Proposed Marine Fish Farm: Muck

Licence reference: CAR/L/1109999

Annex 2: Hydrographic Data

Reports for deployments ID350, ID351 and ID366

Mowi Scotland Limited

January 2022

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Muck

Hydrographic Data Report: Deployment ID350

8th April to 19th May 2010

Report written by [redacted]
Report checked by [redacted]

October 2021
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QUALITY ASSURANCE

Mowi Scotland Ltd is ISO9001 and ISO14001 accredited and all project management follows policies designed to ensure that the collection, collation and reporting of information produced in the course of our operations is done to a consistently high standard meeting the requirements of the end user.

1. Introduction

Mowi Scotland Ltd. is preparing an application to the Scottish Environmental Protection Agency (SEPA) for a technical variation to CAR/L/1109999 to modify an existing salmon farm site located near the Isle of Muck. Mowi Scotland Ltd. propose to change the existing site from 12 x 120 m circumference pens, with 16 m deep nets, held in a 75 m grid (Figure 1) to 8 x 160 m circumference pens with 15 m deep nets, held in a 100 m grid. An increase to the maximum standing biomass, from 3500T to 4069T, will also be applied for.

Mowi Scotland Ltd have carried out hydrographic surveys at the site in 2010 and again in 2021. Hydrographic data at Muck was gathered during this time in three deployments:

i. 8th April to 19th May 2010 (ID350)
ii. 8th April to 18th May 2010 (ID351)
iii. 27th January to 15th April 2021 (ID366)

This report describes the data from the 8th April to 19th May 2010 (ID350) deployment at Muck. The purpose of this report is to assess the suitability of the collected hydrographic data for input into a hydrodynamic model of the Small Isles region and into the NewDepomod model.

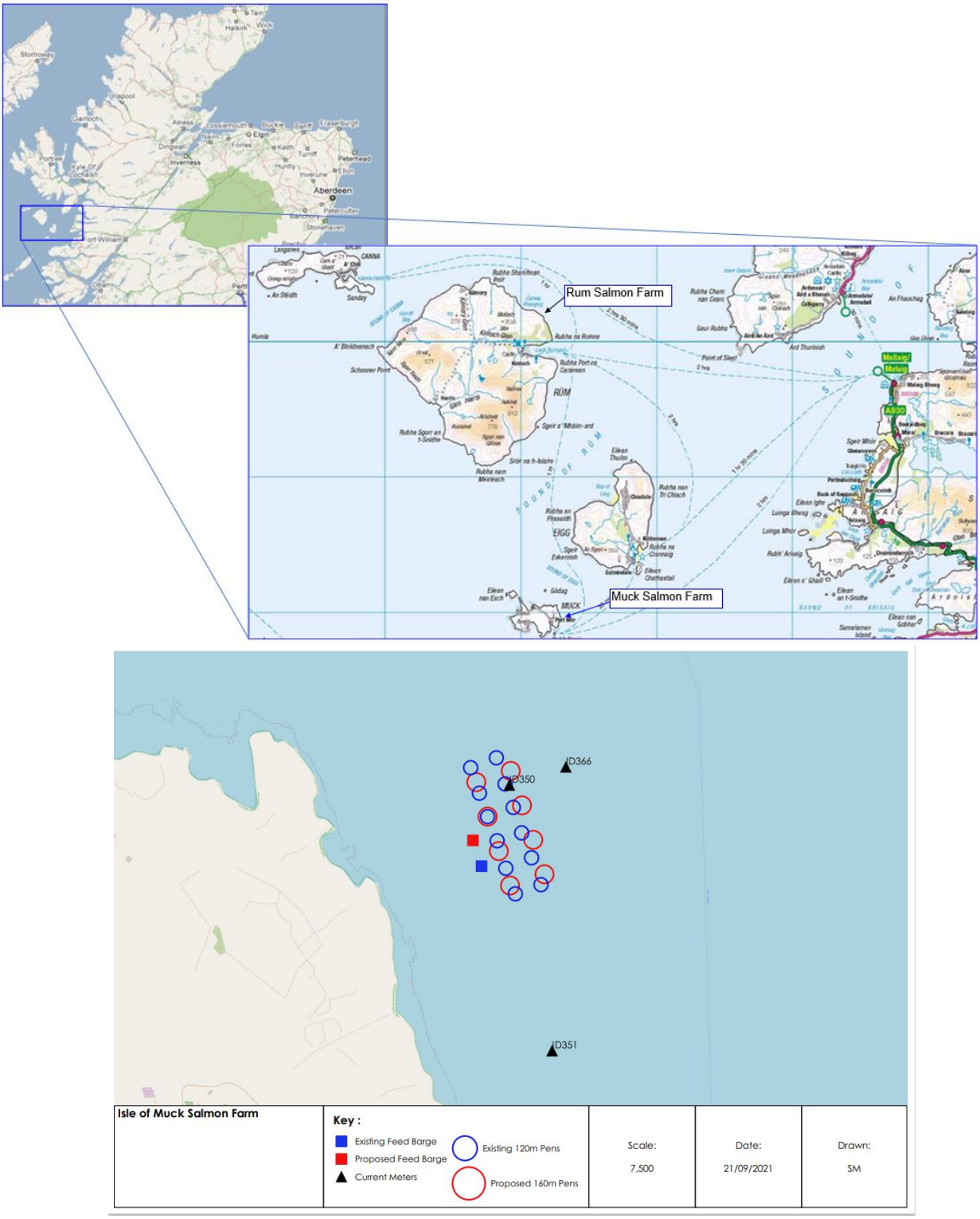


Figure 1. Site location (top) and layout (bottom) and of the salmon farm near the Isle of Muck. The current meter deployment locations are marked by the black triangles.

2. Materials & Methods

2.1 Bathymetry

Bathymetry for the study area was taken from the UKHO INSPIRE bathymetry data (http://aws2.caris.com/ukho/mapViewer/map.action).

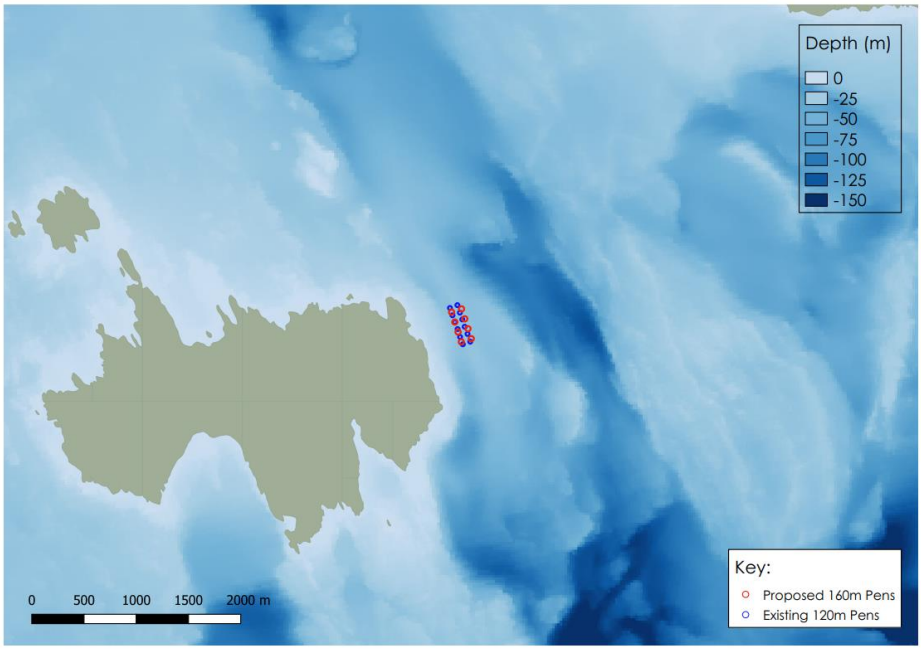


Figure 2. Bathymetry in the region around the Isle of Muck.

2.2 Current Data

Mowi staff carried out hydrographic surveys at the site during 2010 and again in 2021. The purpose of this hydrographic report is to assess the suitability of the collected hydrographic data for use with the NewDepomod and Hydrodynamic models. The data contained in this report were recorded at the site from 8th April to 19th May 2010 (40 days and 22 hours of data; deployment ID350). The data from two other deployments (ID366 and ID351) are presented in separate hydrographic reports.

The WorkHorse ADCP (Table 1), within its mooring frame, was positioned at 56.84458'N, -6.21283'W (143198E 780484N), which was approximately 455m from the nearest shoreline and approximately 116m from the centre of the proposed cage group (Figure 1). The transducer head was 70 cm from the base of the mooring frame. The mean depth (derived from the pressure sensor) at the WorkHorse ADCP position was 35.6 m.

Initial soundings were taken to establish the possible depth the WorkHorse ADCP would be situated at during high tide and so that the most appropriate cell size could be determined. The cell size was set at 0.5 m and the number of cells to 89.

Data was automatically written and stored to the internal memory within the WorkHorse ADCP main body and then downloaded to a computer after completion of the deployment period via WiFi.

2.3 Magnetic Variation

No magnetic variation correction was made to the WorkHorse ADCP during deployment, this was undertaken to the data after the instrument was recovered and data downloaded. The magnetic variation used was -5.08°; this was determined using the World Magnetic Model, produced jointly with the US National Oceanographic and Atmospheric Administration's National Geophysical Data center. Further details can be found at http://www.geomag.bgs.ac.uk/navigation.html

2.4 Data Processing

Upon retrieval of the WorkHorse ADCP current meter, all data was downloaded to a computer for analysis. The raw data file was opened in Teledyne's "Velocity" software and Matlab. Deployment diagnostic data (beam intensity, correlation, pitch and roll) were analysed to confirm that the deployment was successful with the instrument orientated upright. The heading data were also examined to identify any movement of the WorkHorse ADCP mooring frame during the deployment.

The diagnostic data suggested that velocities from the first 51 bins were valid (Figure 3). Calculations were undertaken to identify the cells to be used for surface and middle currents. Surface data was taken at an average depth (derived from the pressure sensor) of 5.19 m (cell 51), and cage-bottom data at 16.19 m (cell 29). Surface and middle cell heights above were 28.42 m and 17.42 m from the seabed respectively. The bottom cell (cell 1) was at a depth of 30.19 m and 3.42 m above the seabed.

Table 1: Workhorse ADCP Specifications.

A Teledyne RD Instruments Marine Measurements Datasheet

Workhorse Sentinel

Self-Contained 1200, 600, 300 kHz ADCP

TECHNICAL SPECIFICATIONS

Water Profiling	Depth Cell Size[1]	Typical Range[2] 12m **1200kHz**		Typical Range[2] 50m **600kHz**		Typical Range[2] 110m **300kHz**	
	Vertical Resolution	Range[3]	Std. Dev.[4]	Range[3]	Std. Dev.[4]	Range[3]	Std. Dev.[4]
	0.25m	11m	14.0cm/s				
	0.5m	12m	7.0cm/s	38m	14.0cm/s	see note 1	
	1m	13m	3.6cm/s	42m	7.0cm/s	83m	14.0cm/s
	2m	15m[5]	1.8cm/s	46m	3.6cm/s	93m	7.0cm/s
	4m	see note [1]		51m[5]	1.8cm/s	103m	3.6cm/s
	8m					116m[5]	1.8cm/s
Long Range Mode	2m	19m	3.4m/s				
	4m			66m	3.6cm/s		
	8m					154m	3.7cm/s
Profile Parameters	Velocity accuracy	0.3% of the water velocity relative to ADCP ±0.3cm/s		0.3% of the water velocity relative to ADCP ±0.3cm/s		0.5% of the water velocity relative to ADCP ±0.5cm/s	
	Velocity resolution	0.1cm/s		0.1cm/s		0.1cm/s	
	Velocity range:	±5m/s (default) ±20m/s (max)		±5m/s (default) ±20m/s (max)		±5m/s (default) ±20m/s (max)	
	Number of depth cells	1–255		1–255		1–255	
	Ping rate	Up to 10Hz		Up to 10Hz		Up to 10Hz	
Echo Intensity Profile	Vertical resolution	Depth cell size, user configurable					
	Dynamic range	80dB					
	Precision	±1.5dB					
Transducer and Hardware	Beam angle	20°					
	Configuration	4-beam, convex					
	Internal memory	Two PCMCIA card slots; one memory card included					
	Communications	RS-232 or RS-422; ASCII or binary output at 1200-115,200 baud					
Power	DC input	20–50VDC.					
	Number of batteries	1 internal battery pack					
	Internal battery voltage	42VDC (new) 28VDC (depleted)					
	Battery capacity @ 0°C	450 watt hrs					
Standard Sensors	Temperature (mounted on transducer)	Range -5° to 45°C, Precision ±0.4°C, Resolution 0.01°					
	Tilt	Range ±15°, Accuracy ±0.5°, Precision ±0.5°, Resolution 0.01°					
	Compass (fluxgate type, includes built-in field calibration feature)	Accuracy ±2°[5], Precision ±0.5°[5], Resolution 0.01°, Maximum tilt ±15°					
Environmental	Standard depth rating	200m; optional to 500m, 1000m, 6000m					
	Operating temperature	-5° to 45°C					
	Storage temperature (without batteries)	-30° to 60°C					
	Weight in air	13.0kg					
	Weight in water	4.5kg					
Software	TRDI's Windows™-based software included: **WinSC**—Data Acquisition System; **WinADCP**—Data Display and Export						
Available Options	• Memory: 2 PCMCIA slots, total 4GB • Pressure sensor • External battery case • High-resolution water-profiling modes • Bottom tracking or surface referencing track • AC/DC power converter, 48VDC output • Pressure cases for depths up to 6000m • Directional Wave Array • Acoustic Modem • Inductive Modem • **Velocity** for advanced post processing						
Dimensions	228.0mm wide x 405.5mm long *(line drawings available upon request)*						

1 User's choice of depth cell size is not limited to the typical values specified.
2 Longer ranges available.
3 Profiling range based on temperature values at 5°C and 20°C, salinity = 35ppt.
4 BroadBand mode single-ping standard deviation (Std. Dev.).
5 <±1.0° is commonly achieved after calibration.

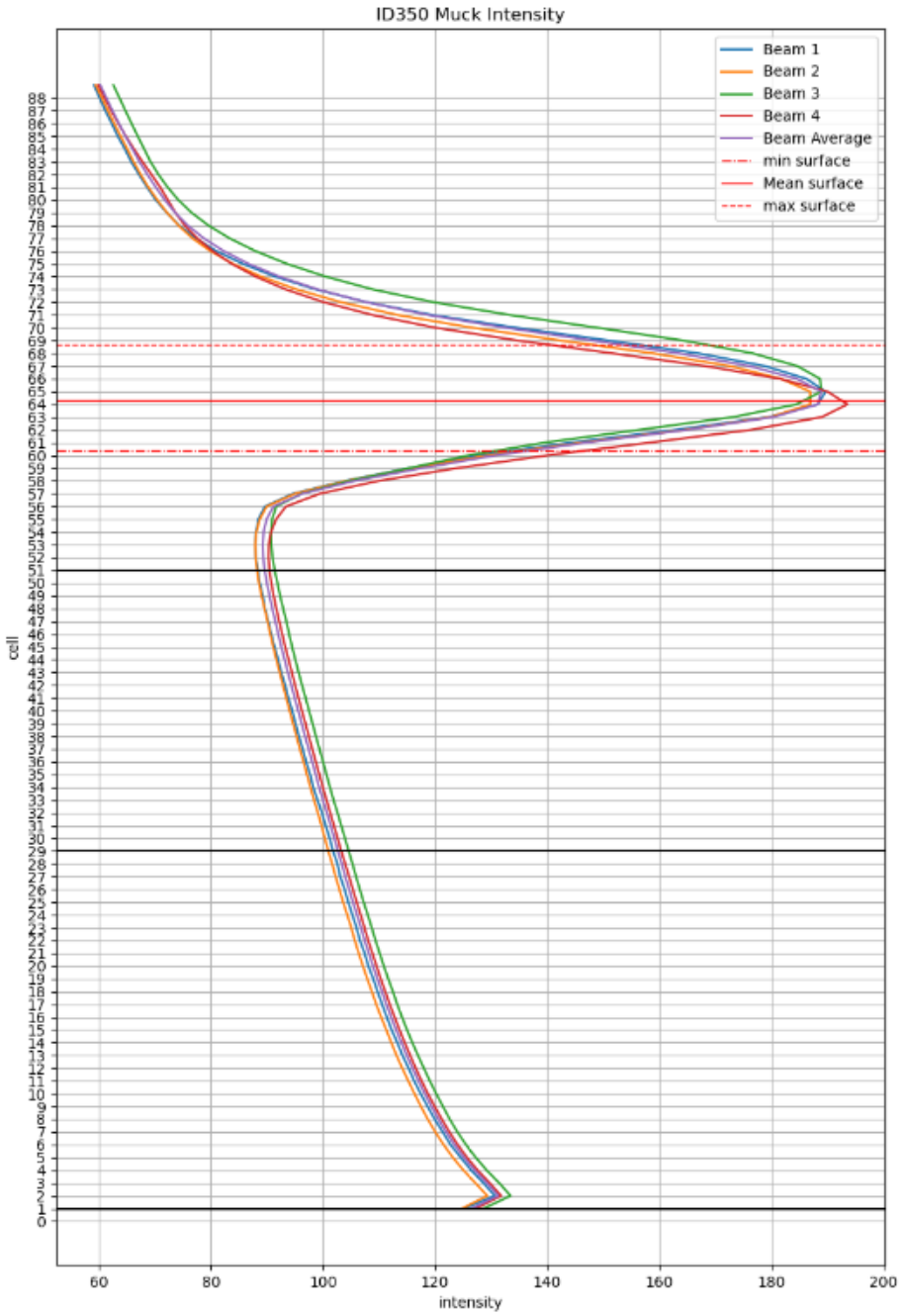


Figure 3. Mean intensity of the ADCP signal for the ID350 dataset plotted by bin number

The 'first cell range' is automatically calculated by the instrument, which is the distance from the transducer head to the first cell. For this deployment, the first cell range was calculated as 2.72 m. This value is then added to the height of the instrument frame (0.7 m) to get the first cell height above the seabed, which equated to 3.42 m

Standard deviation has been assessed throughout the deployment to identify accurate and reliable data for near bed, middle and surface cells using the following equation:

$$Cell\ StdDev = \frac{Instrument\ StdDev}{\sqrt{No.\ valid\ pings}} \qquad (1)$$

The Instrument Standard Deviation (StdDev) in Equation 1 is determined using the deployment settings when the meter is programmed, examples of the StdDev values for different configurations are shown in Table 1. This deployment had a cell size of 0.5m which equates to an Instrument StdDev of 28 cm/s.

The Percentage of valid pings used to calculate Cell StdDev is derived using “Percentage Good” data which allows us to relate the StdDev to the actual data gathered. The percent good data is available for 1, 2, 3 and 4 beams which represent the following:

- Percent good 1 = % of good data computed from 3 Beams
- Percent good 2 = % of bad data due to more than 2 Beam bad
- Percent good 3 = % of bad data due to error velocity exceeded
- Percent good 4 = % of good data computed from 4 Beams

The method described has been used to calculate the Standard deviation throughout the deployment for the surface, middle and bottom cells; the average StdDev values for the surface, middle and bottom was 1.65cm/s, 1.65cm/s and 1.64cm/s respectively which are all within the SEPA criteria of 2cm/s.

2.5 Meteorological Data

The collection of meteorological data is no longer required to support the assessment process and consequently has not been undertaken. The current data used is collected using mulitple deployments and over a longer period and thus provides a more realistic representation of site conditions than short deployments, thus allowing an assessment of the influence of meterological conditions.

3. Results and Discussion

A summary of the current data is shown in Figure 4 to Figure 12 and in Table 2 to Table 5. Over the period analysed for this report, the near-surface, middle and bottom cells had current speed averages of 16.75 cm/s, 14.61 cm/s and 12.79 cm/s respectively. This gave an overall average of 14.71 cm/s. The orientation of the tidal velocities was north-south.

Residual currents at the surface and mid-depth were toward the north-west (339°G and 341°G respectively); near the seabed, the residual flows during the deployment period were also to the north-west (333°G, Figure 9). The magnitude of the residual currents for the surface, middle and bottom cells were moderate, with mean values of 0.072 m/s, 0.060 m/s and 0.005 m/s respectively.

