

Appendix B

2023 Weaver Shoal Bathymetric Survey



U.S. Army Corps of Engineers
Baltimore District

HYDROGRAPHIC SURVEY REPORT

WEAVER BORROW SURVEY

Ocean City, Maryland

Contract No.: W912DR20D0016

Delivery Order No: W912DR23F03

December 2023

Prepared by:



Gahagan & Bryant Associates, Inc.
9008-O Yellow Brick Road
Baltimore, MD 21237

Prepared for:

Baird.

Innovation Engineered.

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1.0 INTRODUCTION

Gahagan & Bryant Associates (GBA) was requested by W. F. Baird & Associates, Ltd. and the U.S. Army Corps of Engineers, Baltimore District (USACE) (Contract: W912DR20D0016 | Delivery Order No: W912DR23F0358) to collect multibeam hydrographic data across the Weaver Shoal Borrow Area extents as shown in Figure 1 below. The project area is approximately 1.5 miles wide by 2.75 miles long totaling approximately 2,600 acres of survey area. The purpose of the survey is to document the existing conditions of the project area. Survey work conducted under this task was completed in accordance with the scope of work dated September 18, 2023 and the approved Survey Plan (October 2023).

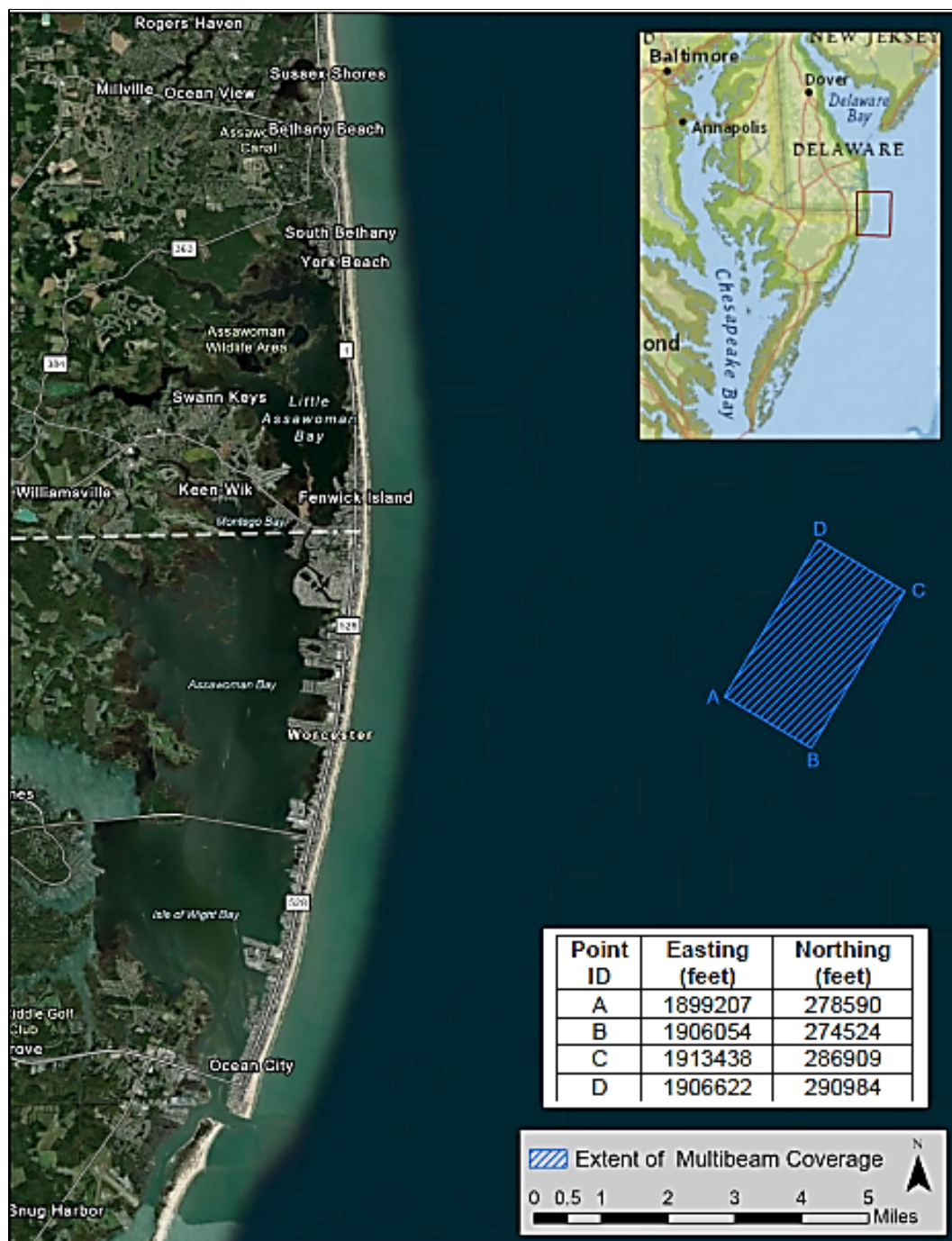


Figure 1 – Weaver Borrow Area Project Location

2.0 CONTROL SURVEY

On October 10, 2023, a GBA survey crew mobilized to Ocean City, Maryland to perform project control surveys. The crew checked into Speicher with a Leica rover using Leica smart net. The crew subsequently established a fixed project base station on top of Carousel Hotel in Ocean City Maryland using the Leica rover. Three 180 epoch observations were stored and averaged together to establish a Northing, Easting, and Elevation on the base station mount point. The GBA survey crew then set up a Trimble Base Station consisting of a Trimble SPS 461, Zephyr Geo Mdl2, and Trimark III radio. The fixed project base station point "Carousel" was established at the rooftop of Carousel Hotel (Elevation 203.18') and the GPS system was set up to broadcast at a rate of 10 Hz. GBA recovered USACE survey control points 146th St. and Bath and performed GPS observations to verify the positional accuracy of the established coordinates on "Carousel." Both known control points measured checked within project specified accuracies. Horizontal and vertical deltas are shown on Attachment 1 project control report.

3.0 HYDROGRAPHIC SURVEY

Prior to mobilization to the site, predetermined survey lines were set up in HYPACK survey software to ensure that all lines were placed at the appropriate transect locations, as per the specifications in the scope of work. The HYPACK software is run on a PC aboard the survey vessel. The software provides real-time navigation for the boat operator to steer the vessel. An R-2 Sonic multibeam echosounder sends out an acoustic signal (sonar), which determines the water depth, and the GPS positioning system provides the vessel's position. Both depth and position are recorded on the PC computer using Hypack data acquisition software package. The software matches the water depth with the position to generate an accurate horizontal location and vertical depth file. GBA utilized *RV Pricus* for the hydrographic survey efforts. The *RV Pricus* is a 40-foot Small Waterplane Area Twin Hull (SWATH) vessel powered by twin Cummins C9 motors.

The survey system on the survey vessel *RV Pricus* consisted of:

- 1) GPS – Applanix PosMv receiver system and a Trimble TDL-450 receiving corrections from the Trimble Base Station referenced to USACE monument "146th St."
- 2) Echosounder – R-2 Sonic multibeam echosounder for water depth measurements,
- 3) IMU – Applanix PosMv system updating at 20Hz to compensate for heave, pitch, and roll and
- 4) A survey grade computer running Windows 11 professional.

Hydrographic survey data was collected from October 12, 2023, through October 19, 2023. Weather conditions at the time of the survey were suitable for data acquisition on the small vessel required for this type of work.

Sound Velocity profiles were performed approximately every 2 hours during survey operations to ensure proper calibration of the echosounder for draft and sound velocity. Sound Velocity profiles were collected using an AML Sound Velocity Profiler. RTK Tide checks were conducted before and after each day of data collection. RTK position checks were checked against TBM 'Sunset'.

Prior to production surveys in the borrow area the survey system was checked for latency, and the

multibeam system was patch and performance tested. Additionally, an uncertainty analysis was performed to identify potential survey errors and uncertainties.

4.0 DATA PROCESSING

Upon completion of the hydrographic survey all data was edited and processed using PosPac and HYPACK 2021 and GBA internal software utilities. During processing, corrections for vessel motion and tidal variation were applied and errant soundings were removed from the database. Using Hypack's Hysweep editor, final XYZ data files were generated based on the average cell depth value using 5', 10', 20', and 50' bin sizes. All data points are provided in Maryland State Plane coordinate (Zone 1900) and reference the vertical plane of the North American Vertical Datum 1988 (NAVD88).

