HAIL COVE LIVING SHORELINE PROJECT

Eastern Neck National Wildlife Refuge

April 21st, 2009

Project Partners:

Chesapeake Bay Trust

Ducks Unlimited

FishAmerica

Friends of Eastern Neck

Maryland Corporate
Wetlands Restoration Partnership

Maryland Department of the Environment

Maryland Department of Natural Resources
Restoration Services Division &
Migratory Waterfowl Stamp Program

Maryland Eastern Shore RC & D

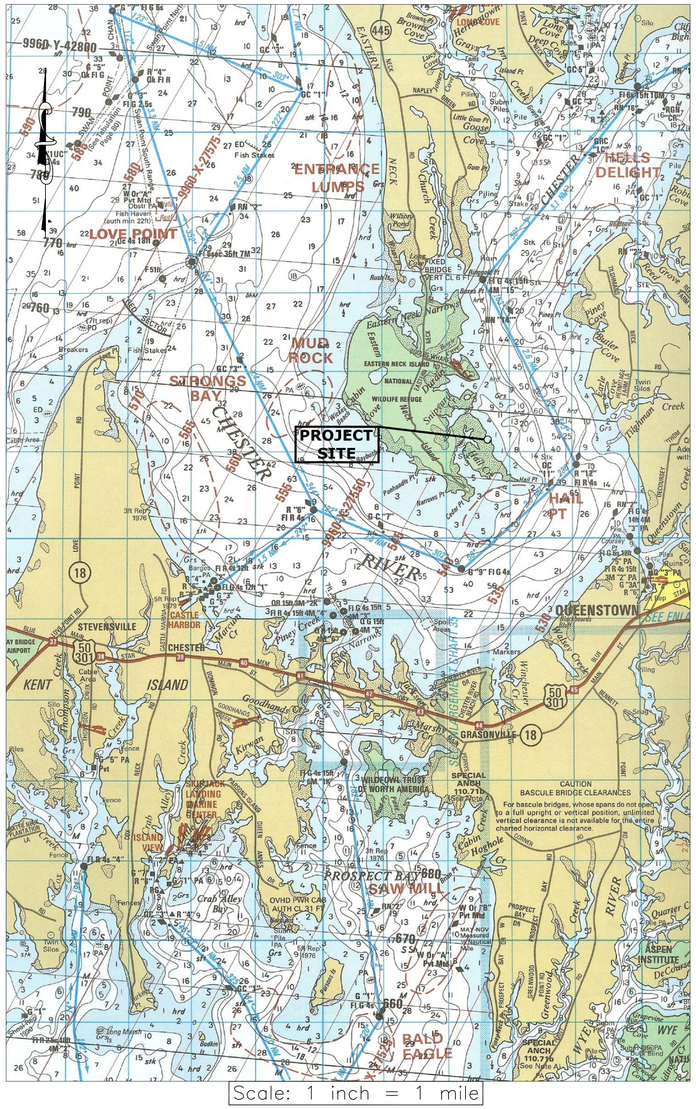
National Aquarium in Baltimore

NOAA Restoration Center

US Fish and Wildlife Service
Chesapeake Bay Field Office &
Chesapeake Bay Marshlands Refuge Complex
North American Wetlands Conservation Act

Vulcan Materials Company

Washington College



Scale: 1 inch = 1 mile

SUSTAINABLE SCIENCE LLC
Ecological Engineering Services
410 S. Second Street
Denton, Maryland 21629
Phone: (410) 924-4316
www.sustainablescience.com

Plan Sheet Index:

Sheet No. 1; *Title Sheet*

Sheet No. 2; *Existing Conditions Plan*

Sheet No. 3; *Hail Cove Living Shoreline Plan*

Sheet No. 4; *North & South Headland Structure Layout Plan*

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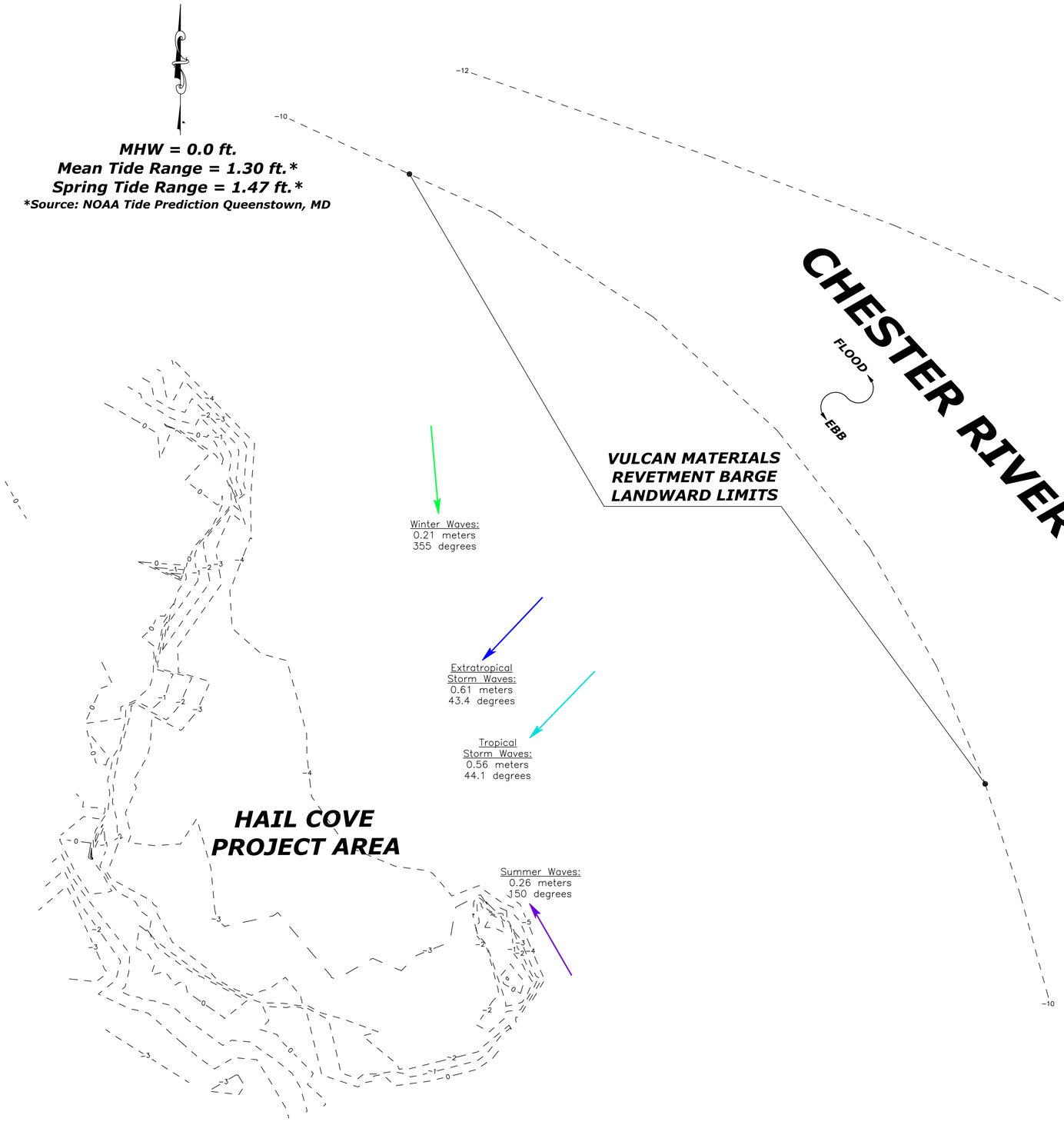

NOTES:

1) Base topography and preliminary cove bathymetry obtained by Ducks Unlimited with electronic files entitled SHEET 1 THROUGH 3; HAILS COVE LIVING SHORELINE, KENT COUNTY, MD dated 5/27/2008 sent to Sustainable Science LLC on 7/15/2008 via e−mail attachment.

2) Detailed cove bathymetry elevation shots obtained by Maryland Department of Natural Resources with electronic files entitled MDNR_TOPO_SURVEY sent to Sustainable Science LLC on 3/12/2009 via e−mail attachment.

3) Offshore bathymetry to define −10 ft. MHW & −12 ft. MHW contours and Ducks Unlimited survey control hubs CP−1 & CP−2 Maryland State Plane Coordinates (feet) obtained by U.S. Fish & Wildlife Service and Sustainable Science LLC on 3/16/2009.

4) All survey data sets merged by Sustainable Science then reprojected to Maryland State Plane Coordinate System (feet).

5) Elevations changed to relate to Mean High Water (MHW) = 0.0 feet by Sustainable Science through interpretation of biological benchmark indicators obtained from the Ducks Unlimited survey effort.

6) Design wave heights & approach angle determined by Sustainable Science LLC through interpretation of Thomas Point Lighthouse wind data and Poplar Island tropical & extratropical storm data.

VULCAN MATERIALS COMPANY BARGE CONDITIONS:

1) Two (2) weeks before site mobilization the Contractor shall contact Mr. John Smack @ (410) 459−3598 with Vulcan Materials Company to coordinate rip−rap stone delivery for headland control structures & oyster reef. The Contractor is responsible for identifying the proper on−site placement of the barge prior to delivery. Fully loaded barge requires ten (10) feet of water.

2) Barges used to deliver rip rap aggregate will be subject to a pre and post use survey by an independent marine surveyor. The surveyor will be experienced in marine applications and will be employed by and at the expense of Vulcan Materials Company. Any and all damage incurred to a barge identified by the pre and post surveys will be fully repaired to the predamaged condition by the Contractor.

3) One (1) mobilization and demobilization event of barge is included. Seven (7) days of free time allowed for off loading rip−rap aggregate beginning from the first 6:00 AM after barge is placed in Contractor determined position or of the barge being placed in the contractor's control. Any day or portion of a day after the allowed seven (7) days will be billed at the rate of three−hundred dollars ($300) per day.

4) Any required or requested tug time by the Contractor will be billed at the rate of four−hundred dollars ($400) per hour port to port. Standby tug time will be billed at the rate of two−hundred dollars ($200) per hour broken in one−half (1/2) hour intervals.

5) Demurrage does not stop unless barge placement error is Vulcan Materials Company.

6) In the event of any additional tug trip to service or change position of a barge, it will be billed at the rate of four−hundred dollars ($400) per hour round trip from Vulcan Materials Company Campostella fleet.

7) At times of darkness Vulcan Material barges must be well lit by the Contractor at each end with 360 degree white lights.

8) Barge bilges must remain pumped free of water at all times by the Contractor while in their possession.

