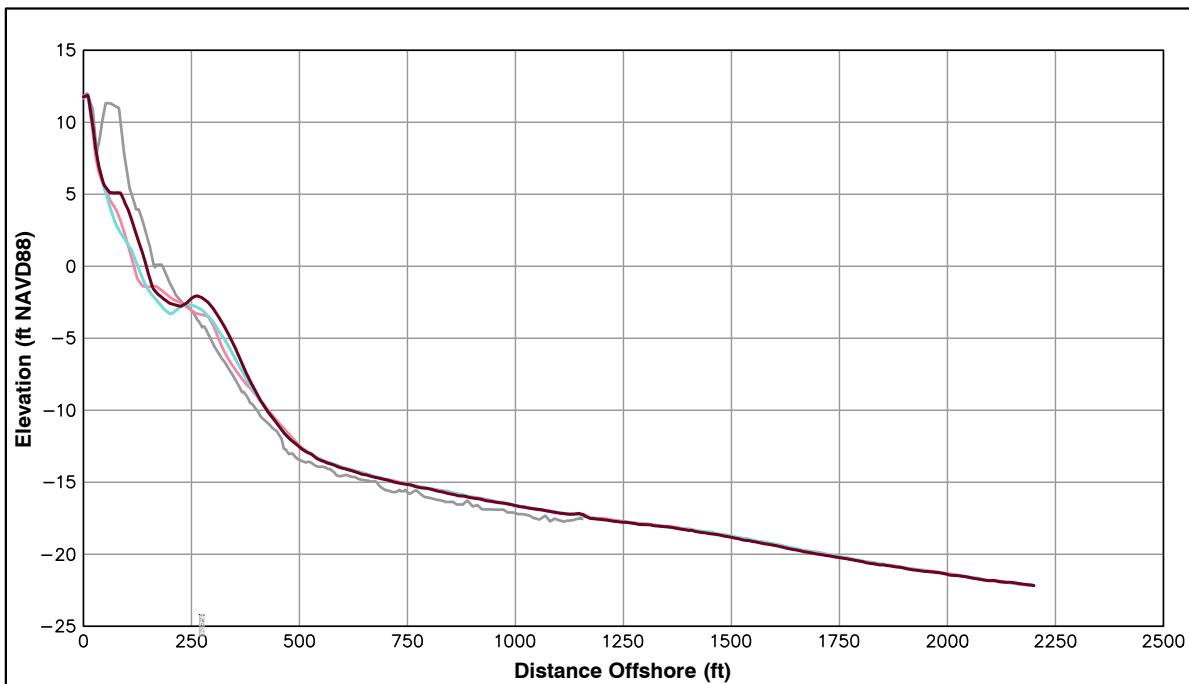
LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

Notes:

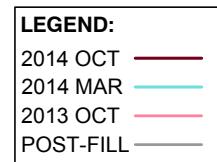
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

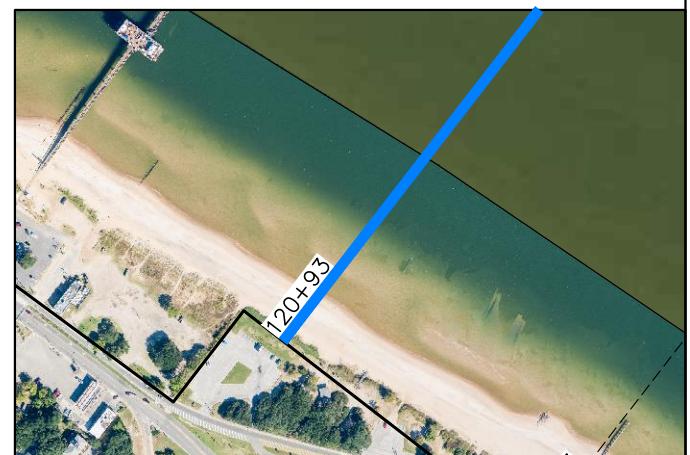


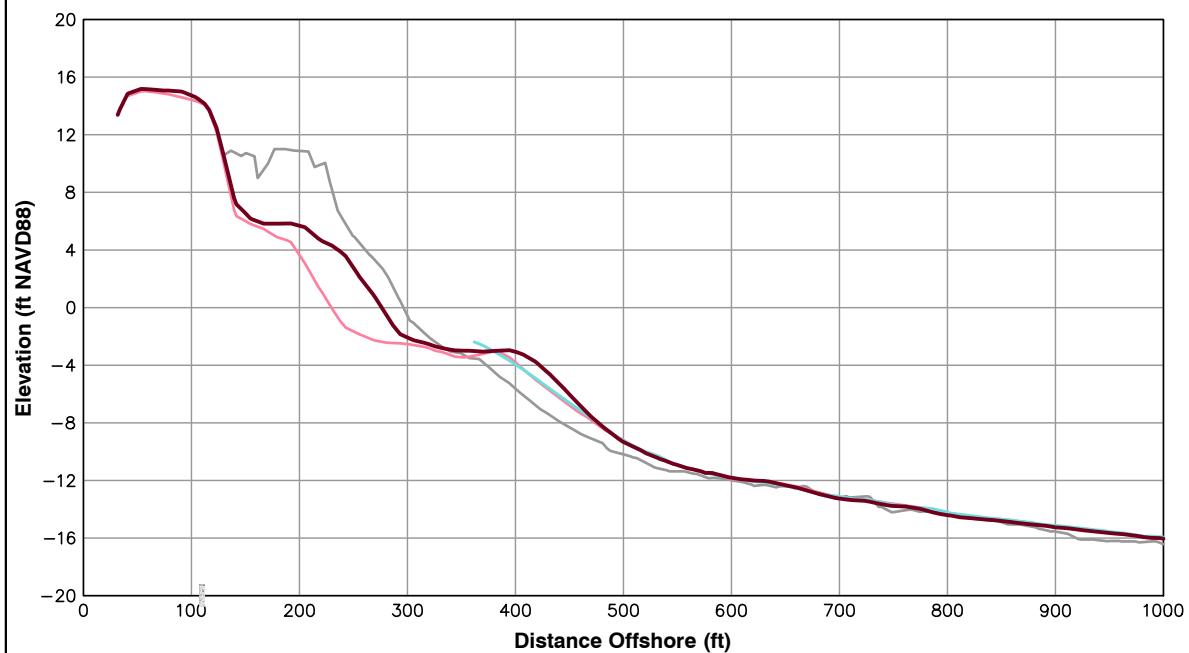
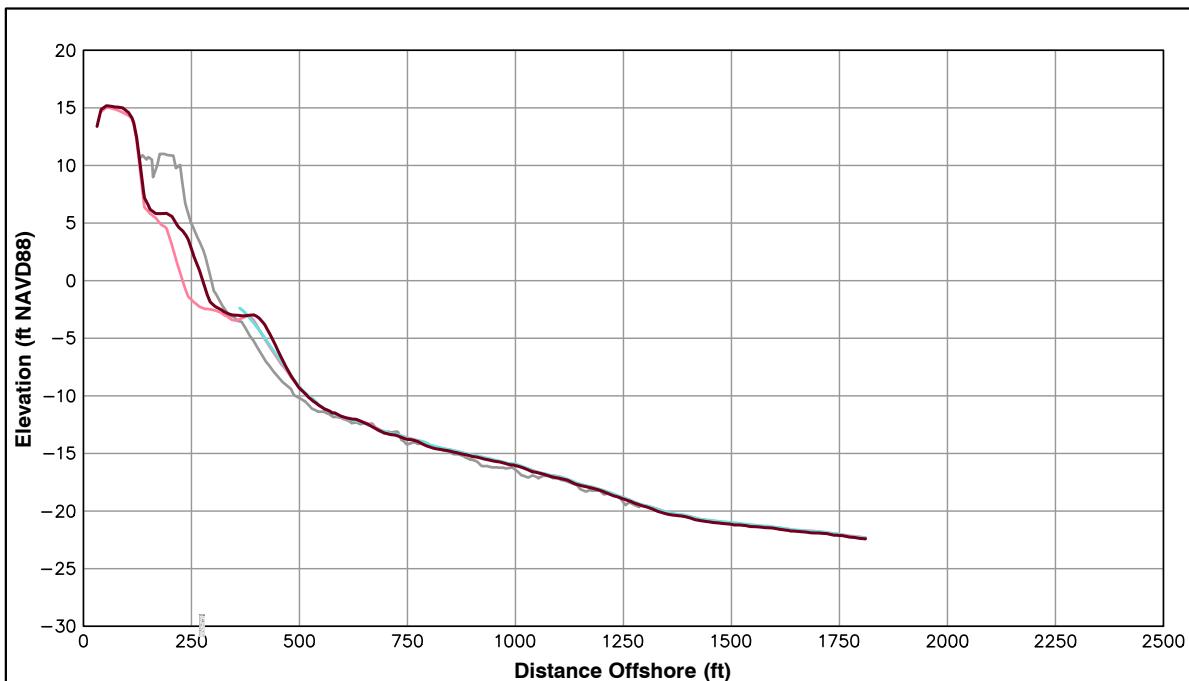
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	29.35 ft/yr	23.17 ft
Volume Change Above -15 ft NAVD88	12.48 cy/ft/yr	12.40 cy/ft
Volume Change Above 0 ft NAVD88	6.12 cy/ft/yr	6.33 cy/ft



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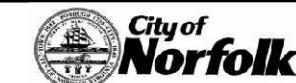
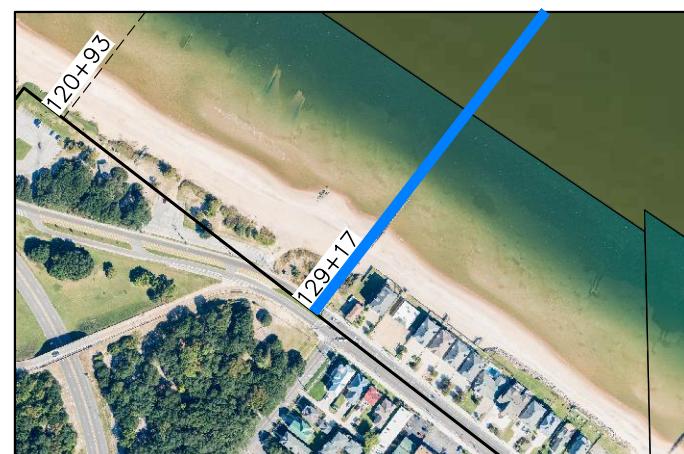


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
129+17	129+17	129+17
Shoreline Change at MHW (0.98 ft NAVD88)	47.28 ft/yr	- ft
Volume Change Above -15 ft NAVD88	17.36 cy/ft/yr	- cy/ft
Volume Change Above 0 ft NAVD88	10.76 cy/ft/yr	- cy/ft

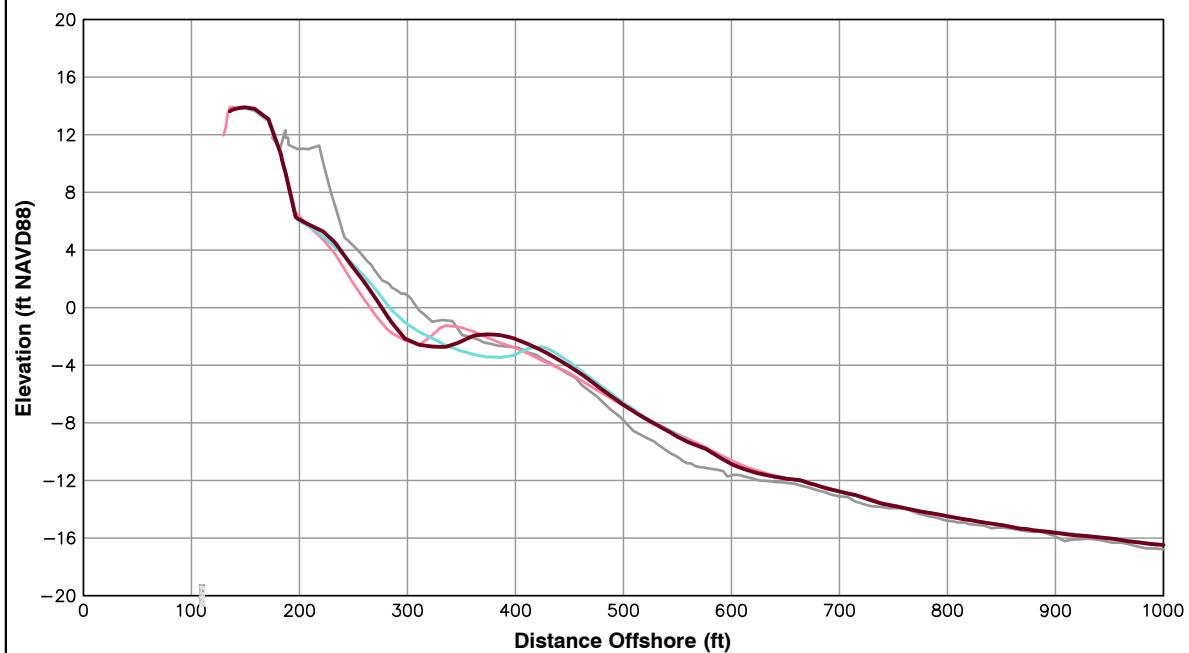
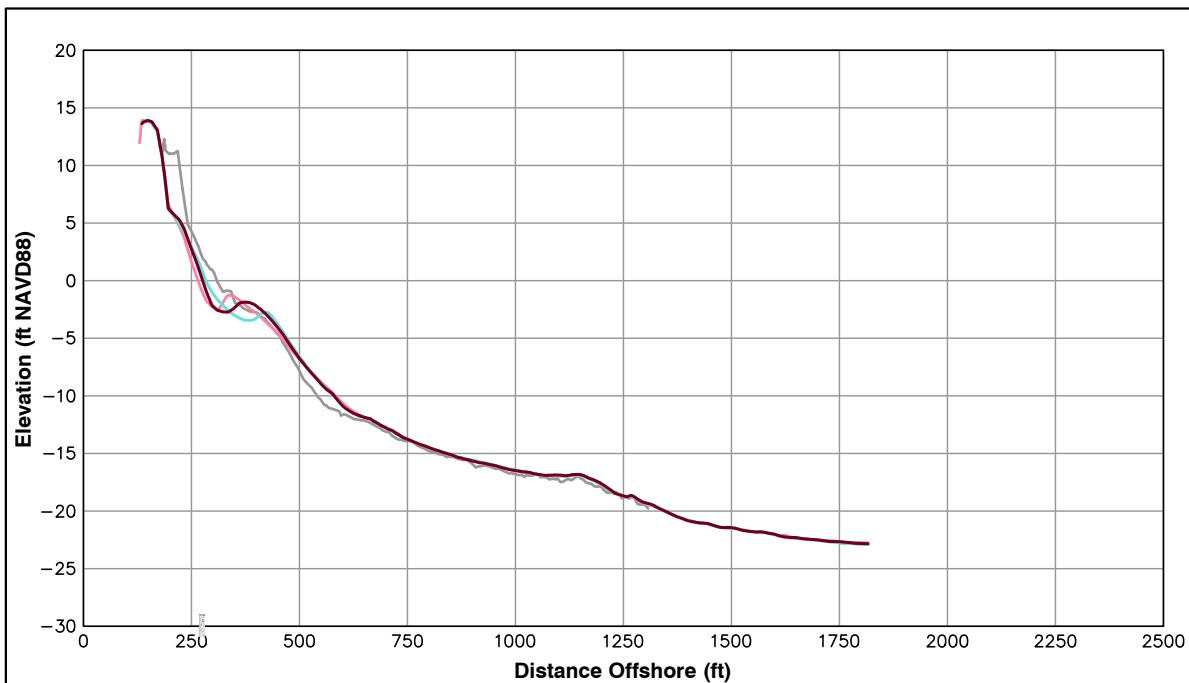
LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

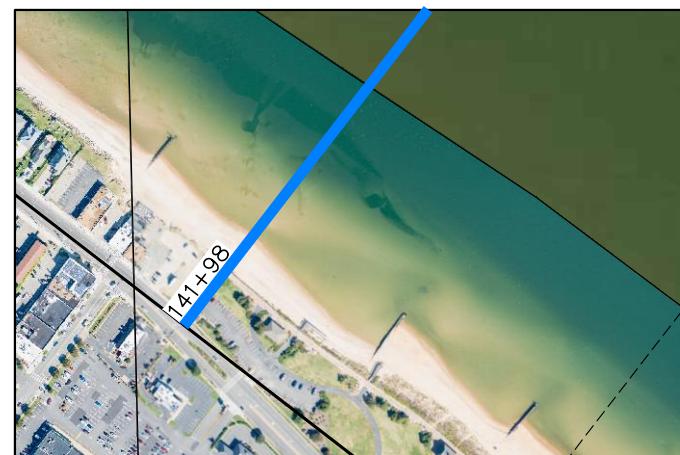


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
141+98		
Shoreline Change at MHW (0.98 ft NAVD88)	11.47 ft/yr	-6.21 ft
Volume Change Above -15 ft NAVD88	2.34 cy/ft/yr	0.32 cy/ft
Volume Change Above 0 ft NAVD88	1.91 cy/ft/yr	-0.11 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

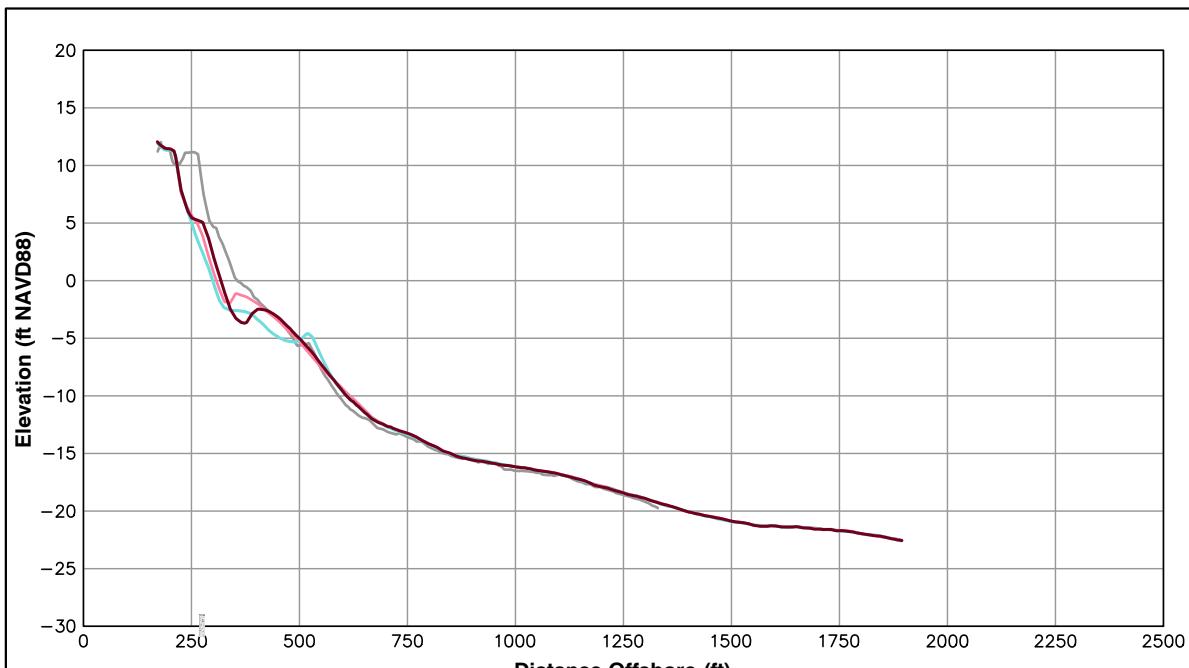
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



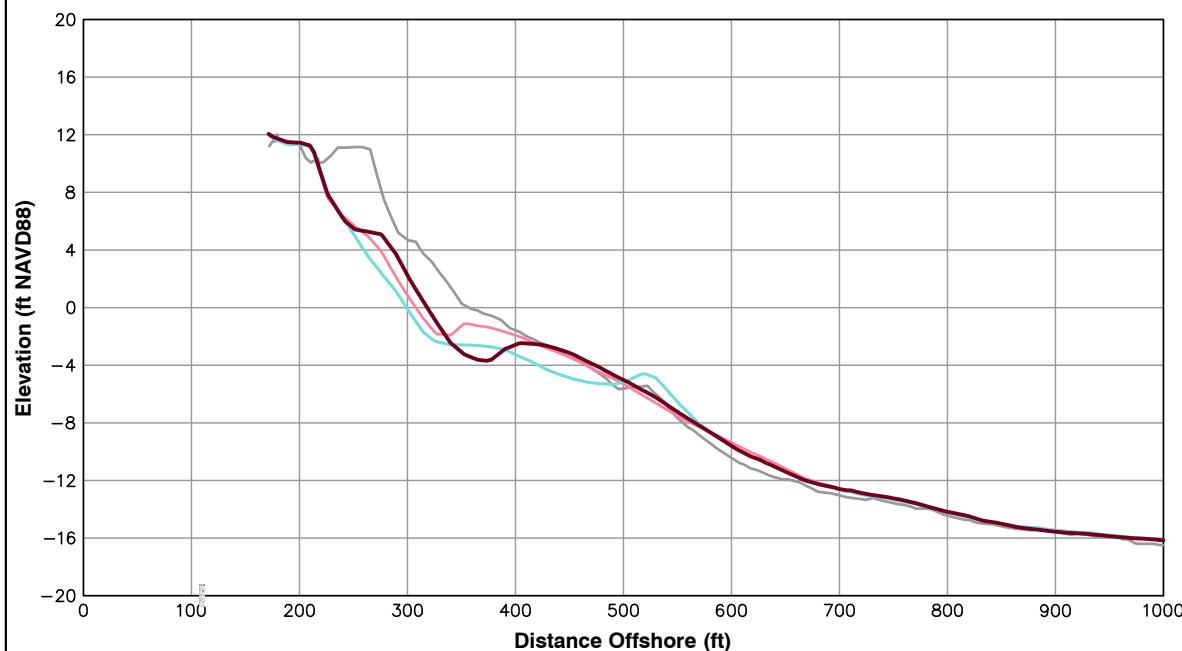
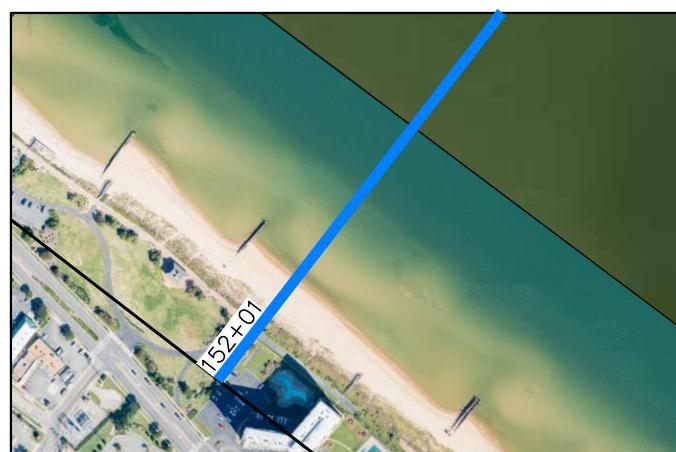
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	11.50 ft/yr	19.37 ft
Volume Change Above -15 ft NAVD88	-0.31 cy/ft/yr	8.62 cy/ft
Volume Change Above 0 ft NAVD88	2.47 cy/ft/yr	4.84 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

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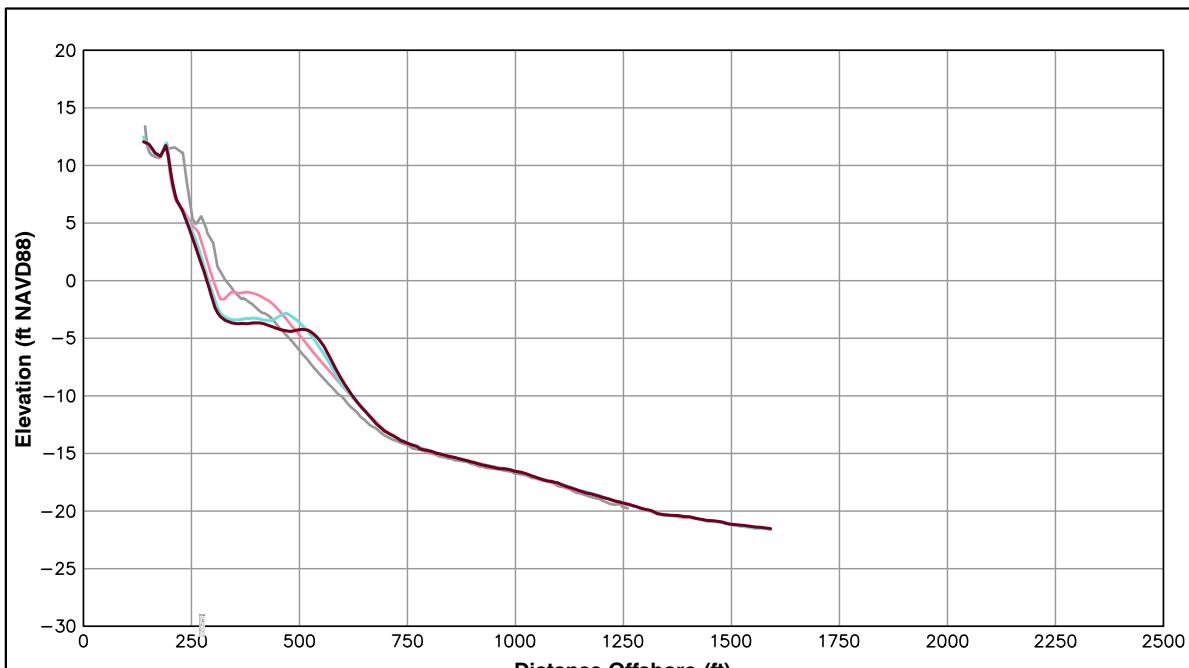


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

Pg 47 of 106

Fall 2014

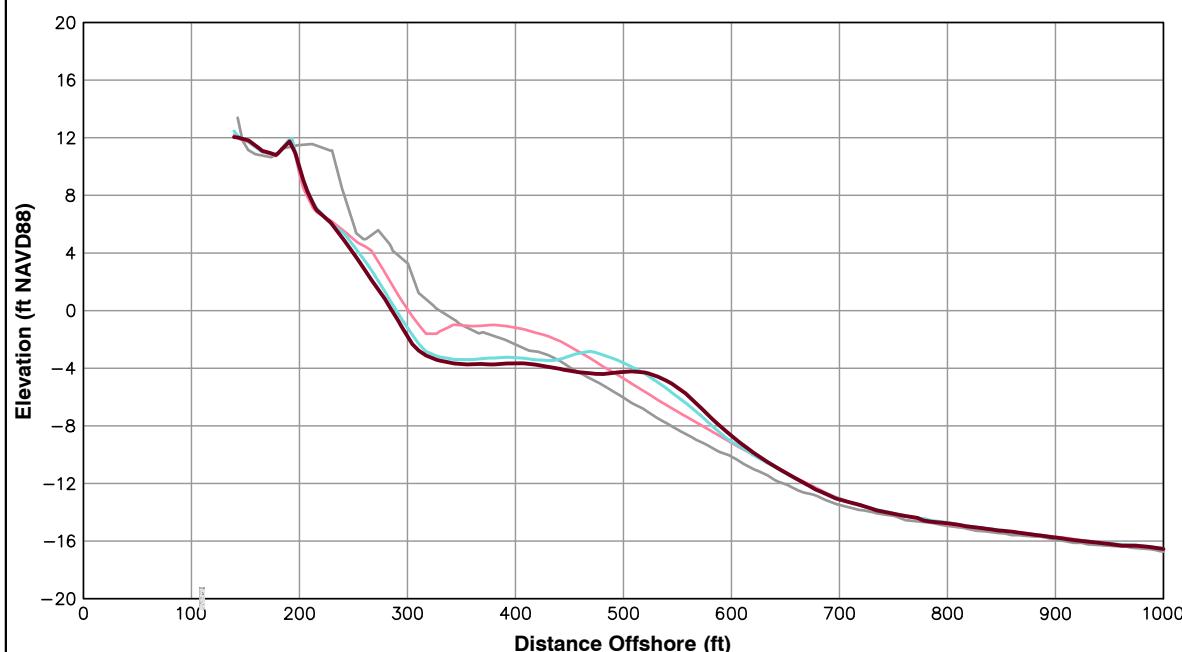
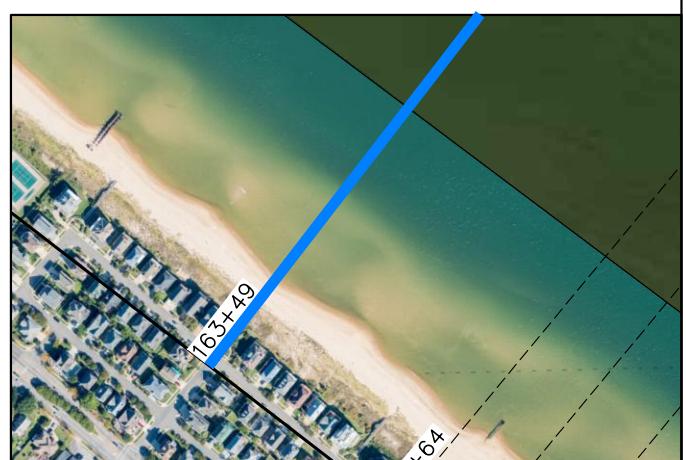


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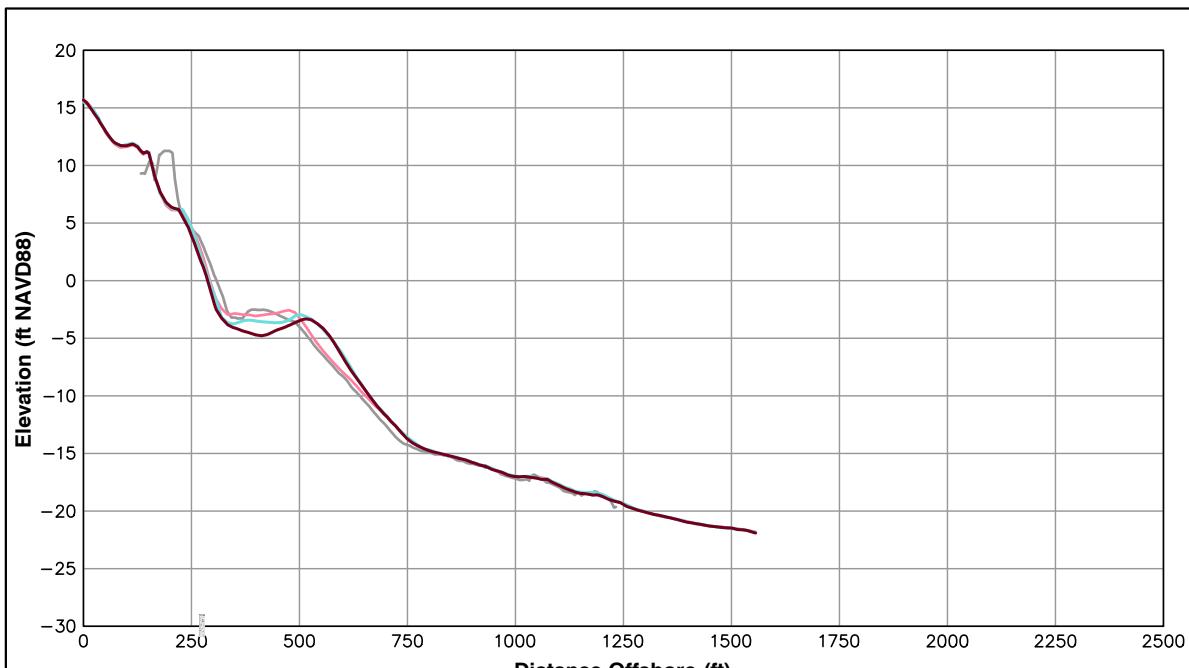
- 2014 OCT ——
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

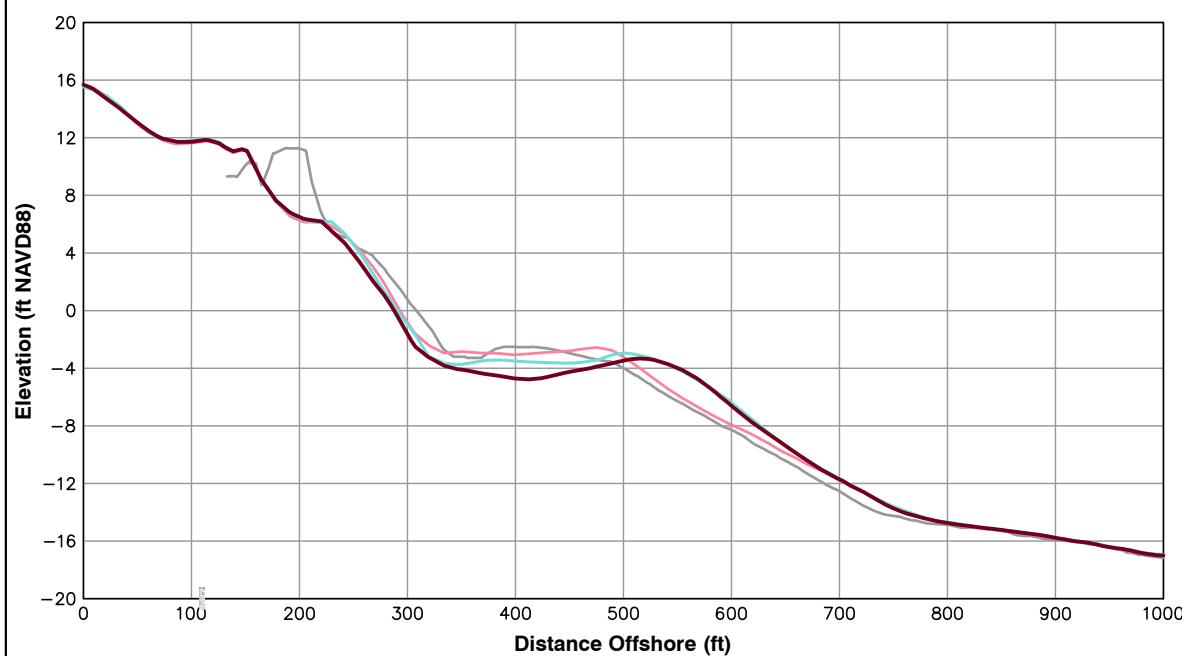
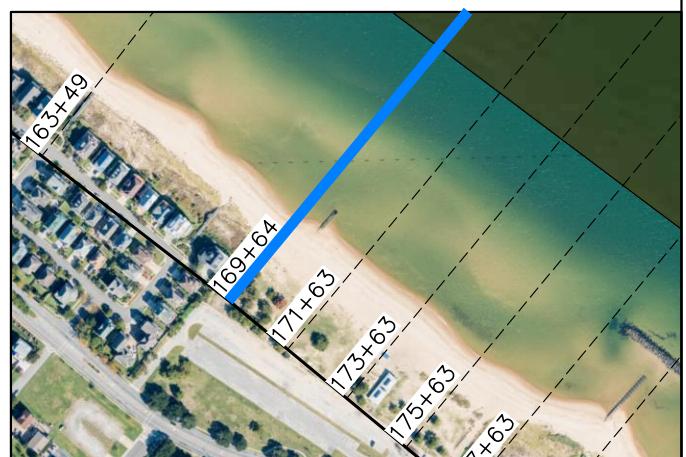


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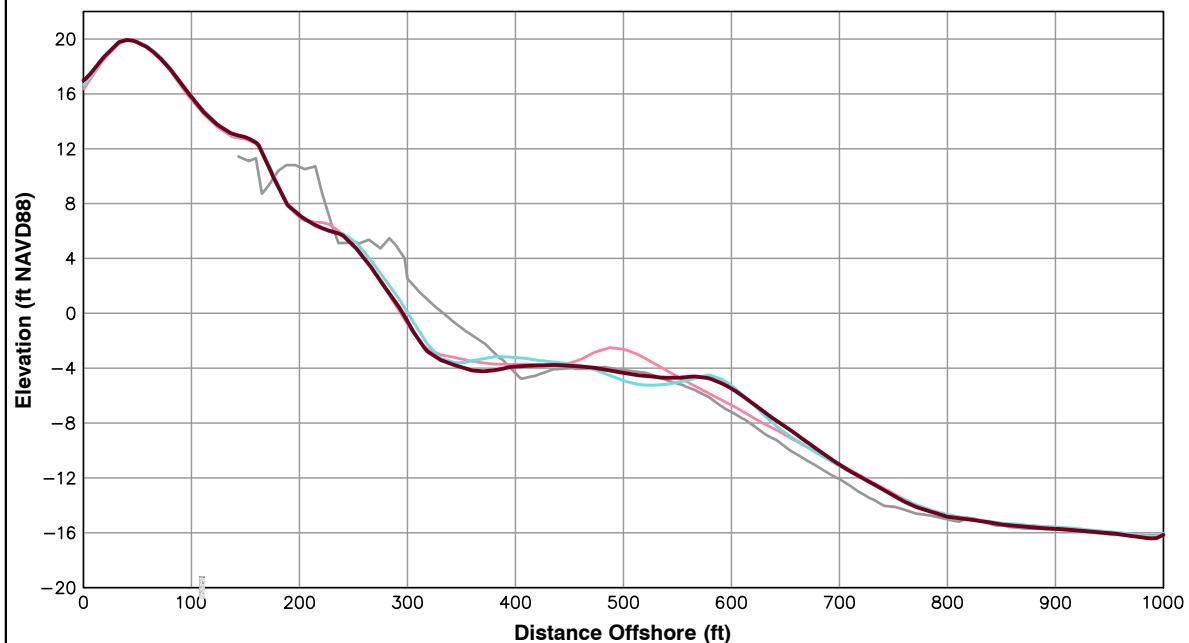
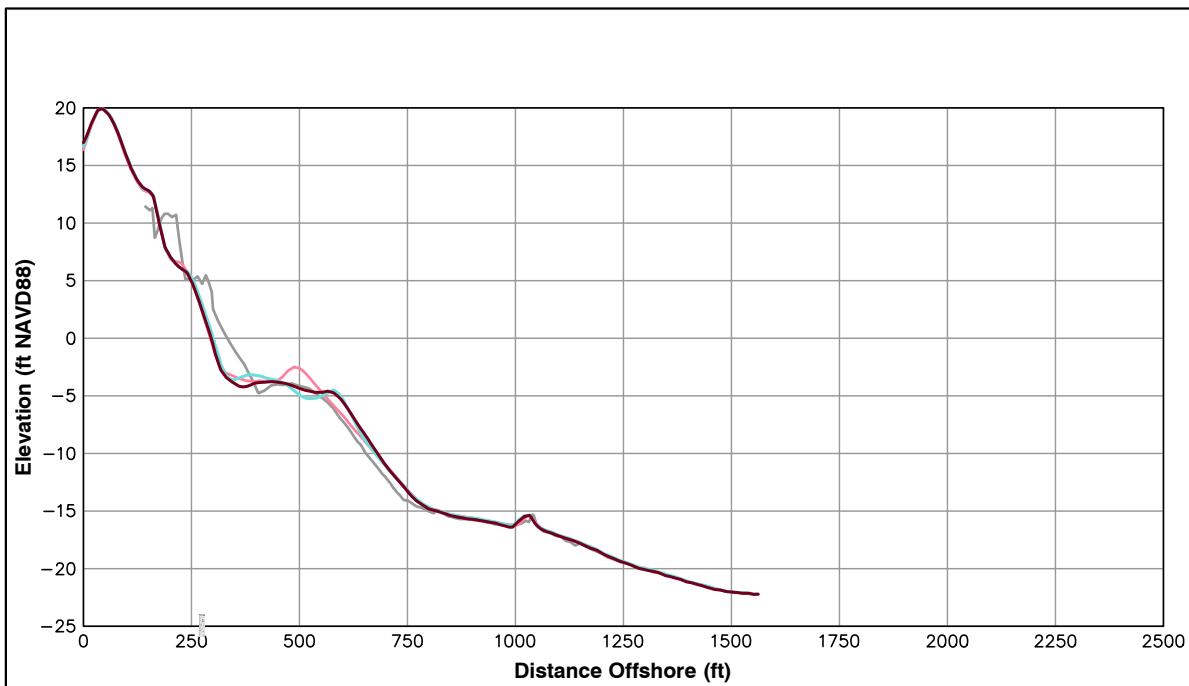


ST 169+63

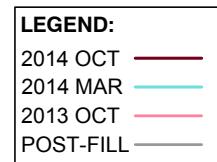
Pg 49 of 106

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

Fall 2014

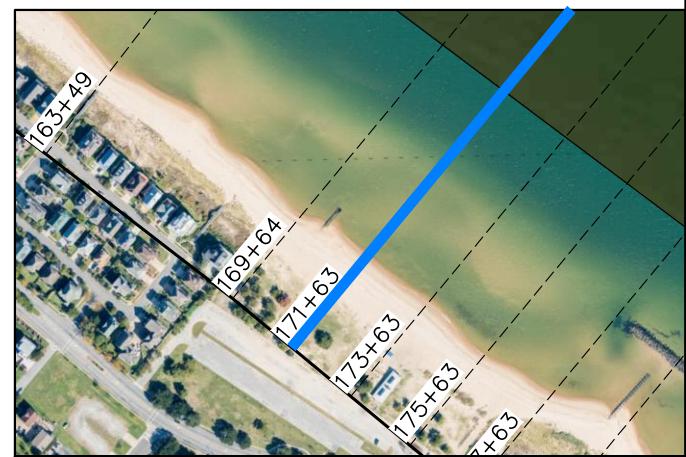


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	1.61 ft/yr	-5.28 ft
Volume Change Above -15 ft NAVD88	-1.54 cy/ft/yr	-2.22 cy/ft
Volume Change Above 0 ft NAVD88	0.68 cy/ft/yr	-1.15 cy/ft

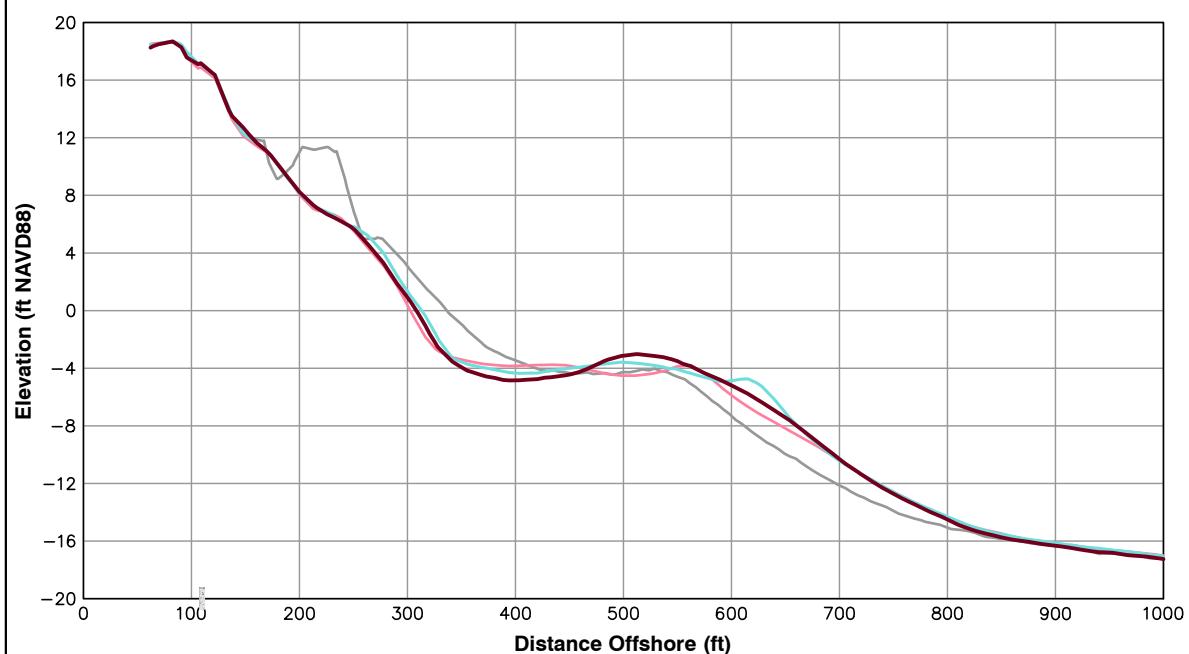
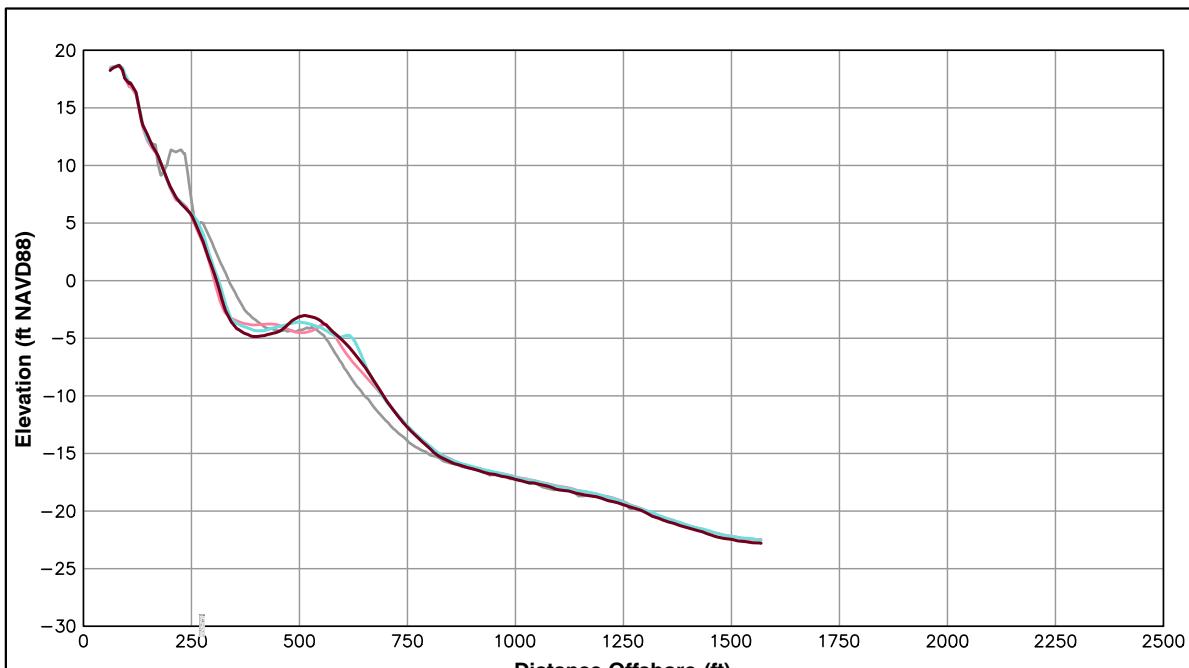


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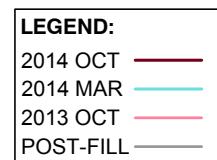
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
173+63		
Shoreline Change at MHW (0.98 ft NAVD88)	3.64 ft/yr	-3.96 ft
Volume Change Above -15 ft NAVD88	3.82 cy/ft/yr	-4.06 cy/ft
Volume Change Above 0 ft NAVD88	1.28 cy/ft/yr	-1.24 cy/ft

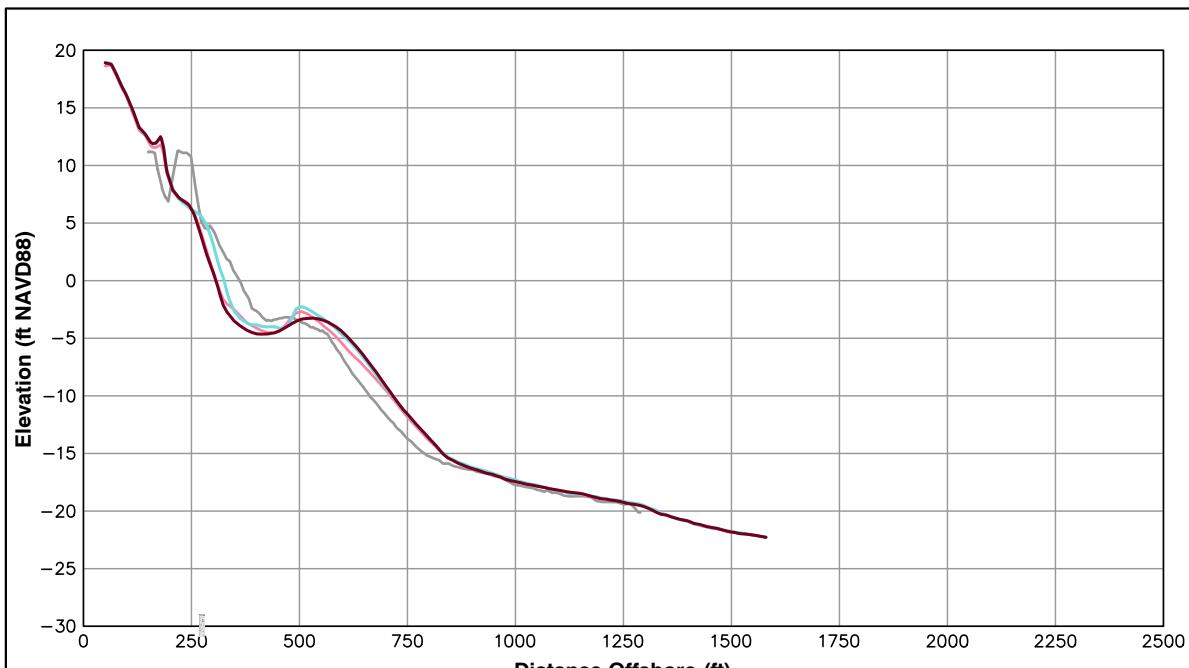


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



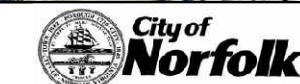
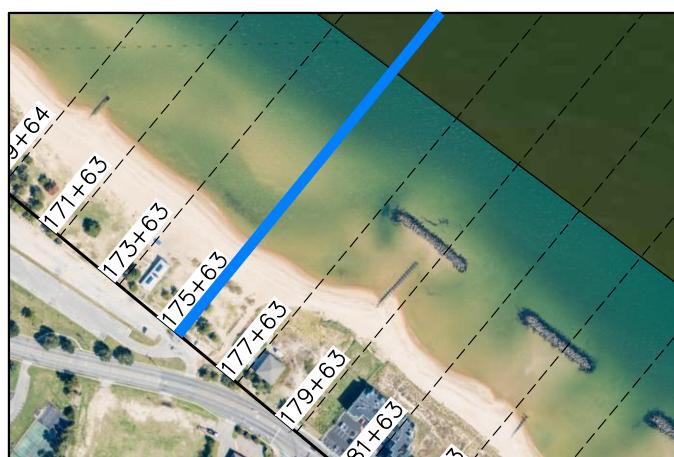
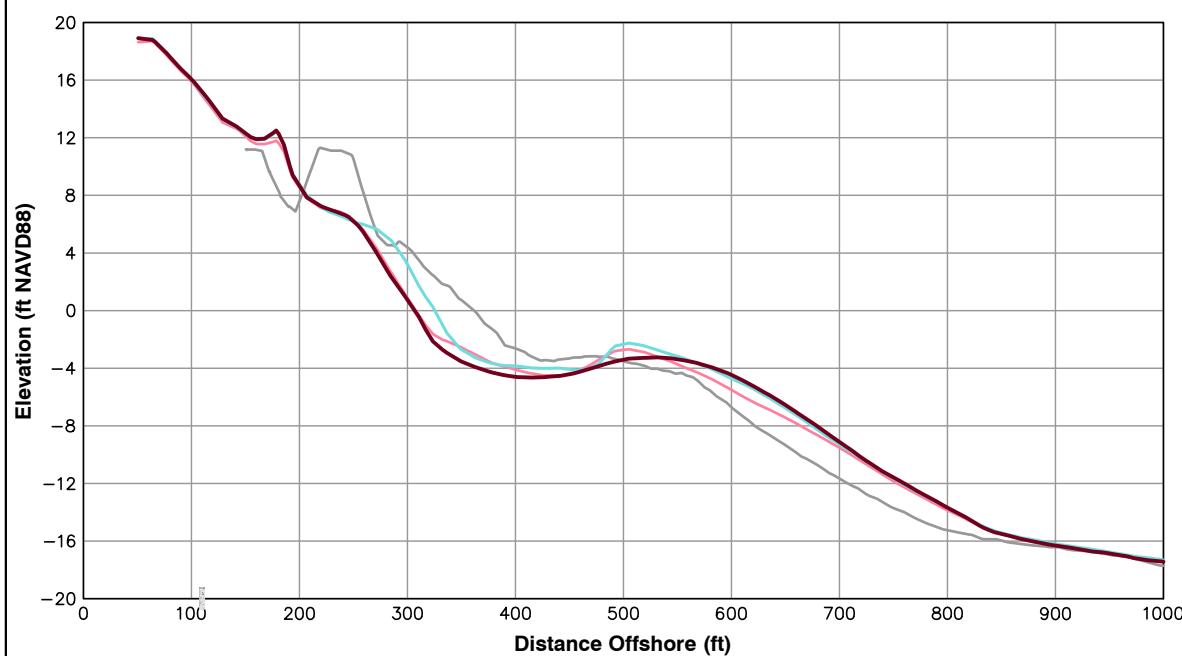
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-1.27 ft/yr	-18.80 ft
Volume Change Above -15 ft NAVD88	2.88 cy/ft/yr	-9.54 cy/ft
Volume Change Above 0 ft NAVD88	1.02 cy/ft/yr	-4.15 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