5.0 QUALITY CONTROL/QUALITY ASSURANCE

GBA performed QA/QC procedures throughout the survey project. RTK control checks were performed before and after all Topographic data collection. Sound Velocity profiles were collected during all hydrographic data collection to eliminate speed of sound and transducer draft errors. Patch and performance tests were run to eliminate offset and latency errors. The data was reviewed daily to ensure proper coverage and quality. Crossline hydrographic survey data was collected at 2000-foot increments perpendicular to long axis of the borrow site. This data was compared to the longitudinally collected data and compared for consistency. Additionally, GBA data was compared to the historical USACE data. Statistical analysis of the data sets showed that the GBA collected data was within project specified tolerances.

All data meet or exceed minimum performance standards established in the USACE Engineering and Design Manual EM 1110-2-1003.

6.0 CONTACT INFORMATION

Gahagan & Bryant Associates, Inc.

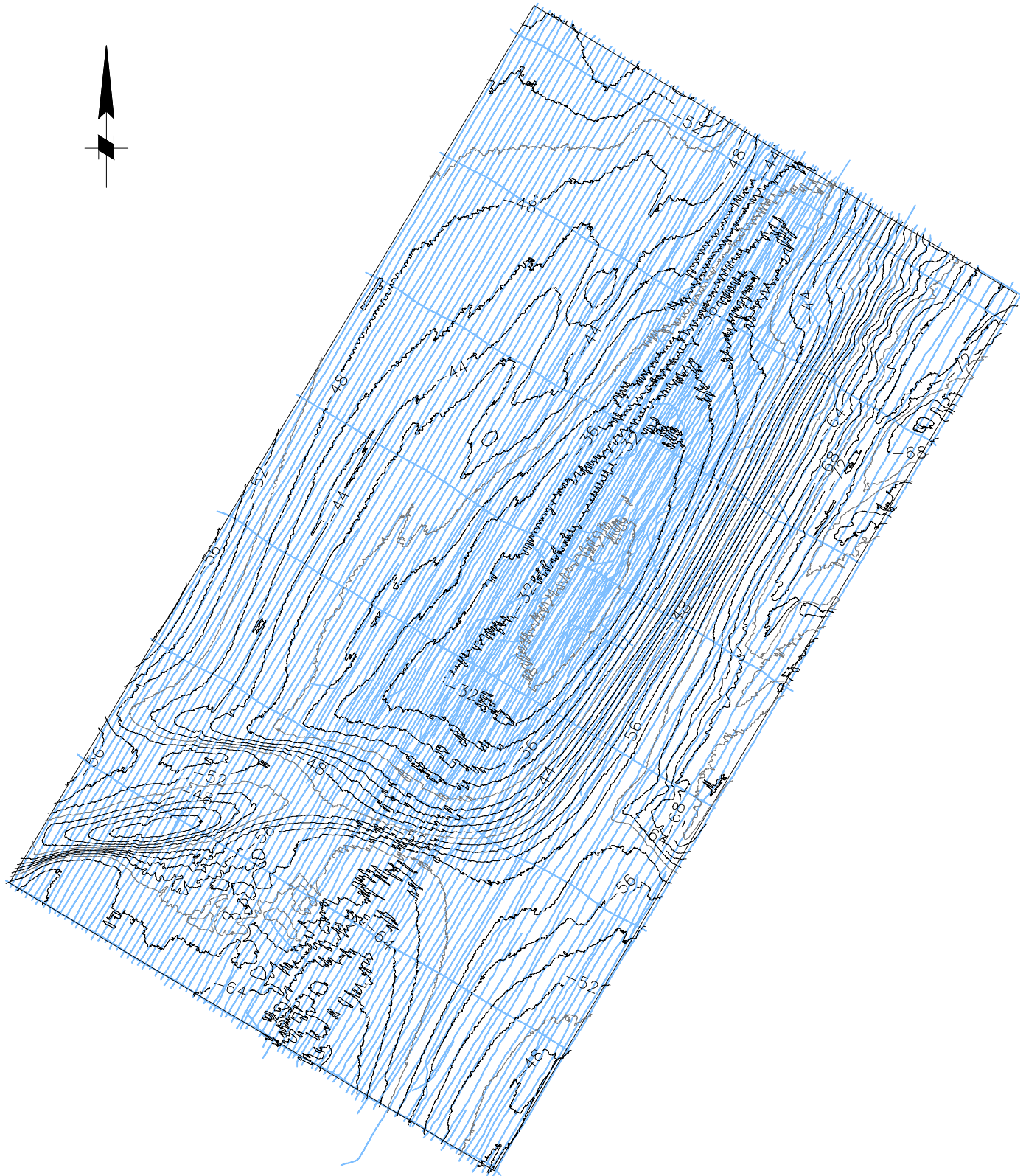
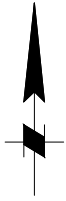
9008-O Yellow Brick Road
Baltimore, MD 21237
Office: 410-682-5595

Survey Manager:

Christopher Mareello, PLS email: ctmareello@gba-inc.com

Technical Project Manager:

Edward DeAngelo email: edeangelo@gba-inc.com

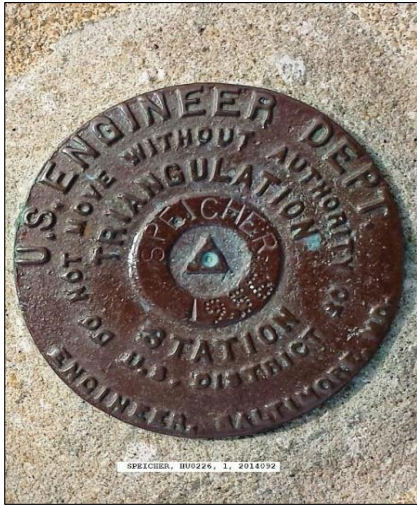


APPENDIX 1

Weaver Borrow Area Control Report

Weaver Borrow Area Control Report - October 10, 2023

CONTROL POINT	STATUS	EASTING	NORTHING	VERTICAL	EASTING	NORTHING	VERTICAL	EASTING	NORTHING	VERTICAL	COMMENTS
GIVEN				FOUND				DELTA			
SPEICHER	Found - Good	1,860,780.12	245,550.83	9.66	1860780.207	245551.003	9.630	0.087	0.173	-0.030	Check Using Leica Rover on Smart Net
146th STREET	Found - Good	1870474.488	291689.393	8.15	1870474.601	291689.393	8.248	0.113	0.000	0.098	Checked using Trimble Base set at Carousel
BATH	Found - Good	1870336.551	298776.04	3.432	1870336.608	298775.946	3.498	0.057	-0.094	0.066	Checked using Trimble Base set at Carousel



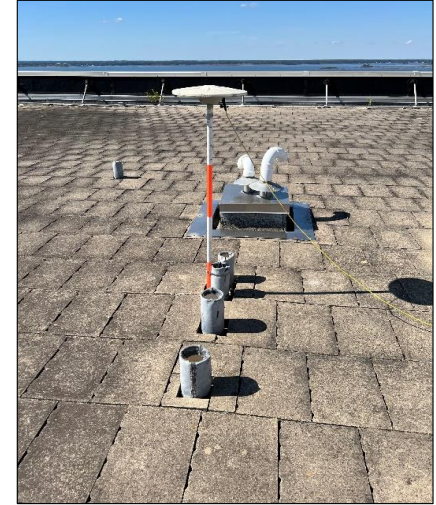
Speicher



146th Street



Bath



Fixed Project Base Station "Carousel"

