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## Technical Note

Comparison between N005 and T006

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## 1 Executive Summary

This technical note was written by Meghan Rochford on behalf of Grieg Seafood Shetland Ltd to compare two Acoustic Doppler Current Profiler (ADCP) records, deployed at the marine fish farm site West of Burwick. The deployment labelled N005 was deployed within 150m of the proposed site development, while T006 was out with the 150m limit. Because T006 exceeded the limit imposed by the Scottish Environment Protection Agency (SEPA), a comparison of datasets was undertaken to determine similarities and differences between both locations.

The results of the comparison between both deployments and at both bins shows a similar trend in their directional pattern, however N005 had greater magnitudes in the sub-surface bin and, to a lesser extent, at the near-bed bin. The conclusion of this work suggests the flow pattern at both locations are similar in direction, with higher speeds at the N005 location. Therefore, in order to take a worst-case scenario with regards modelling, the T006 deployment has been validated for use and will be used in NewDEPOMOD modelling.

## 2 Introduction

This technical note was written by Meghan Rochford on behalf of Grieg Seafood Shetland Ltd to compare two Acoustic Doppler Current Profiler (ADCP) deployments at the West of Burwick marine fish farm. Both ADCPs were deployed in December 2020 and retrieved in March 2021. The proposed site is 500m or greater, and in line with SEPA regulations (SEPA 2019) two ADCPs were deployed at the site (Figure 2.1). N005 was deployed 80m west of the proposed site centre, while T006 was 200m southeast of the proposed site centre. The mid-point between the two meters is within 150m of the site centre, at 74m southeast. The purpose of this technical note is to compare both ADCP’s at three bins (sub surface, cage bottom and near bed) and determine the flow pattern in the area of the West of Burwick site.

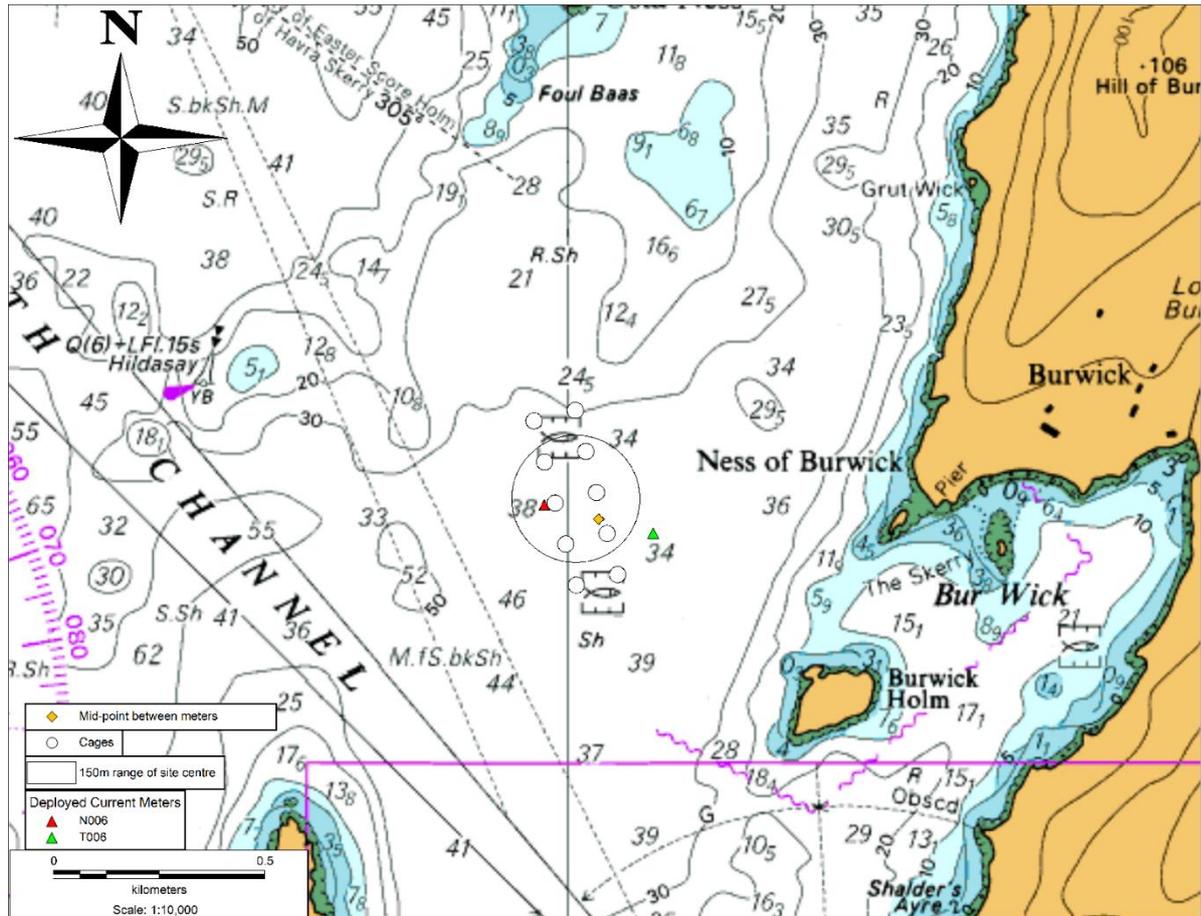


Figure 2.1. Location of ADCP deployments at the proposed West of Burwick site.



### 3 Results of Comparison

Data were compared from two deployments at West of Burwick marine fish farm. Table 3.1 summarises the findings of this comparison. Mean magnitudes for near-bed and cage-bottom were within 0.01m/s. Sub-surface magnitudes had a larger discrepancy of 0.06m/s between T006 and N005. N006 recorded higher magnitudes at every bin level, with maximum magnitudes significantly larger than at T006.