4. Hydrographic Data Summary Sheets

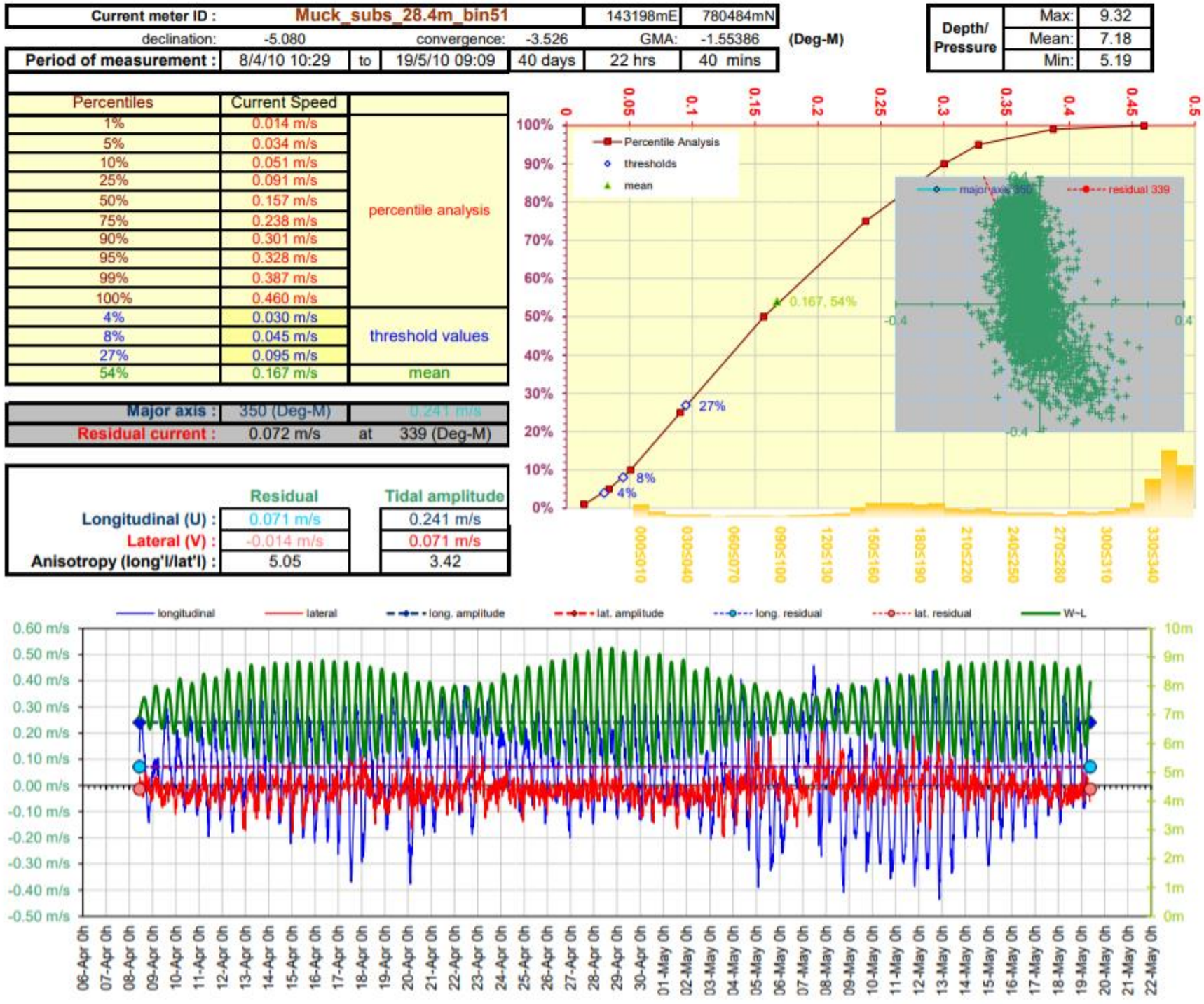


Figure 4. Current Data Summary Sheet for the surface current cell 51, 28.4m from seabed, 8th April to 19th May 2010 inclusive (ID350).

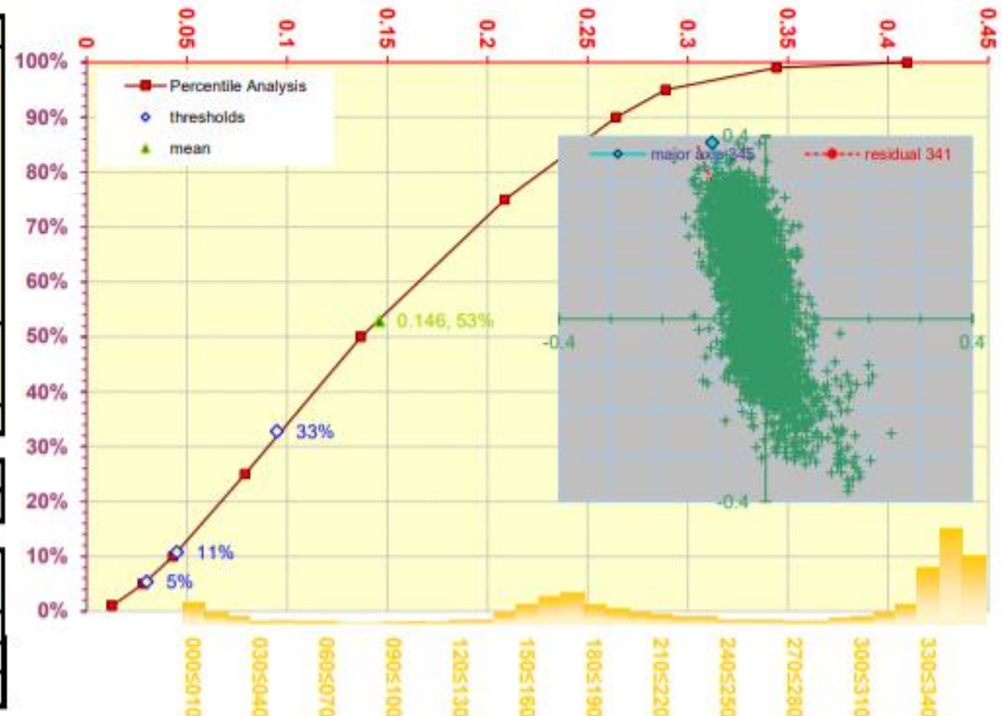
Current meter ID :	Muck_cbot_17.4m_bin29				143198mE	780484mN
declination:	-5.080		convergence:	-3.526	GMA:	-1.55386 (Deg-M)
Period of measurement :	8/4/10 10:29	to	19/5/10 09:09	40 days	22 hrs	40 mins

Depth/ Pressure		
	Max:	20.32
	Mean:	18.18
	Min:	16.19

Percentiles	Current Speed	
1%	0.013 m/s	percentile analysis
5%	0.028 m/s	
10%	0.043 m/s	
25%	0.079 m/s	
50%	0.137 m/s	
75%	0.209 m/s	
90%	0.264 m/s	
95%	0.289 m/s	
99%	0.344 m/s	
100%	0.410 m/s	
5%	0.030 m/s	threshold values
11%	0.045 m/s	
33%	0.095 m/s	
53%	0.146 m/s	mean

Major axis :	345 (Deg-M)		0.215 m/s
Residual current :	0.060 m/s	at	341 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.060 m/s	0.215 m/s
Lateral (V) :	-0.004 m/s	0.054 m/s
Anisotropy (long'l/lat'l) :	13.68	3.94



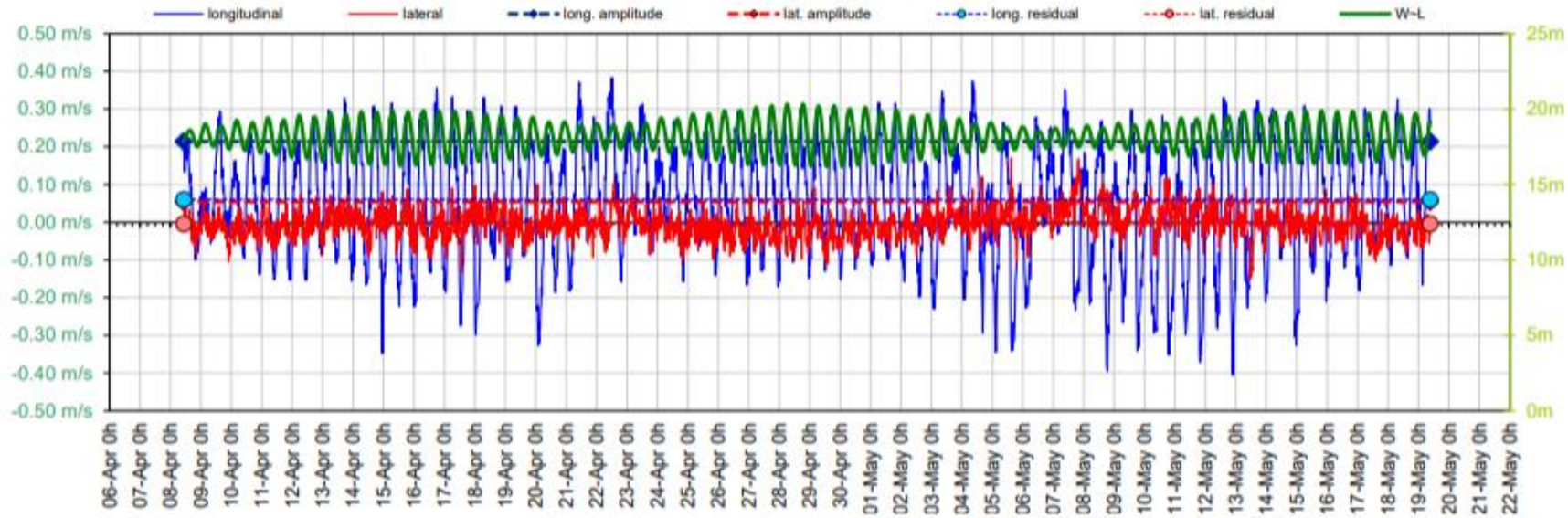


Figure 5. Current Data Summary Sheet for the cage bottom current cell 29, 17.4m from seabed, 8th April to 19th May 2010 inclusive (ID350).

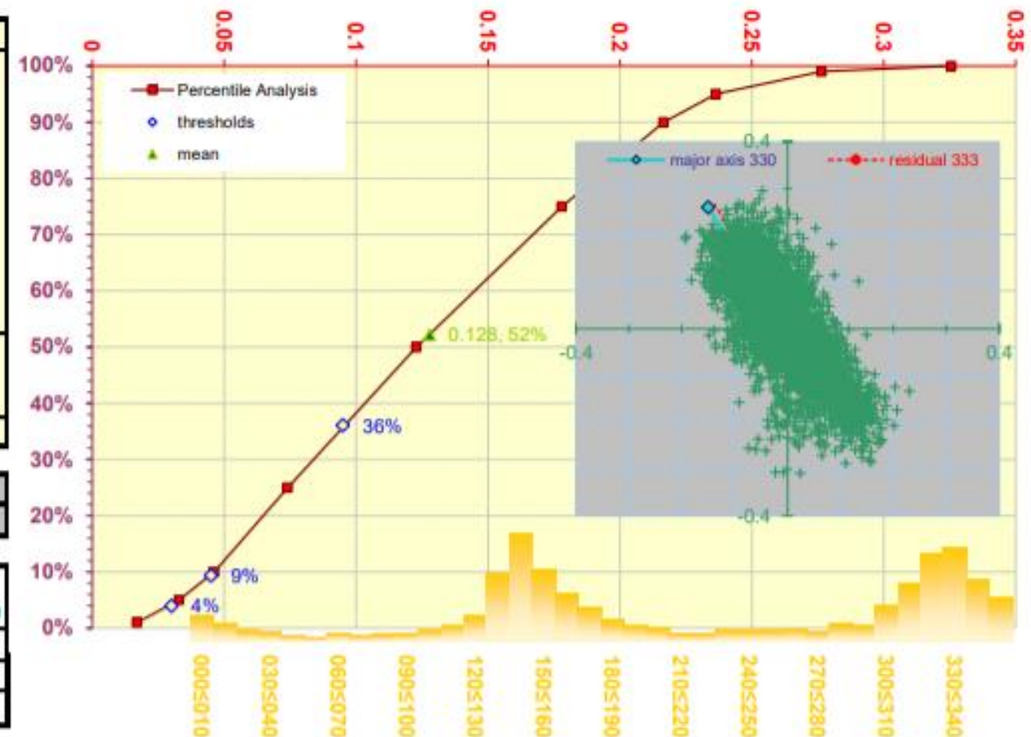
Current meter ID :	Muck_nrbd_3.4m_bin1				143198mE	780484mN
declination:	-5.080		convergence:	-3.526	GMA:	-1.55386 (Deg-M)
Period of measurement :	8/4/10 10:29	to	19/5/10 09:09	40 days	22 hrs	40 mins

Depth/ Pressure		
	Max:	34.32
	Mean:	32.18
	Min:	30.19

Percentiles	Current Speed	
1%	0.017 m/s	percentile analysis
5%	0.033 m/s	
10%	0.046 m/s	
25%	0.074 m/s	
50%	0.123 m/s	
75%	0.178 m/s	
90%	0.217 m/s	
95%	0.236 m/s	
99%	0.276 m/s	
100%	0.326 m/s	
4%	0.030 m/s	threshold values
9%	0.045 m/s	
36%	0.095 m/s	
52%	0.128 m/s	mean

Major axis :	330 (Deg-M)		0.193 m/s
Residual current :	0.005 m/s	at	333 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.005 m/s	0.193 m/s
Lateral (V) :	0.000 m/s	0.063 m/s
Anisotropy (long'l/lat'l) :	21.69	3.06



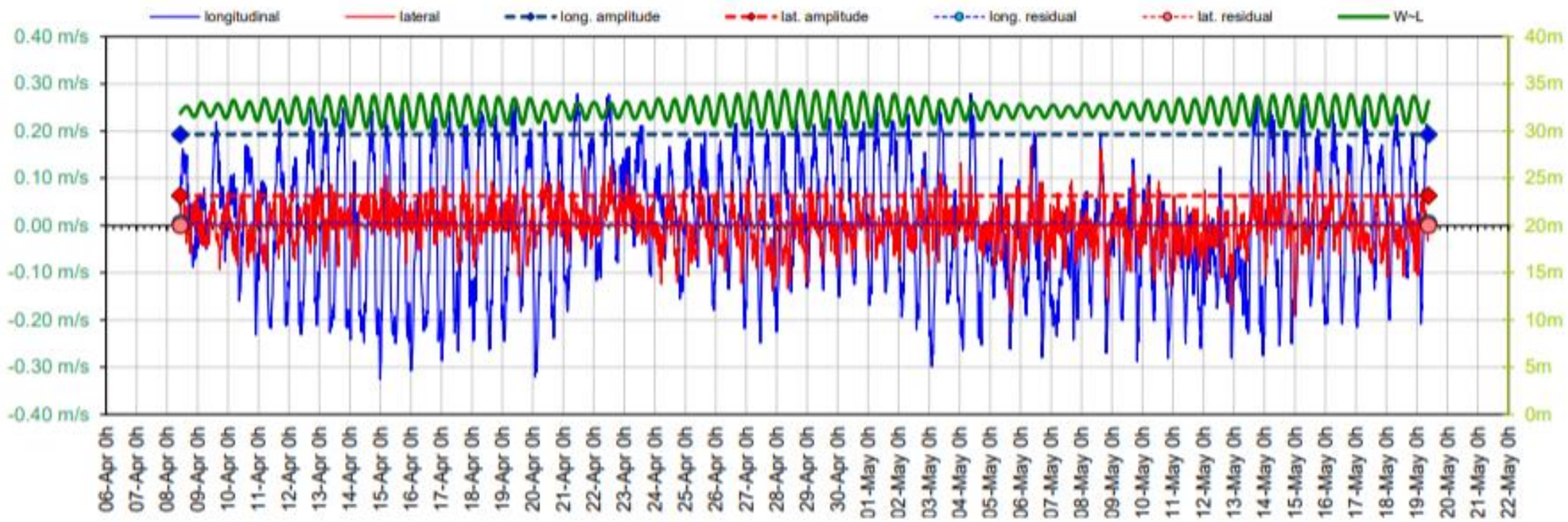


Figure 6. Current Data Summary Sheet for the near bottom current cell 1, 3.4m from seabed, 8th April to 19th May 2021 inclusive (ID350).

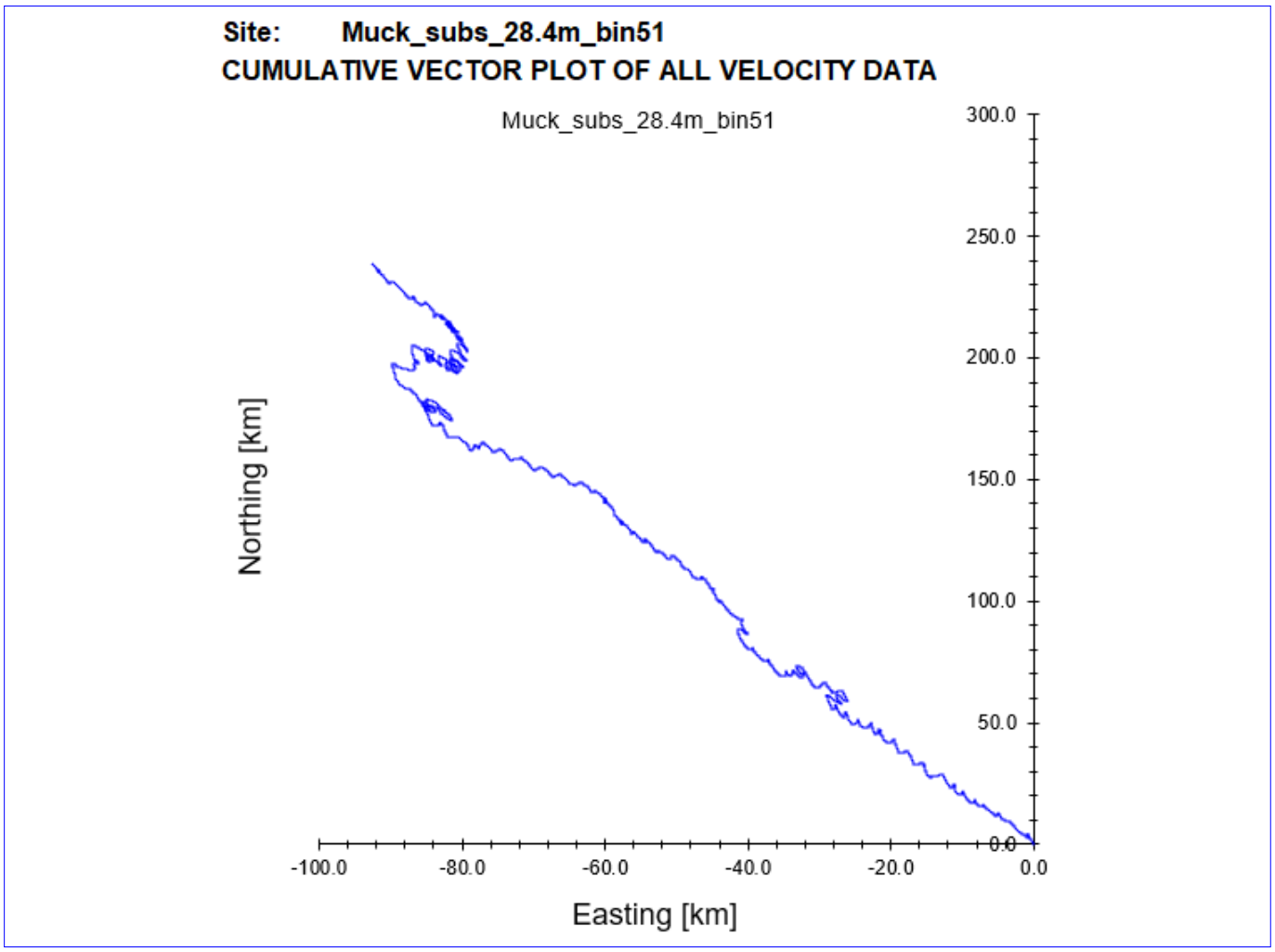


Figure 7. Cumulative Vector Plot of all velocity data from near surface cell for ID350.

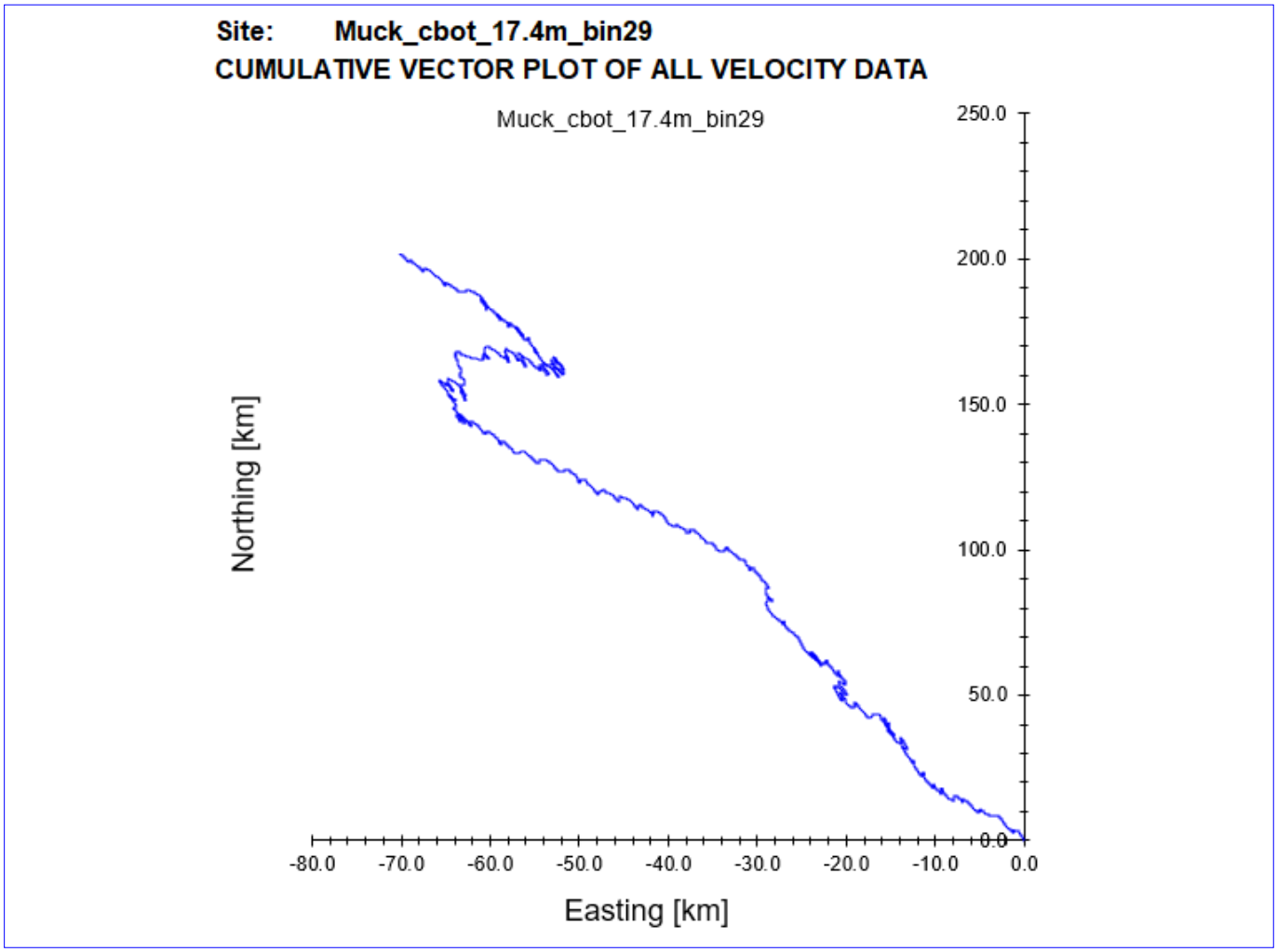


Figure 8. Cumulative Vector Plot of all velocity data from cage bottom cell for ID350.