APPENDIX 2

Hydrographic Survey Field Notes

ZS1010

WEAVER BORROW AREA
CONTROL RECON / BASE
STATION SETUP

CREW CTM
TRS

WX CLEAR
55°-70°

EQUIP

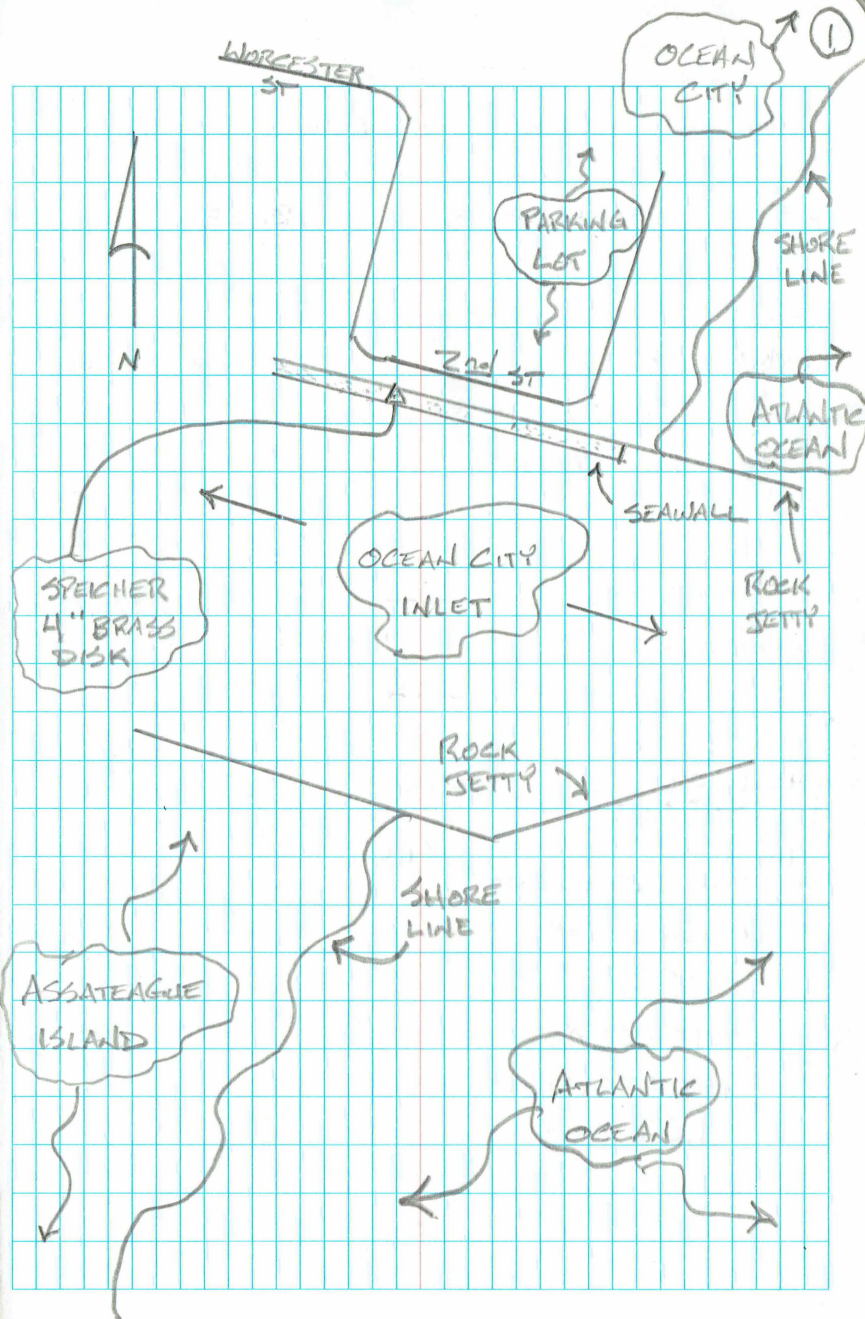
TRIMBLE R/B + TSC3

TRIMBLE SP5 852 + TDL450

LEICA ROVER + DATA COLLECTOR

WORK PERFORMED:

- CONTROL CHECKINS W/ LEICA ROVER
- ESTABLISH BASE STATION MOUNT POINT FOR PROJECT
- CONTROL CHECKIN'S W/ TRIMBLE ROVER



3.3 MINUTE OBSERVATIONS 180 EPOCH
ON SPEICHER W/ LEICA ROVER

KNOWN COORDINATES SPEICHER

NAD 83 NAD 88

MD SPC 1900

N: 245550.83

E: 1860780.12

EL: 9.66

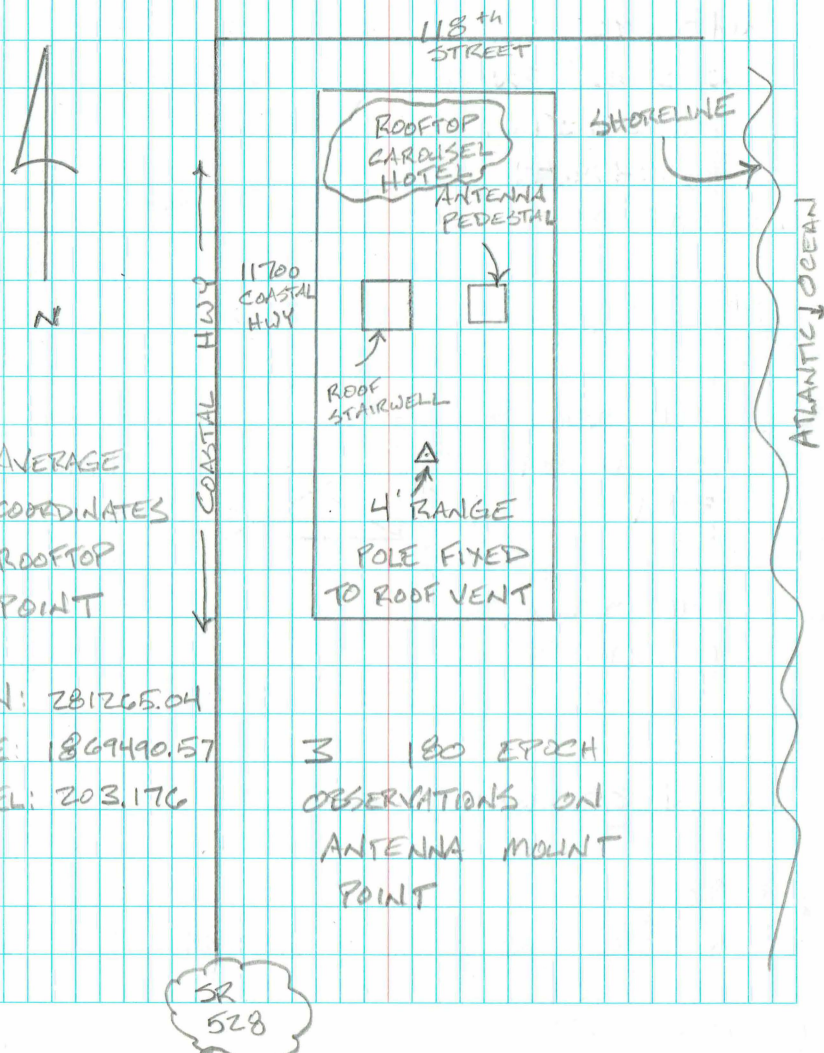
OBSERVED

①
N 245551.00
E 1860780.20
EL 9.64

②
24555.00
1860780.21
9.63

③ 245551.00
1860780.21
9.62

PROJECT BASE STATION FIXED
CONTROL POINT ESTABLISHED ON
CAROUSEL HOTEL ROOF 11700 COASTAL
HWY. OCEAN CITY, MD.



3 180 EPOCH
OBSERVATIONS ON
ANTENNA MOUNT
POINT

CONTROL CHECK IN ② 146th ST
AND BATH

KNOWN COORDINATES:

• 146th ST

NAD 83 NAD 88 SPC MD 1900

N: 291689.39
E: 1870474.49
EL: 8.15

OBSERVED

① N: 291689.38
E: 1870474.59
EL: 8.24

② N: 291689.40
E: 1870474.60
EL: 8.24

③ N: 291689.37
E: 1870474.54
EL: 8.25

KNOWN COORDINATES:

• BATH

NAD 83 NAD 88 SPC MD 1900

N: 298776.04
E: 1870336.55
EL: 3.42

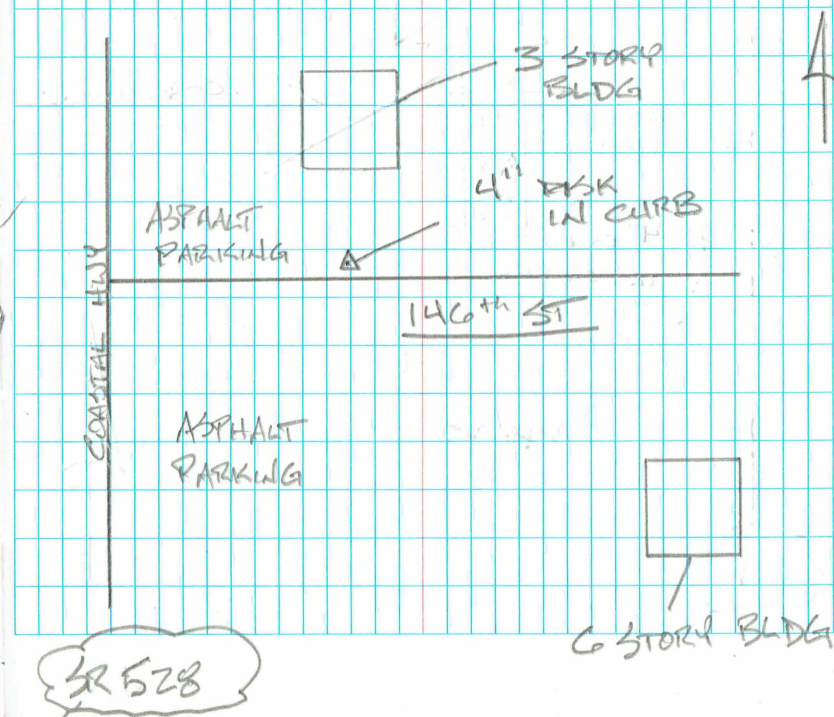
OBSERVED

① N: 298775.95
E: 1870336.61
EL: 3.51

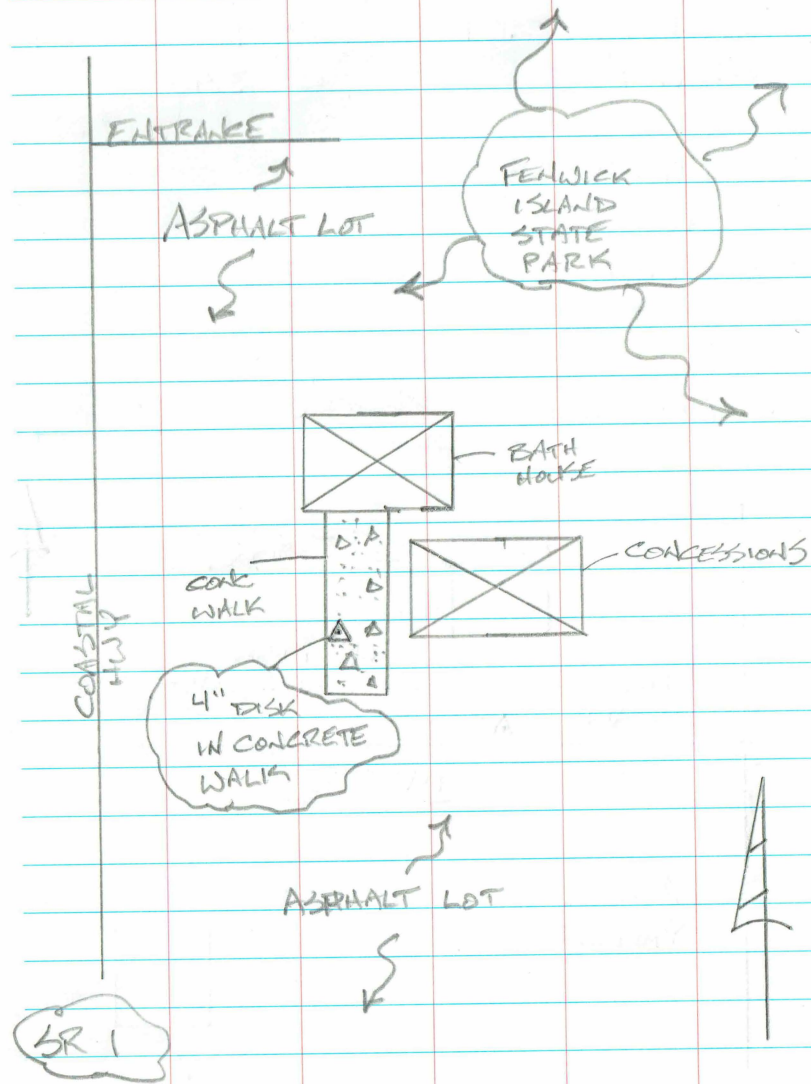
② N: 298775.94
E: 1870336.61
EL: 3.48

③ N: 298775.94
E: 1870336.61
EL: 3.51

LOCATION SKETCH 146th



LOCATION SKETCH BATH





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Baltimore, MD 21237

(410) 682-5595

Prepared By:

C. MARELLA

Hydrographic Survey Field Logs

Body of Water: ATL. OCEANLocation: O. CITY MARYLANDWeather: OVERCASTWind: NE 10-15Sea State: 2-4Vessel Speed: 4.6 KTSDate: 13 OCT 2023Project: WEAVER BORROW

Proj. No. _____

Vessel: PRIEDSCrew: CTMDKN

Multi-Beam Survey

File Name: 231013_RAWPositioning System: POS. MVEchosounder: R-2 SONIC

Single Beam Survey

File Name: _____

Positioning System: _____

Echosounder: _____

Boat Positioning

Position A: X 1856157.8 Y 246887.6Position B: X 1856162.9 Y 246710.0

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Boat Positioning

Position A: X _____ Y _____

Position B: X _____ Y _____

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Transducer Calibration

Sound Velocity Casts

Time: 0815 A Speed of Sound: 4971Time: 1015 B Speed of Sound: 4970Time: 1220 C Speed of Sound: 4971Time: 1500 D Speed of Sound: _____Time: 1500 E Speed of Sound: 4972Time: 1720 F Speed of Sound: 4971

Transducer Calibration

Bar Check

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPS

RTK Base: CAROUSEL Elev: 203.17 Datum: 88Tide Gauge: SUNSET Elev: 2.97 Datum: 88

Time	0730	1730		
Rod	<u>2.97</u>	<u>2.97</u>		
Water Level	<u>1.90</u>	<u>1.70</u>		
Boat	<u>2.00</u>	<u>1.80</u>		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____

HOBO Launch Time: _____ Recover Time: _____

Time			
Elevation			
Rod			
Water Level			

Comments: _____



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(410) 682-5595

Prepared By:

C. MARELLA**Hydrographic Survey Field Logs**Body of Water: ATL OCEANLocation: 0. CITY MARYLANDWeather: OVERCASTWind: N 5-10Sea State: 2-3Vessel Speed: 4-6 KTSDate: 14 OCT 2023Project: WEAVER BORROW

Proj. No. _____

Vessel: PRICUSCrew: CTMPRWDKE DKN**Multi-Beam Survey**File Name: 231014_RAWPositioning System POS MVEchosounder: R-2 SONIC**Single Beam Survey**

File Name: _____

Positioning System _____

Echosounder: _____

Boat PositioningPosition A: X 1856157.80 Y 246889.63Position B: X 1856162.63 Y 246909.01

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Boat Positioning

Position A: X _____ Y _____

Position B: X _____ Y _____

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Transducer Calibration**Sound Velocity Casts**Time: 0905 A Speed of Sound: 4969Time: 1105 B Speed of Sound: 4970Time: 1325 C Speed of Sound: 4967Time: 1735 D Speed of Sound: 4970

Time: _____ E Speed of Sound: _____

Time: _____ F Speed of Sound: _____

Transducer Calibration**Bar Check**

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPSRTK Base: CAROLSEL Elev: _____ Datum: 88Tide Gauge: SUNSET Elev: 2.97 Datum: 88

Time	<u>0745</u>	<u>1840</u>		
Rod	<u>2.97</u>	<u>2.97</u>		
Water Level	<u>2.00</u>	<u>1.66</u>		
Boat	<u>2.20</u>	<u>1.80</u>		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____

HOBO Launch Time: _____ Recover Time: _____

Time			
Elevation			
Rod			
Water Level			

Comments: _____

HYDROGRAPHIC SURVEY LOG SHEET

Survey #: 231014

Sheet # 1 of

Date: 14 - Oct - 23

Project Details: WEAVER

Fathometer Frequency

200

Survey Crew

CTM, PRW, DKN

Draft of Fathometer

Survey Vessel

PRICUS

GPS Mode

FIXED RTK

Sea State

3'-4'