Mean directional values were within 20° at all bins during the deployments, with cage-bottom showing the greatest variation of 18°, and near-bed showing the lowest variation at 11°. Minimum and maximum values were the same, although this is to be expected with directional data. The mean current direction for both near-bed and cage-bottom bins was southwest, while the mean direction for sub-surface bins was south for both locations.

**Error! Reference source not found.** to Figure 3.6 illustrate the trend of magnitude and direction for the full T006 and N005 deployments. Overall, the trend during both deployments is similar for cage-bottom, with near-bed and sub-surface experienced greater magnitudes at N005, including the occasional high magnitude spike in N005. Figure 3.7 to Figure 3.12 illustrate a one-week period taken at random from the full time series. The general trend of the magnified time series for both deployments at cage-bottom is similar, while near-bed and sub-surface magnitudes are faster at N005. Near-bed shows a large spike in magnitudes for N005, which happens throughout the deployment. Sub-surface magnitudes at N005 are generally faster than T006 throughout the week subsection. T006 shows a more averaged, stable deployment than N005.

Table 3.1. Summary of ADCP statistics for both deployments.

	Near-bed				Cage-bottom				Sub-surface			
Magnitude ( $m s^{-1}$ )												
	Mean	Min	Max	Range	Mean	Min	Max	Range	Mean	Min	Max	Range
<b>T006</b>	0.0532	0.001	0.205	0.204	0.0418	0.001	0.208	0.207	0.056	0	0.306	0.306
<b>N005</b>	0.0629	0	0.308	0.308	0.0431	0	0.255	0.255	0.119	0	0.403	0.403
Direction ( $^{\circ}$ )												
	Mean	Min	Max	Range	Mean	Min	Max	Range	Mean	Min	Max	Range
<b>T006</b>	226	0	359	359	204	0	360	360	189	0	360	360
<b>N005</b>	237	0	359	359	222	0	360	360	175	0	360	360

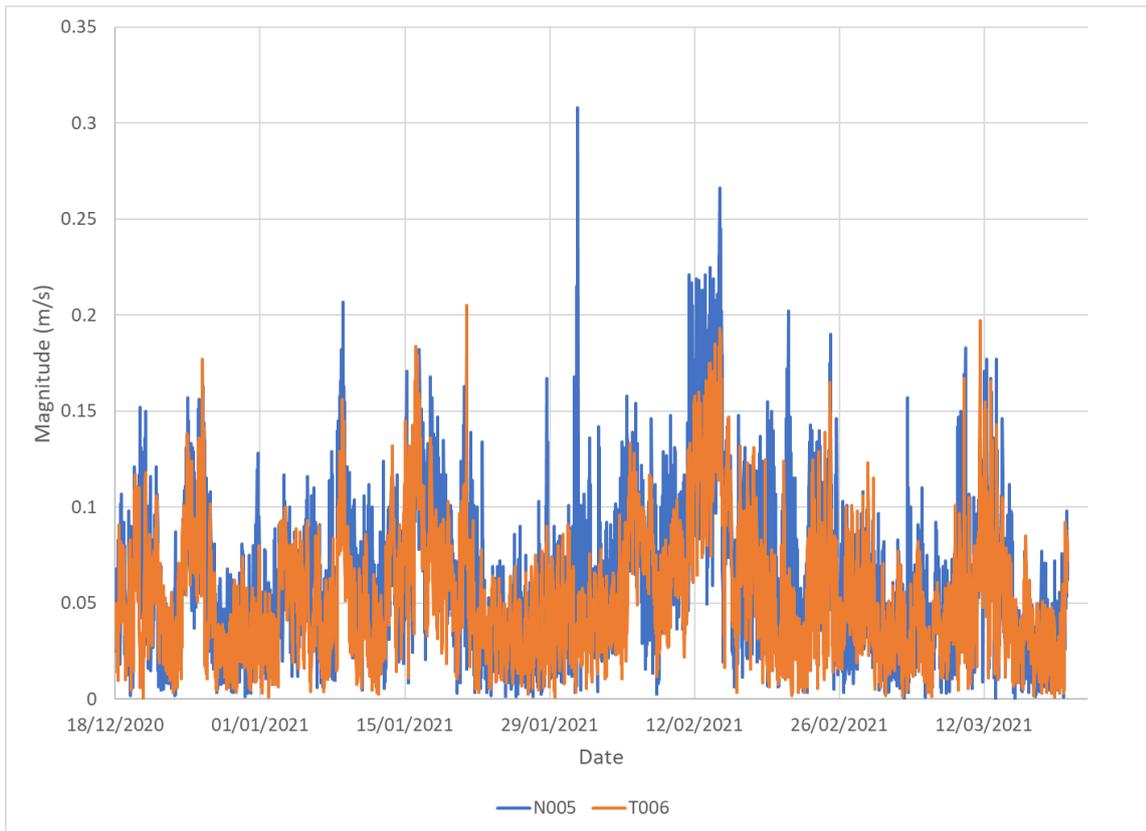


Figure 3.1. Near-bed comparison in magnitude for full deployment period of T006 and N005.