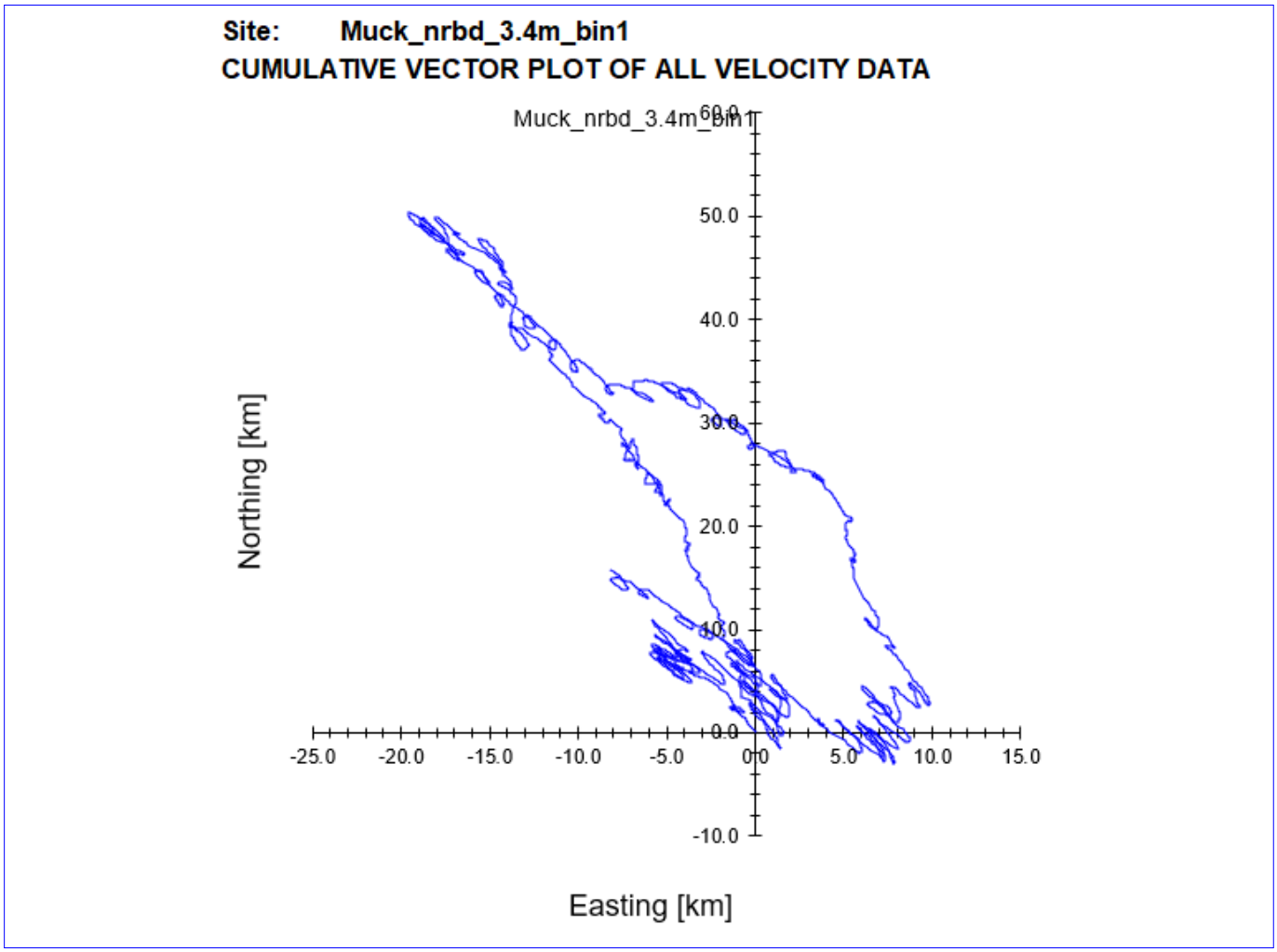


Figure 9. Cumulative Vector Plot of all velocity data from near bottom cell for ID350.

5. Summary of Current Data – ID350

Site Name: Muck
Data start date: 08/04/2010
Data end date: 19/05/2010
Mean Water Depth: 35.6m

Table 2. Summary of current meter deployment

	Cell	Depth Below Surface (m)	Distance from Seabed (m)	Mean current speed (cm/s)
Near surface:	51	5.19	28.42	16.75
Cage bottom:	29	16.19	17.42	14.61
Near bed:	1	30.19	3.42	12.79
			Average current speed:	14.72

Table 3. Ranked percentiles for current speed at all three depths

Cell	Ranked Percentile (%) for mean speed	≤3cm/s (%)	≥4.5cm/s (%)	≥9.5cm/s (%)
Near surface:	54	4	92	63
Cage bottom:	53	5	89	67
Near bed:	52	4	91	64

Table 4. Major axis

Cell	Major Axis (Deg-G)
Near surface:	350
Cage Bottom:	345
Near bed:	330

Table 5. Mean and residual currents

Cell	Mean Speed (m/s)	Residual Speed (m/s)	Residual Parallel (m/s)	Residual Normal (m/s)	Tidal Amplitude Parallel (m/s)	Tidal Amplitude Normal (m/s)
Near Surface:	0.167	0.072	0.071	-0.014	0.241	0.071
Cage Bottom:	0.146	0.060	0.060	-0.004	0.215	0.054
Near Bed:	0.128	0.005	0.005	0.000	0.193	0.063

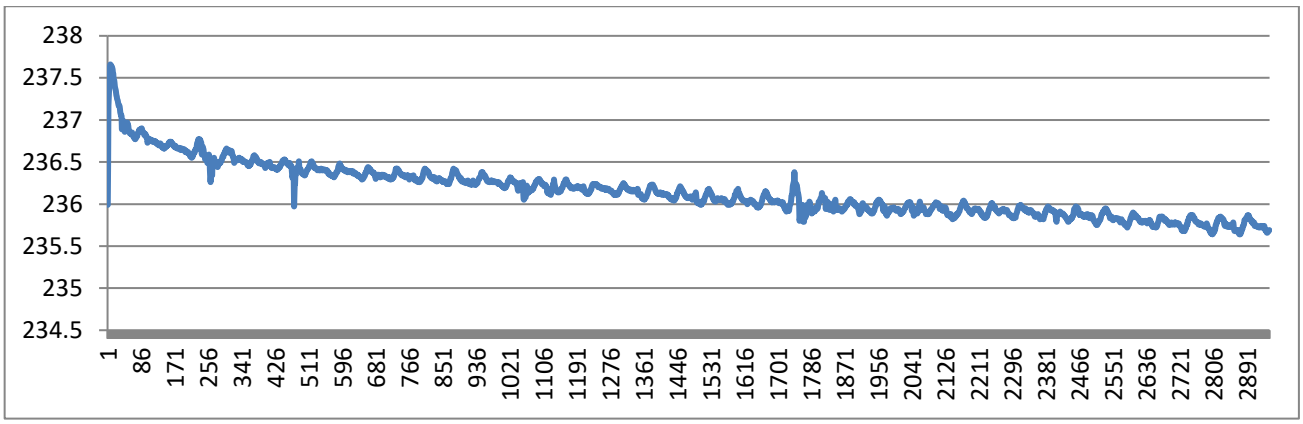


Figure 10. Summary of heading data from deployment ID350.

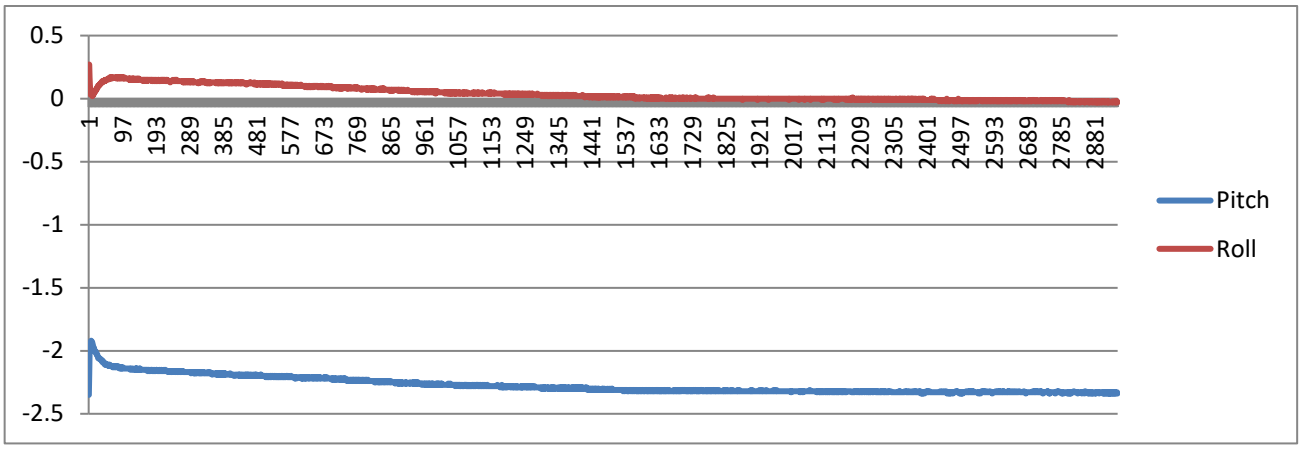


Figure 11. Summary of pitch and roll data from deployment ID350.

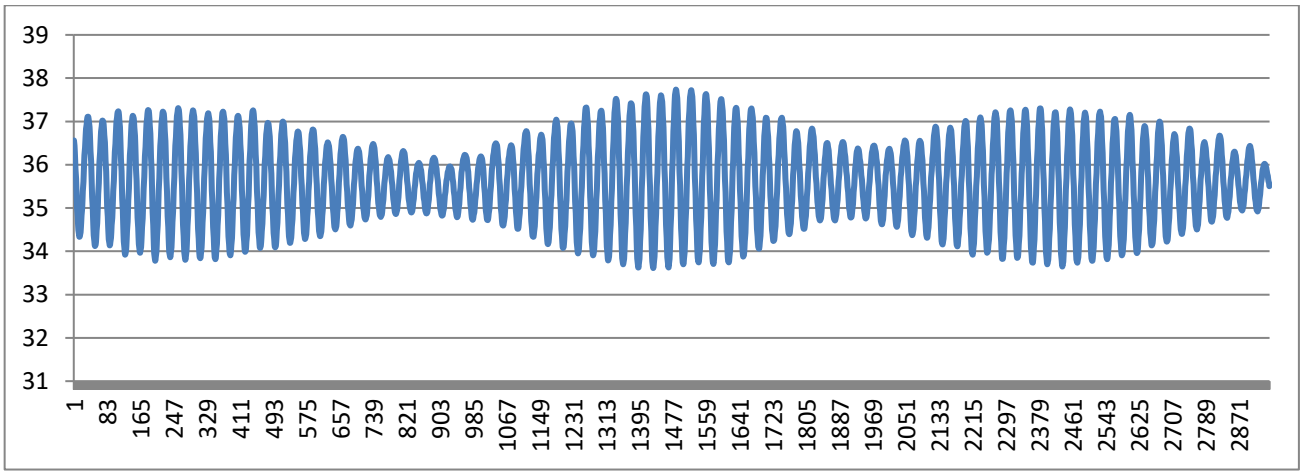


Figure 12. Pressure data from deployment ID350.

6. Conclusion

MOWI has collected and analysed current and bathymetric data for the proposed technical variation at the Muck fish farm. The analysed current data for the 40 days and 22 hours period are believed to be reliable and representative of the proposed location. The bathymetric data from the wider-area UKHO bathymetry data provided a coherent bathymetric dataset for the site.

Annex 1. Survey Equipment Deployment Log

Location:	Muck
Nearest tidal port:	Galmisdale Pier, Isle of Eigg
Time zone:	UTC
Meter switched on:	10:09 08/04/2010
Meter switched off:	03:49 19/05/2010
Period used for this report:	10:29 08/04/2010 – 09:09 19/05/2010
ADCP serial number:	6343
Meter position:	56.84458N, -6.21283W
	143198 E 780484 N
Minimum water depth:	33.61 m (32.91 m measured by ADCP + 0.7 m *)
Water depth (Chart Datum):	32.61 m (actual minimum water depth - 1 m tide timetable)
Mean water depth:	36.4 m (35.6 measured by ADCP + 0.7 m *)
Depth of meter from surface:	34.73 m (below mean low water spring to transducer)
Height of meter from seabed:	0.7 m to transducer head
Sounding at deployment:	34.6 m @ 10:29 on 08/04/2010

Table A1. ADCP meter settings:

Reference:	Transducer
Bin size (m):	0.5
First Cell Range (m):	2.72
Number of bins:	89
Frequency (kHz):	307
Recording interval (mins):	20
No. pings per ensemble:	300
Magnetic correction:	0
Ensemble:	300
Standard Deviation (cm/sec):	28
Time/Ping (seconds):	2

Muck

Hydrographic Data Report: Deployment ID351

8th April to 18th May 2010

Report written by [redacted]
Report checked by [redacted]

October 2021
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1. Introduction

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Mowi Scotland Ltd have carried out hydrographic surveys at the site in 2010 and again in 2021. Hydrographic data at Muck was gathered during this time in three deployments:

i. 8th April to 19th May 2010 (ID350)
ii. 8th April to 18th May 2010 (ID351)
iii. 27th January to 15th April 2021 (ID366)

This report describes the data from the 8th April to 18th May 2010 deployment at Muck (ID351). The purpose of this report is to assess the suitability of the collected hydrographic data for input into a hydrodynamic model of the Small Isles region and into the NewDepomod model.

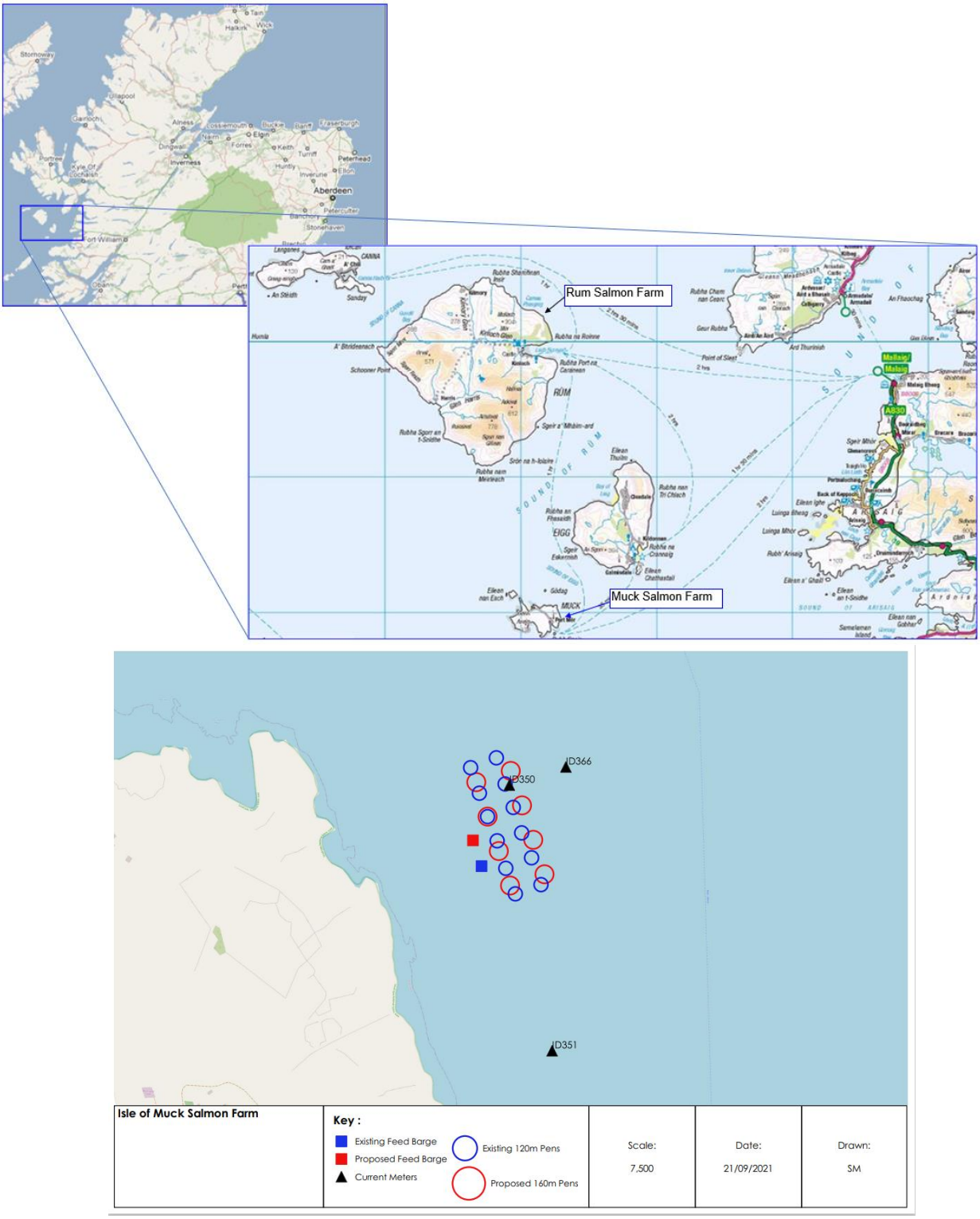


Figure 1. Site location (top) and layout (bottom) and of the salmon farm near the Isle of Muck. The current meter deployment locations are marked by the black triangles.

2. Materials & Methods

2.1 Bathymetry

Bathymetry for the study area was taken from the UKHO INSPIRE bathymetry data (http://aws2.caris.com/ukho/mapViewer/map.action).

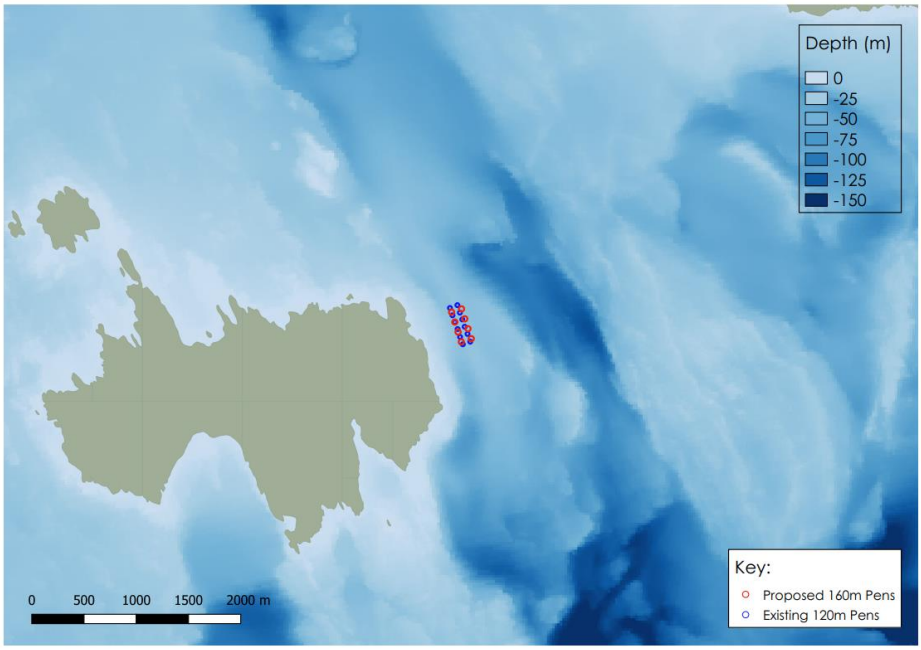


Figure 2. Bathymetry in the region around the Isle of Muck.