9) All barges must be cleaned completely by the Contractor after unlaading rip rap aggregate. If Vulcan Materials Company is required to clean any barge, the standard charge is a minimum one−thousand dollars ($1,000) per barge or actual costs incurred, whichever is greater.

SCALE: 1 inch = 100 feet
DESIGN BY: A. McCullough
DRAWN BY: A. McCullough
CHECKED BY: A. McCullough
SS PROJECT NO: 08006
SHEET NUMBER 2 OF 6

DATE: February 28th, 2009
REVISION DATE: April 20th, 2009
REVISION TYPE: Barge limits & terms
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:

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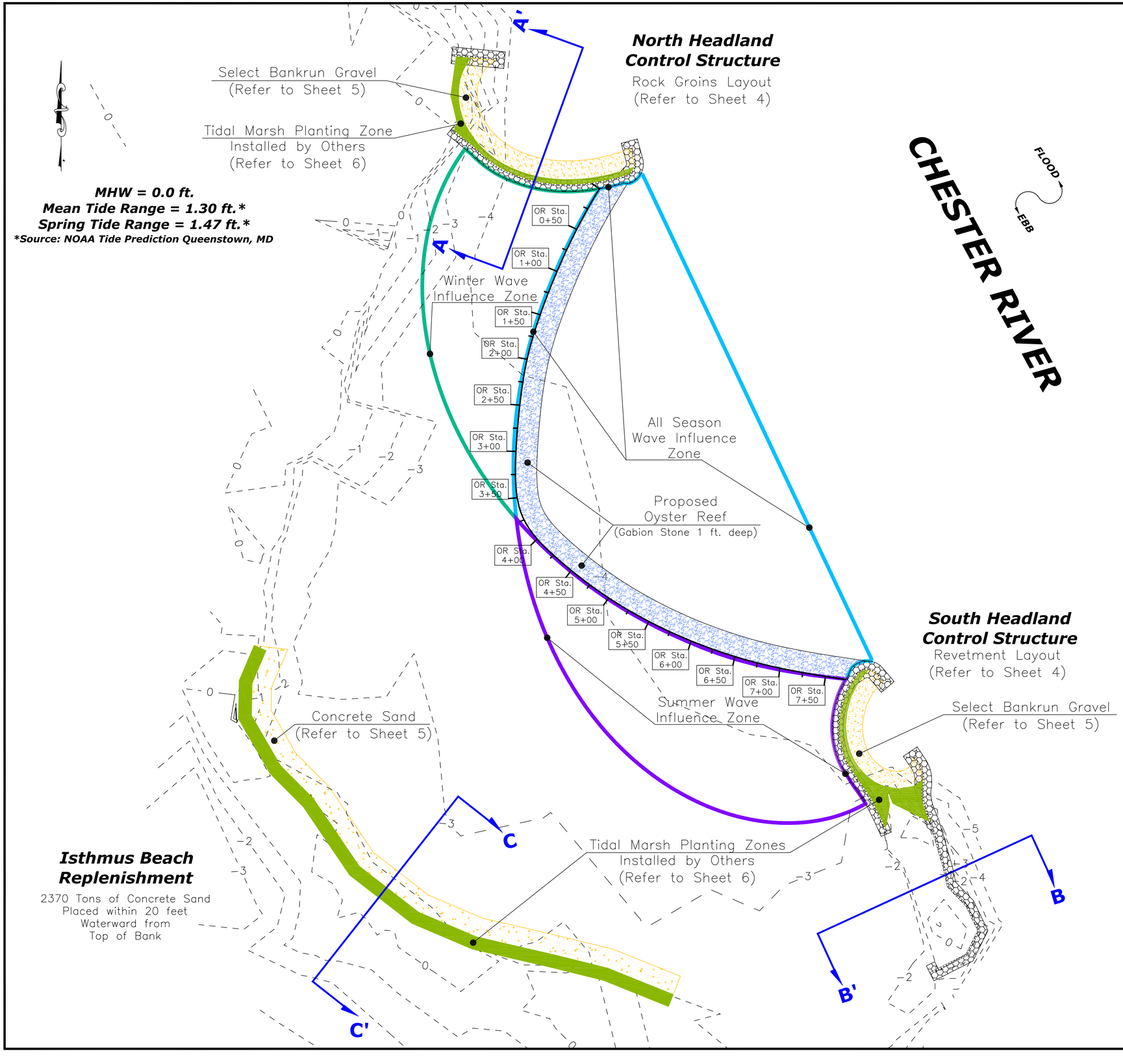
EXISTING CONDITIONS PLAN

Hail Cove Living Shoreline Project
Eastern Neck National Wildlife Refuge
1730 Eastern Neck Road
Kent County, Maryland



CONSTRUCTION SEQUENCE:

1) Notify Mr. Jonathan Priday of U.S. Fish & Wildlife Service Eastern Neck National Wildlife Service two (2) weeks prior to site mobilization @ (410) 639-7056.

2) Notify Mr. John Smack of Vulcan Materials two (2) weeks before site mobilization @ (410) 459-3598 to coordinate revetment material delivery.

3) Mobilize construction equipment & materials to the project site.

4) Place concrete sand in Isthmus Beach Replenishment in accordance with plans and specifications.

5) Construct North & South Headland Control Structure revetment in accordance with plans and specifications.

6) Place oyster reef stone in accordance with plans and specifications.

7) Place washed bankrun gravel within North & South Headland Control Structures in accordance with plans and specifications.