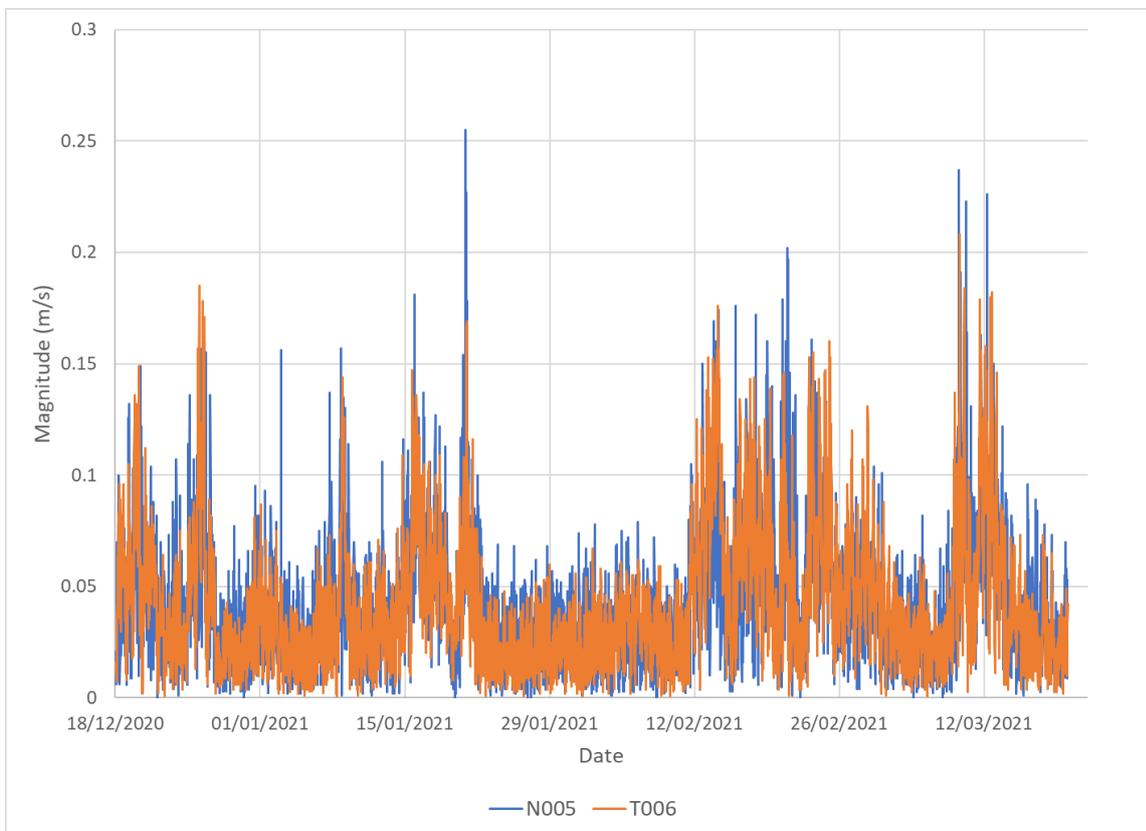


Figure 3.2. Cage-bottom comparison in magnitude for full deployment period of T006 and N005.

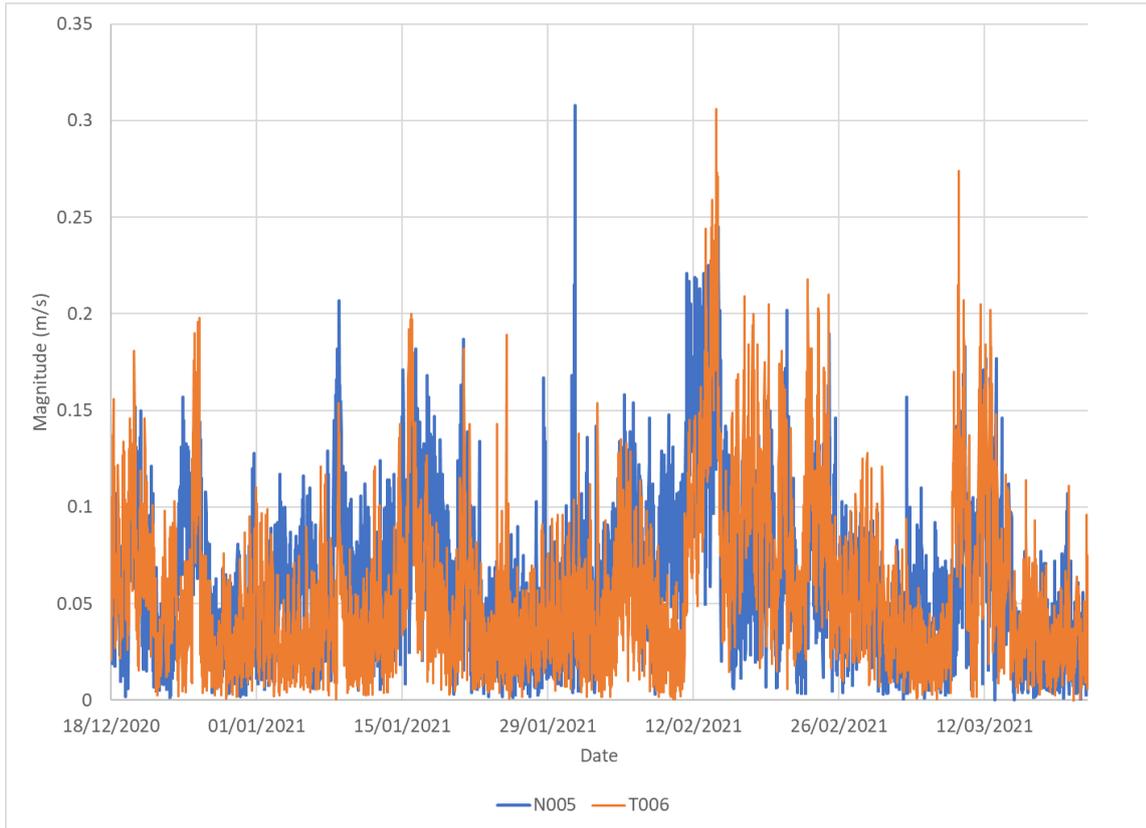


Figure 3.3. Sub surface comparison in magnitude for full deployment period of T006 and N005.

