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BATHYMETRIC STUDY AND SEDIMENT MONITORING REPORT

GOLDSMITH INLET
SAND ACCRETION AND WATER QUALITY STUDY

Prepared For:

Town of Southold
Planning Department
54375 Main Road
P.O. Box 1179
Southold, NY 11971

This (document, report, map, etc.) was prepared for the New York State Department of State with funds provided under NYS DOS EPF Contract C007079 – Goldsmith Inlet and for the County of Suffolk under the Agreement for Improvements to Goldsmith Inlet (CP8207)

Prepared By:

eDesign Dynamics, LLC
338 West 39th Street, 10th Floor
New York, NY 10018

June 1, 2013

eDesign Dynamics

Town of Southold
Planning Department
53093 Route Main Road
P.O. Box 1179
Southold, NY 11971

Attn: Mark Terry, Principal Planner, LWRP Coordinator

Re: Goldsmith Inlet
Bathymetric Study and Sediment Monitoring Report

Dear Mr. Terry,

Presented herein are the results of the bathymetric and sediment monitoring study conducted for the above referenced project. This report serves to satisfy the deliverable for Task 4 of eDesign Dynamics' agreement with the Town of Southold for the above referenced project. The results include a narrative of the field studies performed, graphic results of the data collected, and corresponding sediment load rate calculation results. If you have any questions or require further assistance, please feel free to contact us.

Sincerely,

Eric Rothstein
Managing Partner
eDesign Dynamics

Background

The Town of Southold and residents have been concerned for some decades that conditions within Goldsmith Inlet have been deteriorating, resulting in reduced water quality, compromised habitat, and instability in the channel connection between the "pond" and Long Island Sound. Several studies have been performed over the years to determine the precise causes of and remedies to the conditions that have also caused beach erosion to the east, particularly with respect to the role of the Inlet jetty. In order to sustain the Inlet connection, the Town has diligently removed sand that accumulates near the mouth of the channel and distributed it on the beaches to the east. This annual dredging operation is costly, and is perceived to simply sustain the connection on a temporary basis. Many residents fear that the channel is at constant risk of closure, and the reduced tidal flows between the Sound and the Inlet contribute to poor water quality. In cooperation with the Town, eDesign Dynamics (EDD) proposed a scope-of-work that included a series of field measurements designed to establish a greater understanding of physical changes to the connecting channel that occur over time and in conjunction with extreme weather events. The goal has been to quantify the channel dimensions in such a manner as to assess the degree to which sedimentation within the Inlet system affects tidal flushing, and how to best establish a protocol, maintenance regime or an intervention that will best improve water quality through increased exchange with the Sound.

EDD entered into a contract with the Town in July 2012 to perform several tasks related to study of the Inlet. The project is funded under an Inter-Municipal Agreement between Southold and the County of Suffolk for "Improvement to Goldsmith Inlet." Also under this Agreement, Cornell Cooperative Extension of Suffolk County, under the direction of Lorne Brousseau, was contracted by the Town to simultaneously perform a set of tasks to measure the tidal prism at several points within the Inlet and the Sound, and to analyze for a number of water quality parameters. It has been the intent that EDD and Cornell would collaborate in these efforts as necessary, in order to assure that each team receives adequate data and with minimal overlap. EDD's contract includes the performance of three tasks, corresponding with Tasks 4, 5 and 8 as described in the Town's Agreement with the County. Task 4: Bathymetry and Sediment Monitoring covers the field measurements described below and delivery of this Bathymetric Study and Sediment Monitoring Report. In, Tasks 5 and 8, EDD will elaborate these findings, synthesize the information and expertise of both research teams, and produce a Sediment Management Plan and Recommendations and Action Plan for the Town's use. This Report does not include recommendations or analysis of the data collected, but is intended to report on the methods and findings of the field studies.

Methodology

EDD is seeking to characterize and understand the processes governing Goldsmith Inlet based on a period of field measurements, existing studies, and expert observation. Included in EDD's services are the efforts of Dr. Richard Weggel of Drexel University, a nationally recognized expert in the field of coastal sediment transport and erosion, who is familiar with the physical processes that govern similar inlets and the engineering efforts that have been employed to stabilize them. Dr. Weggel has served as Senior Advisor to the project, reviewing and advising EDD's efforts in the field and in the office. As part of his scope, Dr. Weggel has reviewed a selection of the research previously performed at the Inlet, and

has spent one day in the field observing EDD's bathymetric survey. Dr. Weggel was also instrumental in establishing the field protocols and measurement goals of Task 4. His involvement in subsequent tasks will be mostly limited to analysis and review.

EDD researchers have also reviewed the literature, and have led the efforts to coordinate field activities with Cornell Extension. EDD devised the plan to establish a minimum of twelve "permanent" transect locations for measuring channel geometry. Techniques are standard field practices to measure depth to channel bed from a known elevation, utilizing a taught transect line tied to markers at both banks, and a surveying transit to read the depth at each measurement point. Two field personnel are needed for this process, one to operate and read the transit and one to place the surveyor's rod within the channel at ten foot increments. Each transect marker was located and elevation determined with respect to a permanent marker placed in the adjacent parking lot.

After the second visit to the site, the team decided to also include measurements of the channel's thalweg, or the deepest point within the channel section. Elevations of the thalweg were measured at ten-foot increments by similar technique, utilizing assistance from Cornell Extension. Two researchers stood in the channel, each carrying a rod and connected by a ten-foot length of cord. The advance researcher would pull the cord taught and locate the next point within the thalweg while the trailing researcher held the rod to be read by the surveyor. In this manner, the team took and recorded measurements along the entire length of the channel.

In total, EDD's team visited the site on four separate occasions in performance of the bathymetric study. During these visits, EDD also assisted Cornell Extension with surveying their monitoring points, and spoke at length with visitors and residents who expressed curiosity about the research activities. The final site visit occurred on March 20, 2013.

Field Work

EDD visited the site on four occasions in fulfillment of Task 4. The first visit began on October 7, 2012, and consisted of two full days in the field as the initial transect markers and benchmark were established. At the time of this visit, an extensive sand spit had developed at the mouth of the channel, extending from near the base of the jetty and parallel with the shoreline toward the east. The spit caused the channel to turn eastward, and created a large and deep pool in the area adjacent. In an effort to track the accretion or erosion of the spit, EDD located some of the transect markers such that the spit would be included in the channel measurements. Because of the odd shape, several extra transect lines could be drawn between the markers, further characterizing that area.

The transect markers consisted of four-foot rebar spikes driven into the sandy embankment. A length of fiber reinforced caution tape was secured at the bottom of the spike before it was driven, and several feet of tape were left lying on the sand surface in order to more easily locate the markers on subsequent visits. The tape was also labeled with the marker ID and, in most cases, marked with a "Please do not disturb" message for curious passers-by. The Inlet is a popular destination for residents and visitors. EDD understood that there existed a risk that the markers could be pulled or moved, which would interfere with the ongoing research. EDD was also aware that accretion and erosion could either bury or

wash away the markers, or at least make them difficult to locate. To further assist in their location, the tops of the spikes were painted safety-orange and photographs taken to help identify them. A total of 24 markers were installed, ranging from the Sound-side of the channel to south of the channel proper and across the flood shoal.

On the second day, EDD measured 16 transect lines crossing the channel (some markers were used more than once), and surveyed the locations of each of the markers. A representative from Cornell Extension also arrived so that we could assist them with surveying the locations of their water level loggers. These procedures consumed the entire day. There was not sufficient time to survey Logger #1 located at the south end of the Inlet.

On October 29, 2012, the hurricane Sandy made landfall in the area around southern New York State including the South Fork of Long Island. With several days to anticipate the storm and its potential effects on the Inlet, the Town decided to perform an emergency dredge of the sand spit that had accreted near the jetty. EDD was informed that on October 24th the spit was removed and the sand relocated to the east, allowing the channel to flow more-or-less straight between the Sound and the Inlet. The fear at the time was that the imminent storm could push the spit up the channel and cause significant blockage that would later become difficult to remove. Residents also described that the course of the channel had been moved far enough eastward to risk erosion of the dune.

When EDD arrived for the second site visit on November 9, 2012, the spit had not yet begun to reform and the channel continued to run mostly straight to the Sound. Beyond this change, EDD did not notice any other significant erosion or deposition that appeared to be due to the storm. Four of the northern-most markers, however (E1, W1, W2 and W3), could not be located, likely because they were removed or buried during the dredging. Because of the new conditions at the north end of the channel, it was decided that not all of the markers needed to be replaced. EDD created one new marker, W3*, near the approximate location of W3. On this visit, eleven channel transects were surveyed and recorded.