2.2 Current Data

Mowi staff carried out hydrographic surveys at the site during 2010 and again in 2021. The purpose of this hydrographic report is to assess the suitability of the collected hydrographic data for use with the NewDepomod and Hydrodynamic models. The data contained in this report were recorded at the site from 8th April to 18th May 2010 (40 days and 6 hours of data; deployment ID351). The data from two other deployments (ID350 and ID366) are presented in separate hydrographic reports.

The WorkHorse ADCP (Table 1), within its mooring frame, was positioned at 56.83808'N, -6.21017'W (143316E 779751N), which was approximately 335m from the nearest shoreline and approximately 615m from the centre of the proposed cage group (Figure 1). The transducer head was 70 cm from the base of the mooring frame. The mean depth (derived from the pressure sensor) at the WorkHorse ADCP position was 39.61 m.

Initial soundings were taken to establish the possible depth the WorkHorse ADCP would be situated at during high tide and so that the most appropriate cell size could be determined. The cell size was set at 0.5 m and the number of cells to 119.

Data was automatically written and stored to the internal memory within the WorkHorse ADCP main body and then downloaded to computer after completion of the deployment period via WiFi.

2.3 Magnetic Variation

No magnetic variation correction was made to the WorkHorse ADCP during deployment, this was undertaken to the data after the instrument was recovered and data downloaded. The magnetic variation used was -5.07°; this was determined using the World Magnetic Model, produced jointly with the US National Oceanographic and Atmospheric Administration's National Geophysical Data center. Further details can be found at http://www.geomag.bgs.ac.uk/navigation.html

2.4 Data Processing

Upon retrieval of the WorkHorse ADCP current meter, all data was downloaded to a computer for analysis. The raw data file was opened in Teledyne's "Velocity" software and Matlab. Deployment diagnostic data (beam intensity, correlation, pitch and roll) were analysed to confirm that the deployment was successful with the instrument orientated upright. The heading data were also examined to identify any movement of the WorkHorse ADCP mooring frame during the deployment.

The diagnostic data suggested that velocities from the first 76 bins were valid (Figure 3). Calculations were undertaken to identify the cells to be used for surface and middle currents. Surface data was taken at an average depth (derived from the pressure sensor) of 5.97 m (cell 76), and cage-bottom data at 16.47 m (cell 55). Surface and middle cell heights above were 40.92 m and 30.42 m from the seabed respectively. The bottom cell (cell 1) was at a depth of 43.47 m and 3.42 m above the seabed.

Table 1: WorkHorse ADCP Specifications.

A Teledyne RD Instruments Marine Measurements Datasheet

Workhorse Sentinel

Self-Contained 1200, 600, 300 kHz ADCP

TECHNICAL SPECIFICATIONS

Water Profiling	Depth Cell Size[1]	Typical Range[2] 12m **1200kHz**		Typical Range[2] 50m **600kHz**		Typical Range[2] 110m **300kHz**	
	Vertical Resolution	Range[3]	Std. Dev.[4]	Range[3]	Std. Dev.[4]	Range[3]	Std. Dev.[4]
	0.25m	11m	14.0cm/s				
	0.5m	12m	7.0cm/s	38m	14.0cm/s	see note 1	
	1m	13m	3.6cm/s	42m	7.0cm/s	83m	14.0cm/s
	2m	15m[5]	1.8cm/s	46m	3.6cm/s	93m	7.0cm/s
	4m	see note [1]		51m[5]	1.8cm/s	103m	3.6cm/s
	8m					116m[5]	1.8cm/s
Long Range Mode	2m	19m	3.4m/s				
	4m			66m	3.6cm/s		
	8m					154m	3.7cm/s
Profile Parameters	Velocity accuracy	0.3% of the water velocity relative to ADCP ±0.3cm/s		0.3% of the water velocity relative to ADCP ±0.3cm/s		0.5% of the water velocity relative to ADCP ±0.5cm/s	
	Velocity resolution	0.1cm/s		0.1cm/s		0.1cm/s	
	Velocity range:	±5m/s (default) ±20m/s (max)		±5m/s (default) ±20m/s (max)		±5m/s (default) ±20m/s (max)	
	Number of depth cells	1–255		1–255		1–255	
	Ping rate	Up to 10Hz		Up to 10Hz		Up to 10Hz	
Echo Intensity Profile	Vertical resolution	Depth cell size, user configurable					
	Dynamic range	80dB					
	Precision	±1.5dB					
Transducer and Hardware	Beam angle	20°					
	Configuration	4-beam, convex					
	Internal memory	Two PCMCIA card slots; one memory card included					
	Communications	RS-232 or RS-422; ASCII or binary output at 1200-115,200 baud					
Power	DC input	20–50VDC.					
	Number of batteries	1 internal battery pack					
	Internal battery voltage	42VDC (new) 28VDC (depleted)					
	Battery capacity @ 0°C	450 watt hrs					
Standard Sensors	Temperature (mounted on transducer)	Range -5° to 45°C, Precision ±0.4°C, Resolution 0.01°					
	Tilt	Range ±15°, Accuracy ±0.5°, Precision ±0.5°, Resolution 0.01°					
	Compass (fluxgate type, includes built-in field calibration feature)	Accuracy ±2°[5], Precision ±0.5°[5], Resolution 0.01°, Maximum tilt ±15°					
Environmental	Standard depth rating	200m; optional to 500m, 1000m, 6000m					
	Operating temperature	-5° to 45°C					
	Storage temperature (without batteries)	-30° to 60°C					
	Weight in air	13.0kg					
	Weight in water	4.5kg					
Software	TRDI's Windows™-based software included: **WinSC**—Data Acquisition System; **WinADCP**—Data Display and Export						
Available Options	• Memory: 2 PCMCIA slots, total 4GB • Pressure sensor • External battery case • High-resolution water-profiling modes • Bottom tracking or surface referencing track • AC/DC power converter, 48VDC output • Pressure cases for depths up to 6000m • Directional Wave Array • Acoustic Modem • Inductive Modem • **Velocity** for advanced post processing						
Dimensions	228.0mm wide x 405.5mm long *(line drawings available upon request)*						

1 User's choice of depth cell size is not limited to the typical values specified.
2 Longer ranges available.
3 Profiling range based on temperature values at 5°C and 20°C, salinity = 35ppt.
4 BroadBand mode single-ping standard deviation (Std. Dev.).
5 <±1.0° is commonly achieved after calibration.

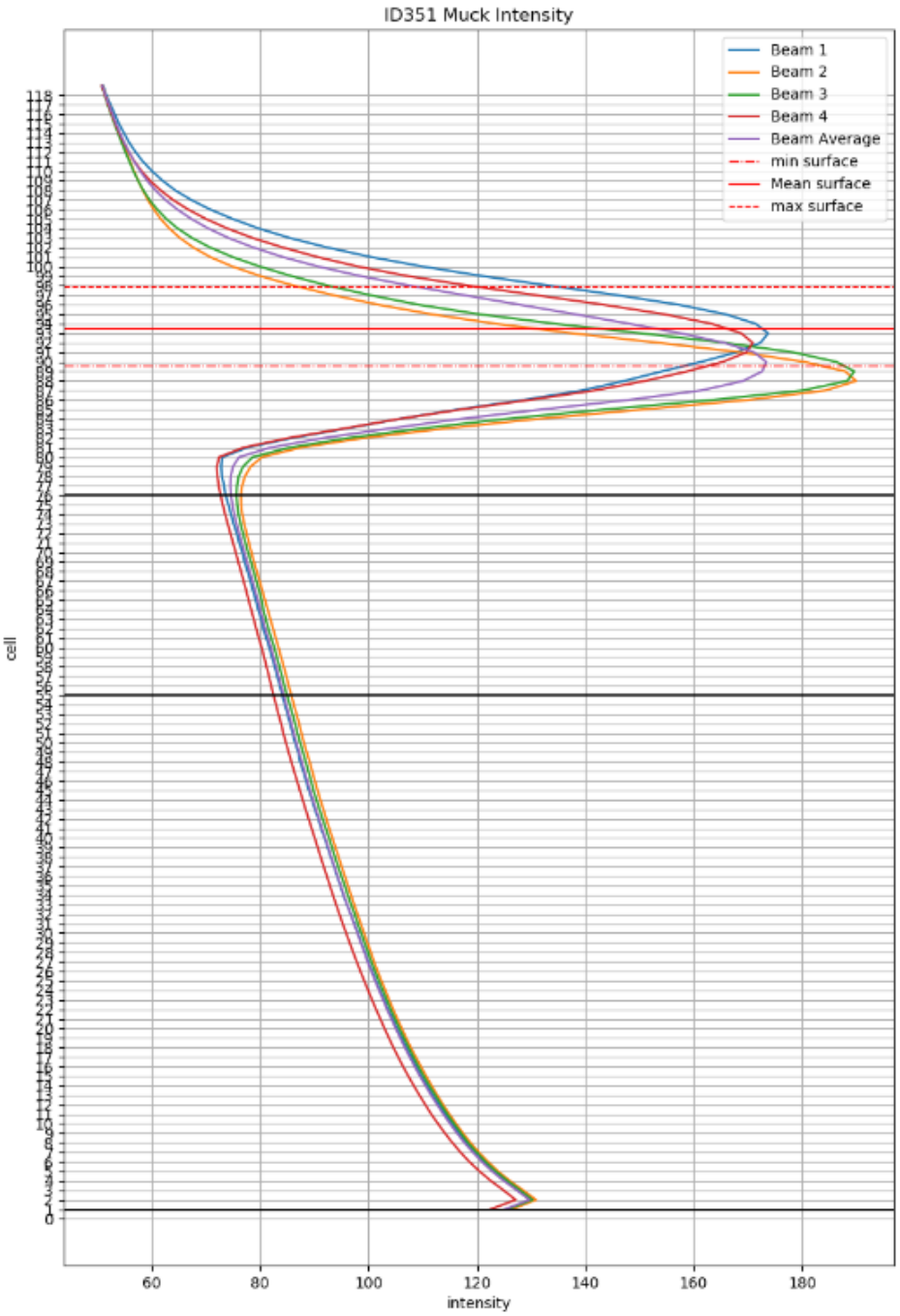


Figure 3. Mean intensity of the ADCP signal for the ID351 dataset plotted by bin number

The 'first cell range' is automatically calculated by the instrument, which is the distance from the transducer head to the first cell. For this deployment, the first cell range was calculated as 2.72 m. This value is then added to the height of the instrument frame (0.7 m) to get the first cell height above the seabed, which equated to 3.42 m

Standard deviation has been assessed throughout the deployment to identify accurate and reliable data for near bed, middle and surface cells using the following equation:

$$Cell\ StdDev = \frac{Instrument\ StdDev}{\sqrt{No.\ valid\ pings}} \qquad (1)$$

The Instrument Standard Deviation (StdDev) in Equation 1 is determined using the deployment settings when the meter is programmed, examples of the StdDev values for different configurations are shown in Table 1. This deployment had a cell size of 0.5m which equates to an Instrument StdDev of 28 cm/s.

The Percentage of valid pings used to calculate Cell StdDev is derived using “Percentage Good” data which allows us to relate the StdDev to the actual data gathered. The percent good data is available for 1, 2, 3 and 4 beams which represent the following:

- Percent good 1 = % of good data computed from 3 Beams
- Percent good 2 = % of bad data due to more than 2 Beam bad
- Percent good 3 = % of bad data due to error velocity exceeded
- Percent good 4 = % of good data computed from 4 Beams

The method described has been used to calculate the Standard deviation throughout the deployment for the surface, middle and bottom cells; the average StdDev values for the surface, middle and bottom was 1.66cm/s, 1.64cm/s and 1.63cm/s respectively which are all within the SEPA criteria of 2cm/s.

2.5 Meteorological Data

The collection of meteorological data is no longer required to support the assessment process and consequently has not been undertaken. The current data used is collected using mulitple deployments and over a longer period and thus provides a more realistic representation of site conditions than short deployments, thus allowing an assessment of the influence of meterological conditions.

3. Results and Discussion

A summary of the current data is shown in Figure 4 to Figure 12 and in Table 2 to Table 5. Over the period analysed for this report, the near-surface, middle and bottom cells had current speed averages of 16.73 cm/s, 15.74 cm/s and 14.4 cm/s respectively. This gave an overall average of 15.62 cm/s. The orientation of the tidal velocities was north-south.

Residual currents at the surface and mid-depth were toward the north (340°G and 346°G respectively); near the seabed, the residual flows during the deployment period were to the west (248°G, Figure 9). The magnitude of the residual currents for the surface, middle and bottom cells were moderate, with mean values of 0.042 m/s, 0.037 m/s and 0.027 m/s respectively.

4. Hydrographic Data Summary Sheets

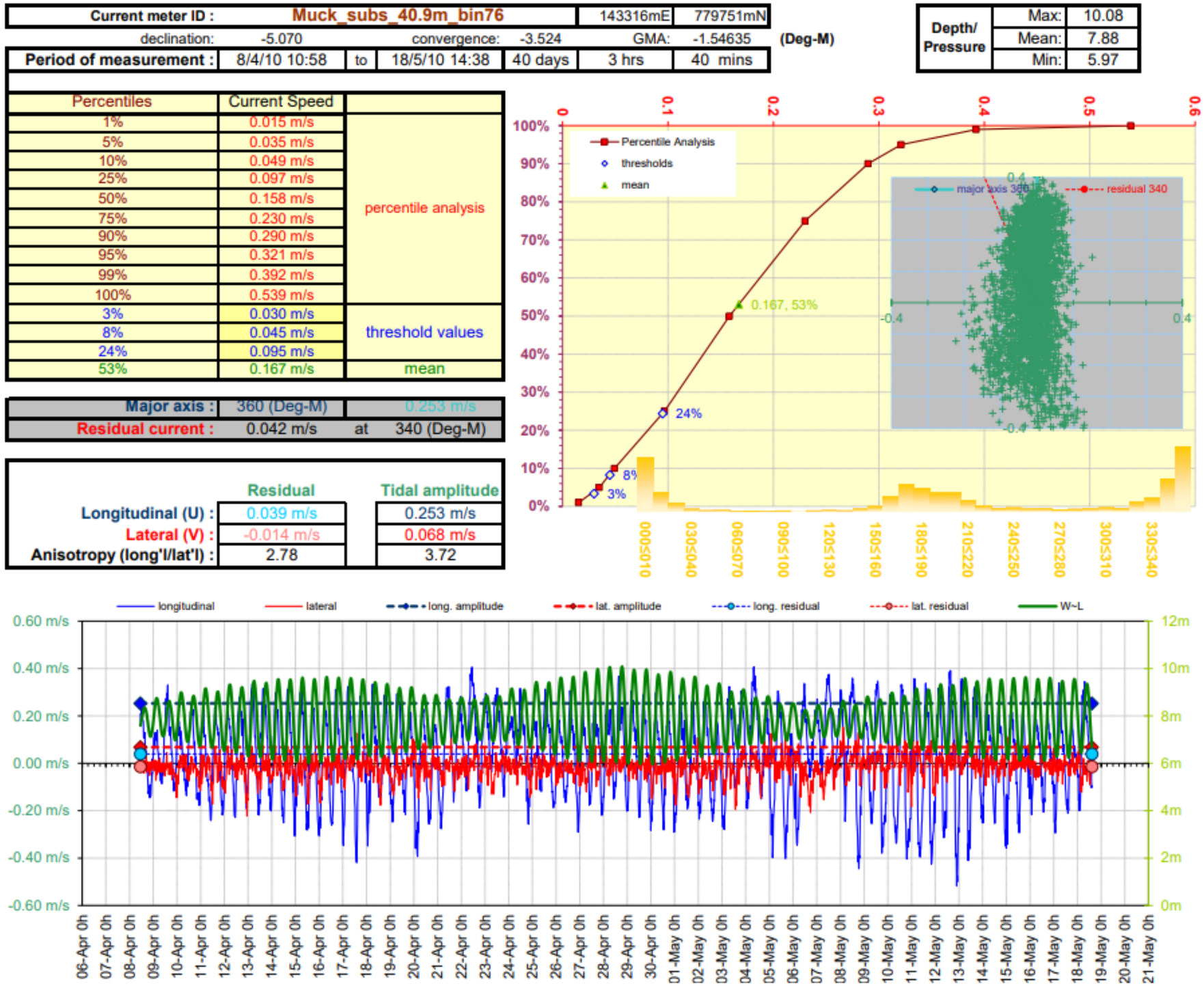


Figure 4. Current Data Summary Sheet for the surface current cell 76, 40.9m from seabed, 8th April to 18th May 2010 inclusive (ID351).

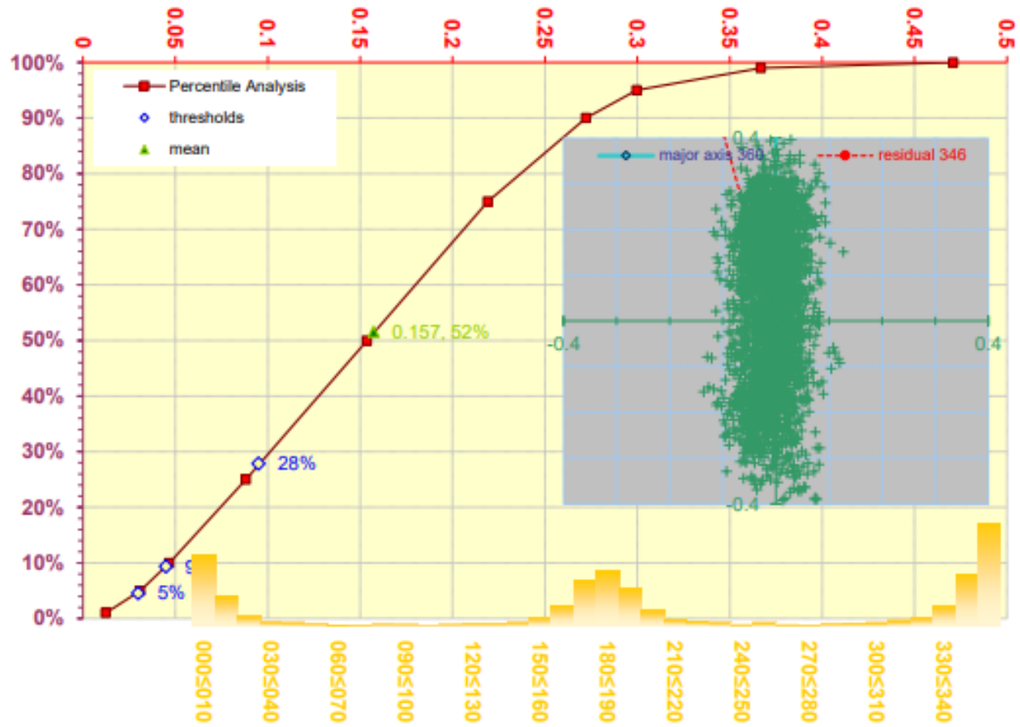
Current meter ID :	Muck_cbot_30.4m_bin55				143316mE	779751mN
declination:	-5.070		convergence:	-3.524	GMA:	-1.54635 (Deg-M)
Period of measurement :	8/4/10 10:58	to	18/5/10 14:38	40 days	3 hrs	40 mins

Depth/ Pressure		
	Max:	20.58
	Mean:	18.38
	Min:	16.47

Percentiles	Current Speed	
1%	0.012 m/s	percentile analysis
5%	0.031 m/s	
10%	0.047 m/s	
25%	0.088 m/s	
50%	0.154 m/s	
75%	0.219 m/s	
90%	0.272 m/s	
95%	0.300 m/s	
99%	0.367 m/s	
100%	0.471 m/s	
5%	0.030 m/s	threshold values
9%	0.045 m/s	
28%	0.095 m/s	
52%	0.157 m/s	mean

Major axis :	360 (Deg-M)		0.242 m/s
Residual current :	0.037 m/s	at	346 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.036 m/s	0.242 m/s
Lateral (V) :	-0.009 m/s	0.051 m/s
Anisotropy (long'l/lat'l) :	4.14	4.75



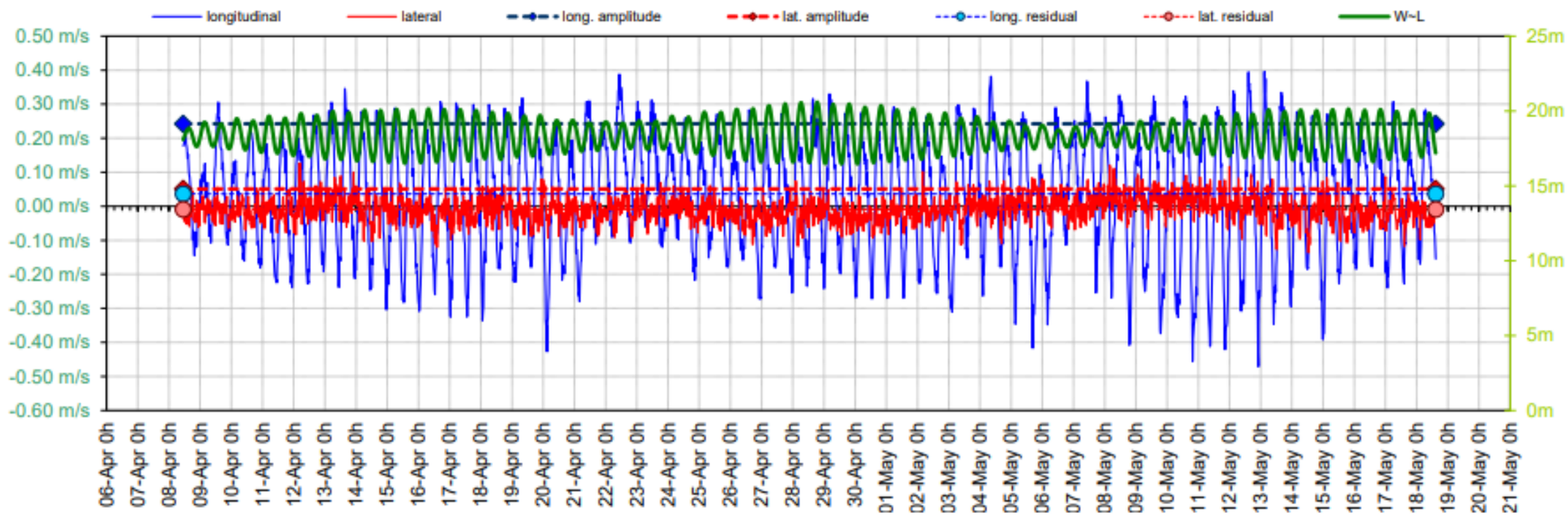


Figure 5. Current Data Summary Sheet for the cage bottom current cell 55, 30.4m from seabed, 8th April to 18th May 2021 inclusive (ID351).