GPS Latency

Avg. Speed of Sound

4969

Vessel Squat

HYPACK File Information

Project Bench Mark

Bench Mark Elev and Datum

Bench Mark LAT/Y

Bench Mark LONG/X

Horizontal Datum

NAD 83 MD SPC

Vertical Datum

88

MLLW-NAVD88 Relationship

Line Name

Start Time

End Time

Tide

Speed

WS307

09:33:55

09:52:59

-2.15

7.33

WS301

09:55:03

10:00:49

-2.05

7.46

WS301

10:00:49

10:09:28

-2.37

7.34

WS301

10:09:28

10:15:11

-2.25

7.08

WS291

10:19:51

10:30:33

-1.64

6.55

WS291

10:30:33

10:34:42

-1.61

6.47

WS291

10:34:42

10:42:19

-1.45

6.22

WS296

10:44:13

10:53:10

-1.53

6.88

WS296

10:53:10

10:59:23

-1.37

6.86

WS296

10:59:23

11:05:06

-1.22

7.57

WS304

11:11:33

11:17:54

-0.94

6.48

WS304

11:17:54

11:25:48

-1.26

6.67

WS304

11:25:48

11:32:50

-0.94

6.78

WS287

11:34:42

11:41:31

-0.42

6.47

WS287

11:41:31

11:48:33

-0.54

6.36

WS287

11:48:33

11:55:30

-0.72

7.97

WS283

11:58:57

12:04:55

-0.61

7.31

WS283

12:04:55

12:12:53

-0.63

7.38

WS283

12:12:53

12:18:57

-0.38

7.38

WS278

12:21:57

12:28:37

-0.50

7.78

WS278

12:28:37

12:35:16

-0.46

7.82

WS278

12:35:16

12:40:24

-0.44

8.43

WS273

12:41:58

12:47:26

0.29

8.26

WS273

12:47:26

13:00:40

0.13

7.75

WS268

13:02:19

13:16:41

0.14

7.66

WS268

13:16:41

13:20:43

0.31

8.39

WS263

13:34:38

13:40:23

0.37

7.98

WS263

13:40:23

13:48:02

0.83

7.56

WS263

13:48:02

13:53:49

0.44

7.43

WS258

13:55:58

14:02:19

0.62

7.98

WS258

14:02:19

14:11:17

0.46

7.79

WS258

14:11:17

14:14:51

0.42

8.06

WS253

14:23:22

14:37:33

0.44

7.17

WS253

14:37:33

14:42:45

0.38

7.45

WS256

14:44:33

14:57:55

0.38

8.77

WS261

14:59:48

15:07:46

0.45

8.37

WS261	15:07:46	15:13:48	0.37	7.61
WS270	15:15:46	15:21:39	0.29	7.01
WS270	15:21:39	15:31:17	-0.25	7.52
WS280	15:33:38	15:43:07	-1.86	6.87
WS280	15:43:07	15:47:57	0.02	6.51
WS265	15:50:39	15:55:07	0.01	6.59
WS265	15:55:07	16:02:05	-0.96	7.22
WS260	16:03:22	16:06:14	-0.91	6.60
WS259	16:17:45	16:22:19	0.00	0.00
WS257	16:24:10	16:24:53	-0.43	7.08
WS276	16:25:22	16:34:15	-0.82	6.21
WS272	16:34:15	16:34:53	-0.79	6.34
WS266	16:34:53	16:36:21	-0.48	6.56
WS280	16:39:02	16:40:07	-1.78	6.32
WS319	16:41:33	16:47:10	-0.85	6.78
WS319	16:47:10	17:02:01	-1.25	7.14
WS348	17:03:37	17:08:30	-1.51	6.38
WS348	17:08:30	17:13:11	0.00	0.00
WS348	17:13:33	17:20:48	-1.37	6.56
WS348	17:20:48	17:26:09	-1.34	5.73



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Prepared By:

P. WINCHELL**Hydrographic Survey Field Logs**Body of Water: ATLANTIC OCEANLocation: OCEAN CITY, MDWeather: PARTLY CLOUDY 45-60FWind: NW 5-15 KTSSea State: 2-4 FTVessel Speed: 4-6 KTSDate: 16 OCT 2023Project: WEAVER BORROWProj. No. 201-23:01Vessel: PRICUSCrew: PRWDKN**Multi-Beam Survey**File Name: 231016_RAWPositioning System POS MVEchosounder: R2 SONIC**Single Beam Survey**

File Name: _____

Positioning System _____

Echosounder: _____

Boat Positioning

KNOWN
Position A: X 1856157.80 Y 246889.63
Position B: X 1856162.43 Y 246909.32
Delta AB: X 4.63 Y 19.69
Position C: X 1856163.52 Y 246908.90
Delta AC-BC: X 5.72 Y 19.27

Boat Positioning

Position A: X _____ Y _____
Position B: X _____ Y _____
Delta AB: X _____ Y _____
Position C: X _____ Y _____
Delta AC-BC: X _____ Y _____

Transducer Calibration

Sound Velocity Casts

Time: 0809 A Speed of Sound: 4960.6
Time: 1015 B Speed of Sound: 4964.7
Time: 1210 C Speed of Sound: 4960.8
Time: 1428 D Speed of Sound: 4961.2
Time: 1612 E Speed of Sound: 4961.6
Time: 1740 F Speed of Sound: 4963.5

Transducer Calibration

Bar Check

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPS

RTK Base: CAROUSEL Elev: _____ Datum: NAVD88
Tide Gauge: SUNSET Elev: 2.97 Datum: NAVD88

Time	<u>0712</u>	<u>1829</u>		
Rod	<u>1.12</u>	<u>2.12</u>		
Water Level	<u>1.85</u>	<u>0.85</u>		
Boat	<u>2.07</u>	<u>0.98</u>		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____
HOBO Launch Time: _____ Recover Time: _____

Time				
Elevation				
Rod				
Water Level				

Comments: Vessel positioned approx. 20FT North of tide point at Fixed T-Head Pier Face

Line #	Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
36	WS200	13:45:22	13:51:18	0.02	7.96	210.89	1.62	0.00	WS200_0002.RAW	
37	WS200	13:51:18	13:58:15	-0.00	7.25	210.89	1.64	0.00	WS200_0003.RAW	
38	WS195	14:00:45	14:08:53	0.21	5.91	30.89	2.01	0.00	WS195.RAW	
39	WS195	14:08:53	14:19:08	-0.06	5.54	30.89	2.14	0.00	WS195_0001.RAW	
40	WS195	14:19:08	14:26:12	-0.03	5.68	30.89	2.25	0.00	WS195_0002.RAW	
41	WS232	14:37:06	14:44:11	0.61	7.04	210.89	2.54	0.00	WS232.RAW	
42	WS232	14:44:11	14:52:34	0.72	7.12	210.89	2.61	0.00	WS232_0001.RAW	Begin Infill
43	WS222	14:54:37	15:06:13	0.80	5.00	30.89	1.83	0.00	WS222.RAW	
44	WS222	15:06:13	15:14:15	0.71	5.95	30.89	1.84	0.00	WS222_0001.RAW	
45	WS241	15:29:12	15:33:28	0.61	3.56	30.89	1.72	0.00	WS241.RAW	Discard. Autopilot test
46	WS213	15:51:59	16:07:29	0.71	6.94	210.89	2.05	0.00	WS213.RAW	
47	WS203	16:17:57	16:24:58	0.41	5.33	30.89	2.00	0.00	WS203.RAW	
48	WS203	16:24:58	16:38:27	0.42	5.60	30.89	2.15	0.00	WS203_0001.RAW	
49	WS233	16:40:13	16:51:58	0.51	7.16	210.89	2.27	0.00	WS233.RAW	
50	WS227	16:51:58	16:54:43	-0.05	7.51	30.89	2.28	0.00	WS227.RAW	
51	WS241	16:56:27	17:12:49	0.08	6.18	30.89	2.61	0.00	WS241_0001.RAW	
52	WS212	17:19:01	17:21:06	-0.28	6.07	210.89	2.57	0.00	WS212.RAW	
53	WS228	17:22:18	17:27:50	-0.00	6.66	210.89	2.50	0.00	WS228.RAW	
	WS218	17:28:21	17:33:46	-0.22	6.42	210.89	2.43	0.00	WS218.RAW	TGT: 17:32:20 - 1904673.40 , 281432.29



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Prepared By:

P. WINCHELL

Hydrographic Survey Field Logs

Body of Water: ATLANTIC OCEAN

Location: OCEAN CITY, MD

Weather: PARTLY CLOUDY, 45-66 F

Wind: NW 10-15 KTS

Sea State: 1-3 Ft

Vessel Speed: 4-6 KTS

Date: 17 OCT 2023

Project: WEAVER BORROW

Proj. No. 201-23-01

Vessel: PRICUS

Crew: PRW

DKN

Multi-Beam Survey

File Name: 231017-RAW

Positioning System POS MV

Echosounder: R2 SONIC

Single Beam Survey

File Name: _____

Positioning System _____

Echosounder: _____

Boat Positioning

Position A: X 1856157.80 Y 246889.63

Position B: X 1856164.26 Y 246909.03

Delta AB: X 6.46 Y 19.40

Position C: X 1856162.05 Y 246908.43

Delta AC-BC: X 4.25 Y 18.80

Boat Positioning

Position A: X _____ Y _____

Position B: X _____ Y _____

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Transducer Calibration

Sound Velocity Casts

Time: 0815 A Speed of Sound: 4959.3

Time: 1038 B Speed of Sound: 4961.4

Time: 1231 C Speed of Sound: 4960.1

Time: 1501 D Speed of Sound: 4961.0

Time: 1642 E Speed of Sound: 4960.5

Time: _____ F Speed of Sound: _____

Transducer Calibration

Bar Check

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPS

RTK Base: CAROUSEL Elev: _____ Datum: NAVD88

Tide Gauge: SUNSET Elev: 2.97 Datum: NAVD88

Time	<u>0715</u>	<u>1808</u>		
Rod	<u>1.64</u>	<u>2.53</u>		
Water Level	<u>1.33</u>	<u>0.44</u>		
Boat	<u>1.65</u>	<u>0.75</u>		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____

HOBO Launch Time: _____ Recover Time: _____

Time			
Elevation			
Rod			
Water Level			

Comments: Vessel positioned approx. 20 FT North of tide point @ Fixed T-head Pier face

Infill survey over shoal performed before further production

Line #	Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
3	WS174	13:59:19	14:07:36	-0.25	7.83	210.89	2.04	0.00	WS174_0001.RAW	
3	WS174	14:07:36	14:09:33	-0.22	7.70	210.89	2.07	0.00	WS174_0002.RAW	
4	WS170	14:11:14	14:19:19	-0.73	5.57	30.89	2.20	0.00	WS170.RAW	
4	WS170	14:19:19	14:28:21	-0.24	5.39	30.89	2.35	0.00	WS170_0001.RAW	
4	WS170	14:28:21	14:36:49	-0.12	5.79	30.89	2.50	0.00	WS170_0002.RAW	
4	WS164	14:38:40	14:44:34	0.08	7.47	210.89	2.59	0.00	WS164.RAW	
4	WS164	14:44:34	14:51:06	-0.03	8.22	210.89	2.62	0.00	WS164_0001.RAW	
4	WS164	14:51:07	14:57:40	0.28	7.43	210.89	1.82	0.00	WS164_0002.RAW	
4	WS159	15:05:35	15:18:06	0.13	5.78	30.89	1.76	0.00	WS159.RAW	
4	WS159	15:18:06	15:30:58	0.59	5.46	30.89	1.71	0.00	WS159_0001.RAW	
4	WS154	15:32:42	15:38:44	0.69	7.63	210.89	2.43	0.00	WS154.RAW	
4	WS154	15:38:44	15:45:25	0.30	7.54	210.89	2.43	0.00	WS154_0001.RAW	
5	WS154	15:45:25	15:52:05	0.53	7.29	210.89	2.40	0.00	WS154_0002.RAW	
5	WS149	15:53:35	16:02:01	0.64	5.90	30.89	2.06	0.00	WS149.RAW	
5	WS149	16:02:01	16:11:01	0.78	5.88	30.89	1.82	0.00	WS149_0001.RAW	
5	WS149	16:11:01	16:18:38	0.89	5.76	30.89	1.83	0.00	WS149_0002.RAW	
5	WS144	16:20:14	16:27:59	0.53	7.75	210.89	2.08	0.00	WS144.RAW	
5	WS144	16:27:59	16:33:44	0.67	7.79	210.89	2.14	0.00	WS144_0001.RAW	
5	WS144	16:33:44	16:39:11	0.32	7.71	210.89	2.20	0.00	WS144_0002.RAW	



ENGINEERS ★ SURVEYORS

9008-O Yellow Brick Road

Baltimore, MD 21237

(410) 682-5595

Prepared By:

P. WINCHELL

Hydrographic Survey Field Logs

Body of Water: ATLANTIC OCEAN

Location: OCEAN CITY, MD

Weather: CLEAR, 50-65F

Wind: NW 2-10 KTS

Sea State: 1-2 FT

Vessel Speed: 4-6 KTS

Date: 18 OCT 2023

Project: WEAVER BORROW

Proj. No. 201-23:01

Vessel: PRICUS

Crew: PRW

DKV

Multi-Beam Survey

File Name: 231018-RAW

Positioning System POSMV

Echosounder: K2 SONIC

Single Beam Survey

File Name: _____

Positioning System _____

Echosounder: _____

Boat Positioning

Position A: X 1856157.80 Y 246889.63

Position B: X 1856159.29 Y 246908.04

Delta AB: X 1.49 Y 18.41

Position C: X 1856162.43 Y 246907.78

Delta AC-BC: X 4.63 Y 18.15

Boat Positioning

Position A: X _____ Y _____

Position B: X _____ Y _____

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Transducer Calibration

Sound Velocity Casts

Time: 0752 A Speed of Sound: 4958.4

Time: 1011 B Speed of Sound: 4959.8

Time: 1246 C Speed of Sound: 4961.7

Time: 1515 D Speed of Sound: 4962.6

Time: 1750 E Speed of Sound: 4960.8

Time: _____ F Speed of Sound: _____

Transducer Calibration

Bar Check

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPS

RTK Base: CAROUSEL Elev: _____ Datum: NAD88

Tide Gauge: SUNSET Elev: 2.97 Datum: NAD88

Time	0705	1838		
Rod	2.44	2.95		
Water Level	0.53	0.02		
Boat	0.35	0.08		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____

HOBO Launch Time: _____ Recover Time: _____

Time			
Elevation			
Rod			
Water Level			

Comments: Vessel positioned approx. 200ft North of tide point @ Field T-head pier face

Progress made from Sta. 140 - Sta. 55

Line #	Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
3	WS102	13:25:45	13:33:32	-0.93	7.03	210.89	2.21	0.00	WS102_0001.RAW	
3	WS102	13:33:32	13:36:03	-0.74	7.06	210.89	2.24	0.00	WS102_0002.RAW	
4	WS97	13:37:28	13:44:43	-0.83	6.27	30.89	1.62	0.00	WS97.RAW	
4	WS97	13:44:43	13:54:41	-0.62	6.45	30.89	1.66	0.00	WS97_0001.RAW	
4	WS97	13:54:41	14:00:22	-0.56	6.14	30.89	1.96	0.00	WS97_0002.RAW	
4	WS93	14:02:07	14:08:35	-0.63	7.33	210.89	2.00	0.00	WS93.RAW	
4	WS93	14:08:35	14:15:16	-0.34	6.95	210.89	2.01	0.00	WS93_0001.RAW	
4	WS93	14:15:16	14:22:04	-0.47	7.55	210.89	2.00	0.00	WS93_0002.RAW	
4	WS87	14:25:44	14:34:25	-0.40	6.19	30.89	1.93	0.00	WS87.RAW	
4	WS87	14:34:25	14:43:17	0.14	6.31	30.89	1.85	0.00	WS87_0001.RAW	
4	WS87	14:43:17	14:49:50	0.03	5.96	30.89	1.78	0.00	WS87_0002.RAW	
4	WS82	14:51:37	14:58:10	0.27	7.06	210.89	1.62	0.00	WS82.RAW	
5	WS82	14:58:11	15:05:03	0.39	7.05	210.89	1.84	0.00	WS82_0001.RAW	
5	WS82	15:05:03	15:11:38	0.03	7.43	210.89	1.84	0.00	WS82_0002.RAW	
5	WS77	15:20:11	15:30:25	0.54	6.07	30.89	1.74	0.00	WS77.RAW	
5	WS77	15:30:25	15:36:17	0.89	6.35	30.89	2.43	0.00	WS77_0001.RAW	
5	WS77	15:36:17	15:43:23	1.03	6.43	30.89	2.42	0.00	WS77_0002.RAW	
5	WS73	15:44:59	15:51:16	0.79	7.56	210.89	2.37	0.00	WS73.RAW	
5	WS73	15:51:16	15:58:23	0.98	7.86	210.89	2.06	0.00	WS73_0001.RAW	
5	WS73	15:58:23	16:04:50	0.84	7.37	210.89	1.81	0.00	WS73_0002.RAW	
5	WS68	16:06:17	16:14:03	1.05	6.05	30.89	1.84	0.00	WS68.RAW	
5	WS68	16:14:03	16:22:31	1.05	6.25	30.89	2.07	0.00	WS68_0001.RAW	
6	WS68	16:22:31	16:29:15	1.19	6.56	30.89	2.14	0.00	WS68_0002.RAW	
6	WS64	16:31:12	16:37:25	1.28	7.11	210.89	2.22	0.00	WS64.RAW	
6	WS64	16:37:25	16:46:06	2.27	6.94	210.89	2.28	0.00	WS64_0001.RAW	
6	WS64	16:46:06	16:51:02	2.29	7.46	210.89	2.30	0.00	WS64_0002.RAW	
6	WS59	16:52:32	17:00:29	1.01	6.35	30.89	2.27	0.00	WS59.RAW	
6	WS59	17:00:29	17:08:12	0.87	6.33	30.89	2.60	0.00	WS59_0001.RAW	
	WS59	17:08:12	17:11:30	0.71	1.87	30.89	2.58	0.00	WS59_0002.RAW	Ended line for mystery vibration inspection.
6	WS59	17:16:43	17:20:47	0.96	6.33	30.89	2.49	0.00	WS59_0003.RAW	
6	WS55	17:26:16	17:32:43	0.85	6.87	210.89	2.34	0.00	WS55.RAW	
6	WS55	17:32:43	17:40:13	0.68	6.96	210.89	2.25	0.00	WS55_0001.RAW	
7	WS55	17:40:13	17:46:40	1.12	7.36	210.89	2.04	0.00	WS55_0002.RAW	