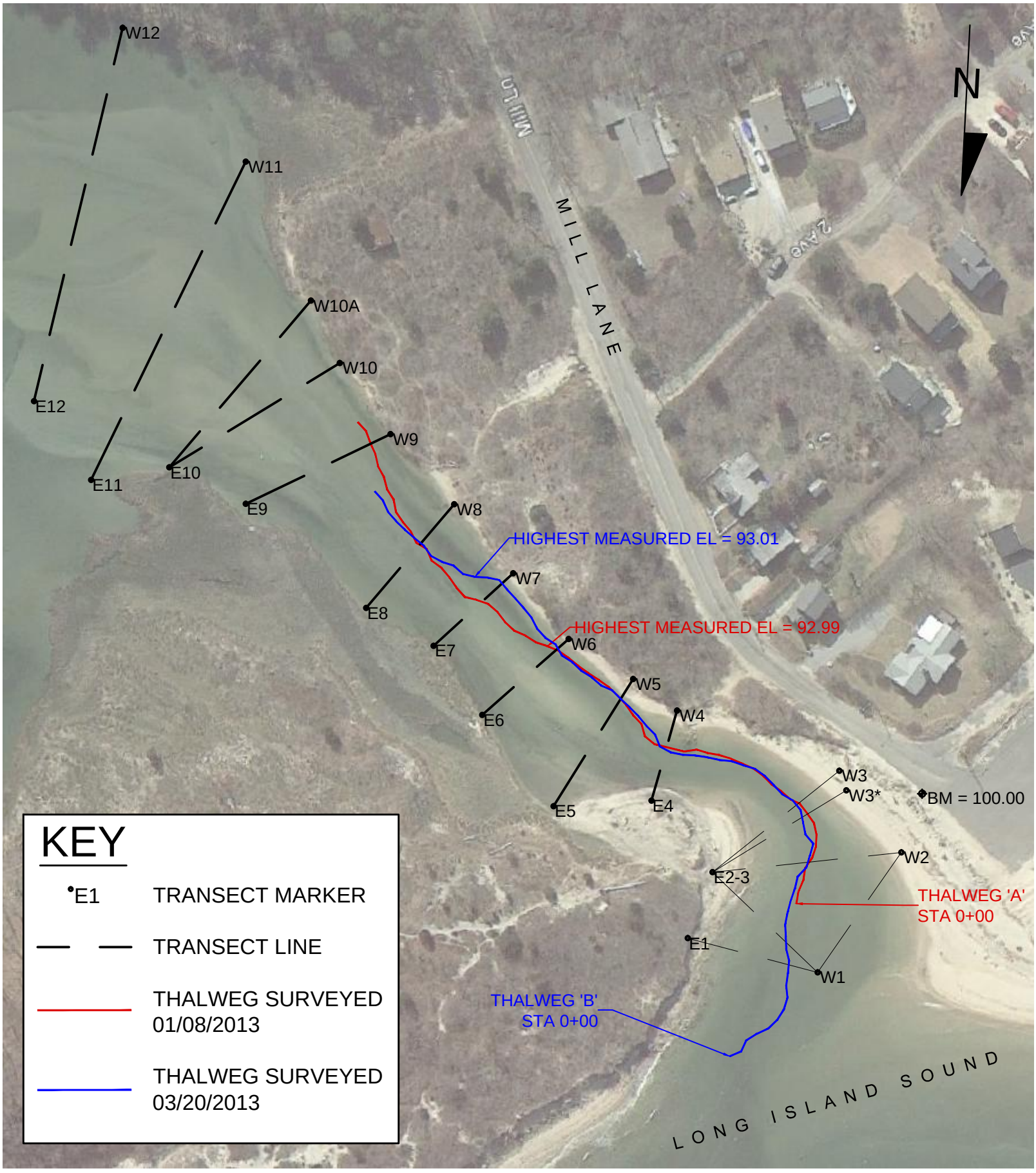
Dr. Weggel accompanied the EDD team for the third site visit on December 21, 2012. Dr. Weggel had been reviewing the data collected thus far and had become increasingly interested in acquiring greater understanding of the behavior of the thalweg within the channel. Dr. Weggel's assertion has been that the point within the channel most critical to regulating flowrates (and thus flushing of the Inlet) was the area called the "sill," or the stretch of channel thalweg that sits highest above the average channel elevation. The sill location could be approximated from the channel transects, but would be easier to identify if the thalweg itself were surveyed and in smaller increments. If a simple protocol could be established for identifying the sill, then recommendations for periodic dredging could be based on its location. A total of 59 points along the thalweg were surveyed in ten-foot increments. However, unusually heavy winds and rains throughout the previous night and into the morning altered the normal water levels expected during low tide and shortened the low water window during which measurements could be made. With concerns for safety, the team decided to forego measurement of the transects during this visit. Dr. Weggel used this time to hear testimonies from some area residents and view historic photos of the Inlet. Additionally, transect marker W2 was found, having been uncovered since the previous site visit.

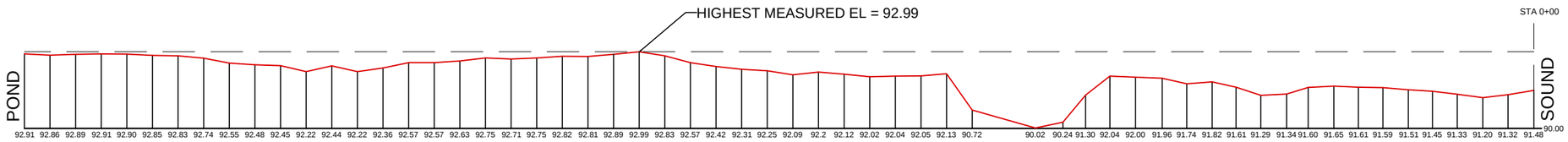
The fourth and final EDD field visit occurred on March 20, 2013. By this time the Town had performed construction of riprap armoring along the west bank of the channel where it is nearest to the roadway. Two transect markers, W3* and W4 were lost in this process. EDD was also unable to locate E2, E3 and W2 due to movement of sand and changing topography. Eight transect surveys were performed using the remaining markers, and a total of 71 points along the thalweg from Sound to shoal. Cornell Extension arrived to assist in re-surveying their water level loggers. Loggers 1, 2 and 3 were surveyed, but the logger in the Sound was not because of low temperatures and rough surf.

Results

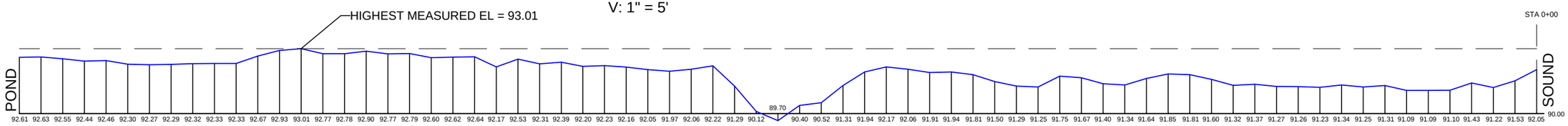
The following pages present summaries of the data collected over the course of the four site visits performed by eDesign Dynamics. The first page details the benchmark, transect, and thalweg locations superimposed over an aerial image[1] of Goldsmith Inlet. The subsequent pages illustrate channel cross sections and thalweg profiles using an exaggerated vertical scale (1H:10V). The final pages present calculated depositional rates during the periods of time between 10/8/2012 - 11/9/2012 and 11/9/2012 - 3/20/2013. These data are presented without analysis. In subsequent deliverables to the Town, and in fulfillment of the Tasks 5 and 8, the team will seek to draw conclusions and recommendations based on these data, Cornell Extension's data, existing literature, historic photographs, and expert observation.

[1] Image obtained from Google Earth.


W12
W11
W10A
W10
W9
W8
W7
W6
W5
W4
W3
W3*
W2
W1
E12
E11
E10
E9
E8
E7
E6
E5
E4
E2-3
E1
BM = 100.00
HIGHEST MEASURED EL = 93.01
HIGHEST MEASURED EL = 92.99
THALWEG 'A'
STA 0+00
THALWEG 'B'
STA 0+00
MILL LANE
N
LONG ISLAND SOUND
KEY
E1 TRANSECT MARKER
TRANSECT LINE
THALWEG SURVEYED 01/08/2013
THALWEG SURVEYED 03/20/2013
100 0 25 50 100 200
1" = 100'



12/21/2012 THALWEG PROFILE
SCALE
H: 1" = 50'
V: 1" = 5'