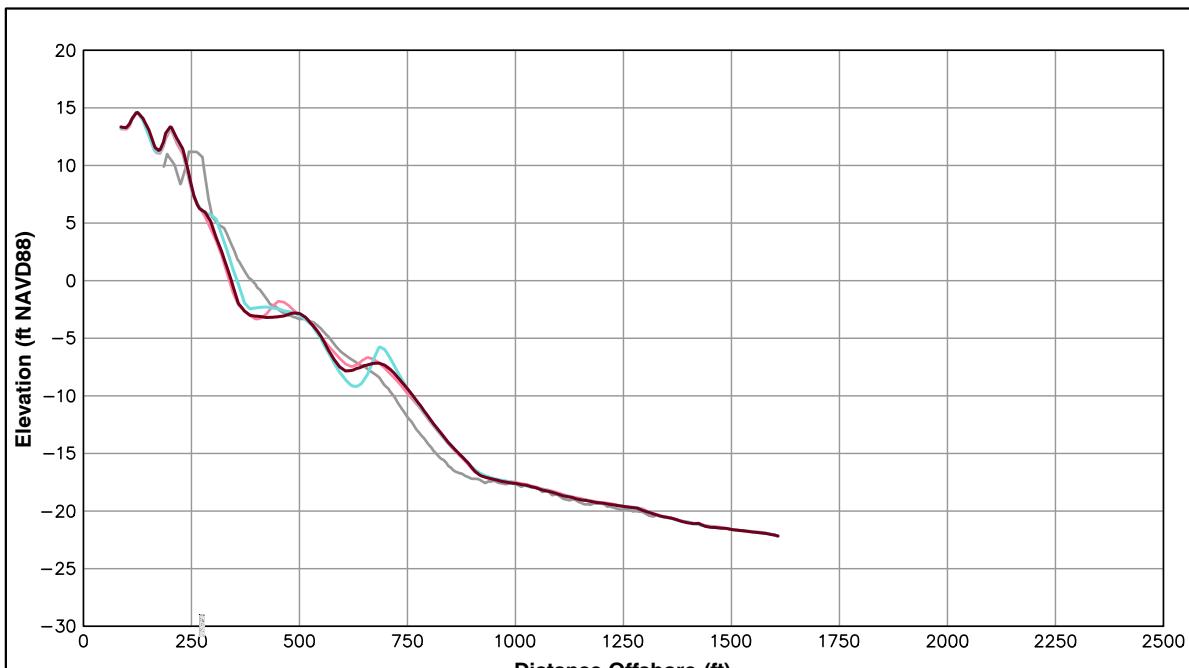
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

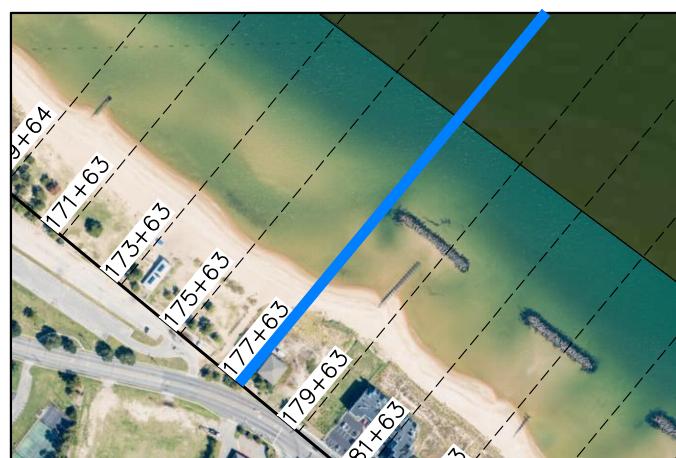
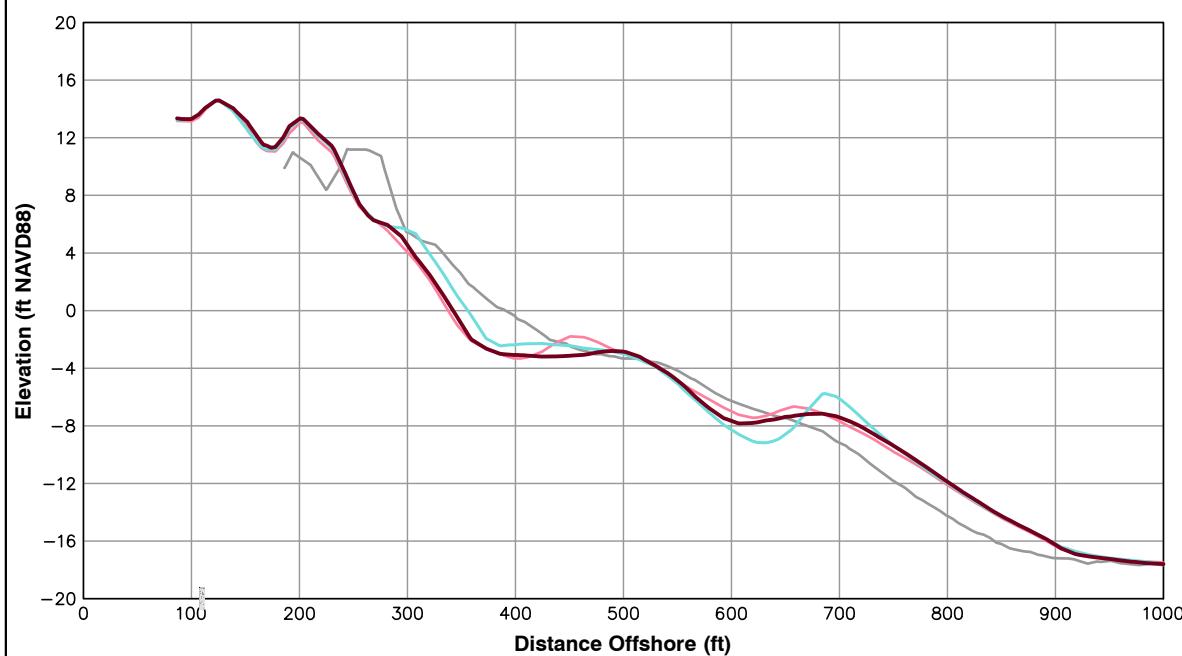


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	4.30 ft/yr	-12.43 ft
Volume Change Above -15 ft NAVD88	0.77 cy/ft/yr	-4.02 cy/ft
Volume Change Above 0 ft NAVD88	2.97 cy/ft/yr	-1.96 cy/ft

LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

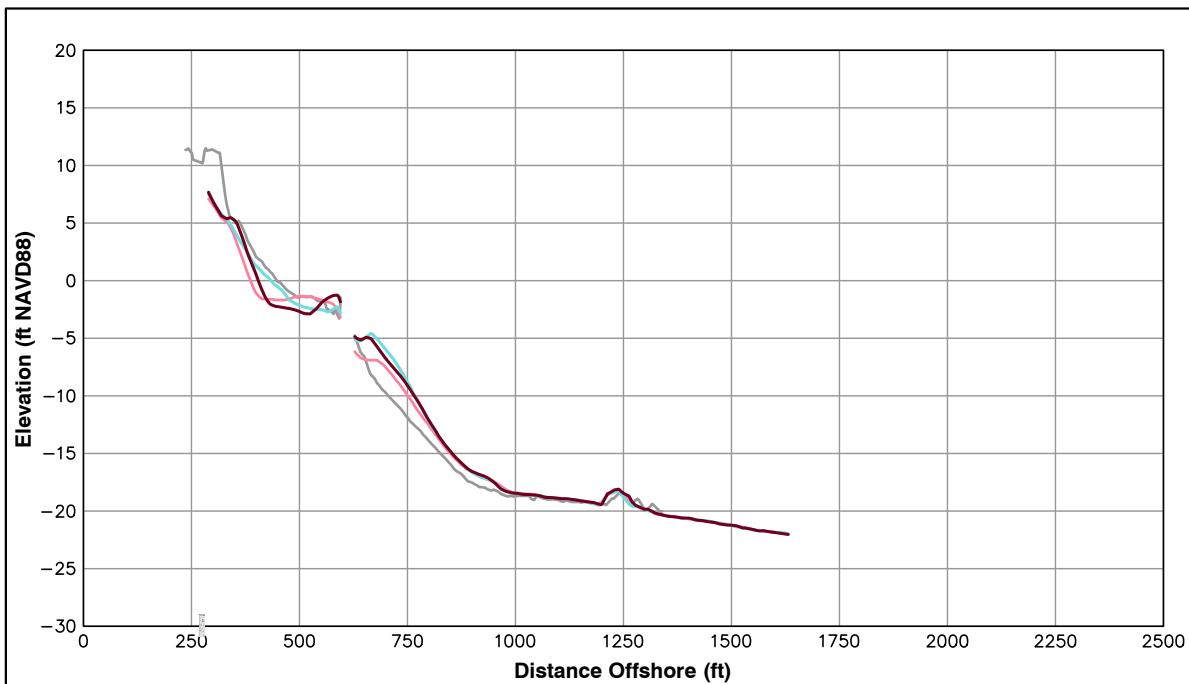
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

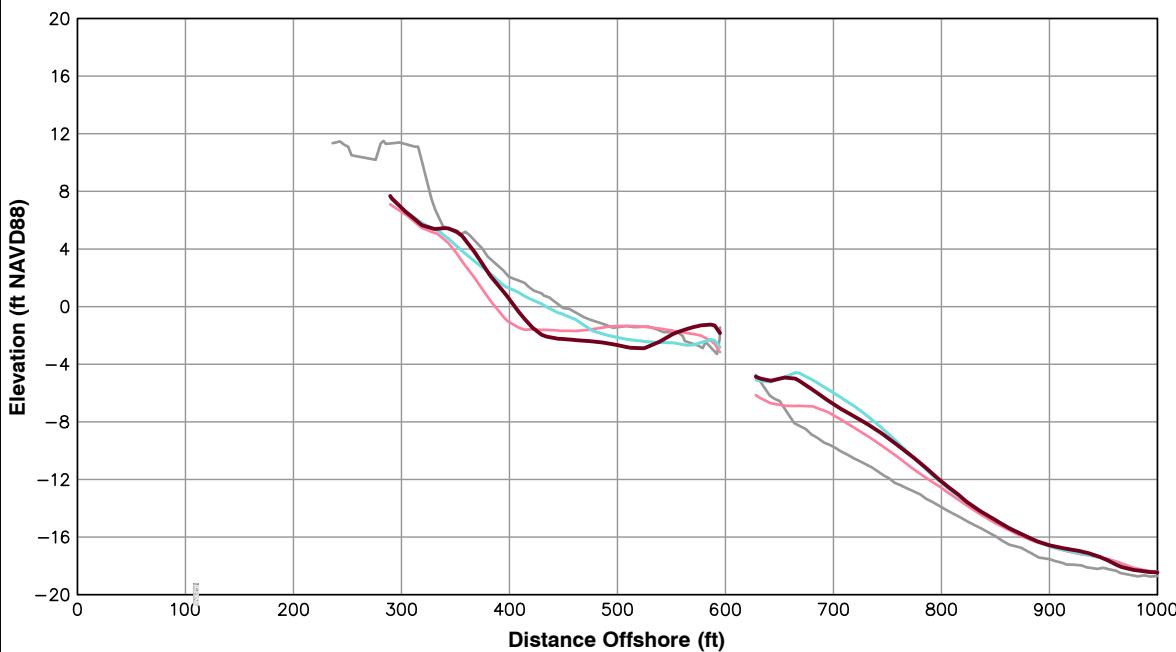


LEGEND:

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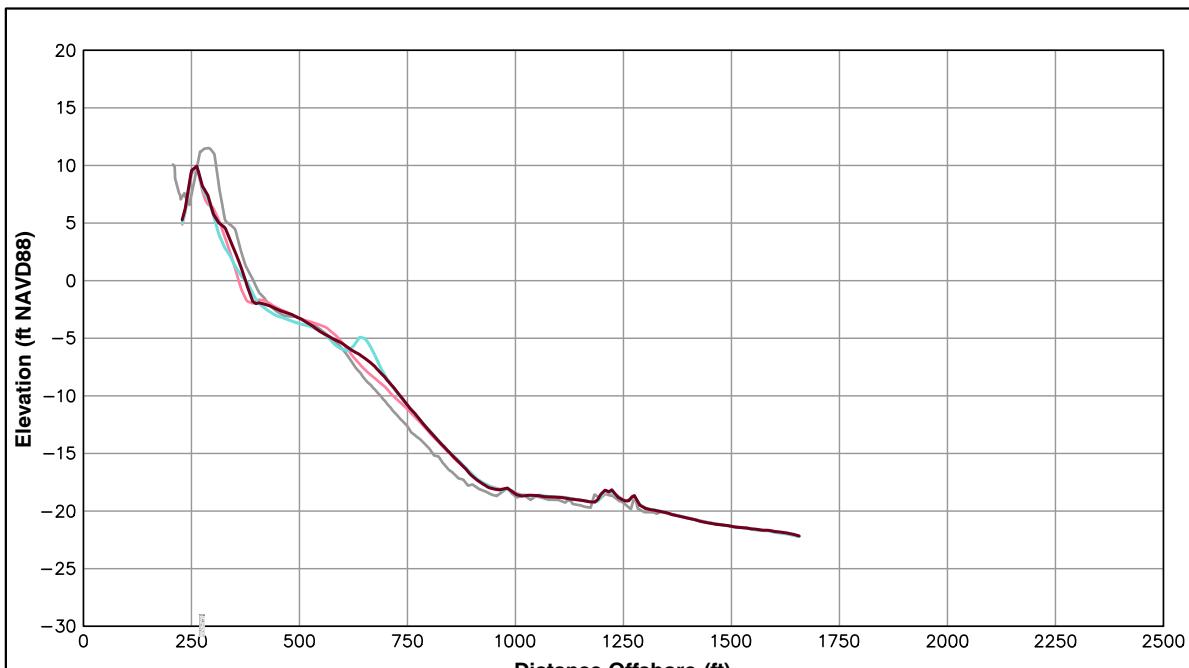


ST 179+63

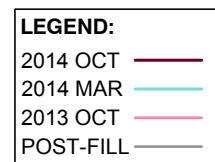
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

Pg 54 of 106

Fall 2014

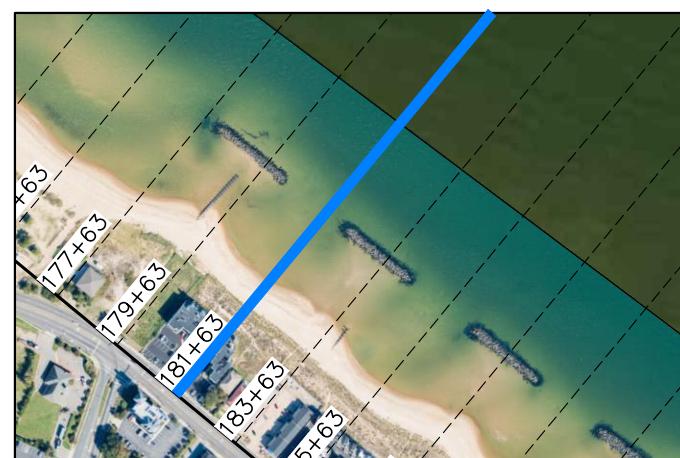
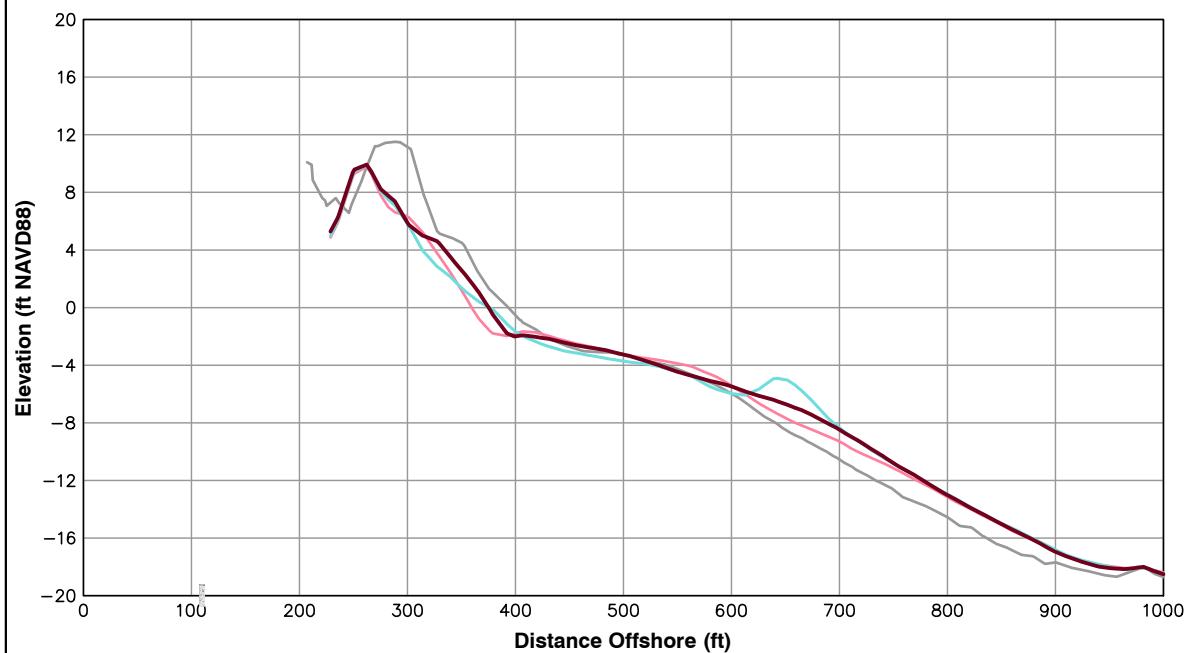


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
181+63		
Shoreline Change at MHW (0.98 ft NAVD88)	15.21 ft/yr	10.41 ft
Volume Change Above -15 ft NAVD88	6.71 cy/ft/yr	2.53 cy/ft
Volume Change Above 0 ft NAVD88	2.88 cy/ft/yr	3.28 cy/ft



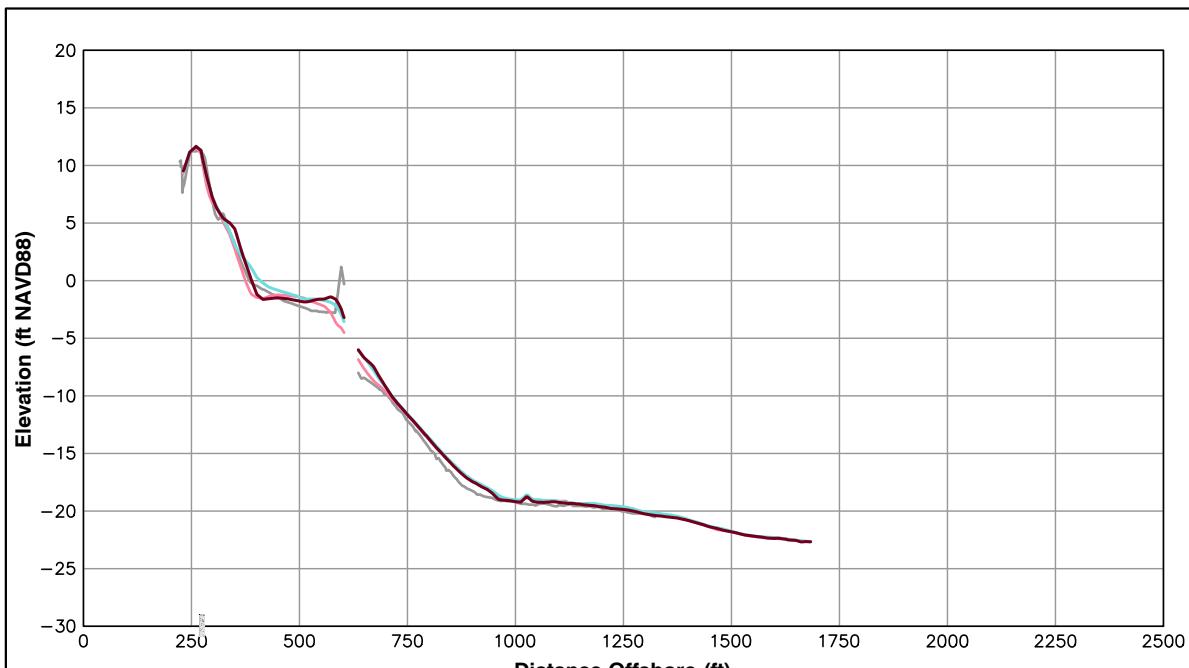
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

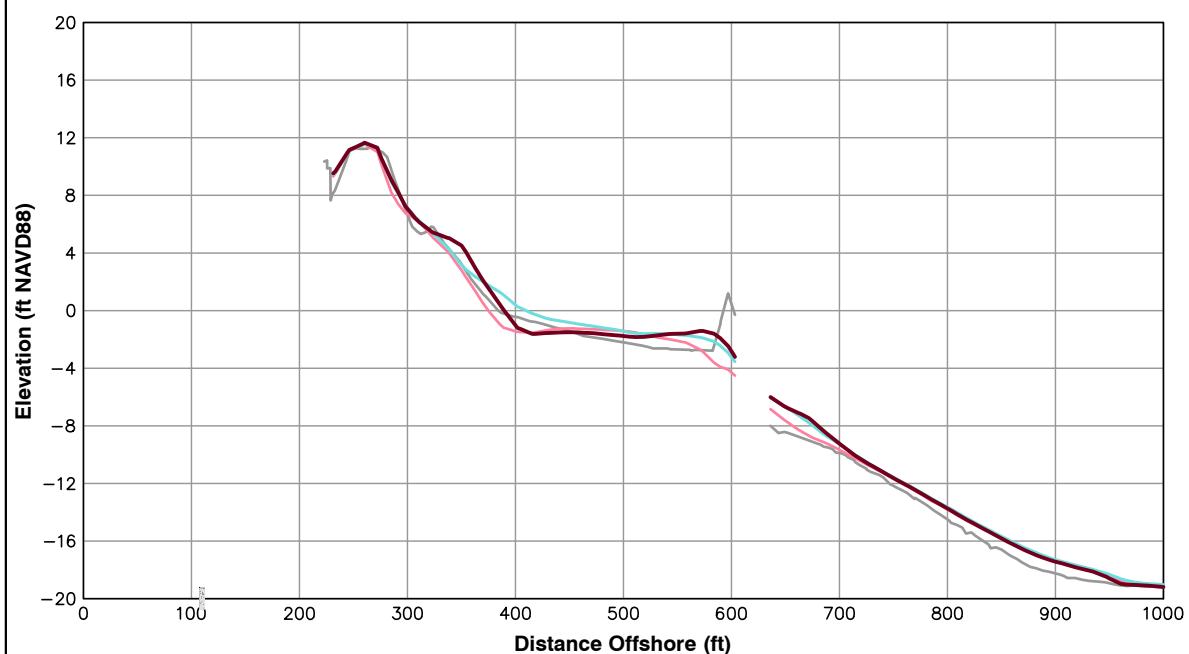


LEGEND:

- 2014 OCT ——
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- 2013 OCT ——
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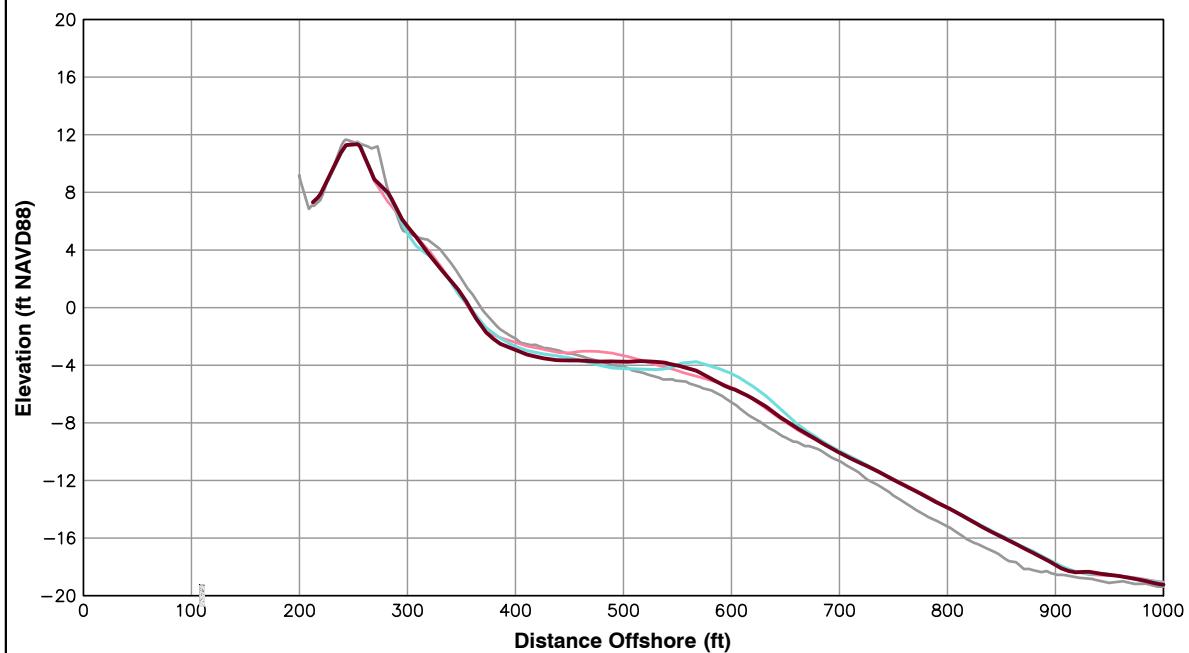
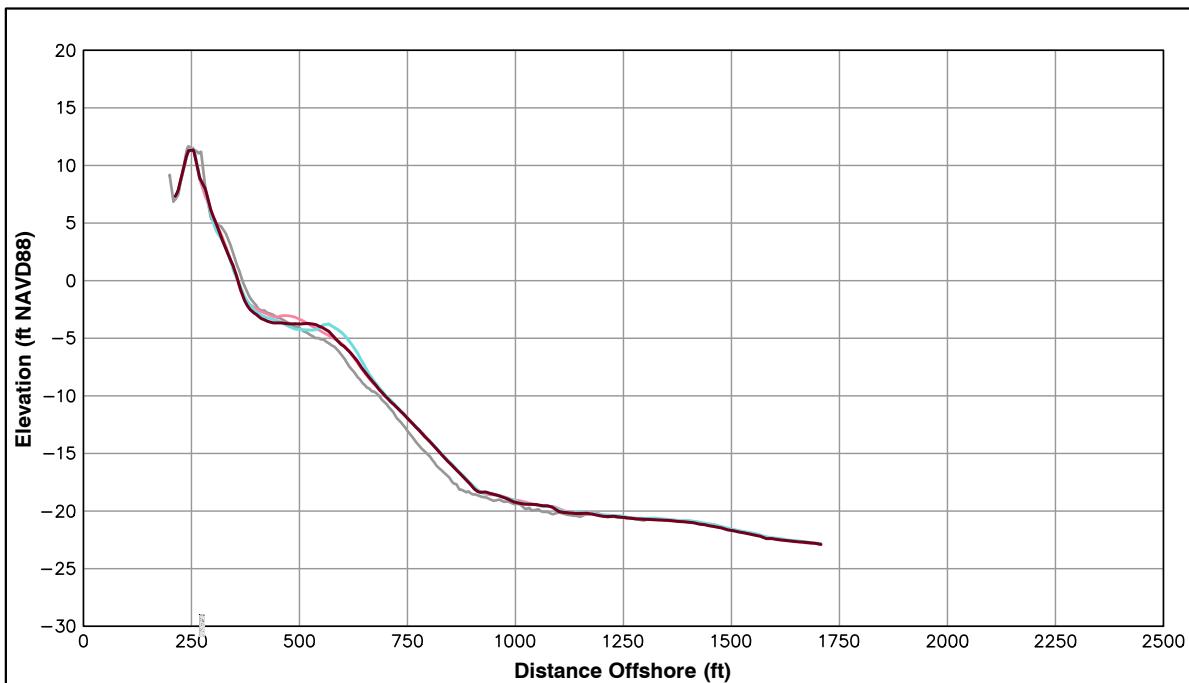
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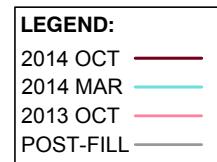


**City of
Norfolk**

OCEAN VIEW PERIODIC
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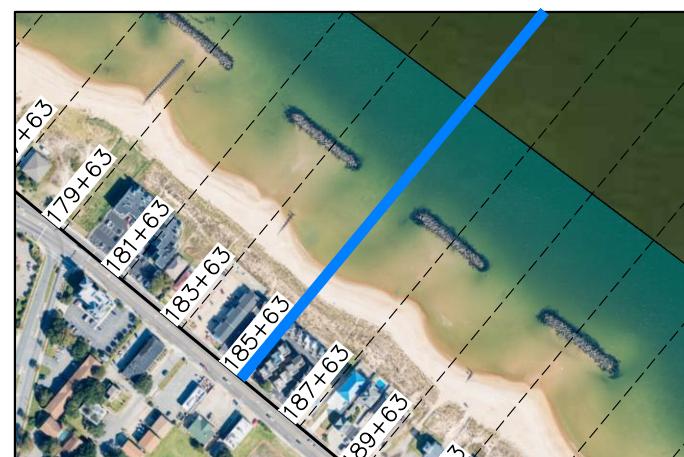


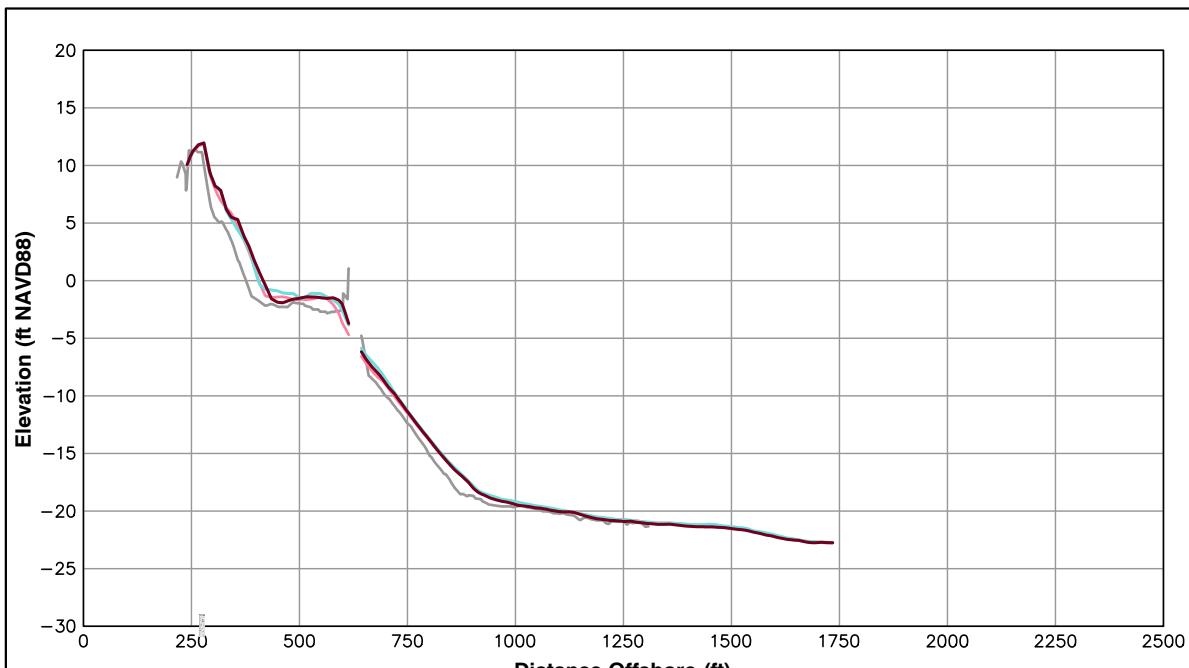
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
185+63		
Shoreline Change at MHW (0.98 ft NAVD88)	1.73 ft/yr	2.68 ft
Volume Change Above -15 ft NAVD88	-1.84 cy/ft/yr	-2.50 cy/ft
Volume Change Above 0 ft NAVD88	0.29 cy/ft/yr	0.66 cy/ft



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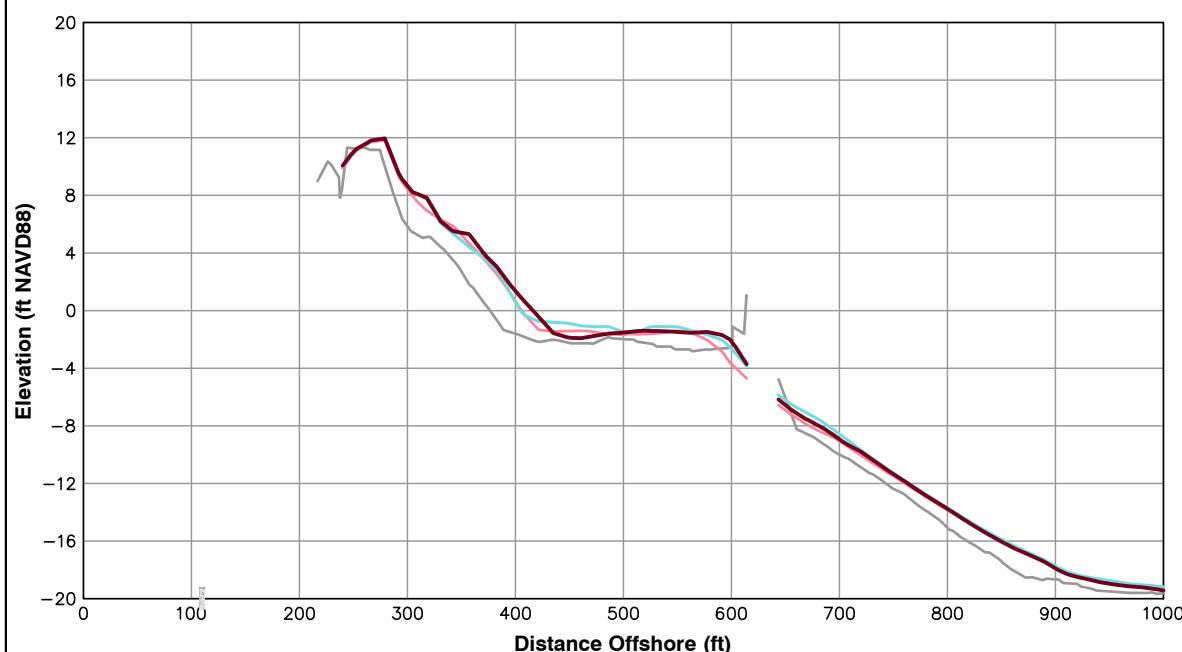
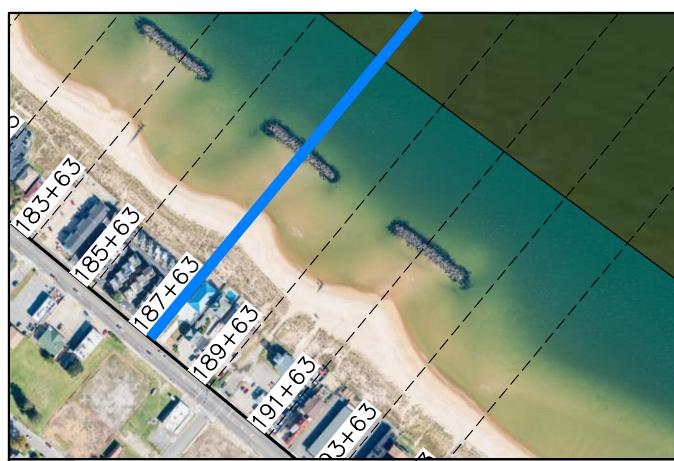
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	7.22 ft/yr	7.26 ft
Volume Change Above -15 ft NAVD88	5.27 cy/ft/yr	-1.27 cy/ft
Volume Change Above 0 ft NAVD88	2.01 cy/ft/yr	1.56 cy/ft

LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——
- POST-FILL ——

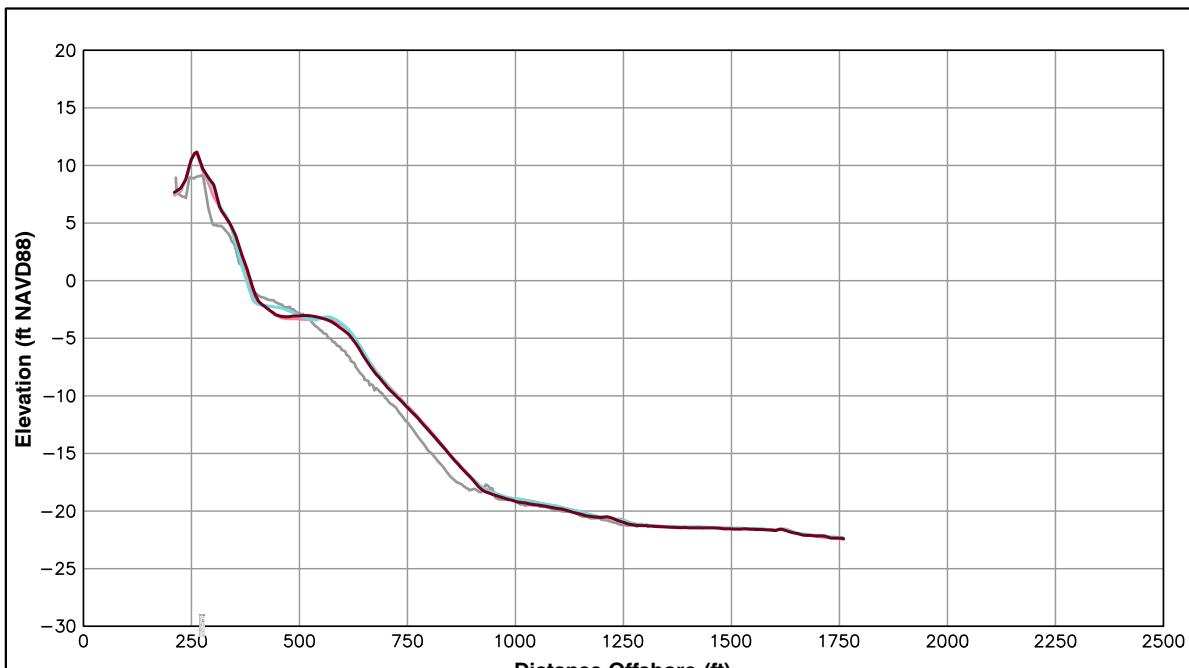
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**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

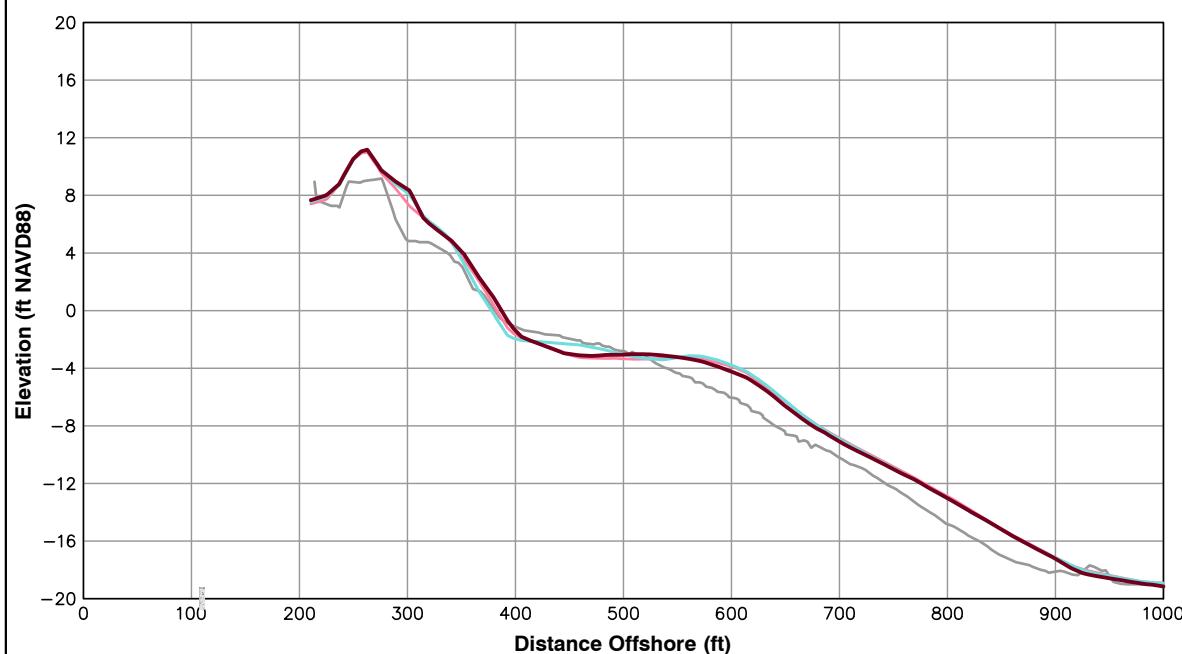
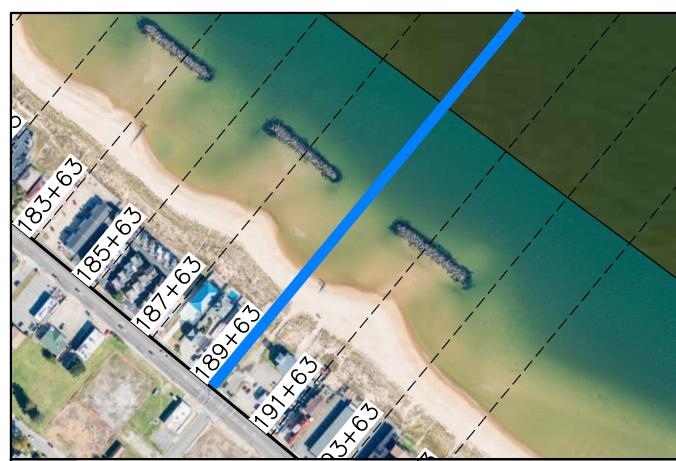


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	4.15	9.81
Volume Change Above -15 ft NAVD88	0.66	-0.76
Volume Change Above 0 ft NAVD88	1.73	1.40

LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

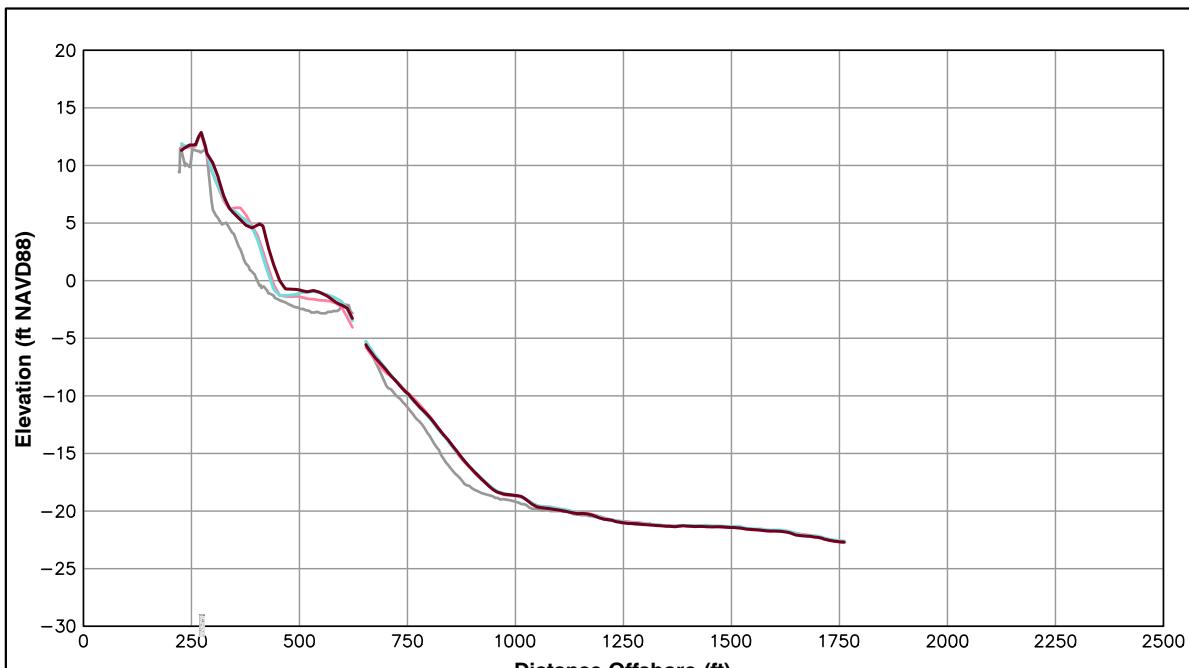
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



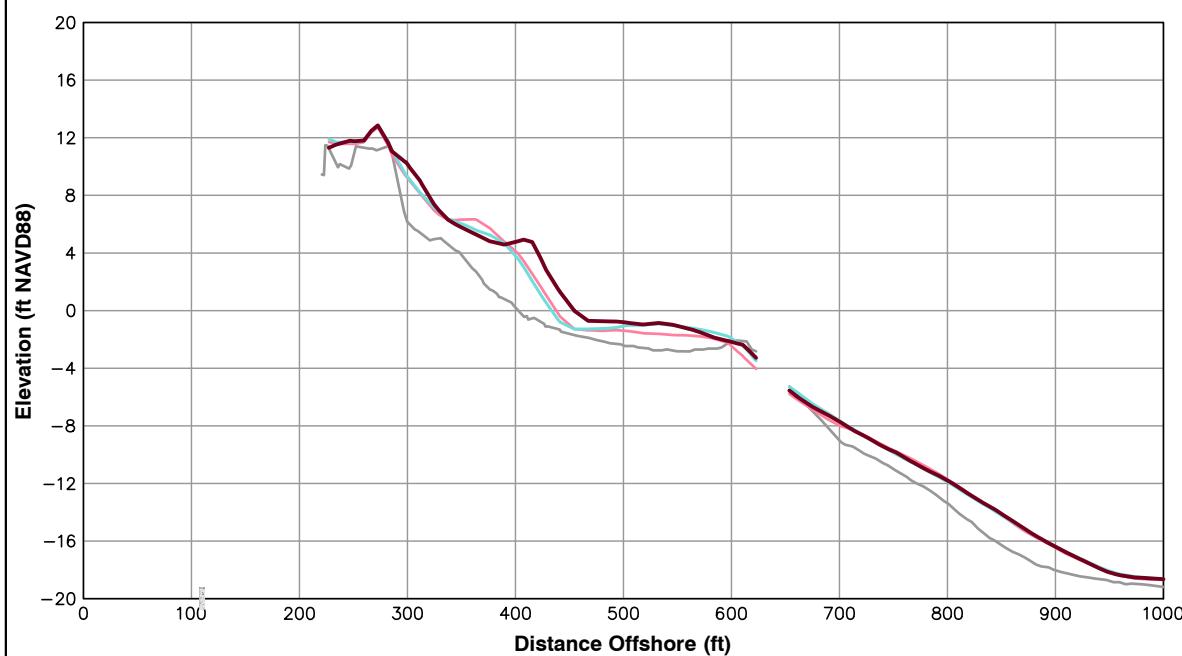
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	15.70 ft/yr	19.86 ft
Volume Change Above -15 ft NAVD88	7.41 cy/ft/yr	5.35 cy/ft
Volume Change Above 0 ft NAVD88	3.16 cy/ft/yr	3.91 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

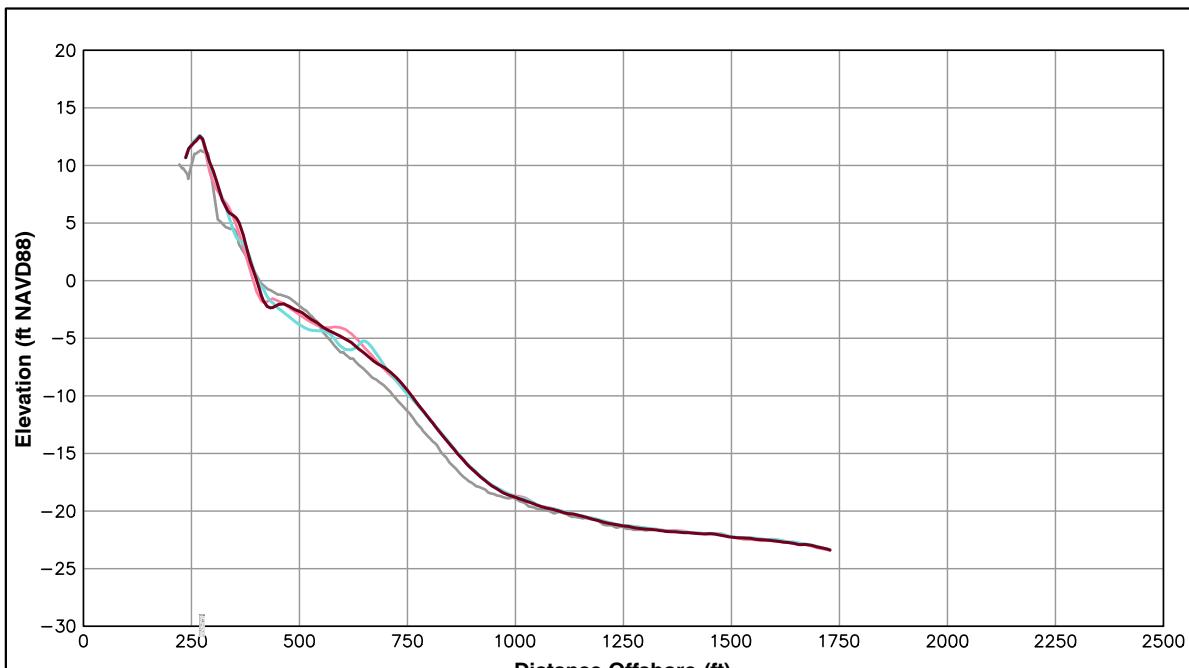
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Norfolk**