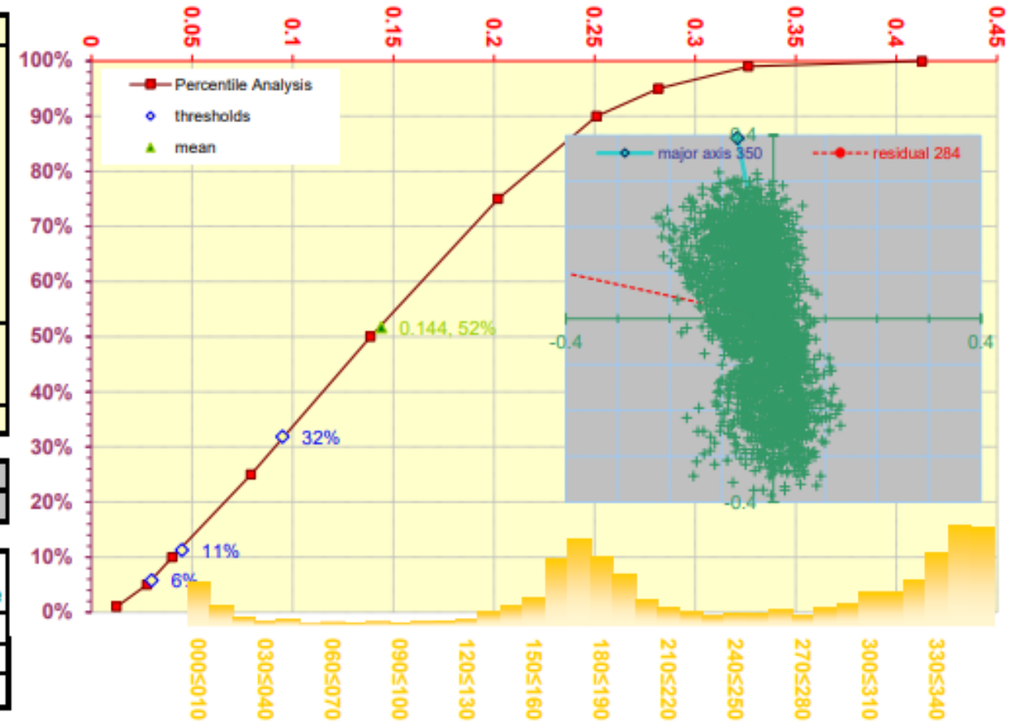
Current meter ID :	Muck_nrbd_3.4m_bin1			143316mE	779751mN
declination:	-5.070	convergence:	-3.524	GMA:	-1.54635 (Deg-M)
Period of measurement :	8/4/10 10:58	to	18/5/10 14:38	40 days	3 hrs	40 mins

Depth/ Pressure	Max:	47.58
	Mean:	45.38
	Min:	43.47

Percentiles	Current Speed	
1%	0.012 m/s	percentile analysis
5%	0.028 m/s	
10%	0.040 m/s	
25%	0.079 m/s	
50%	0.139 m/s	
75%	0.202 m/s	
90%	0.251 m/s	
95%	0.282 m/s	
99%	0.327 m/s	
100%	0.413 m/s	
6%	0.030 m/s	threshold values
11%	0.045 m/s	
32%	0.095 m/s	
52%	0.144 m/s	mean

Major axis :	350 (Deg-M)	0.219 m/s
Residual current :	0.027 m/s	at 284 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.011 m/s	0.219 m/s
Lateral (V) :	-0.025 m/s	0.069 m/s
Anisotropy (long'l/lat'l) :	0.44	3.17



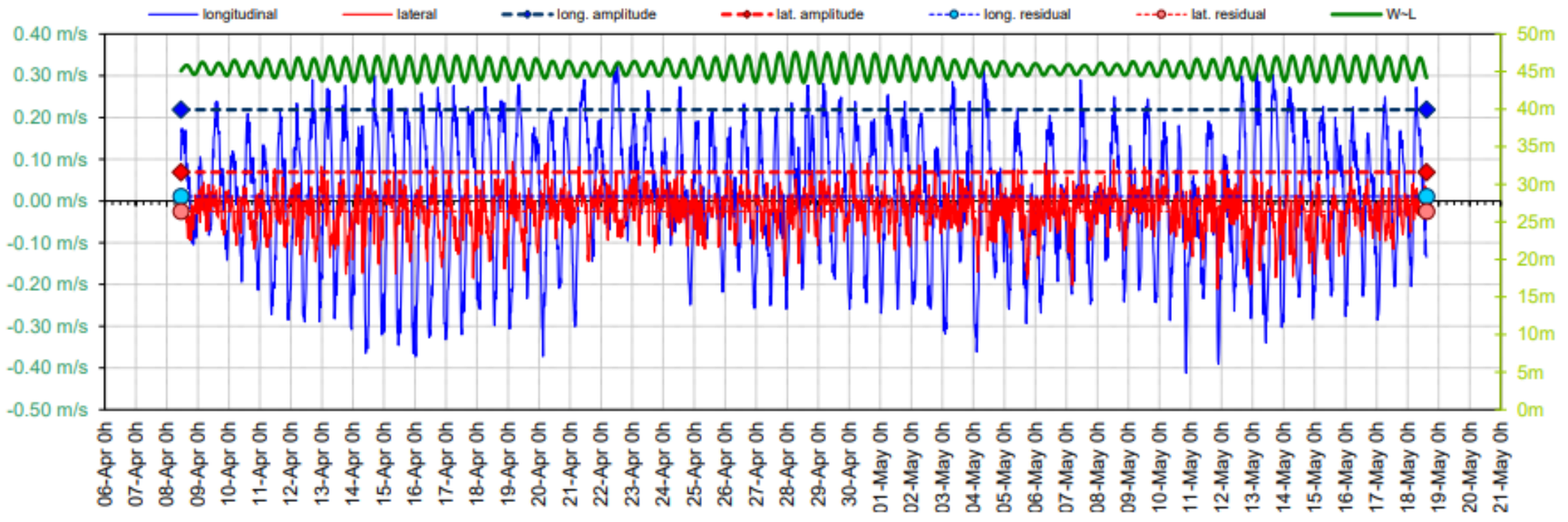


Figure 6. Current Data Summary Sheet for the near bottom current cell 1, 3.4m from seabed, 8th April to 18th May 2021 inclusive (ID351).

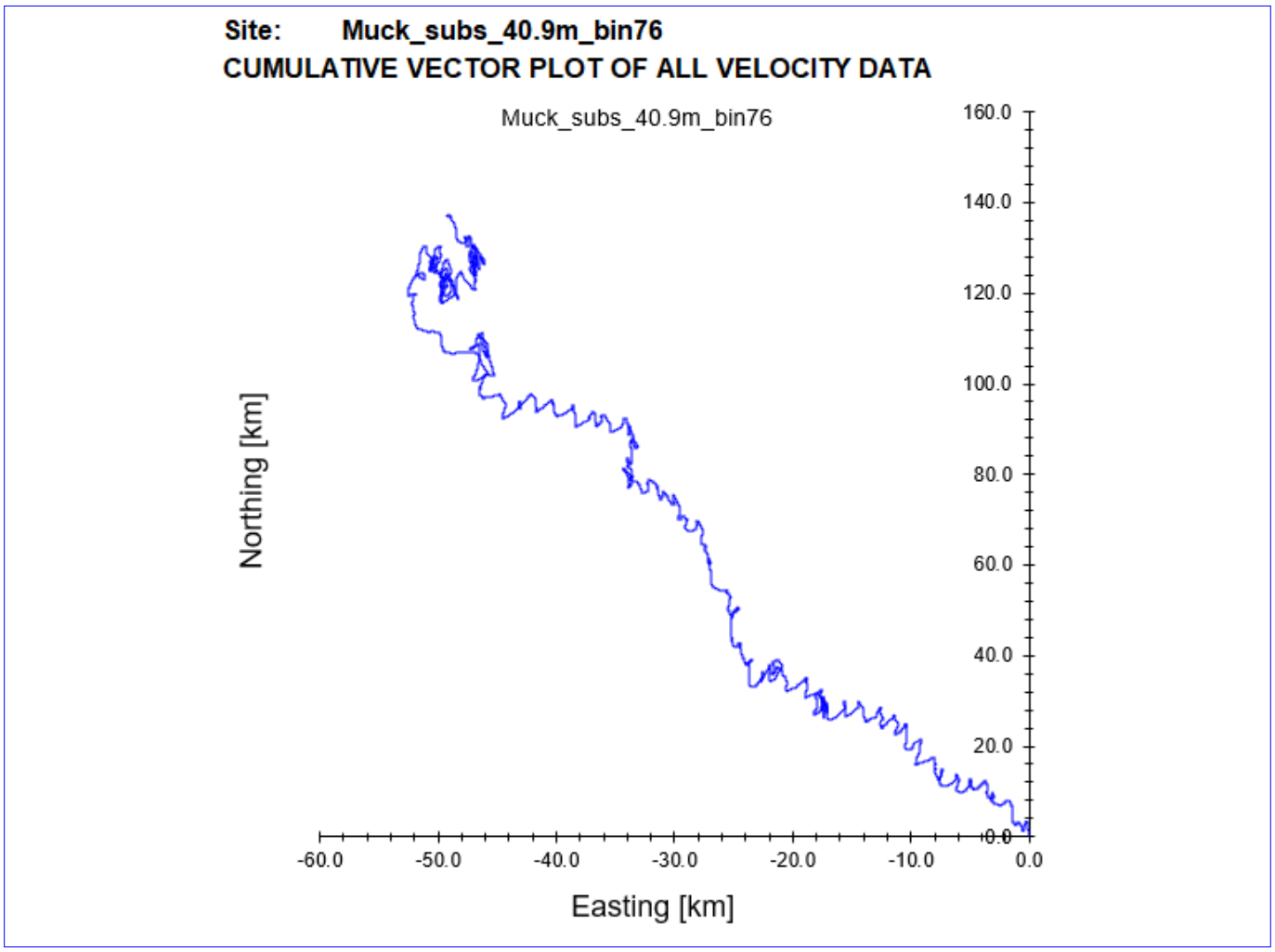


Figure 7. Cumulative Vector Plot of all velocity data from near surface cell for ID351.

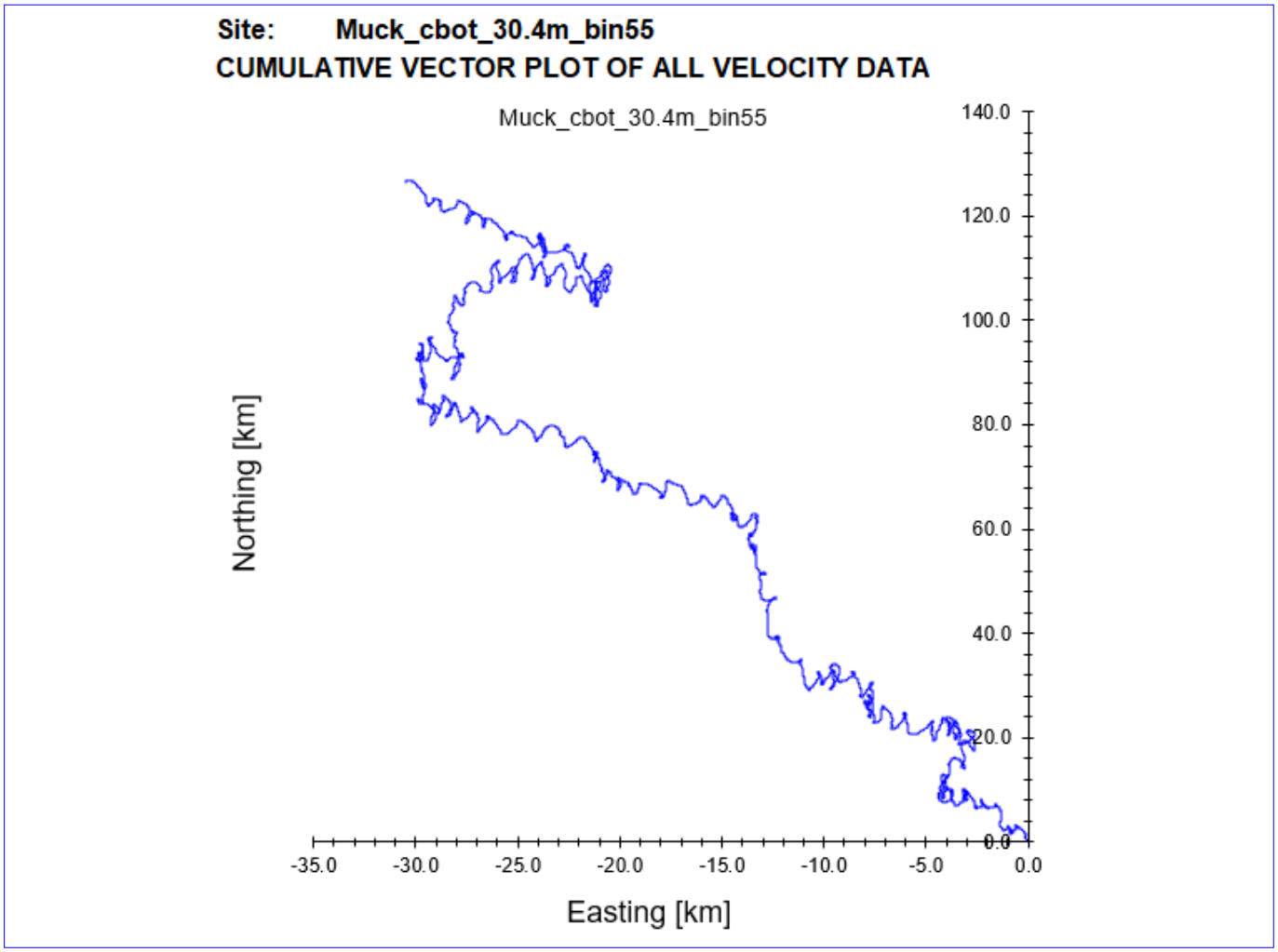


Figure 8. Cumulative Vector Plot of all velocity data from cage bottom cell for ID351.

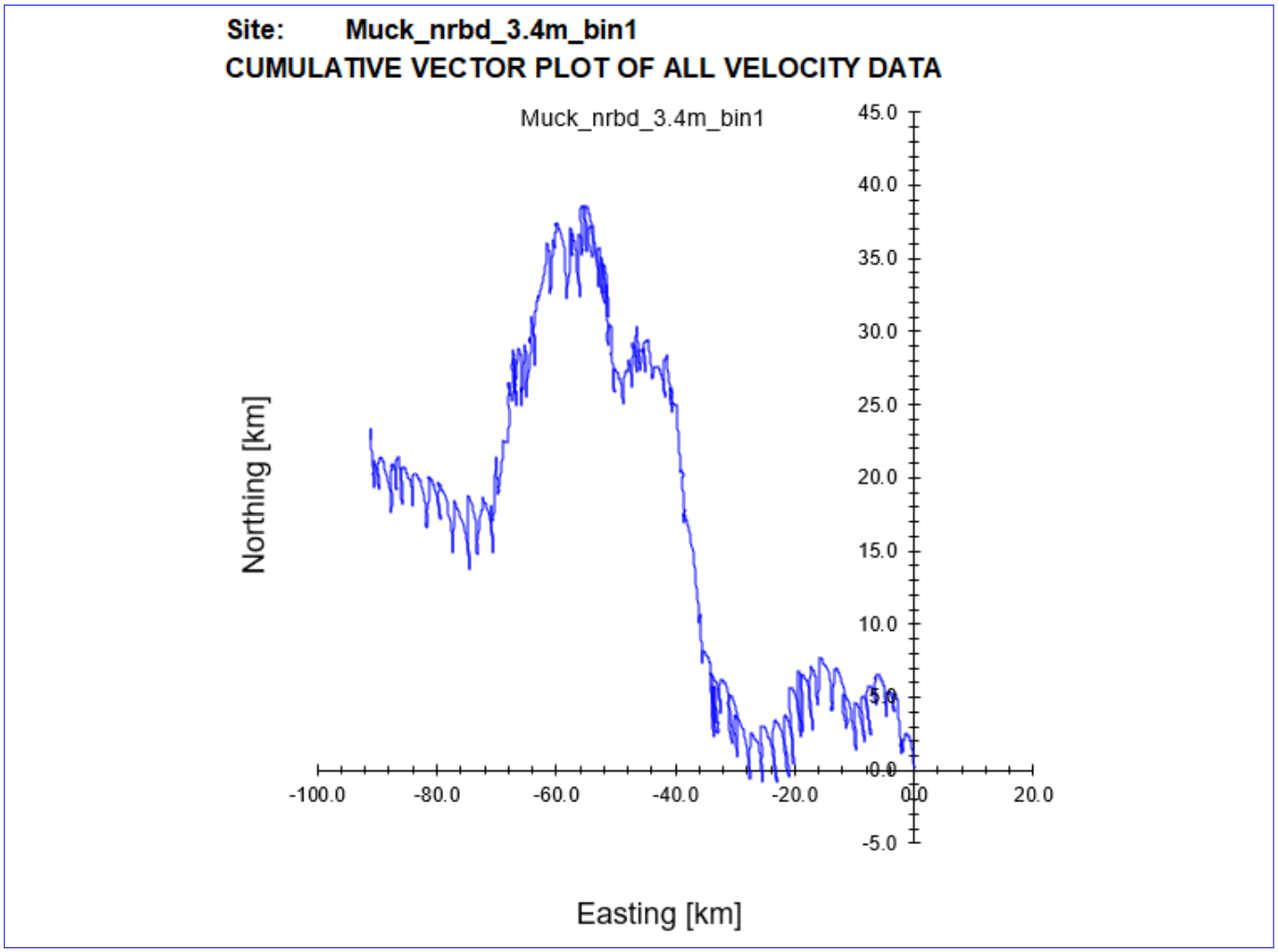


Figure 9. Cumulative Vector Plot of all velocity data from near bottom cell for ID351.

5. Summary of Current Data – ID351

Site Name: Muck
Data start date: 08/04/2010
Data end date: 18/05/2010
Mean Water Depth: 48.8 m

Table 2. Summary of current meter deployment

	Cell	Depth Below Surface (m)	Distance from Seabed (m)	Mean current speed (cm/s)
Near surface:	76	5.97	40.92	16.73
Cage bottom:	55	16.47	30.42	15.74
Near bed:	1	43.47	3.42	14.4
			Average current speed:	15.62

Table 3. Ranked percentiles for current speed at all three depths

Cell	Ranked Percentile (%) for mean speed	≤3cm/s (%)	≥4.5cm/s (%)	≥9.5cm/s (%)
Near surface:	53	3	92	76
Cage bottom:	52	5	91	72
Near bed:	52	6	89	68

Table 4. Major axis

Cell	Major Axis (Deg-G)
Near surface:	360
Cage Bottom:	360
Near bed:	350

Table 5. Mean and residual currents

Cell	Mean Speed (m/s)	Residual Speed (m/s)	Residual Parallel (m/s)	Residual Normal (m/s)	Tidal Amplitude Parallel (m/s)	Tidal Amplitude Normal (m/s)
Near surface:	0.167	0.042	0.039	-0.014	0.253	0.068
Cage bottom:	0.157	0.037	0.036	-0.009	0.242	0.051
Near bed:	0.144	0.027	0.011	-0.025	0.219	0.069

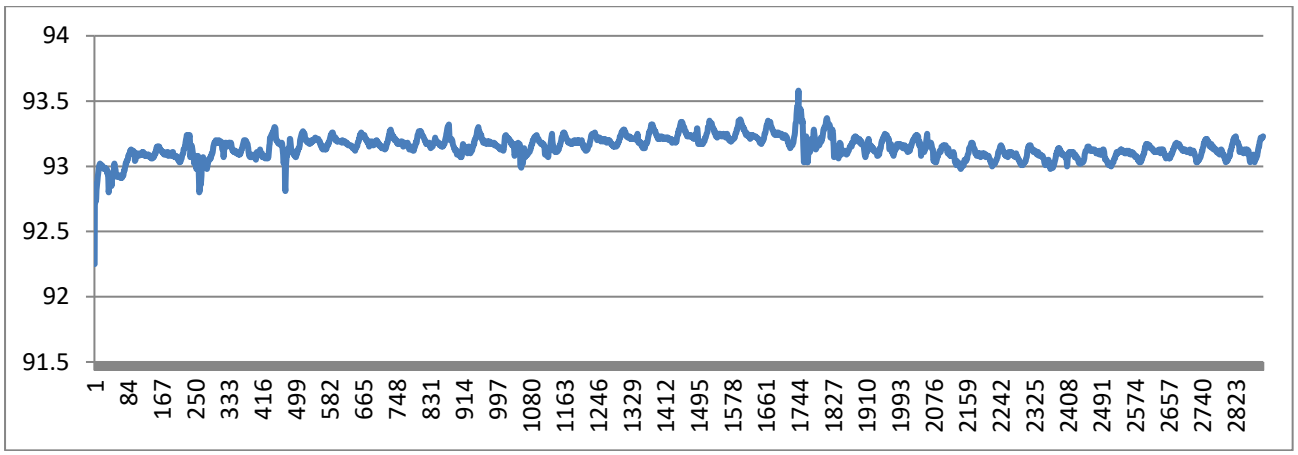


Figure 10. Summary of heading data from deployment ID351.