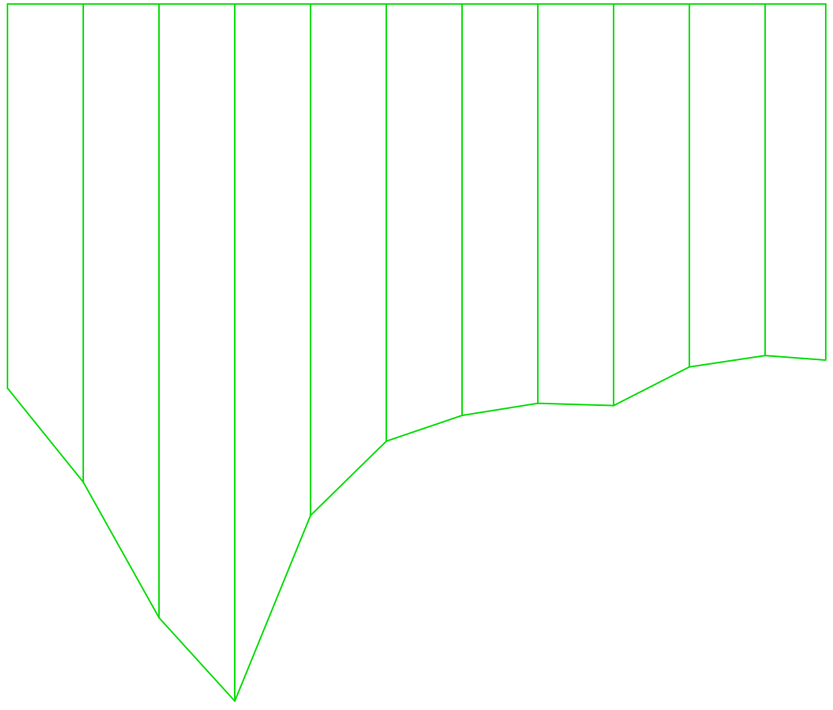


03/20/2013 THALWEG PROFILE
SCALE
H: 1" = 50'
V: 1" = 5'

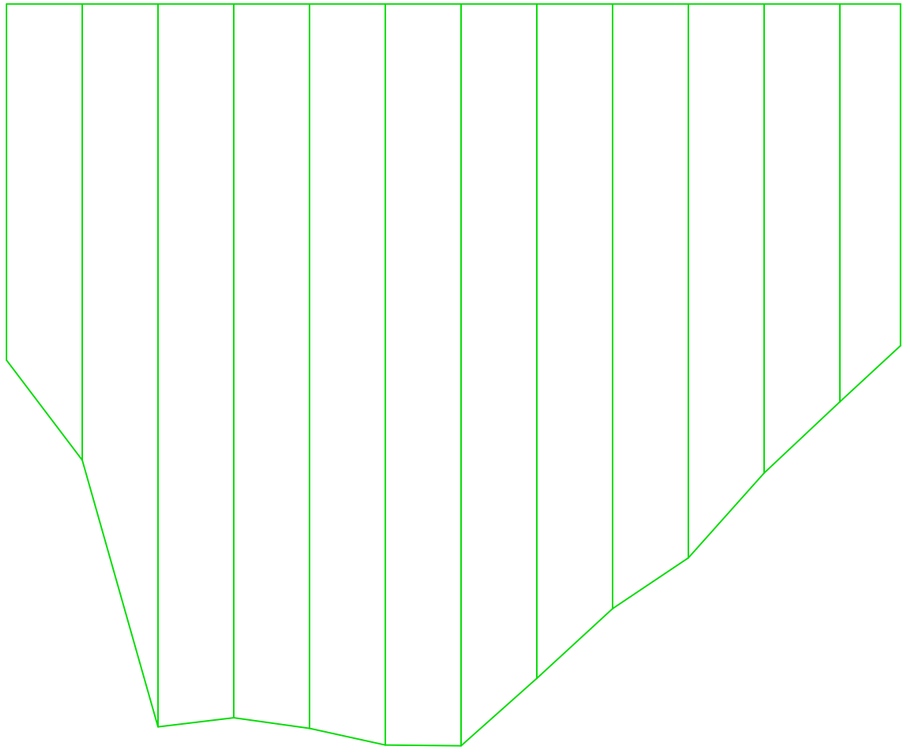
NOTES:

1. ALL THALWEG PROFILES SHOWN IN 1"=50' HORIZONTAL SCALE AND 1" = 5' VERTICAL SCALE.
2. HORIZONTAL LINE AT TOP OF EACH PROFILE INDICATES THE HIGHEST ELEVATION MEASURED ALONG THE THALWEG, OR THALWEG SILL, REGULATING TIDAL EBB DYNAMICS.
3. PROFILES HAVE BEEN ALIGNED TO APPROXIMATE CORRESPONDING PLANAR LOCATIONS.

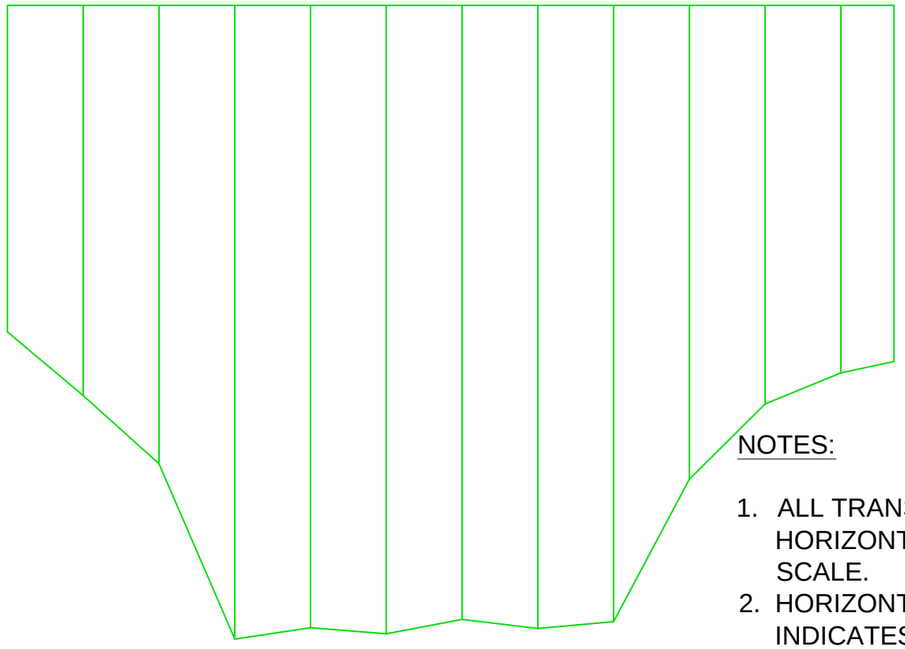
E1-W1



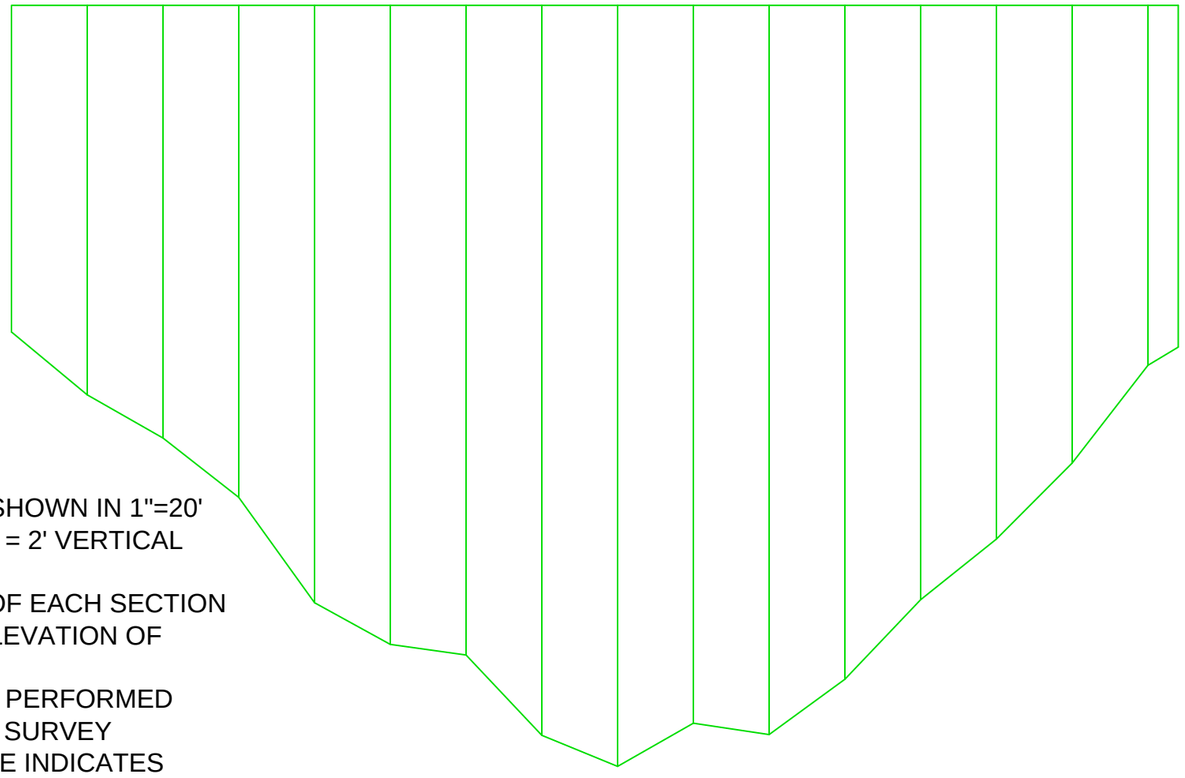
W1-W2



E2/3-W1



E2/3-W2



NOTES:

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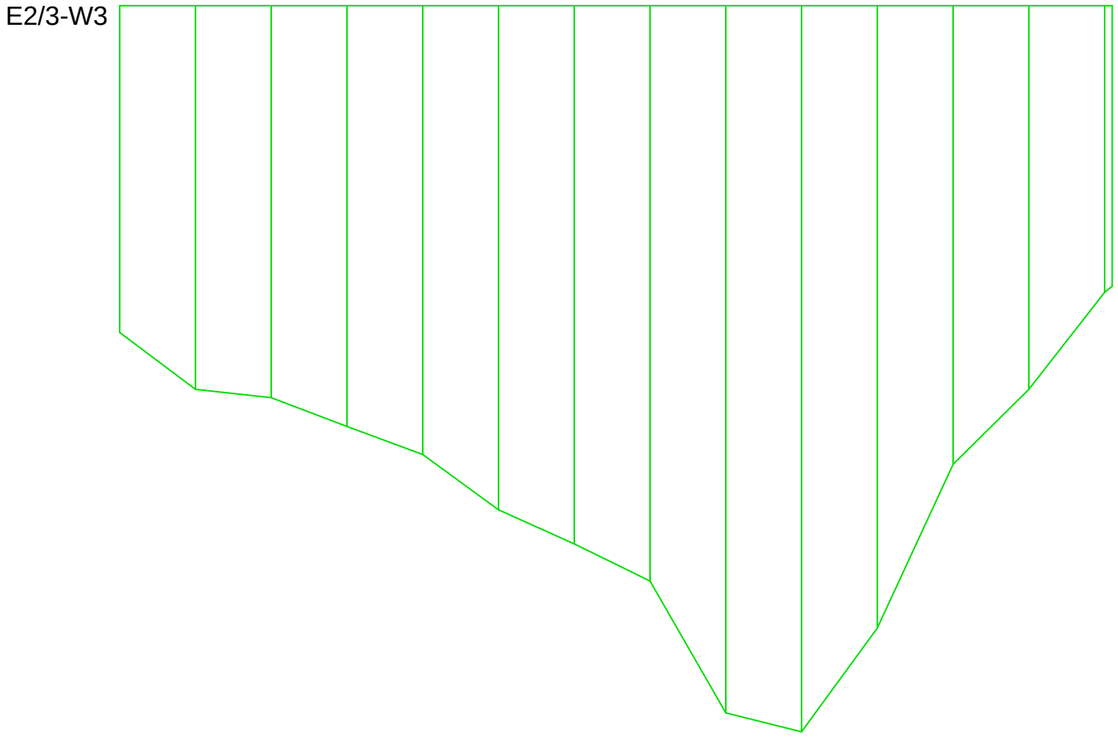

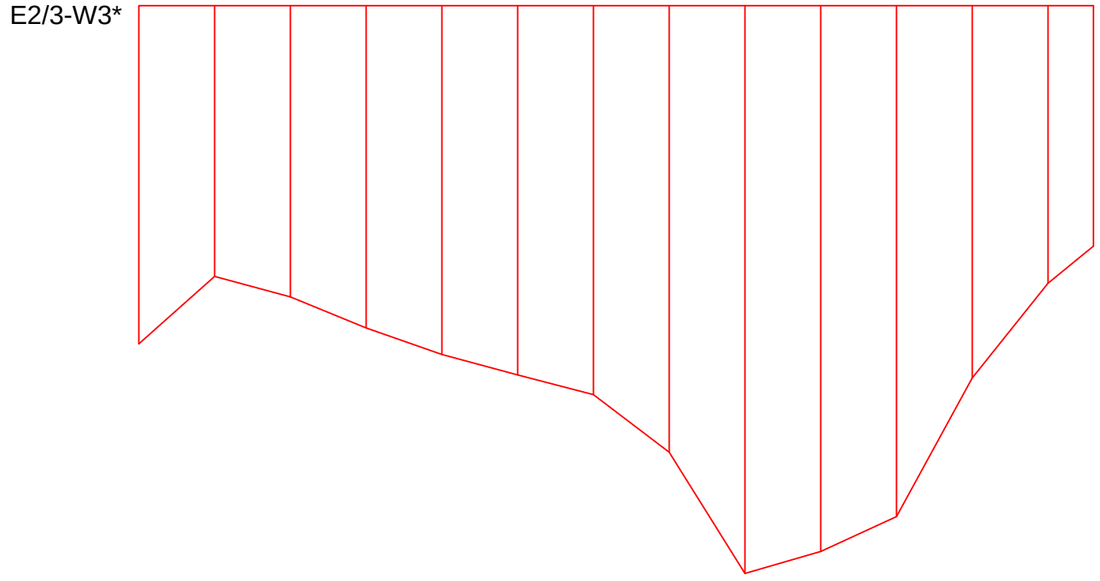

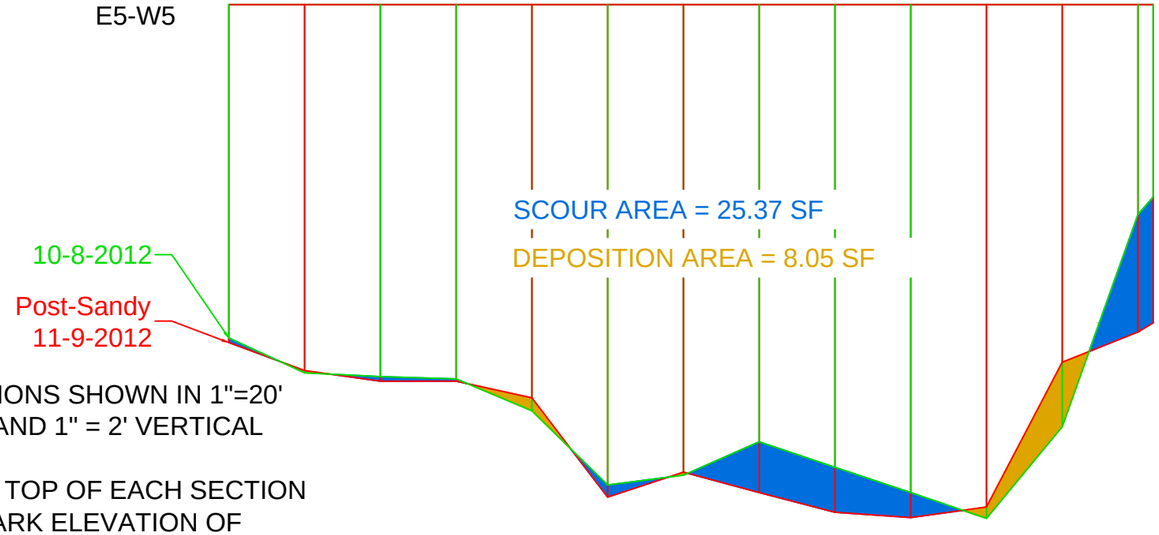

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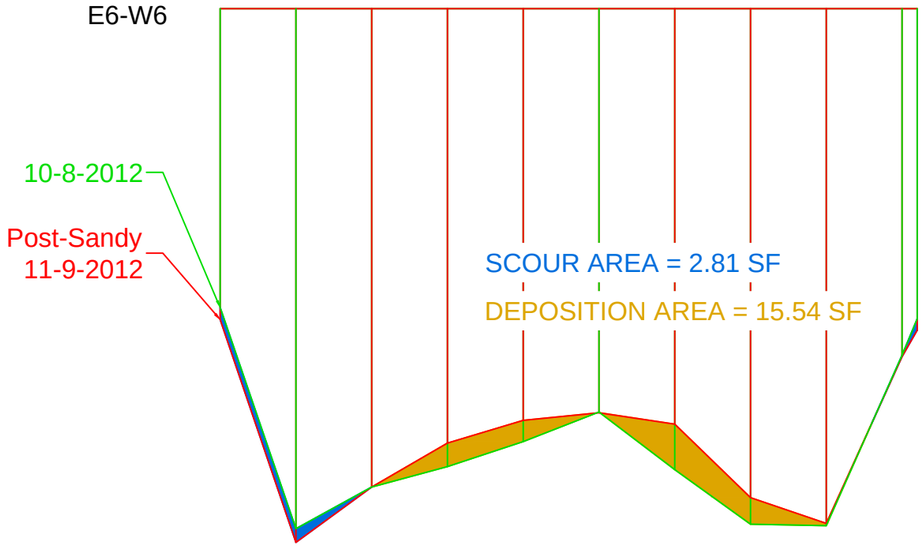