OCEAN VIEW PERIODIC
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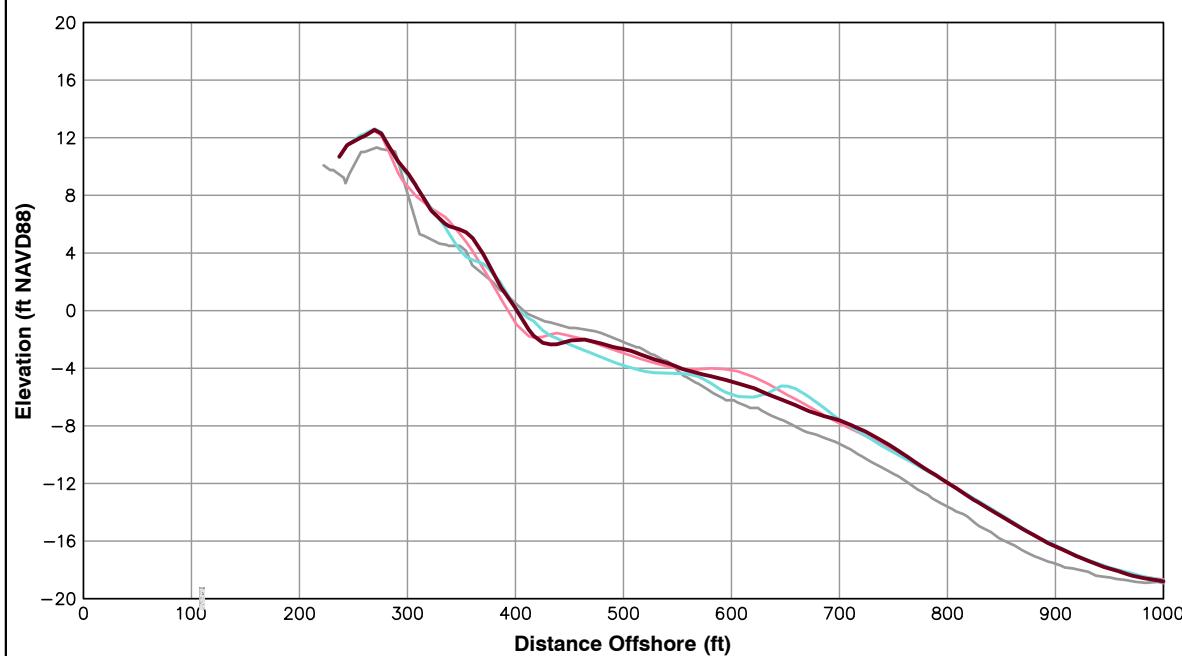
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	7.45 ft/yr	-1.32 ft
Volume Change Above -15 ft NAVD88	0.85 cy/ft/yr	4.09 cy/ft
Volume Change Above 0 ft NAVD88	2.37 cy/ft/yr	1.49 cy/ft

LEGEND:

2014 OCT	—
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POST-FILL	—

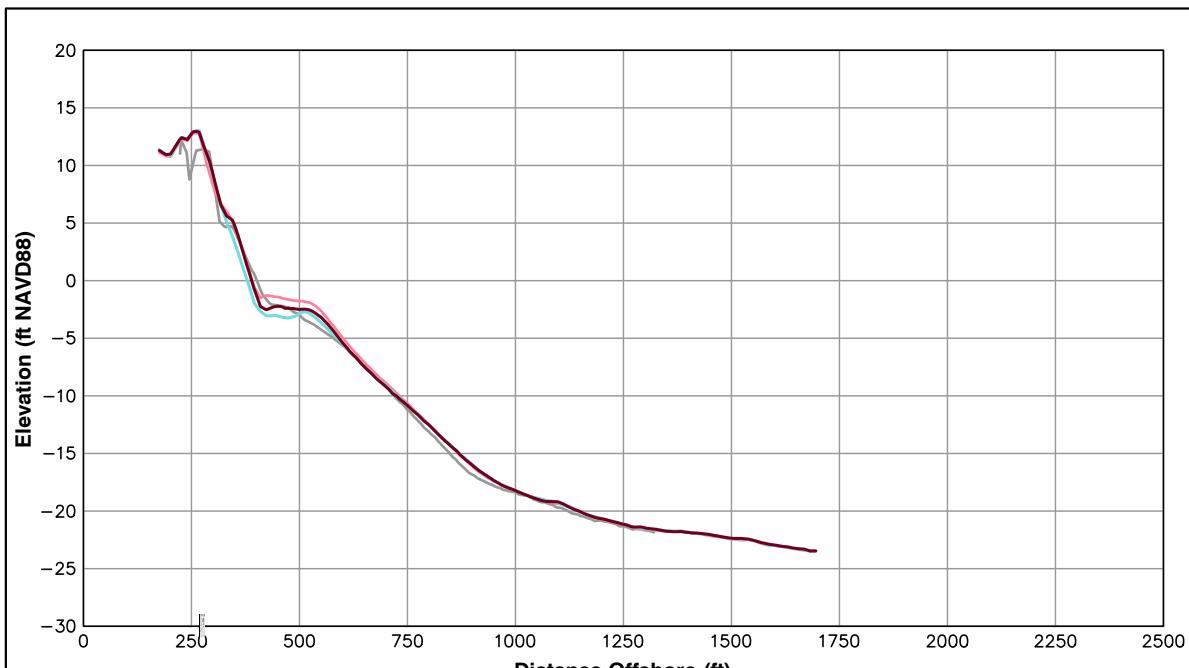
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Norfolk**

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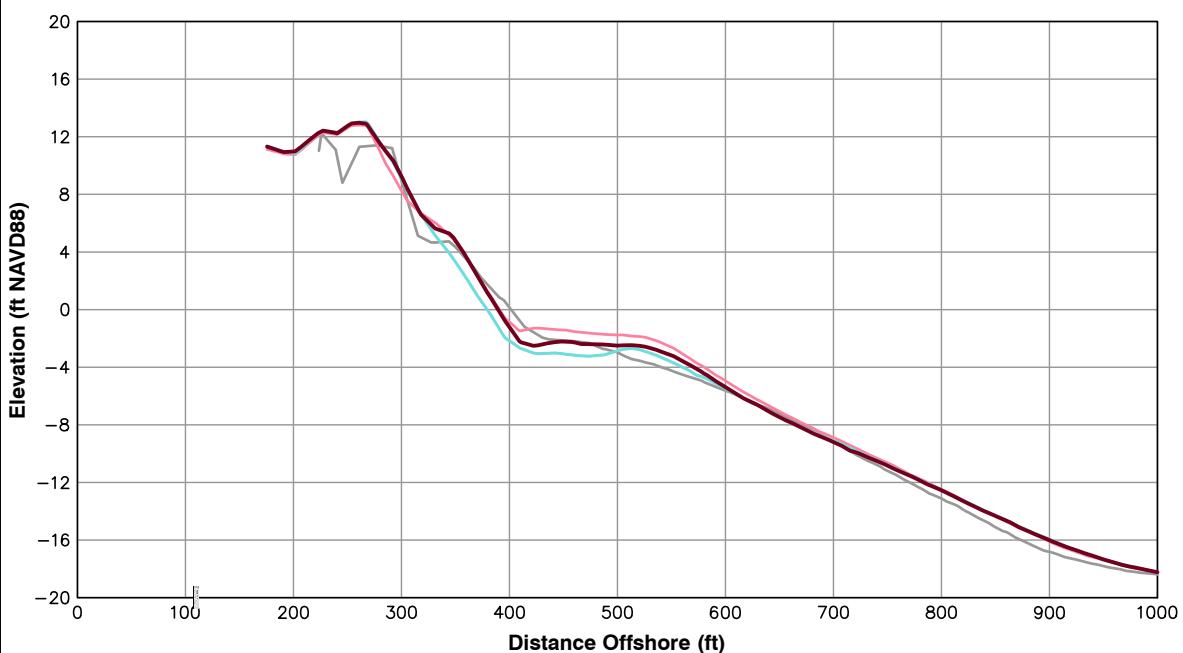
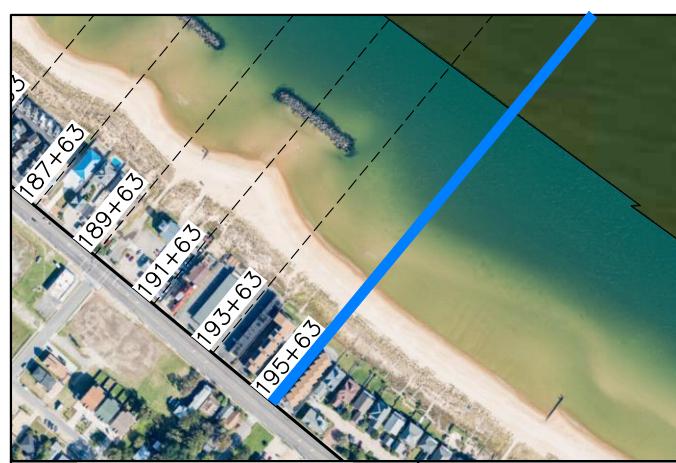


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
195+63		
Shoreline Change at MHW (0.98 ft NAVD88)	-1.00 ft/yr	11.04 ft
Volume Change Above -15 ft NAVD88	-6.05 cy/ft/yr	6.74 cy/ft
Volume Change Above 0 ft NAVD88	1.55 cy/ft/yr	2.70 cy/ft

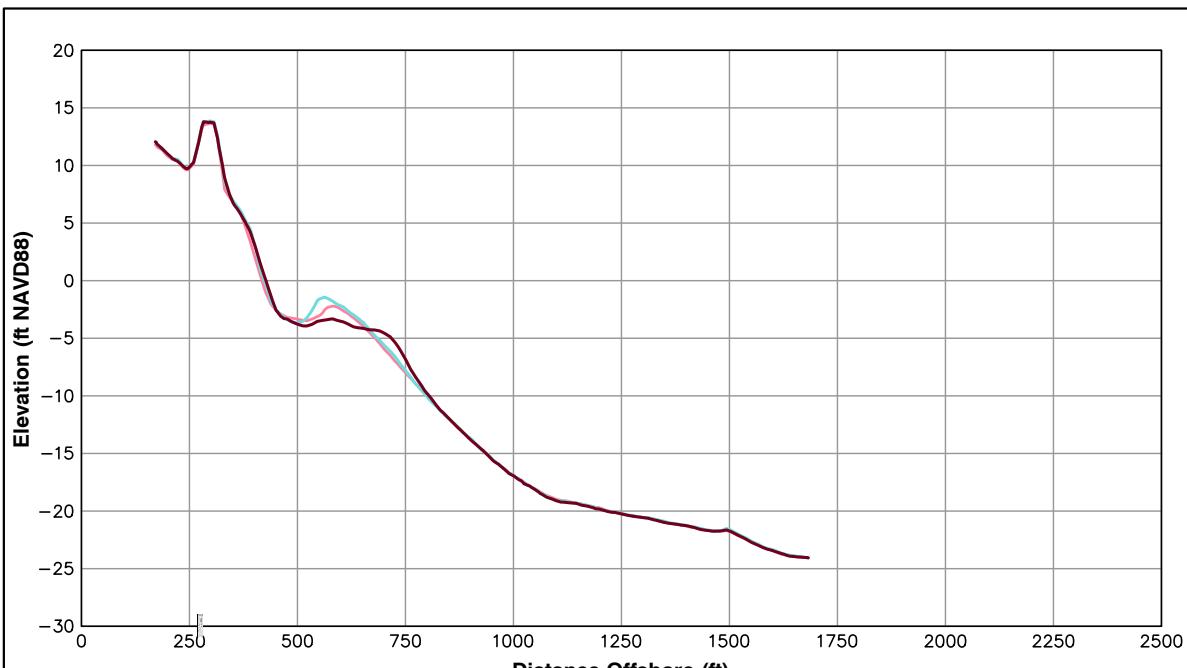
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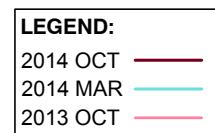
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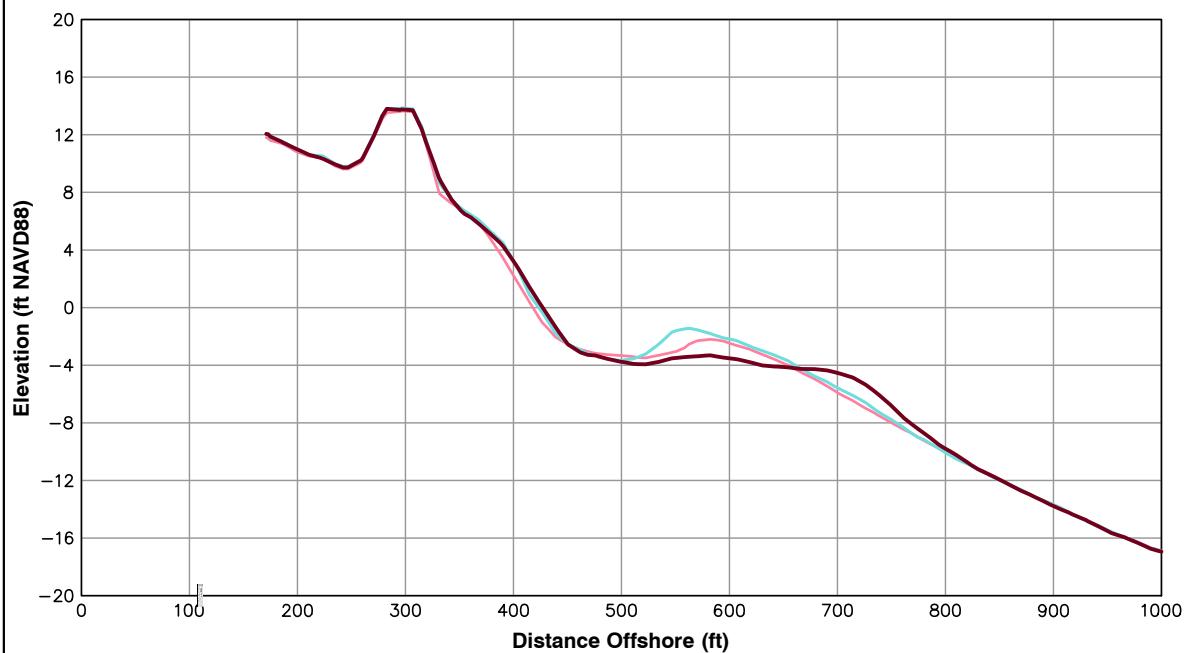
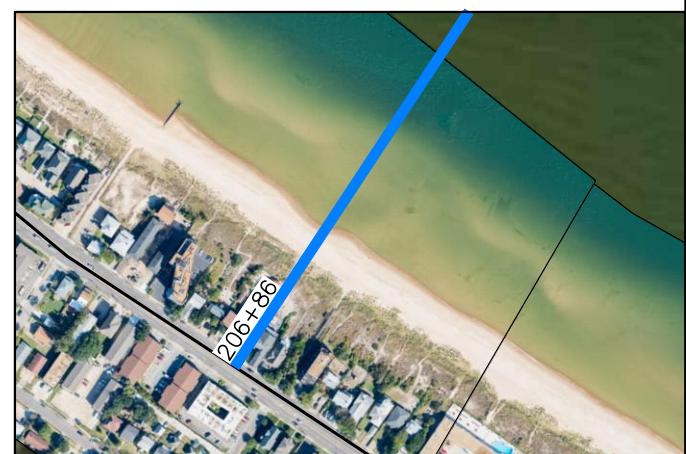


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	8.78 ft/yr	4.36 ft
Volume Change Above -15 ft NAVD88	4.02 cy/ft/yr	-2.91 cy/ft
Volume Change Above 0 ft NAVD88	2.77 cy/ft/yr	-0.28 cy/ft



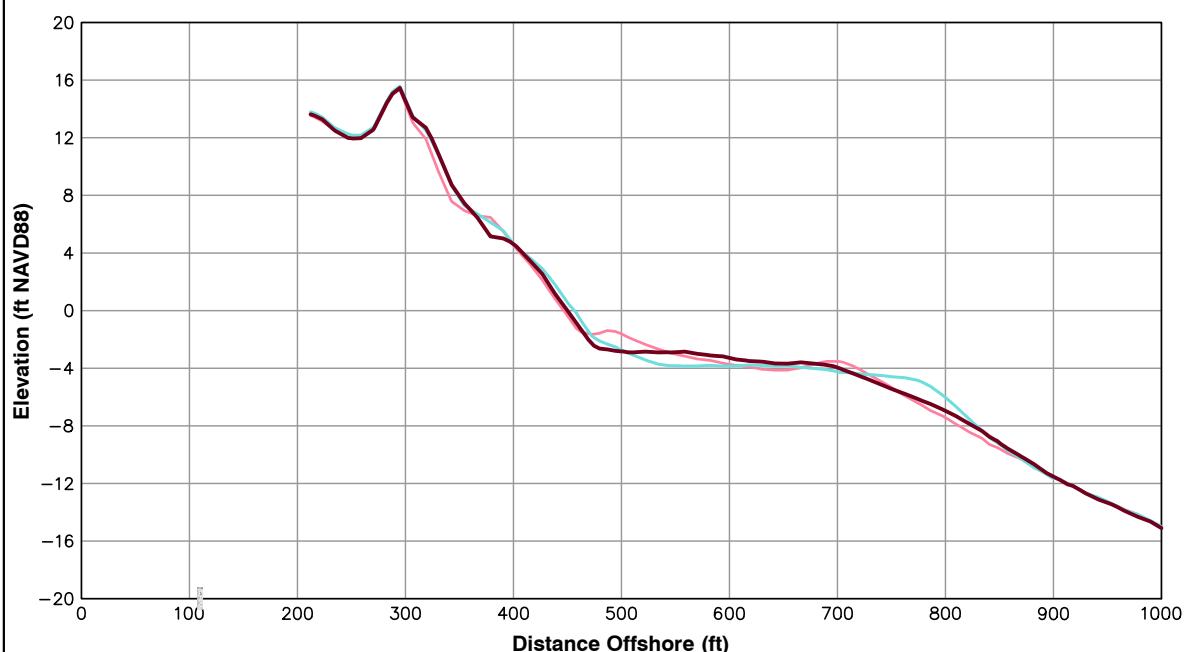
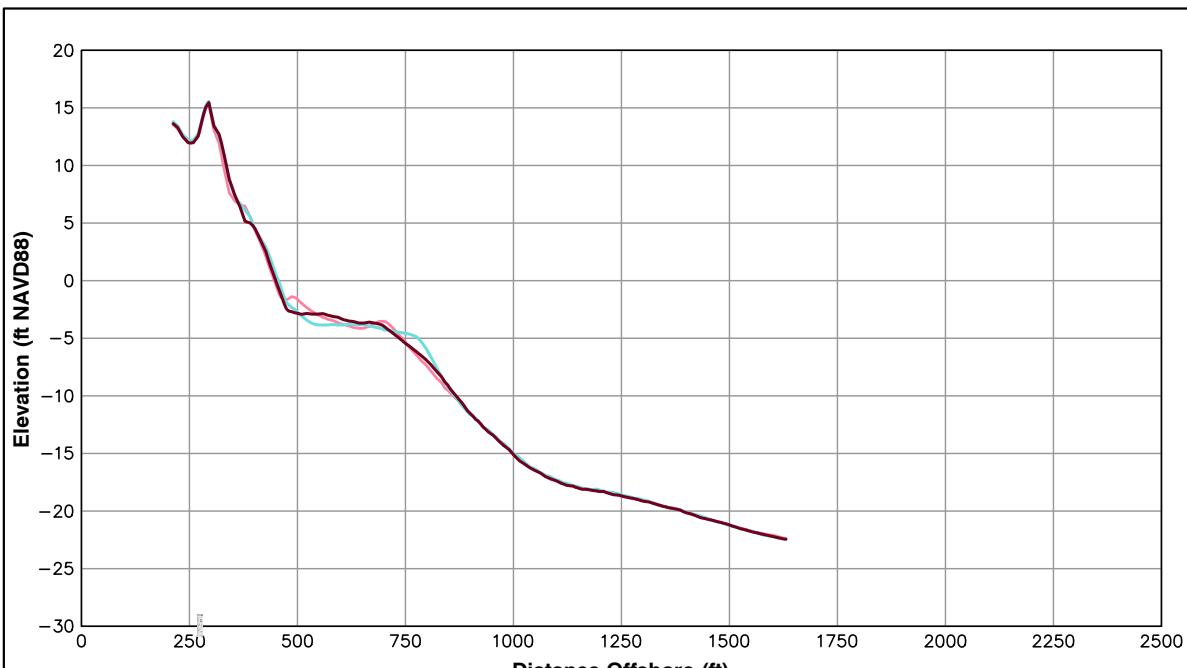
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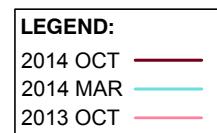


**City of
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**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

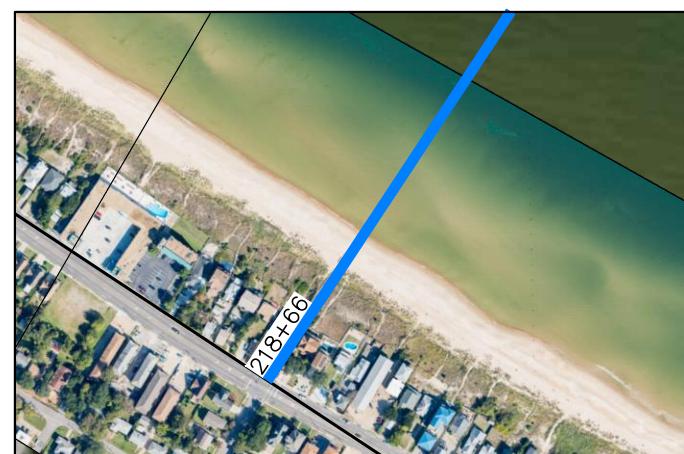


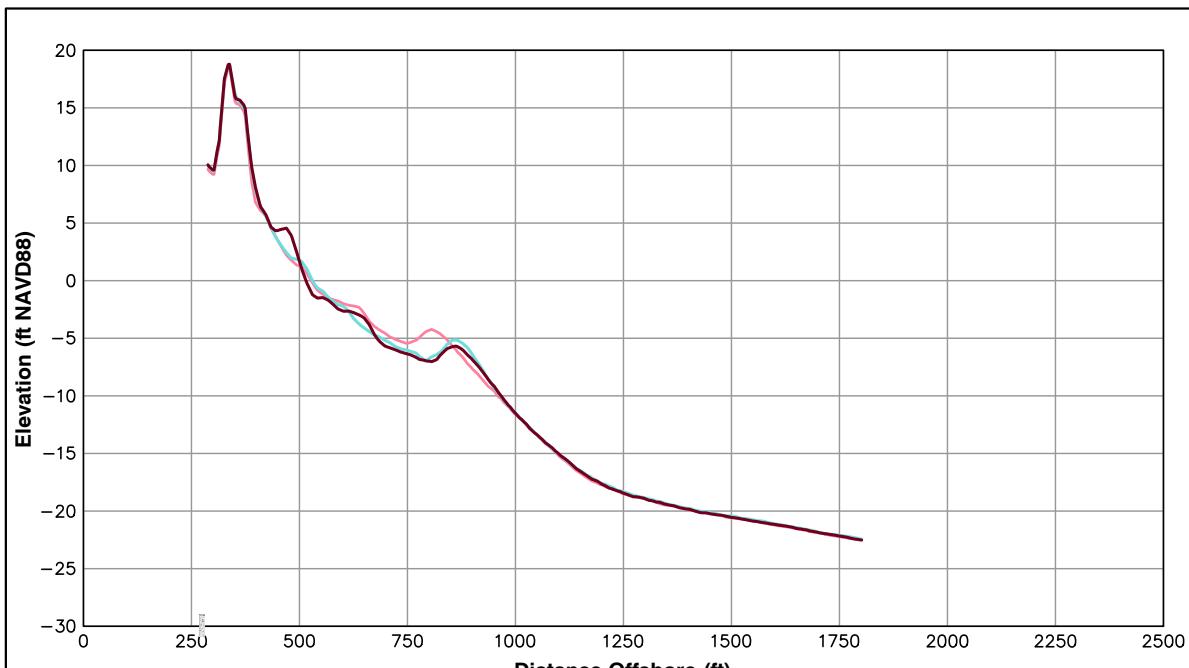
Survey Transect 218+66	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	3.38 ft/yr	-5.76 ft
Volume Change Above -15 ft NAVD88	2.40 cy/ft/yr	-2.17 cy/ft
Volume Change Above 0 ft NAVD88	1.76 cy/ft/yr	-1.84 cy/ft



Notes:

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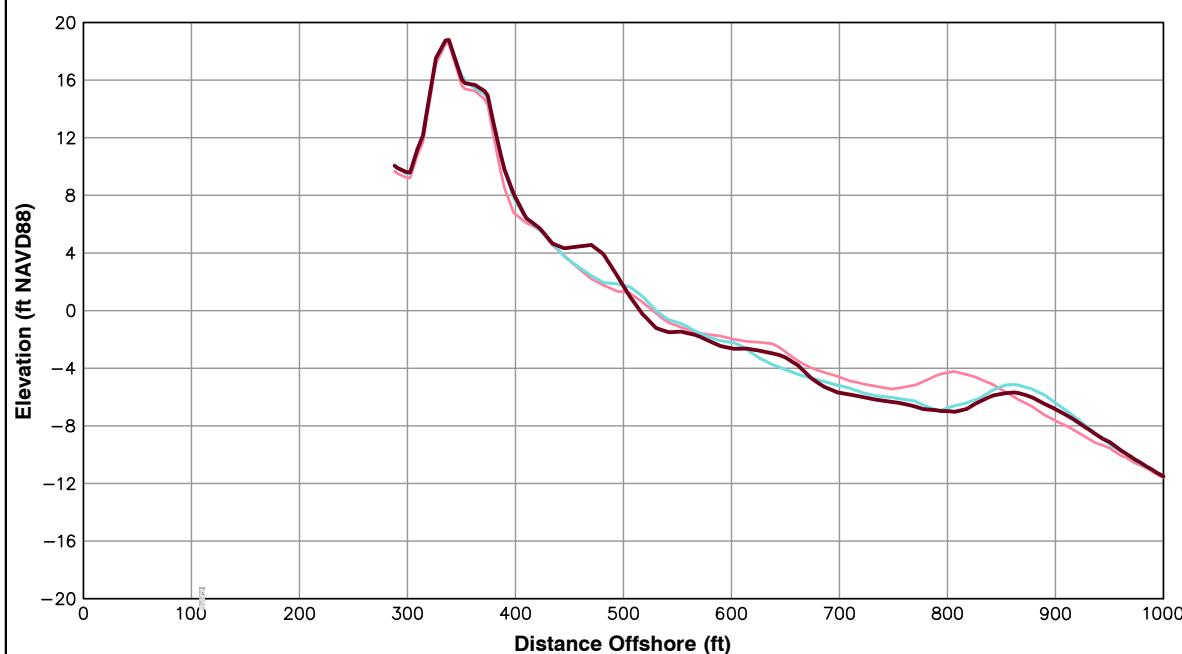
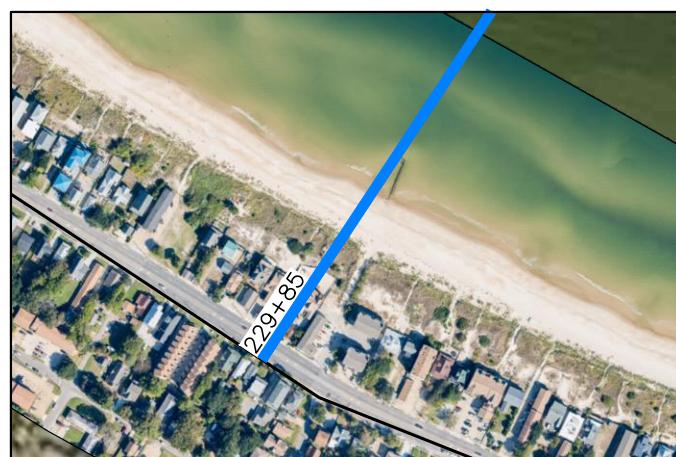


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-4.40 ft/yr	-11.86 ft
Volume Change Above -15 ft NAVD88	-3.94 cy/ft/yr	-1.24 cy/ft
Volume Change Above 0 ft NAVD88	5.94 cy/ft/yr	2.58 cy/ft

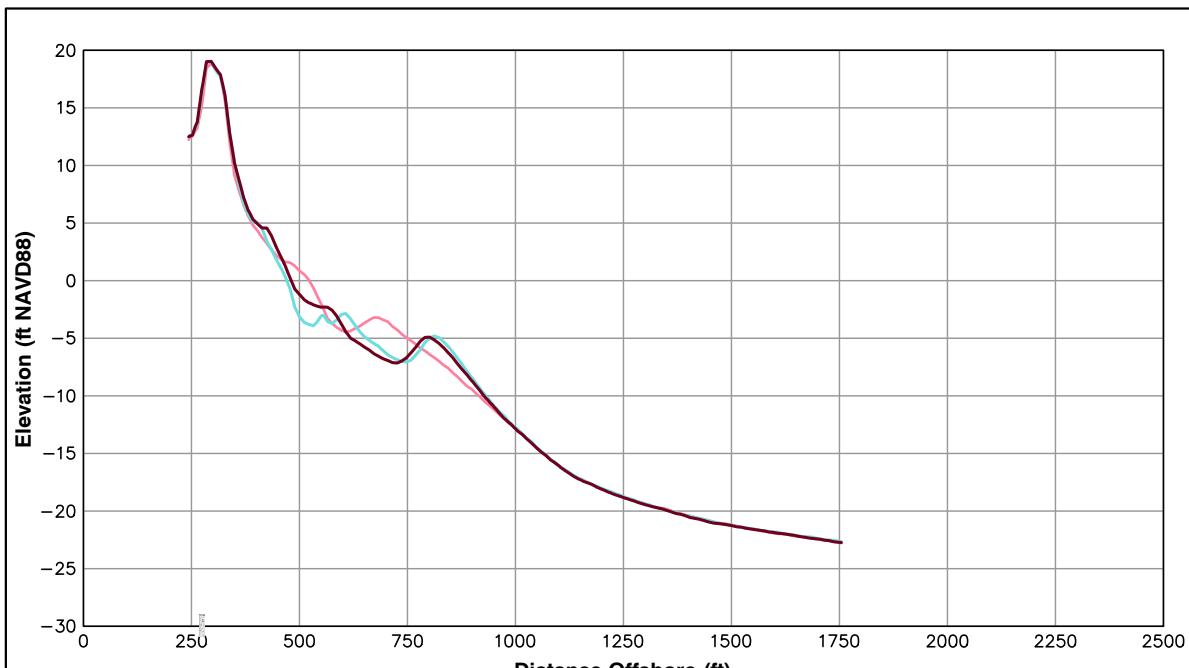
LEGEND:
2014 OCT
2014 MAR
2013 OCT

Notes:

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

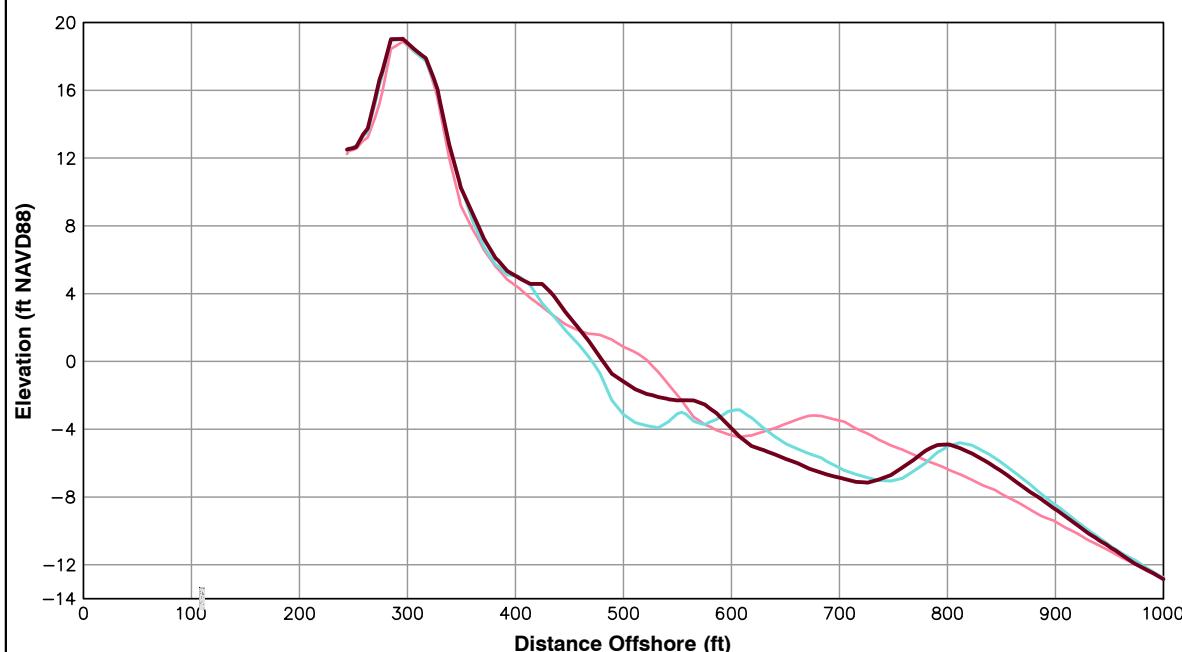
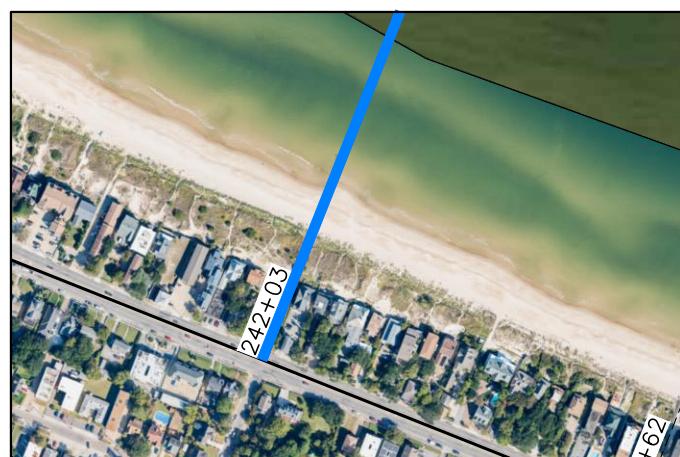


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

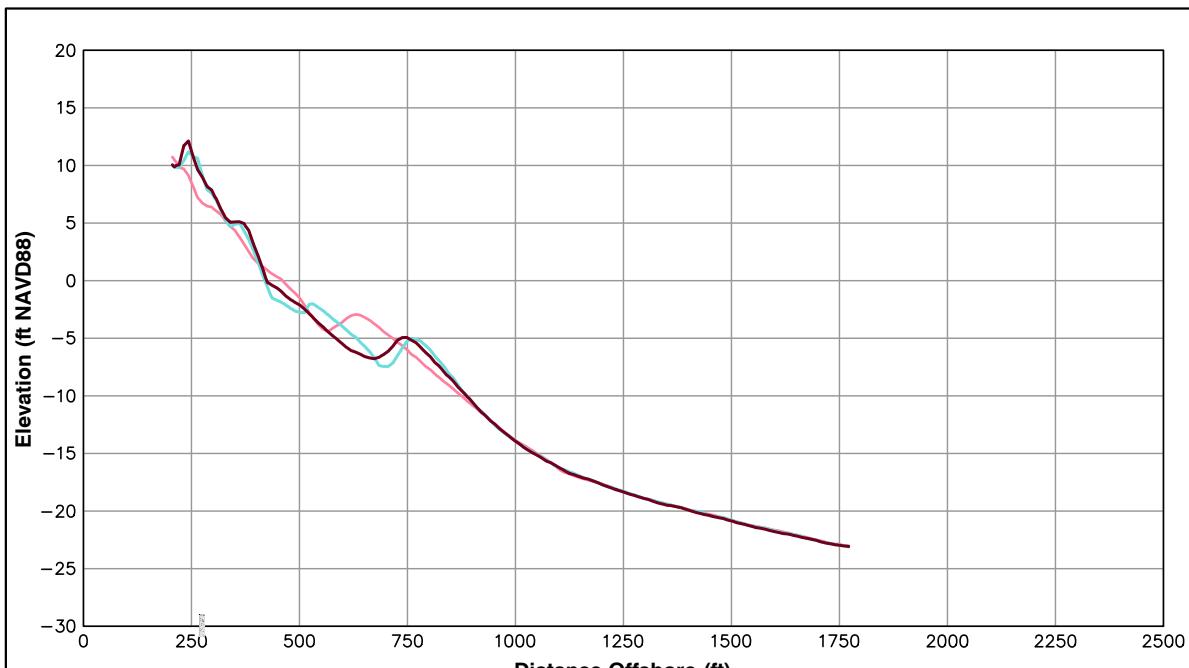
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

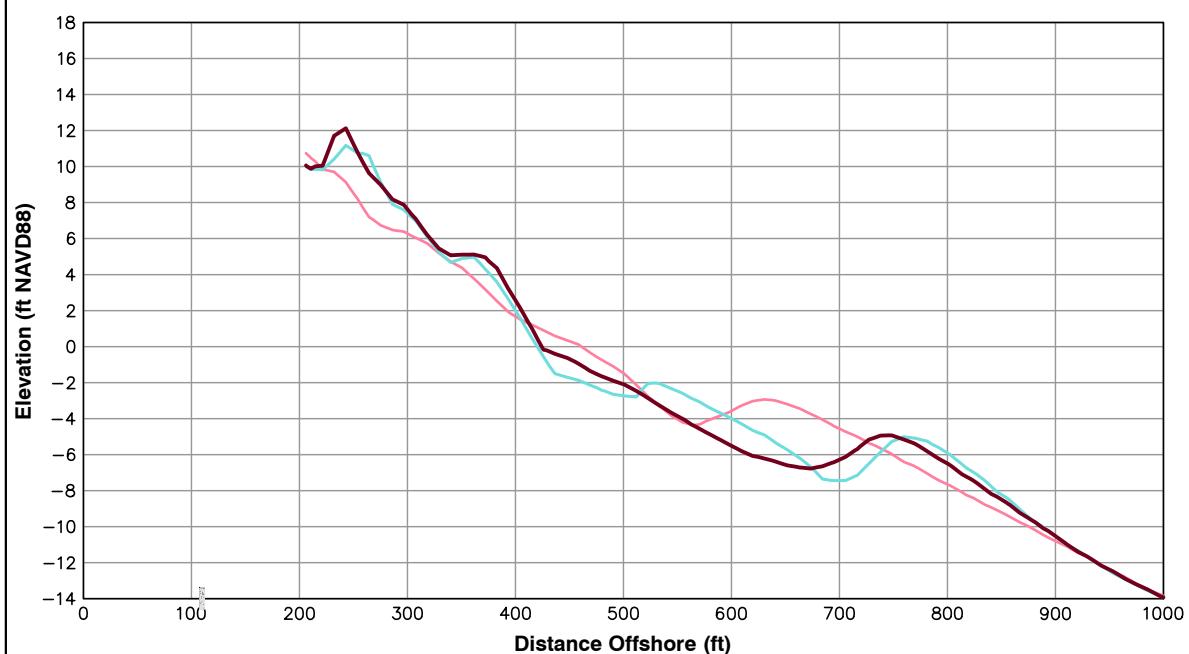
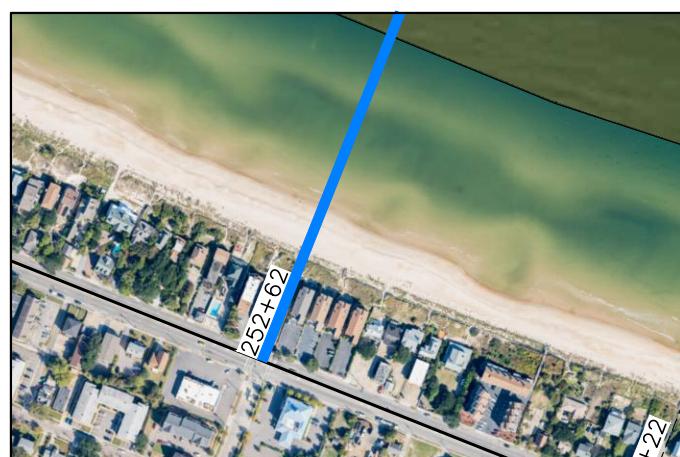


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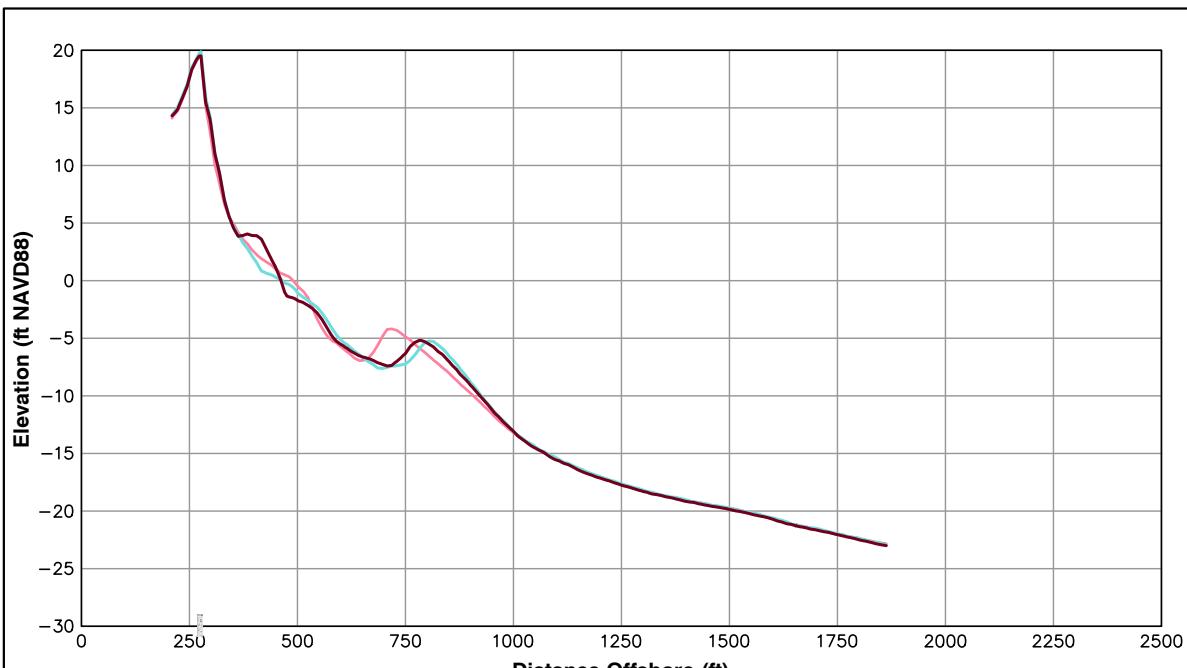
2014 OCT	—
2014 MAR	—
2013 OCT	—

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

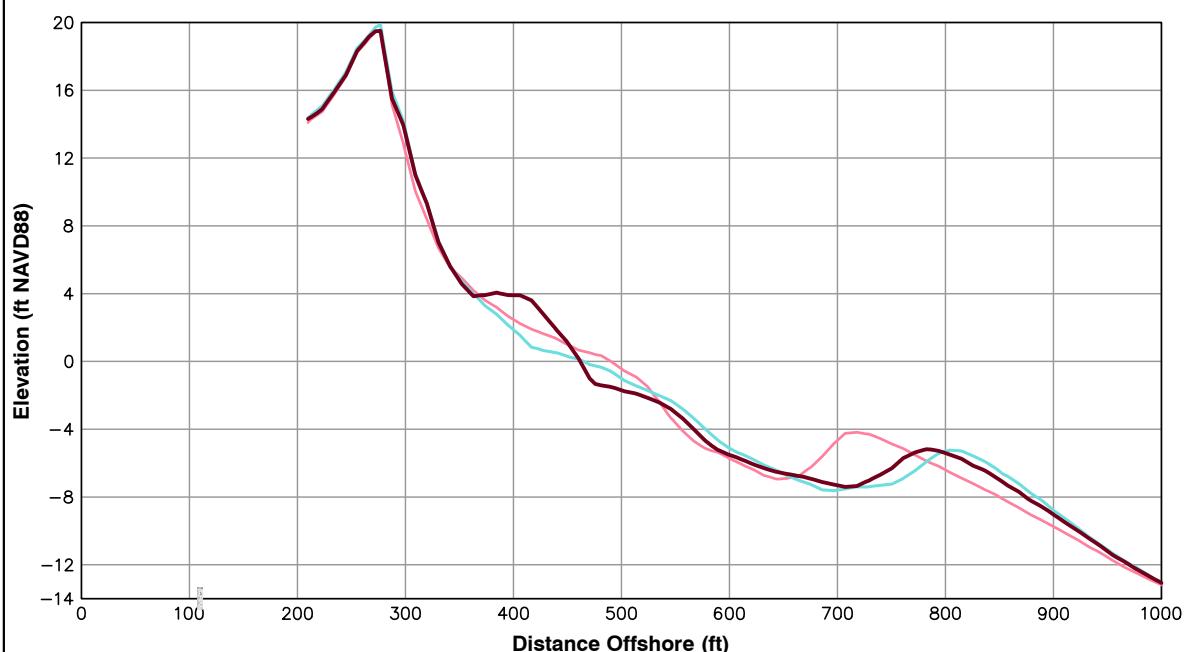
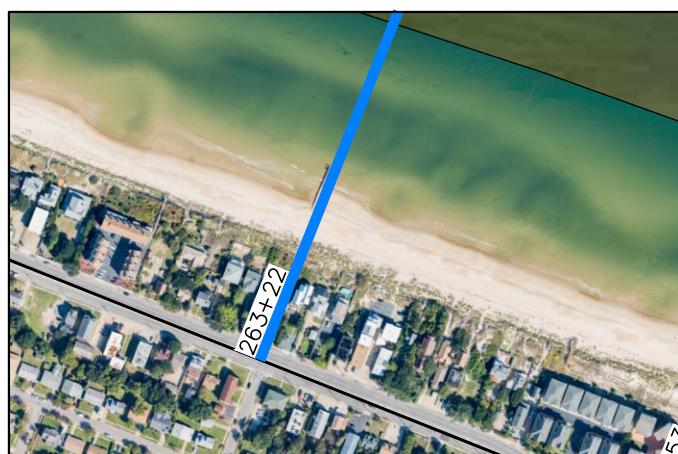


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

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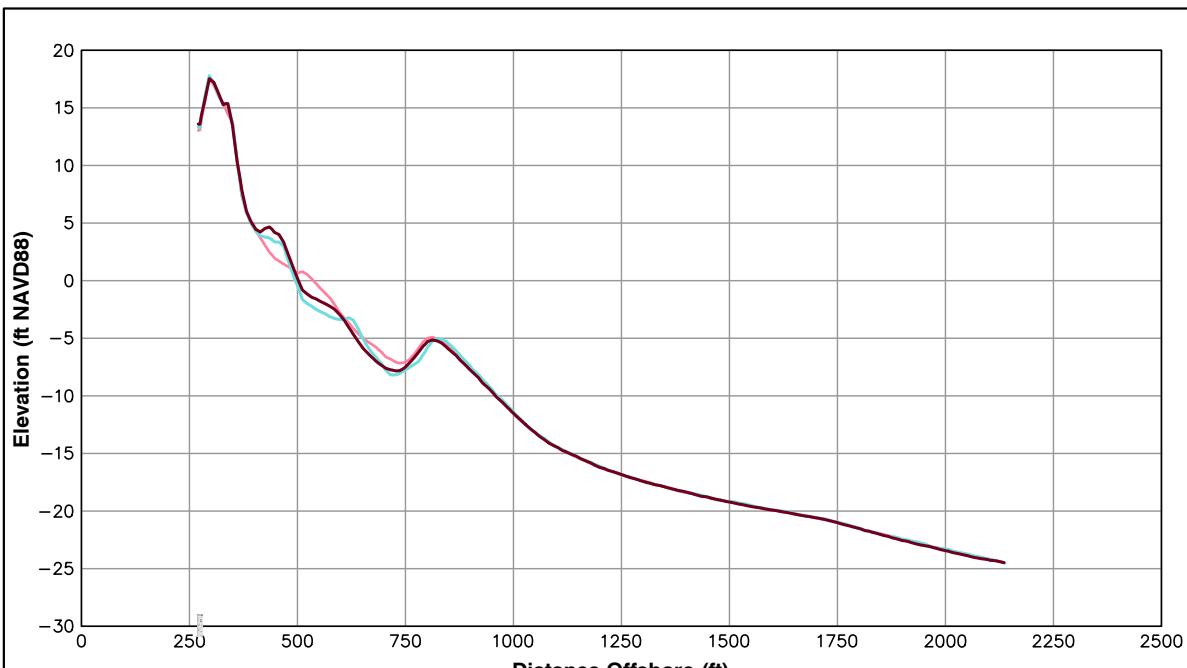