ENGINEERS ★ SURVEYORS

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Prepared By:

P. WINCHELL

Hydrographic Survey Field Logs

Body of Water: ATLANTIC OCEAN

Location: OCEAN CITY, MD

Weather: CLEAR, 45-65F

Wind: 5-15 KTS, S

Sea State: 1-2 FT

Vessel Speed: 4-6 KTS

Date: 19 OCT 2023

Project: WEAVER BORROW

Proj. No. 201-23:01

Vessel: PRICUS

Crew: PRN

DKN

Multi-Beam Survey

File Name: 231019_RAN

Positioning System POSMV

Echosounder: R2 SONIC

Single Beam Survey

File Name: _____

Positioning System _____

Echosounder: _____

Boat Positioning

Position A: X 1856157.80 Y 246889.63

Position B: X 1856163.25 Y 246909.13

Delta AB: X 5.45 Y 19.50

Position C: X 1856162.72 Y 246907.20

Delta AC-BC: X 4.92 Y 17.57

Boat Positioning

Position A: X _____ Y _____

Position B: X _____ Y _____

Delta AB: X _____ Y _____

Position C: X _____ Y _____

Delta AC-BC: X _____ Y _____

Transducer Calibration

Sound Velocity Casts

Time: 0809 A Speed of Sound: 4959.8

Time: 1035 B Speed of Sound: 4959.7

Time: 1304 C Speed of Sound: 4959.9

Time: 1537 D Speed of Sound: 4960.5

Time: 1857 E Speed of Sound: 4958.6

Time: _____ F Speed of Sound: _____

Transducer Calibration

Bar Check

Time	Draft Hi	Draft Lo	Depths	Speed of Sound

RTK-GPS

RTK Base: CAROUSEL Elev: _____ Datum: NAVD88

Tide Gauge: SUNSET Elev: 2.97 Datum: NAVD88

Time	0701	2012		
Rod	3.10	3.08		
Water Level	-0.13	-0.11		
Boat	-0.04	-0.23		

Differential GPS

Tide Gauge: _____ Elev: _____ Datum: _____

HOBO Launch Time: _____ Recover Time: _____

Time			
Elevation			
Rod			
Water Level			

Comments: Vessel positioned approx. 20FT North of Tide Point "Sunset"

Gaps Filled, Production Finished, XLines complete

Date: 19 - Oct - 23

HYPACK File Information:

Line Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
WS402	08:19:25	08:26:43	-0.84	6.88	30.89	1.84	0.00	WS402.RAW	Gap Filling
WS364	08:29:34	08:37:54	0.00	0.00	210.89	0.00	0.00	WS364.RAW	Gap Filling, Hypack Crash
WS363	08:40:09	08:41:07	-1.90	7.03	30.89	1.84	0.00	WS363.RAW	Gap Filling
WS377	08:43:34	08:49:27	-1.53	6.47	30.89	1.80	0.00	WS377.RAW	Gap Filling
WS384	08:52:00	08:59:02	-1.62	6.68	210.89	1.55	0.00	WS384.RAW	Gap Filling
WS399	09:00:50	09:08:08	-1.28	6.37	30.89	1.67	0.00	WS399.RAW	Gap Filling
WS363	09:10:29	09:11:06	-1.90	6.53	210.89	1.67	0.00	WS363_0000.RAW	Gap Filling
WS312	09:13:03	09:18:41	-1.77	6.74	30.89	2.02	0.00	WS312.RAW	Gap Filling
WS328	09:20:49	09:21:46	-1.88	7.18	30.89	2.04	0.00	WS328.RAW	Gap Filling
WS331	09:24:58	09:27:48	-2.14	7.10	30.89	2.08	0.00	WS331.RAW	Gap Filling
WS273	09:28:34	09:29:37	-1.91	6.23	30.89	2.10	0.00	WS273.RAW	Gap Filling
WS273	09:29:37	09:30:12	-1.86	6.60	30.89	2.10	0.00	WS273_0000.RAW	Gap Filling
WS245	09:30:51	09:31:11	-1.93	7.03	210.89	2.11	0.00	WS245.RAW	Gap Filling
WS219	09:33:26	09:41:05	-1.98	6.02	210.89	2.87	0.00	WS219.RAW	Gap Filling
WS219	09:41:05	09:42:55	-1.94	6.90	210.89	2.89	0.00	WS219_0000.RAW	Gap Filling
WS225	09:44:00	09:45:18	-1.77	5.91	30.89	2.92	0.00	WS225.RAW	Gap Filling
WS239	09:45:38	09:50:05	-1.77	6.53	30.89	2.96	0.00	WS239.RAW	Gap Filling
WS227	09:51:04	09:52:26	-2.08	7.05	30.89	2.96	0.00	WS227.RAW	Gap Filling
WS209	09:53:34	09:54:27	-2.15	6.93	30.89	2.96	0.00	WS209.RAW	Gap Filling
WS202	09:56:03	09:56:49	-2.26	6.82	210.89	2.95	0.00	WS202.RAW	Gap Filling
WS238	09:58:07	09:58:50	-2.04	6.26	210.89	2.93	0.00	WS238.RAW	Gap Filling
WS288	10:00:19	10:00:47	-1.91	5.97	210.89	2.91	0.00	WS288.RAW	Gap Filling
WS271	10:02:09	10:02:50	-2.48	5.67	210.89	2.88	0.00	WS271.RAW	Gap Filling
WS280	10:03:31	10:05:34	-2.44	6.57	210.89	2.11	0.00	WS280.RAW	Gap Filling
WS266	10:06:38	10:08:01	-2.52	6.07	210.89	2.10	0.00	WS266.RAW	Gap Filling
WS281	10:09:31	10:11:00	-2.60	6.88	30.89	2.09	0.00	WS281.RAW	Gap Filling
WS247	10:12:43	10:13:00	-2.69	6.28	210.89	2.08	0.00	WS247.RAW	Gap Filling
WS240	10:13:00	10:15:46	-2.54	6.67	210.89	2.06	0.00	WS240.RAW	Gap Filling
WS265	10:16:42	10:17:42	-2.51	5.53	210.89	2.05	0.00	WS265.RAW	Gap Filling
WS245	10:19:05	10:19:47	-2.31	6.89	210.89	1.81	0.00	WS245_0000.RAW	Gap Filling
WS218	10:20:49	10:21:36	-2.58	6.30	210.89	1.80	0.00	WS218.RAW	Gap Filling
WS213	10:22:26	10:23:21	-2.44	6.65	210.89	1.79	0.00	WS213.RAW	Gap Filling
WS184	10:26:58	10:28:31	-2.95	5.37	210.89	1.76	0.00	WS184.RAW	Gap Filling
WS199	10:29:43	10:30:09	-2.68	6.60	210.89	1.74	0.00	WS199.RAW	Gap Filling
WS209	10:43:07	10:43:51	-2.65	6.04	30.89	2.08	0.00	WS209_0000.RAW	Gap Filling
WS333	10:46:56	10:48:14	-2.72	6.82	30.89	2.07	0.00	WS333.RAW	Gap Filling
WS332	10:49:53	10:50:36	-2.69	6.63	30.89	2.06	0.00	WS332.RAW	Gap Filling