8) Demobilize construction equipment & clean project area.

9) Allow a minimum of two (2) weeks of tidal influence after placement of beach materials to adjust headland and isthmus beaches.

10) Plant areas (by others) in accordance with plans & specifications. No planting shall be performed until all construction activities have been completed & demobilized.

OYSTER REEF LAYOUT (OR)

OR Sta. No.	Landward Northing (feet)	Landward Easting (feet)
0+00	494,374.01	1,538,055.82
0+25	494,352.57	1,538,042.98
0+50	494,330.51	1,538,031.23
0+75	494,308.03	1,538,020.28
1+00	494,285.21	1,538,010.10
1+25	494,262.06	1,538,000.65
1+50	494,238.62	1,537,991.95
1+75	494,214.87	1,537,984.16
2+00	494,190.70	1,537,977.82
2+25	494,166.12	1,537,973.26
2+50	494,141.34	1,537,969.97
2+75	494,116.46	1,537,967.53
3+00	494,091.52	1,537,965.86
3+25	494,066.53	1,537,965.30
3+50	494,041.63	1,537,967.20
3+75	494,017.86	1,537,974.58
4+00	493,997.30	1,537,988.68
4+25	493,979.67	1,538,006.38
4+50	493,963.38	1,538,025.34
4+75	493,948.09	1,538,045.11
5+00	493,933.83	1,538,065.64
5+25	493,920.66	1,538,086.89
5+50	493,908.61	1,538,108.79
5+75	493,897.60	1,538,131.23
6+00	493,887.64	1,538,154.16
6+25	493,878.70	1,538,177.50
6+50	493,870.81	1,538,201.22
6+75	493,864.03	1,538,225.29
7+00	493,858.40	1,538,249.64
7+25	493,853.57	1,538,274.17
7+50	493,849.13	1,538,298.78
7+72	493,846.09	1,538,320.39

NOTES:
1) Northing and Easting values relate to Maryland State Plane Coordinate System (feet).

2) Select bankrun gravel shall have less than ten percent (10%) passing No. 100 sieve by weight. Material gradation to be approved prior to project delivery.

3) Revetment layouts provided on Sheet 4 with cross-sections shown on Sheet 5.

DATE: February 28th, 2009
REVISION DATE: April 16th, 2009
REVISION TYPE: Revised oyster reef
REVISION DATE: April 20th, 2009
REVISION TYPE: Oyster reef layout
REVISION DATE: NONE
REVISION TYPE:

SCALE: 1 inch = 50 feet
DESIGN BY: A. McCullough
DRAWN BY: A. McCullough
CHECKED BY: A. McCullough
SS PROJECT NO: 08006

SHEET NUMBER 3 OF 6

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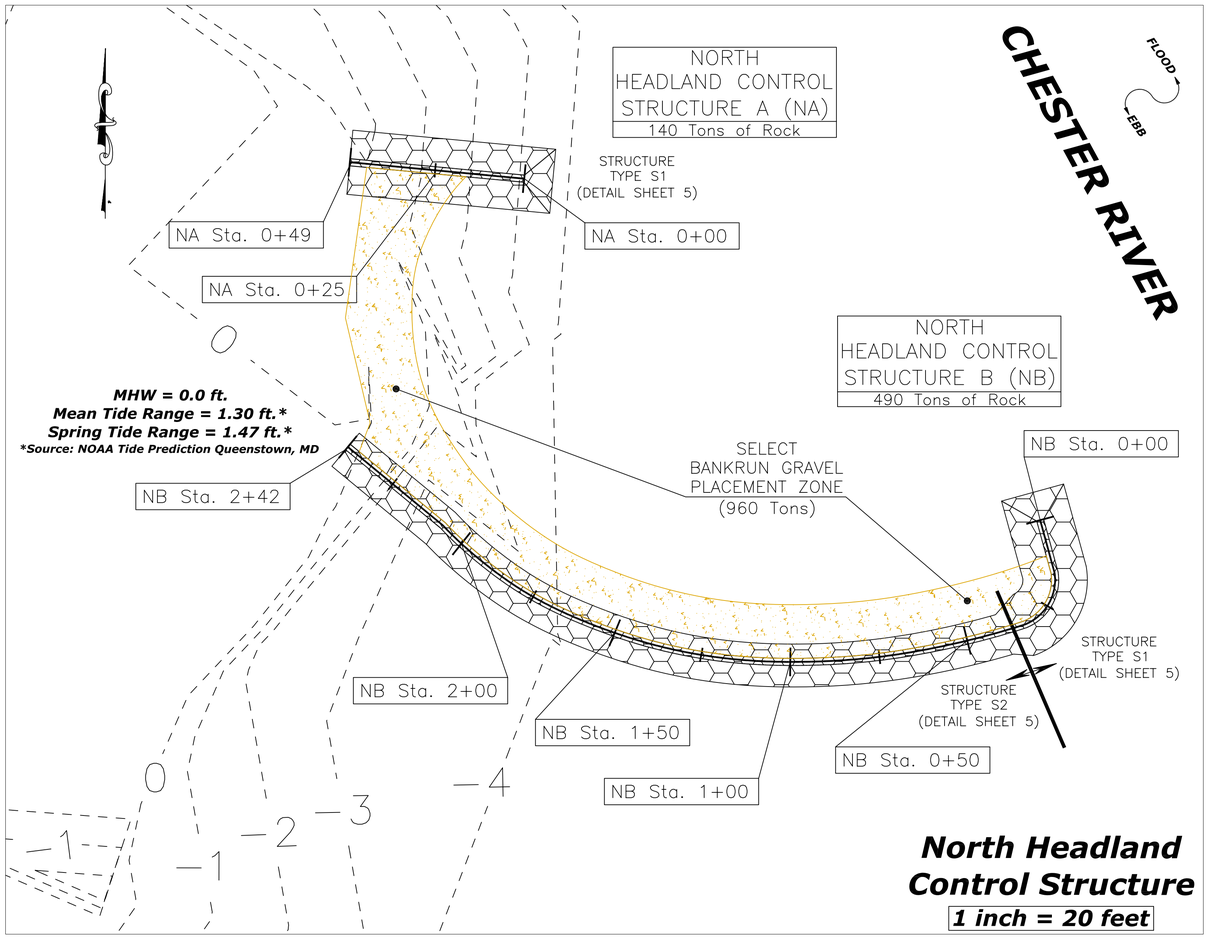
HAIL COVE LIVING SHORELINE PLAN