ST 263+22

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

Pg 68 of 106

Fall 2014

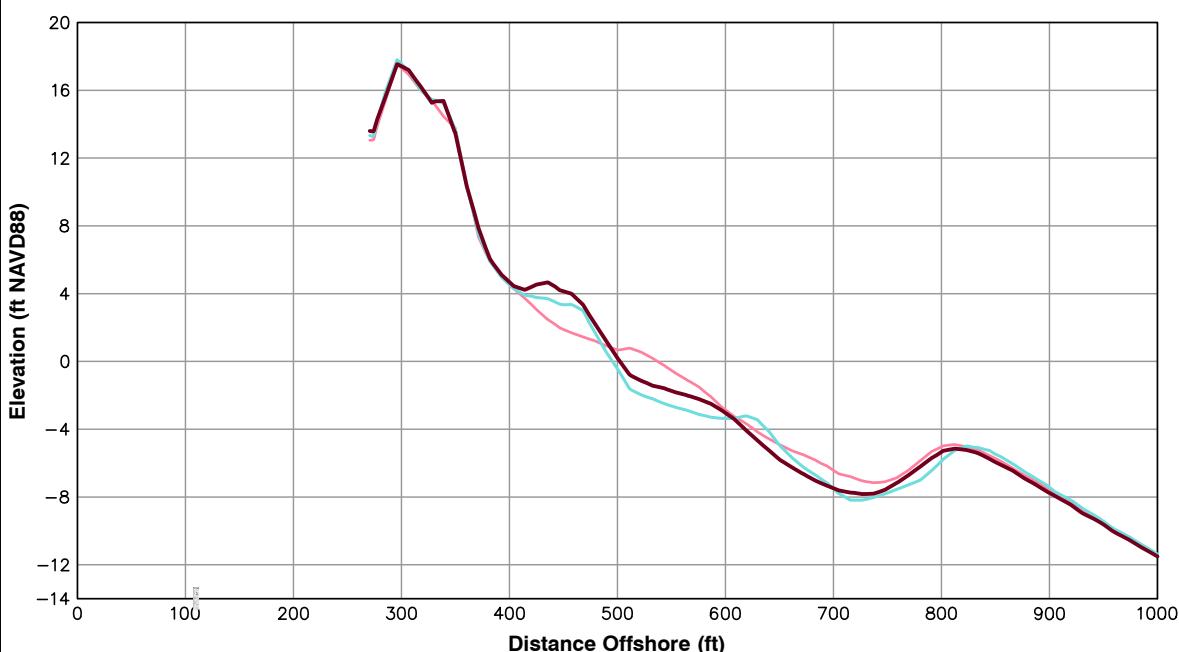
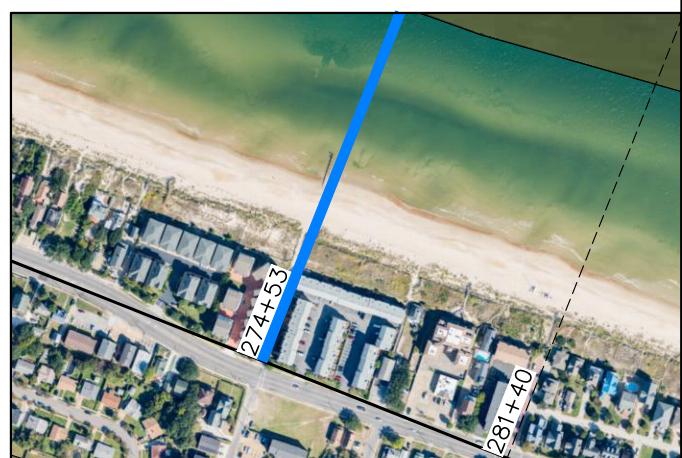


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

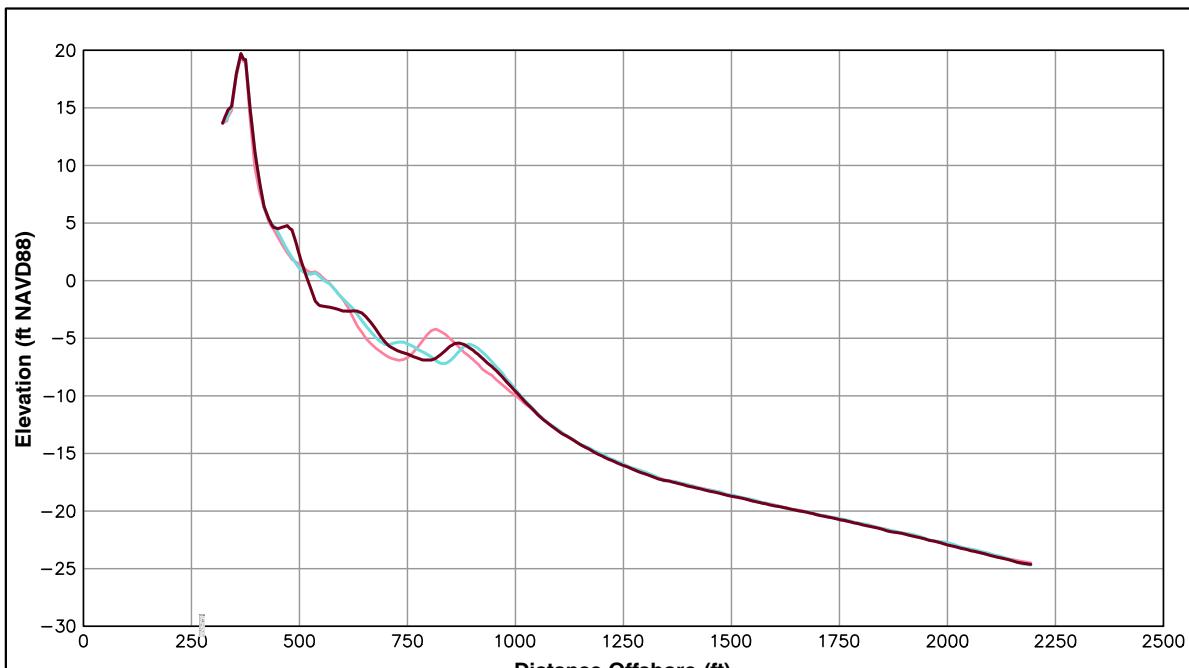
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect 281+40

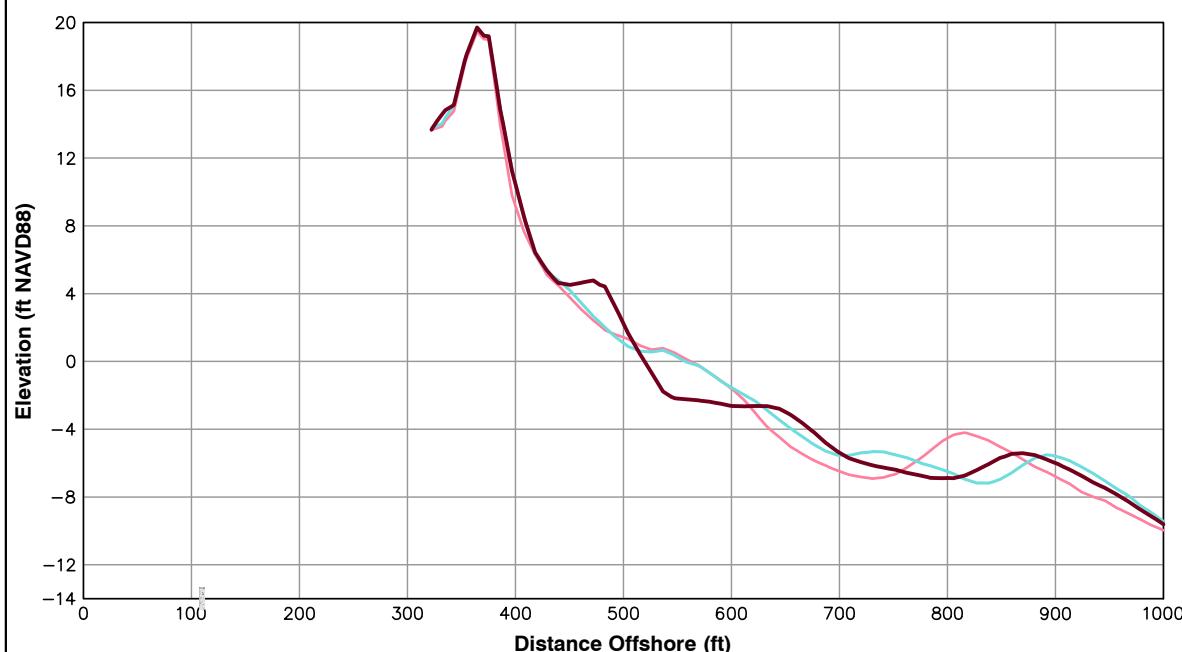
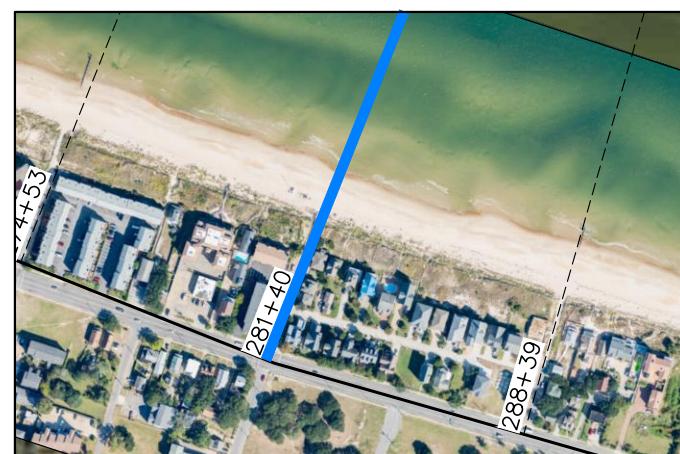
Parameter	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-3.87 ft/yr	8.11 ft
Volume Change Above -15 ft NAVD88	3.49 cy/ft/yr	-3.63 cy/ft
Volume Change Above 0 ft NAVD88	4.87 cy/ft/yr	2.83 cy/ft

LEGEND:

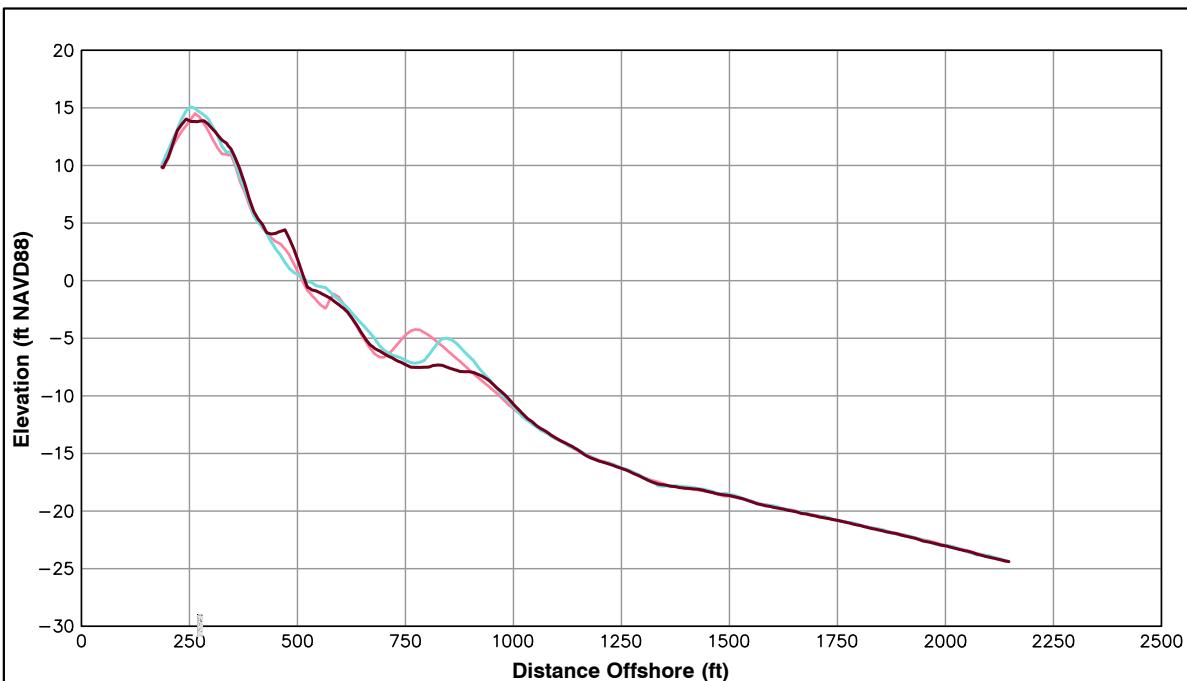
- 2014 OCT —— (dark red)
- 2014 MAR —— (light blue)
- 2013 OCT —— (pink)

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

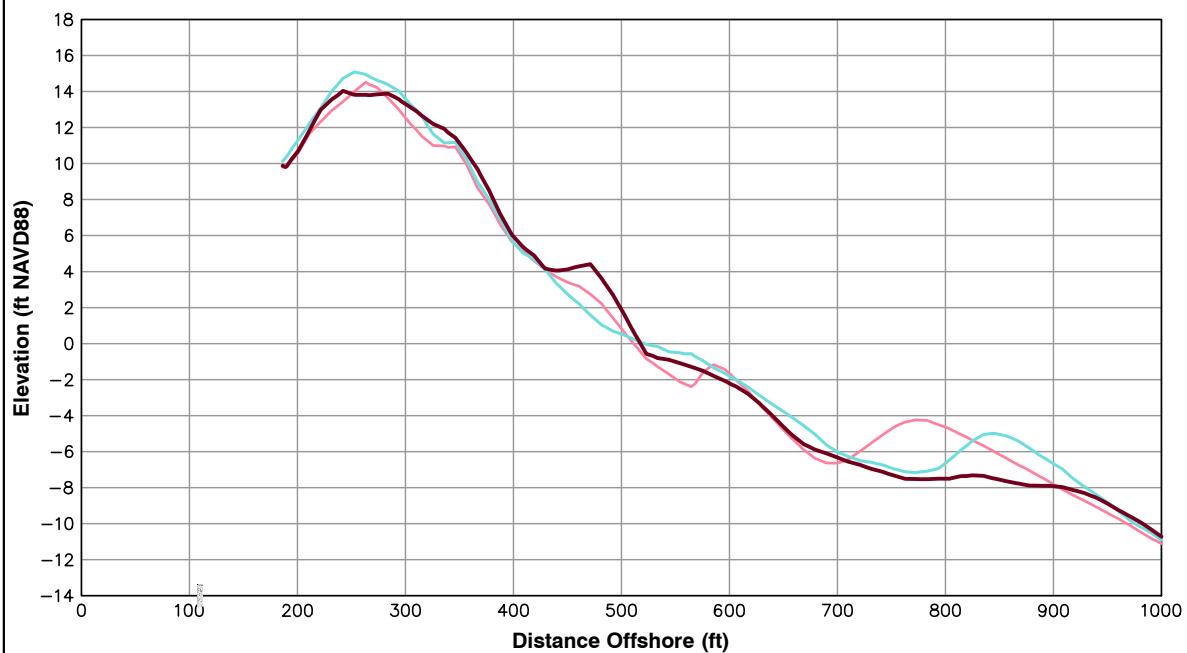
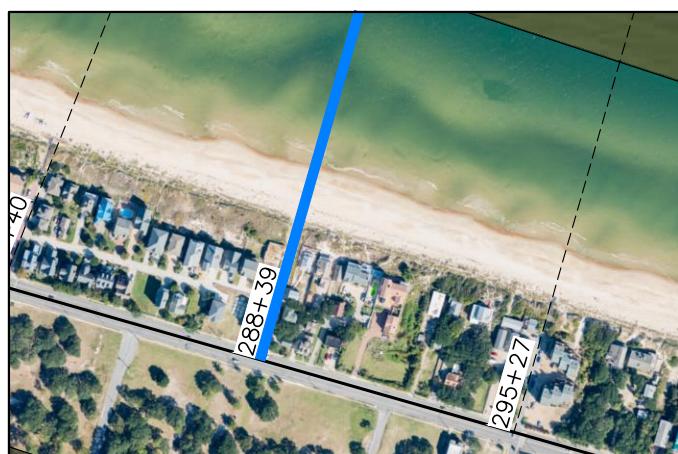


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)		
Volume Change Above -15 ft NAVD88	-2.11 cy/ft/yr	-8.70 cy/ft
Volume Change Above 0 ft NAVD88	7.28 cy/ft/yr	3.98 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT

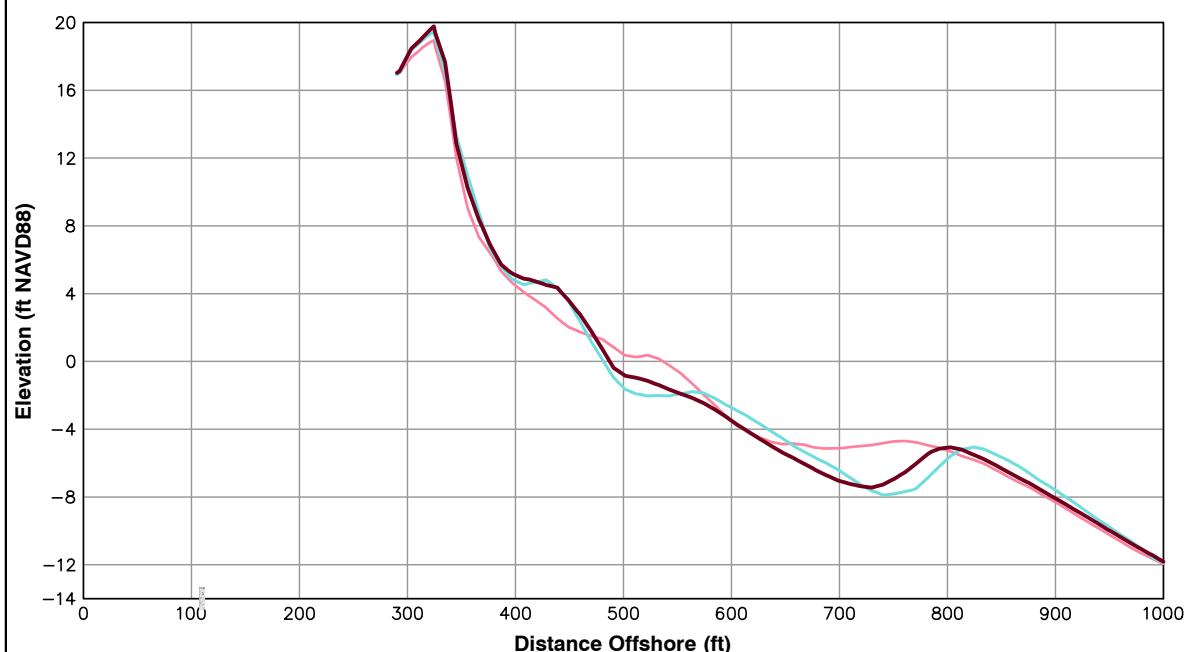
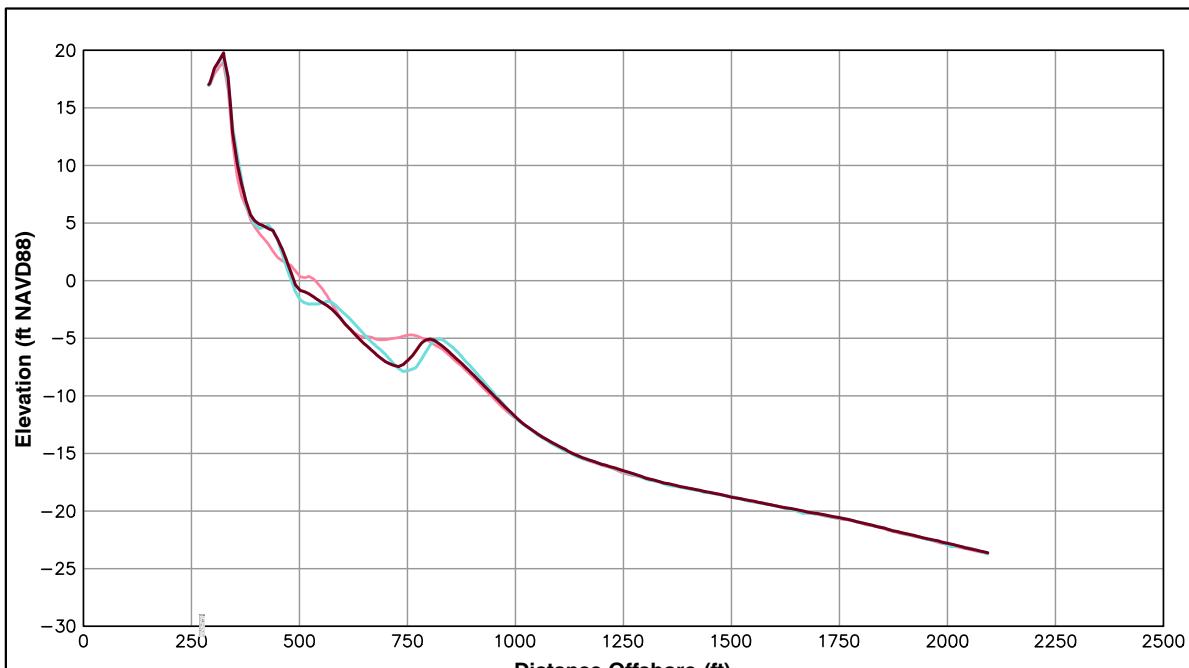
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



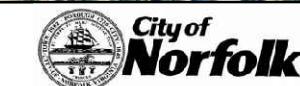
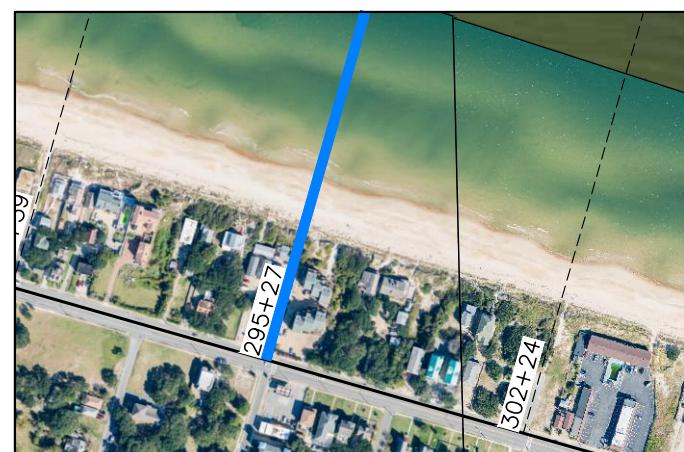
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
295+27		
Shoreline Change at MHW (0.98 ft NAVD88)	-10.00	5.98
Volume Change Above -15 ft NAVD88	-5.31	-0.94
Volume Change Above 0 ft NAVD88	5.10	0.78

LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——

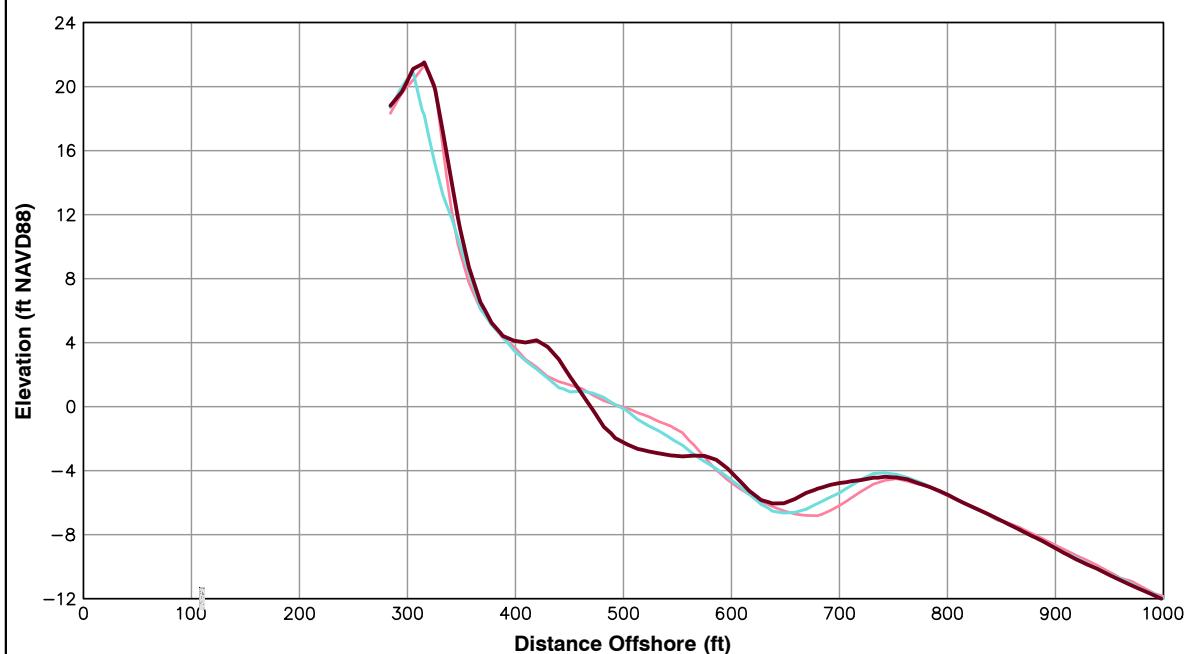
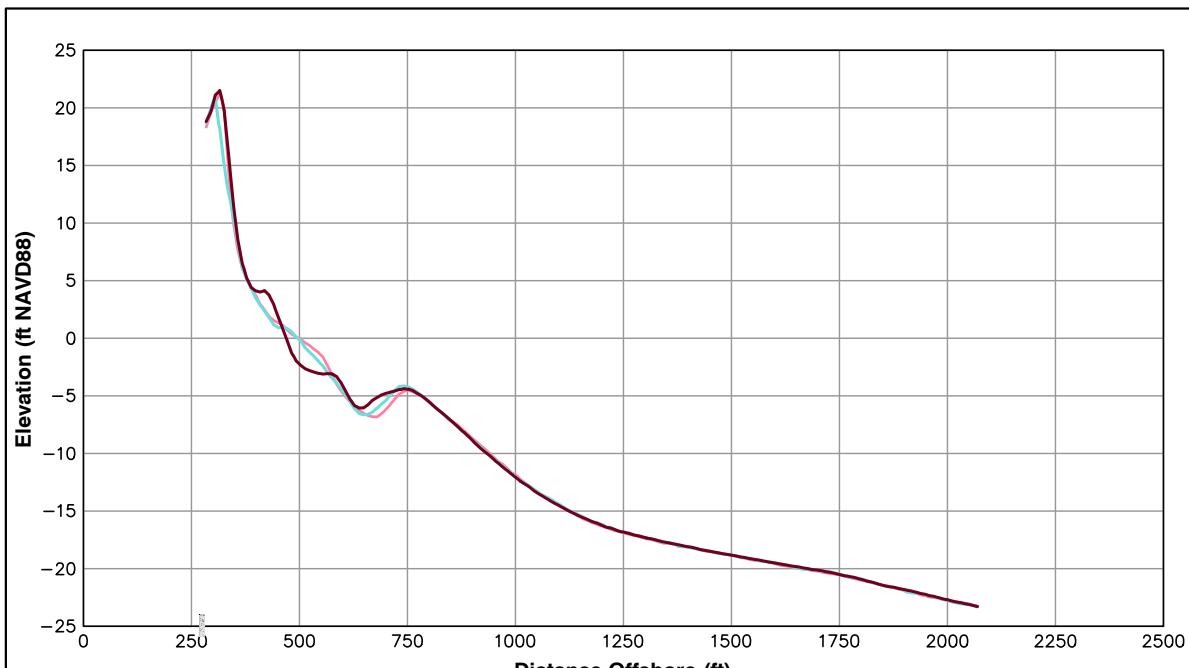
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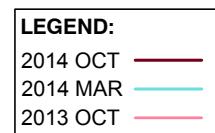


**City of
Norfolk**

**OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS**

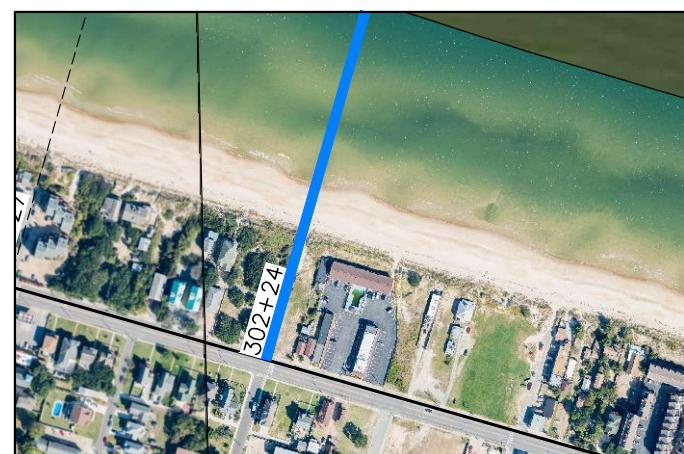


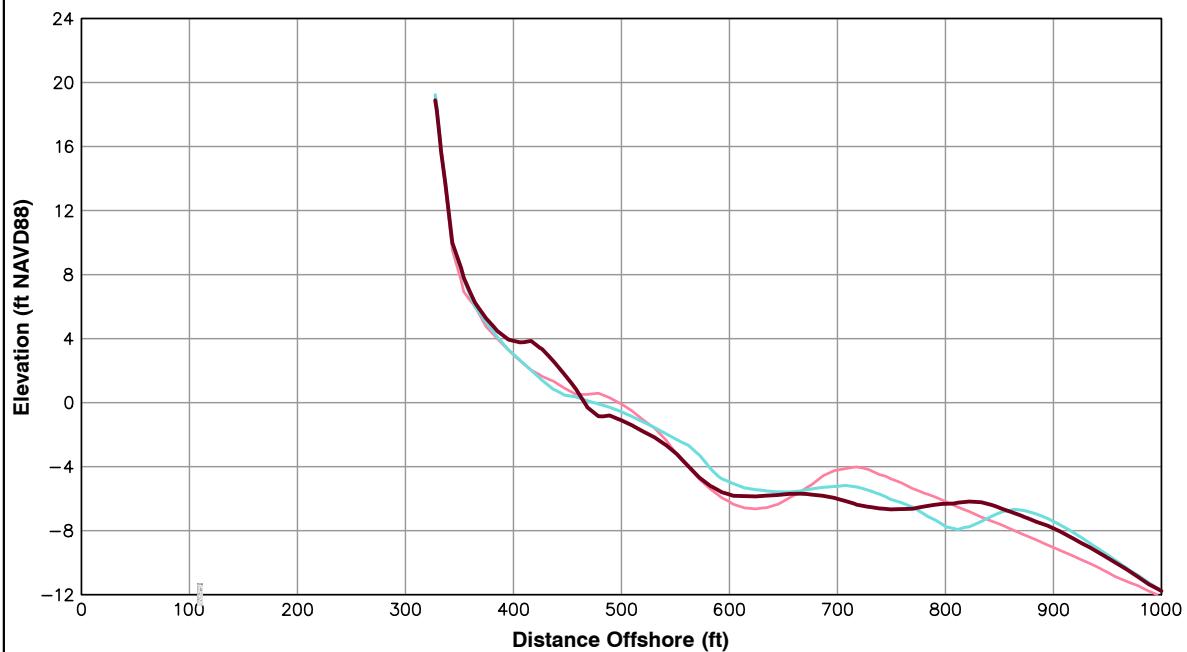
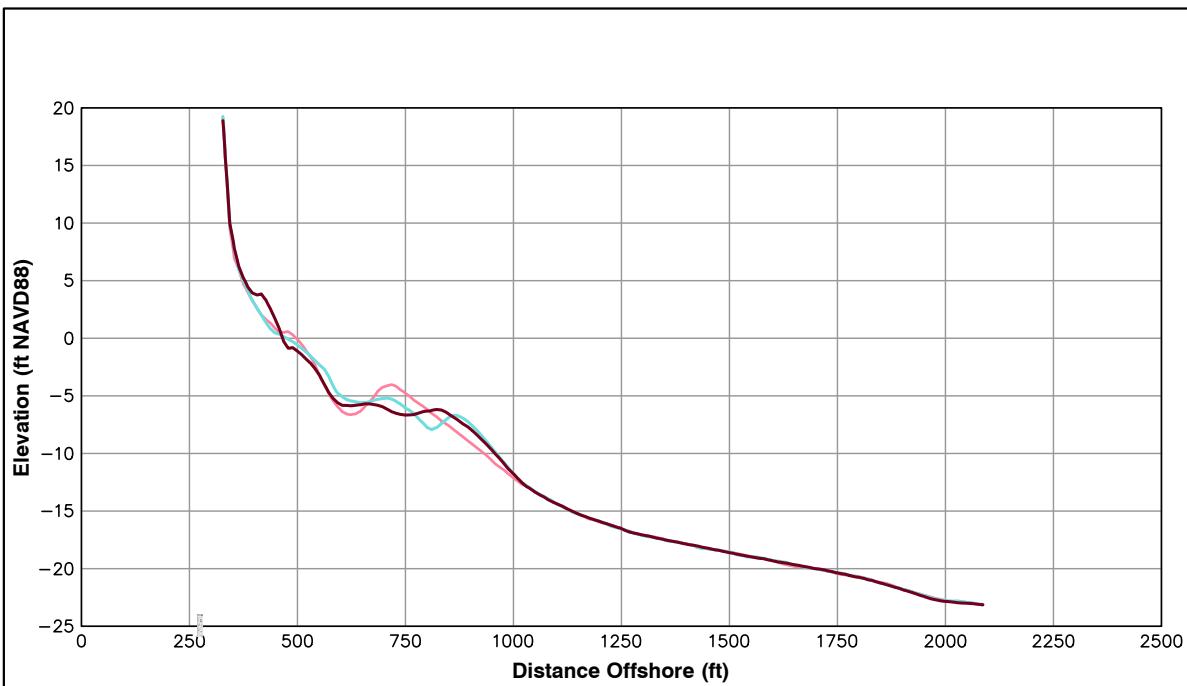
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-5.70 ft/yr	10.84 ft
Volume Change Above -15 ft NAVD88	1.73 cy/ft/yr	5.04 cy/ft
Volume Change Above 0 ft NAVD88	4.39 cy/ft/yr	7.70 cy/ft



Notes:

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Survey Transect	October 2014 - October 2013	October 2014 - March 2014
315+96		
Shoreline Change at MHW (0.98 ft NAVD88)	11.14 ft/yr	22.08 ft
Volume Change Above -15 ft NAVD88	2.33 cy/ft/yr	-1.95 cy/ft
Volume Change Above 0 ft NAVD88	3.47 cy/ft/yr	3.77 cy/ft

LEGEND:

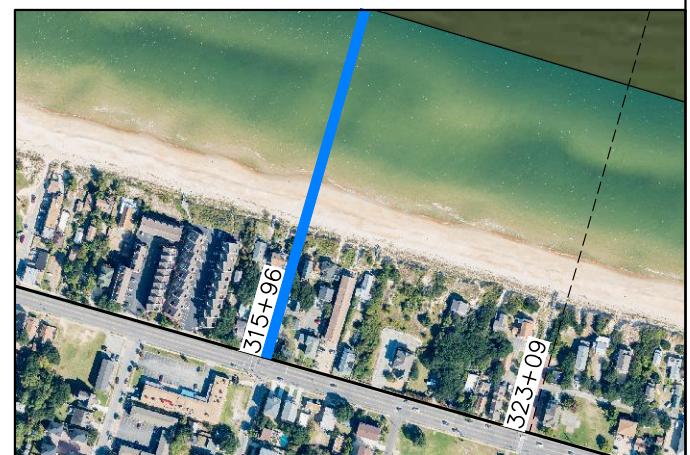
2014 OCT —

2014 MAR —

2013 OCT —

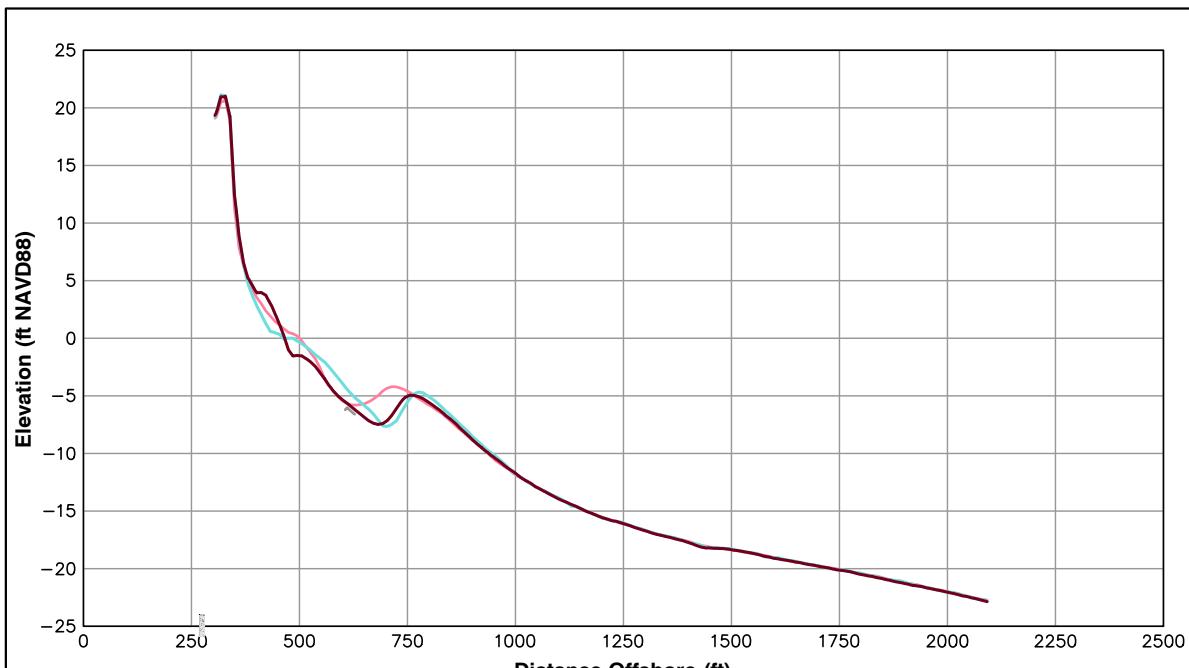
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

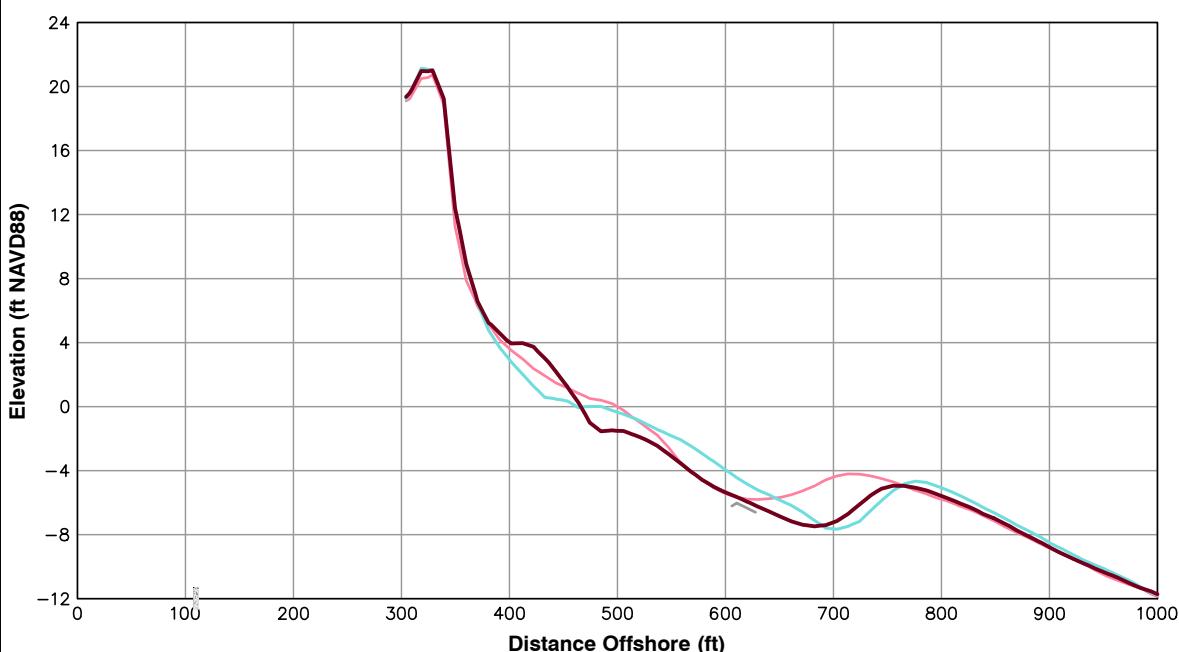
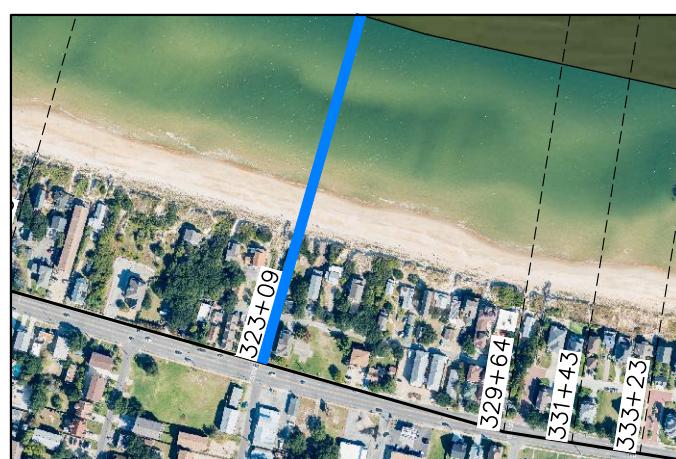


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-3.25	29.29
Volume Change Above -15 ft NAVD88	-7.57	-5.54
Volume Change Above 0 ft NAVD88	2.86	4.70

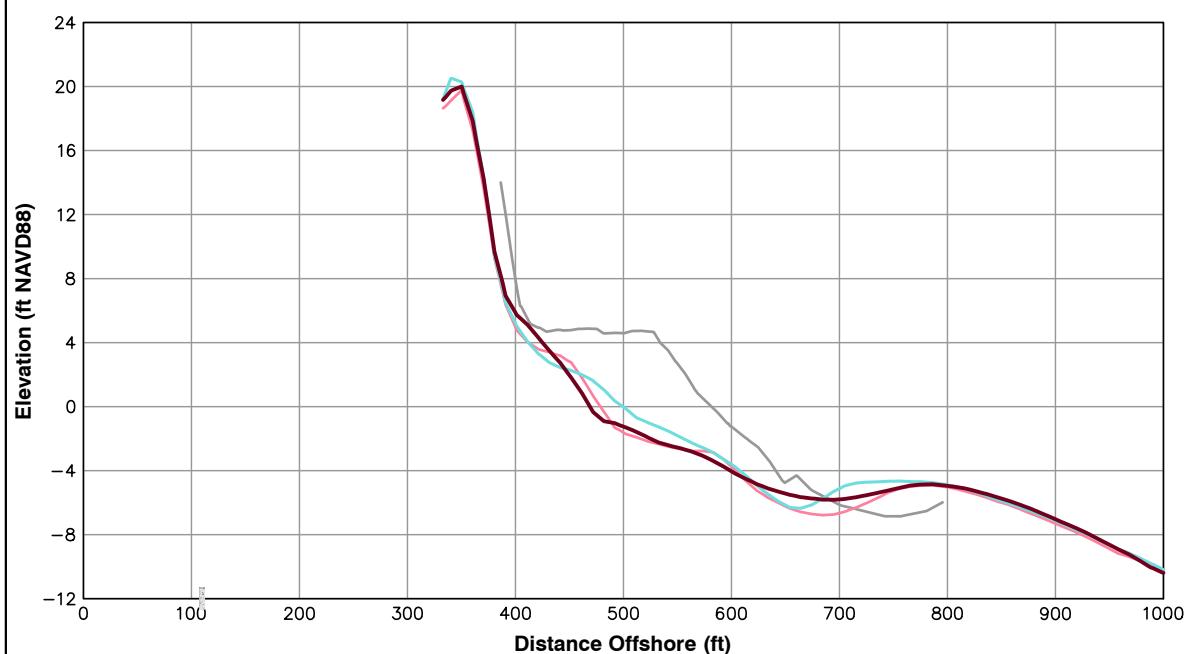
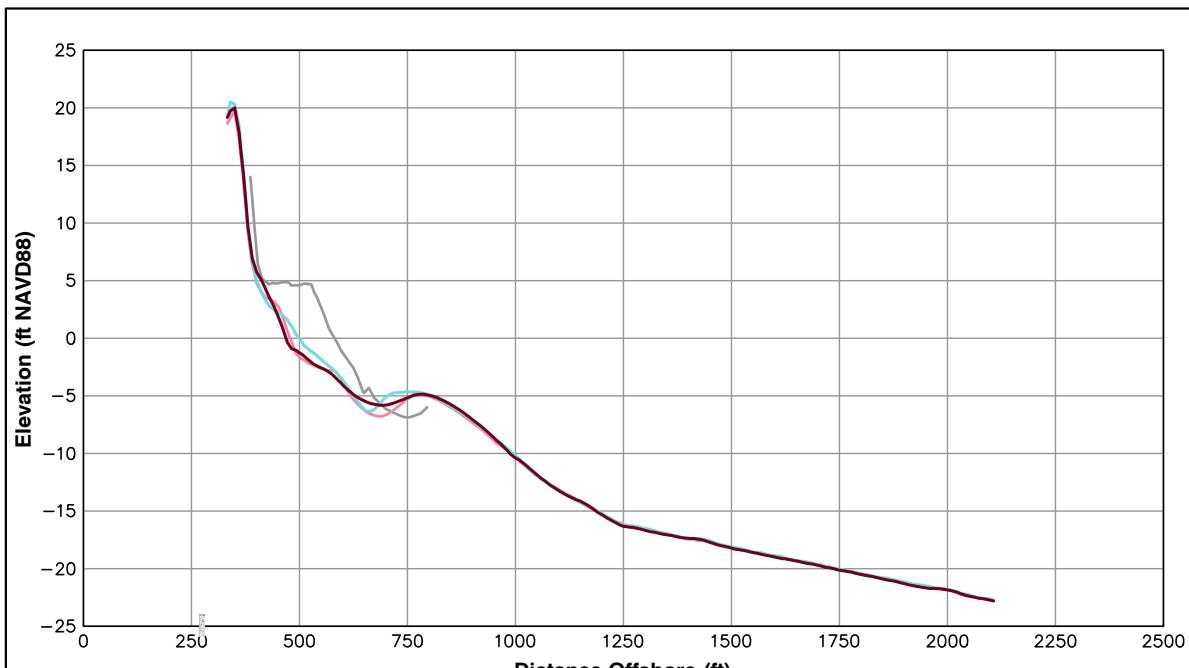
LEGEND:
2014 OCT
2014 MAR
2013 OCT

Notes:

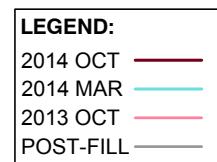
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

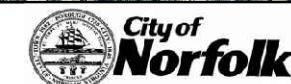
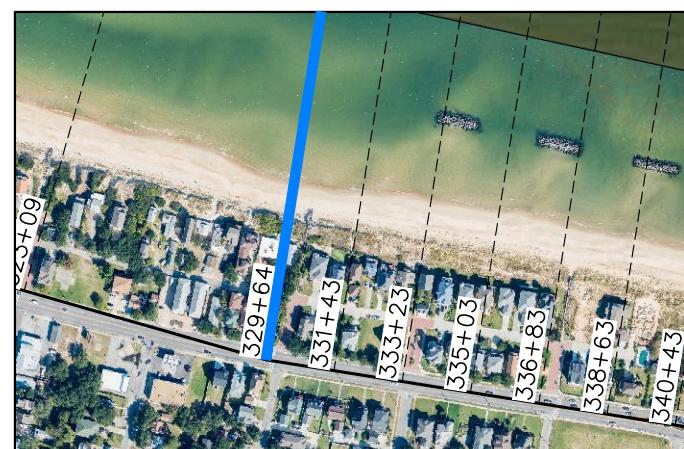


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-9.08 ft/yr	-22.59 ft
Volume Change Above -15 ft NAVD88	6.06 cy/ft/yr	-5.05 cy/ft
Volume Change Above 0 ft NAVD88	1.16 cy/ft/yr	-0.68 cy/ft

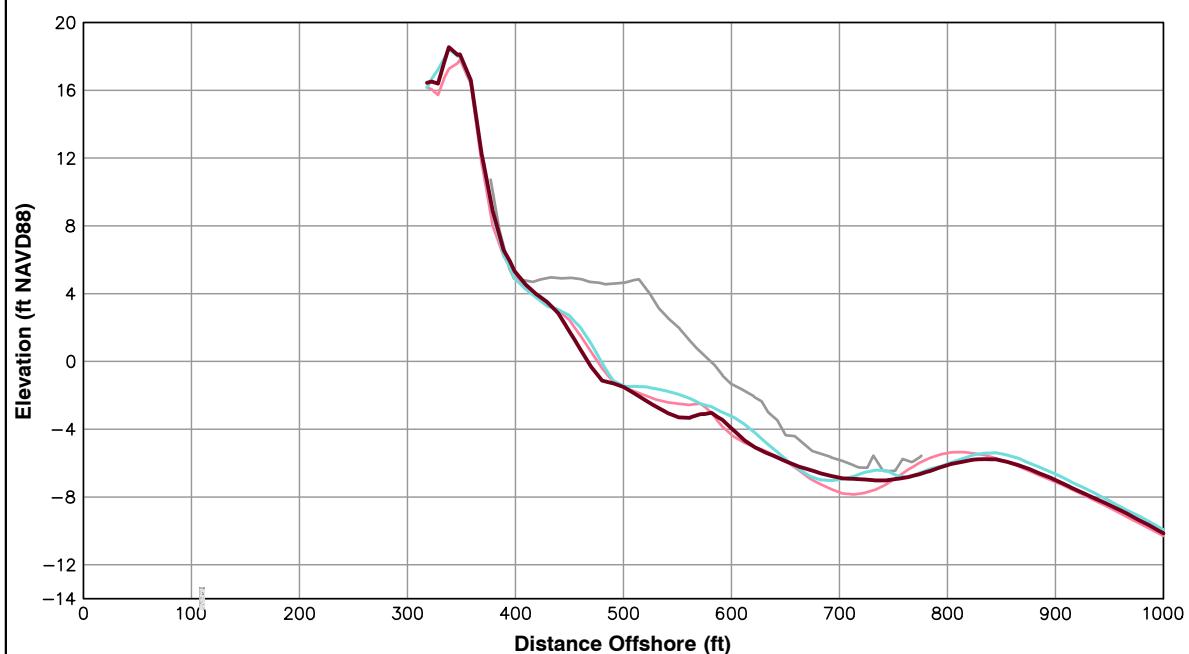
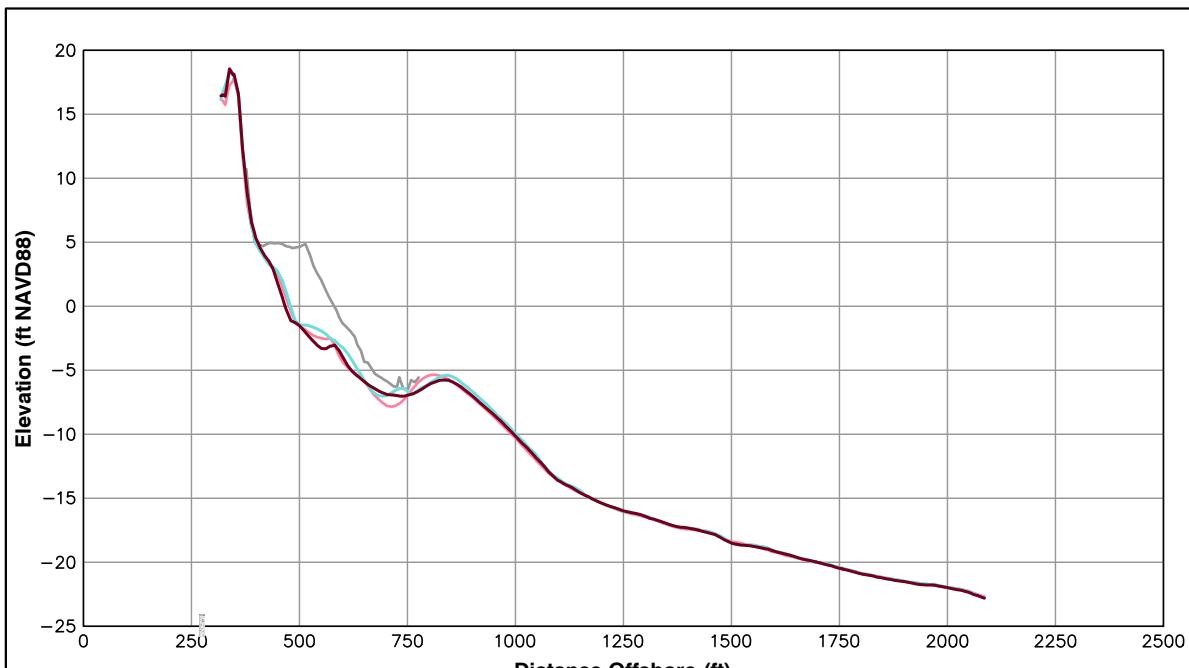


