DRAFT
DATA REPORT

Lubec, ME Breakwater Current and Wave Collection
April 05 – May 04, 2023

Lubec Breakwater
Data Report
May 30, 2023

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
V1	Data Report	Nathan West	Trap Puckette	Trap Puckette	5/30/2023

Approval for issue

Trap Puckette

Prepared by:

RPS

Nathan West
Marine Scientist

3319 Maybank Highway
Johns Island SC 29455

T +1 843 377 0286
E nathan.west@rpsgroup.com

Prepared for:

Jacobs

Atilla Bayran

T
E Atilla.Bayram@jacobs.com

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1 INTRODUCTION

RPS was contracted to install a bottom-mounted wave and current gage in support of a breakwater project in Lubec, ME. The target deployment duration was for 4 weeks at a depth of 35 ft. In addition, 6 sediment samples were taken in the area of the proposed breakwater for grain size analysis.

2 INSTRUMENTATION AND FIELD OPERATIONS

2.1 Instrumentation

A 1MHz Nortek AWAC was used to measure water column current profiles and waves. The AWAC was set to measure the water velocity profile in a series of 50-cm bins. The current profile begins at approximately 1.2 meters above bottom. Current profiles were collected at 10-minute intervals over a 2-minute period, and the average of the measurements is recorded. Each profile of recorded water velocity is referred to as an ensemble.

For wave measurements, the AWAC collects 2,048 samples at 2 Hz, over an approximately 17-minute period, once every hour. Concurrent with the water velocity and pressure measurements for wave data analysis, the AWAC also measures the water surface elevation at a rate of 4 Hz with a fourth acoustic beam oriented vertically. This feature is referred to as acoustic surface tracking (AST), and it provides improved resolution of small, high-frequency waves.

2.2 Field Operations

The AWAC was installed in an aluminum bottom mount equipped with an acoustic release system (Photograph 1). The acoustic release holds a buoy in place on the mount while the equipment is deployed. At recovery, the vessel is positioned near the deployment site and a topside deck box is used to send a coded acoustic signal to the release using a transducer lowered over the side of the vessel. Upon receiving the signal, the release opens, allowing the buoy to float to the surface bringing a recovery line with it. The recovery line is used to pull the mount up onto the vessel.

The equipment was mobilized on Wednesday April 5, 2023, and the instrument was deployed that afternoon. As part of the mobilization, the compass in the AWAC was calibrated, and the sampling parameters were uploaded into the instrument. The mount was loaded onto the vessel using the pier crane, and the vessel transited to the deployment location near Lubec. The vessel ran a series of lines across the proposed deployment location, and the data from depth sounder indicated that the bottom in the area was flat and there were no obvious obstructions. Once the conditions at the deployment site were confirmed, the mount was deployed using a slip line in 34 ft of water. Location for the instrument is 44.8584600°, -066.9984160° (State Plane 1811 769284.460mE, 114282.625mN).

Following the deployment of the bottom mount, a ponar style sampler was rigged to the winch cable on the vessel and used to collect six sediment grabs from the project area. The locations of the mount and sediment samples are provided in the table below and are shown in Figure 1.

Location	Latitude	Longitude	Date	Time UTC
AWAC	44.85846	-66.998416	04/05/2023	19:15:01
Sed 1	44.85498	-67.00078	04/05/2023	19:58:04
Sed 2	44.85589	-66.998521	04/05/2023	20:07:20
Sed 3	44.85486	-66.997284	04/05/2023	20:33:55
Sed 4	44.85714	-66.996477	04/05/2023	20:21:17
Sed 5	44.85610	-66.995059	04/05/2023	20:27:37
Sed 6	44.85767	-67.001127	04/05/2023	19:40:26

RPS returned to recover the mount on the morning of May 4, 2023. The vessel was prepped and departed the Eastport pier at 12:45 local time. The client had requested to have four personnel on the vessel for recovery operation. The team was picked up at the Lubec town pier and given a safety briefing by RPS and the captain. The vessel then proceeded to the bottom mount deployment location, and the acoustic signal was sent to the acoustic release on the mount. The recovery buoy surfaced immediately, and the mount was brought on board at 13:20 local time without incident. An inspection of the mount indicated that everything was in order, and it was confirmed that the instrument was still pinging. The team from Jacobs was dropped off in Lubec, and the vessel returned to the pier in Eastport. The vessel was demobilized, and equipment was palletized for shipping.

3 DATA PROCESSING

The recorded data was processed and reviewed to produce a standard set of data products, including plots and ASCII data files. The review of the data indicated the data set was complete and of good quality. All times provided in the data files are in UTC and a magnetic declination 15.99° west was applied to the direction, so they are all referenced to true North. A description of the parameters provided in the ASCII data files is provided in Appendix A. Additional information on the various parameters measured is provided below.

3.1 Current Data

The AWAC collects current measurements in 32 bins that are 50cm in length, which results in several bins being positioned above the water's surface. The instruments will record data for these bins even though they are out of the water, and often these data will appear reasonable. To cut the data above the water's surface, the spike in the backscatter amplitude was used to determine which bin should be considered the last good bin. In addition, the water depth measurements based on the AST were used to confirm that the correct cutoff point had been selected. Plots of the current data are provided in Appendix B. An ASCII text file of the current data (*Lubec AWAC_05Apr2023_04May2023_CurrentData_H.txt*) accompanies this report and the header of the file provides information on the data contained in the file. A second current data file (*Lubec AWAC_05Apr2023_04May2023_CurrentData_From WaveFigure.txt)* is also provided, and it includes the current data from a near surface bin, a mid-depth bin and a near bottom bin as plotted on the wave data figure discussed below. An additional thing to be noted is that the AWAC does not collect current data during the wave burst so there is no current data reported for the sample point at 10 minutes past the hour.

The current data indicate that currents at the site are tidally driven with daily maximum depth-averaged velocities typically around 35 cm/s. However, there were periods during the deployment where the current speeds varied rapidly from 10 to 20 cm/s to over 100 cm/s with rapid changes in direction during the same period. A review of the data indicates that these rapid variations in velocity and direction are related to the passage of an eddy over the instrument location. The boat captain confirmed that eddies were not uncommon in this area and that the current speed in the eddies could be quite significant.

3.2 Ancillary Data

In addition to the current and wave measurements, the instrument records additional ancillary information used in processing the data and providing an assessment of the instrument's performance. Plots of the ancillary data and data quality parameters are provided in Appendix C. As can be seen in the plots, the instrument measured significant downward vertical velocities in the near surface during the time periods when the horizontal velocities indicated that there were eddies at the site. This is consistent with what would be expected in an eddy as it would impart a downward motion in the water. The auxiliary data also indicates that the instrument orientation had no variation in pitch, roll and heading indicating that the mount was stable over the deployment. At the start of the deployment the water temperature was approximately 4.5° C and gradually increased over the deployment to 6.5° C. The backscatter data indicate that all the beams were functioning properly throughout the deployment period.

3.3 Water Level Data

For each current measurement burst, the AWAC reports the water level over the instrument based on the data from the pressure sensor. In order to adjust this water level to NAVD88, the first step was to remove any variations in the water level due to variations in the atmospheric pressure over the deployment period. This was accomplished using barometric data from the NOAA station 8410140 in Eastport approximately 2.5 miles from the site. Once the water level was corrected for barometric pressure, the average water level from the instrument was compared to the average water level measured by the tide station relative to NAVD88 to determine an offset between the AWAC water level and the tide station water level. This offset was then applied to the AWAC data to adjust the measured water level to NAVD 88. A plot of the AWAC adjusted water level relative to the NOAA station water level is provided in Appendix D. An excel file (*Lubec_WL_NAVD88 AWAC and NOAA_V1.xls*) containing the adjusted water level data from the instrument as well as NOAA tide data accompanies this report.