Hail Cove Living Shoreline Project
Eastern Neck National Wildlife Refuge
1730 Eastern Neck Road
Kent County, Maryland



NORTH HEADLAND CONTROL STRUCTURE A (NA)

NA Sta. No.	Centerline Northing (feet)	Centerline Easting (feet)
0+00	494,513.14	1,537,945.59
0+25	494,515.48	1,537,920.76
0+49	494,517.72	1,537,896.86

NORTH HEADLAND CONTROL STRUCTURE B (NB)

NB Sta. No.	Centerline Northing (feet)	Centerline Easting (feet)
0+00	494,417.68	1,537,945.59
0+25	494,393.67	1,538,091.80
0+50	494,384.00	1,538,069.42
0+75	494,379.47	1,538,044.87
1+00	494,378.05	1,538,019.85
1+25	494,380.01	1,537,995.06
1+50	494,386.19	1,537,970.83
1+75	494,396.25	1,537,948.07
2+00	494,411.09	1,537,928.04
2+25	494,427.77	1,537,908.86
2+42	494,438.14	1,537,896.30

NOTES:

1) Northing and Easting values relate to Maryland State Plane Coordinate System in feet.

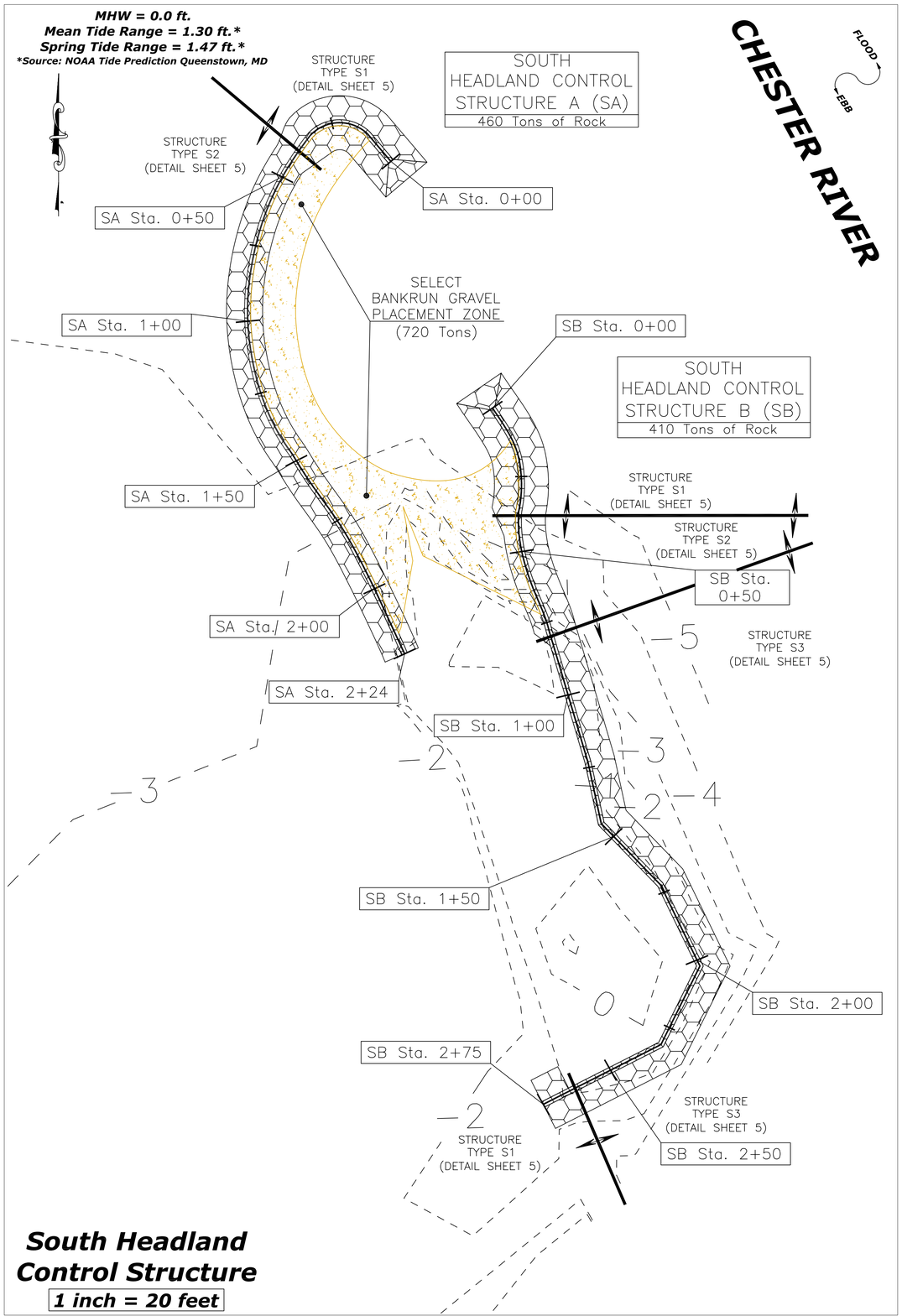
2) Select bankrun gravel shall have less than ten percent (10%) passing by weight the No. 100 sieve. Material gradation to be approved prior to delivery to project.