Notes:

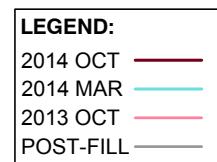
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

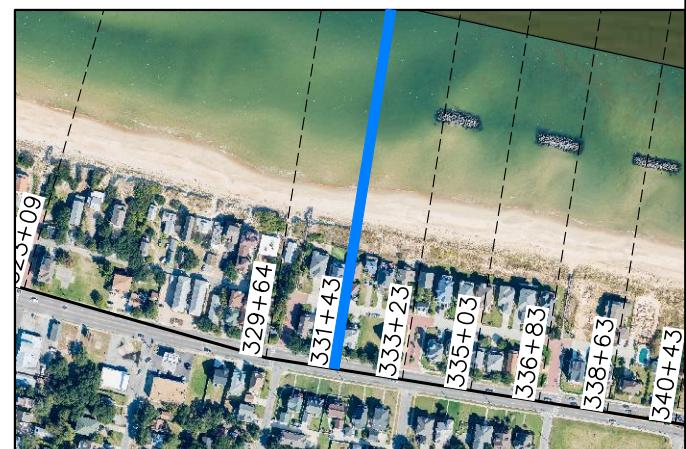


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
331+43		
Shoreline Change at MHW (0.98 ft NAVD88)	-8.39 ft/yr	-13.06 ft
Volume Change Above -15 ft NAVD88	1.33 cy/ft/yr	-8.83 cy/ft
Volume Change Above 0 ft NAVD88	1.13 cy/ft/yr	-0.80 cy/ft



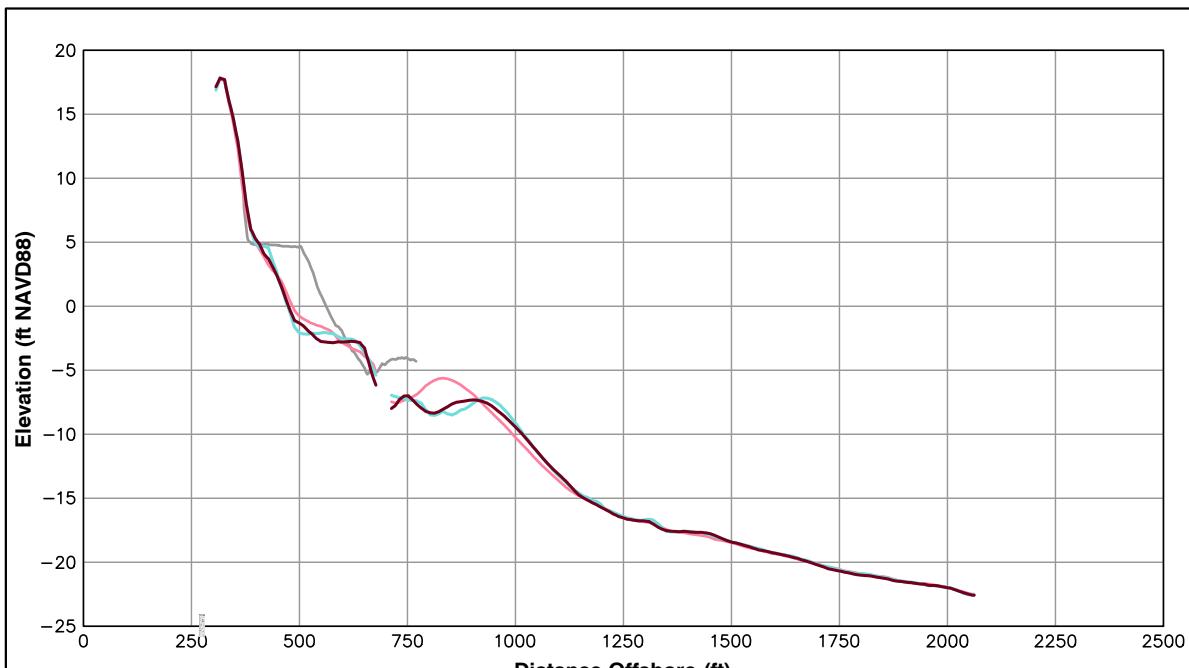
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

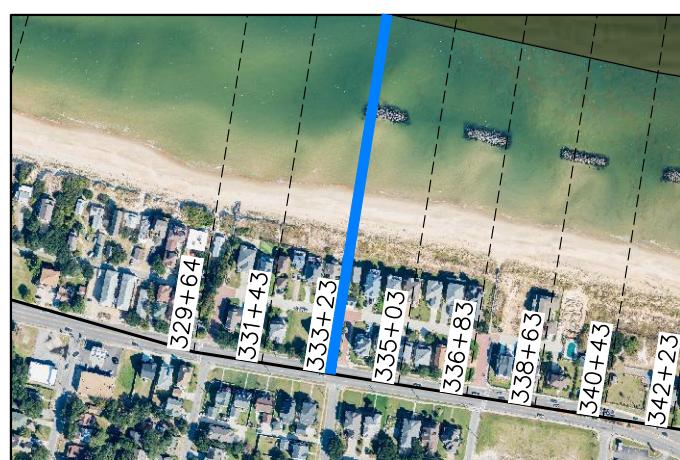
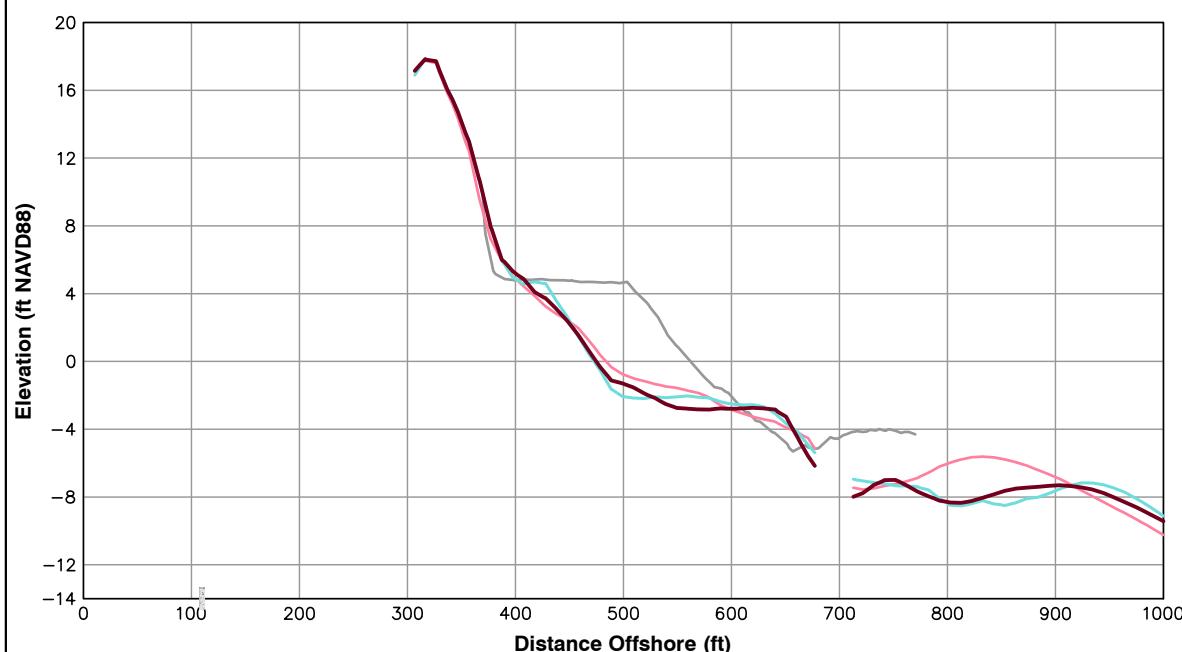


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——
- POST-FILL ——

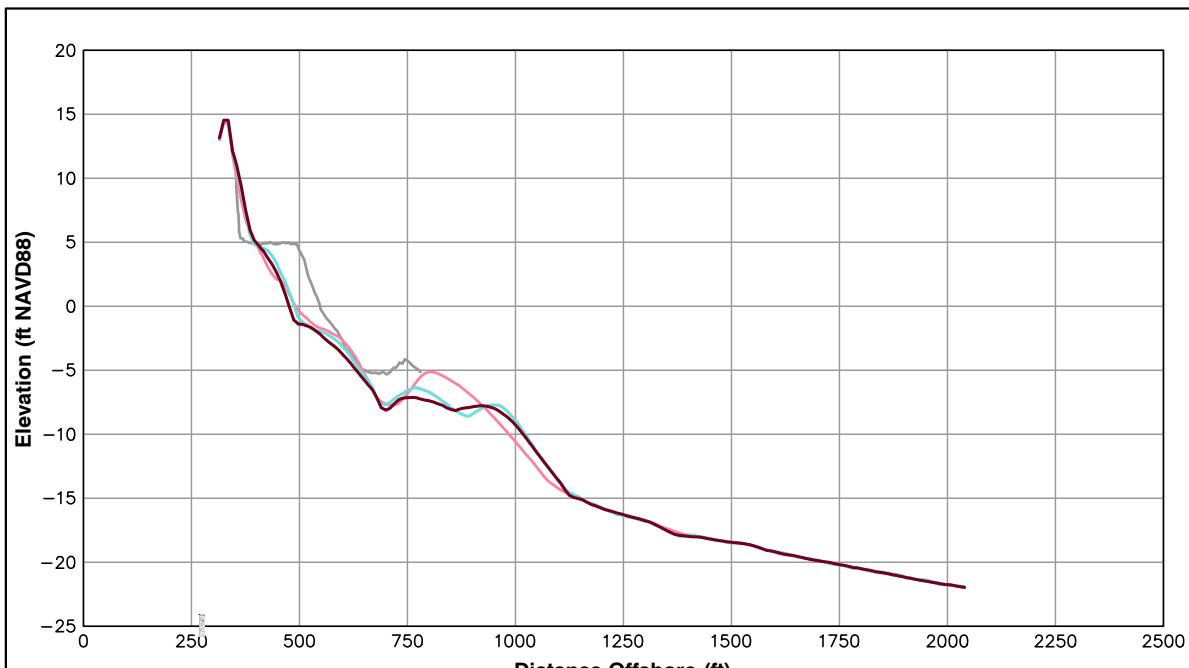
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
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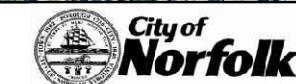
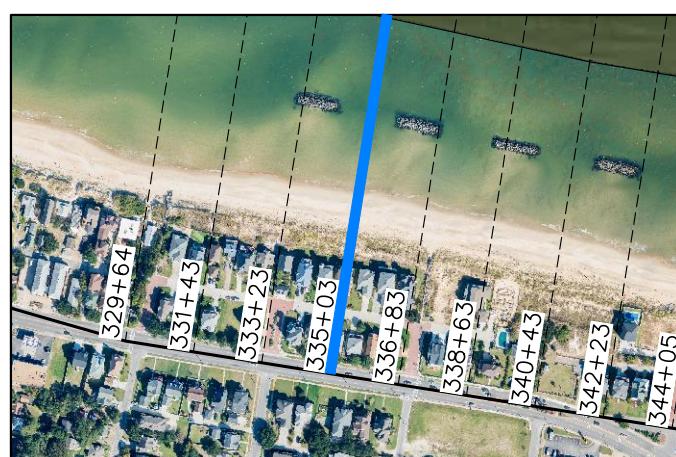
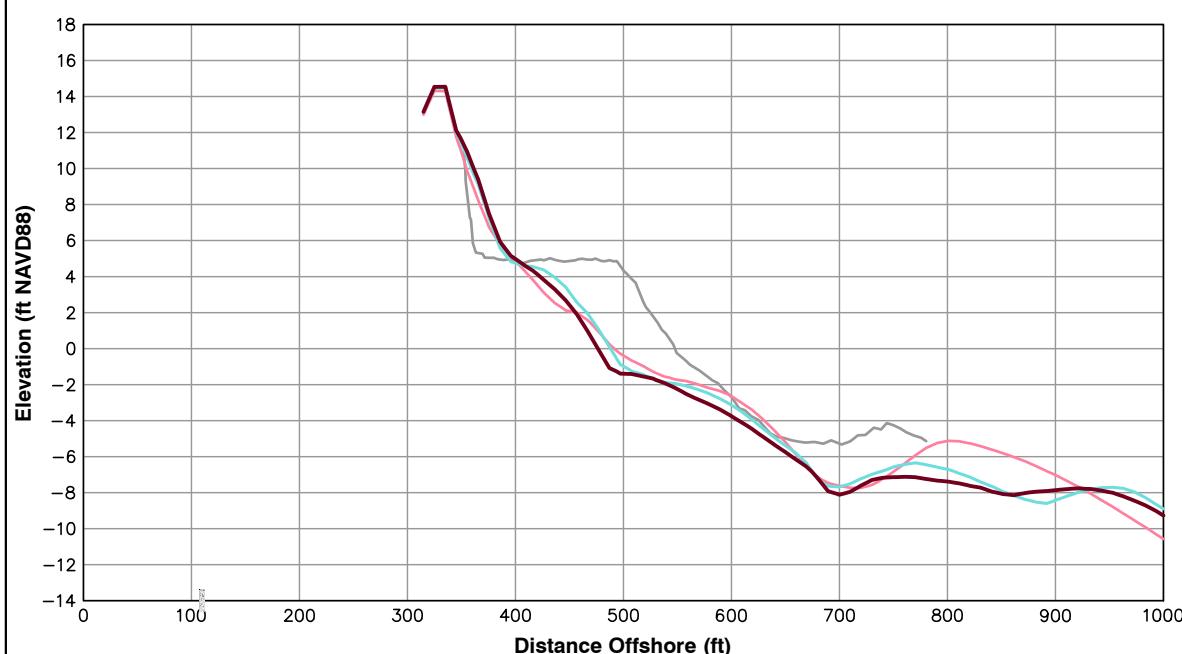
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-9.81	-11.03
ft/yr	ft	ft
Volume Change Above -15 ft NAVD88	-7.53	-7.56
cy/ft/yr	cy/ft	cy/ft
Volume Change Above 0 ft NAVD88	1.93	-1.15
cy/ft/yr	cy/ft	cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

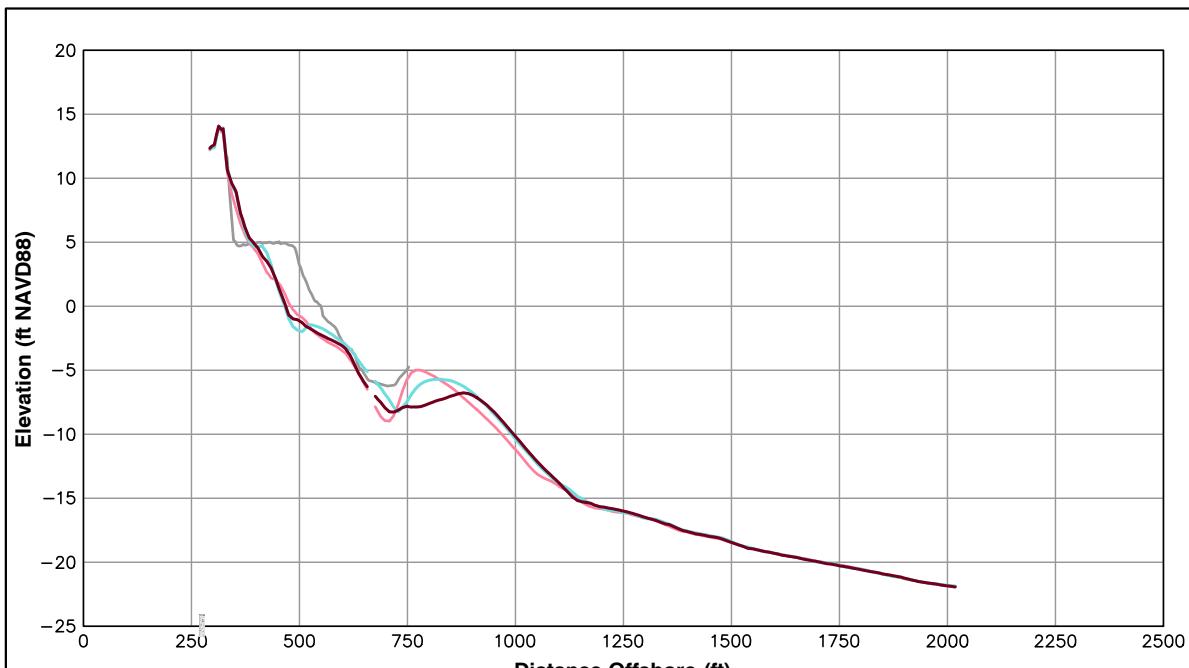
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OCEAN VIEW PERIODIC
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ANALYSIS



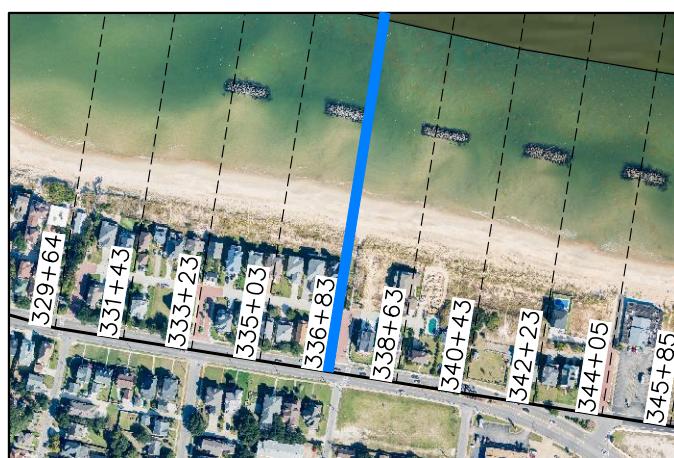
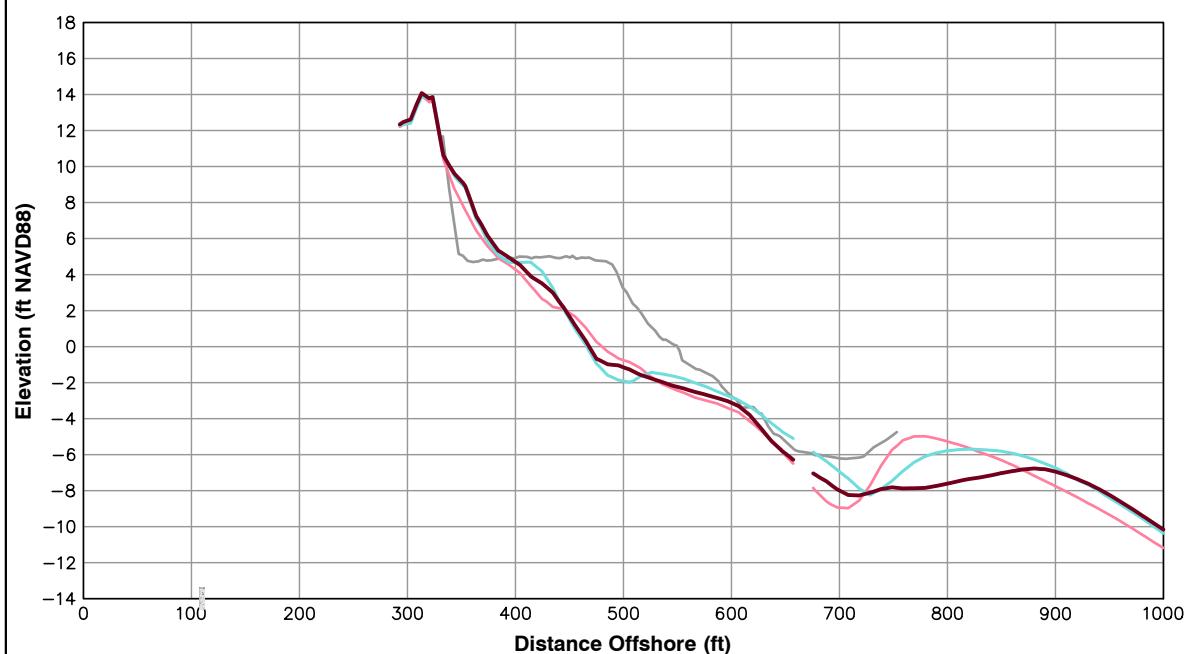
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-8.68 ft/yr	2.51 ft
Volume Change Above -15 ft NAVD88	2.15 cy/ft/yr	-9.80 cy/ft
Volume Change Above 0 ft NAVD88	2.46 cy/ft/yr	0.06 cy/ft

LEGEND:

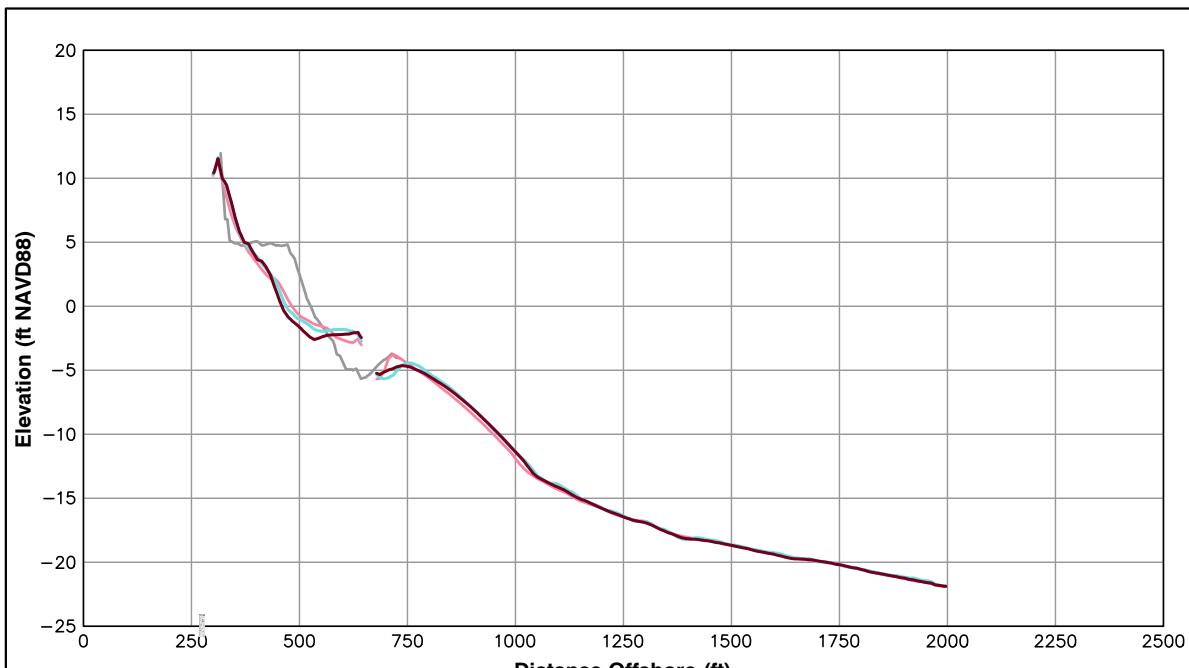
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

Notes:

1. Stationing From West To East At Varying Intervals.
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5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

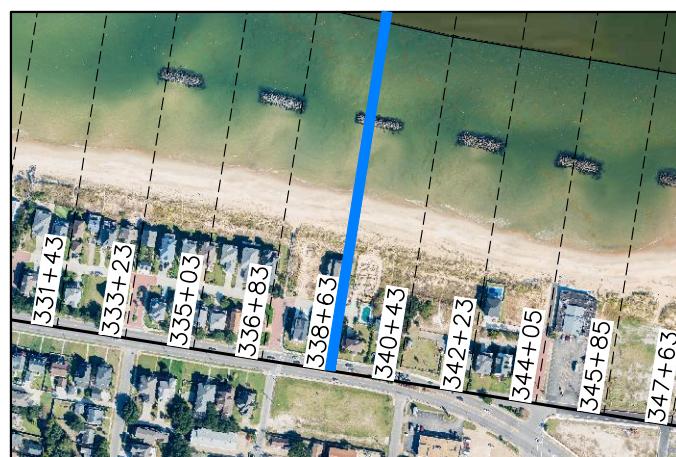
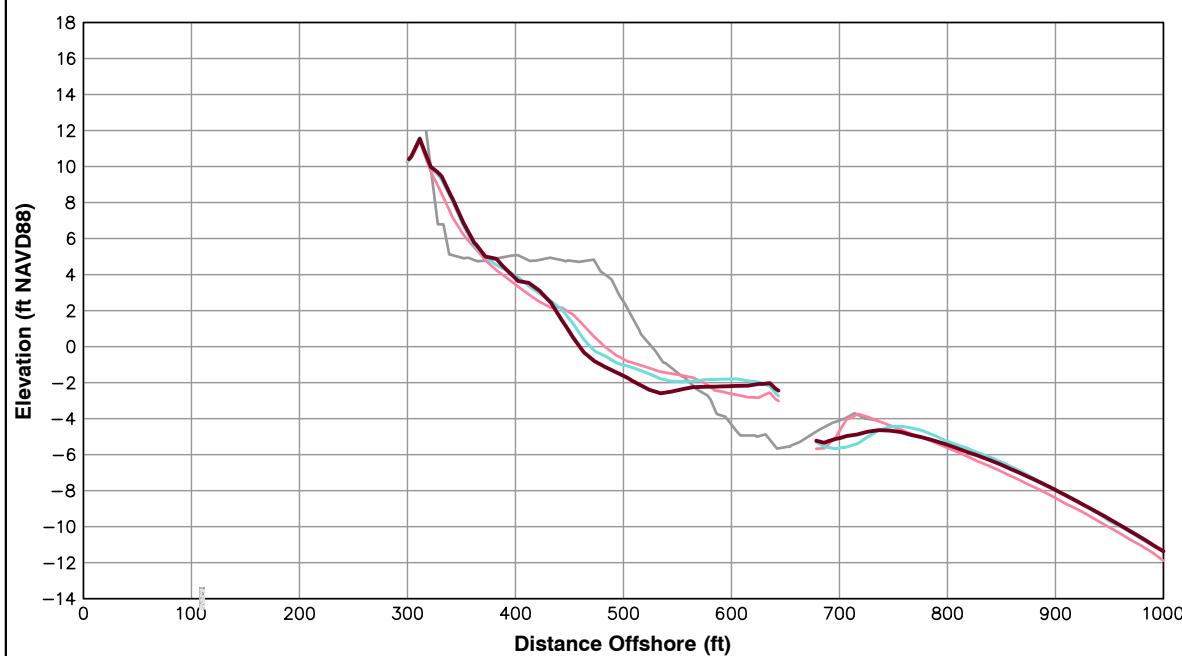


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-18.38 ft/yr	-8.44 ft
Volume Change Above -15 ft NAVD88	1.53 cy/ft/yr	-4.28 cy/ft
Volume Change Above 0 ft NAVD88	1.06 cy/ft/yr	-0.26 cy/ft

LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

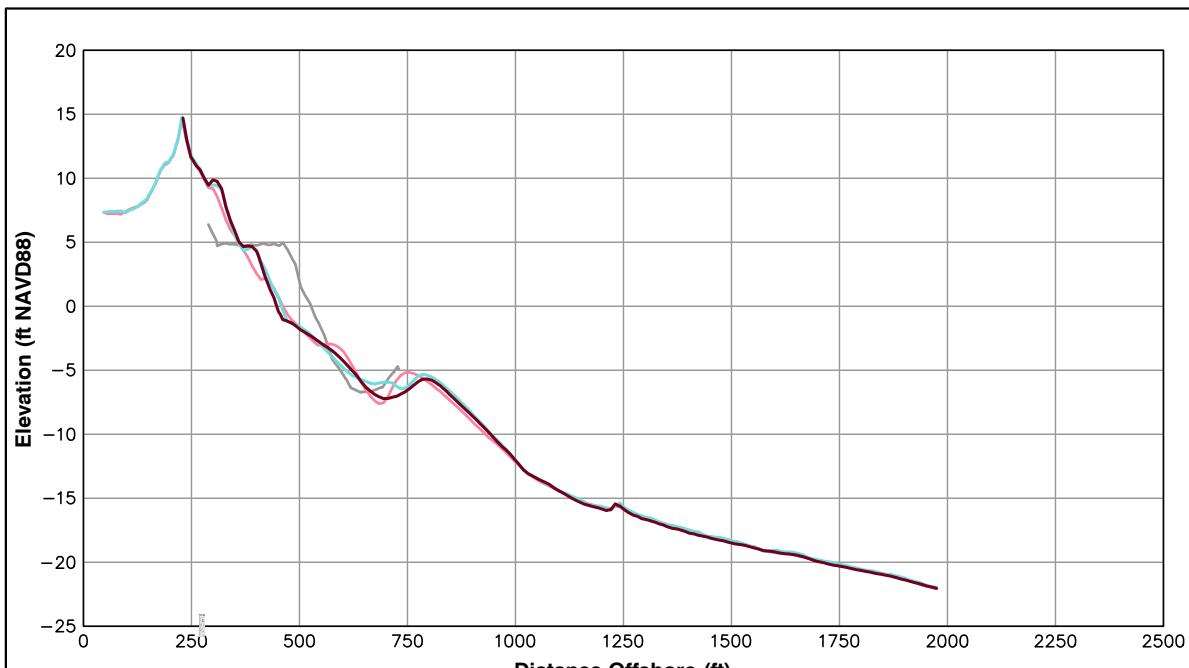
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



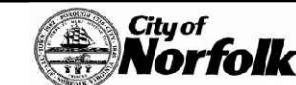
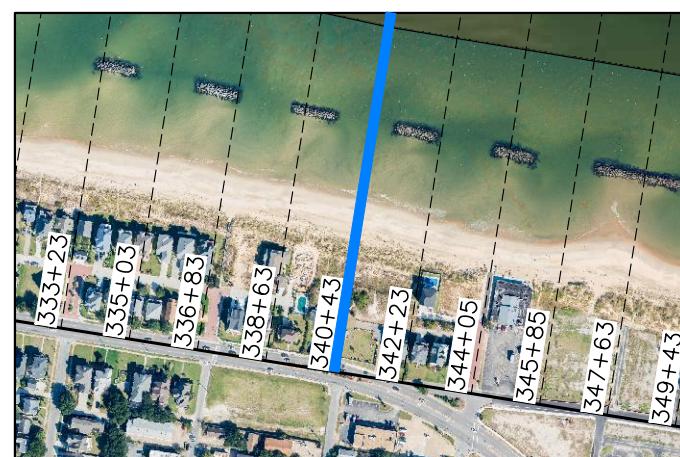
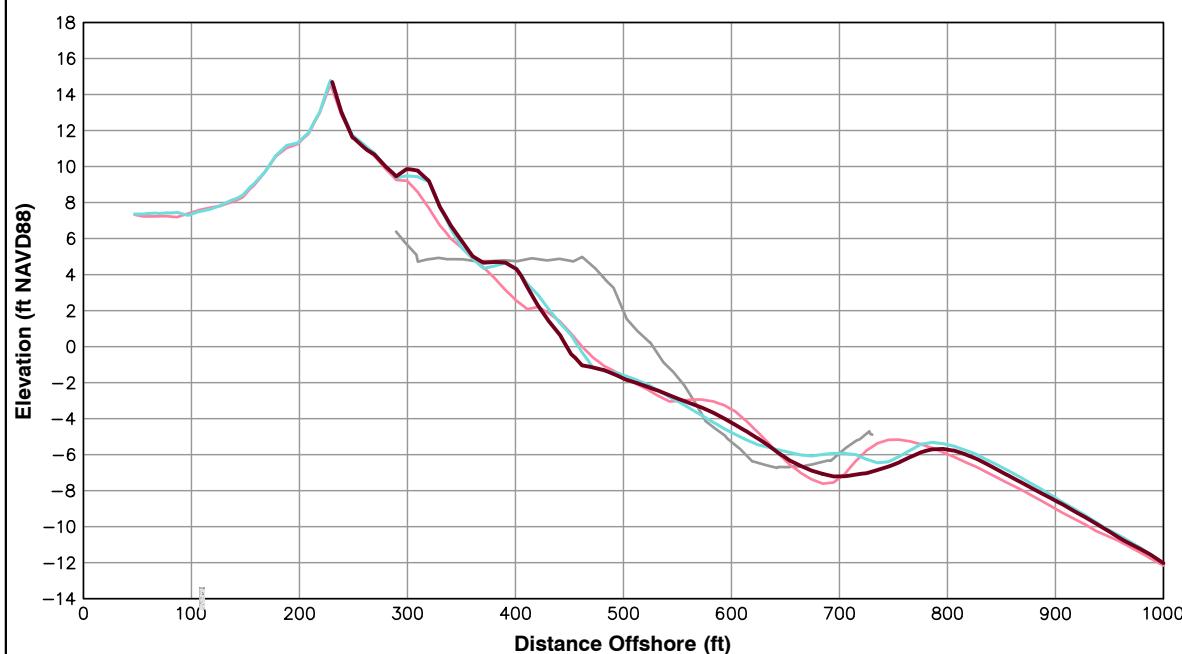
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-11.25 ft/yr	-9.54 ft
Volume Change Above -15 ft NAVD88	2.65 cy/ft/yr	-4.78 cy/ft
Volume Change Above 0 ft NAVD88	3.84 cy/ft/yr	-0.37 cy/ft

LEGEND:

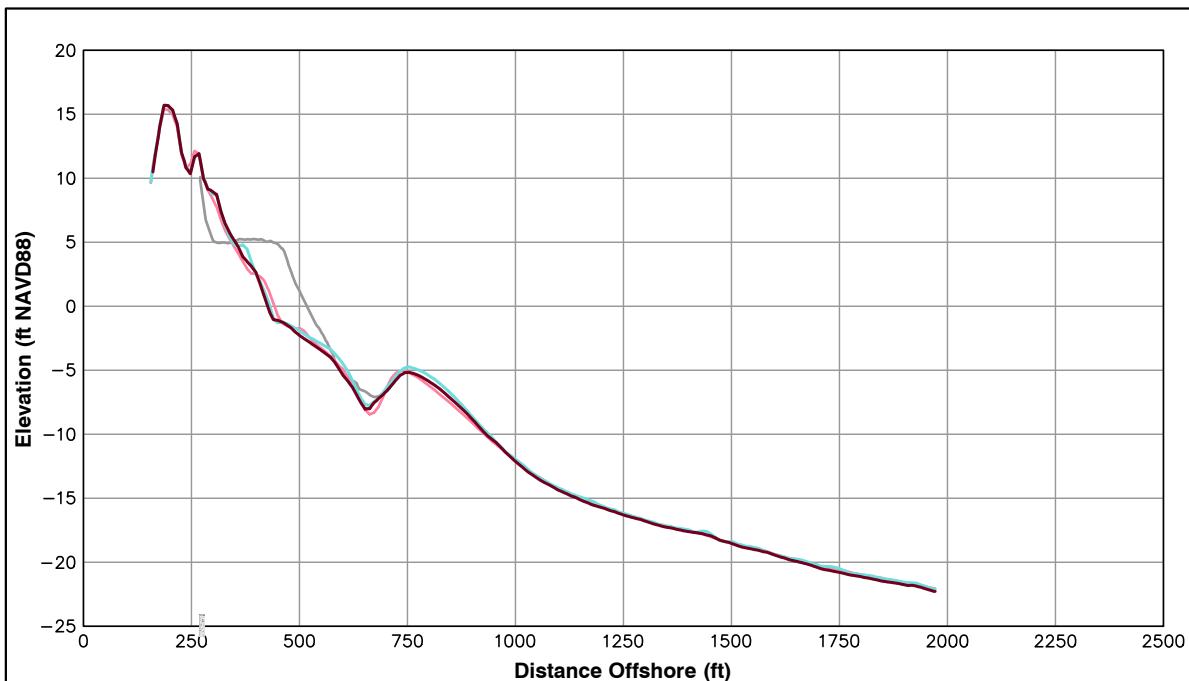
2014 OCT	—
2014 MAR	—
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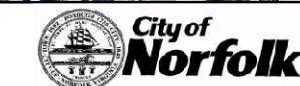
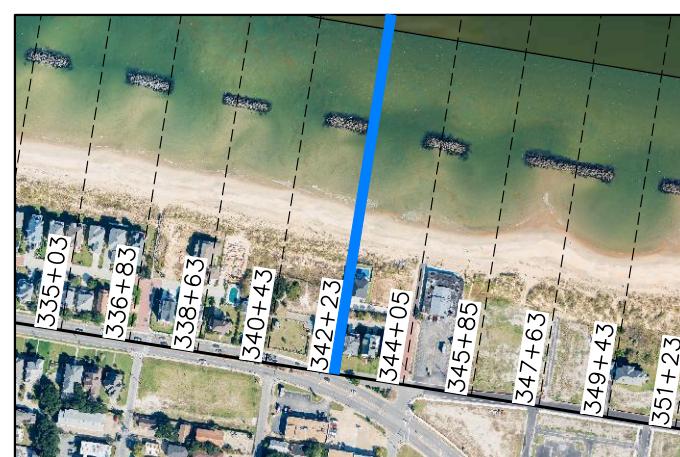
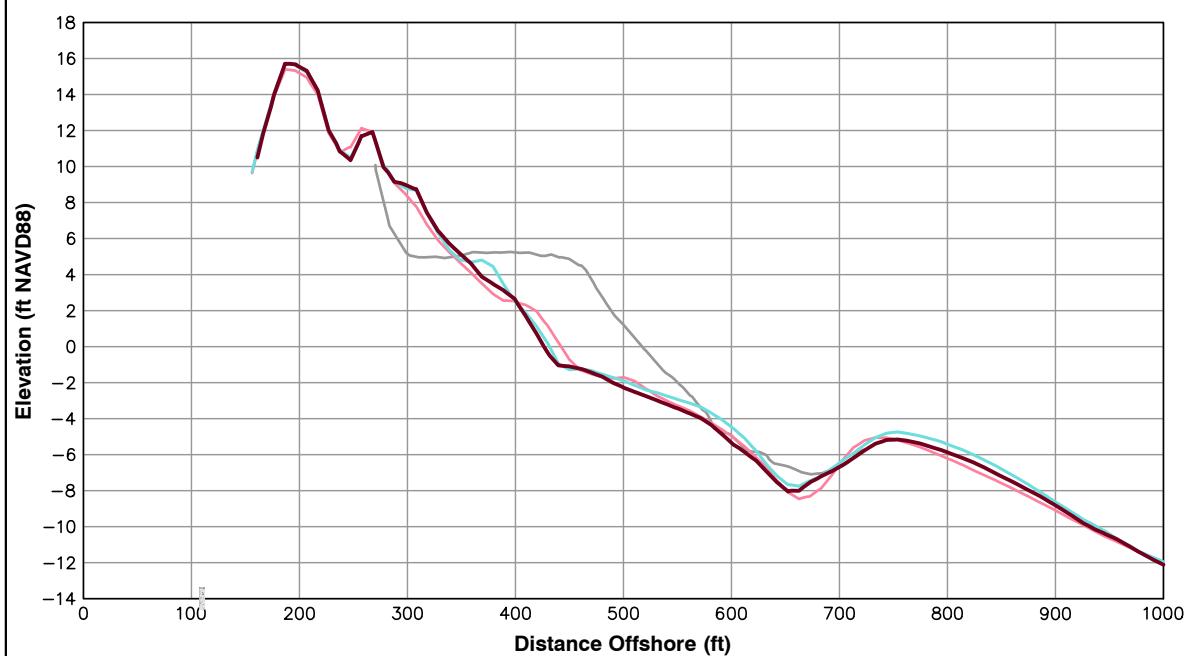


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
342+23		
Shoreline Change at MHW (0.98 ft NAVD88)	-15.40 ft/yr	-4.28 ft
Volume Change Above -15 ft NAVD88	0.41 cy/ft/yr	-8.72 cy/ft
Volume Change Above 0 ft NAVD88	1.02 cy/ft/yr	-0.92 cy/ft

LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

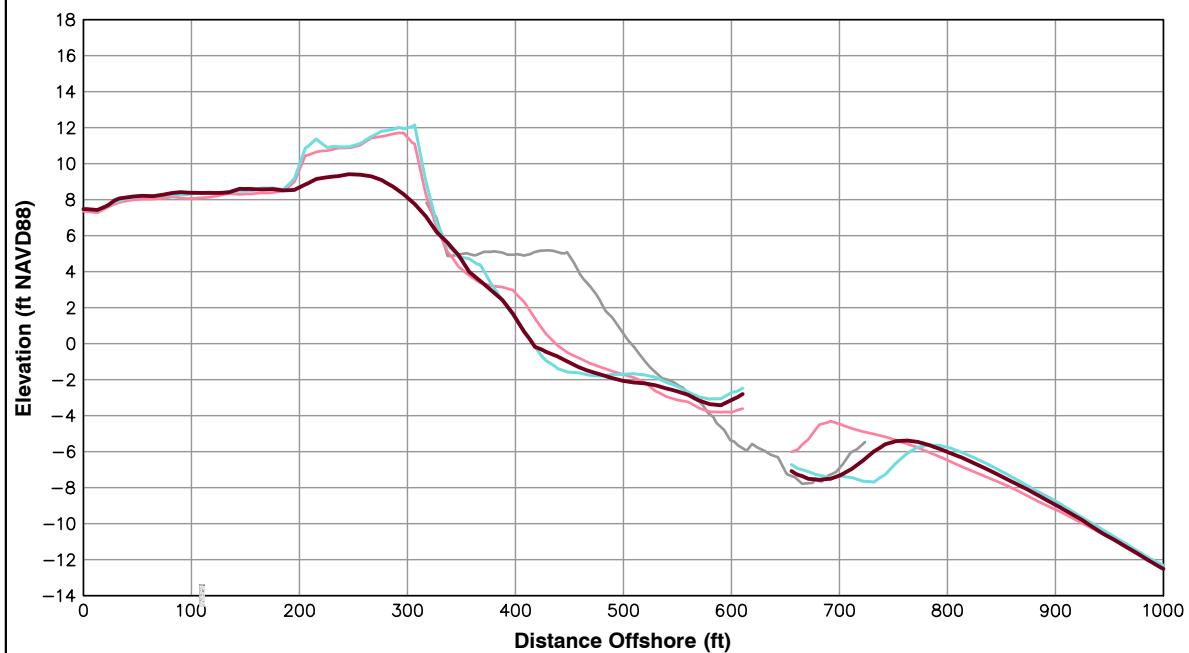
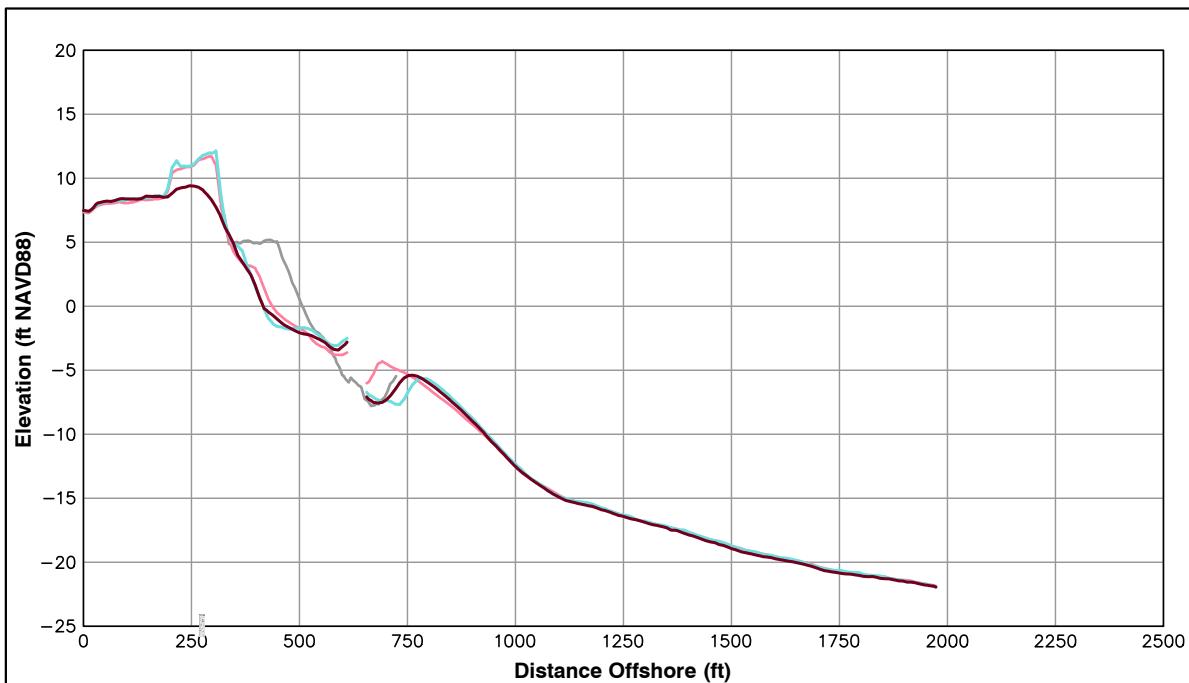
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

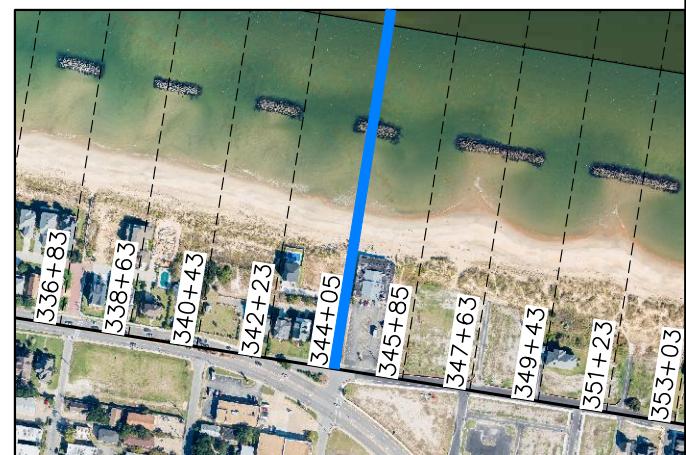


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
344+05		
Shoreline Change at MHW (0.98 ft NAVD88)	-18.84 ft/yr	0.00 ft
Volume Change Above -15 ft NAVD88	-14.97 cy/ft/yr	-12.02 cy/ft
Volume Change Above 0 ft NAVD88	-10.08 cy/ft/yr	-11.65 cy/ft

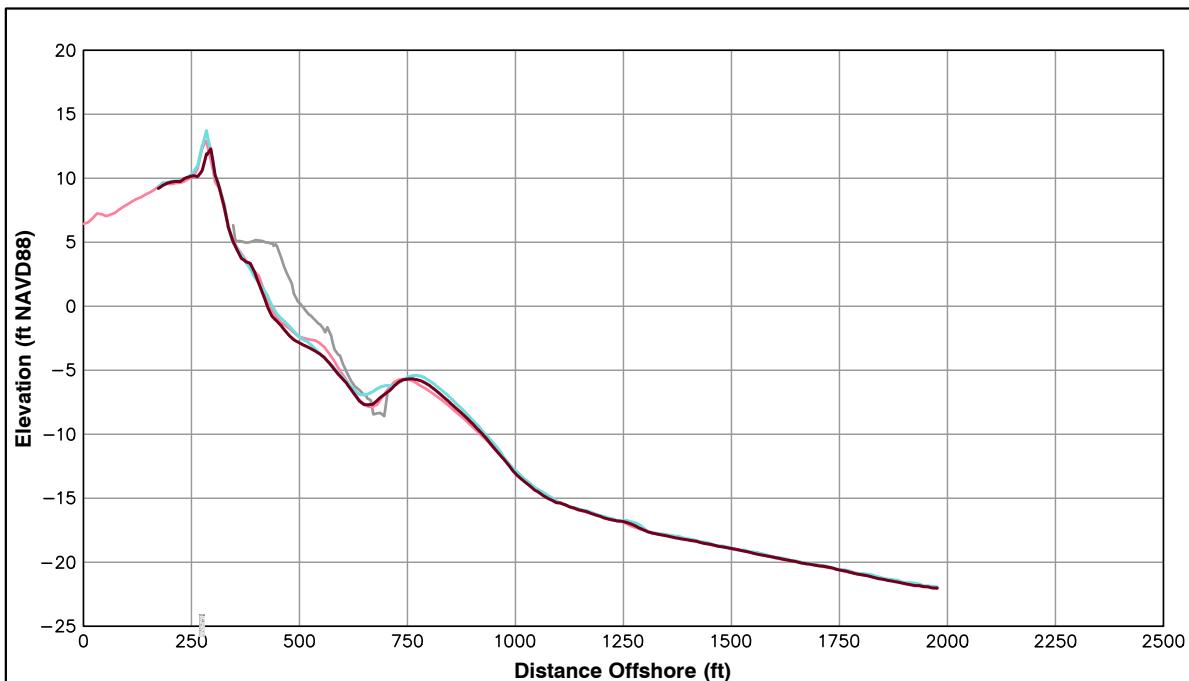
LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