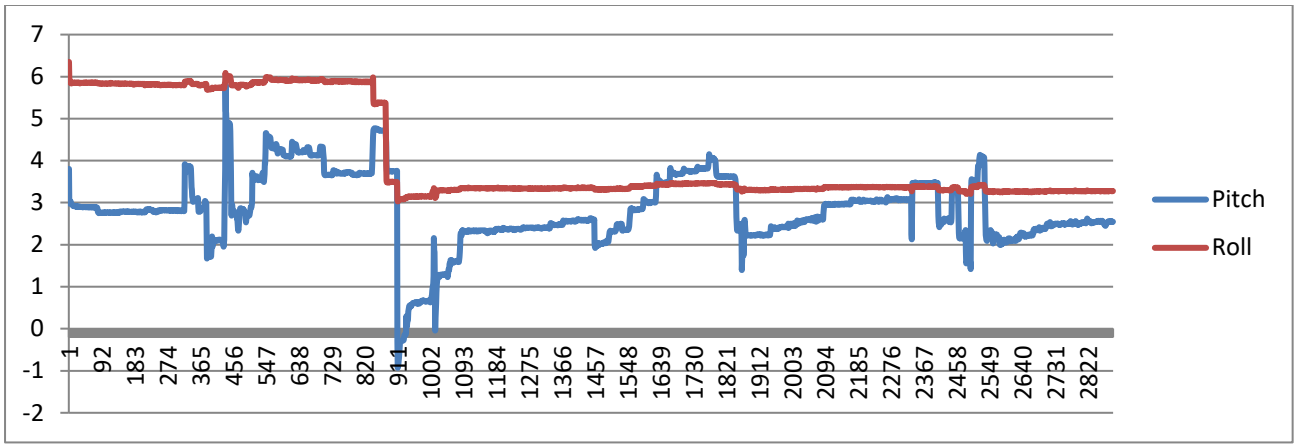


Figure 11. Summary of pitch and roll data from deployment ID351.

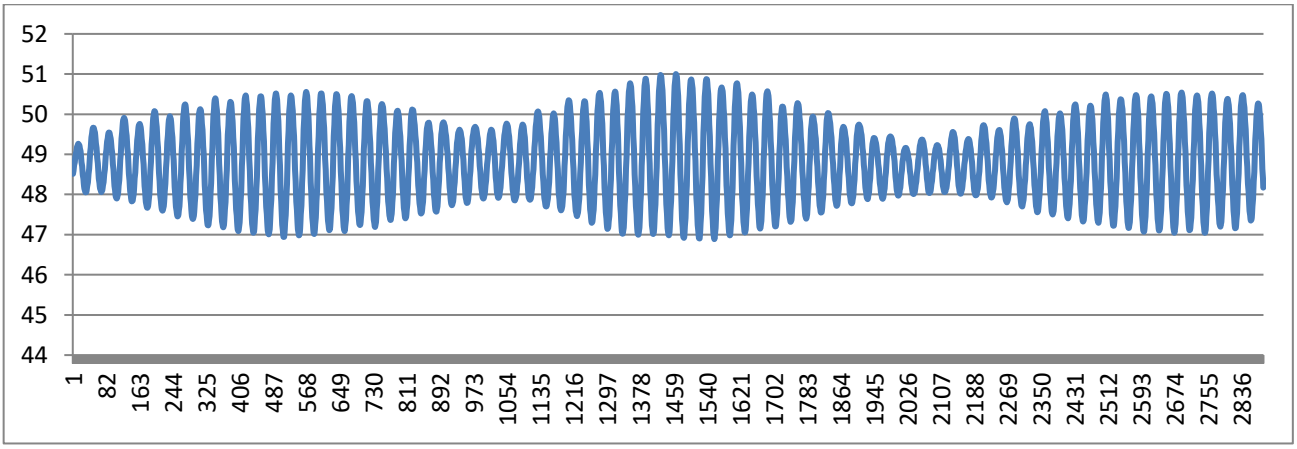


Figure 12. Pressure data from deployment ID351

6. Conclusion

MOWI has collected and analysed current and bathymetric data for the proposed technical variation at the Muck fish farm. The analysed current data for the 40 days and 6 hours period are believed to be reliable and representative of the proposed location. The bathymetric data from the wider-area UKHO bathymetry data provided a coherent bathymetric dataset for the site.

Annex 1. Survey Equipment Deployment Log

Location:	Muck
Nearest tidal port:	Galmisdale Pier, Isle of Eigg
Time zone:	UTC
Meter switched on:	10:18 08/04/2010
Meter switched off:	16:38 18/05/2010
Period used for this report:	10:58 08/04/2010 – 14:38 18/05/2010
ADCP serial number:	0
Meter position:	56.83808N -6.21017W
	143316 E 779751 N
Minimum water depth:	46.89 m (46.19m measured by ADCP + 0.7 m *)
Water depth (Chart Datum):	45.99 m (minimum water depth – 0.9 m tide timetable)
Mean water depth:	48.8 m (48.1 measured by ADCP + 0.7 m *)
Depth of meter from surface:	47.35 m (below mean low water spring to transducer)
Height of meter from seabed:	0.7 m to transducer head
Sounding at deployment:	47.8 m @ 10:58 on 08/04/2010

Table A1. ADCP meter settings:

Reference:	Transducer
Bin size (m):	0.5
First Cell Range (m):	2.72
Number of bins:	119
Frequency (kHz):	307
Recording interval (mins):	20
No. pings per ensemble:	300
Magnetic correction:	0
Ensemble:	300
Standard Deviation (cm/sec):	28
Time/Ping (seconds):	2

Muck

Hydrographic Data Report: Deployment ID366

27th January to 15th April 2021

Report written by [redacted]
Report checked by [redacted]

September 2021
Mowi Scotland Limited

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Figure 6. Current Data Summary Sheet for the near bottom current cell 1, 3.71m from seabed, 27th January to 15th April 2021 inclusive (ID366). **14**

Figure 7. Cumulative Vector Plot of all velocity data from near surface cell for ID366. **15**

Figure 8. Cumulative Vector Plot of all velocity data from cage bottom cell for ID366. **16**

Figure 9. Cumulative Vector Plot of all velocity data from near bottom cell for ID366. **17**

Figure 10. Summary of heading data from deployment ID366. **19**

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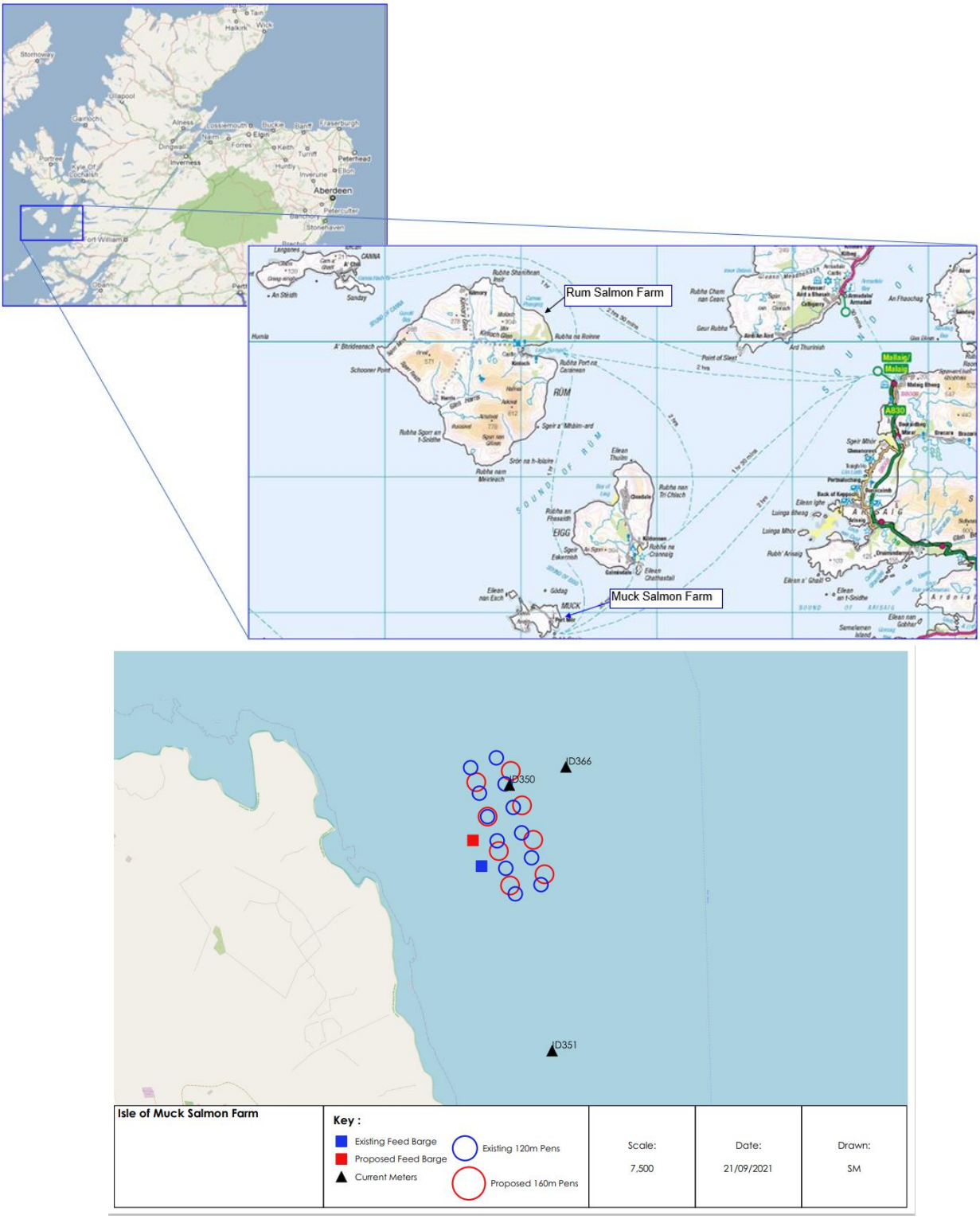


Figure 1. Site location (top) and layout (bottom) and of the salmon farm near the Isle of Muck. The current meter deployment locations are marked by the black triangles.

2. Materials & Methods

2.1 Bathymetry

Bathymetry for the study area was taken from the UKHO INSPIRE bathymetry data (http://aws2.caris.com/ukho/mapViewer/map.action).

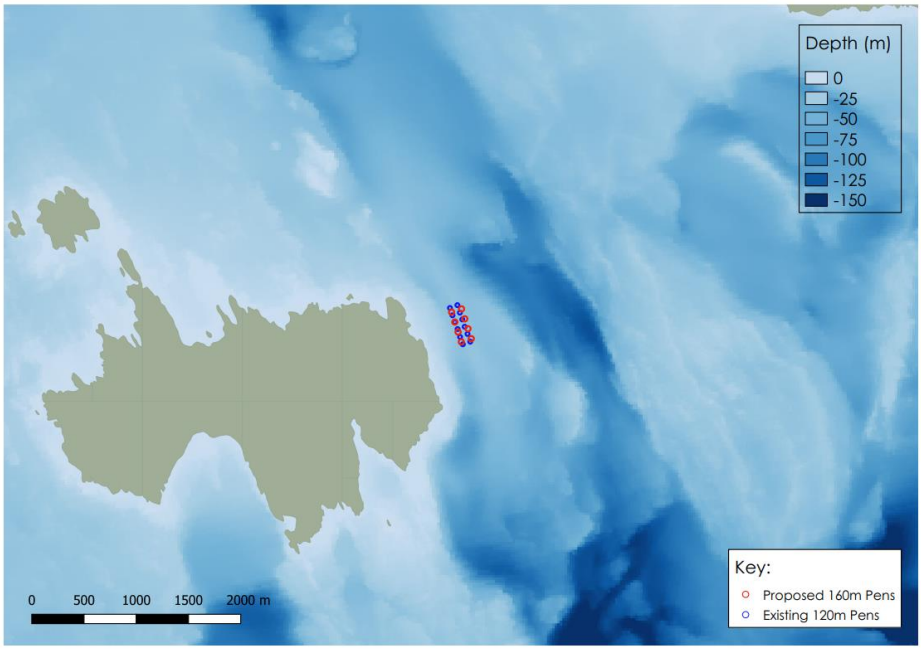


Figure 2. Bathymetry in the region around the Isle of Muck.

2.2 Current Data

Mowi staff carried out hydrographic surveys at the site during 2010 and again in 2021. The purpose of this hydrographic report is to assess the suitability of the collected hydrographic data for use with the NewDepomod and Hydrodynamic models. The data contained in this report were recorded at the site from 27th January to 15th April 2021 (77 days and 18 hours of data; deployment ID366). The data from two earlier deployments (ID350 and ID351) are presented in separate hydrographic reports.

The Sentinel V100 (Wide) ADCP (Table 1), within its mooring frame, was positioned at 56.84512'N, -6.21033'W (143354E 780534N), which was approximately 615m from the nearest shoreline and approximately 220m from the centre of the proposed cage group (Figure 1). The transducer head was 70 cm from the base of the mooring frame. The mean depth (derived from the pressure sensor) at the Sentinel V100 ADCP position was 39.61 m.

Initial soundings were taken to establish the possible depth the Sentinel V100 ADCP would be situated at during high tide and so that the most appropriate cell size could be determined. The cell size was set at 1.0 m and the number of cells to 49.

Data was automatically written and stored to the internal memory within the Sentinel V100 ADCP main body and then downloaded to computer after completion of the deployment period via WiFi.

2.3 Magnetic Variation

No magnetic variation correction was made to the Sentinel V100 ADCP during deployment, this was undertaken to the data after the instrument was recovered and data downloaded. The magnetic variation used was -3.12°; this was determined using the World Magnetic Model, produced jointly with the US National Oceanographic and Atmospheric Administration's National Geophysical Data center. Further details can be found at http://www.geomag.bgs.ac.uk/navigation.html

2.4 Data Processing

Upon retrieval of the Sentinel V100 ADCP current meter, all data was downloaded to a computer for analysis. The raw data file was opened in Teledyne's "Velocity" software and Matlab. Deployment diagnostic data (beam intensity, correlation, pitch and roll) were analysed to confirm that the deployment was successful with the instrument orientated upright. The heading data were also examined to identify any movement of the Sentinel V100 ADCP mooring frame during the deployment.

The diagnostic data suggested that velocities from the first 28 bins were valid (Figure 3). Calculations were undertaken to identify the cells to be used for surface and middle currents. Surface data was taken at an average depth (derived from the pressure sensor) of 6.37 m (cell 28), and cage-bottom data at 14.37 m (cell 20). Surface and middle cell heights above were 30.71 m and 22.71 m from the seabed respectively. The bottom cell (cell 1) was at a depth of 33.37 m and 3.71 m above the seabed.

Table 1: Sentinel V100 ADCP Specifications.

Depth Cell Size[1]		**V20 (1000kHz)**		**V50 (500kHz)**		**V100 (300kHz)**	
	Depth Cell Size[1]	Range (m)[2,3] Wide/Narrow	Std Dev (cm/s)[3,4] Wide/Narrow	Range (m)[2,3] Wide/Narrow	Std Dev (cm/s)[3,4] Wide/Narrow	Range (m)[2,3] Wide/Narrow	Std Dev (cm/s)[3,4] Wide/Narrow
	0.25m	18.0/22.6	19.2/36.5				
	0.3m	19.3/24.0	11.1/20.8				
	0.5m	20.2/24.9	7.1/13.4	44.1/57.6	19.2/36.5		
	1.0m	22.1/26.9	3.6/6.7	50.5/64.6	7.1/13.5	94.5/120.6	10.9/20.6
	2.0m	24.5/29.4	1.7/3.2	56.0/70.6	3.6/6.7	103.5/130.4	5.5/10.3
	4.0m	26.9/32.0	0.8/1.6	63.1/78.2	1.7/3.2	114.6/142.3	2.7/5.2
	6.0m			67.4/82.8	1.1/2.1	121.7/151.5	1.8/3.3
Communications and Recording	Wireless	802.11b/g/n					
	Internal memory	One 16GB Micro SD Card included					
Profile Parameters	Velocity accuracy	V20/V50: 0.3% of the water velocity relative to the ADCP ±0.3cm/s V100: 0.5% of the water velocity relative to the ADCP ±0.5cm/s					
	Velocity resolution	0.1cm/s					
	Velocity range	±5m/s (default); ±20m/s (maximum)					
	Ping rate	Up to 4Hz					
Echo Intensity Profile	Vertical resolution	Depth cell size					
	Dynamic range	80dB					
	Precision	±1.5dB					
Transducer and Hardware	Beam angle	25°					
	Configuration	4-beam, convex; 5th beam vertical					
	Depth rating	200m					
	Materials	Transducer, housing, and end cap: plastic Connector: metal shell					
Standard Sensors	Temperature (mounted on transducer)	Range -5° to 45°C, precision ±0.4°C, resolution 0.1°					
	Compass (magneto-inductive sensor)	Accuracy 2° RMS, resolution 0.1°, max. dip angle 85°					
	Tilt (MEMS accelerometers)	Pitch range ±90°, roll range ±180°, accuracy 2° RMS, precision 0.05° RMS, resolution 0.1°					
	Pressure sensor (mounted on transducer)	Range 300m, accuracy 0.1%FS					
Power	External DC input	12–20VDC					
	Internal battery voltage	18VDC new					
	Battery capacity; over-the-counter @0°C	100 watt hours (typical)					
	Battery pack @5°C	510 watt hours					
Software	Teledyne RDI's new software included	ReadyV—Pre-deployment (testing, planning, and data recovery)[5] Velocity—Post-processing (data handling, display, and export)[6]					
Environmental	Standard depth rating	200m					
	Operating temperature	-5° to 45°C					
	Storage temperature (without batteries)	-30° to 60°C					
	Weight in air	7.5kg – 16.0kg					
	Weight in water	1.6kg – 6.0kg					
Available Options	External battery case • AC/DC power converter • 5th beam (at time of order only) • Waves processing • Straight or right-angle metal shell connector						
Dimensions	Special configuration drawing available upon request						

1 User's choice of depth cell not limited to the typical values specified.
2 Ranges specified are typical at temperature of 5°C and salinity of 35psu; longer ranges are possible.
3 User selects the bandwidth mode; wide = 25% or narrow = 6%.
4 Standard deviations (Std Dev) are typical values for single ping data
5 Resident in ADCP accessed via a web browser.
6 Windows™ based software program.