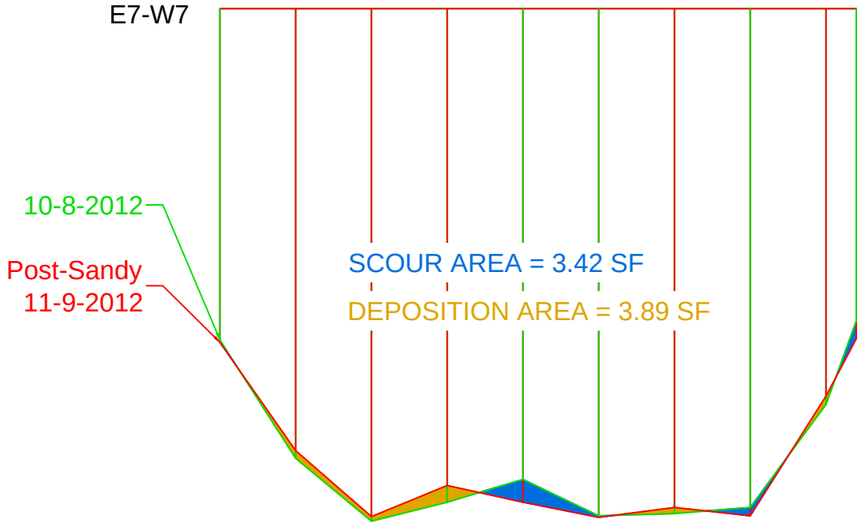

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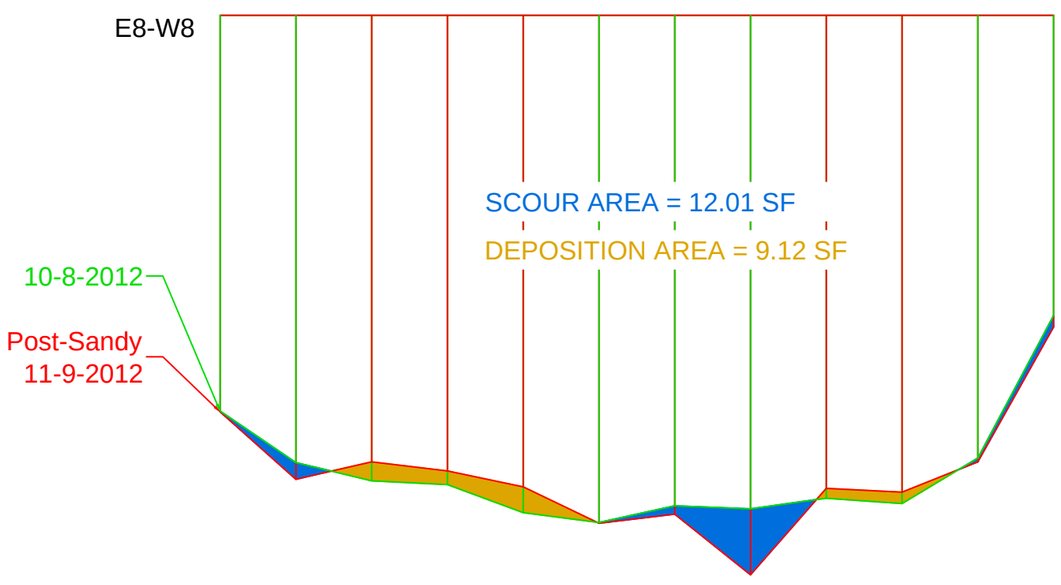