SOUTH HEADLAND CONTROL STRUCTURE A (SA)

SA Sta. No.	Centerline Northing (feet)	Centerline Easting (feet)
0+00	494,844.19	1,538,360.67
0+25	494,856.82	1,538,340.91
0+50	493,838.97	1,538,324.49
0+75	493,815.72	1,538,315.55
1+00	493,790.93	1,538,312.99
1+25	493,766.42	1,538,317.52
1+50	493,744.42	1,538,329.17
1+75	493,723.79	1,538,343.26
2+00	493,701.75	1,538,355.19
2+24	493,680.08	1,538,365.23

SOUTH HEADLAND CONTROL STRUCTURE B (SB)

SB Sta. No.	Centerline Northing (feet)	Centerline Easting (feet)
0+00	493,761.96	1,538,394.49
0+25	493,739.16	1,538,404.07
0+50	493,714.17	1,538,404.25
0+75	493,690.50	1,538,412.61
1+00	493,666.37	1,538,419.68
1+25	493,642.23	1,538,426.67
1+50	493,619.20	1,538,434.88
1+75	493,600.63	1,538,451.64
2+00	493,578.02	1,538,462.63
2+25	493,555.48	1,538,453.42
2+50	493,541.31	1,538,433.82
2+75	493,529.92	1,538,411.41



SCALE: 1 inch = 20 feet
DESIGN BY: A. McCullough
DRAWN BY: A. McCullough
CHECKED BY: A. McCullough
SS PROJECT NO: 08006
SHEET NUMBER 4 OF 6

DATE: February 28th, 2009
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:

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NORTH & SOUTH HEADLAND STRUCTURE LAYOUT PLAN

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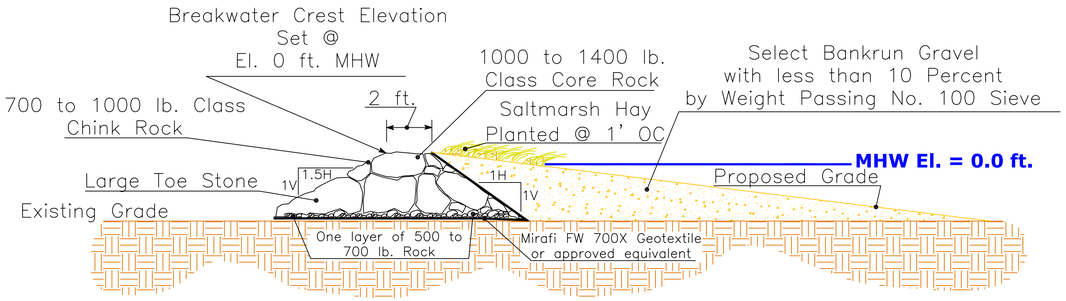
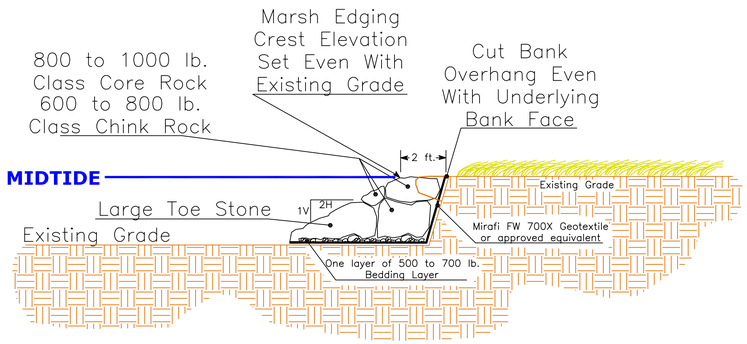


CROSS SECTION A - A'