Specifications subject to change without

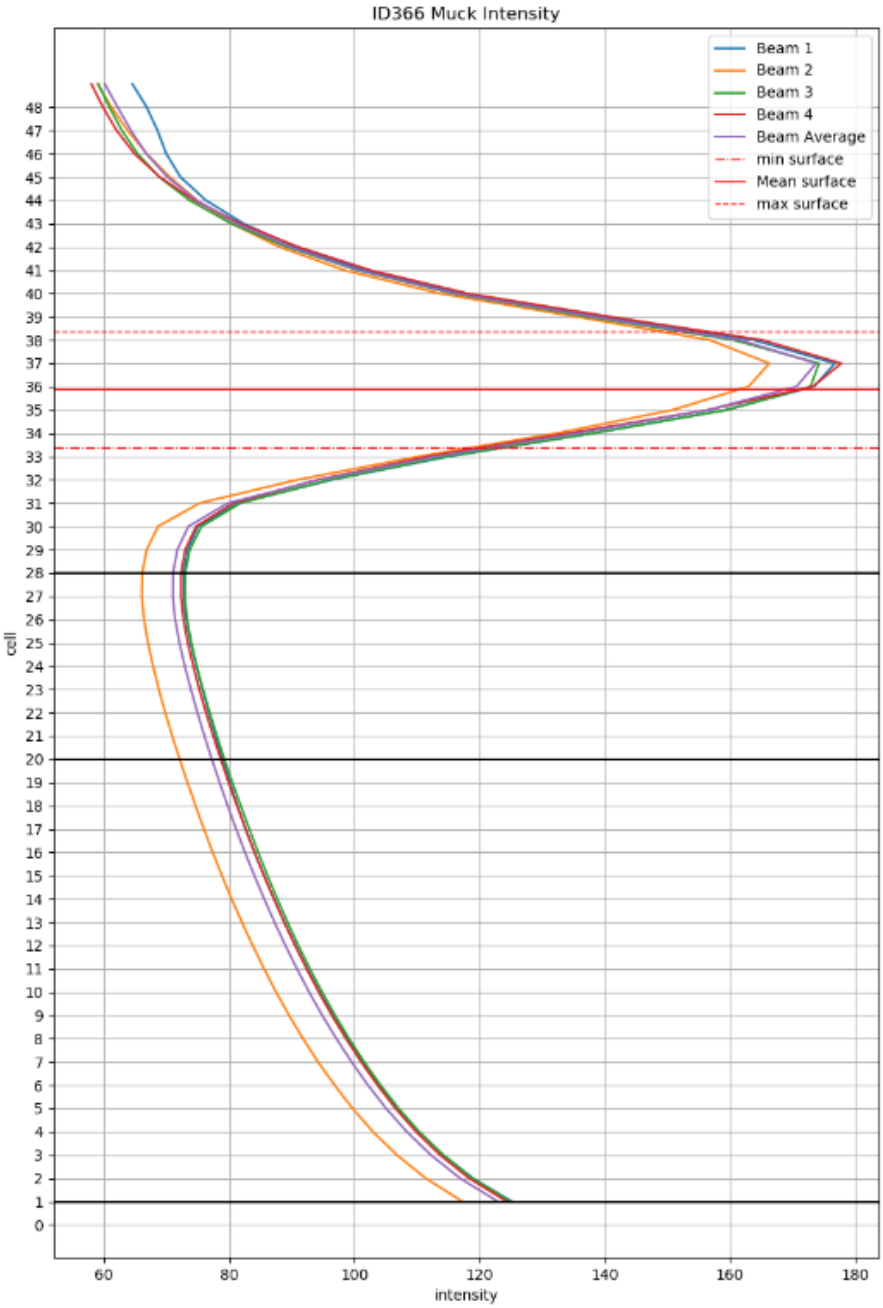


Figure 3. Mean intensity of the ADCP signal for the ID366 dataset plotted by bin number

The 'first cell range' is automatically calculated by the instrument, which is the distance from the transducer head to the first cell. For this deployment, the first cell range was calculated as 3.01 m. This value is then added to the height of the instrument frame (0.7 m) to get the first cell height above the seabed, which equated to 3.71 m

Standard deviation has been assessed throughout the deployment to identify accurate and reliable data for near bed, middle (net depth) and surface cells using the following equation:

$$Cell\ StdDev = \frac{Instrument\ StdDev}{\sqrt{No.\ valid\ pings}} \qquad (1)$$

The Instrument Standard Deviation (StdDev) in Equation 1 is determined using the deployment settings when the meter is programmed, examples of the StdDev values for different configurations are shown in Table 1. This deployment had a cell size of 1m which equates to an Instrument StdDev of 10.9 cm/s.

The Percentage of valid pings used to calculate Cell StdDev is derived using “Percentage Good” data which allows us to relate the StdDev to the actual data gathered. The percent good data is available for 1, 2, 3 and 4 beams which represent the following:

- Percent good 1 = % of good data computed from 3 Beams
- Percent good 2 = % of bad data due to more than 2 Beam bad
- Percent good 3 = % of bad data due to error velocity exceeded
- Percent good 4 = % of good data computed from 4 Beams

The method described has been used to calculate the Standard deviation throughout the deployment for the surface, middle and bottom cells; the average StdDev values for the surface middle and bottom was 0.63cm/s, 0.63cm/s and 0.63cm/s respectively which are all within the SEPA criteria of 2cm/s.

2.5 Meteorological Data

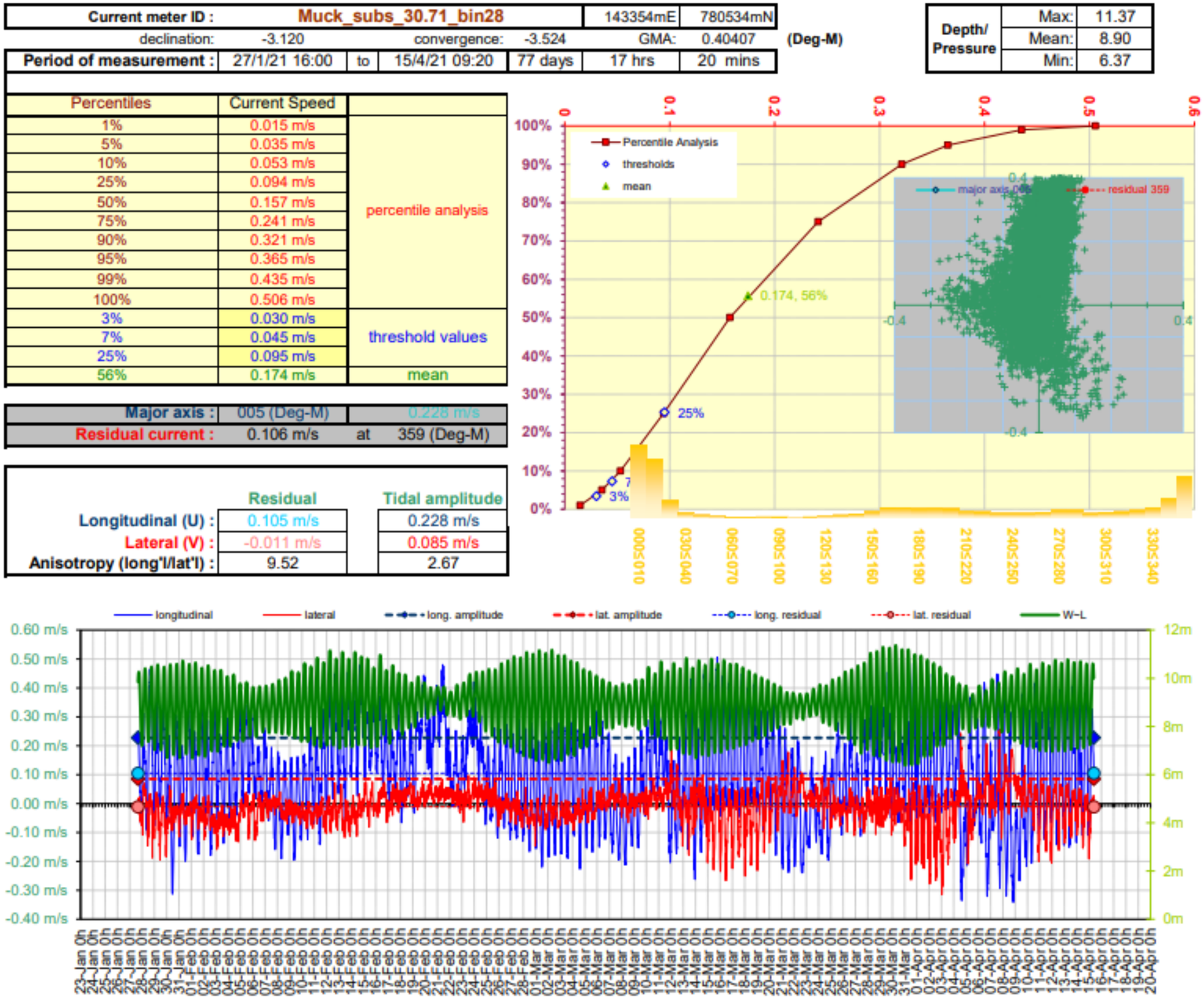
The collection of meteorological data is no longer required to support the assessment process and consequently has not been undertaken. The current data used is collected using mulitple deployments and over a longer period and thus provides a more realistic representation of site conditions than short deployments, thus allowing an assessment of the influence of meterological conditions.

3. Results and Discussion

A summary of the current data is shown in Figure 4 to Figure 12 and in Table 2 to Table 5. Over the period analysed for this report, the near-surface, middle and bottom cells had current speed averages of 17.44 cm/s, 16.73 cm/s and 14.22 cm/s respectively. This gave an overall average of 16.13 cm/s. The orientation of the tidal velocities was north-south.

Residual currents at the surface and mid-depth were toward the north-west (359°G and 002°G respectively); near the seabed, the residual flows during the deployment period were to the north (006°G, Figure 9). The magnitude of the residual currents for the surface, middle and bottom cells were moderate, with mean values of 0.106 m/s, 0.105 m/s and 0.065 m/s respectively.

4. Hydrographic Data Summary Sheets



x	y
major axis 005	
0.0436	0.4981
0.0198	0.2268
0	0
######	######
residual 359	
0	0
-0.002	0.1056
-0.009	0.4999

Figure 4. Current Data Summary Sheet for the surface current cell 28, 30.71m from seabed, 27th January to 15th April 2021 inclusive (ID366).

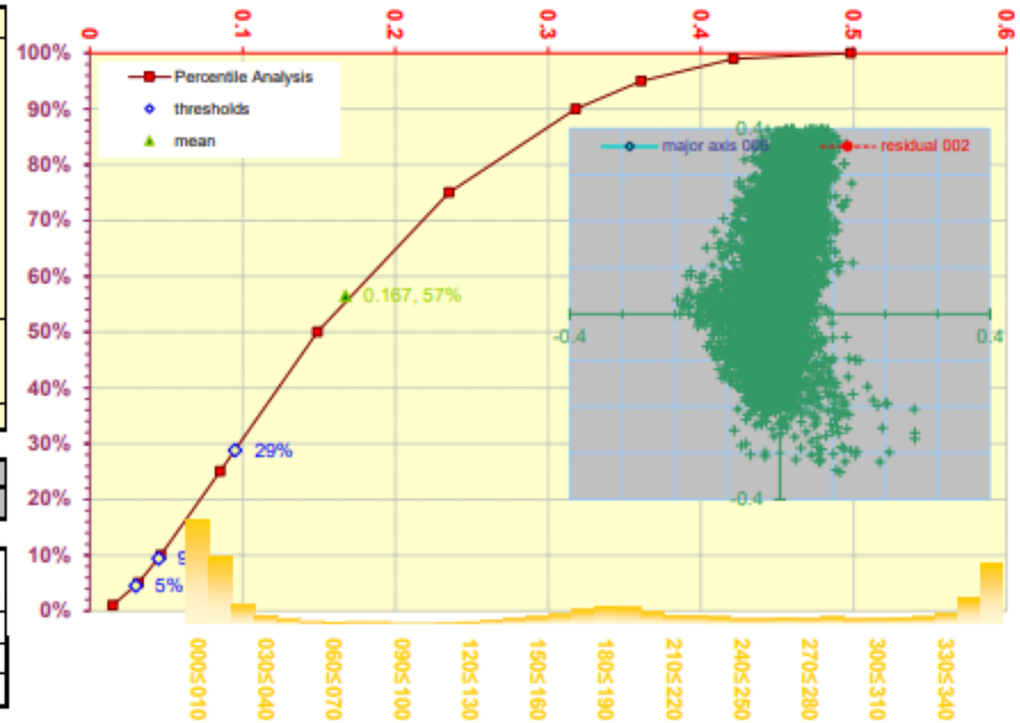
Current meter ID :	Muck_cbot_22.71m_bin20				143354mE	780534mN
declination:	-3.120		convergence:	-3.524	GMA:	0.40407 (Deg-M)
Period of measurement :	27/1/21 16:00	to	15/4/21 09:20	77 days	17 hrs	20 mins

Depth/ Pressure		
	Max:	19.37
	Mean:	16.90
	Min:	14.37

Percentiles	Current Speed	
1%	0.015 m/s	percentile analysis
5%	0.032 m/s	
10%	0.046 m/s	
25%	0.085 m/s	
50%	0.149 m/s	
75%	0.235 m/s	
90%	0.318 m/s	
95%	0.361 m/s	
99%	0.421 m/s	
100%	0.498 m/s	
5%	0.030 m/s	threshold values
9%	0.045 m/s	
29%	0.095 m/s	
57%	0.167 m/s	mean

Major axis :	005 (Deg-M)	0.224 m/s
Residual current :	0.105 m/s	at 002 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.105 m/s	0.224 m/s
Lateral (V) :	-0.006 m/s	0.066 m/s
Anisotropy (long'l/lat'l) :	16.48	3.42



x	y
major axis 005	
0.0436	0.4981
0.0195	0.2233
0	0
######	######
residual 002	
0	0
0.0028	0.1052
0.0133	0.4998

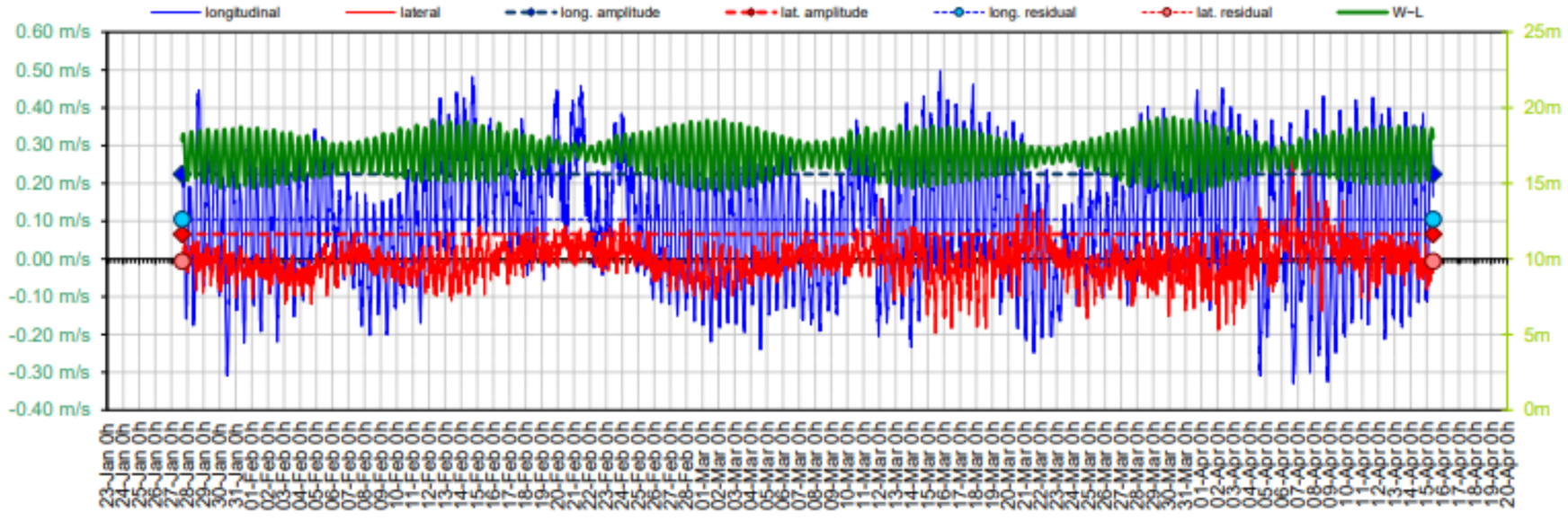


Figure 5. Current Data Summary Sheet for the cage bottom current cell 20, 22.71m from seabed, 27th January to 15th April 2021 inclusive (ID366).

Current meter ID :	Muck_nrbd_3.71m_bin01				143354mE	780534mN
declination:	3.120		convergence:	2.716	GMA:	0.40407
Period of measurement :	27/1/21 16:00	to	15/4/21 09:20	77 days	17 hrs	20 mins

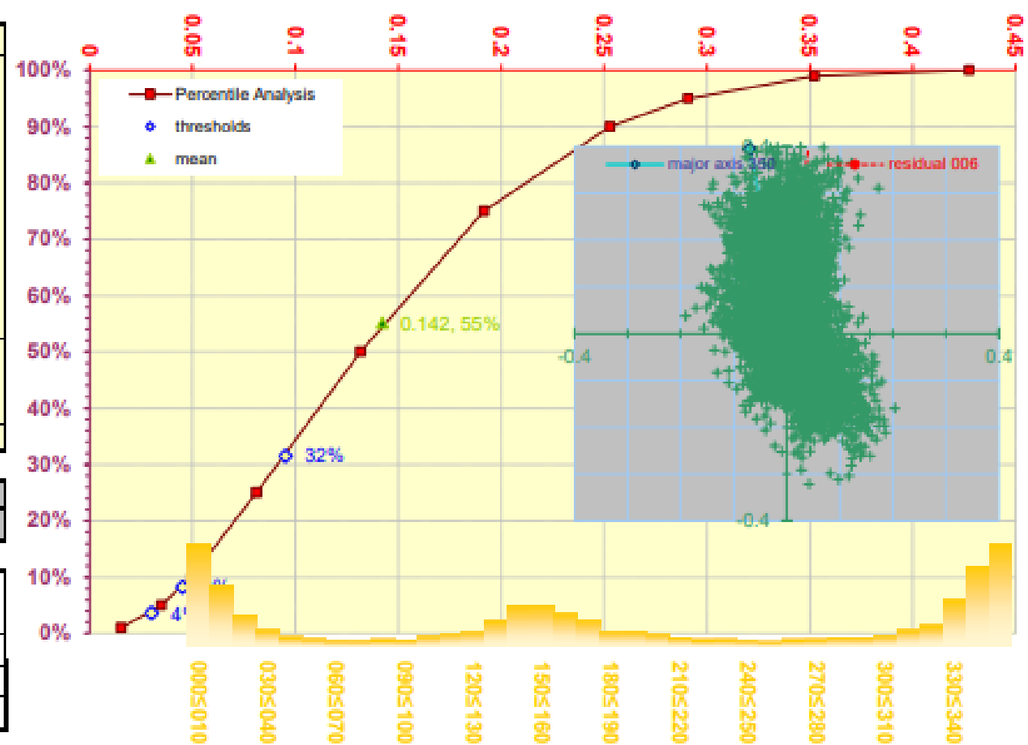
(Deg-M)

Depth/ Pressure		
	Max:	38.37
	Mean:	35.90
	Min:	33.37

Percentiles	Current Speed	
1%	0.015 m/s	percentile analysis
5%	0.035 m/s	
10%	0.049 m/s	
25%	0.081 m/s	
50%	0.132 m/s	
75%	0.192 m/s	
90%	0.253 m/s	
95%	0.291 m/s	
99%	0.352 m/s	
100%	0.428 m/s	
4%	0.030 m/s	threshold values
8%	0.045 m/s	
32%	0.095 m/s	
55%	0.142 m/s	mean

Major axis :	350 (Deg-M)		0.197 m/s
Residual current :	0.065 m/s	at	006 (Deg-M)

	Residual	Tidal amplitude
Longitudinal (U) :	0.063 m/s	0.197 m/s
Lateral (V) :	0.018 m/s	0.073 m/s
Anisotropy (long'l/lat'l) :	3.53	2.70



x	y
major axis 350	
-0.069	0.3939
-0.034	0.1941
0	0
######	######
residual 006	
0	0
0.0066	0.0647
0.0406	0.3979

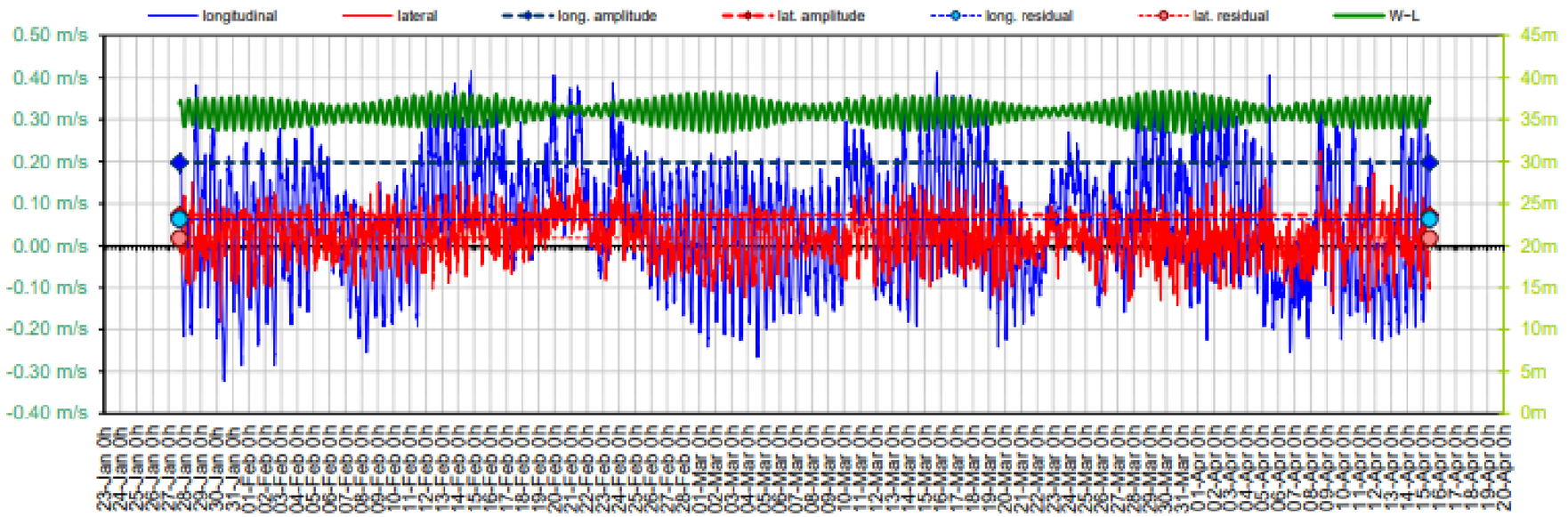


Figure 6. Current Data Summary Sheet for the near bottom current cell 1, 3.71m from seabed, 27th January to 15th April 2021 inclusive (ID366).