3.4 Wave Data

The wave data were processed using Nortek's QuickWave software using cutoff frequencies of 0.02Hz and 0.99Hz, and a step frequency of 0.01Hz. A magnetic declination of 15.99 degrees west was applied to the data to adjust the direction to True North. Plots of the time series wave data results are shown in the figures in Appendix E. An ASCII text file of the wave data (*Lubec AWAC_Apr2023_May2023_CleanWaveData_m*) accompanies this report and the header of the file provides information on the data contained in the file.

Overall, the quality of the wave data is good, and the instrument was functioning properly during the deployment. The wave data from the deployment indicates that wave conditions at the site are typically very

low with only a few periods during which the wave heights exceeded 0.25 m and several periods where the wave height went to zero. These results are consistent with what would be expected given that the location where the wave gage was deployed is a confined bay with the only a limited area of open water to the north and northeast. There are periods in the time series where wave conditions were so low in amplitude that the sensor was unable to measure them due to the physical limitations of the sensor. In other instances, the sensor was able to measure a wave height, but could not resolve their direction due to their high frequency. The analysis routine for processing the data identifies wave bursts where there are issues such as the ones described above and flags the results of the analysis for that wave bursts based on the issue encountered. The flag indicator is referred to as an error code, and it is reported with the results for each burst and is included in the ASCII files for the wave data.

A description of the various error codes reported for this data set are provided below. Note that an error code can have more than one error associated with it.

The descriptions of the data flags in the data set are as follows:

Error 0 Data Good

Error 16 (Unreasonable Estimate): *If it appears that there is an unreasonable wave parameter estimate, then the burst is flagged as bad. Such estimates that would be considered unreasonable are:*

Hs > 20 meters
Tm02 > 35 seconds or Tm02 < 0.5 seconds
Tp > 50 seconds or Tp < 0.5 seconds

Error 66 (Low Pressure): *This flag indicates that there was no dynamic pressure detected in the time series, and suggests that the waves were not measurable (i.e. a constant pressure). This would occur if the instrument was deployed at a depth that is too deep to measure the waves or simply that there were no measurable waves.*

(AST Out of Bounds): *Since many of the AST estimates are based on the zero-crossing, there is a check to make certain none of these estimates are unreasonable. Estimates are limited as follows:*

H3 < 20.0 meters
H10 < 25.0 meters
Hmax < 35.0 meters
0.5 seconds < Tmean < 35.0 seconds
Tpeak < 30 seconds

Error 128 (Direction for Peak Period Out of Bounds): *This limit is applicable for directional estimation using the Maximum Likelihood Method. As the wave frequency increases, the wavelength decreases and at some wavelength there is a limit associated with the array separation distance that can unambiguously resolve wave directions. This limit is dependent on water depth and will vary as the water level varies. A check is performed to see if the wavelength associated with the peak period is too small to resolve the wave direction at this frequency. If the wavelength is too small this error code is reported.*

This is the most common error code and indicates that the directional wave information for the peak period should be disregarded. Data for the other parameters is unaffected.

Error 132 *Low signal amplitude and flag 128*

Error 144 *Both flag 16 and 128*

Error 1168 *Flag 16 and 128 and high AST data loss*

3.5 Meteorological DATA

To aid in the interpretation of the wave data, wind data for vicinity over the deployment periods has been compiled. These data include mean wind speed, peak gust speeds, wind direction, atmospheric pressure, barometric pressure, and relative humidity. These data came from NOAA Station 8410140 which is in Eastport, ME approximately 2.5 miles North of the deployment site and are provided in ASCII format along with the report (*CO-OPS_8410140_met.txt*).

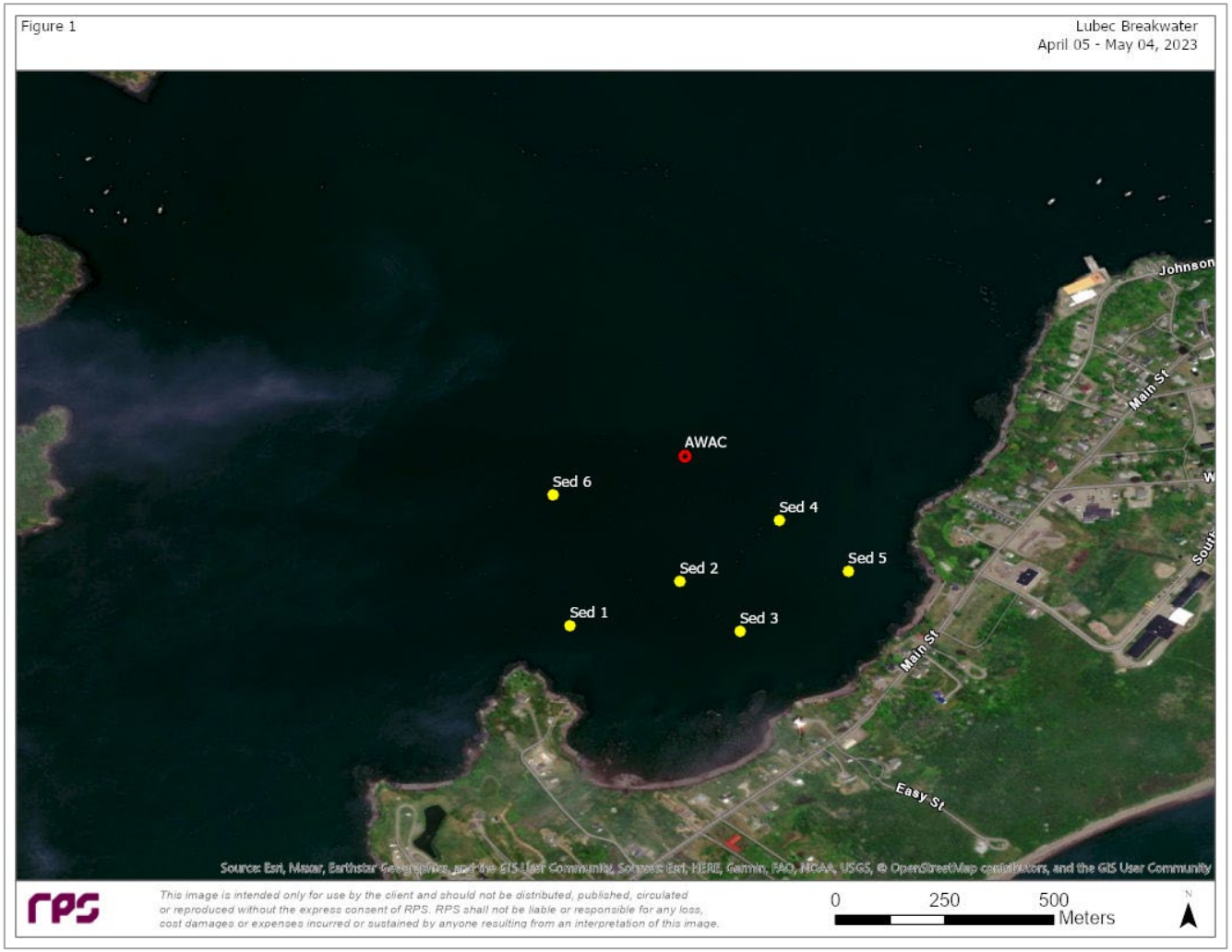
3.6 Sediment Analysis

Sediment sampling results are given in Appendix F, and a picture of each sample precedes the test results. The grain size analysis results indicate that the sediments at the site are primarily fine grain with approximately 1-2 inches of a silty fluff at the surface with the underlying sediments being a more consolidated fine grain material. The breakdown of the fines versus coarse fractions of the samples are summarized in the table below:

Location	Silts & Clays	Sand & Gravel
Sed 1	68.5%	31.5%
Sed 2	84.8%	15.2%
Sed 3	94.3%	5.7%
Sed 4	94.1%	5.9%
Sed 5	92.3%	7.7%
Sed 6	98.3%	1.7%

Figures

Figure 1: AWAC Mount and Sediment Locations



Photographs

Picture 1: AWAC in bottom mount prior to deployment

Picture 2: Ponar Style Sediment Sampler

Appendix A

Description of ASCII Data

WAVE DATA FILES

ASCII File reference	Acronym	Units	Description	Comment
Significant Wave Height	Hsig or Hm0	m	Calculated from energy spectrum. Known as Significant Wave Height, defined as the mean f the highest 1/3 of all waves in the record's ranking.	
Mean 1/3 Height	H3	m	Time series based estimate. Mean of the 1/3 largest waves in a record	Calculated using zero crossing up approach
Mean 1/10 Height	H10	m	Time series based estimate. Mean of the 1/10 largest waves in a record	Calculated using zero crossing up approach
Max Height	Hmax	m	Time series based estimate. Largest wave in a record	Calculated using zero crossing up approach
Mean Period	Tm02	s	Calculated from energy spectrum. Mean period	
Peak Period	Tp	s	Calculated from energy spectrum. Peak period of the waves corresponding to the peak frequency	
Mean Zero crossing Period	Tz	s	Time series based estimate. Mean period. This is a direct measurement unlike the spectral equivalent, Tm02	Calculated using zero crossing up approach
Peak Direction	TpDir	Deg	Calculated from energy spectrum. Peak direction is the wave direction at the frequency at which a wave energy spectrum reaches its maximum.	Adjusted to True north; direction from
Directional Spread	Spr1	Deg	Calculated from energy spectrum. Measure of the directional variance at peak frequency.	
Mean Direction	Mdir	Deg	Calculated from energy spectrum. Mean direction. Weighted average of all the directions in the wave spectrum	Adjusted to True north; direction from
Unidirectivity Index			Calculated from energy spectrum. Measure of how much of the wave energy over the full spectrum is from a single direction. Value of 1.0 indicates the energy is from one primary direction	

Mean Pressure		dbar	Mean pressure recorded over the wave burst measurement	
Water level		m unref	Water level over the wave measurement burst relative to the top of the instrument based on the pressure sensor	Referenced to the top transducer on the instrument only – no datum
No detects			Number of AST pings in a wave burst where water surface was not detected	
Bad detects			Number of AST pings in a wave burst where reported water surface distance is unrealistic.	
Current Speed (wave cell)		m/s	The current magnitude in the cell used for the wave measurement calculations	
Current Direction (wave cell)		deg	The current magnitude direction in the cell used for the wave measurement calculations	Referenced to True north; direction towards
Error Code			Numeric flag generated by the wave analysis routine to indicate any issues or limitations of the results. Listing of error codes attached.	

CURRENT DATA FILES

ASCII File reference	Acronym	Units	Description	Comment
Depth Avg Current Speed		cm/s	Current speed averaged over all good depth bins for a particular ensemble. Averaging done using vector components from each bin and then converted back to a magnitude.	
Depth Avg Current Dir		deg	Current direction averaged over all good depth bins for a particular ensemble. Averaging done using vector components from each bin and then converted back to direction in degrees	Direction referenced to True north and indicate direction current is going
Current Speed		cm/s		
Current Direction		deg		Direction referenced to True north and indicate direction current is going
Vertical Velocity		cm/s	Vertical component of current velocity	
Temperature		deg C	Water temperature as measured by the instrument	
Pressure		m	Meters of water over the instrument based on the pressure sensor. Unreferenced to a datum	This parameter actually represents the meters of water over the instrument instead of pressure but that is the nomenclature used to be consistent with other sensor systems.

FIGURES

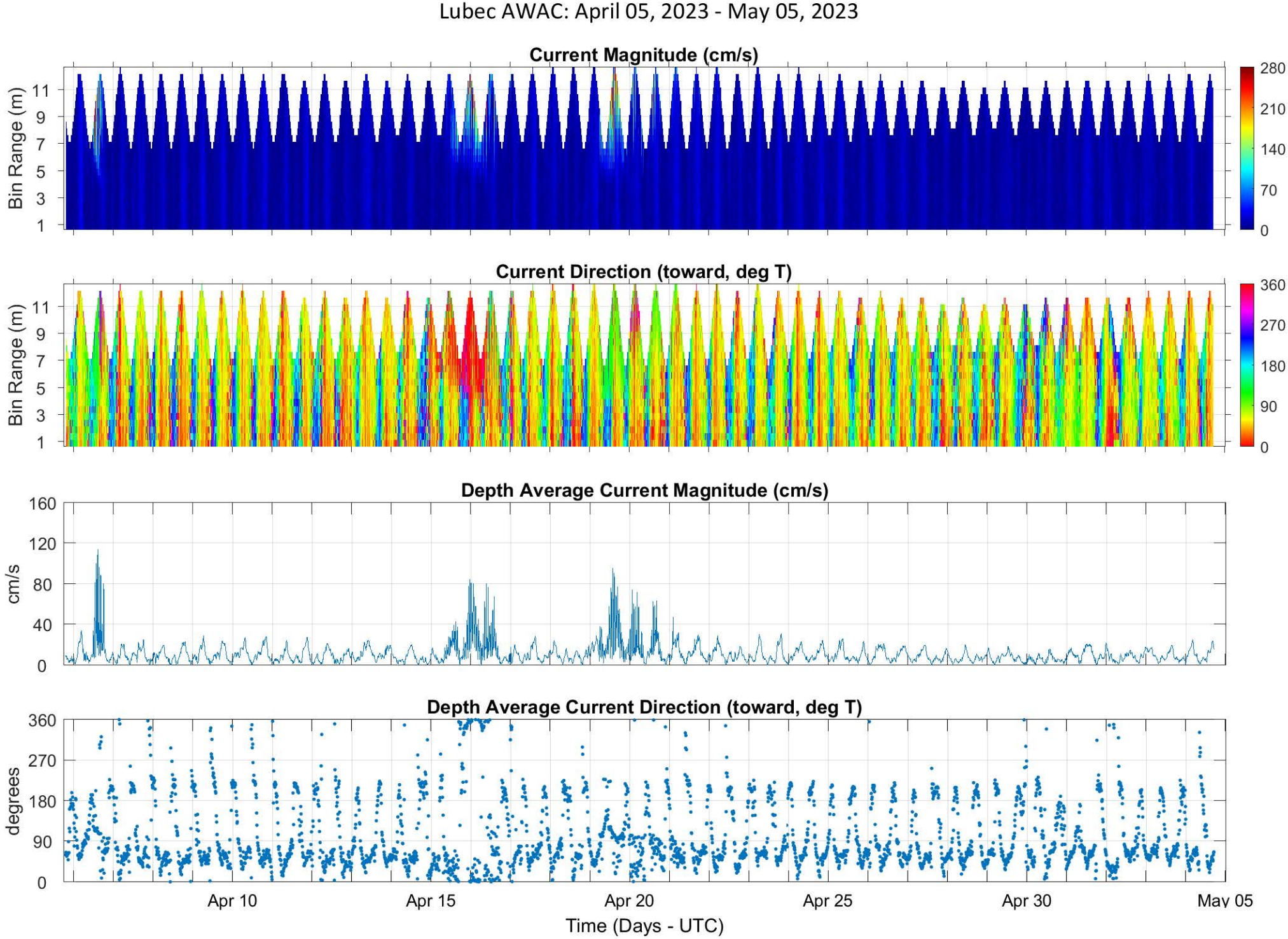
ASCII File reference	Acronym	Units	Description	Comment
Signal Amplitude		counts	Raw backscattered signal amplitude recorded by the instrument during the current measurements	
Average vertical velocity		cm/s	Vertical component of the measured current velocity averaged over all good bins in an ensemble	
Instrument Pitch & Roll		deg	The pitch and roll of the instrument as measure by an internal sensor. Data is used to correct the beam orientation during data processing if the instrument is tilted	Instrument can correct for pitch and roll of up to 15 deg
Instrument heading		deg	Heading of the sensor based on compass in the instrument. Used to convert measurements to earth referenced values (ie to True north)	
Current magnitude at average depth		cm/s	Current measurements at different bins intended to provide a snapshot of water velocity near the surface, near mid-depth and near the bottom. Depths referenced in the plot are the average distance of the bin over the deployment below the average water level surface	
Current direction at average depth		deg	Current direction at different bins intended to provide a snapshot of water direction near the surface, near mid-depth and near the bottom. Depths referenced in the plot are the average distance of the bin over the deployment below the average water level surface	Direction is relative to True north and represents the direction towards which the current is going.