Line Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
WS 363	10:54:30	10:55:50	-3.33	6.16	30.89	2.04	0.00	WS363_0002.RAW	Gap Filling
WS 199	10:56:44	10:57:10	-3.47	6.11	30.89	2.03	0.00	WS199_0003.RAW	Gap Filling
WS 213	10:58:12	11:00:15	-2.84	6.52	30.89	1.64	0.00	WS213_0003.RAW	Gap Filling
WS 220	11:00:15	11:01:05	-2.96	5.07	30.89	1.64	0.00	WS220.RAW	Gap Filling
WS 264	11:02:08	11:03:28	-2.83	6.11	30.89	1.64	0.00	WS264.RAW	Gap Filling
WS 289	11:04:05	11:04:25	-2.51	6.89	30.89	1.63	0.00	WS289.RAW	Gap Filling
WS 198	11:06:28	11:06:53	-2.60	7.12	30.89	1.63	0.00	WS198.RAW	Gap Filling
WS 225	11:11:21	11:12:38	-2.95	6.42	30.89	1.92	0.00	WS225_0003.RAW	Gap Filling
WS 208	11:13:35	11:14:06	-2.96	7.45	30.89	1.92	0.00	WS208.RAW	Gap Filling
WS 200	11:14:06	11:15:57	-2.79	7.44	210.89	1.93	0.00	WS200.RAW	Gap Filling
WS 50	11:23:09	11:31:32	-2.69	6.36	210.89	2.87	0.00	WS50.RAW	Production
WS 50	11:31:32	11:39:14	-2.94	6.36	210.89	2.82	0.00	WS50_0001.RAW	
WS 50	11:39:14	11:45:56	-2.71	6.46	210.89	3.34	0.00	WS50_0002.RAW	
WS 45	11:47:38	11:55:46	-2.47	6.91	30.89	3.46	0.00	WS45.RAW	
WS 45	11:55:46	12:02:27	-2.57	6.98	30.89	3.57	0.00	WS45_0001.RAW	
WS 45	12:02:27	12:08:28	-2.63	7.08	30.89	3.67	0.00	WS45_0002.RAW	
WS 40	12:10:17	12:22:50	-2.48	5.93	210.89	2.76	0.00	WS40.RAW	
WS 40	12:22:50	12:25:06	-2.27	6.08	210.89	2.75	0.00	WS40_0001.RAW	
WS 41	12:25:06	12:33:31	-2.39	6.12	30.89	2.44	0.00	WS41.RAW	
WS 36	12:39:44	12:49:56	-2.22	6.78	30.89	1.74	0.00	WS36.RAW	
WS 36	12:49:56	12:55:23	-2.07	7.04	30.89	1.79	0.00	WS36_0001.RAW	
WS 36	12:55:23	13:01:03	-1.89	6.79	30.89	1.98	0.00	WS36_0002.RAW	
WS 32	13:08:28	13:15:14	-1.91	6.48	210.89	1.98	0.00	WS32.RAW	
WS 32	13:15:14	13:23:28	-1.83	6.52	210.89	2.08	0.00	WS32_0001.RAW	
WS 32	13:23:28	13:30:33	-1.49	6.62	210.89	2.15	0.00	WS32_0002.RAW	
WS 27	13:32:40	13:39:00	-1.39	6.50	30.89	1.58	0.00	WS27.RAW	
WS 27	13:39:00	13:46:56	-0.98	6.66	30.89	1.61	0.00	WS27_0001.RAW	
WS 27	13:46:56	13:53:17	-0.91	7.07	30.89	1.63	0.00	WS27_0002.RAW	
WS 23	13:59:07	14:06:17	-1.31	6.44	210.89	2.00	0.00	WS23.RAW	
WS 23	14:06:17	14:14:38	-1.19	6.24	210.89	2.01	0.00	WS23_0001.RAW	
WS 23	14:14:38	14:22:37	-1.07	6.23	210.89	1.98	0.00	WS23_0002.RAW	
WS 18	14:24:42	14:32:35	-0.68	6.48	30.89	1.91	0.00	WS18.RAW	
WS 18	14:32:35	14:39:39	-0.36	6.79	30.89	1.85	0.00	WS18_0001.RAW	
WS 18	14:39:39	14:46:15	-0.70	7.07	30.89	1.78	0.00	WS18_0002.RAW	
WS 14	14:48:29	14:55:36	-0.74	6.40	210.89	1.61	0.00	WS14.RAW	
WS 14	14:55:36	15:03:14	-0.53	6.51	210.89	1.85	0.00	WS14_0001.RAW	
WS 14	15:03:14	15:10:42	-0.71	6.61	210.89	1.76	0.00	WS14_0002.RAW	
WS 9	15:14:19	15:21:37	-0.20	7.03	30.89	2.23	0.00	WS9.RAW	
WS 9	15:21:37	15:28:01	-1.02	6.87	30.89	2.42	0.00	WS9_0001.RAW	
WS 9	15:28:01	15:34:57	0.71	7.81	30.89	2.43	0.00	WS9_0002.RAW	
WS 5	15:41:44	15:49:52	0.32	6.13	210.89	2.35	0.00	WS5.RAW	
WS 5	15:49:52	15:56:52	0.28	6.54	210.89	2.05	0.00	WS5_0001.RAW	
WS 5	15:56:52	16:04:37	0.23	5.74	210.89	1.83	0.00	WS5_0002.RAW	
WS 84	16:15:28	16:16:37	0.50	7.21	30.89	2.05	0.00	WS84.RAW	Gap Fill
WS 133	16:19:04	16:24:25	0.68	5.95	30.89	2.13	0.00	WS133.RAW	Gap Fill
WS 123	16:26:39	16:28:43	0.34	6.17	210.89	2.18	0.00	WS123.RAW	Gap Fill
WS 118	16:29:51	16:30:25	0.47	7.47	210.89	2.20	0.00	WS118.RAW	Gap Fill
WS 85	16:33:28	16:34:15	0.43	7.24	30.89	2.23	0.00	WS85.RAW	Gap Fill
X 66	16:42:56	16:50:50	0.70	6.67	120.70	2.30	0.00	XL6.RAW	XLines
X 76	16:50:50	16:55:26	0.70	6.40	120.70	2.28	0.00	XL6_0001.RAW	
X 85	16:58:28	17:04:54	1.18	6.68	300.70	2.60	0.00	XL5.RAW	
X 05	17:04:54	17:11:08	1.29	6.45	300.70	2.55	0.00	XL5_0001.RAW	

Line Name	Start Time	End Time	Tide	Speed	Heading	HDOP	Satellites	File Name	Remarks
X04	17:14:06	17:20:13	0.98	6.77	120.70	2.45	0.00	XL4.RAW	
X14	17:20:13	17:26:15	1.16	6.72	120.70	2.37	0.00	XL4_0001.RAW	Crab pot floats on line
X23	17:29:09	17:35:34	1.39	6.41	300.70	2.25	0.00	XL3.RAW	Crab pot floats on line
X83	17:35:34	17:41:32	1.18	6.82	300.70	2.04	0.00	XL3_0001.RAW	
X42	17:44:31	17:51:17	1.09	6.14	120.70	1.99	0.00	XL2.RAW	
X52	17:51:17	17:57:33	1.18	6.19	120.70	1.62	0.00	XL2_0001.RAW	
XL2	17:58:40	17:59:53	0.68	4.02	300.70	1.64	0.00	XL2_0002.RAW	Gap fill to reach border file at northeast corner.
X7	18:09:56	18:17:07	0.98	7.67	300.70	1.73	0.00	XL7.RAW	
X87	18:17:07	18:21:26	0.77	7.17	300.70	1.74	0.00	XL7_0001.RAW	
X98	18:24:57	18:31:16	0.81	6.71	120.70	2.68	0.00	XL8.RAW	
X00	18:31:16	18:37:20	0.79	6.55	120.70	2.80	0.00	XL8_0001.RAW	
X09	18:40:24	18:46:32	0.98	6.15	300.70	2.65	0.00	XL9.RAW	
X09	18:46:32	18:52:47	1.19	6.90	300.70	2.74	0.00	XL9_0001.RAW	