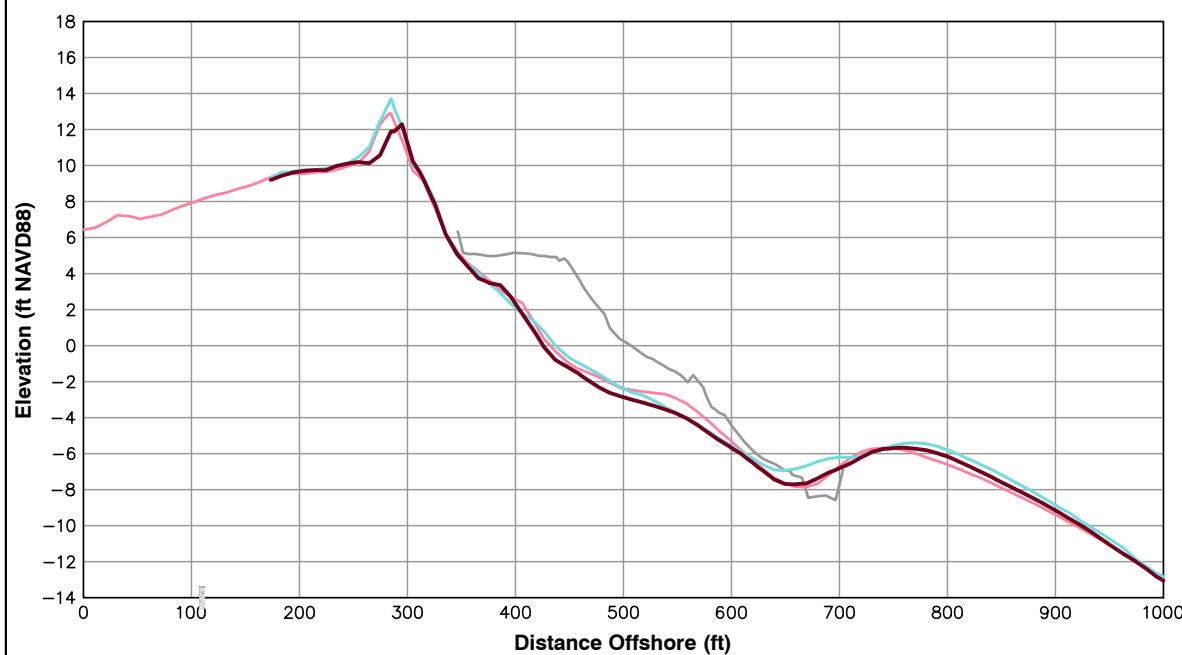
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-5.38 ft/yr	-8.07 ft
Volume Change Above -15 ft NAVD88	-3.64 cy/ft/yr	-10.64 cy/ft
Volume Change Above 0 ft NAVD88	-1.24 cy/ft/yr	-2.31 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

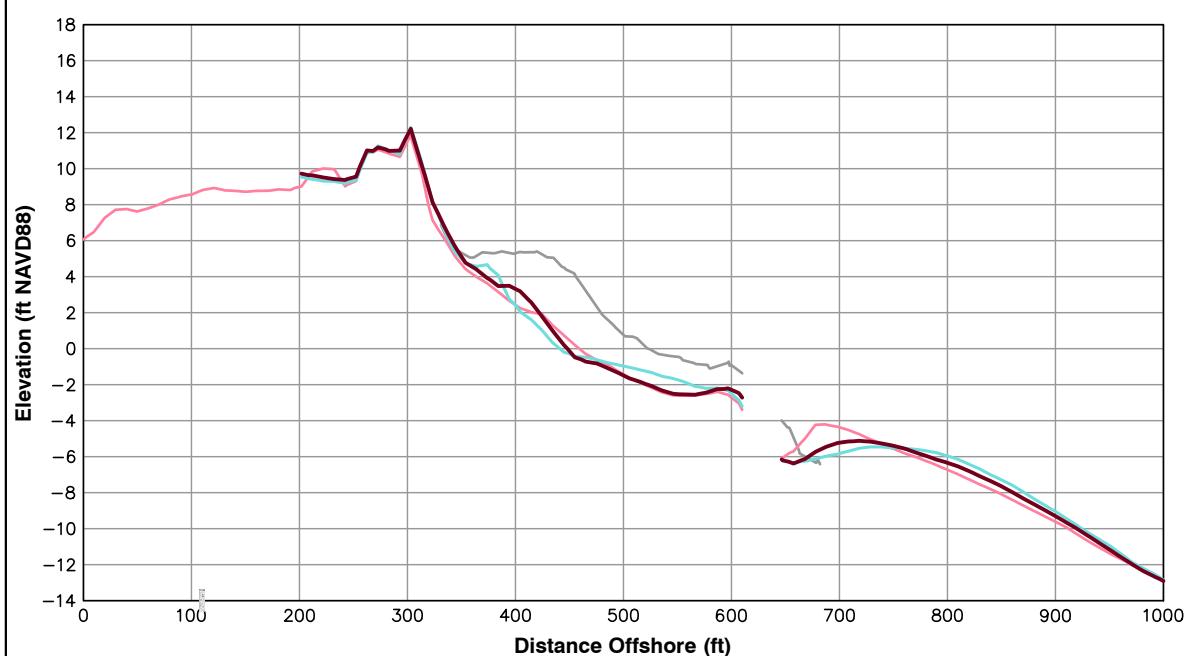
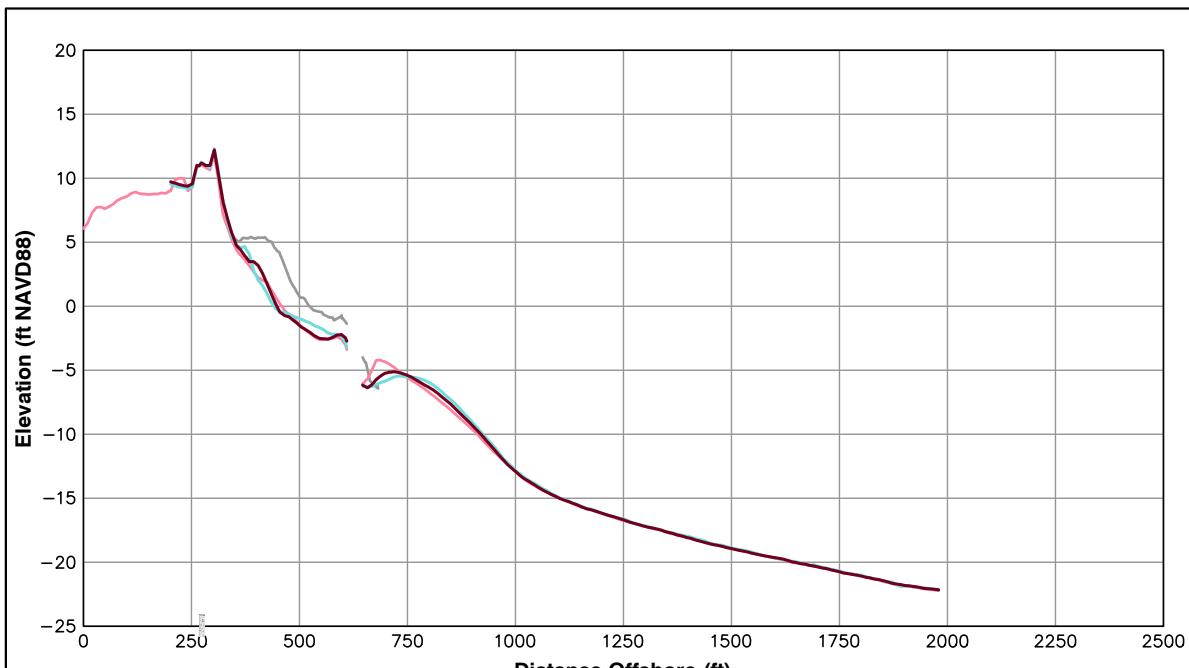
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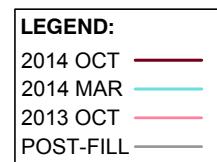


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

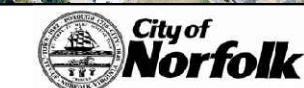
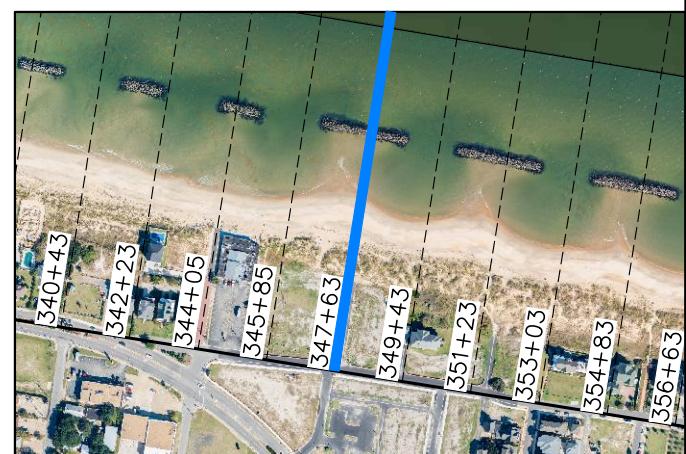


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
347+63		
Shoreline Change at MHW (0.98 ft NAVD88)	-5.79 ft/yr	9.53 ft
Volume Change Above -15 ft NAVD88	2.63 cy/ft/yr	-1.44 cy/ft
Volume Change Above 0 ft NAVD88	2.31 cy/ft/yr	1.68 cy/ft



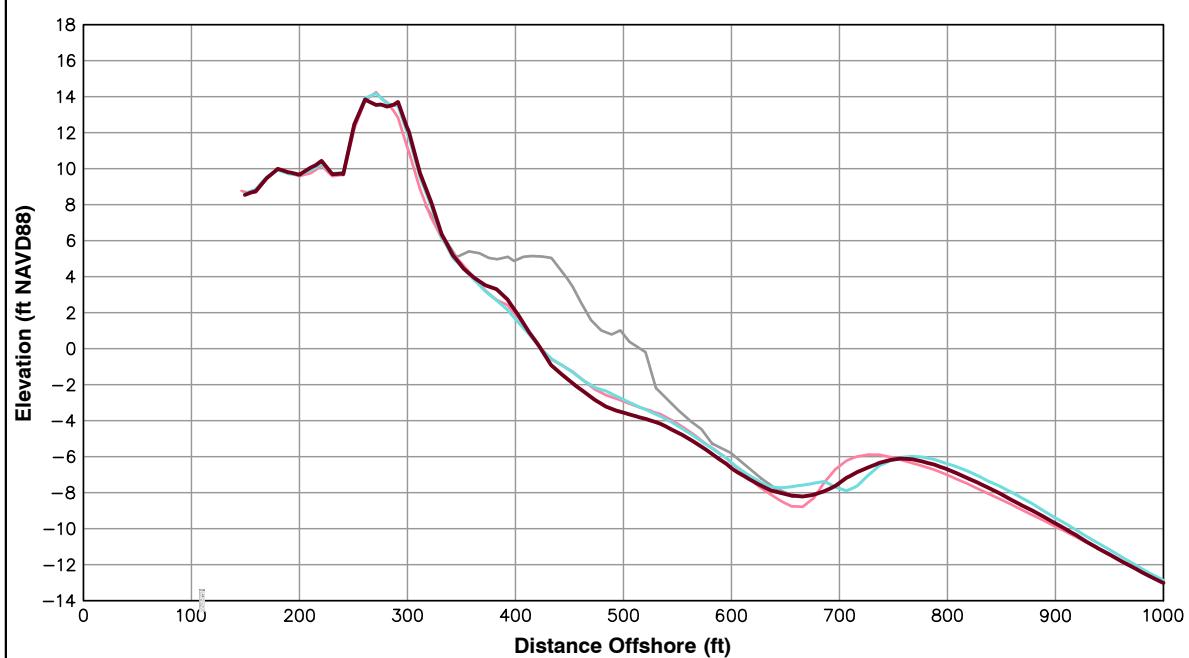
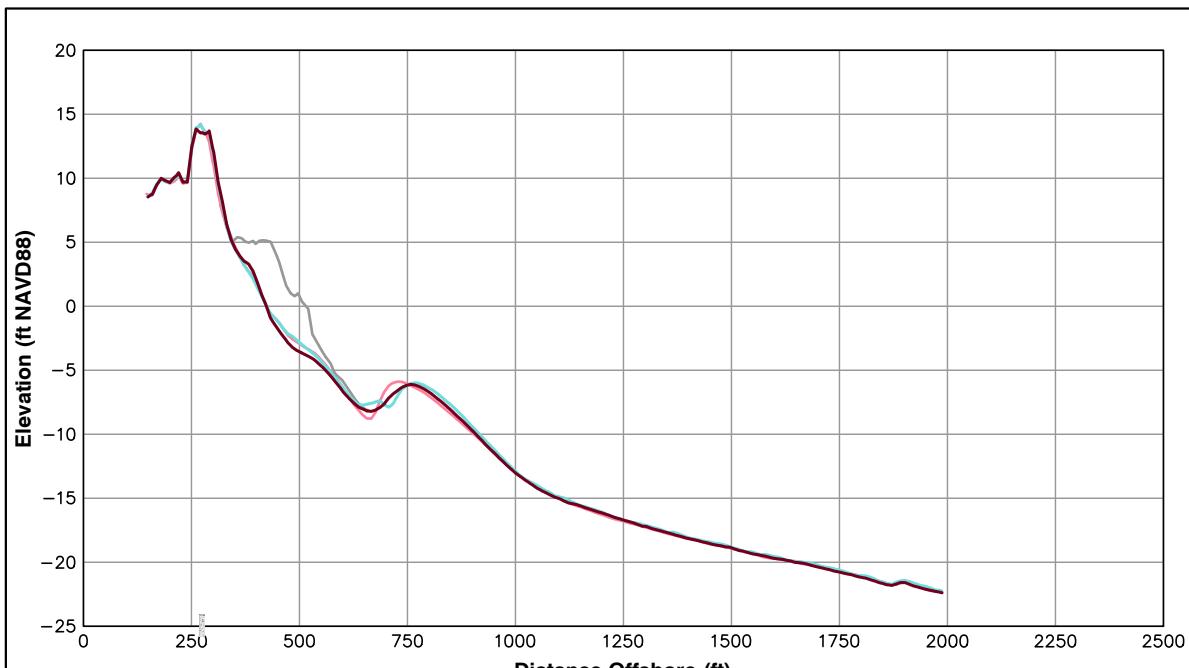
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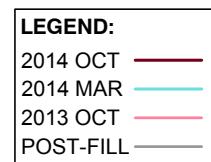


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

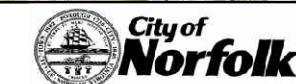
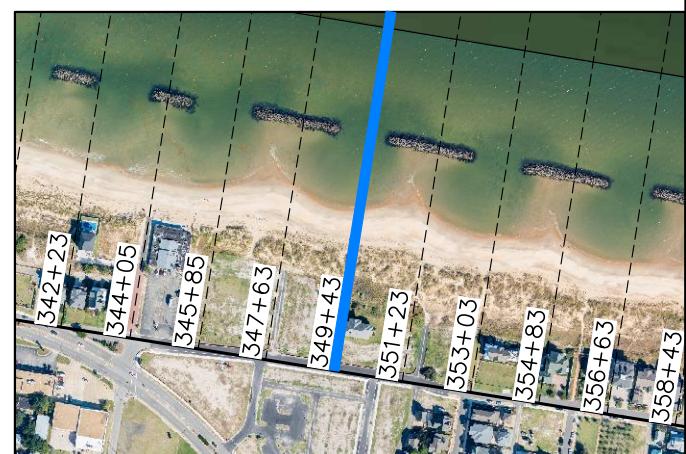


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	1.20 ft/yr	2.06 ft
Volume Change Above -15 ft NAVD88	-0.82 cy/ft/yr	-5.89 cy/ft
Volume Change Above 0 ft NAVD88	2.11 cy/ft/yr	1.03 cy/ft

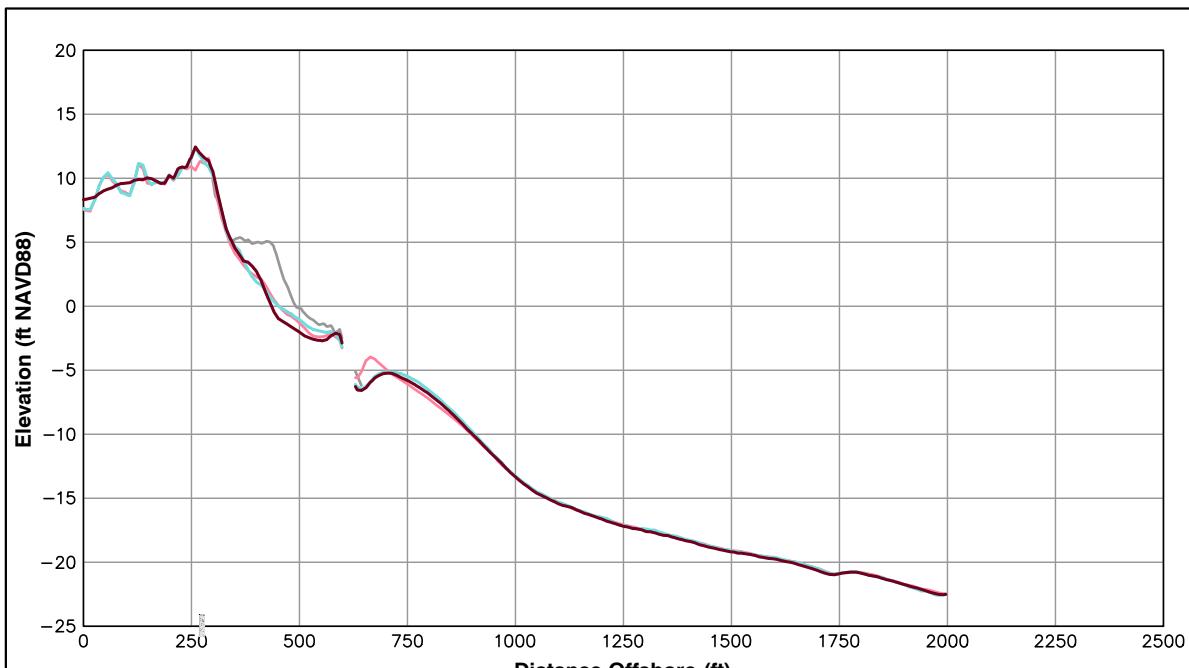


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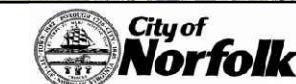
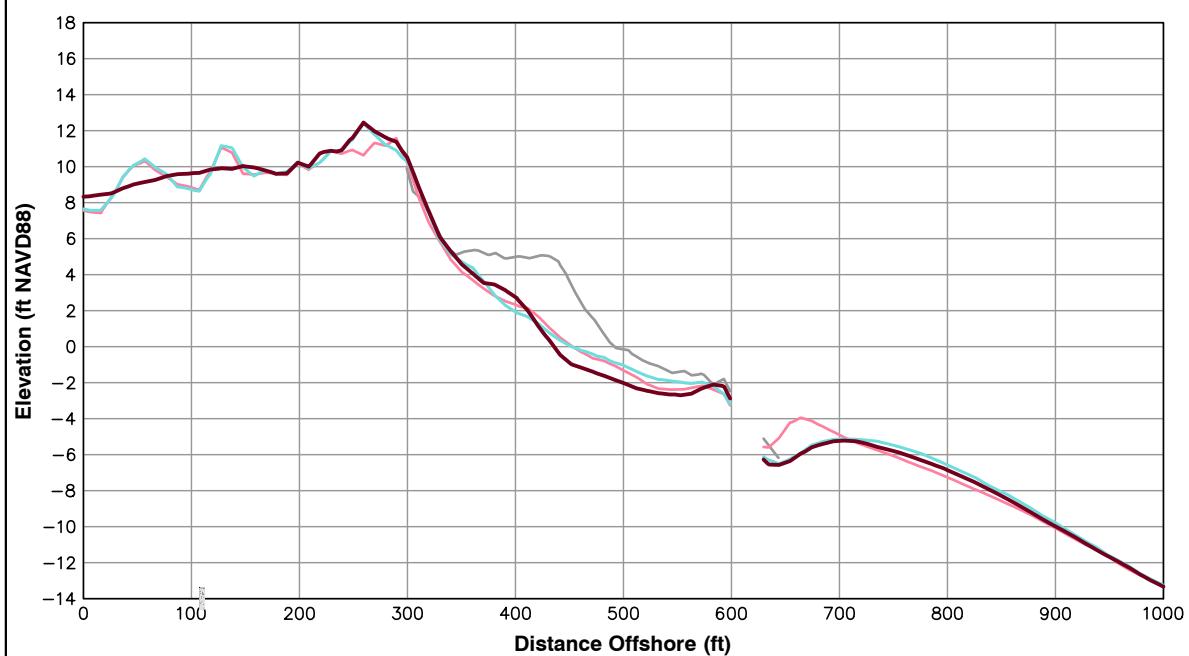


LEGEND:

- 2014 OCT ——
- 2014 MAR ——
- 2013 OCT ——
- POST-FILL ——

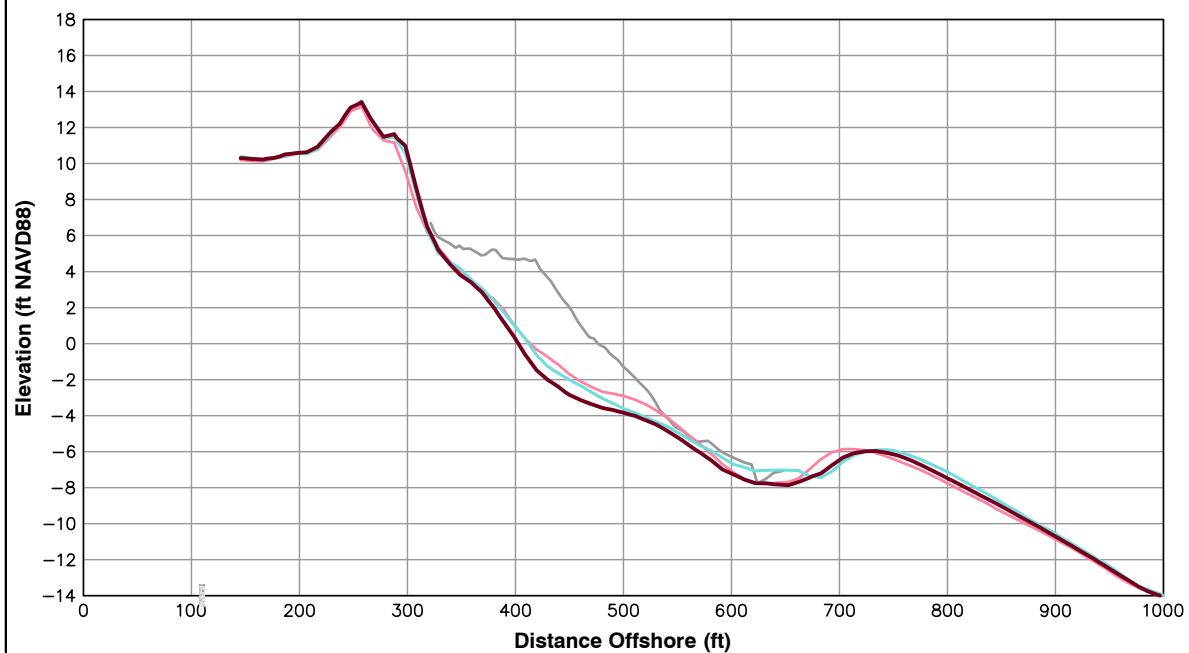
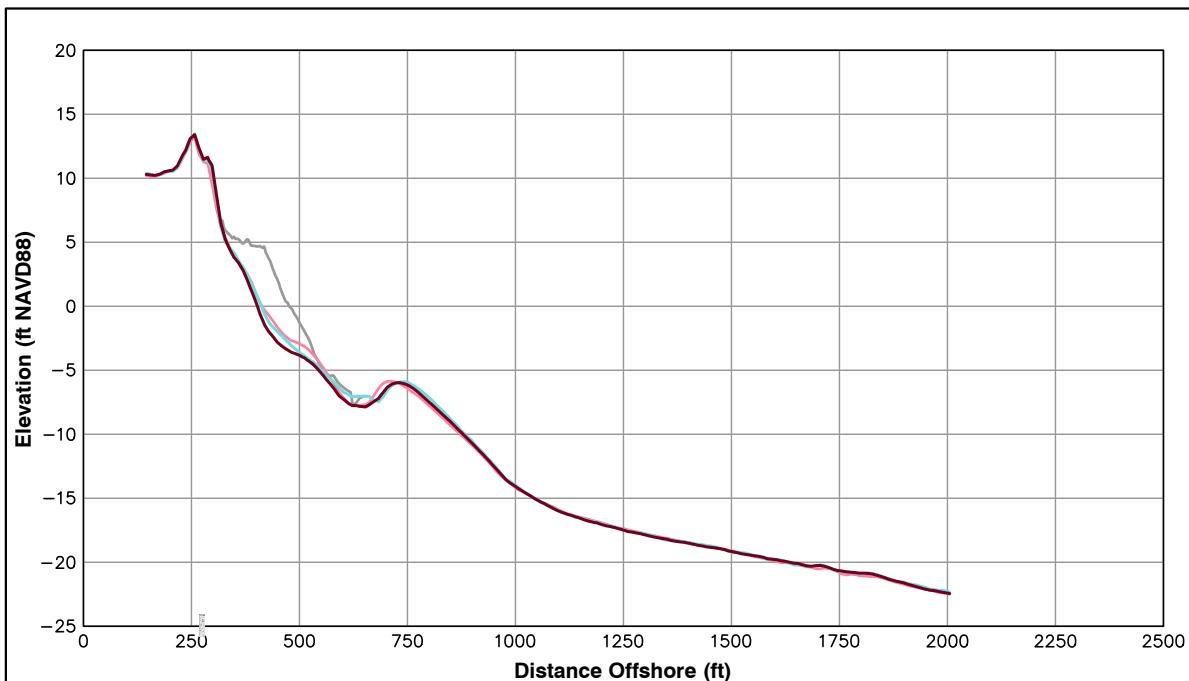
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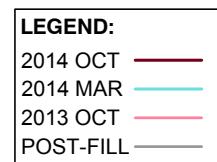


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
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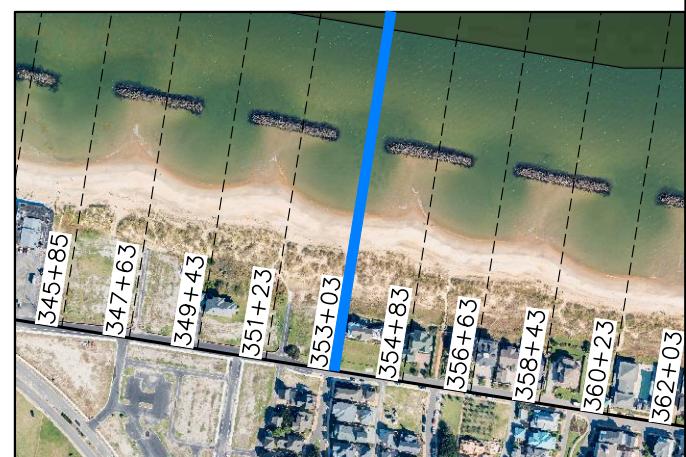


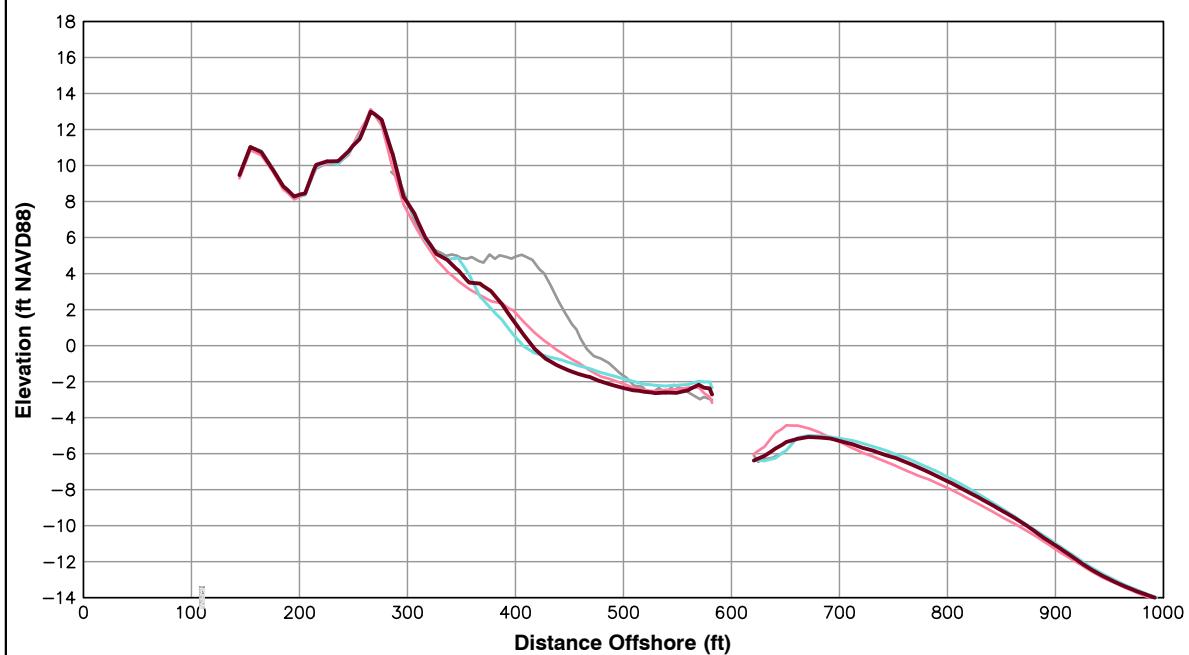
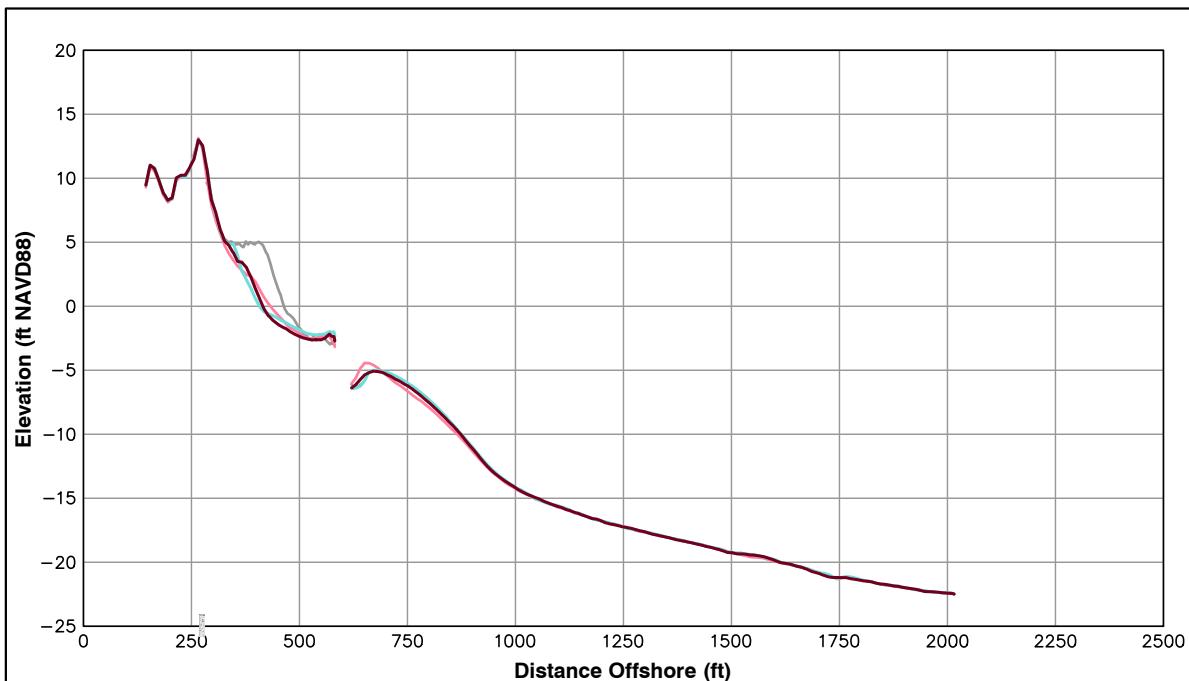
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
353+03		
Shoreline Change at MHW (0.98 ft NAVD88)	-7.93 ft/yr	-7.78 ft
Volume Change Above -15 ft NAVD88	-4.16 cy/ft/yr	-7.26 cy/ft
Volume Change Above 0 ft NAVD88	1.13 cy/ft/yr	-0.34 cy/ft



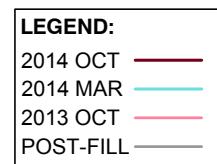
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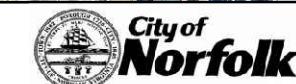
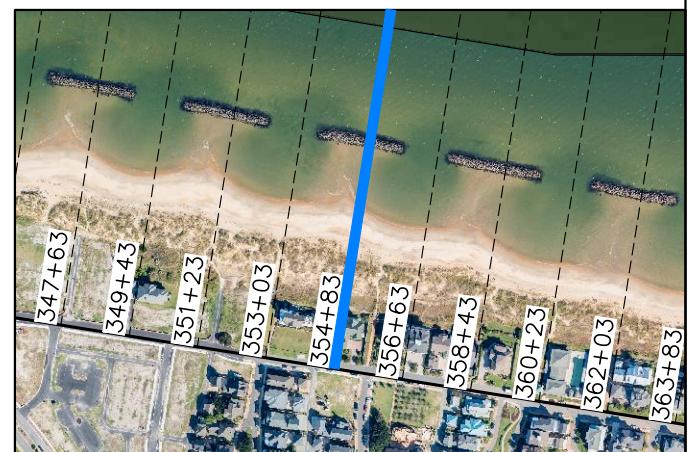


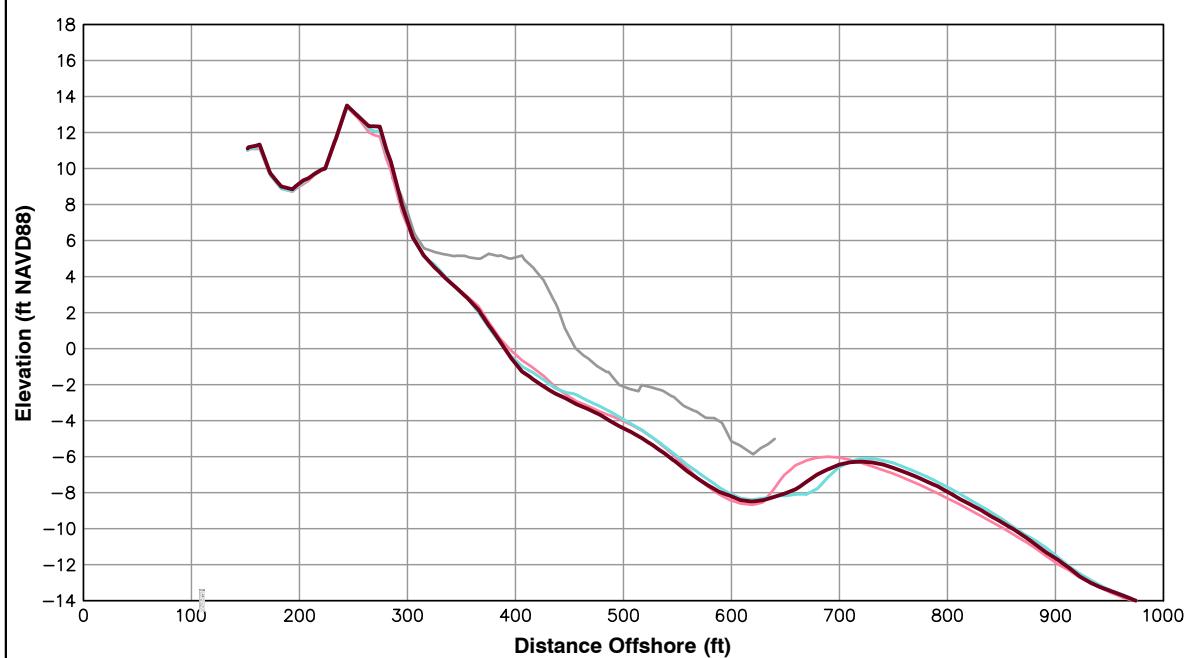
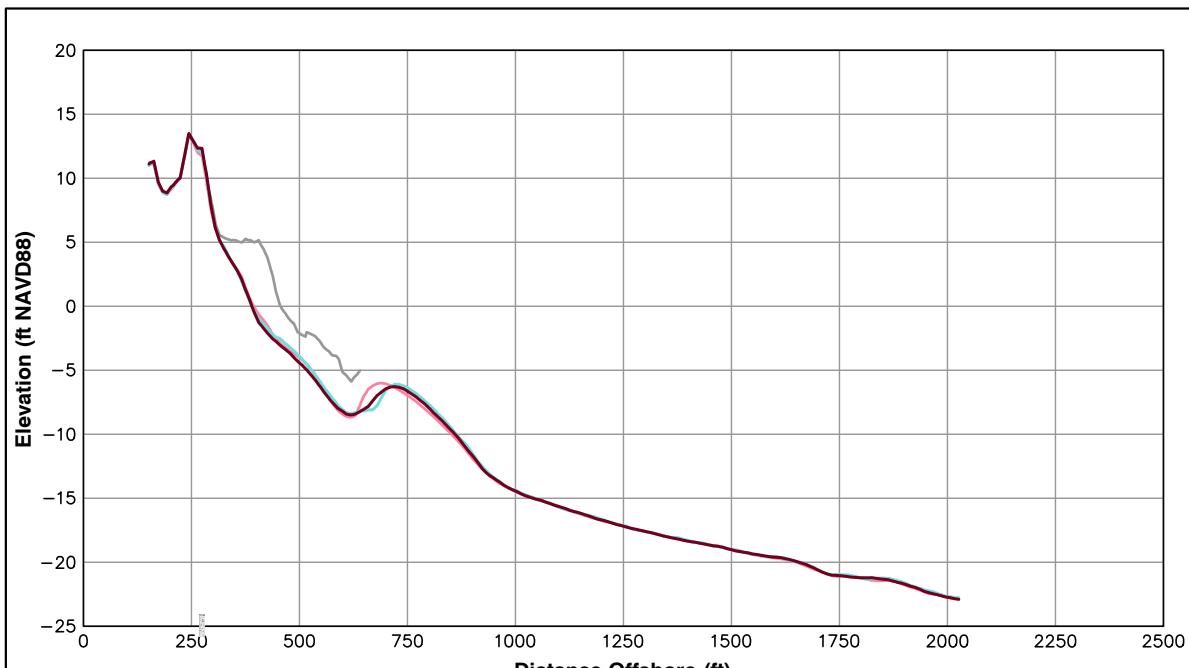
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-10.61 ft/yr	9.90 ft
Volume Change Above -15 ft NAVD88	1.43 cy/ft/yr	-2.53 cy/ft
Volume Change Above 0 ft NAVD88	1.72 cy/ft/yr	1.17 cy/ft



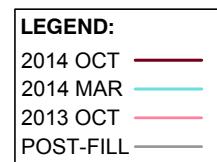
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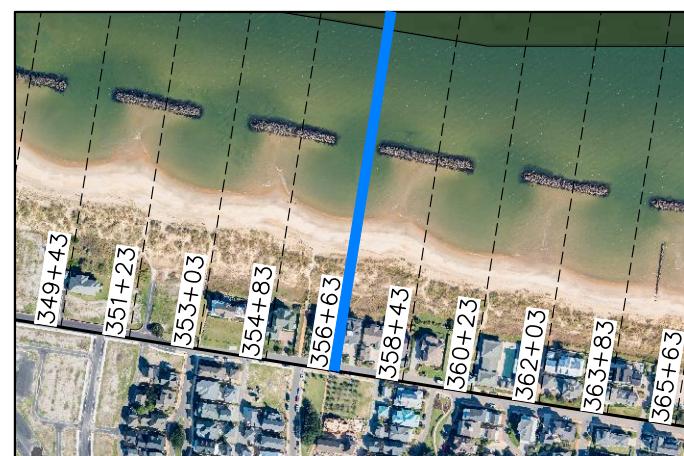


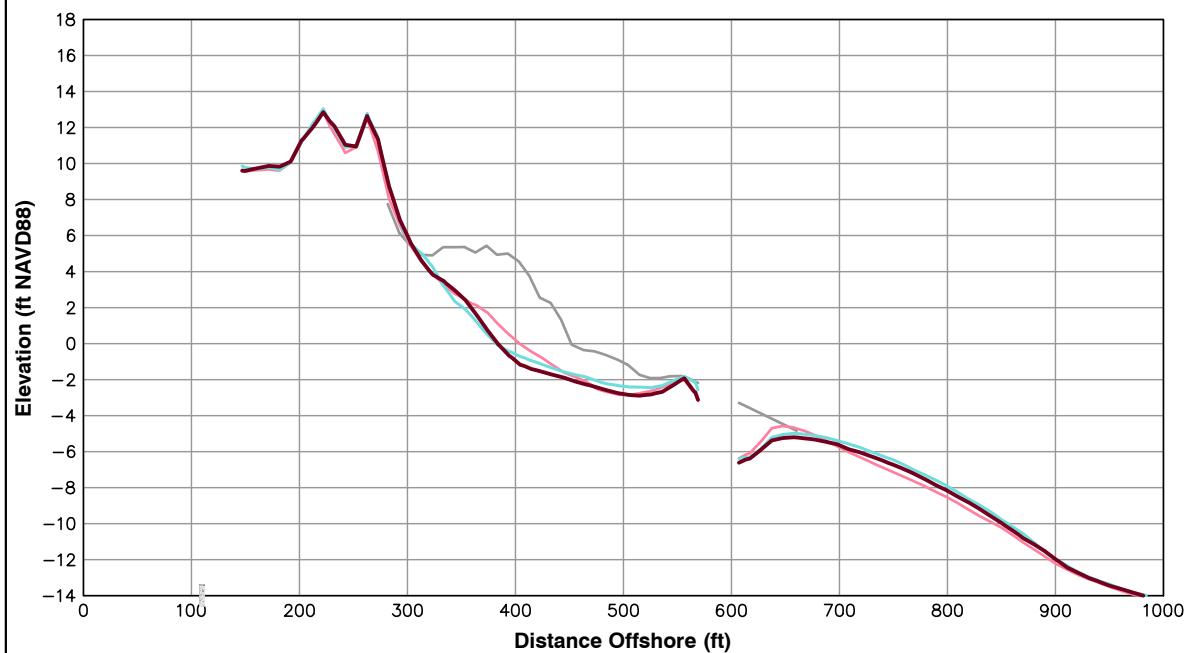
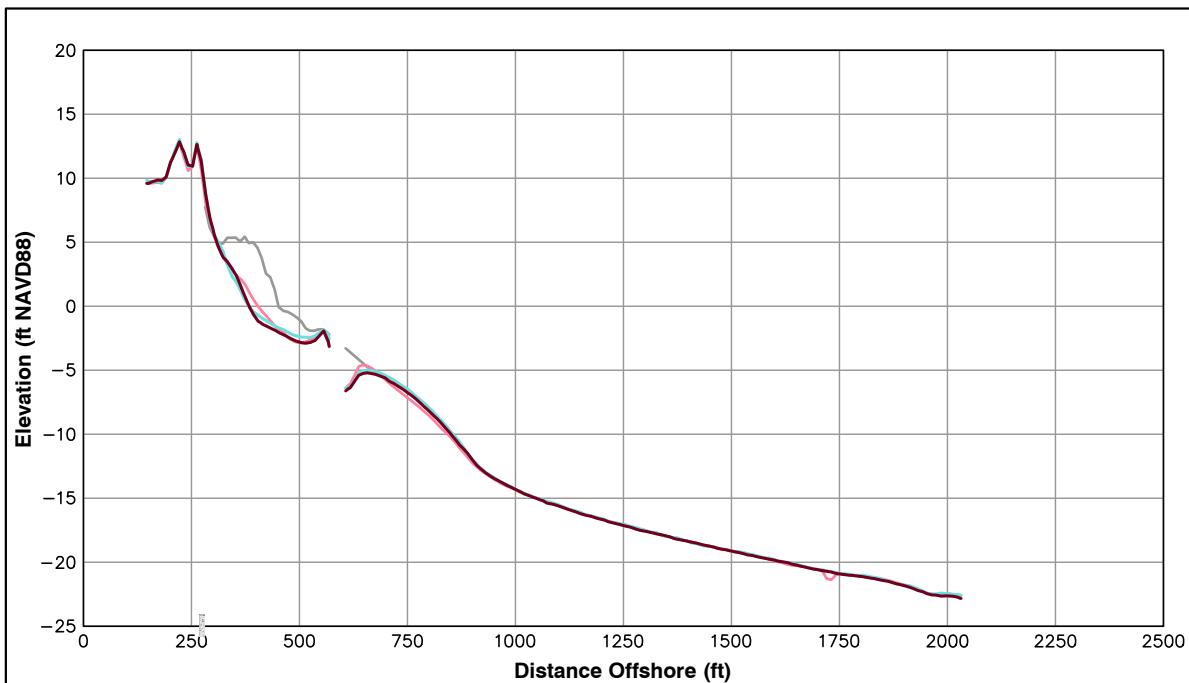
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
356+63		
Shoreline Change at MHW (0.98 ft NAVD88)	-1.93 ft/yr	1.36 ft
Volume Change Above -15 ft NAVD88	-1.04 cy/ft/yr	-3.51 cy/ft
Volume Change Above 0 ft NAVD88	0.95 cy/ft/yr	0.53 cy/ft



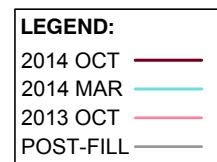
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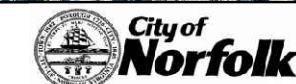
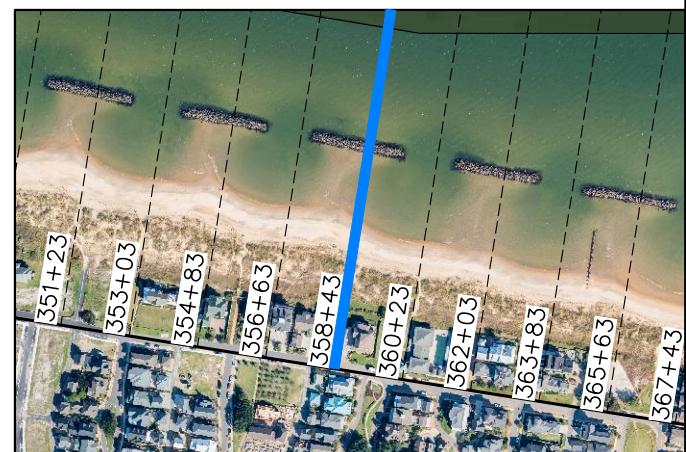


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-14.80 ft/yr	4.07 ft
Volume Change Above -15 ft NAVD88	-0.18 cy/ft/yr	-4.41 cy/ft
Volume Change Above 0 ft NAVD88	0.26 cy/ft/yr	0.42 cy/ft



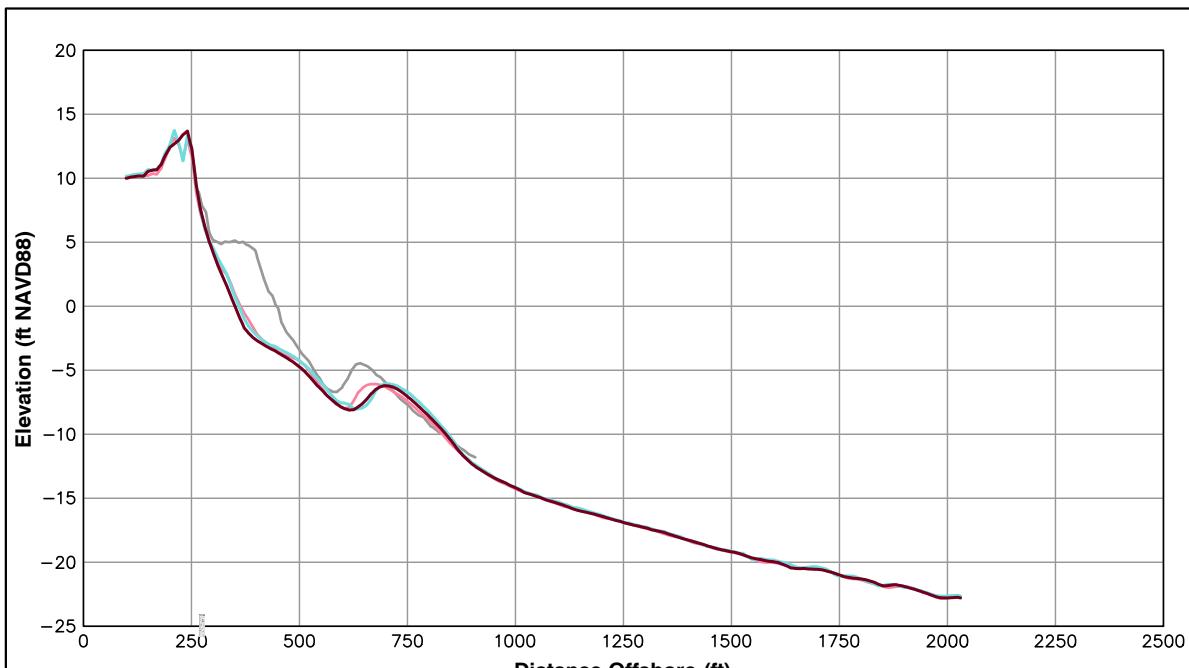
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**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

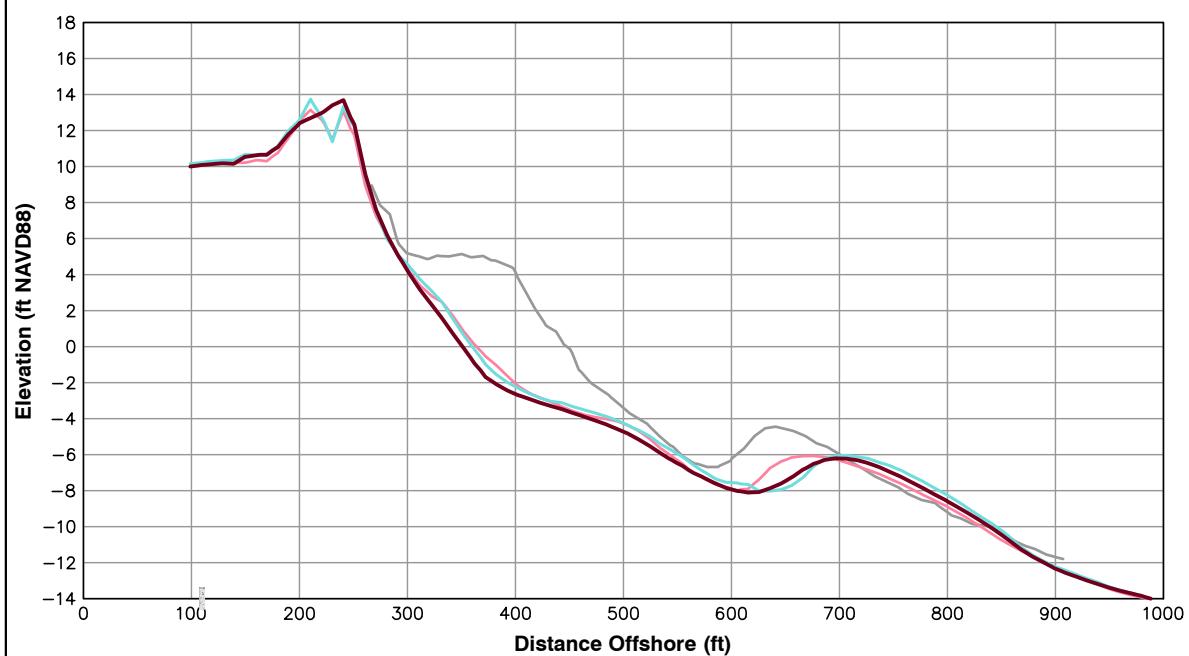


LEGEND:

- 2014 OCT ——
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- POST-FILL ——

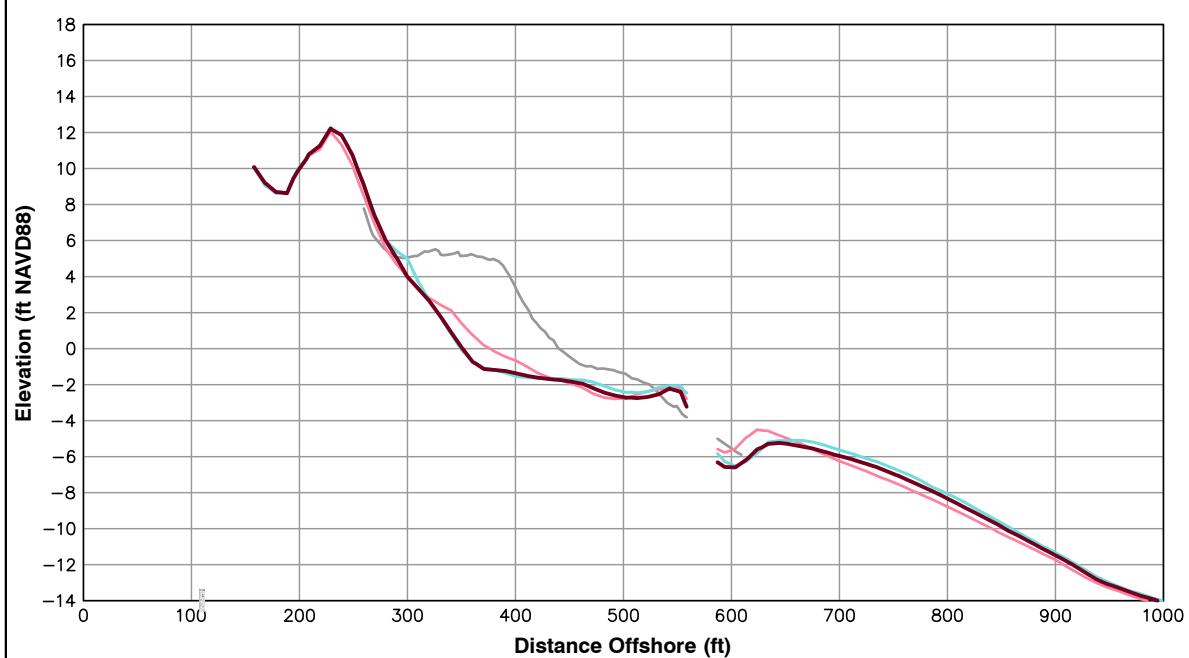
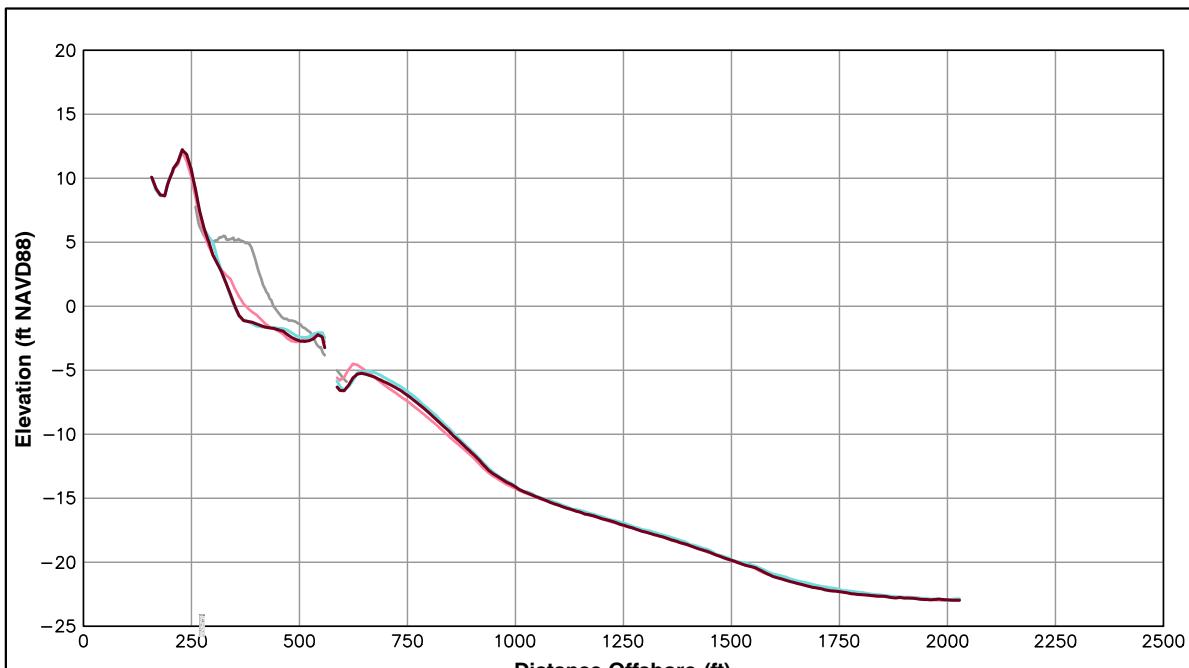
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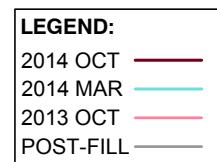


**City of
Norfolk**

OCEAN VIEW PERIODIC
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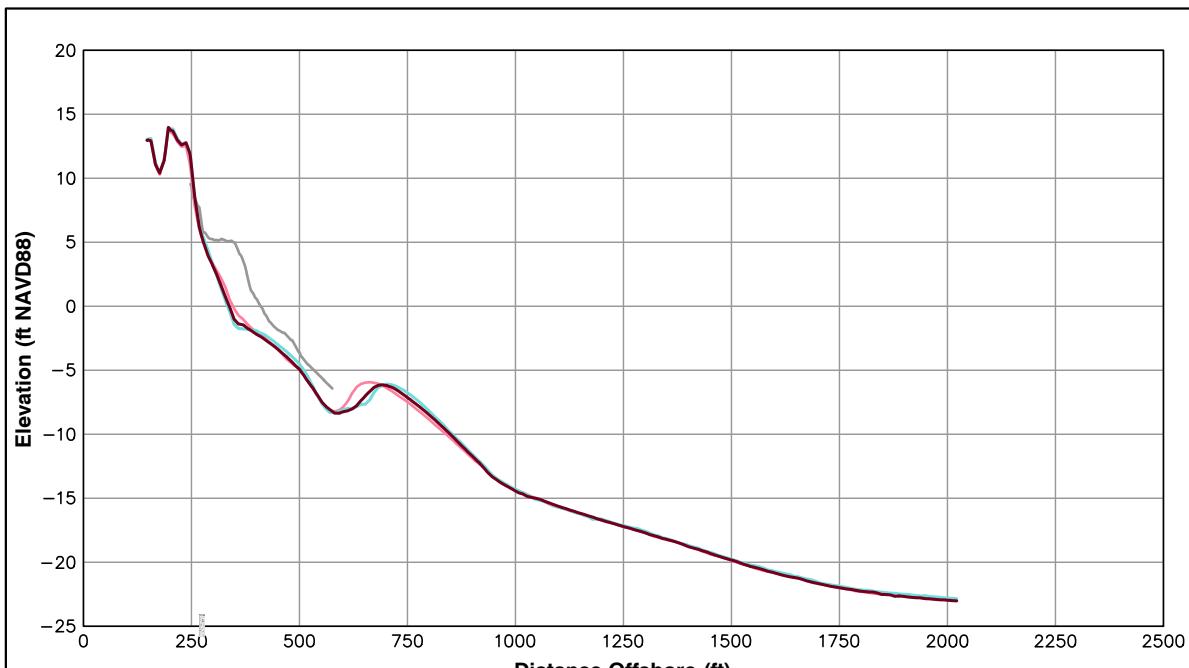
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
362+03		
Shoreline Change at MHW (0.98 ft NAVD88)	-17.49 ft/yr	1.18 ft
Volume Change Above -15 ft NAVD88	-0.31 cy/ft/yr	-4.76 cy/ft
Volume Change Above 0 ft NAVD88	-0.26 cy/ft/yr	-0.54 cy/ft



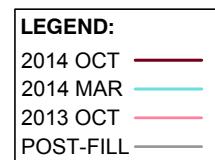
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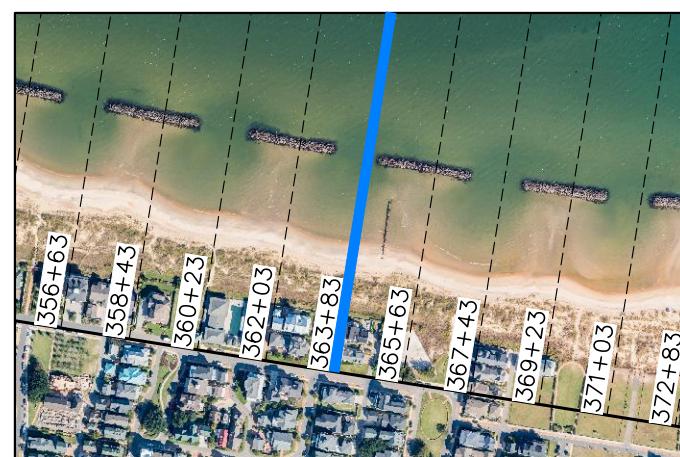
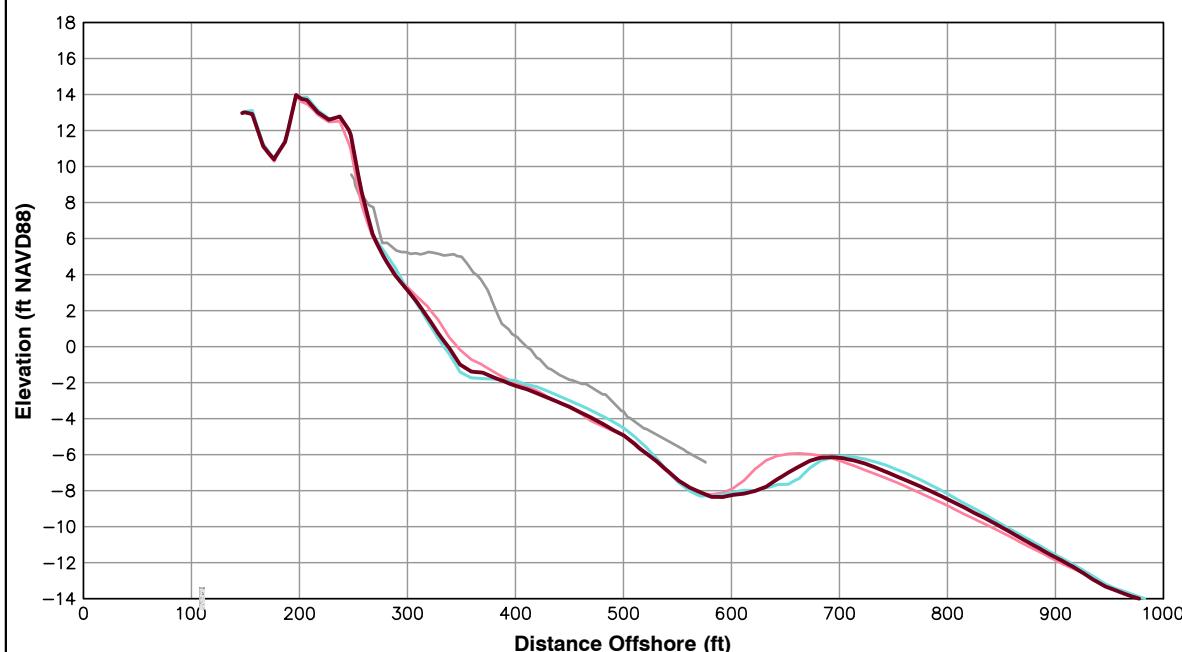


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
363+83		
Shoreline Change at MHW (0.98 ft NAVD88)	-8.19 ft/yr	2.83 ft
Volume Change Above -15 ft NAVD88	-1.59 cy/ft/yr	-3.31 cy/ft
Volume Change Above 0 ft NAVD88	0.10 cy/ft/yr	-0.33 cy/ft

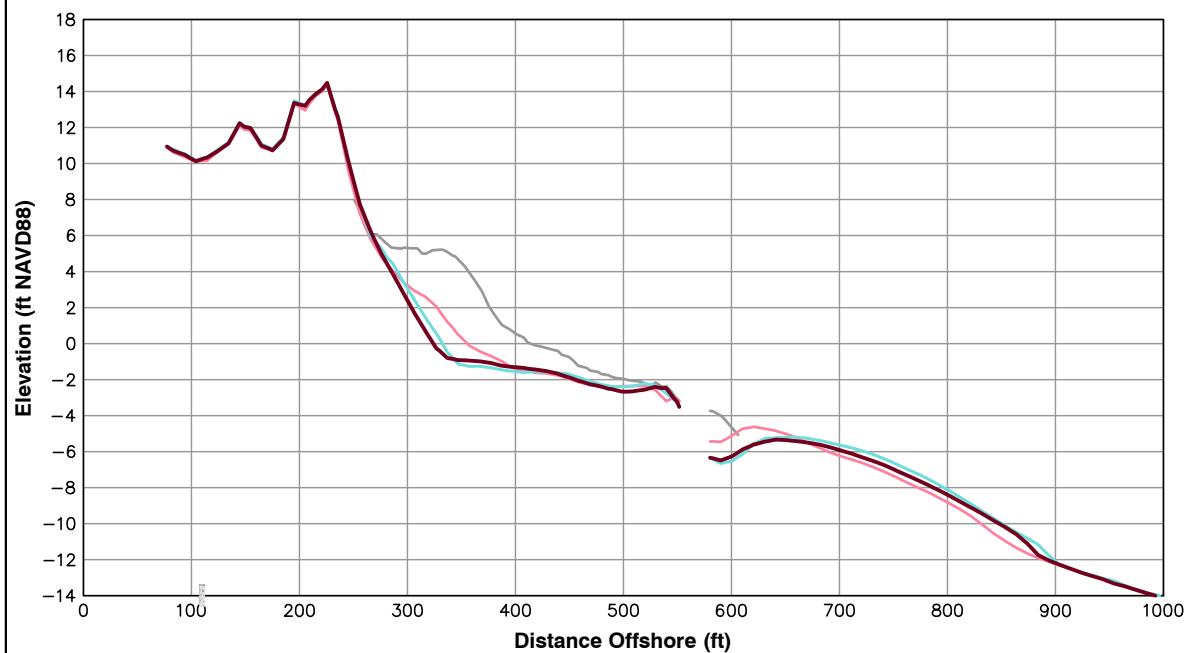
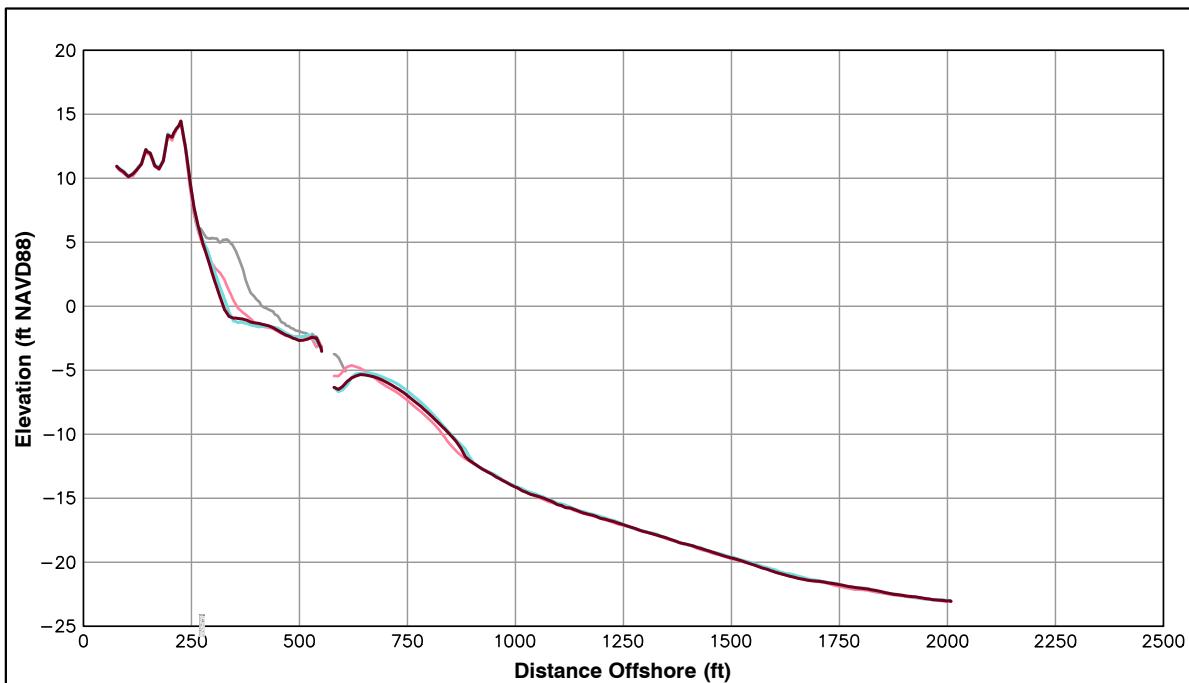


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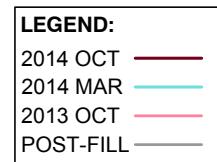
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

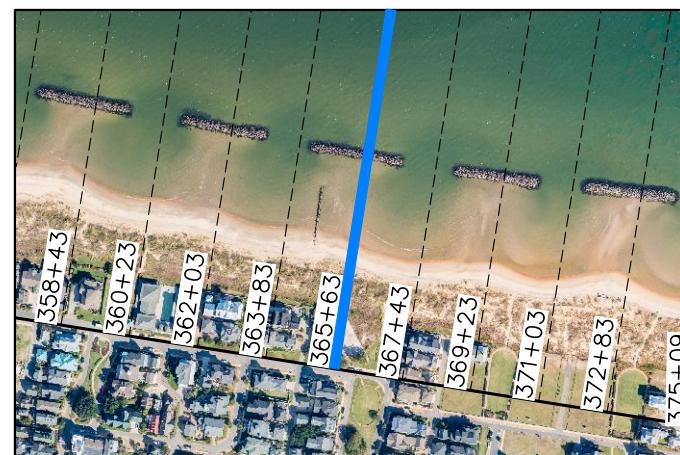


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
365+63		
Shoreline Change at MHW (0.98 ft NAVD88)	-27.48 ft/yr	-8.18 ft
Volume Change Above -15 ft NAVD88	-2.01 cy/ft/yr	-4.42 cy/ft
Volume Change Above 0 ft NAVD88	-1.72 cy/ft/yr	-1.50 cy/ft

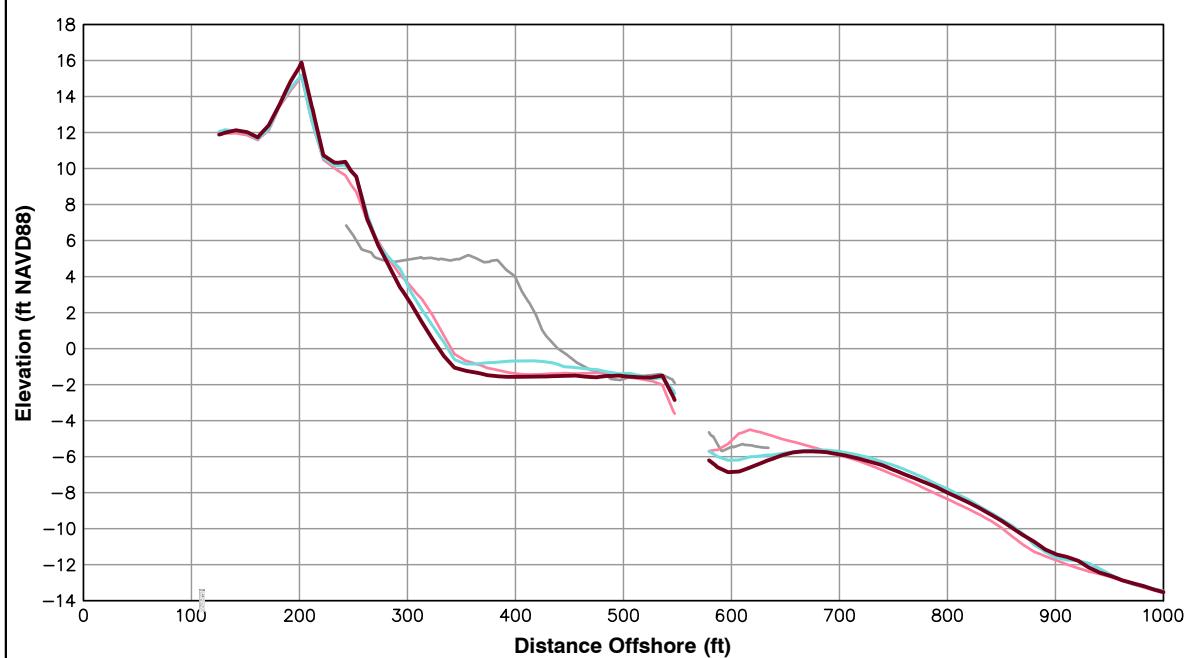
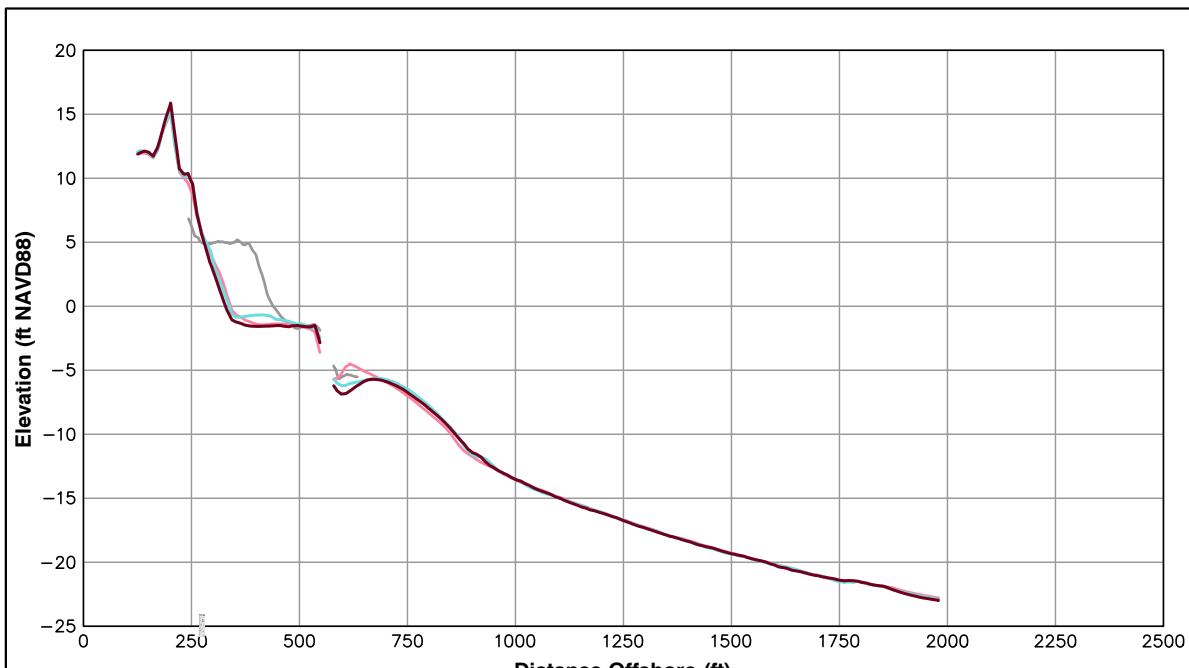


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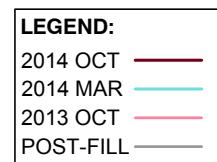
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

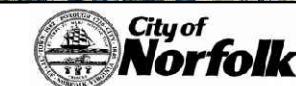
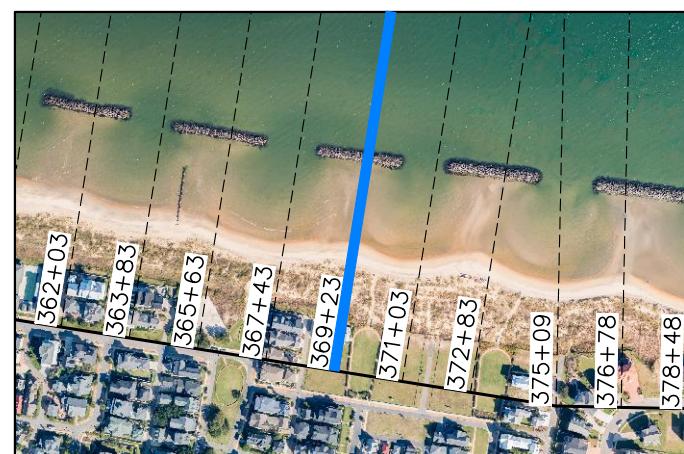


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
369+23		
Shoreline Change at MHW (0.98 ft NAVD88)	-13.17 ft/yr	-8.07 ft
Volume Change Above -15 ft NAVD88	-2.87 cy/ft/yr	-6.57 cy/ft
Volume Change Above 0 ft NAVD88	-0.11 cy/ft/yr	-0.61 cy/ft

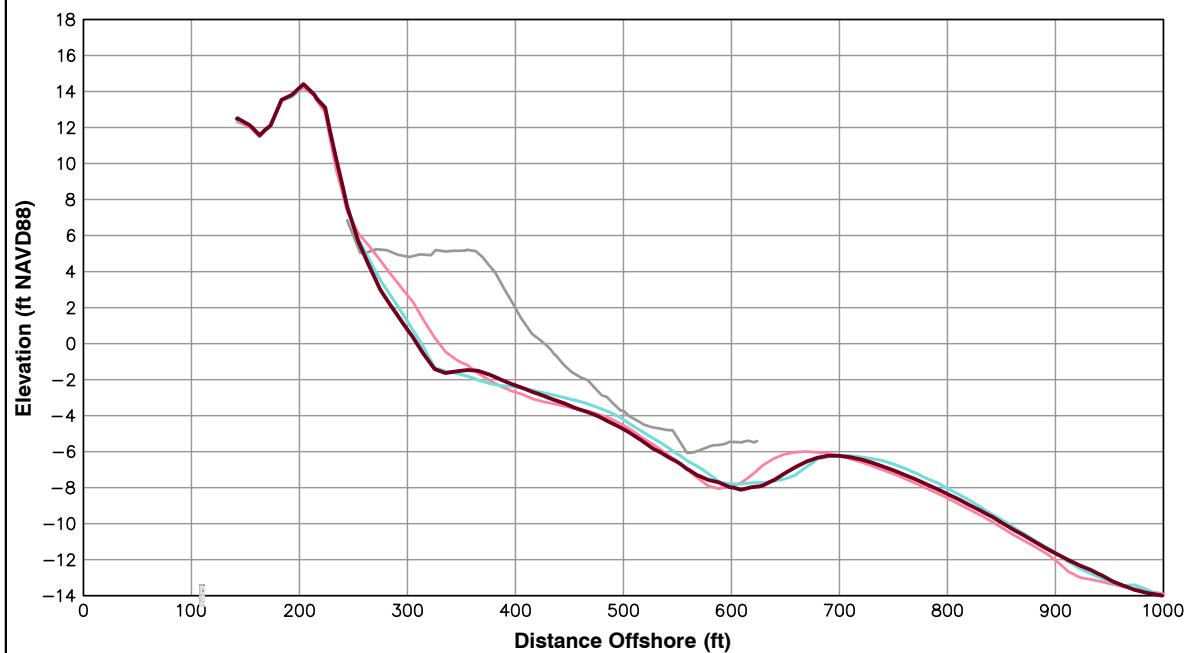
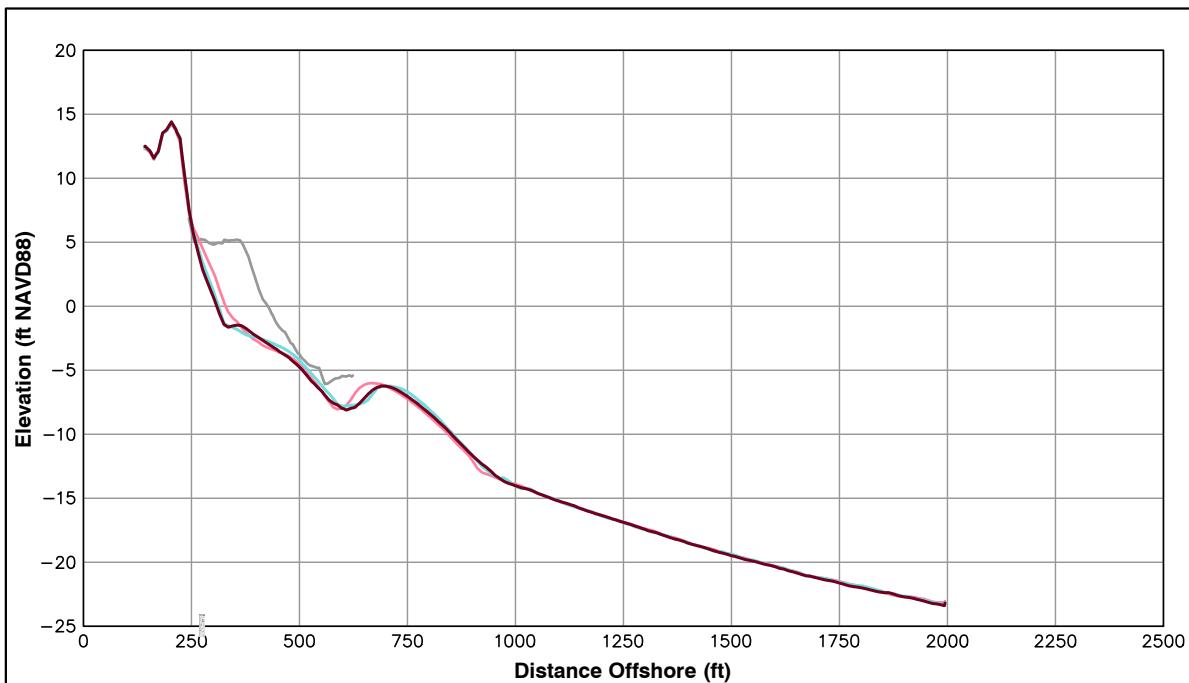


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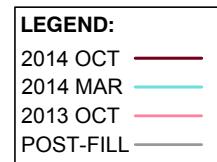
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

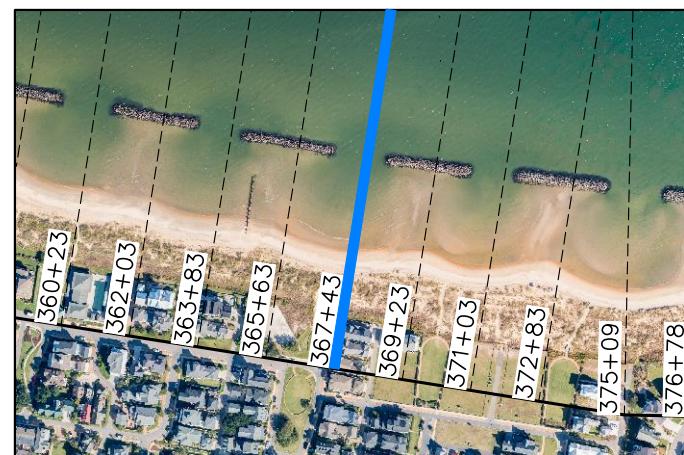


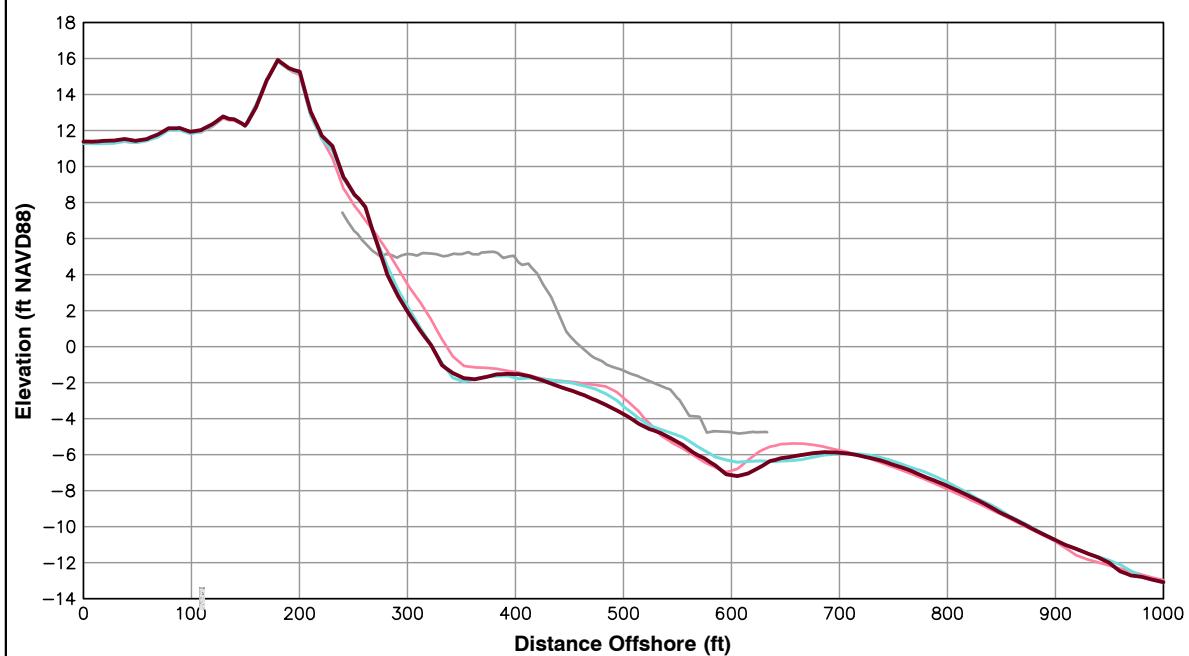
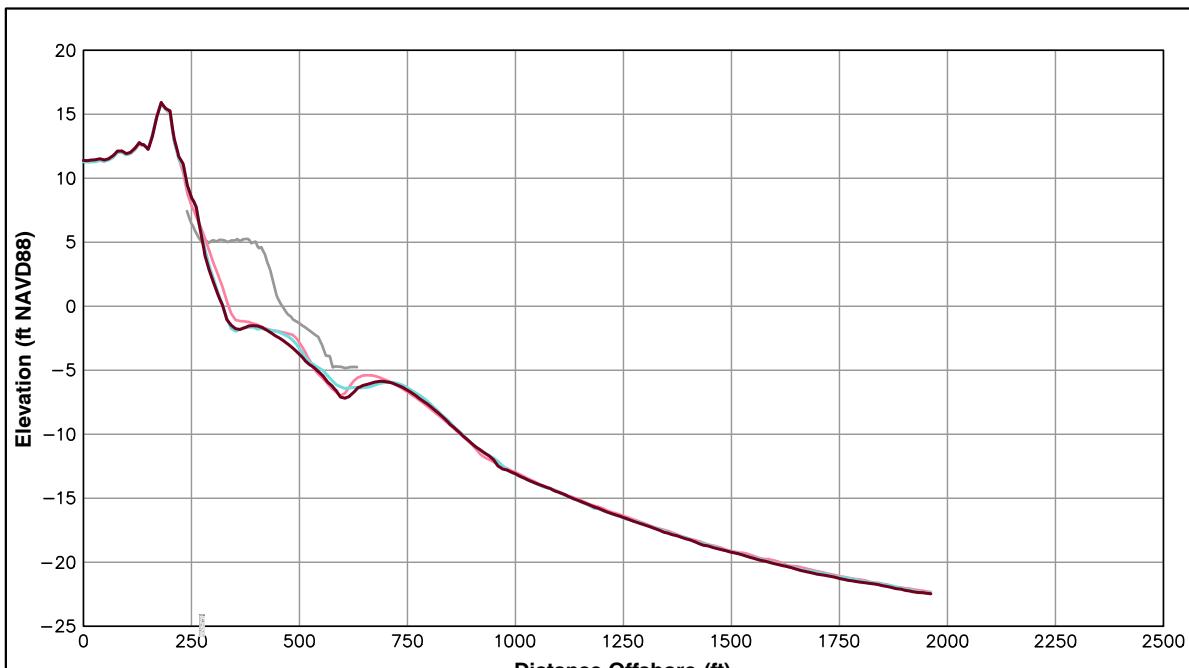
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-21.38 ft/yr	-5.11 ft
Volume Change Above -15 ft NAVD88	-3.85 cy/ft/yr	-4.44 cy/ft
Volume Change Above 0 ft NAVD88	-3.26 cy/ft/yr	-0.85 cy/ft



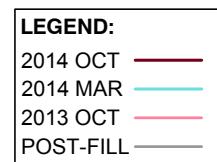
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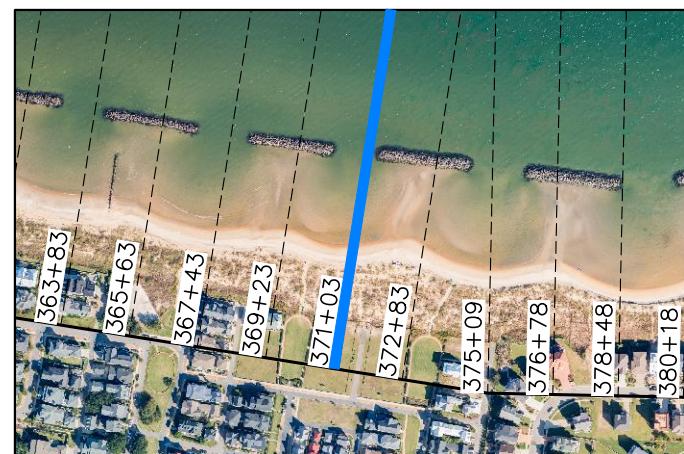


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-16.34 ft/yr	-1.71 ft
Volume Change Above -15 ft NAVD88	-6.79 cy/ft/yr	-3.52 cy/ft
Volume Change Above 0 ft NAVD88	-1.33 cy/ft/yr	0.35 cy/ft

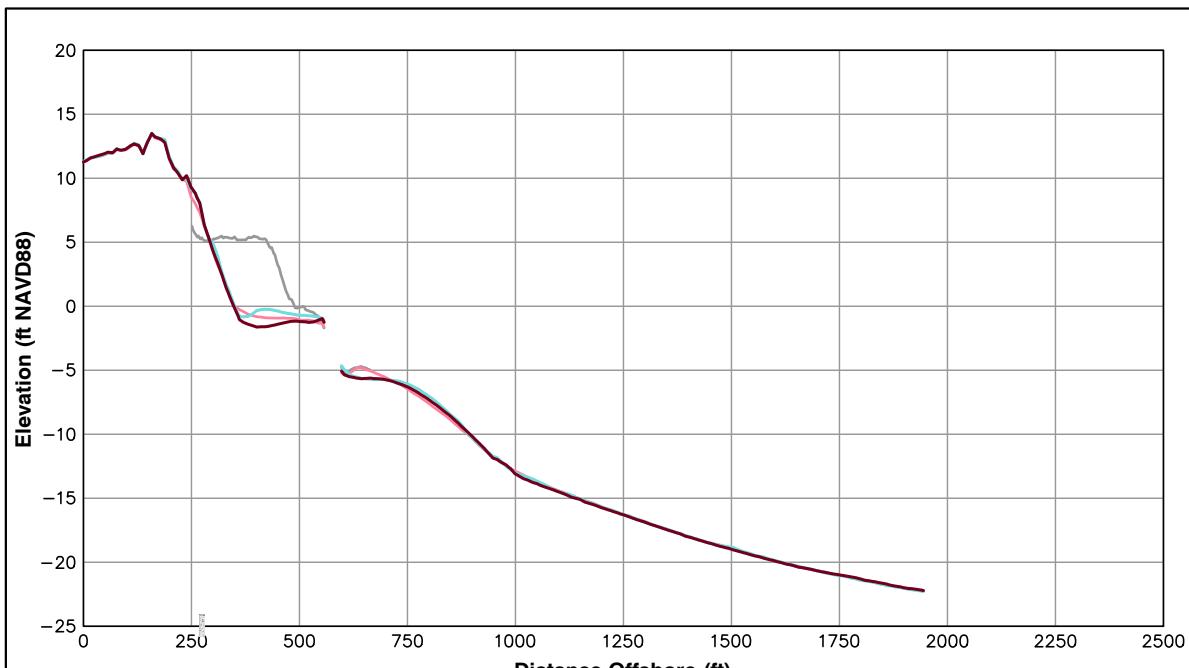


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



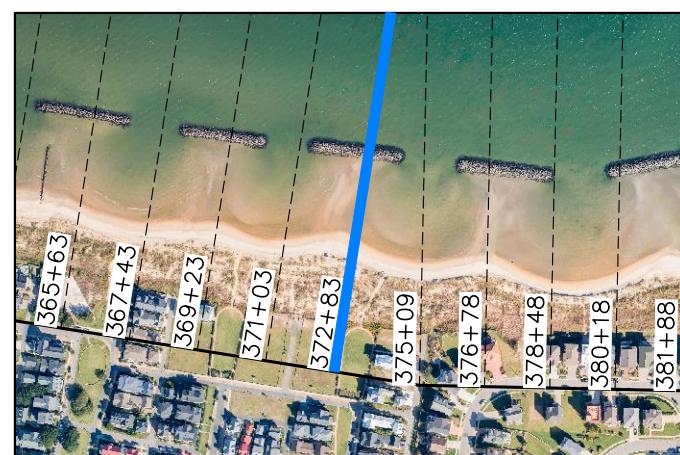
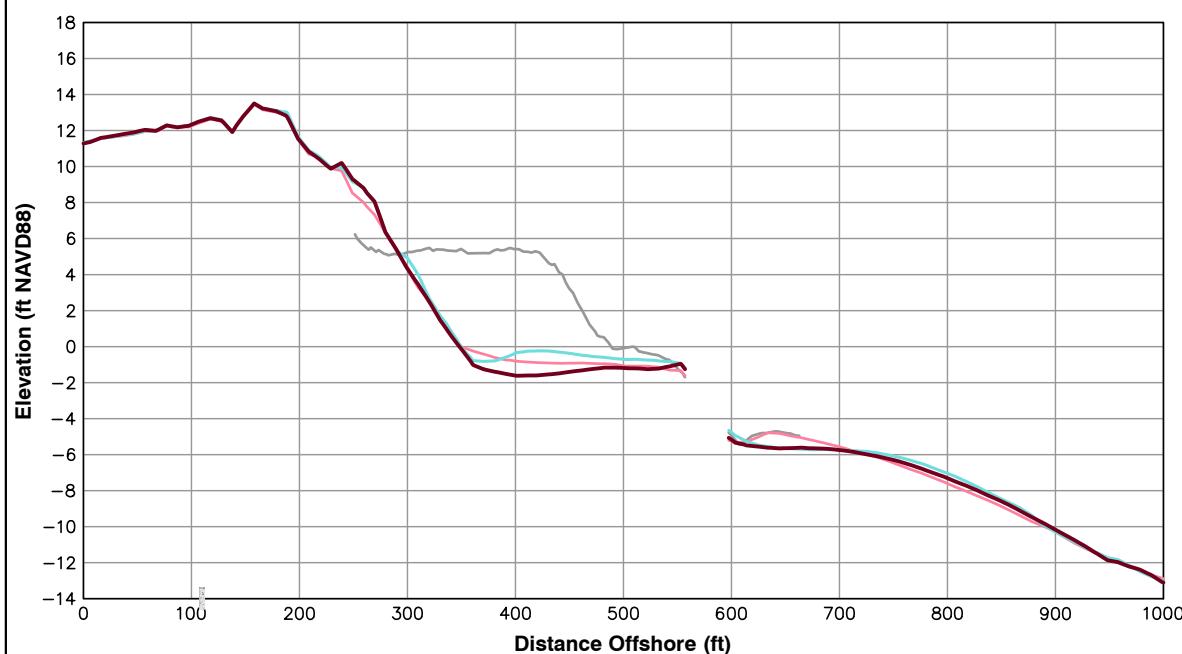
Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-0.53 ft/yr	-3.14 ft
Volume Change Above -15 ft NAVD88	-2.80 cy/ft/yr	-8.38 cy/ft
Volume Change Above 0 ft NAVD88	1.36 cy/ft/yr	-0.80 cy/ft

LEGEND:

2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

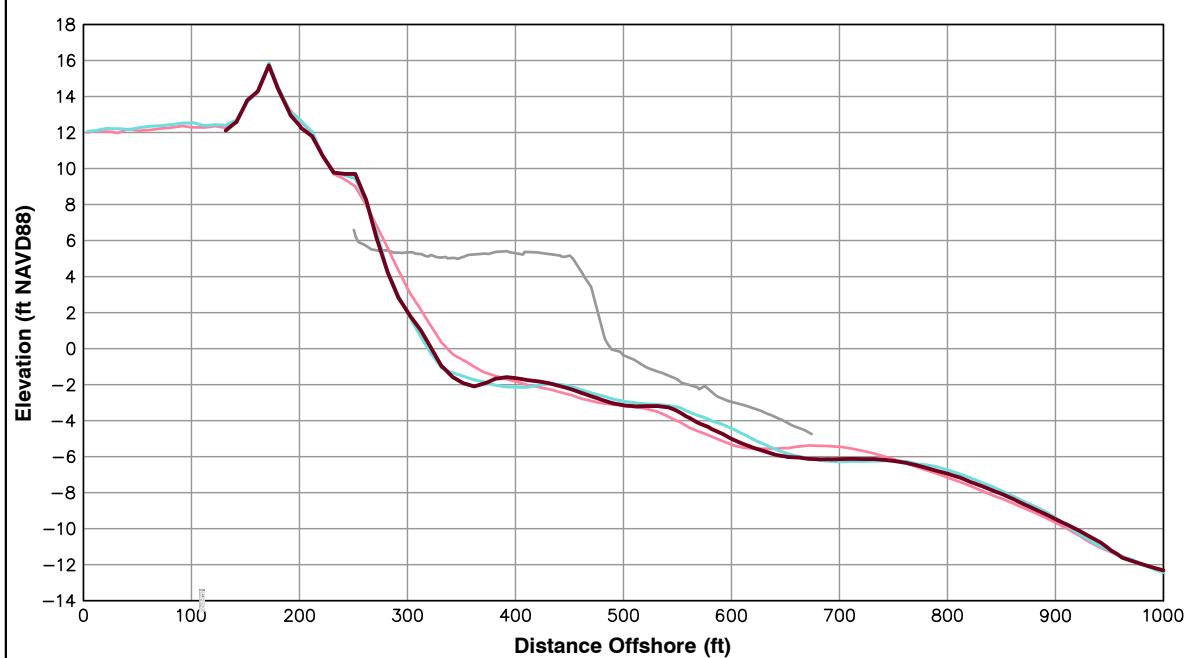
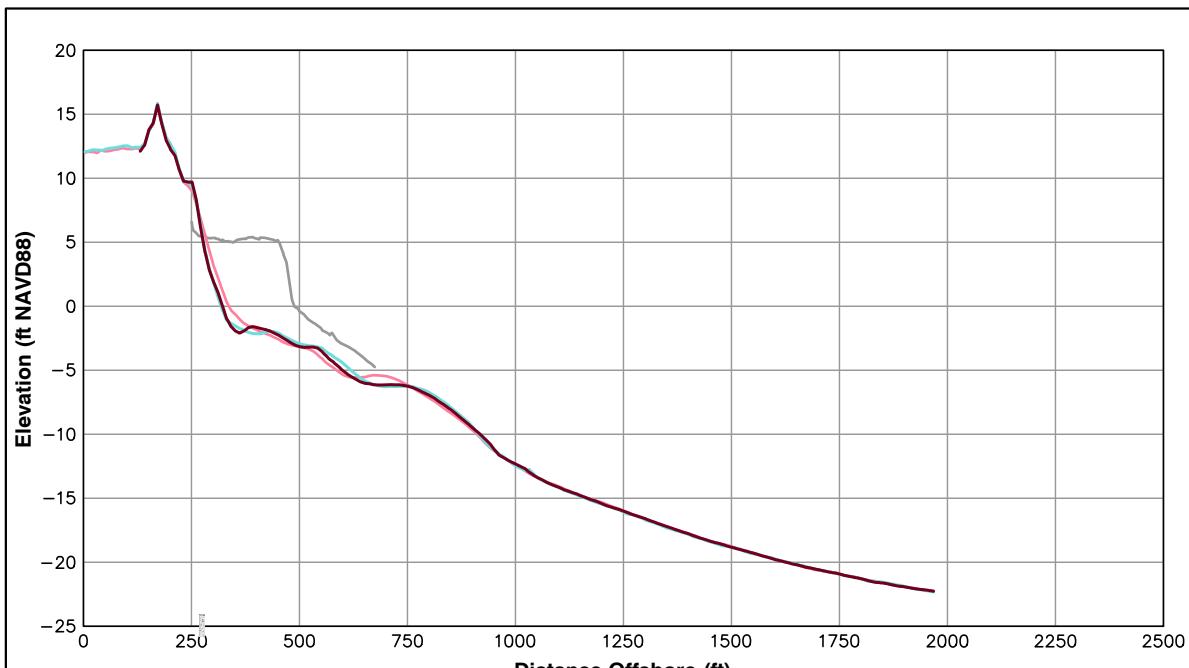
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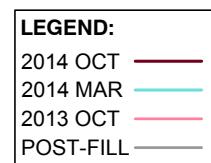


**City of
Norfolk**

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-12.39 ft/yr	3.34 ft
Volume Change Above -15 ft NAVD88	-2.91 cy/ft/yr	-2.39 cy/ft
Volume Change Above 0 ft NAVD88	-2.62 cy/ft/yr	-0.30 cy/ft