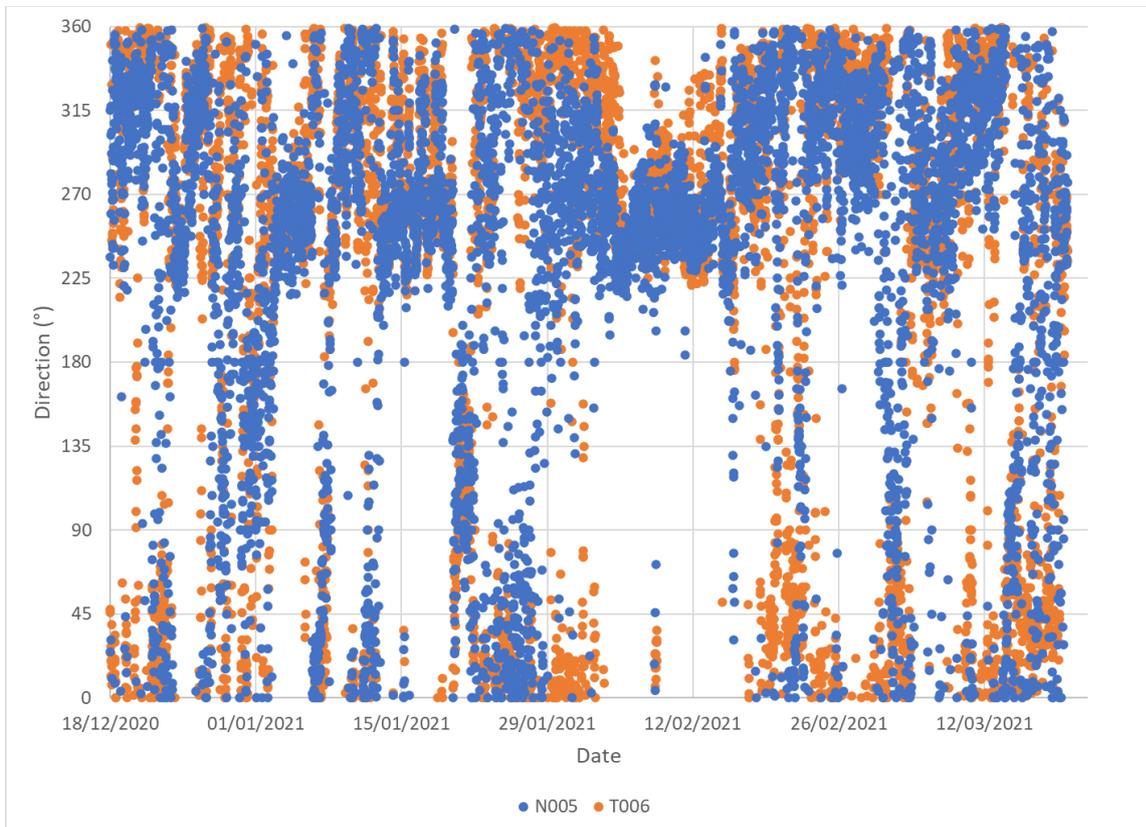


Figure 3.4. Near-bed comparison in direction for full deployment period of T006 and N005.

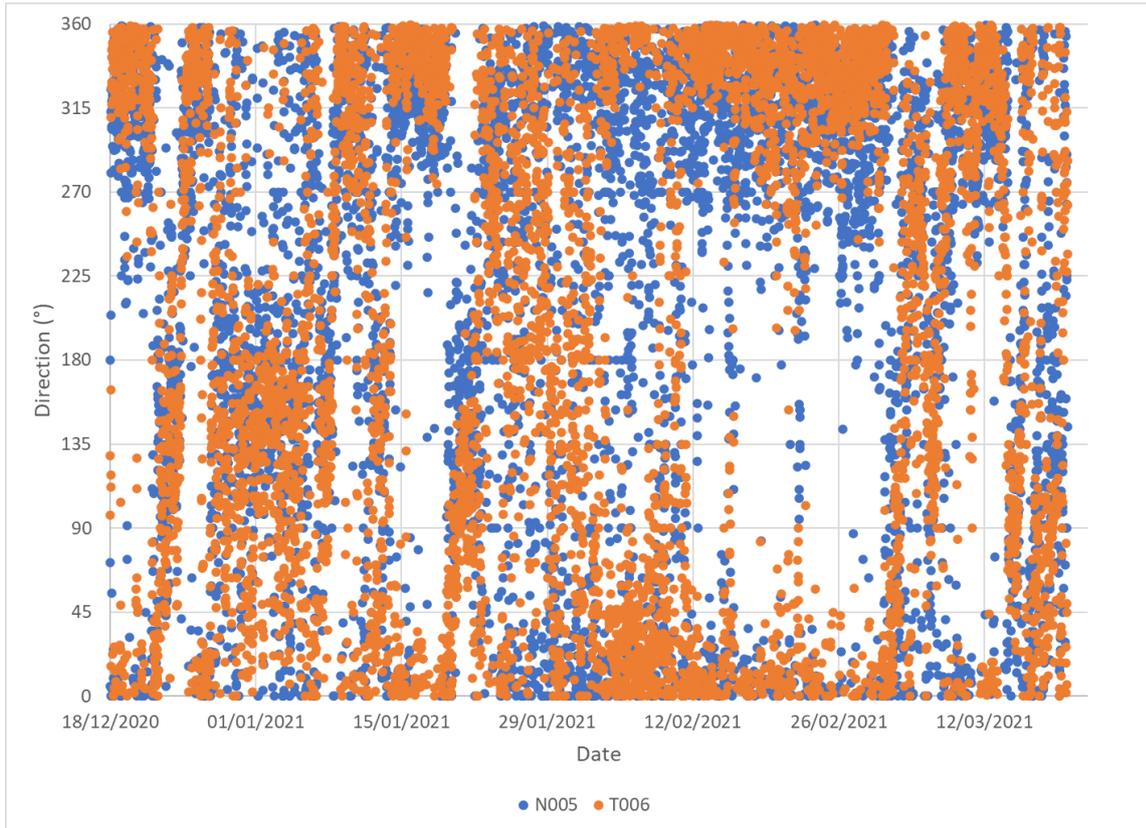


Figure 3.5. Cage-bottom comparison in direction for full deployment period of T006 and N005.