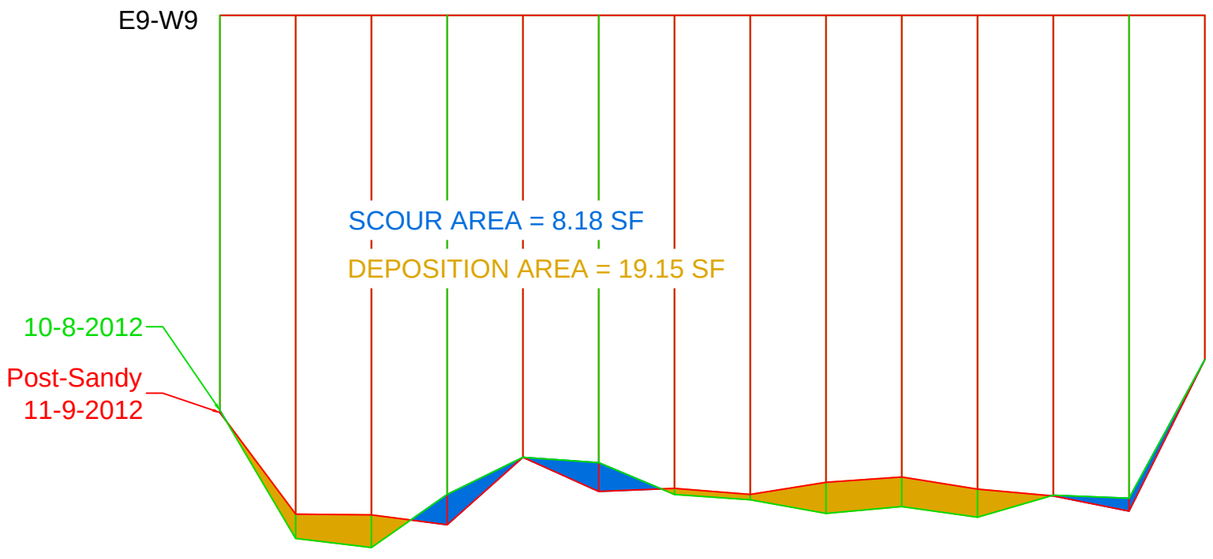

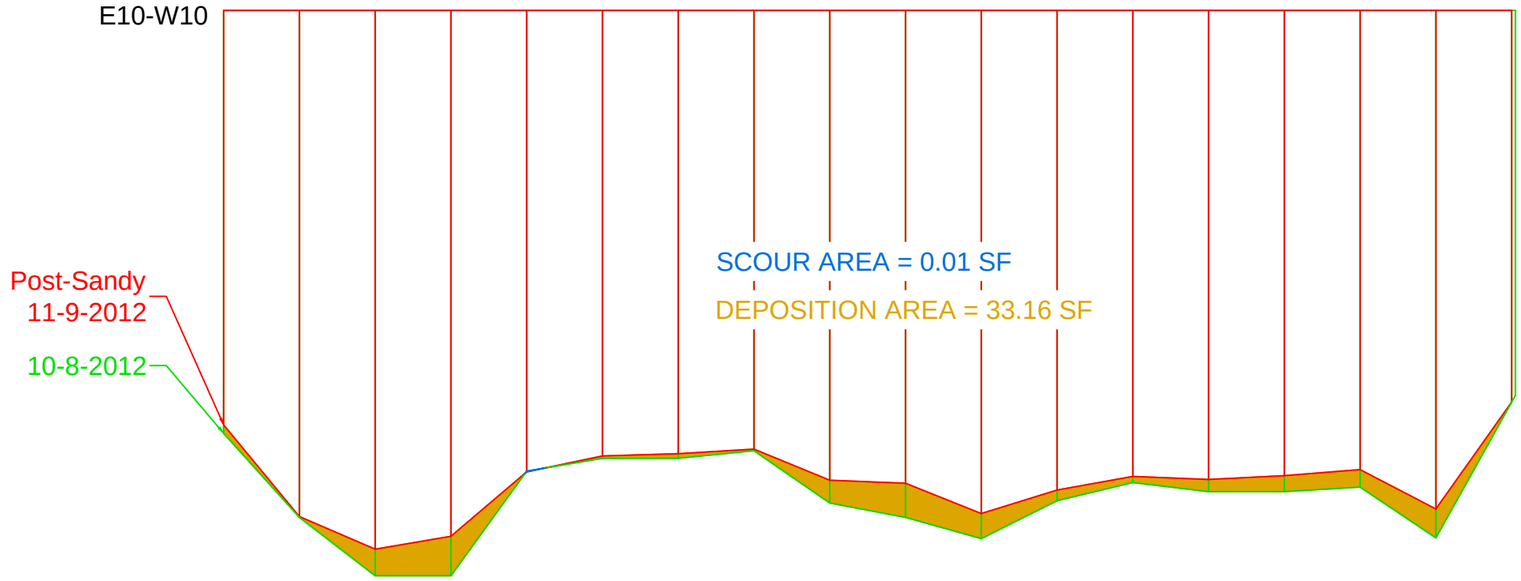

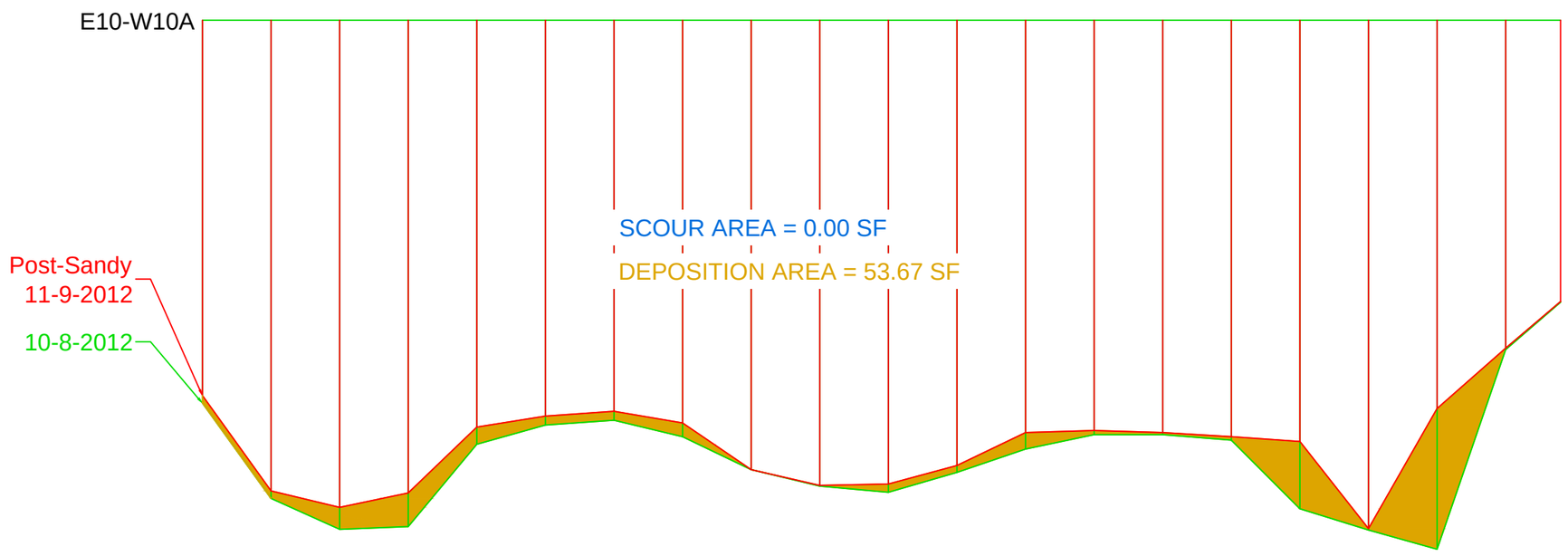

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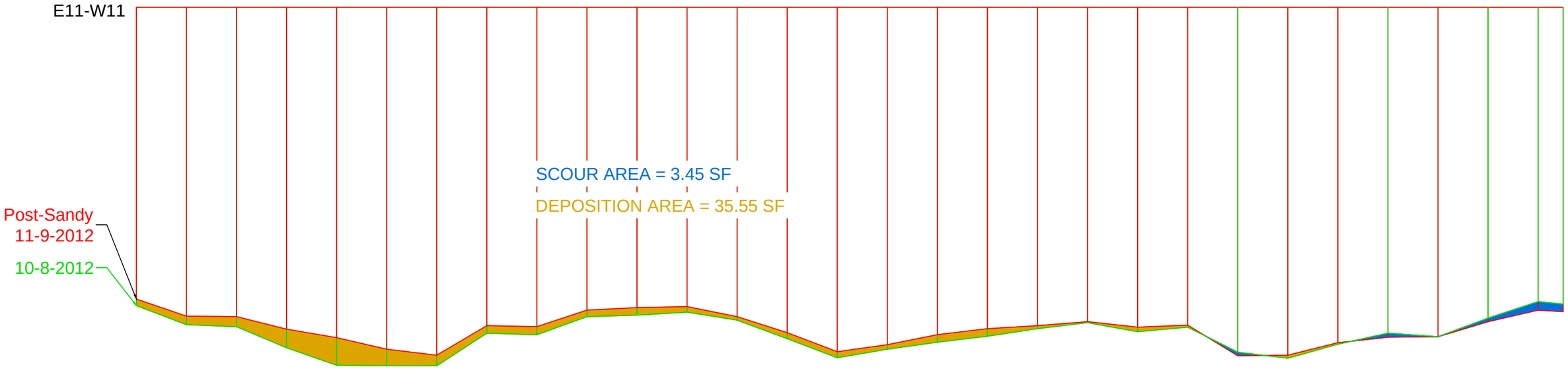

