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Cork County Council

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Administration,
Environmental Licensing Programme,
Office of Climate, Licensing & Resource Use,
Environmental Protection Agency,
Headquarters,
PO Box 3000,
Johnstown Castle Estate,
County Wexford

6th October 2010

Re: **Waste Water Discharge Licence Application – Additional Information for D0297-01 – Castletownbere**

Dear Mr. Clabby,

I refer to your e-mail of the 22nd of September 2010 to this office regarding modelling for the above mentioned Wastewater Discharge Licence application. Please find enclosed the following for your information.

Draft Hydrometric Survey and
Draft Hydrodynamic Modelling Results

Please note that these reports form part of the Preliminary Report carried out for Castletownbere Sewerage Scheme. This report is currently with the Department of Environment, Heritage and Local Government for approval, therefore these reports are to be considered as Draft copies for information purposes only.

1 CD-ROM with reports in PDF format also enclosed.

Yours sincerely,

Niall O'Mahony,
Senior Engineer,
Water Services.

Enclosures

D0297-01 CASTLETOWNBERE

WASTE WATER DISCHARGE LICENCE APPLICATION

ADDITIONAL INFORMATION

Draft Hydrometric Survey
&
Draft Hydrodynamic Modelling Results

6th October 2010

DRAFT HYDROMETRIC SURVEY

HYDROMETRIC SURVEY

CASTLETOWNBERE CO. CORK

FOR

MARCON COMPUTATIONS

ON BEHALF OF

TOBIN ENGINEERING

Moore Marine Services

Job Number: M09C03

Author: Eoghan Kieran & Benen Hayden

Date: August 2009

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1 SCOPE OF WORKS

1.1 Introduction

MarCon Computations and Moore Marine were commissioned by Cork County Council to carry out a programme of hydrometric survey associated with the Castletownbere Sewerage Scheme and Regional Water Supply Scheme. The programme of survey was designed to provide information regarding sediment and plume movement both geographically and in the water column.

2. CHARACTERISTICS OF THE PROJECT

2.1 General

Field studies were carried out between 22 June and 10 July 2009. The aim of the studies was to collect data which would provide information relating to current movement and plume dispersal in the water column

3. MATERIALS AND METHODS

3.1 Drogues

Drogue tracking surveys were carried out over two days of Spring Tides on 29th and 30th June and two days of Neap Tides on 7th and 8th July. They were released from two pre-determined points, A and B, each on separate days. Ten numbered window-blind type drogues were released into the water; the windows were placed at a depth of 0.5m and were designed to track surface current. The drogues were released hourly and covered the full extent of the tide. The positions of the drogues were recorded at 20 minute intervals using differential GPS and position fixes were transferred to a site chart for record of individual drogue path plotting. Once completed, the results of the tracking were tabulated.

3.2 Dye Survey

Dye tracking surveys were carried out over two days of Spring Tides on 29th and 30th June and two days of Neap Tides on 7th and 8th July using a Chelsea Technology Unilux flurometer integrated with a Trimble DGPS. A Rhodamine dye solution mixed to a density of 1.025kg/litre (for saline waters) by dilution with methanol and distilled water was used for this survey.

Initially it had been requested that a continuous dye release survey be used but after consultation with the local Harbour Master and SFPA officers as well as a number of locals, it was recommended that hourly batch releases of 1 litre dye solutions would be more preferable. As a result individual discreet batches of 1L of pre-prepared dye were released into the water column at the relevant location each hour over the full duration of a tidal cycle during both the spring and neap tides. The location, extent and density of the resulting plumes were logged using the integrated flurometer and DGPS system, which recorded data each second.

3.3 Current Measurements

Two separate current measurement regimes were used in this project. The first was a Nortek Aquadopp Accoustic Doppler Current Profiler (ADCP). It was deployed at Point B for a period of three weeks from 22/06/2009 to 13/07/2009. It recorded 1202 current speed and direction measurements at a number of water depths including 1m above the seabed, mid depth and 1m below the surface.

In addition to the fixed station, spot measurements were taken at five moving stations every hour over a full tidal cycle on the day of the spring and neap tide. A Tyledene ADCP was used for this purpose. It was a direct reading current meter and spot measurements were recorded on Monday 29th June and Tuesday 7th July. The resulting time, speed and direction of the current at each particular point were recorded on a proforma sheet for later transfer to tabulated form.

3.4 Tidal Measurements

The tidal regime in the survey area was recorded through the use of a Valeport 740 stationary tide gauge. This geo-referenced recorder was placed at Bere Island Harbour and recorded tidal regime throughout the duration of the current measurements and bathymetric survey. The tide gauge was referenced to a nearby graduated tide pole and remained in situ from 30 June until 20 July 2009. Additional tidal information was provided by the stationary tidal gauge of the Marine Institute located at Castletownbere Harbour.

3.5 Wind Measurements

Wind measurements were taken from Sea Point Pier at ten minute intervals on the days of 29th June and the 8th July 2009. A Kestrel 4500 Anemometer mounted on a tripod with an accompanying vane was the unit used to record the data. It was placed in an

unobstructed area of the pier and was set to auto record wind speed and direction, both true and magnetic.