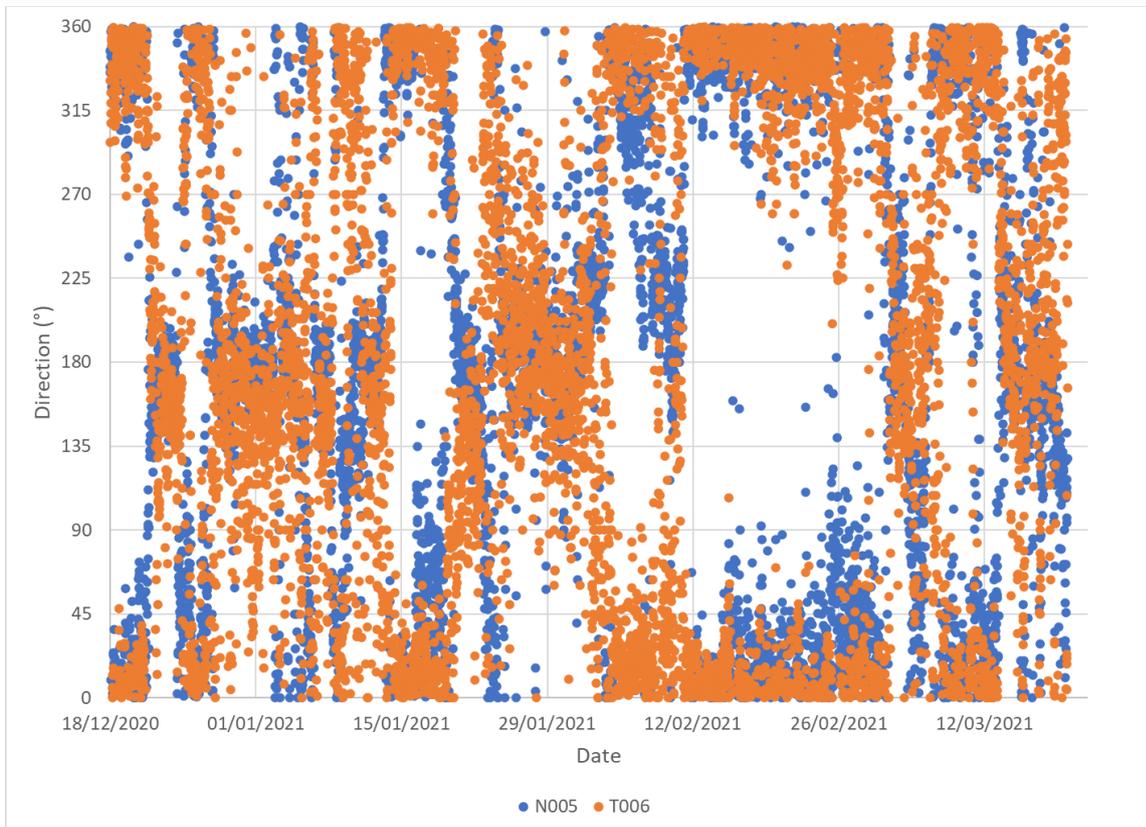


Figure 3.6. Sub-surface comparison in direction for full deployment period of T006 and N005.

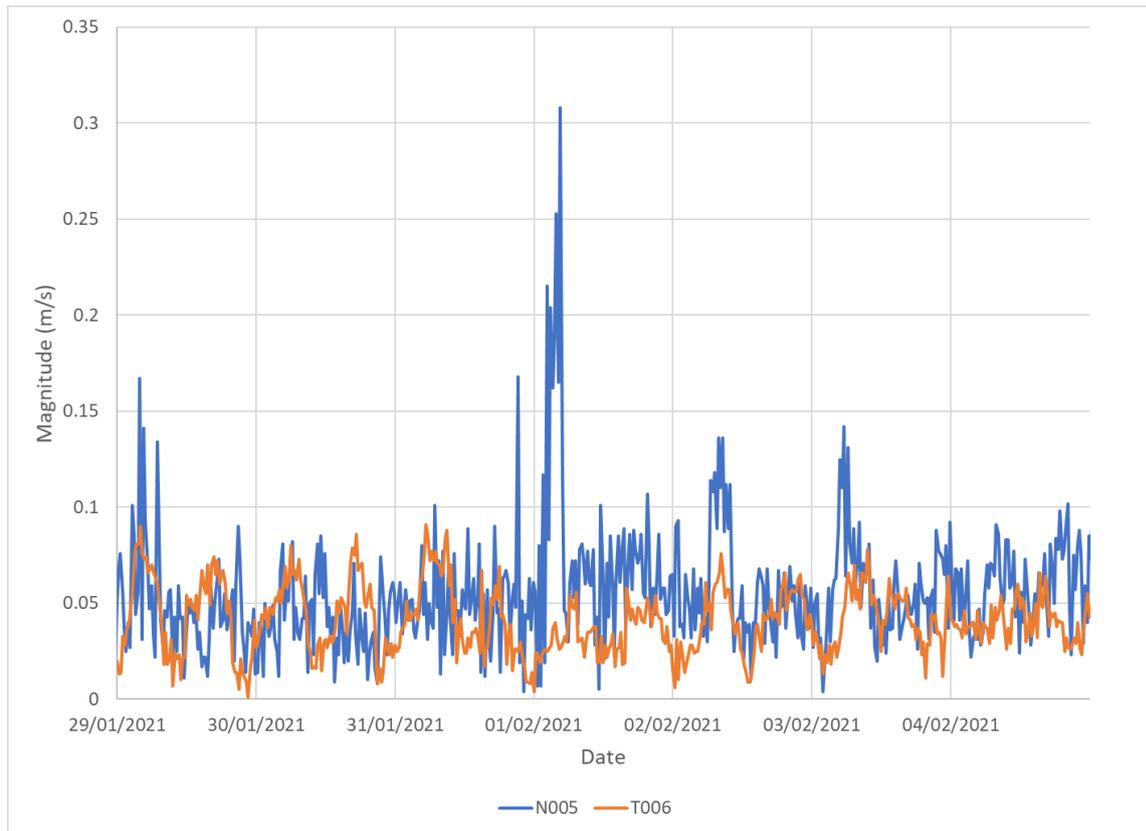


Figure 3.7. Near-bed comparison in magnitude between T006 and N005 from 29<sup>th</sup> January to 4<sup>th</sup> February 2021.