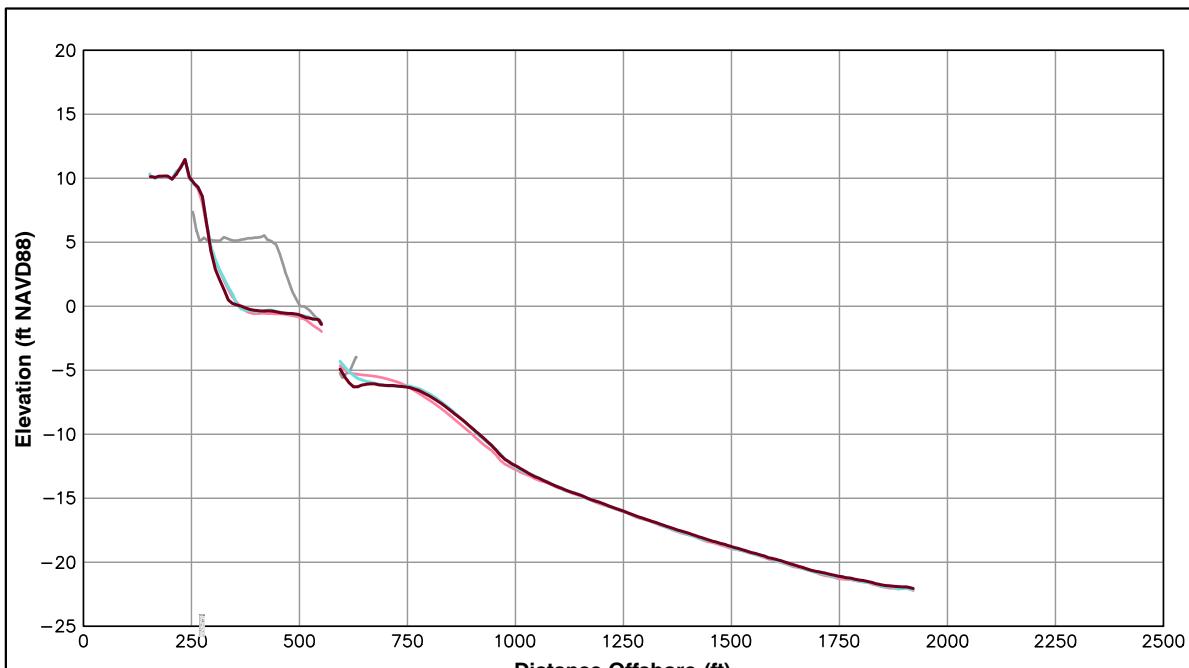
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**City of
Norfolk**

OCEAN VIEW PERIODIC
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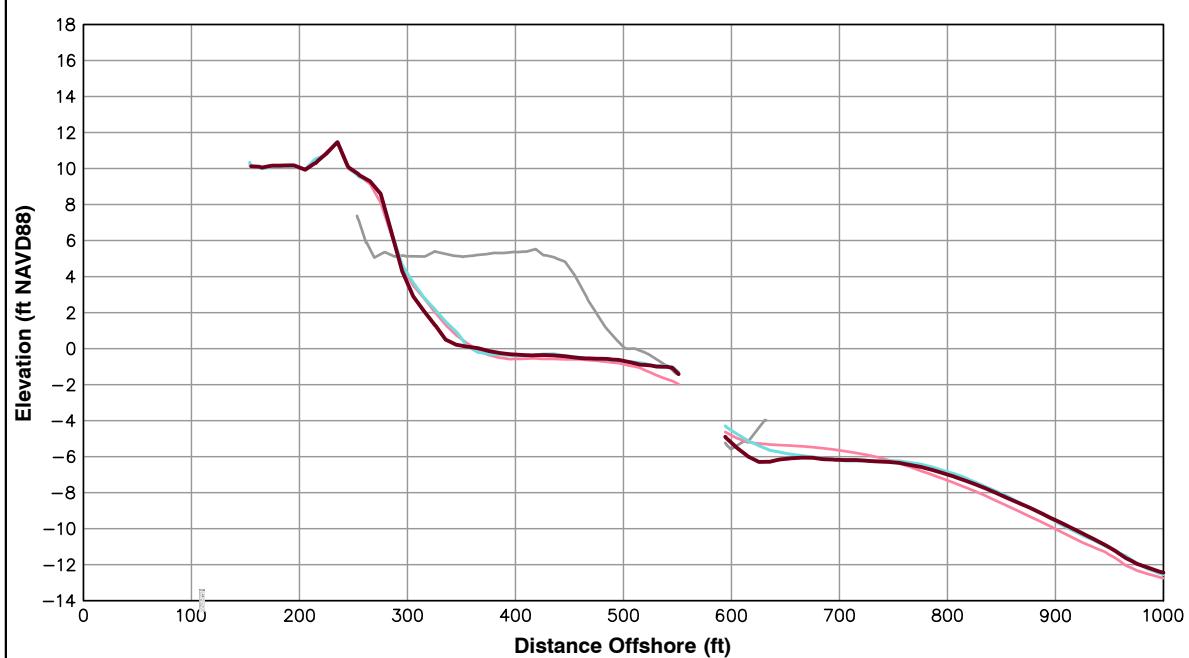


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
376+78		
Shoreline Change at MHW (0.98 ft NAVD88)	-11.86 ft/yr	-14.98 ft
Volume Change Above -15 ft NAVD88	1.70 cy/ft/yr	-3.38 cy/ft
Volume Change Above 0 ft NAVD88	-0.94 cy/ft/yr	-1.56 cy/ft

LEGEND:
2014 OCT
2014 MAR
2013 OCT
POST-FILL

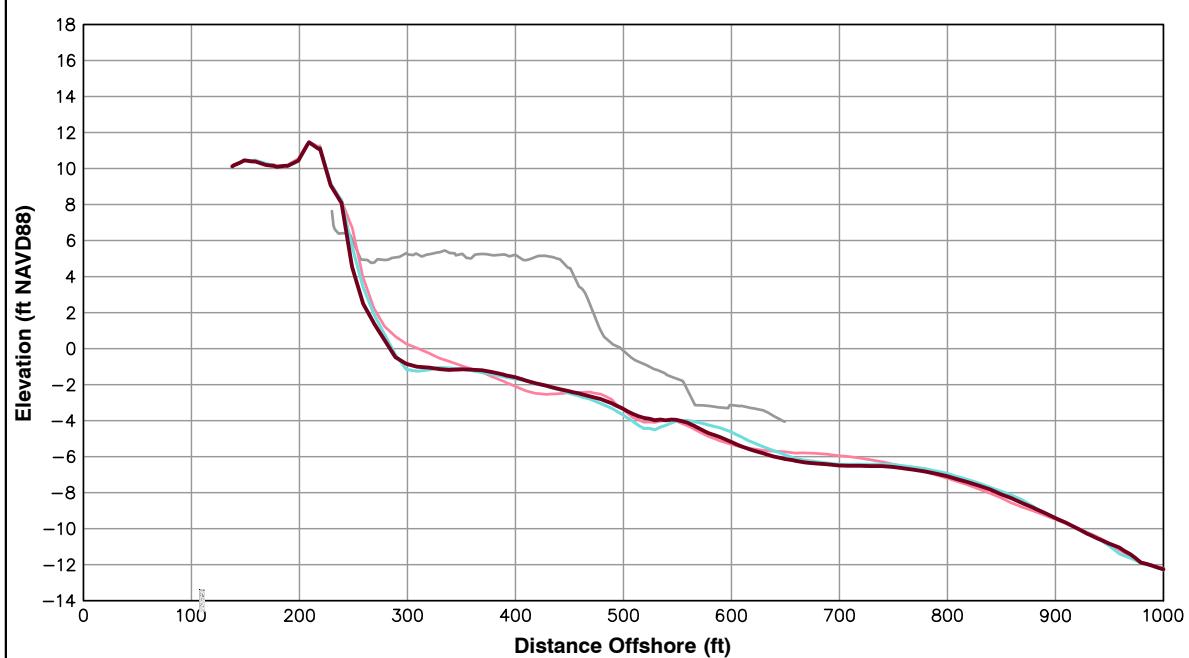
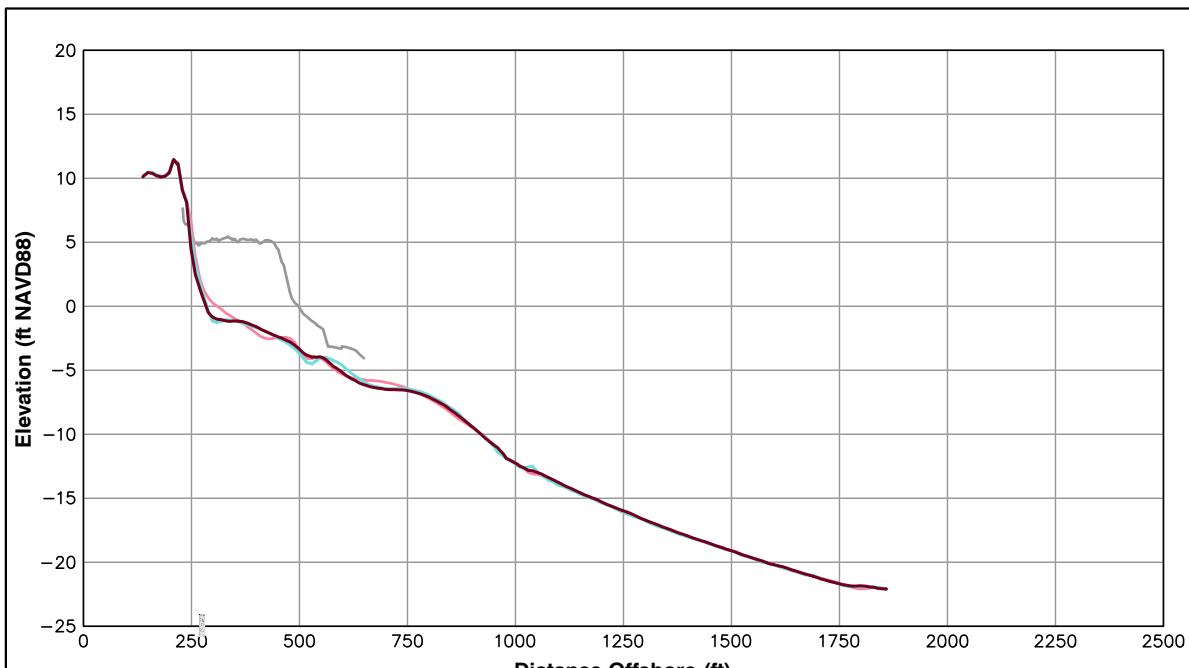
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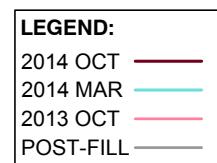


**City of
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OCEAN VIEW PERIODIC
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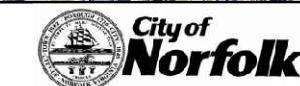
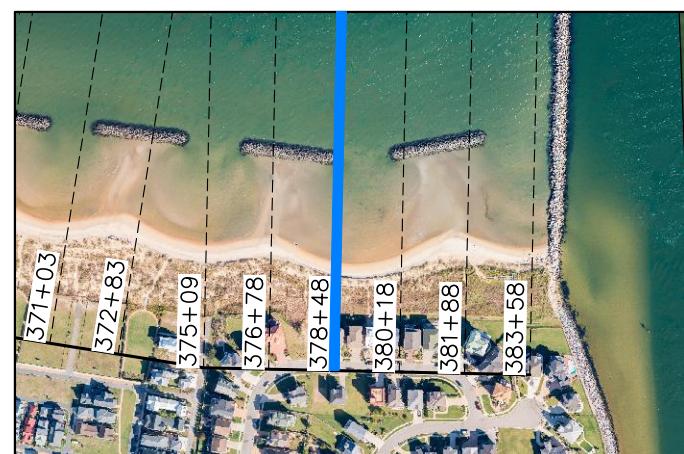


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-10.10 ft/yr	-3.67 ft
Volume Change Above -15 ft NAVD88	-3.51 cy/ft/yr	-1.60 cy/ft
Volume Change Above 0 ft NAVD88	-2.66 cy/ft/yr	-1.26 cy/ft



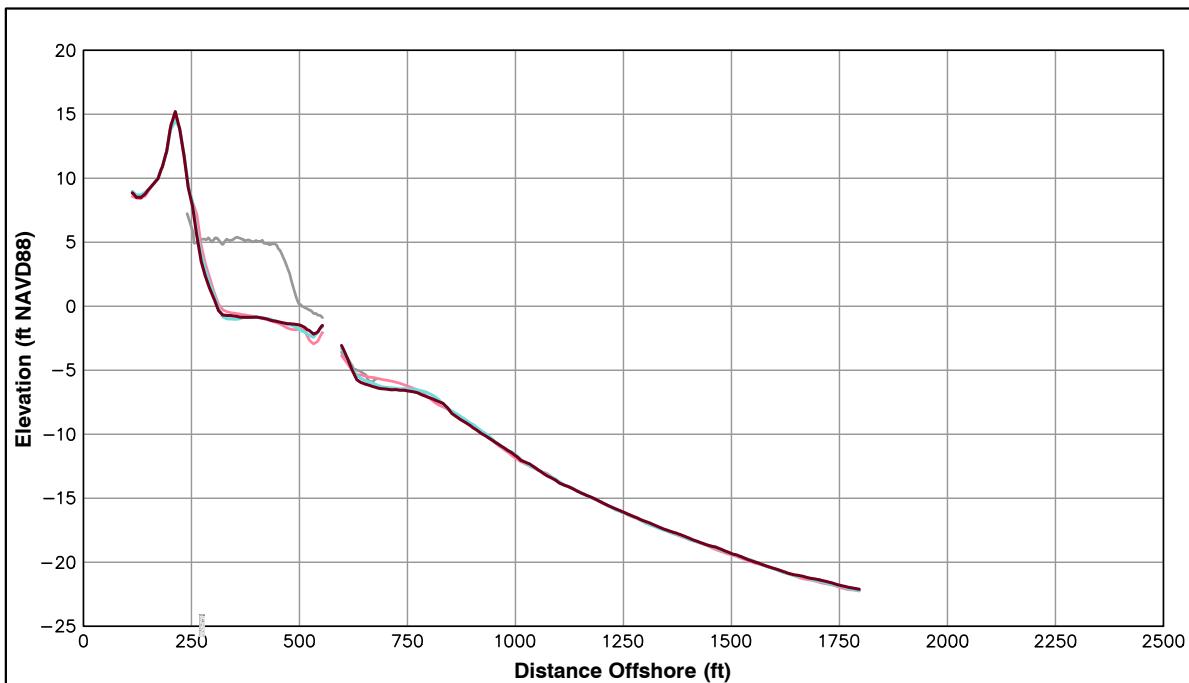
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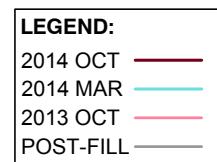


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OCEAN VIEW PERIODIC
SURVEYING DATA &
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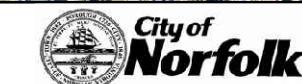
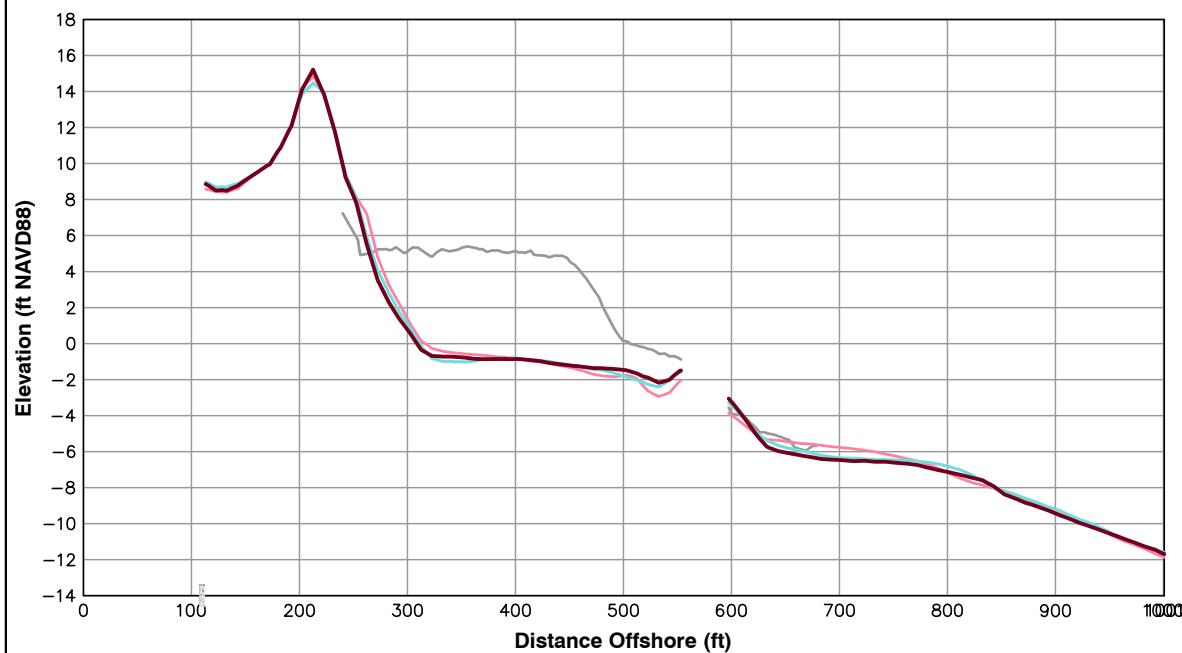


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
380+18		
Shoreline Change at MHW (0.98 ft NAVD88)	-6.70 ft/yr	-3.81 ft
Volume Change Above -15 ft NAVD88	-3.31 cy/ft/yr	-2.44 cy/ft
Volume Change Above 0 ft NAVD88	-1.95 cy/ft/yr	-0.93 cy/ft

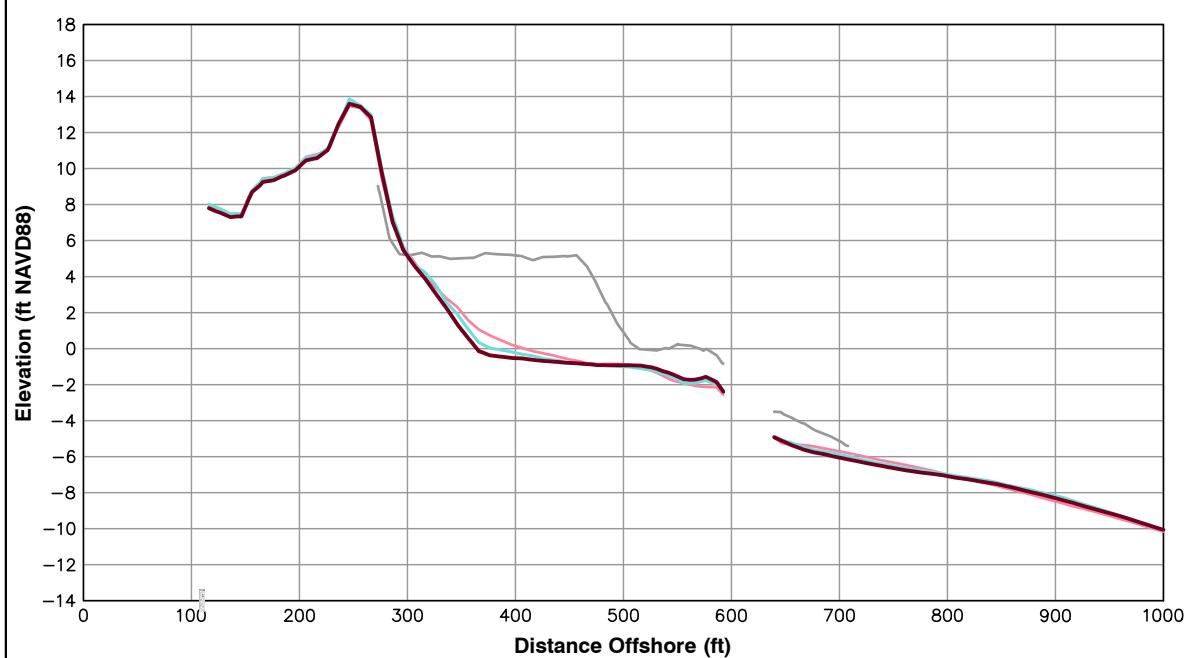
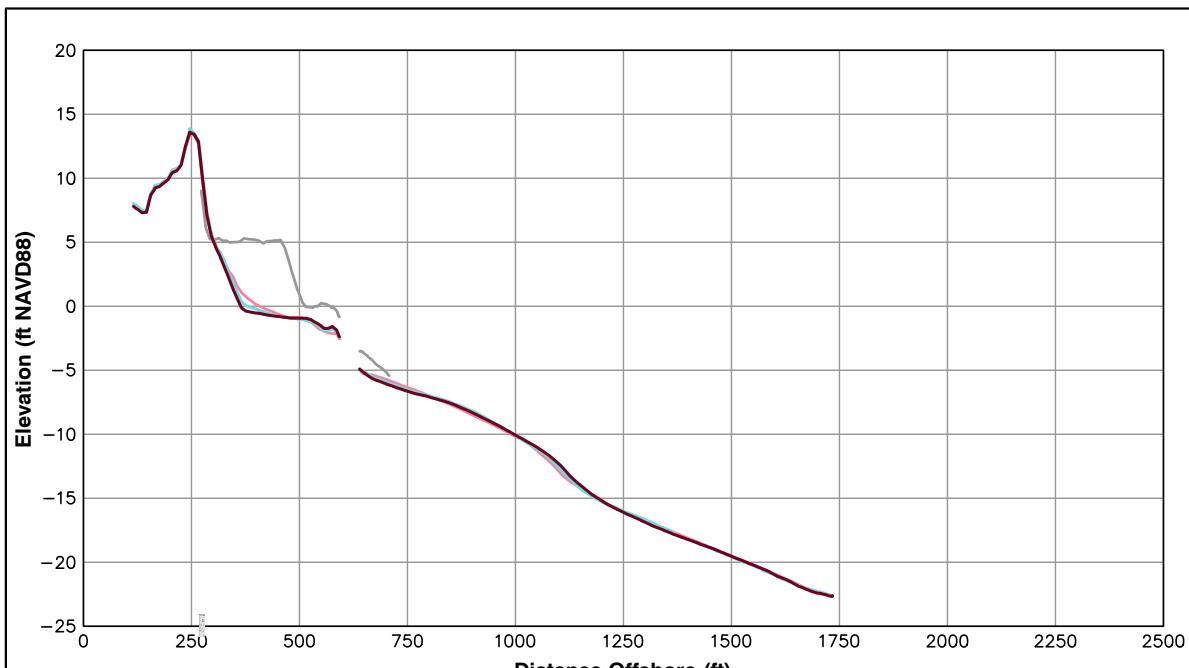


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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

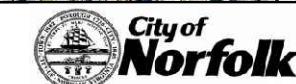


Survey Transect	October 2014 - October 2013	October 2014 - March 2014
381+88		
Shoreline Change at MHW (0.98 ft NAVD88)	-18.10 ft/yr	-6.75 ft
Volume Change Above -15 ft NAVD88	-1.73 cy/ft/yr	-2.24 cy/ft
Volume Change Above 0 ft NAVD88	-2.50 cy/ft/yr	-2.05 cy/ft

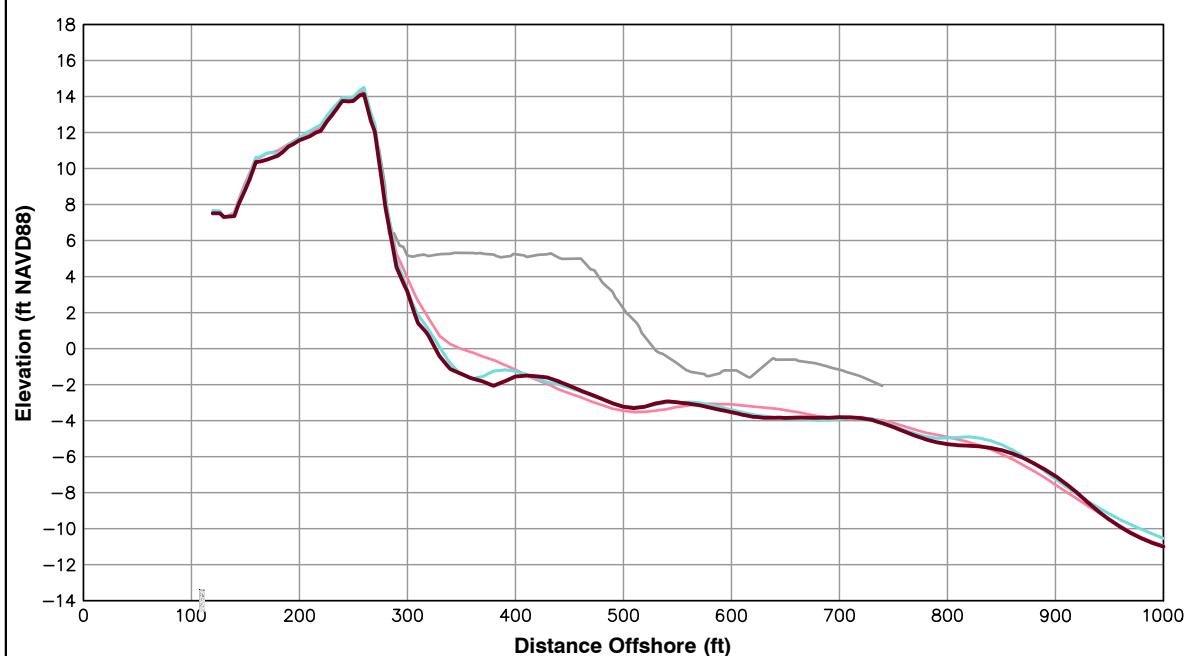
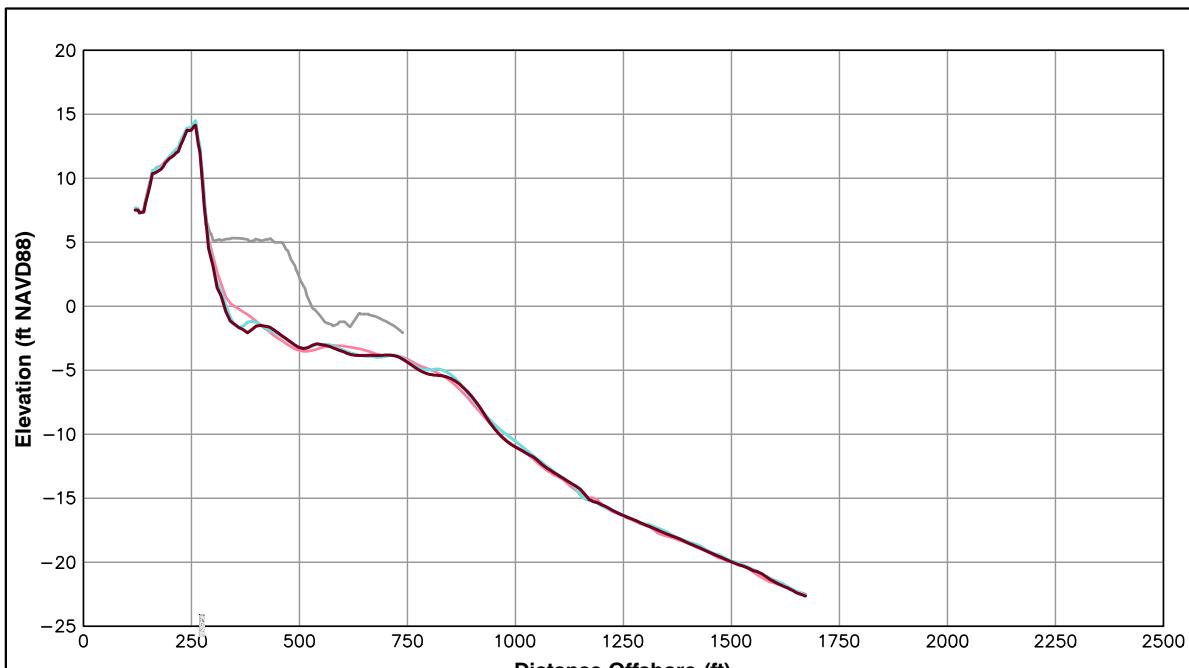
LEGEND:	
2014 OCT	—
2014 MAR	—
2013 OCT	—
POST-FILL	—

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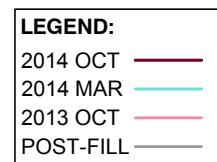
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



Survey Transect	October 2014 - October 2013	October 2014 - March 2014
Shoreline Change at MHW (0.98 ft NAVD88)	-11.00 ft/yr	-4.08 ft
Volume Change Above -15 ft NAVD88	-5.03 cy/ft/yr	-5.35 cy/ft
Volume Change Above 0 ft NAVD88	-3.08 cy/ft/yr	-2.05 cy/ft



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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2013 to October 2014)**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from October 17, 2013 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
0+00	10/17/2013	10/7/2014	21.86	6.32	10.91
2+50	10/17/2013	10/7/2014	14.02	2.96	19.07
5+00	10/17/2013	10/7/2014	4.01	1.27	-10.61
7+50	10/17/2013	10/7/2014	-9.41	-0.91	23.20
10+00	10/17/2013	10/7/2014	61.32	19.06	15.68
12+50	10/17/2013	10/7/2014	33.94	7.95	0.65
15+00	10/17/2013	10/7/2014	53.27	10.13	12.40
17+50	10/17/2013	10/7/2014	24.16	6.40	5.96
20+00	10/17/2013	10/7/2014	12.41	3.94	-6.60
22+50	10/17/2013	10/7/2014	20.14	5.33	2.52
25+00	10/17/2013	10/7/2014	32.91	7.35	16.88
27+50	10/17/2013	10/7/2014	1.48	4.00	3.65
30+00	10/17/2013	10/7/2014	-13.72	2.04	3.54
32+50	10/17/2013	10/7/2014	9.35	5.02	0.94
35+00	10/17/2013	10/7/2014	41.13	6.20	0.39
37+50	10/17/2013	10/7/2014	34.07	5.69	3.36
40+00	10/17/2013	10/7/2014	-16.37	0.41	-10.56
42+50	10/17/2013	10/7/2014	-42.14	-2.01	-25.25
45+00	10/17/2013	10/7/2014	-77.86	-9.16	-6.21
45+25	10/17/2013	10/7/2014	-62.70	-9.17	-36.07
47+30	10/17/2013	10/7/2014	-52.74	-8.68	-43.66
49+35	10/17/2013	10/7/2014	-22.78	-4.08	-20.97
51+41	10/17/2013	10/7/2014	-10.50	-1.70	-10.38
53+46	10/17/2013	10/7/2014	-1.94	-0.33	-5.14
55+51	10/17/2013	10/7/2014	-8.41	-1.22	-5.33
57+57	10/17/2013	10/7/2014	0.74	0.71	0.91
59+62	10/17/2013	10/7/2014	-4.60	-0.21	-2.17
61+62	10/17/2013	10/7/2014	8.10	1.66	-1.12
63+62	10/17/2013	10/7/2014	3.35	0.23	-4.90
65+62	10/17/2013	10/7/2014	31.89	6.07	4.40
67+62	10/17/2013	10/7/2014	8.49	1.93	1.29
69+62	10/17/2013	10/7/2014	10.82	2.91	1.41
71+62	10/17/2013	10/7/2014	6.16	1.84	4.48
73+62	10/17/2013	10/7/2014	29.71	6.50	7.77
75+62	10/17/2013	10/7/2014	13.40	3.45	6.01
77+62	10/17/2013	10/7/2014	5.09	-0.31	-1.20
79+62	10/17/2013	10/7/2014	-9.26	-0.88	-2.04
81+62	10/17/2013	10/7/2014	-15.10	-2.33	-4.73
83+62	10/17/2013	10/7/2014	-8.35	-1.16	-2.91
85+62	10/17/2013	10/7/2014	-4.91	1.10	-0.05
87+62	10/17/2013	10/7/2014	-7.03	0.18	-1.81

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2013 to October 2014) Cont.**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from October 17, 2013 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
93+41	10/17/2013	10/7/2014	3.87	1.43	1.79
103+08	10/17/2013	10/7/2014	-2.11	0.62	5.39
120+93	10/17/2013	10/7/2014	29.35	6.12	12.48
129+17	10/17/2013	10/7/2014	47.28	10.76	17.36
141+98	10/17/2013	10/7/2014	11.47	1.91	2.34
152+01	10/17/2013	10/7/2014	11.50	2.47	-0.31
163+49	10/17/2013	10/7/2014	-15.26	-2.91	-12.99
169+63	10/17/2013	10/7/2014	-6.44	-1.17	-4.03
171+63	10/17/2013	10/7/2014	1.61	0.68	-1.54
173+63	10/17/2013	10/7/2014	3.64	1.28	3.82
175+63	10/17/2013	10/7/2014	-1.27	1.02	2.88
177+63	10/17/2013	10/7/2014	4.30	2.97	0.77
179+63	10/17/2013	10/7/2014	18.55	4.07	9.08
181+63	10/17/2013	10/7/2014	15.21	2.88	6.71
183+63	10/17/2013	10/7/2014	14.82	4.01	9.45
185+63	10/17/2013	10/7/2014	1.73	0.29	-1.84
187+63	10/17/2013	10/7/2014	7.22	2.01	5.27
189+63	10/17/2013	10/7/2014	4.15	1.73	0.66
191+63	10/17/2013	10/7/2014	15.70	3.16	7.41
193+63	10/17/2013	10/7/2014	7.45	2.37	0.85
195+63	10/17/2013	10/7/2014	-1.00	1.55	-6.05
206+86	10/17/2013	10/7/2014	8.78	2.77	4.02
218+66	10/17/2013	10/7/2014	3.38	1.76	2.40
229+85	10/17/2013	10/7/2014	-4.40	5.94	-3.94
242+03	10/17/2013	10/7/2014	-27.48	3.44	-4.66
252+62	10/17/2013	10/7/2014	-7.97	9.25	-0.80
263+22	10/17/2013	10/7/2014	0.85	4.09	1.79
274+53	10/17/2013	10/7/2014	4.60	5.06	-4.53
281+40	10/17/2013	10/7/2014	-3.87	4.87	3.49
288+39	10/17/2013	10/7/2014	10.54	7.28	-2.11
295+27	10/17/2013	10/7/2014	-10.00	5.10	-5.31
302+24	10/17/2013	10/7/2014	-5.70	4.39	1.73
315+96	10/17/2013	10/7/2014	11.14	3.47	2.33
323+09	10/17/2013	10/7/2014	-3.25	2.86	-7.57
329+63	10/17/2013	10/7/2014	-9.08	1.16	6.06
331+43	10/17/2013	10/7/2014	-8.39	1.13	1.33
333+23	10/17/2013	10/7/2014	-7.13	1.37	-5.40
335+03	10/17/2013	10/7/2014	-9.81	1.93	-7.53
336+83	10/17/2013	10/7/2014	-8.68	2.46	2.15
338+63	10/17/2013	10/7/2014	-18.38	1.06	1.53
340+43	10/17/2013	10/7/2014	-11.25	3.84	2.65
342+23	10/17/2013	10/7/2014	-15.40	1.02	0.41

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2013 to October 2014) Cont.**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from October 17, 2013 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
344+05	10/17/2013	10/7/2014	-18.84	-10.08	-14.97
345+85	10/17/2013	10/7/2014	-5.38	-1.24	-3.64
347+63	10/17/2013	10/7/2014	-5.79	2.31	2.63
349+43	10/17/2013	10/7/2014	1.20	2.11	-0.82
351+23	10/17/2013	10/7/2014	-9.73	2.87	-1.43
353+03	10/17/2013	10/7/2014	-7.93	1.13	-4.16
354+83	10/17/2013	10/7/2014	-10.61	1.72	1.43
356+63	10/17/2013	10/7/2014	-1.93	0.95	-1.04
358+43	10/17/2013	10/7/2014	-14.80	0.26	-0.18
360+23	10/17/2013	10/7/2014	-11.77	0.68	-2.54
362+03	10/17/2013	10/7/2014	-17.49	-0.26	-0.31
363+83	10/17/2013	10/7/2014	-8.19	0.10	-1.59
365+63	10/17/2013	10/7/2014	-27.48	-1.72	-2.01
367+43	10/17/2013	10/7/2014	-21.38	-3.26	-3.85
369+23	10/17/2013	10/7/2014	-13.17	-0.11	-2.87
371+03	10/17/2013	10/7/2014	-16.34	-1.33	-6.79
372+83	10/17/2013	10/7/2014	-0.53	1.36	-2.80
375+08	10/17/2013	10/7/2014	-12.39	-2.62	-2.91
376+78	10/17/2013	10/7/2014	-11.86	-0.94	1.70
378+48	10/17/2013	10/7/2014	-10.10	-2.66	-3.51
380+18	10/17/2013	10/7/2014	-6.70	-1.95	-3.31
381+88	10/17/2013	10/7/2014	-18.10	-2.50	-1.73
383+58	10/17/2013	10/7/2014	-11.00	-3.08	-5.03

**Table C-2. Summary of Shoreline Change and Volume Change
(March 2014 to October 2014)**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 20, 2014 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
0+00	3/20/2014	10/7/2014	6.75	2.47	-4.83
2+50	3/20/2014	10/7/2014	6.36	1.57	7.11
5+00	3/20/2014	10/7/2014	8.41	1.36	-4.35
7+50	3/20/2014	10/7/2014	-7.25	-1.17	16.07
10+00	3/20/2014	10/7/2014	31.91	11.79	-1.30
12+50	3/20/2014	10/7/2014	20.97	4.96	-2.98
15+00	3/20/2014	10/7/2014	21.33	3.99	-4.24
17+50	3/20/2014	10/7/2014	12.59	2.29	-3.81
20+00	3/20/2014	10/7/2014	3.56	0.75	-7.85
22+50	3/20/2014	10/7/2014	8.64	2.11	-8.16
25+00	3/20/2014	10/7/2014	7.36	1.22	-9.68
27+50	3/20/2014	10/7/2014	-13.41	-1.36	-12.03
30+00	3/20/2014	10/7/2014	18.17	3.17	2.96
32+50	3/20/2014	10/7/2014	34.64	5.88	2.43
35+00	3/20/2014	10/7/2014	13.32	2.05	-0.46
37+50	3/20/2014	10/7/2014	11.43	3.48	1.83
40+00	3/20/2014	10/7/2014	-31.73	-4.27	-14.15
42+50	3/20/2014	10/7/2014	-12.60	-1.80	-6.39
45+00	3/20/2014	10/7/2014	-33.62	-5.47	-7.01
45+25	3/20/2014	10/7/2014	-28.64	-5.01	-9.14
47+30	3/20/2014	10/7/2014	-26.23	-4.98	-18.97
49+35	3/20/2014	10/7/2014	-9.66	-2.73	-8.01
51+41	3/20/2014	10/7/2014	-4.49	-1.25	-10.27
53+46	3/20/2014	10/7/2014	0.48	-0.91	-5.52
55+51	3/20/2014	10/7/2014	-4.43	-0.78	-8.80
57+57	3/20/2014	10/7/2014	-0.47	-0.24	-4.03
59+62	3/20/2014	10/7/2014	-3.83	-0.27	-5.42
61+62	3/20/2014	10/7/2014	-9.52	-0.25	-5.39
63+62	3/20/2014	10/7/2014	3.30	1.95	-2.14
65+62	3/20/2014	10/7/2014	-7.36	1.18	-5.06
67+62	3/20/2014	10/7/2014	-1.14	0.65	1.23
69+62	3/20/2014	10/7/2014	6.32	1.04	-4.14
71+62	3/20/2014	10/7/2014	11.66	2.44	0.87
73+62	3/20/2014	10/7/2014	27.03	3.26	2.99
75+62	3/20/2014	10/7/2014	10.96	2.16	3.26
77+62	3/20/2014	10/7/2014	3.98	0.07	-2.13
79+62	3/20/2014	10/7/2014	-2.48	-0.03	2.77
81+62	3/20/2014	10/7/2014	-7.70	-1.14	-4.18
83+62	3/20/2014	10/7/2014	-16.59	-2.26	-5.34
85+62	3/20/2014	10/7/2014	0.49	0.41	-3.49
87+62	3/20/2014	10/7/2014	-1.22	0.06	-4.36

**Table C-2. Summary of Shoreline Change and Volume Change
(March 2014 to October 2014) Cont.**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 20, 2014 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
93+41	3/20/2014	10/7/2014	2.54	0.40	1.98
103+08	3/20/2014	10/7/2014	-4.79	-1.21	-0.32
120+93	3/20/2014	10/7/2014	23.17	6.33	12.40
129+17	3/20/2014	10/7/2014	-	-	-
141+98	3/20/2014	10/7/2014	-6.21	-0.11	0.32
152+01	3/20/2014	10/7/2014	19.37	4.84	8.62
163+49	3/20/2014	10/7/2014	-4.25	-1.20	-4.57
169+63	3/20/2014	10/7/2014	-2.79	-1.29	-7.47
171+63	3/20/2014	10/7/2014	-5.28	-1.15	-2.22
173+63	3/20/2014	10/7/2014	-3.96	-1.24	-4.06
175+63	3/20/2014	10/7/2014	-18.80	-4.15	-9.54
177+63	3/20/2014	10/7/2014	-12.43	-1.96	-4.02
179+63	3/20/2014	10/7/2014	-13.44	0.02	-4.95
181+63	3/20/2014	10/7/2014	10.41	3.28	2.53
183+63	3/20/2014	10/7/2014	-10.30	0.63	-2.00
185+63	3/20/2014	10/7/2014	2.68	0.66	-2.50
187+63	3/20/2014	10/7/2014	7.26	1.56	-1.27
189+63	3/20/2014	10/7/2014	9.81	1.40	-0.76
191+63	3/20/2014	10/7/2014	19.86	3.91	5.35
193+63	3/20/2014	10/7/2014	-1.32	1.49	4.09
195+63	3/20/2014	10/7/2014	11.04	2.70	6.74
206+86	3/20/2014	10/7/2014	4.36	-0.28	-2.91
218+66	3/20/2014	10/7/2014	-5.76	-1.84	-2.17
229+85	3/20/2014	10/7/2014	-11.86	2.58	-1.24
242+03	3/20/2014	10/7/2014	11.53	3.18	3.16
252+62	3/20/2014	10/7/2014	5.25	2.48	-0.75
263+22	3/20/2014	10/7/2014	36.96	4.34	1.16
274+53	3/20/2014	10/7/2014	6.14	2.28	2.74
281+40	3/20/2014	10/7/2014	8.11	2.83	-3.63
288+39	3/20/2014	10/7/2014	24.66	3.98	-8.70
295+27	3/20/2014	10/7/2014	5.98	0.78	-0.94
302+24	3/20/2014	10/7/2014	10.84	7.70	5.04
315+96	3/20/2014	10/7/2014	22.08	3.77	-1.95
323+09	3/20/2014	10/7/2014	29.29	4.70	-5.54
329+63	3/20/2014	10/7/2014	-22.59	-0.68	-5.05
331+43	3/20/2014	10/7/2014	-13.06	-0.80	-8.83
333+23	3/20/2014	10/7/2014	1.43	-0.44	-1.59
335+03	3/20/2014	10/7/2014	-11.03	-1.15	-7.56
336+83	3/20/2014	10/7/2014	2.51	0.06	-9.80
338+63	3/20/2014	10/7/2014	-8.44	-0.26	-4.28
340+43	3/20/2014	10/7/2014	-9.54	-0.37	-4.78

**Table C-2. Summary of Shoreline Change and Volume Change
(March 2014 to October 2014) Cont.**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 20, 2014 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
342+23	3/20/2014	10/7/2014	-4.28	-0.92	-8.72
344+05	3/20/2014	10/7/2014	0.00	-11.65	-12.02
345+85	3/20/2014	10/7/2014	-8.07	-2.31	-10.64
347+63	3/20/2014	10/7/2014	9.53	1.68	-1.44
349+43	3/20/2014	10/7/2014	2.06	1.03	-5.89
351+23	3/20/2014	10/7/2014	-3.97	0.96	-5.82
353+03	3/20/2014	10/7/2014	-7.78	-0.34	-7.26
354+83	3/20/2014	10/7/2014	9.90	1.17	-2.53
356+63	3/20/2014	10/7/2014	1.36	0.53	-3.51
358+43	3/20/2014	10/7/2014	4.07	0.42	-4.41
360+23	3/20/2014	10/7/2014	-9.12	-1.25	-7.33
362+03	3/20/2014	10/7/2014	1.18	-0.54	-4.76
363+83	3/20/2014	10/7/2014	2.83	-0.33	-3.31
365+63	3/20/2014	10/7/2014	-8.18	-1.50	-4.42
367+43	3/20/2014	10/7/2014	-5.11	-0.85	-4.44
369+23	3/20/2014	10/7/2014	-8.07	-0.61	-6.57
371+03	3/20/2014	10/7/2014	-1.71	0.35	-3.52
372+83	3/20/2014	10/7/2014	-3.14	-0.80	-8.38
375+08	3/20/2014	10/7/2014	3.34	-0.30	-2.39
376+78	3/20/2014	10/7/2014	-14.98	-1.56	-3.38
378+48	3/20/2014	10/7/2014	-3.67	-1.26	-1.60
380+18	3/20/2014	10/7/2014	-3.81	-0.93	-2.44
381+88	3/20/2014	10/7/2014	-6.75	-2.05	-2.24
383+58	3/20/2014	10/7/2014	-4.08	-2.05	-5.35

**Table C-3. Summary of Shoreline Change and Volume Change from
East Ocean View Nourishment (March 2009 to October 2014)**

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 20, 2009 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
329+63	3/20/2009	10/7/2014	-19.10	-3.90	-
331+43	3/20/2009	10/7/2014	-19.31	-3.35	-
333+23	3/20/2009	10/7/2014	-15.13	-2.49	-
335+03	3/20/2009	10/7/2014	-12.59	-1.80	-
336+83	3/20/2009	10/7/2014	-12.65	-1.65	-
338+63	3/20/2009	10/7/2014	-11.84	-1.74	-
340+43	3/20/2009	10/7/2014	-13.41	-1.05	-
342+23	3/20/2009	10/7/2014	-15.57	-1.90	-
344+05	3/20/2009	10/7/2014	-16.28	-3.19	-
345+85	3/20/2009	10/7/2014	-12.98	-2.73	-
347+63	3/20/2009	10/7/2014	-11.06	-2.42	-
349+43	3/20/2009	10/7/2014	-12.35	-2.59	-
351+23	3/20/2009	10/7/2014	-10.02	-2.19	-
353+03	3/20/2009	10/7/2014	-12.43	-2.52	-
354+83	3/20/2009	10/7/2014	-9.42	-1.94	-
356+63	3/20/2009	10/7/2014	-12.27	-2.76	-
358+43	3/20/2009	10/7/2014	-13.23	-2.59	-
360+23	3/20/2009	10/7/2014	-16.99	-3.35	-
362+03	3/20/2009	10/7/2014	-15.65	-2.92	-
363+83	3/20/2009	10/7/2014	-12.13	-2.52	-
365+63	3/20/2009	10/7/2014	-13.56	-2.56	-
367+43	3/20/2009	10/7/2014	-20.27	-3.78	-
369+23	3/20/2009	10/7/2014	-19.22	-3.09	-
371+03	3/20/2009	10/7/2014	-24.37	-4.27	-
372+83	3/20/2009	10/7/2014	-24.47	-4.30	-
375+08	3/20/2009	10/7/2014	-30.29	-5.79	-
376+78	3/20/2009	10/7/2014	-28.22	-4.80	-
378+48	3/20/2009	10/7/2014	-37.02	-6.94	-
380+18	3/20/2009	10/7/2014	-34.72	-6.27	-
381+88	3/20/2009	10/7/2014	-26.68	-5.04	-
383+58	3/20/2009	10/7/2014	-35.98	-6.71	-

Table C-4. Summary of Shoreline Change and Volume Change from Central Ocean View Nourishment (March 2005 to October 2014)

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 15, 2005 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
15+00	3/15/2005	10/7/2014	2.87	1.35	-
17+50	3/15/2005	10/7/2014	3.28	1.08	-
20+00	3/15/2005	10/7/2014	-1.69	-0.39	-
22+50	3/15/2005	10/7/2014	-4.99	-1.96	-
25+00	3/15/2005	10/7/2014	8.68	-0.49	-
27+50	3/15/2005	10/7/2014	2.53	-1.09	-
30+00	3/15/2005	10/7/2014	0.70	-0.68	-
32+50	3/15/2005	10/7/2014	-0.02	-1.16	-
35+00	3/15/2005	10/7/2014	4.71	0.10	-
37+50	3/15/2005	10/7/2014	3.61	-0.71	-
40+00	3/15/2005	10/7/2014	-2.18	-1.15	-
42+50	3/15/2005	10/7/2014	-3.46	-1.73	-
45+00	3/15/2005	10/7/2014	-8.94	-2.77	-
45+25	3/15/2005	10/7/2014	-11.12	-3.09	-
47+30	3/15/2005	10/7/2014	-11.80	-3.30	-
49+35	3/15/2005	10/7/2014	-7.15	-2.29	-
51+41	3/15/2005	10/7/2014	-5.99	-1.62	-
53+46	3/15/2005	10/7/2014	-3.80	-1.15	-
55+51	3/15/2005	10/7/2014	-7.71	-2.40	-
57+57	3/15/2005	10/7/2014	-2.74	-1.06	-
59+62	3/15/2005	10/7/2014	-6.86	-1.89	-
61+62	3/15/2005	10/7/2014	0.08	0.07	-
63+62	3/15/2005	10/7/2014	-5.50	-0.80	-
65+62	3/15/2005	10/7/2014	-1.13	0.40	-
67+62	3/15/2005	10/7/2014	-12.02	-1.48	-
69+62	3/15/2005	10/7/2014	-3.33	-0.21	-
71+62	3/15/2005	10/7/2014	-9.40	-1.23	-
73+62	3/15/2005	10/7/2014	-2.59	0.13	-
75+62	3/15/2005	10/7/2014	-5.93	-0.39	-
77+62	3/15/2005	10/7/2014	-1.61	0.72	-
79+62	3/15/2005	10/7/2014	-3.83	-0.62	-
81+62	3/15/2005	10/7/2014	-5.15	-1.31	-
83+62	3/15/2005	10/7/2014	-7.04	-2.08	-
85+62	3/15/2005	10/7/2014	-3.42	-1.31	-
87+62	3/15/2005	10/7/2014	-3.00	-0.64	-
93+41	3/15/2005	10/7/2014	-0.54	-0.76	-
103+08	3/15/2005	10/7/2014	-3.71	-1.43	-
120+93	3/15/2005	10/7/2014	-2.13	-1.74	-
129+17	3/15/2005	10/7/2014	-2.31	-2.25	-
141+98	3/15/2005	10/7/2014	-2.80	-1.25	-
152+01	3/15/2005	10/7/2014	-3.54	-1.59	-

Table C-4. Summary of Shoreline Change and Volume Change from Central Ocean View Nourishment (March 2005 to October 2014) Cont.

NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. MHW assumed at +0.98 ft-NAVD88.
3. Shoreline Change and Volume Change is calculated for the period between surveys from March 15, 2005 to October 7, 2014.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
163+49	3/15/2005	10/7/2014	-3.84	-1.48	-
169+63	3/15/2005	10/7/2014	-1.96	-0.89	-
171+63	3/15/2005	10/7/2014	-3.29	-1.00	-
173+63	3/15/2005	10/7/2014	-2.68	-1.21	-
175+63	3/15/2005	10/7/2014	-5.04	-1.18	-
177+63	3/15/2005	10/7/2014	-3.84	-0.81	-
179+63	3/15/2005	10/7/2014	-3.39	-1.05	-
181+63	3/15/2005	10/7/2014	-1.39	-1.07	-
183+63	3/15/2005	10/7/2014	0.84	0.25	-
185+63	3/15/2005	10/7/2014	-1.05	-0.33	-
187+63	3/15/2005	10/7/2014	3.94	1.31	-
189+63	3/15/2005	10/7/2014	0.77	0.95	-
191+63	3/15/2005	10/7/2014	6.26	2.10	-
193+63	3/15/2005	10/7/2014	-0.09	0.78	-
195+63	3/15/2005	10/7/2014	-0.80	0.47	-