3.6 Bathymetric Survey

A bathymetric survey of a large section of Berehaven Sound was carried out between the 8 and 10th July 2009. It covered an area from the northern shore of Bear island, east to Minanekeal, southwest to Dunboy Castle- Fort Point and also included inner Castletownbere Harbour. The survey was done on the basis of survey transects based at 25m line spacing with points taken every second or at 1.5 -2.5 m intervals, depending on the survey vessel speed. The density of the bathymetric survey was increased to 10m spacing within a radius of outfall points A & B1.

An Odom Echotrac CVM was the bathymetric survey system used. Geo-referencing was provided by a Trimble AgGPS 132 with differential corrections. Calibration of echo sounder data was carried out at both the start and the end of the survey using a bar-check. The records of position were time stamped in Hypack which enabled subsequent correction of tidal height with the continual recorded data. The results of the survey were plotted graphically in Hypack.

3.7 Bed Survey

A bed survey was carried out of proposed outfall pipes and pipeline crossing using a combination of diver probing and sub bottom profiling. The diver probe survey was carried out along the line of outfall B1 whilst the sub bottom profiling survey was carried out along two proposed lines X-X1 and Y-Y1.

The diver probe survey used probes to record sediment depths to a maximum of 3m at 20m intervals along the pipeline. A vessel mounted and DGPS integrated (Trition) Tritech SeaKing DST Parametric Sub Bottom profiler sub bottom profiler was the unit used for the sub bottom profiler survey. All acquired data was processed using the units proprietary Seanet Software.

4. RESULTS

4.1 Drogue Tracks

As previously noted, ten curtain type drogues were released over two days of spring tides on 29th and 30th June and two days of neap tides on 7th and 8th July2009.

4.1.1 Drogue Point A: Neap Tide

Ten individually numbered drogues were released from Point A on the 29th June 2009. They were first deployed at 08:45 and were released on an hourly basis until 21:28 when they were retrieved. Notes were taken as to the movement of the drogues and any outside factors which may have influenced their passage. A number of times the drogues had to be removed from rocks before their allotted time had passed. In two other instances the drogues became damaged and sank. The drogues exhibited a steady northeast – southwest passage through Bere Haven Sound with no obvious impairments. They did not enter the harbour but accumulated close to the southern shore of Dinish Island.