LIST OF FLAGS/ CODES FOR WAVE DATA ANALYSIS

Code 0	Good Data
Code 16	Unreasonable estimate: Hs > 20 m, Tm02 > 30 or Tm02 < 0.5 sec, Tp > 30 or TP < 0.5 sec
Code 66	AST out of bounds -AND- Low Pressure change
Code 128	Directional ambiguity (cannot resolve direction at peak period
Code 132	Directional ambiguity -AND- Low amplitude
Code 144	Directional ambiguity -AND- Unreasonable estimate
Code 1168	High AST Data Loss -AND- directional ambiguity -AND- unreasonable estimate

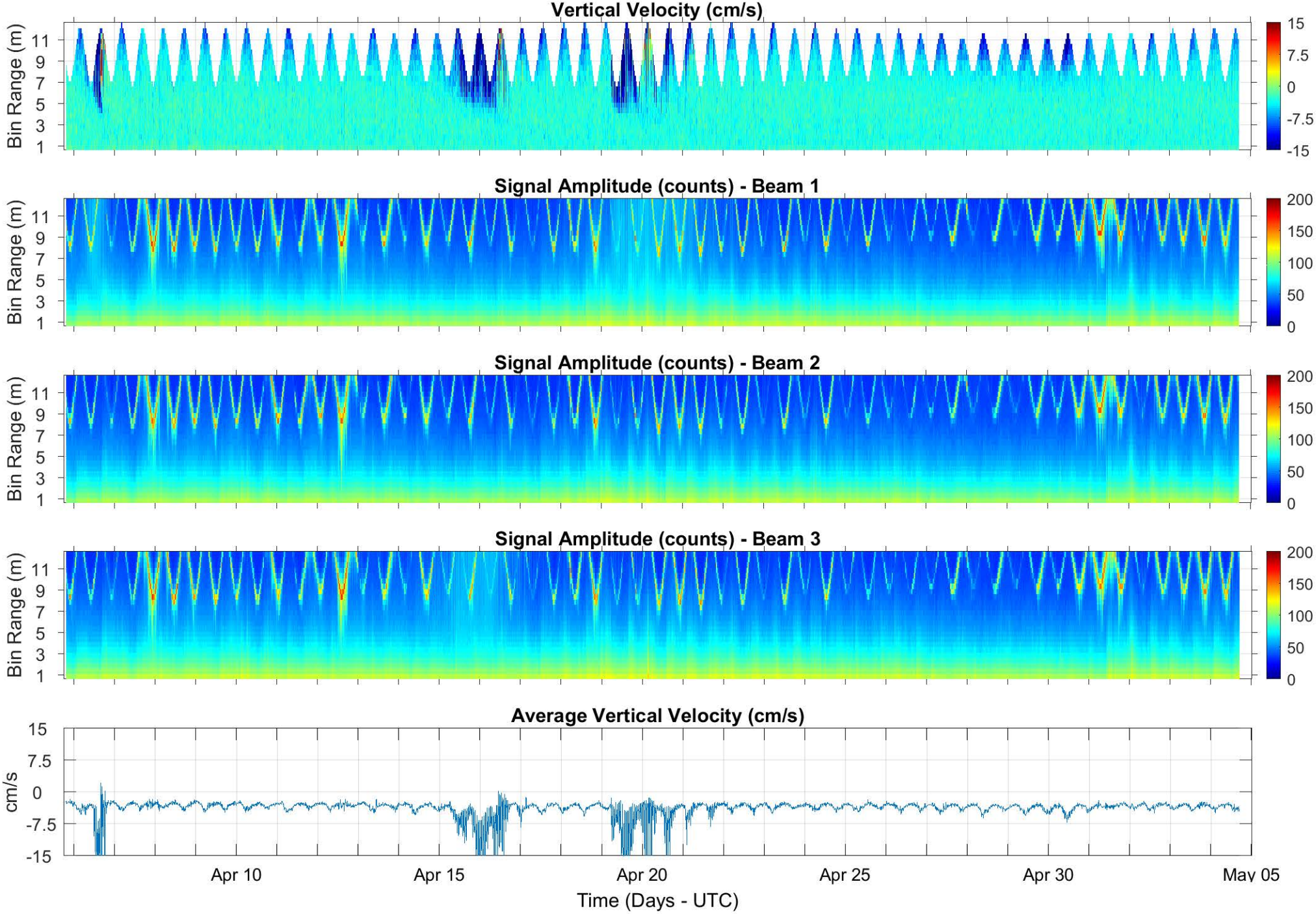
Appendix B

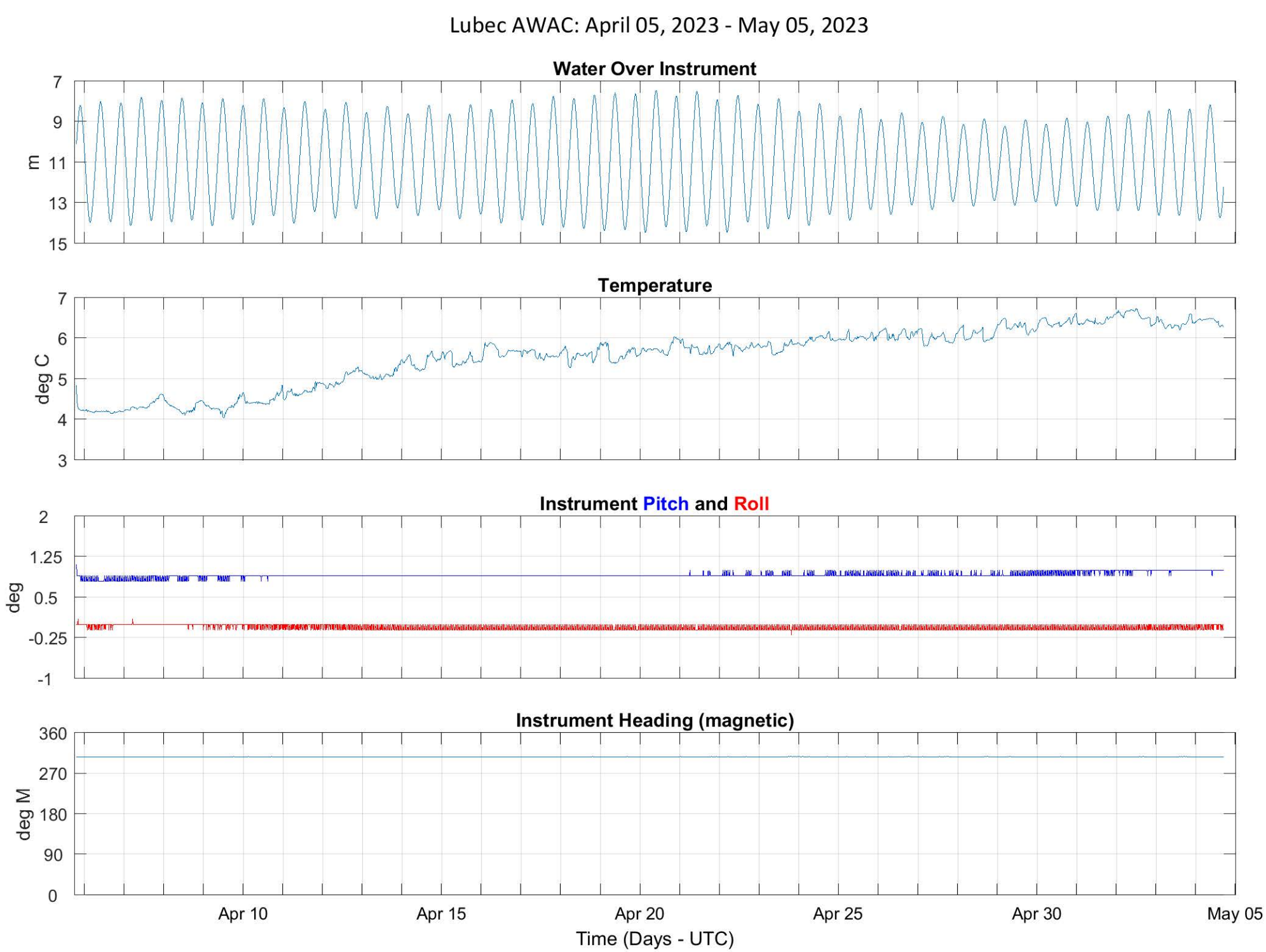
Plots of Current Data


Lubec AWAC: April 05, 2023 - May 05, 2023
Current Magnitude (cm/s)
Bin Range (m)
1
3
5
7
9
11
280
210
140
70
0
Current Direction (toward, deg T)
Bin Range (m)
1
3
5
7
9
11
360
270
180
90
0
Depth Average Current Magnitude (cm/s)