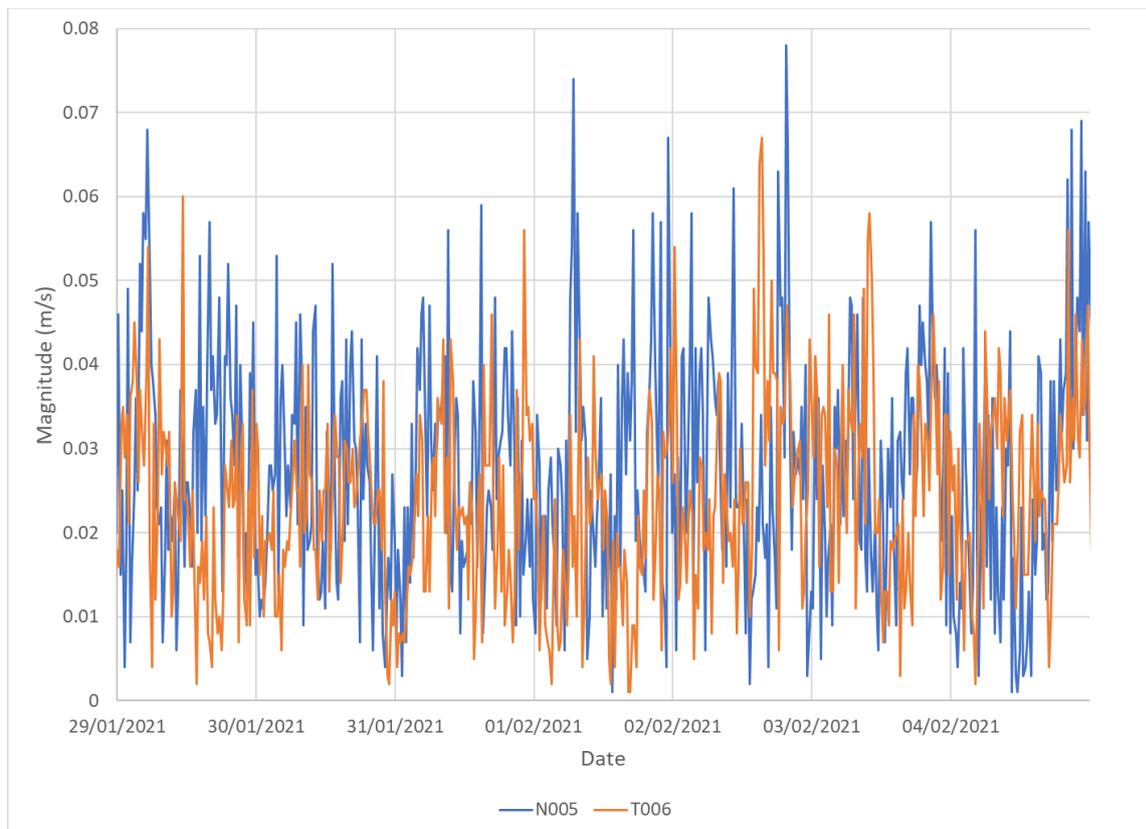


Figure 3.8. Cage-bottom comparison in magnitude between T006 and N005 from 29<sup>th</sup> January to 4<sup>th</sup> February 2021.