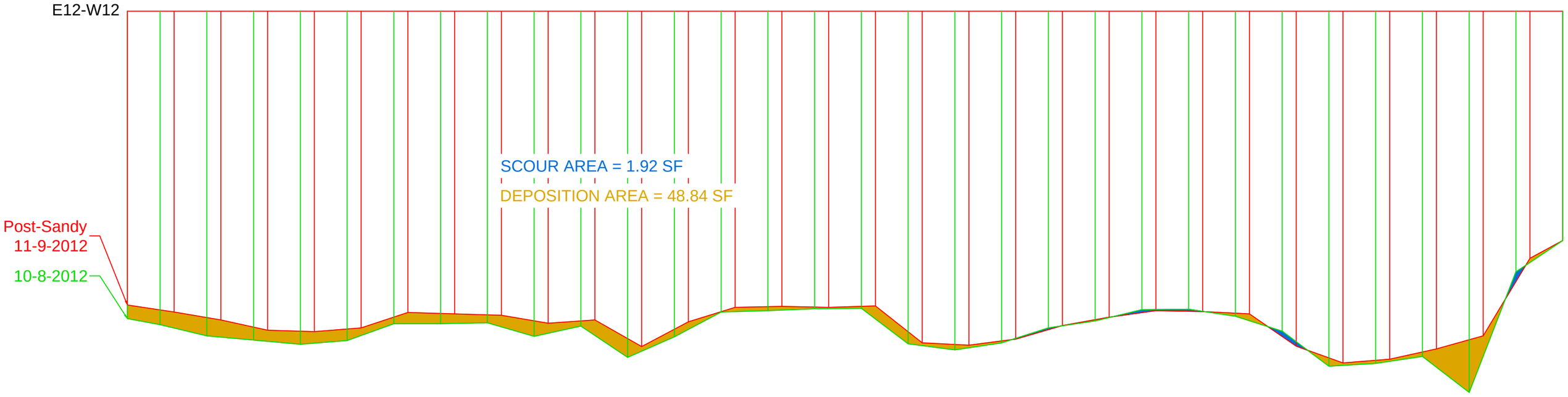

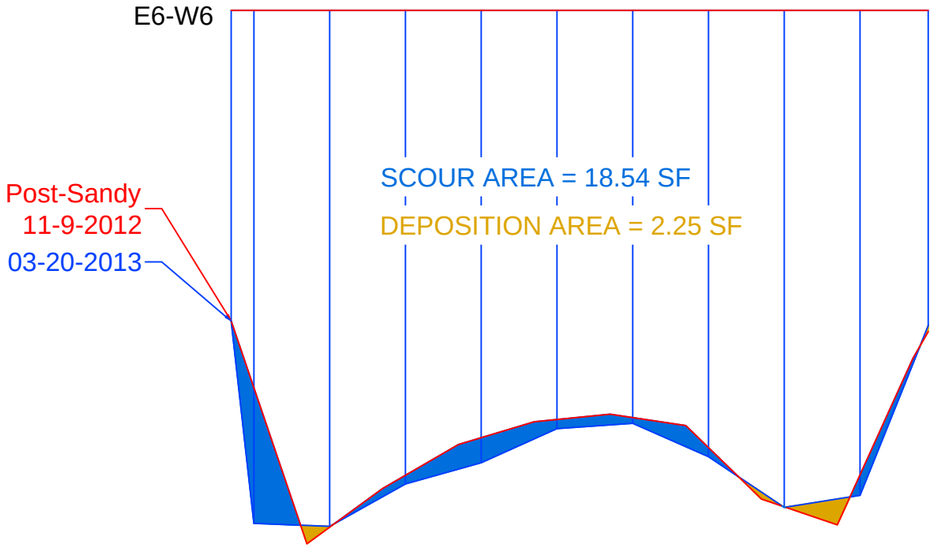

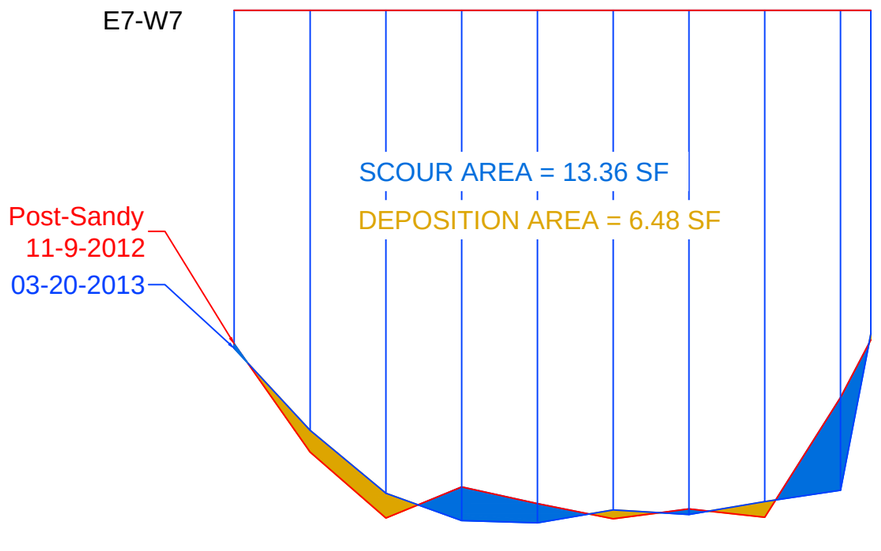

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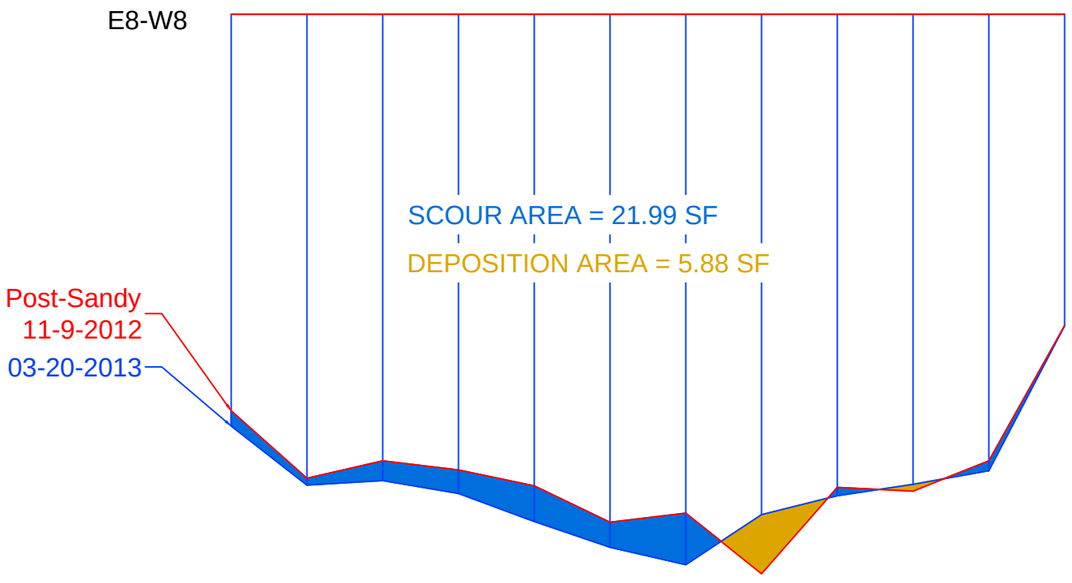