cm/s
0
40
80
120
160
Depth Average Current Direction (toward, deg T)
degrees
0
90
180
270
360
Apr 10
Apr 15
Apr 20
Apr 25
Apr 30
May 05
Time (Days - UTC)

Appendix C

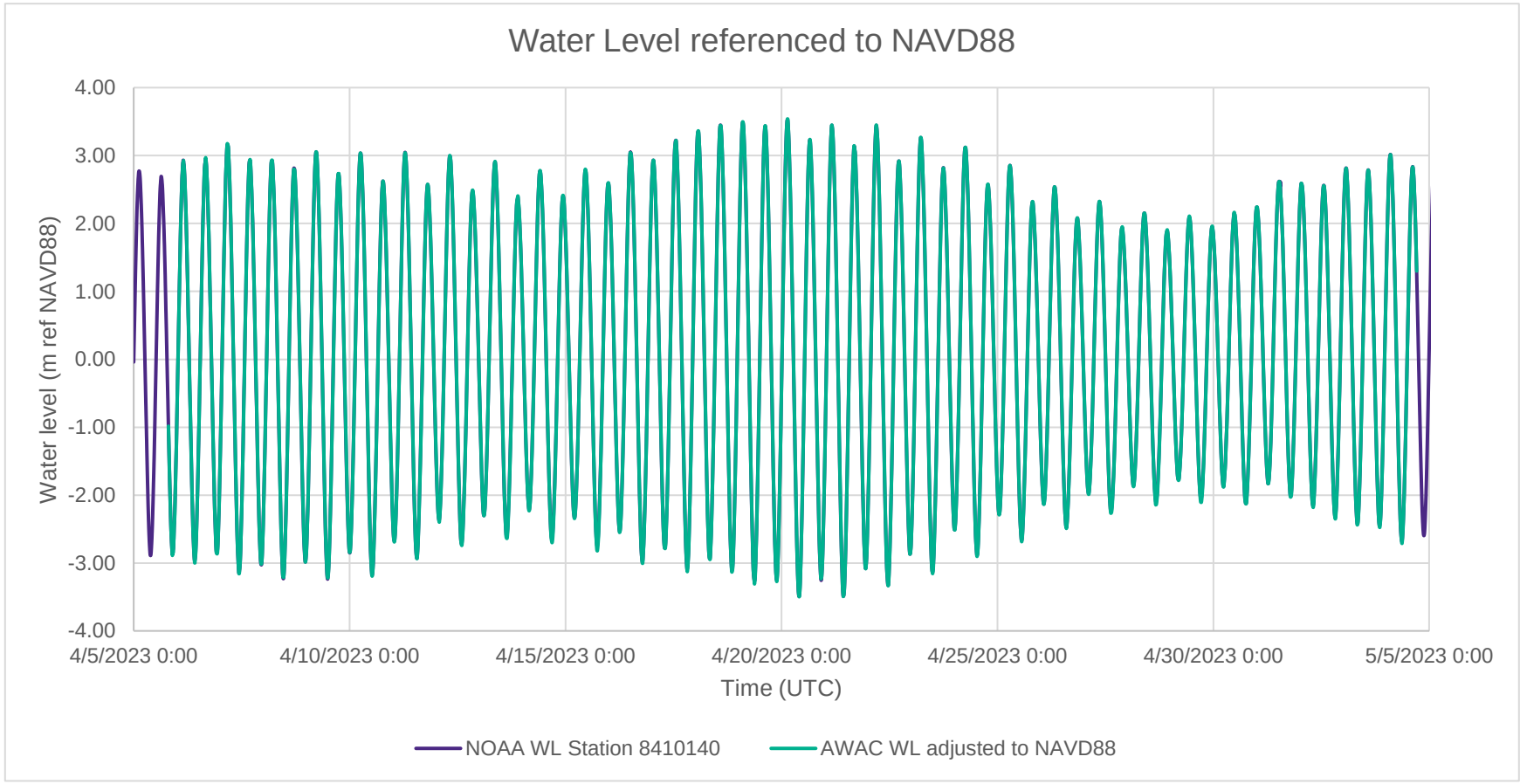
Plots of Data Quality Parameters and Ancillary Data


Lubec AWAC: April 05, 2023 - May 05, 2023
Vertical Velocity (cm/s)
Signal Amplitude (counts) - Beam 1
Signal Amplitude (counts) - Beam 2
Signal Amplitude (counts) - Beam 3
Bin Range (m)
Average Vertical Velocity (cm/s)
cm/s
Apr 10
Apr 15
Apr 20
Apr 25
Apr 30
May 05
Time (Days - UTC)


Lubec AWAC: April 05, 2023 - May 05, 2023
Water Over Instrument
m
7
9
11
13
15
Temperature
deg C
7
6
5
4
3
Instrument Pitch and Roll
deg
2
1.25
0.5
-0.25
-1
Instrument Heading (magnetic)
deg M
360
270
180
90
0
Apr 10
Apr 15
Apr 20
Apr 25
Apr 30
May 05
Time (Days - UTC)