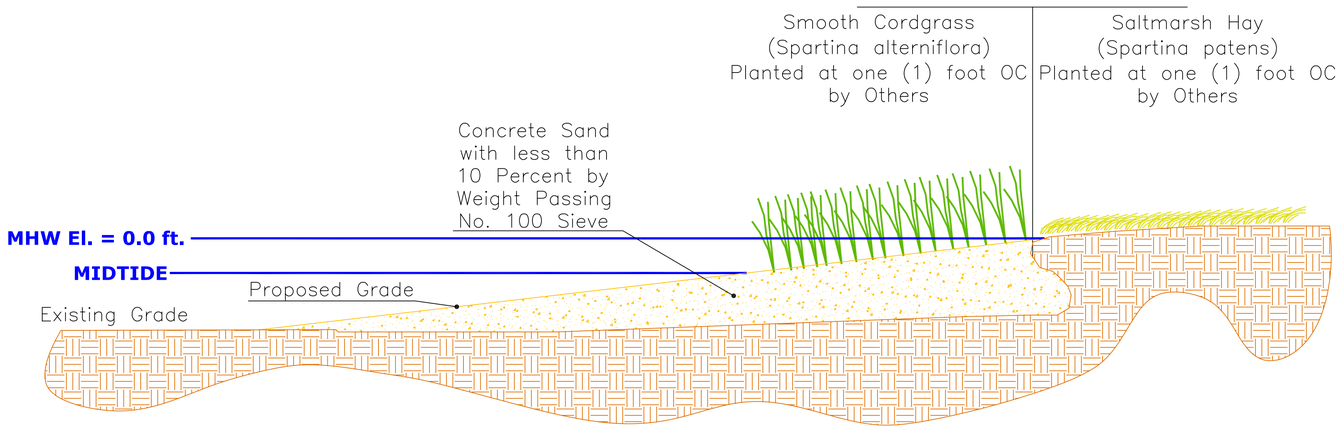
Not to Scale



Where Necessary, Such As Eroded Coves, Fill With Bankrun Gravel Containing Less Than 10 Percent of Fines by Weight Passing No. 100 Sieve

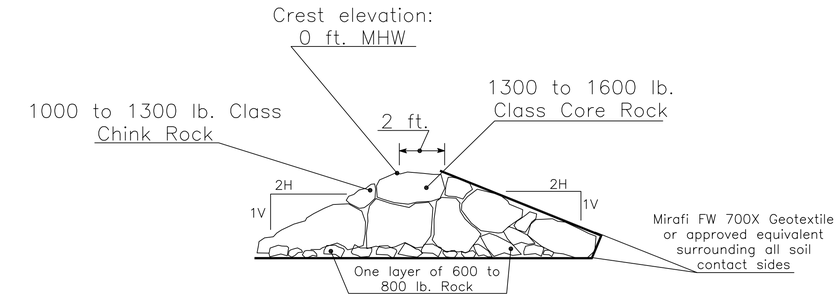
CROSS SECTION B - B'

Not to Scale



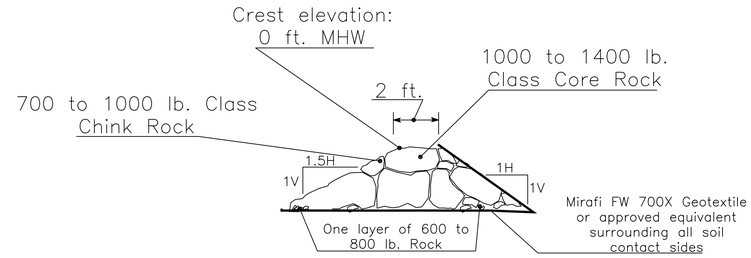
CROSS SECTION C - C'

Not to Scale



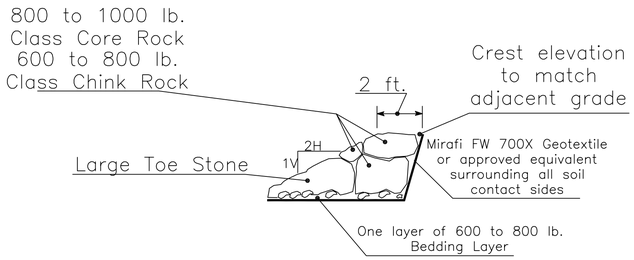
STRUCTURE TYPE S1

Not to Scale



STRUCTURE TYPE S2

Not to Scale



STRUCTURE TYPE S3

Not to Scale

SCALE: As Shown
DESIGN BY: A. McCullough
DRAWN BY: A. McCullough
CHECKED BY: A. McCullough
SS PROJECT NO: 08006
SHEET NUMBER 5 OF 6

DATE: February 28th, 2009
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:

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CROSS-SECTIONS & CONSTRUCTION DETAILS