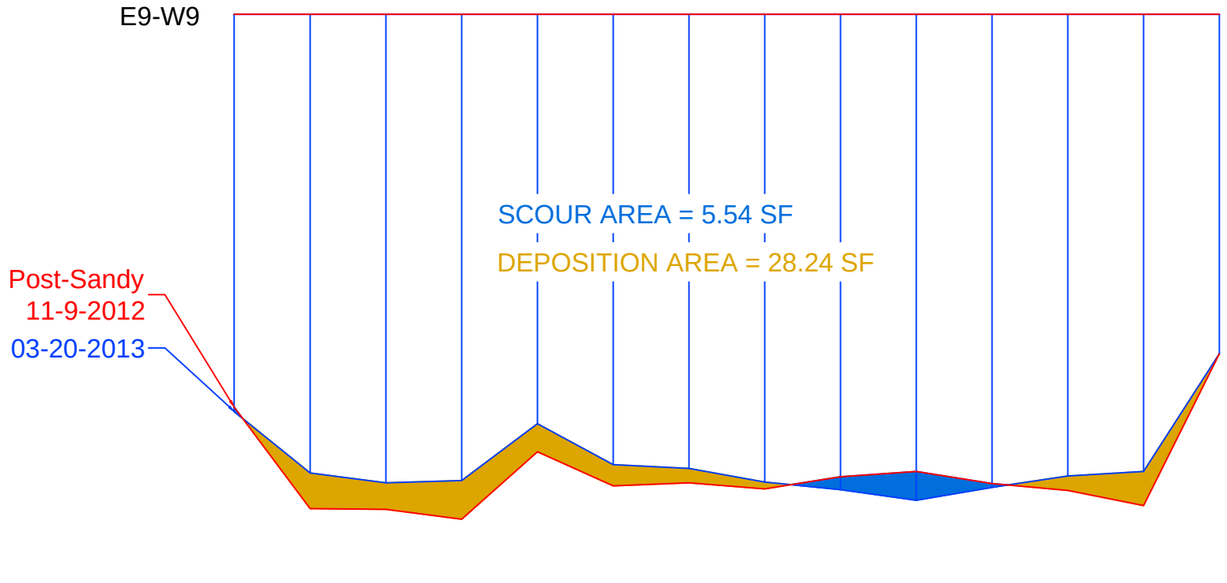

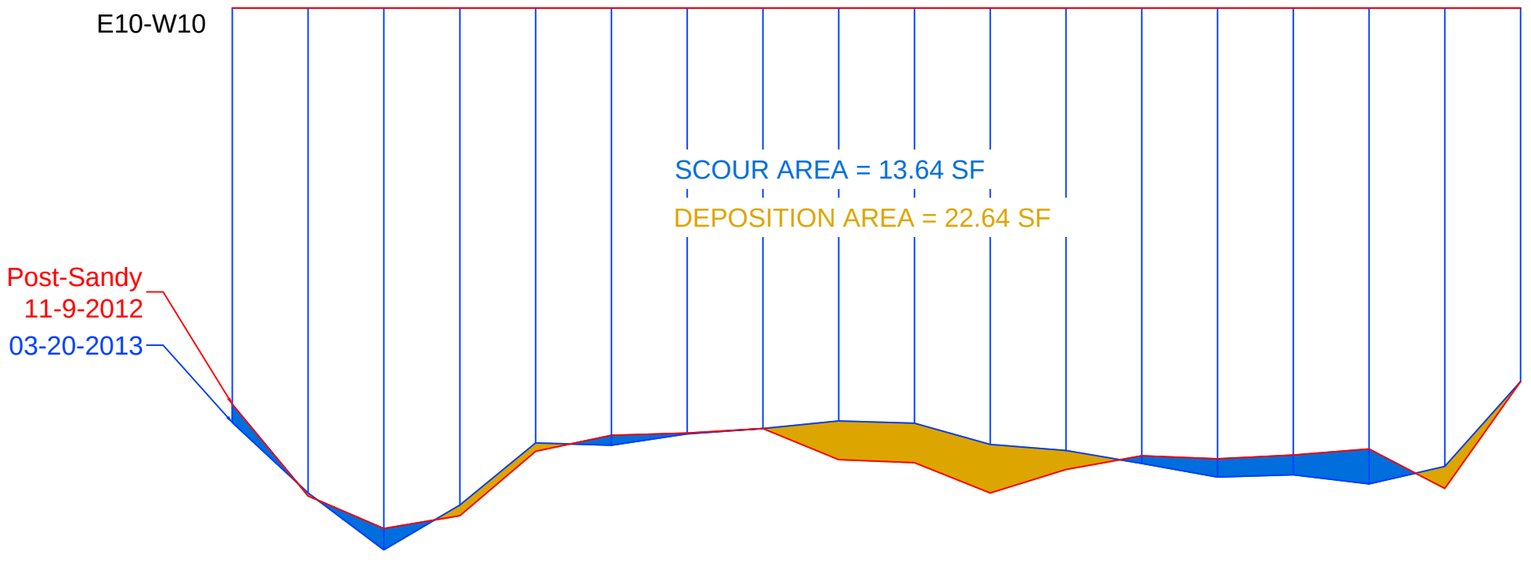

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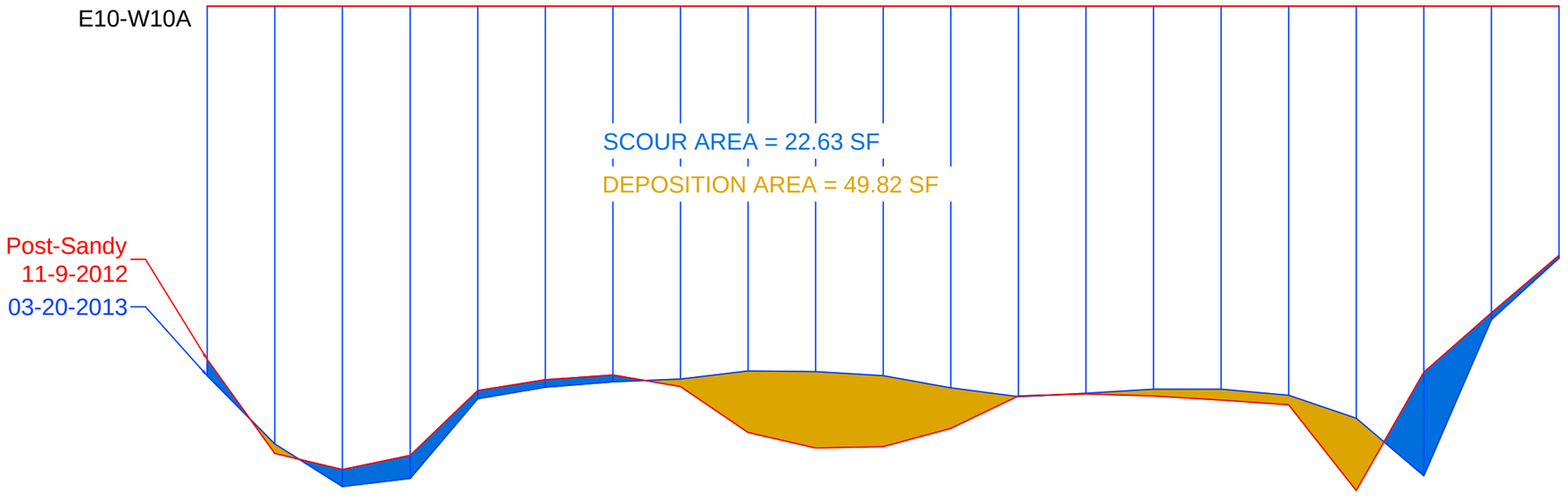

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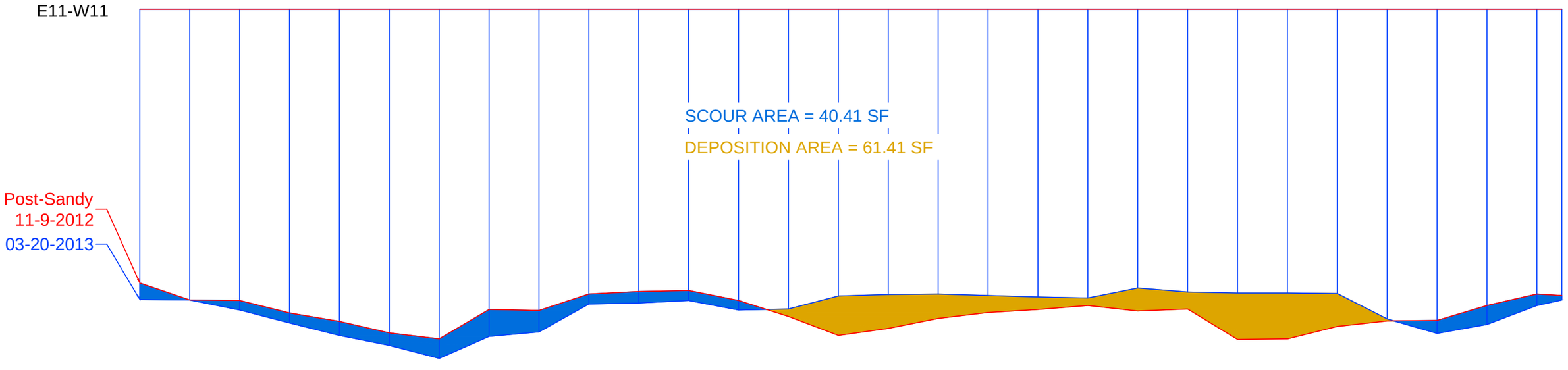
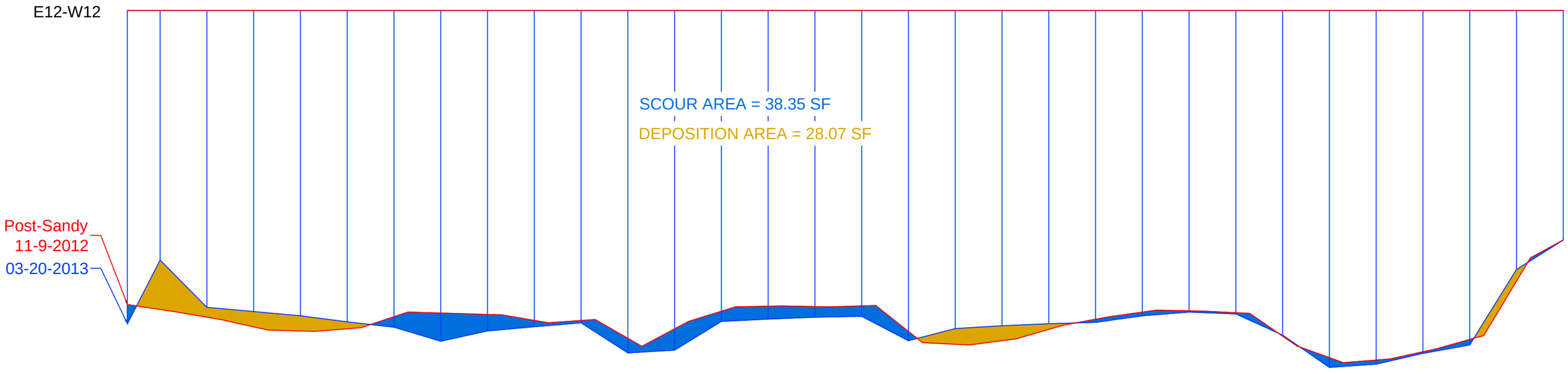
4. BLUE FILL INDICATES MEASURED SCOUR DIFFERENCE BETWEEN 10/8 AND 11/9 SURVEYS. TAN FILL INDICATES MEASURED DEPOSITION DIFFERENCE.





SEDIMENT DEPOSITION RATE CALCULATION

All midpoint distances in feet

All deposition and scour data is in square feet

Transect Length				78				122				92				84					
Survey Increments		E3-W3	Midpoint distance	E4-W4	net dep1	net dep2	Midpoint distance	E5-W5	net dep1	net dep2	Midpoint distance	E6-W6	Midpoint distance	net dep1	net dep2	E7-W7	Midpoint distance	net dep1	net dep2	CONTINUED BELOW	
10/8/12 - 11/9/12	scour	-	104.75	9.86	1145.48625	-446.195	58.25	23.37	-585.301	486.3497	76.41	2.81	68.84	438.1666	16.1774	3.42	66.92	15.7262	-96.6994		
	Dep.	-		49.19				8.05				15.54				3.89					
11/9/12 - 3/20/13	scour											18.54		-560.702	-236.8096	13.36		-230.205	-539.041		
	Dep.											2.25				6.48					

Transect Length			110				130			170				198			285			307
Survey Increments		net dep2	E8-W8	Midpoint distance	net dep1	net dep2	E9-W9	Midpoint distance	net dep1	net dep2	E10-W10	Midpoint distance	net dep1	net dep2	E10-W10A	Midpoint distance	net dep1	net dep2	E11-W11	Midpoint distance	net dep1	net dep2	E12-W12
10/8/12 - 11/9/12	scour	-96.7	12.01	102.43	-148.01135	561.82855	8.18	67.33	369.3051	1115.995	0.01	27.78	460.4535	745.4763	0	77.29	2074.07715	1240.505	3.45	112.55	1806.428	2640.423	1.92
	Dep.		9.12				19.15				33.16				53.67				35.55				48.84
11/9/12 - 3/20/13	scour	-539	21.99		-825.07365	1162.5805	5.54		764.1955	302.985	13.64		125.01	377.6691	22.63		1050.75755	811.545	40.41		1181.775	-578.507	38.35
	Dep.		5.88				28.24				22.64				49.82				61.41				28.07

	total net deposition between transects 6 and 11 (ft3)	total distance between 6 and 11 (ft)	days between measurements	**Daily rate of net deposition (ft3/ft/day)**
10/8/12 - 11/9/12	11239.84975	523.14	32	**0.671**
11/9/12 - 3/20/13	2806.1802	523.14	131	**0.041**

Next Steps

EDD's next task will be to look for links between climatic and/or marine events and sediment transport within the channel and Inlet, and to correlate the tidal prism data collected by Cornell Extension with the channel geometries measured in Task 4. EDD will review the collection of historical photos, and attempt to determine if there exists evidence of an expanding flood shoal, channel bank erosion, beach erosion, etc. EDD will also locate high quality local climate data, specifically wind data, to perform an analysis of wave energy and direction as it correlates with specific storms and conditions. The wave analysis should provide insight into the processes that govern the movement of coastal sediments and their deposition at and around the Inlet. These data, along with the wealth of research already performed at the Inlet, and the expertise of Dr. Weggel, will inform the findings and analysis of the channel conditions. The team will prepare a succinct summary of these insights and develop a set of conclusions based on the efforts of Task 4. The Town shall receive a draft copy of the Sediment Management Plan by July 1, 2013.