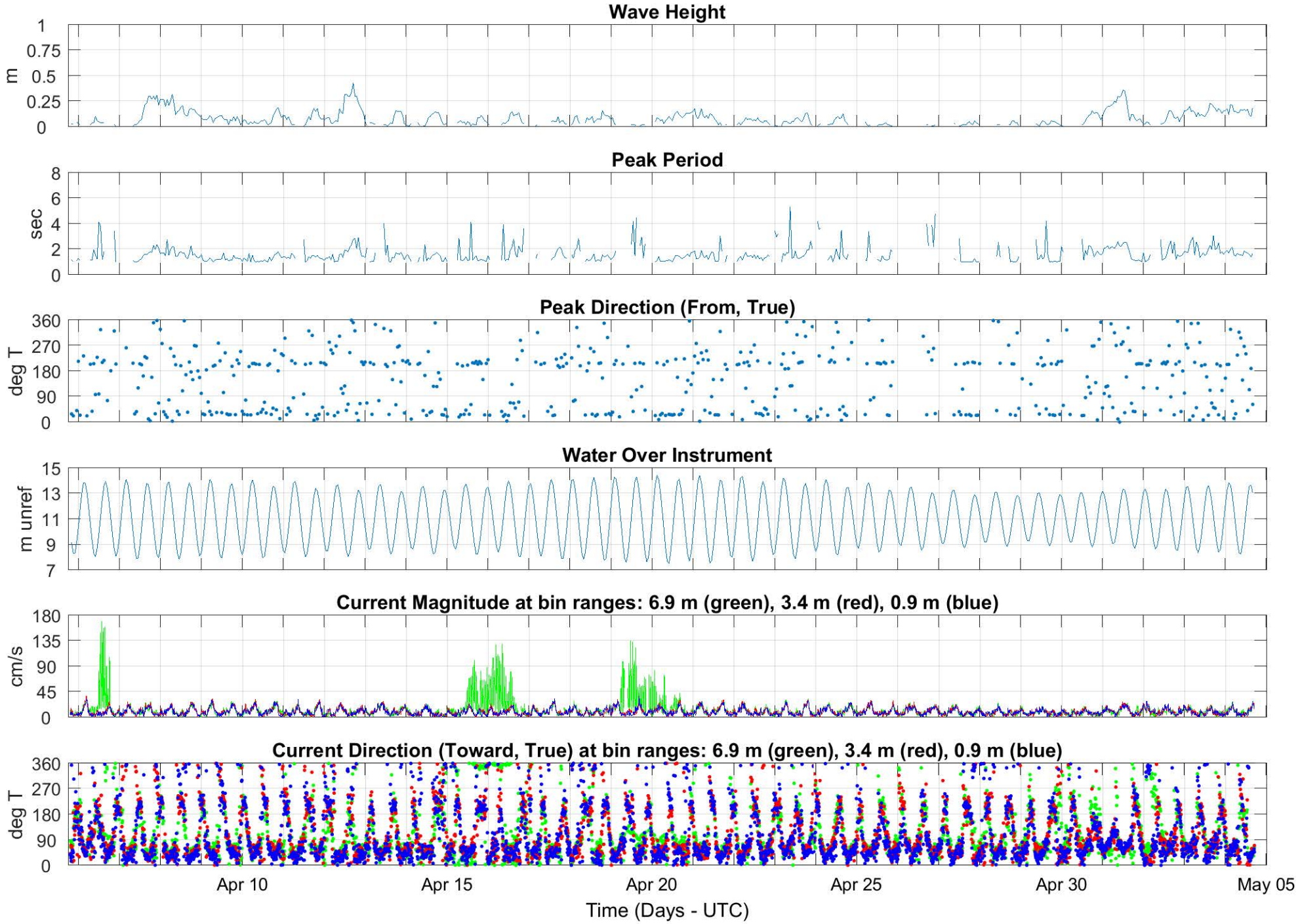
Appendix D

Plots of Water Level Data


Water Level referenced to NAVD88
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Water level (m ref NAVD88)
4/5/2023 0:00
4/10/2023 0:00
4/15/2023 0:00
4/20/2023 0:00
4/25/2023 0:00
4/30/2023 0:00
5/5/2023 0:00
Time (UTC)
NOAA WL Station 8410140
AWAC WL adjusted to NAVD88

Appendix E

Plots of Wave Data


Lubec AWAC: April 5, 2023 - May 4, 2023
Wave Height
m
1
0.75
0.5
0.25
0
Peak Period
sec
8
6
4
2
0
Peak Direction (From, True)
deg T
360
270
180
90
0
Water Over Instrument
m unref
15
13
11
9
7
Current Magnitude at bin ranges: 6.9 m (green), 3.4 m (red), 0.9 m (blue)
cm/s
180
135
90
45
0
Current Direction (Toward, True) at bin ranges: 6.9 m (green), 3.4 m (red), 0.9 m (blue)
deg T
360
270
180
90
0
Apr 10
Apr 15
Apr 20
Apr 25
Apr 30
May 05
Time (Days - UTC)

Appendix F

Sediment Results and Grab Images

Sample 1

SCI
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Charleston, South Carolina 29402
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www.SoilConsultantsInc.com

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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/01/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 04051558-SED-1 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-1

TEST RESULTS

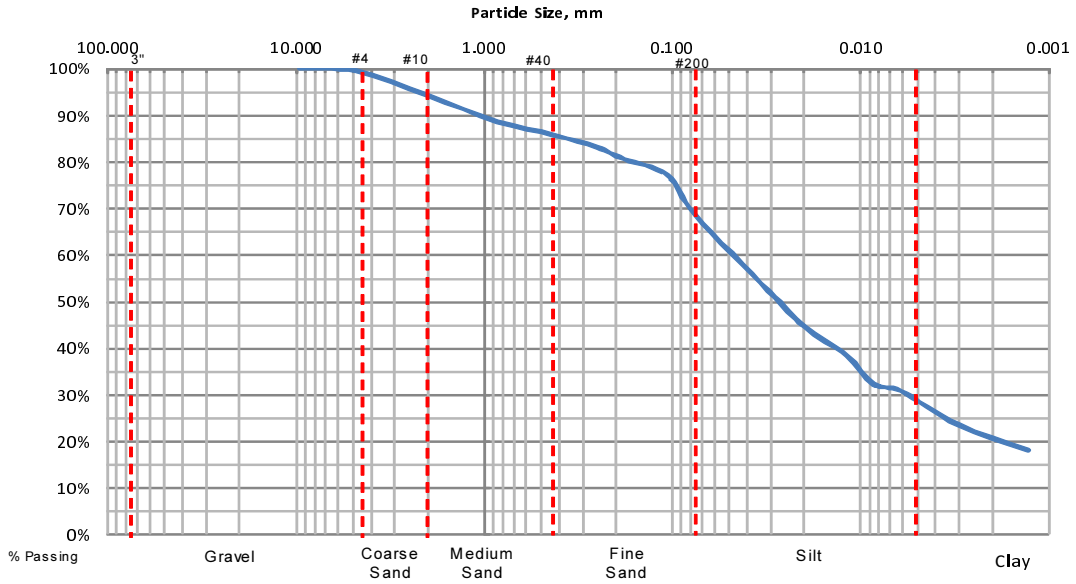
Report No: 82162-1
Page 1 of 1

Sample Identification
SED-1

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.	9.5	100
No. 4	4.75	99
No. 10	2.00	94
No. 20	0.85	89
No. 40	0.425	86
No. 60	0.25	83
No. 80	0.18	81
No. 140	0.106	77
No. 200	0.075	68.5

Material	%
Gravel	0.5
Total Sand	31.0
Coarse Sand	5.3
Medium Sand	8.5
Fine Sand	17.2
Silt and Clay	68.5
Silt size	40.3
Clay	11.2
Colloids	17.0

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	4.75
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification	
	Sandy Lean Clay

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
E-Mail: trap.puckette@rpsgroup.com
(1-ec copy)

Respectfully Submitted,
SOIL CONSULTANTS, INC.