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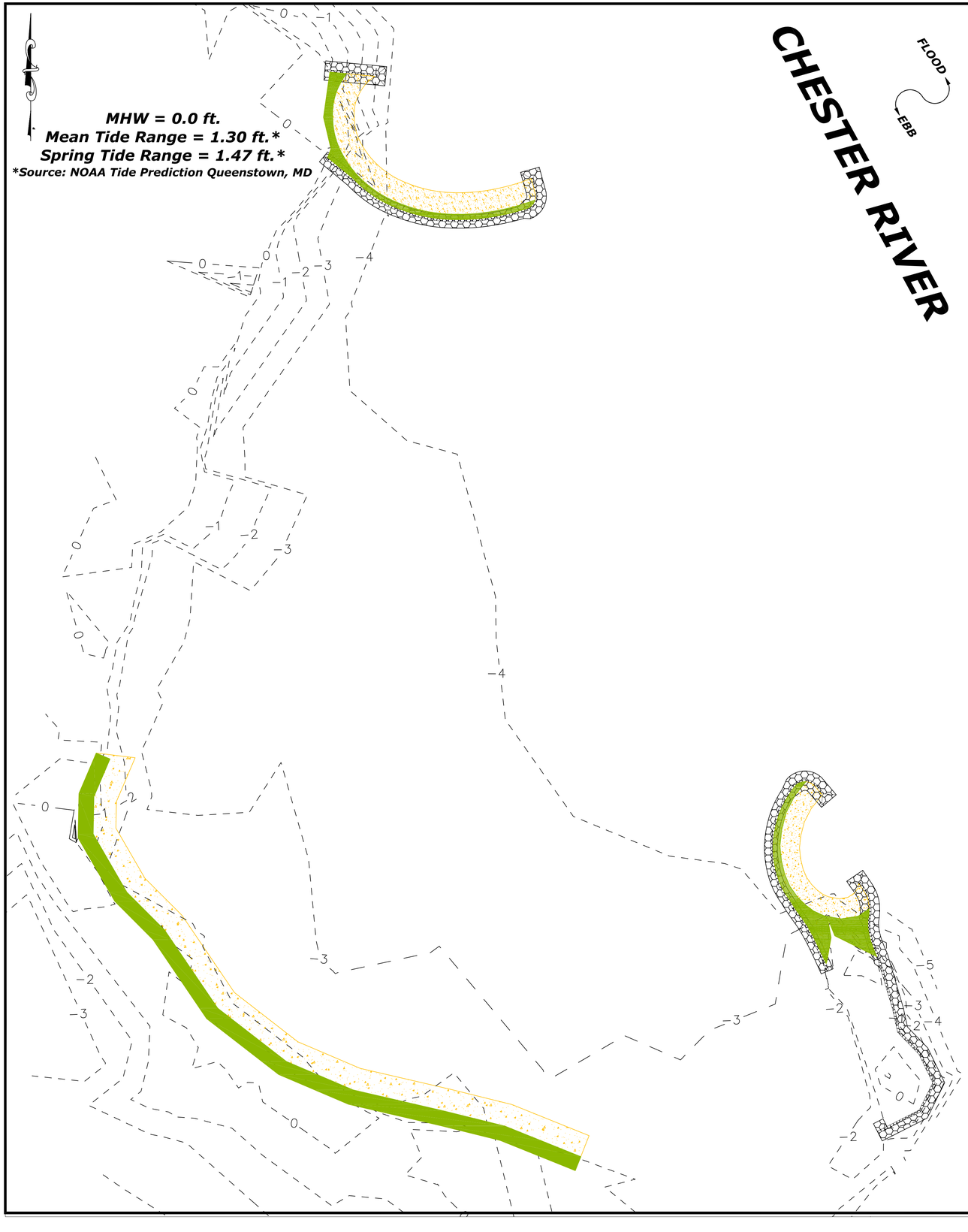

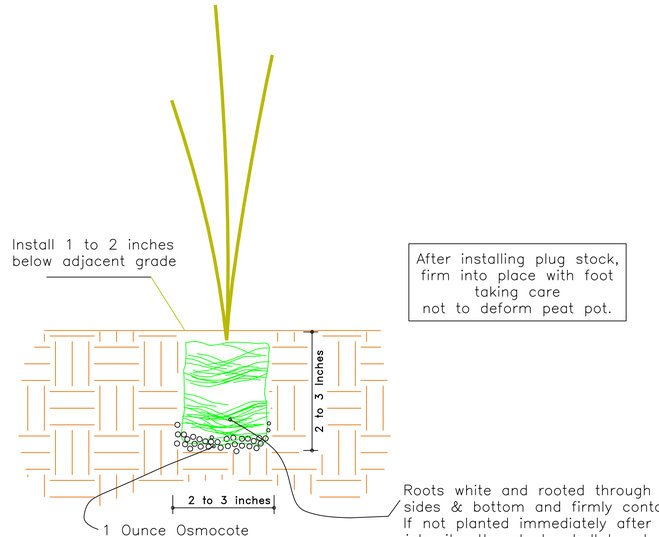

2-INCH PLUG PLANTING DETAIL

Not to Scale

PLUG MATERIAL ACCEPTANCE CRITERIA:
Provide plug stock with healthy root systems developed by transplanting or root pruning. The extracted root system shall conform to the container dimensions and not be pot bound. Roots shall be white in color, firm to the touch, not have "rotten egg" odor, be free of disease, insects, larvae and defects such as knots, sun-scald, injuries, abrasions or disfigurement. Any stock not satisfying the above criteria shall be replaced at the Contractor's expense.

ZONE A: Low Marsh (Isthmus at back of cove)

Botanical Name	Common Name	Size	Plant Spacing	Quantity	Planting Elevation	Planting Period
Spartina alterniflora	Smooth Cordgrass	2-inch plug	2 ft. OC	3,050	-0.7 to 0.0 MHW	July 15th to Aug. 15th

ZONE B: High Marsh (Headland structure beach areas)

Botanical Name	Common Name	Size	Plant Spacing	Quantity	Planting Elevation	Planting Period
Spartina patens	Saltmarsh Hay	2-inch plug	1 ft. OC	4,330	0.0 to 0.7 MHW	July 15th to Aug. 15th

DATE: February 28th, 2009
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:
REVISION DATE: NONE
REVISION TYPE:

SCALE: 1 inch = 50 feet
DESIGN BY: A. McCullough
DRAWN BY: A. McCullough
CHECKED BY: A. McCullough
SS PROJECT NO: 08006

SHEET NUMBER 6 OF 6

SUSTAINABLE SCIENCE LLC
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LANDSCAPE PLAN & PLANTING DETAILS

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