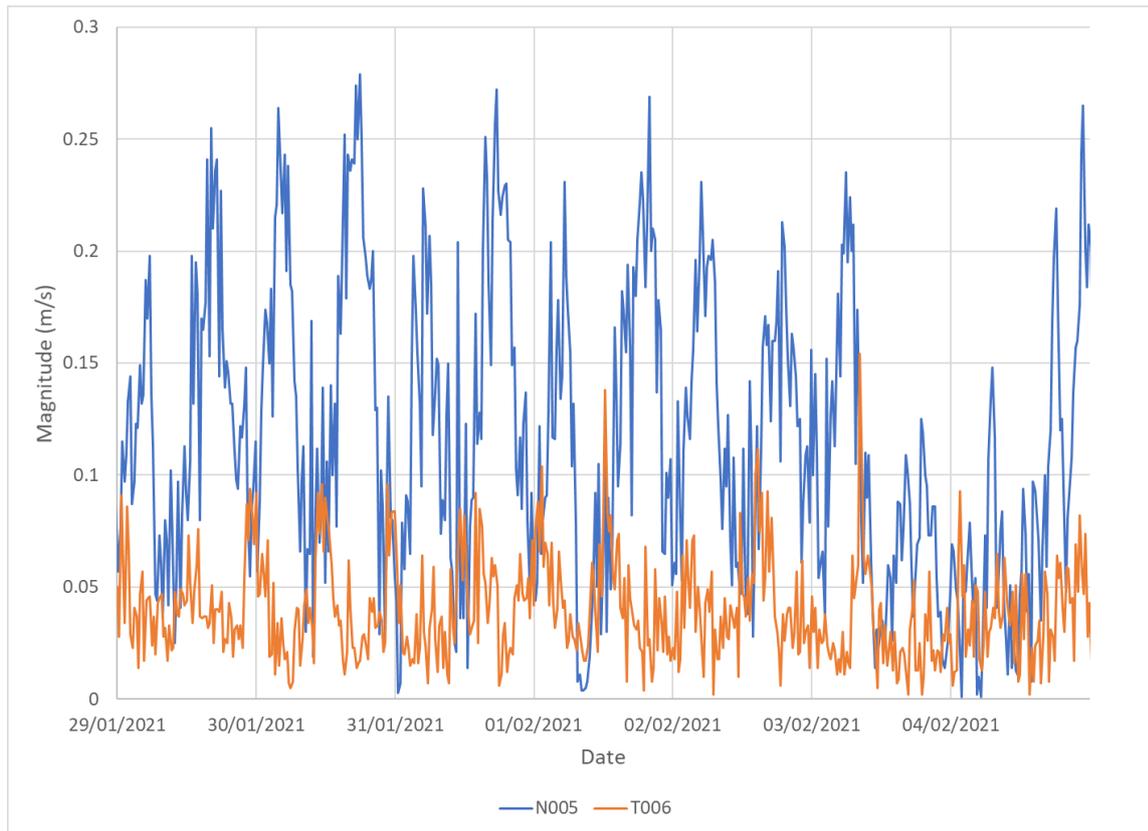


Figure 3.9. Sub-surface comparison in magnitude between T06 and N005 from 29th January to 4th February 2021.

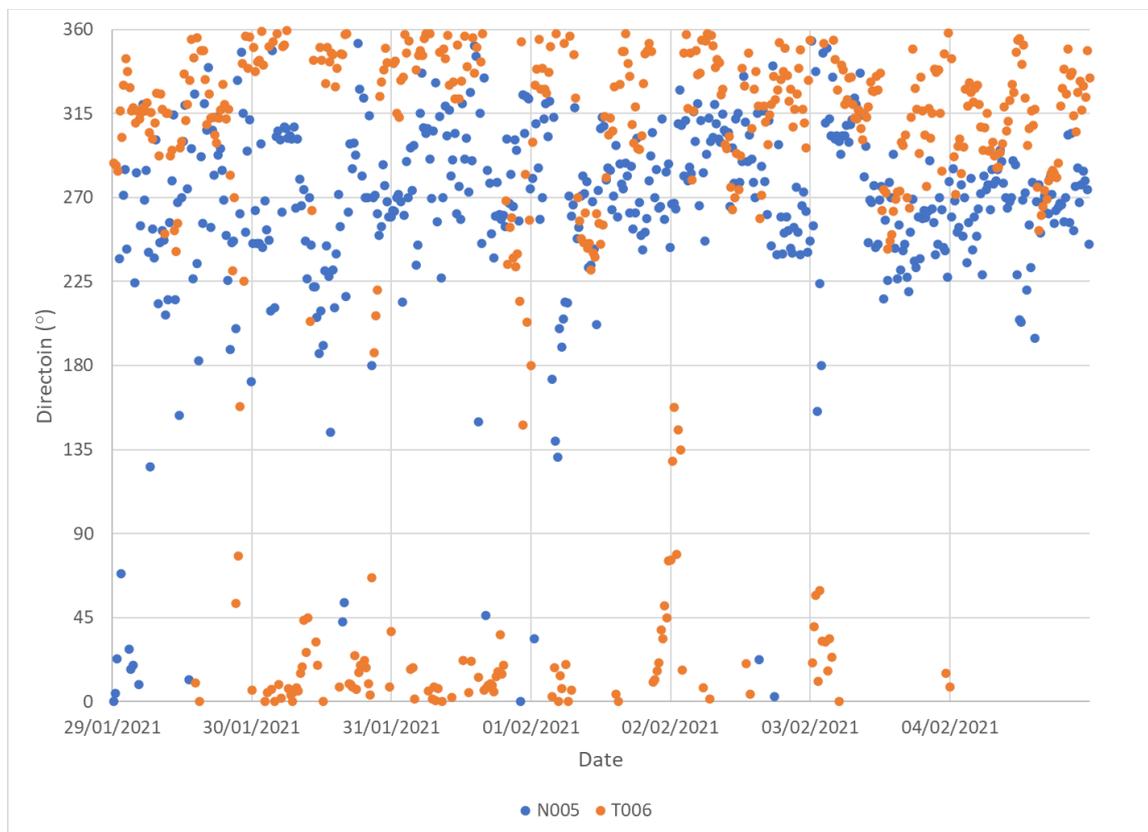


Figure 3.10. Near-bed comparison in direction between T06 and N005 from 29<sup>th</sup> January to 4<sup>th</sup> February 2021.