AASHTO ACCREDITED

Audrey Chubb
CMT Manager

Sample 2

SCI
SOIL CONSULTANTS, INC.
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Charleston, South Carolina 29402
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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/01/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 04051607-SED-2 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-2

TEST RESULTS

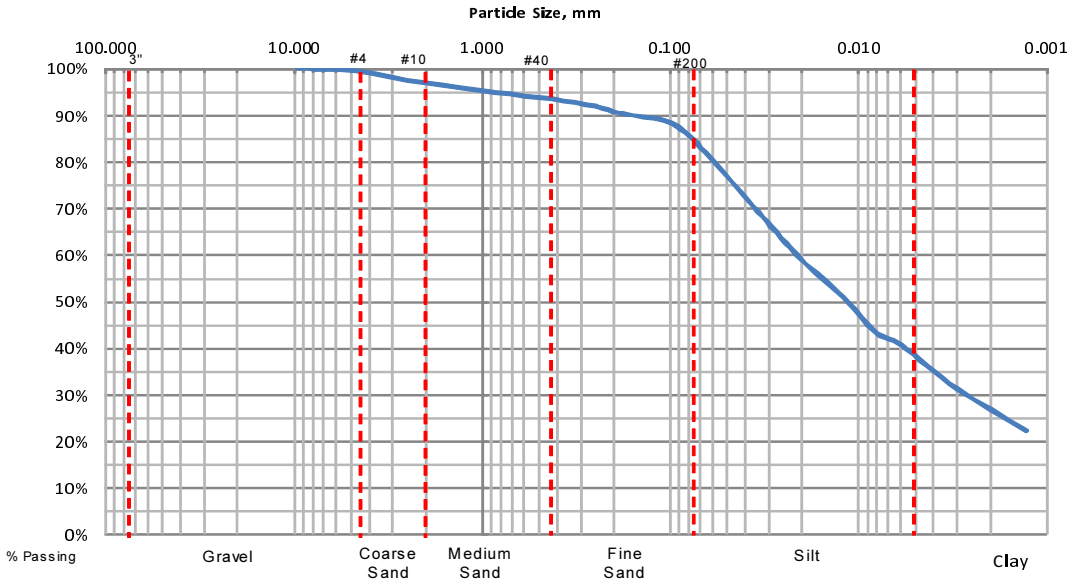
Report No: 82162-2
Page 1 of 1

Sample Identification
SED-2

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.	9.5	100
No. 4	4.75	100
No. 10	2.00	97
No. 20	0.85	95
No. 40	0.425	93
No. 60	0.25	92
No. 80	0.18	90
No. 140	0.106	89
No. 200	0.075	84.8

Material	%
Gravel	0.4
Total Sand	14.8
Coarse Sand	2.7
Medium Sand	3.4
Fine Sand	8.7
Silt and Clay	84.8
Silt size	46.8
Clay	16.2
Colloids	21.8

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	4.75
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification
Lean Clay with Sand

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
E-Mail: trap.puckette@rpsgroup.com
(1-ec copy)

Respectfully Submitted,
SOIL CONSULTANTS, INC.

AASHTO ACCREDITED

Audrey Chubb
CMT Manager

Sample 3

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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/01/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 04051634-SED-3 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-3

TEST RESULTS

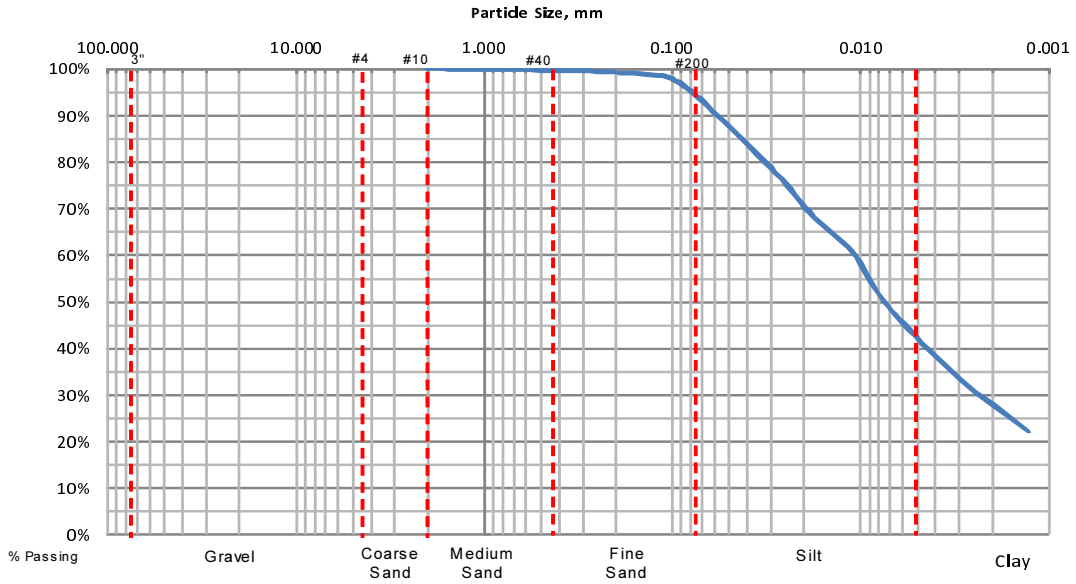
Report No: 82162-3
Page 1 of 1

Sample Identification
SED-3

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
No. 4		
No. 10	2.00	100
No. 20	0.85	100
No. 40	0.425	100
No. 60	0.25	99
No. 80	0.18	99
No. 140	0.106	98
No. 200	0.075	94.3

Material	%
Gravel	0.0
Total Sand	5.7
Coarse Sand	0.0
Medium Sand	0.4
Fine Sand	5.3
Silt and Clay	94.3
Silt size	52.3
Clay	22.0
Colloids	20.0

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	0.85
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification
Fat Clay

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
E-Mail: trap.puckette@rpsgroup.com
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Sample 4

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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/02/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 04051620-SED-4 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-4

TEST RESULTS

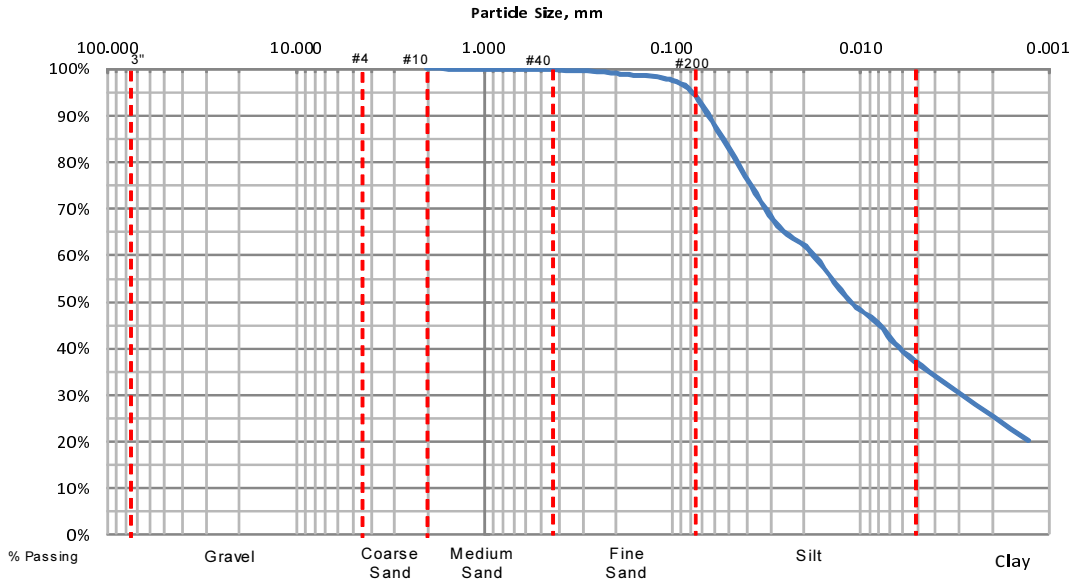
Report No: 82162-4
Page 1 of 1

Sample Identification
SED-4

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
No. 4		
No. 10	2.00	100
No. 20	0.85	100
No. 40	0.425	100
No. 60	0.25	99
No. 80	0.18	99
No. 140	0.106	98
No. 200	0.075	94.1