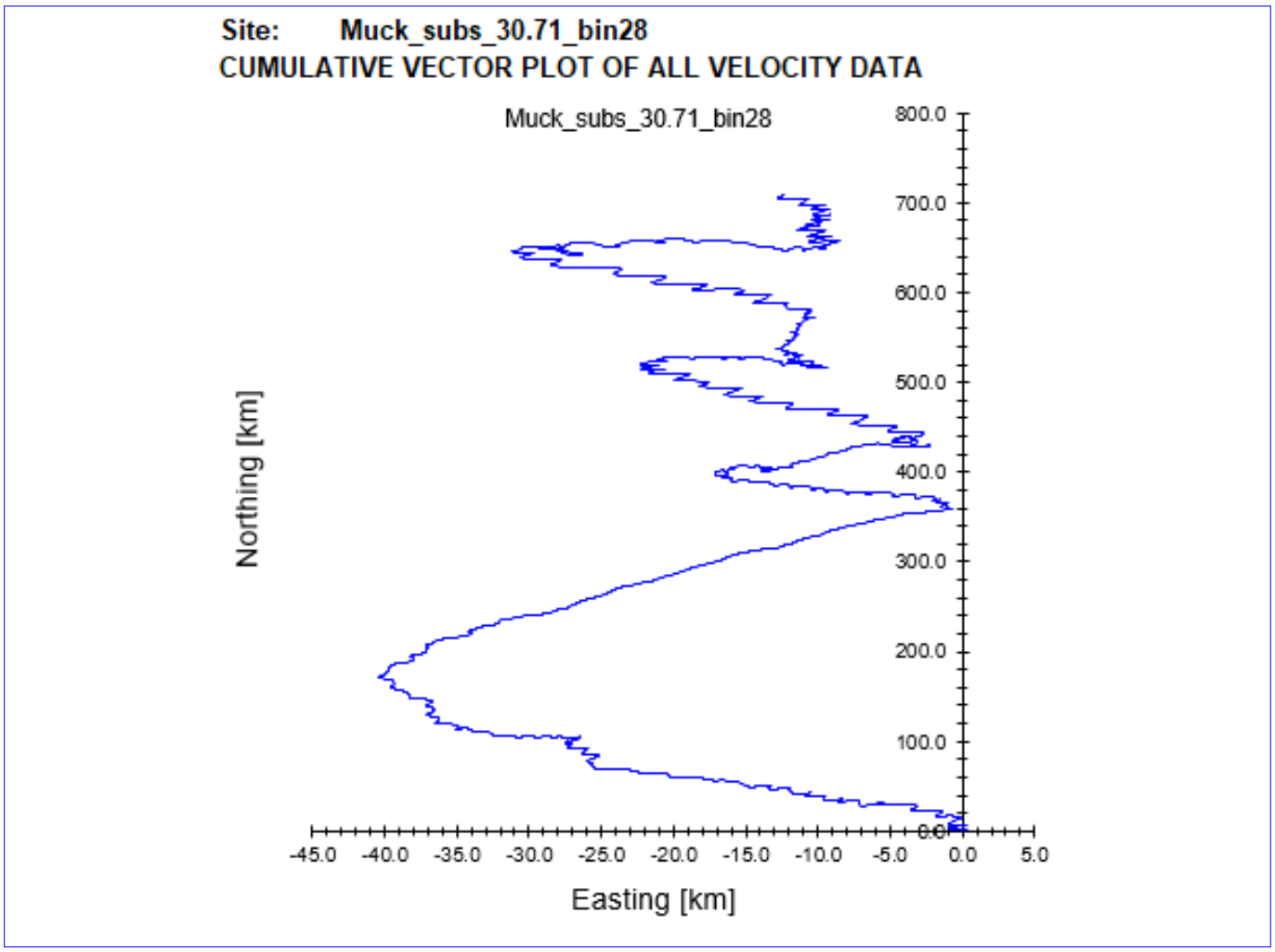


Figure 7. Cumulative Vector Plot of all velocity data from near surface cell for ID366.

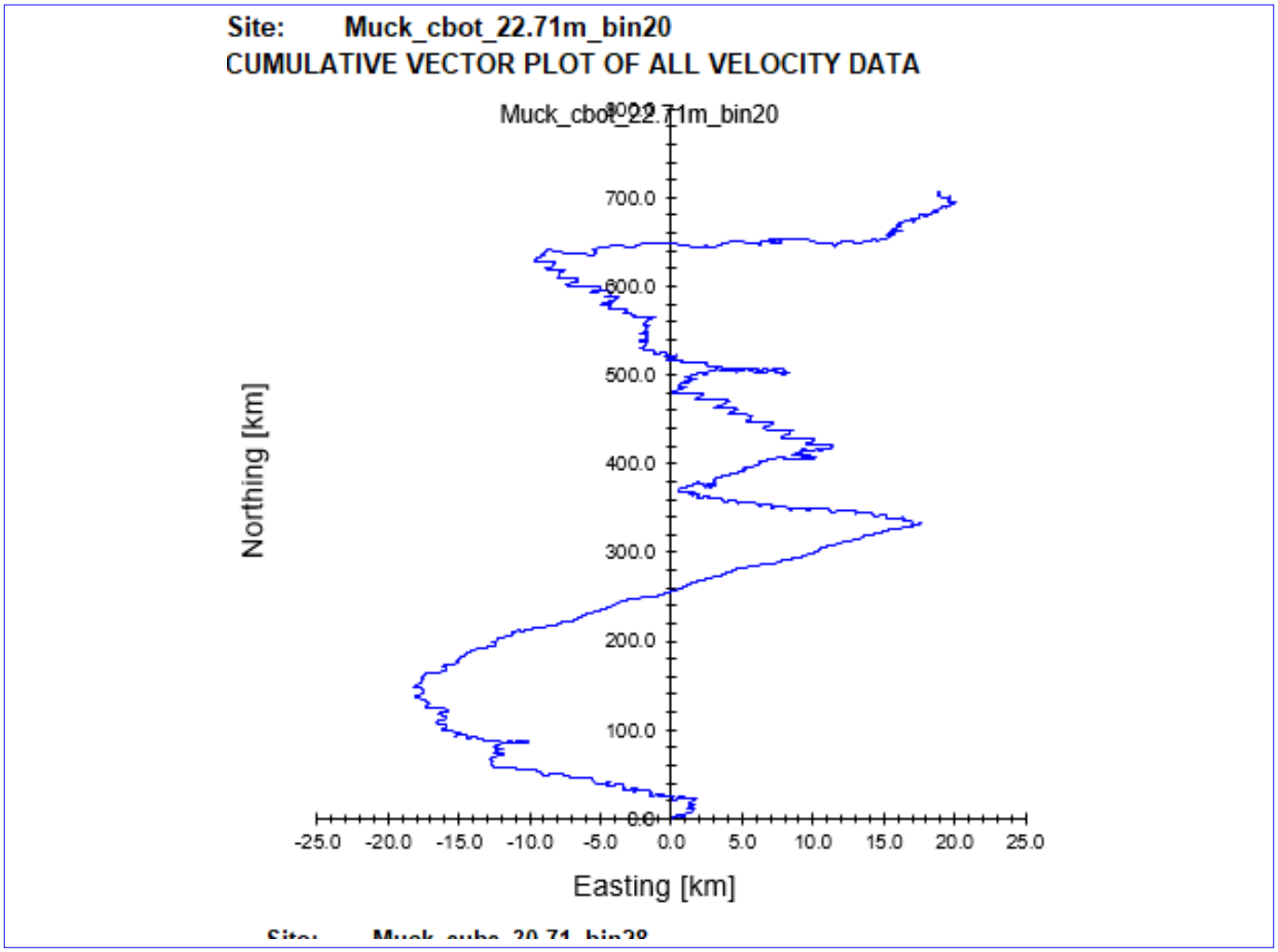


Figure 8. Cumulative Vector Plot of all velocity data from cage bottom cell for ID366.

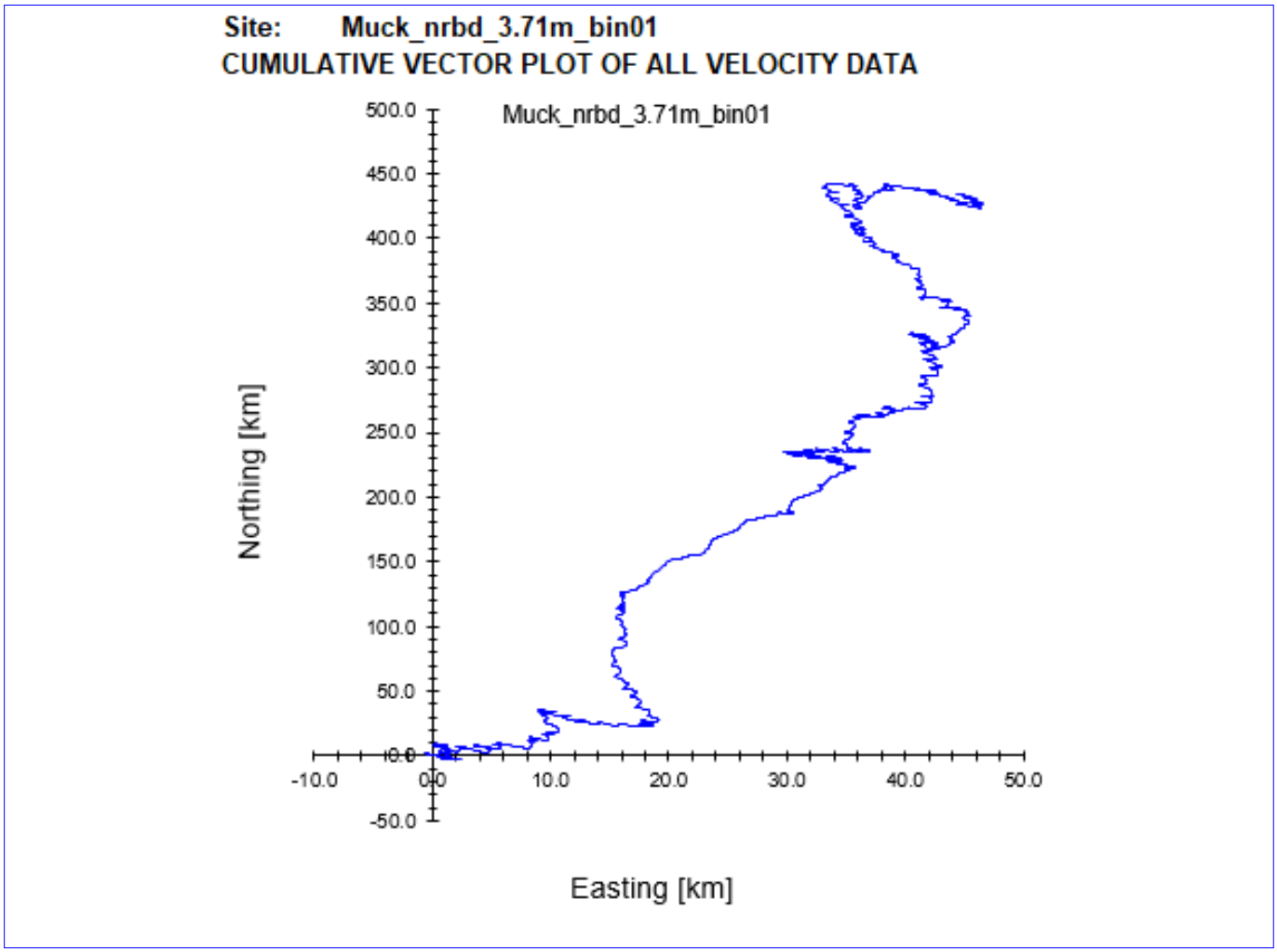


Figure 9. Cumulative Vector Plot of all velocity data from near bottom cell for ID366.

5. Summary of Current Data – ID366

Site Name: Muck
Data start date: 27/01/2021
Data end date: 15/04/2021
Mean Water Depth: 39.61m

Table 2. Summary of current meter deployment

	Cell	Depth Below Surface (m)	Distance from Seabed (m)	Mean current speed (cm/s)
Near surface:	28	6.37	30.71	17.44
Cage bottom:	20	14.37	22.71	16.73
Near bed:	1	33.37	3.71	14.22
			Average current speed:	16.13

Table 3. Ranked percentiles for current speed at all three depths

Cell	Ranked Percentile (%) for mean speed	≤3cm/s (%)	≥4.5cm/s (%)	≥9.5cm/s (%)
Near surface:	56	3	93	75
Cage bottom:	57	5	91	71
Near bed:	55	4	92	68

Table 4. Major axis

Cell	Major Axis (Deg-G)
Near surface:	005
Cage Bottom:	005
Near bed:	350

Table 5. Mean and residual currents

Cell	Mean Speed (m/s)	Residual Speed (m/s)	Residual Parallel (m/s)	Residual Normal (m/s)	Tidal Amplitude Parallel (m/s)	Tidal Amplitude Normal (m/s)
Near Surface:	0.174	0.106	0.105	-0.011	0.228	0.085
Cage Bottom:	0.167	0.105	0.105	-0.006	0.224	0.066
Near Bed:	0.142	0.065	0.063	0.018	0.197	0.073

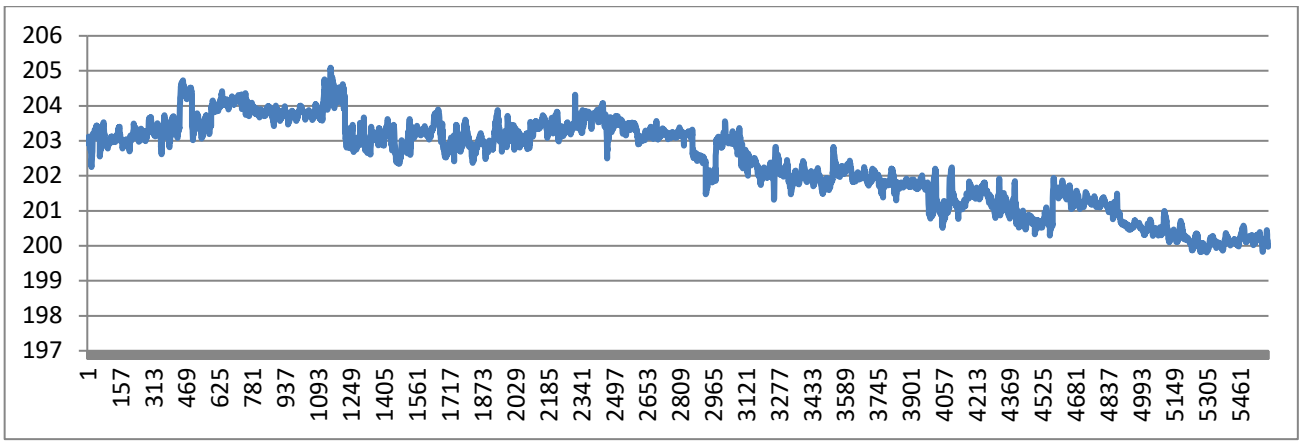


Figure 10. Summary of heading data from deployment ID366.

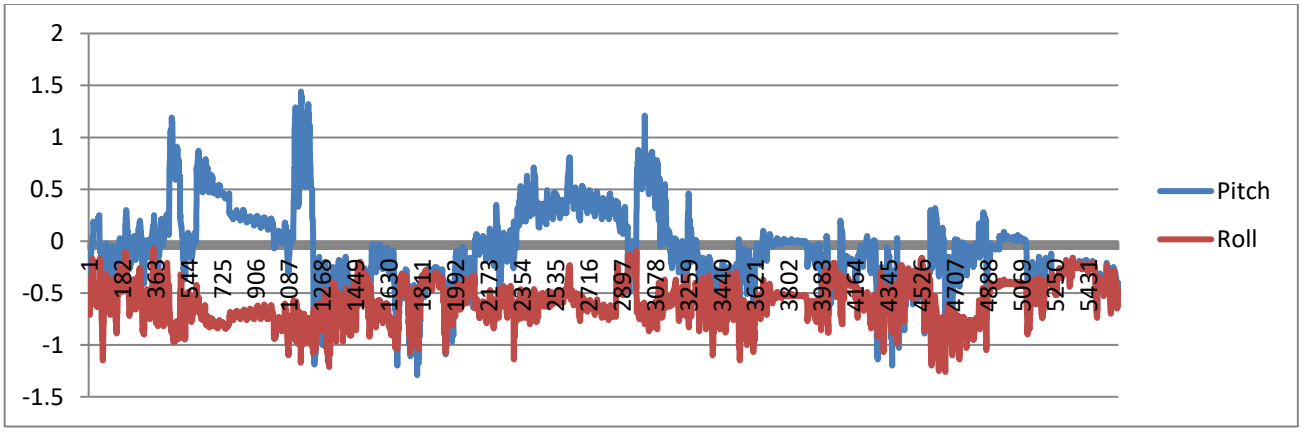


Figure 11. Summary of pitch and roll data from deployment ID366.

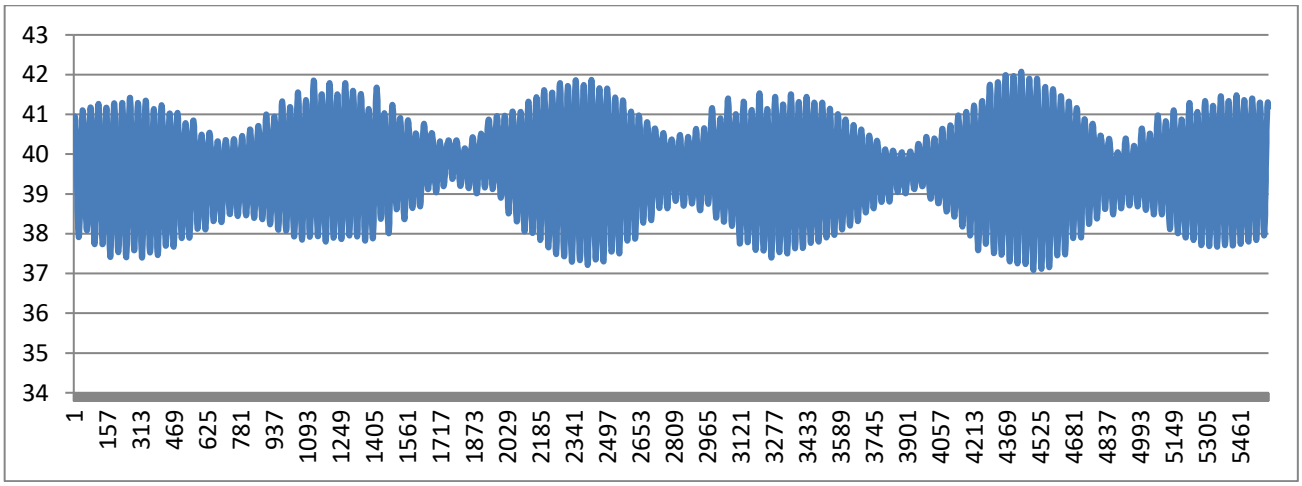


Figure 12. Pressure data from deployment ID366

6. Conclusion

MOWI has collected and analysed current and bathymetric data for the proposed technical variation at the Muck fish farm. The analysed current data for the 77 days and 18 hours period are believed to be reliable and representative of the proposed location. The bathymetric data from the wider-area UKHO bathymetry data provided a coherent bathymetric dataset for the site.

Annex 1. Survey Equipment Deployment Log

Location:	Muck
Nearest tidal port:	Galmisdale Pier, Isle of Eigg
Time zone:	UTC
Meter switched on:	16:00 27/01/2021
Meter switched off:	10:00 15/04/2021
Period used for this report:	16:00 27/01/2021 – 09:20 15/04/2021
ADCP serial number:	24616
Meter position:	56.84512'N -6.21033'W
	143354 E 780534 N
Minimum water depth:	37.08 m (36.38m measured by ADCP + 0.7 m *)
Water depth (Chart Datum):	36.78 m (minimum water depth - 0.3 m tide timetable)
Mean water depth:	40.31 m (39.61 measured by ADCP + 0.7 m *)
Depth of meter from surface:	37.03 m (below mean low water spring to transducer)
Height of meter from seabed:	0.7 m to transducer head
Sounding at deployment:	39 m @ 11:30 on 27/01/2021

Table A1. ADCP meter settings:

Reference:	Transducer
Bin size (m):	1.0
Dist to 1st bin (m):	3.02
Number of bins:	49
Frequency (kHz):	307
Recording interval (mins):	20
No. pings per ensemble:	300
Magnetic correction:	0
Ensemble:	300
Standard Deviation (cm/sec):	0.63
Time/Ping (seconds):	2