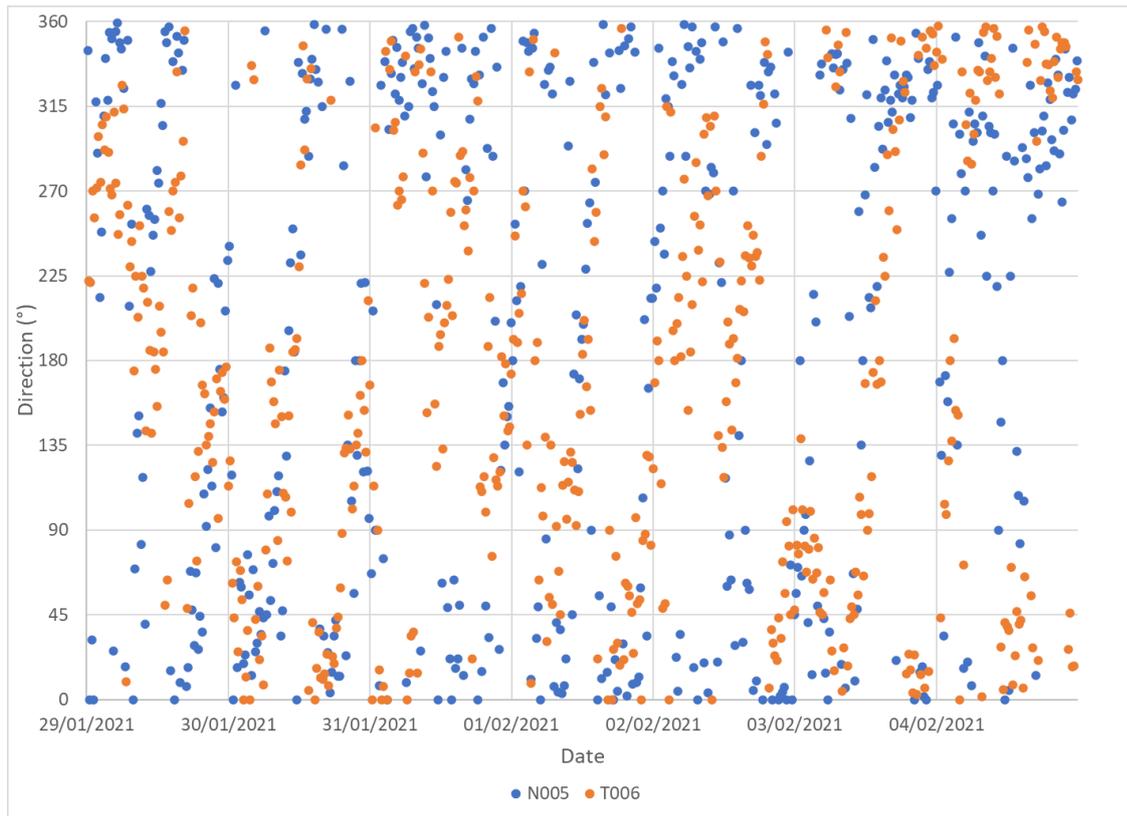


Figure 3.11. Cage-bottom comparison in direction between T006 and N005 from 29<sup>th</sup> January to 4<sup>th</sup> February 2021.

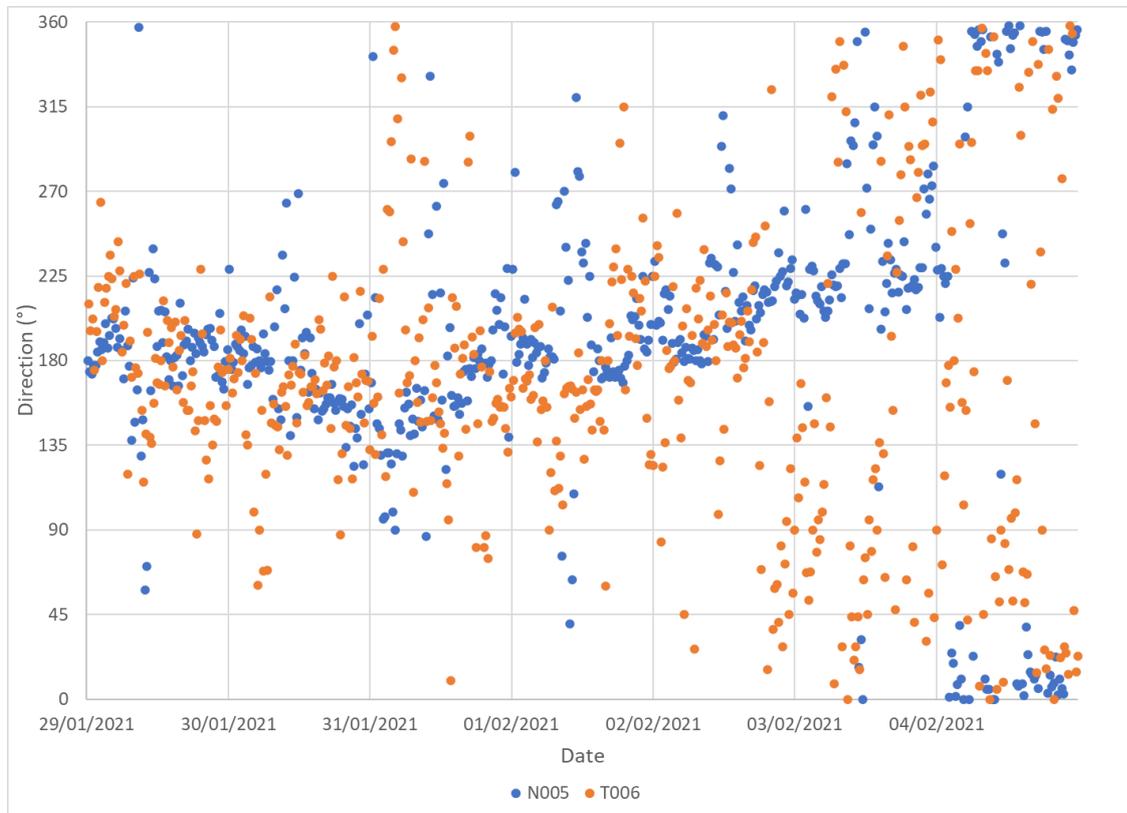


Figure 3.12. Sub-surface comparison in direction between T006 and N005 from 29<sup>th</sup> January to 4<sup>th</sup> February 2021.



#### 4 Conclusion

The purpose of this comparison was to determine the similarities and differences between two deployments, N005 and T006, at the West of Burwick marine fish farm. T006 was out with the 150m limit of current meter deployment, while N005 was within the 150m limit. The mid-point between both deployments was 74m southeast of the proposed site centre. Both deployments show similar flow directions, while N005 exhibits faster flows at both near-bed and sub-surface bins. Cage-bottoms flows at both locations are similar.

The conclusion of this technical note is that the T006 deployment shows slower, more stable speeds than N005. Therefore, it is suggested that T006 should be used for future modelling.

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