Material	%
Gravel	0.0
Total Sand	5.9
Coarse Sand	0.0
Medium Sand	0.3
Fine Sand	5.6
Silt and Clay	94.1
Silt size	57.6
Clay	17.5
Colloids	19.0

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	0.85
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification
Fat Clay

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
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CMT Manager

Sample 5

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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/01/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 04051627-SED-5 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-5

TEST RESULTS

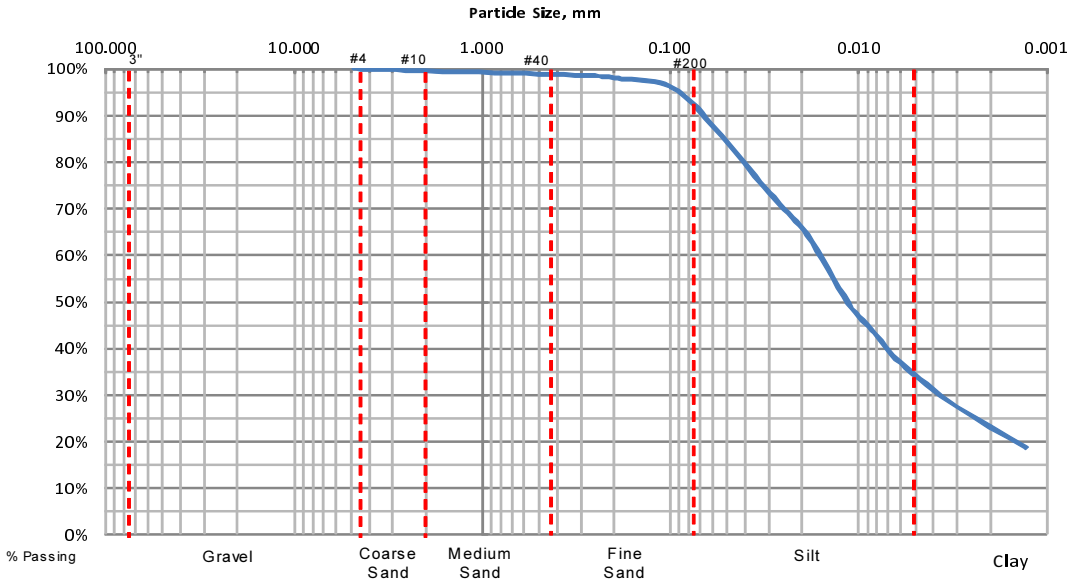
Report No: 82162-5
Page 1 of 1

Sample Identification
SED-5

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
No. 4	4.75	100
No. 10	2.00	100
No. 20	0.85	99
No. 40	0.425	99
No. 60	0.25	98
No. 80	0.18	98
No. 140	0.106	97
No. 200	0.075	92.3

Material	%
Gravel	0.0
Total Sand	7.7
Coarse Sand	0.5
Medium Sand	0.7
Fine Sand	6.5
Silt and Clay	92.3
Silt size	57.8
Clay	16.5
Colloids	18.0

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	2
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification
Fat Clay

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
E-Mail: trap.puckette@rpsgroup.com
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CMT Manager

Sample 6

SCI
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Acct. No: RP004 **Project No:** 221192 **Date Sampled:** 04/05/2023
Report Date: 05/01/2023 **Sampled By:** Client
Project: Lubec ME **By Order Of:** Client

Location: 451540-SED-6 **Order Number:**

Client: RPS EVANS-HAMILTON

REPORT: Particle Size Distribution **LAB NO:** 82162-6

TEST RESULTS

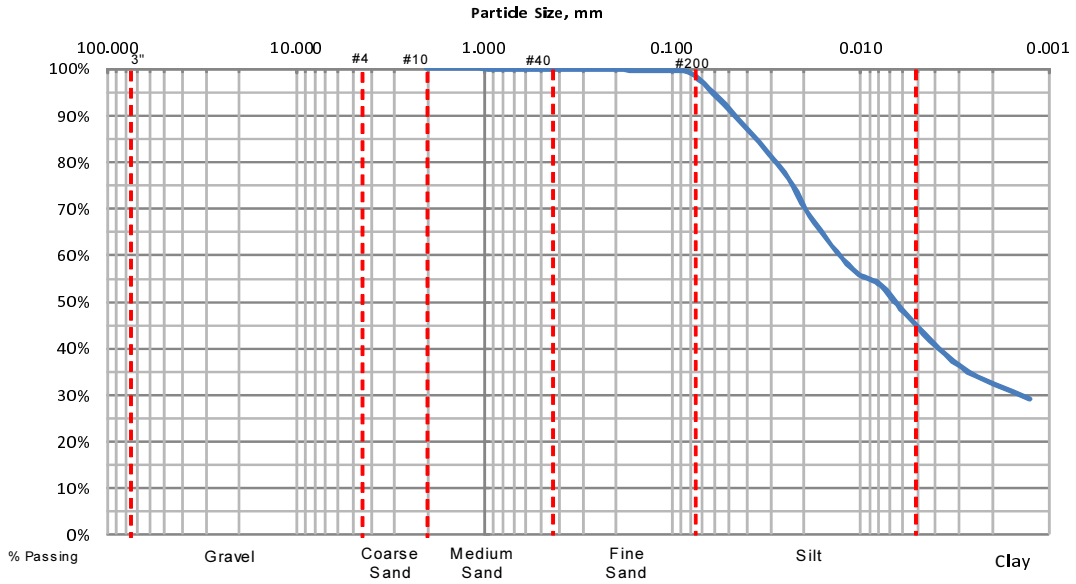
Report No: 85162-6
Page 1 of 1

Sample Identification
SED-6

Sieve	Size, mm	% Passing
3 in.		
2 in.		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
No. 4		
No. 10	2.00	100
No. 20	0.85	100
No. 40	0.425	100
No. 60	0.25	100
No. 80	0.18	100
No. 140	0.106	100
No. 200	0.075	98.3

Material	%
Gravel	0.0
Total Sand	1.7
Coarse Sand	0.0
Medium Sand	0.1
Fine Sand	1.6
Silt and Clay	98.3
Silt size	54.3
Clay	16.0
Colloids	28.0

Plasticity Characteristics		
Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)



Max Particle Size, mm	0.85
Dispersion	Mechanical stirrer /1 min
Specfic Gravity	2.68 (estimated)

Visual Classification
Fat Clay

Test Method (As Applicable): ASTM D422

Orig: RPS EVANS-HAMILTON Attn: Mr. Trap Puckette
E-Mail: trap.puckette@rpsgroup.com
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CMT Manager