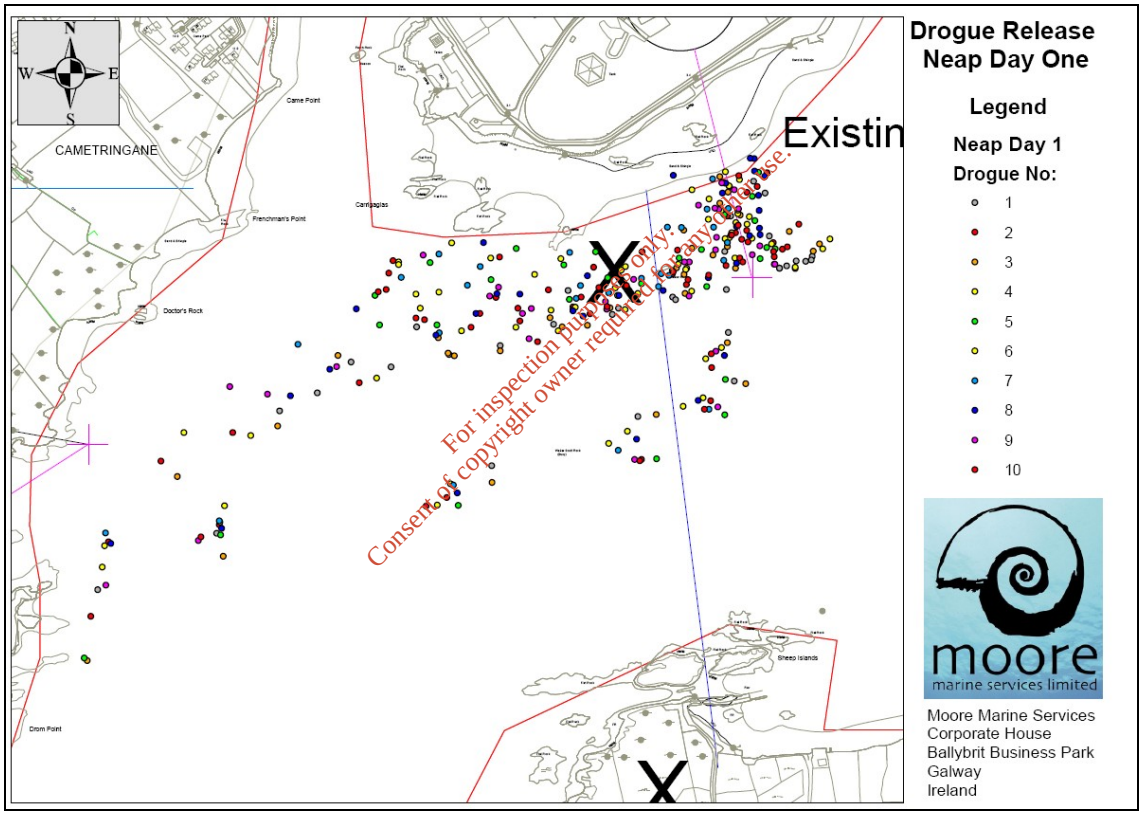


Figure 1. Drogue survey results for Point A on 29th July 2009

4.1.2 Drogue Point B: Neap Tide

Ten individually numbered drogues were released from Point B on the 30th June 2009. They were first deployed at 08:40 and were released on an hourly basis until 20:40 when they were finally retrieved. Notes were taken as to the movement of the drogues and any outside factors which may have influenced their passage. Similar to the previous

release, the drogues exhibited a steady northeast – southwest passage through Bere Haven Sound with no obvious impairments. They did not enter the harbour but congregate close to the southern shore of Dinish Island. They accumulated mid-channel between the northwestern tip of Bere Island and the mainland.

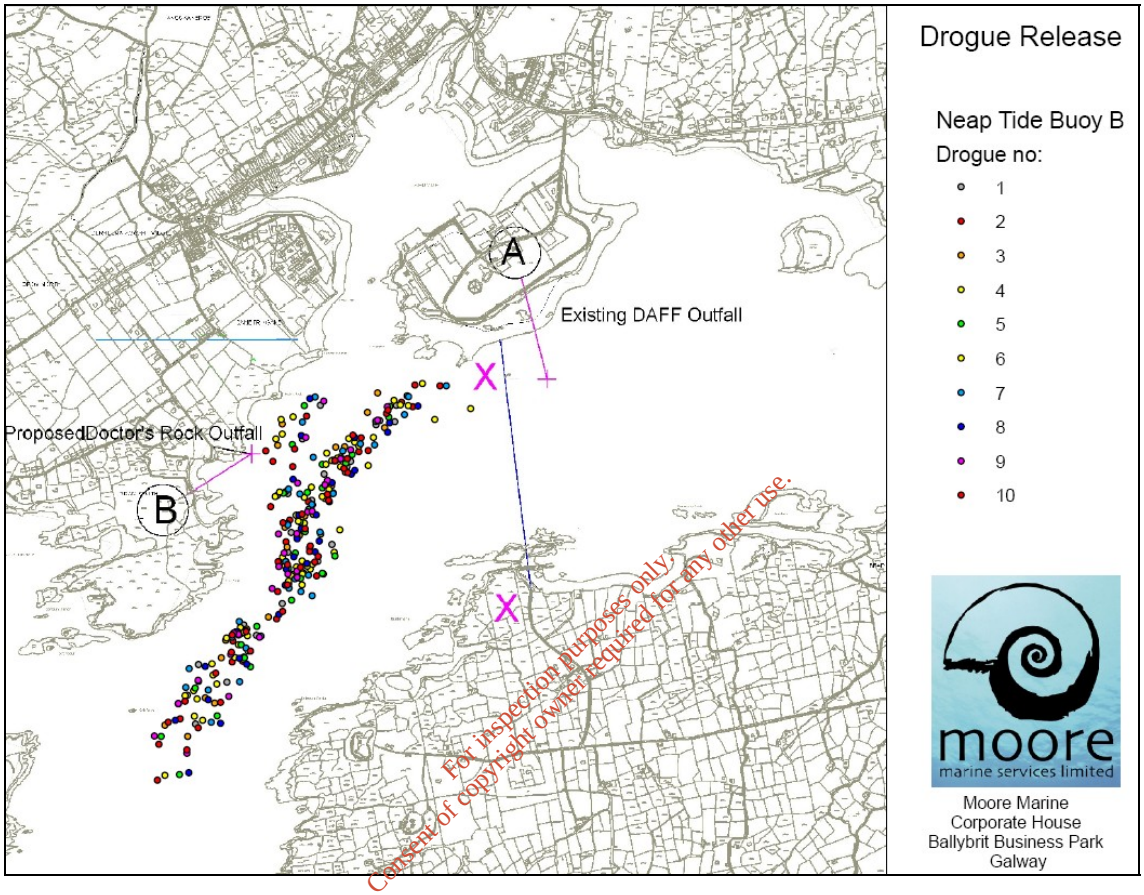


Figure 2. Drogue survey results for Point B on 30th June 2009

4.1.3 Drogue Point A: Spring Tide

Ten individually numbered drogues were released from Point A on the 7th July 2009. They were first deployed at 08:35 and were released on an hourly basis until 21:03 when they were retrieved. Notes were taken as to the movement of the drogues and any outside factors which may have influenced their passage. The drogues exhibited a steady northeast – southwest passage through Bere Haven Sound with no obvious impairments. They did not enter the harbour but accumulated in mid-channel between the northern tip of Bere Island and the mainland.

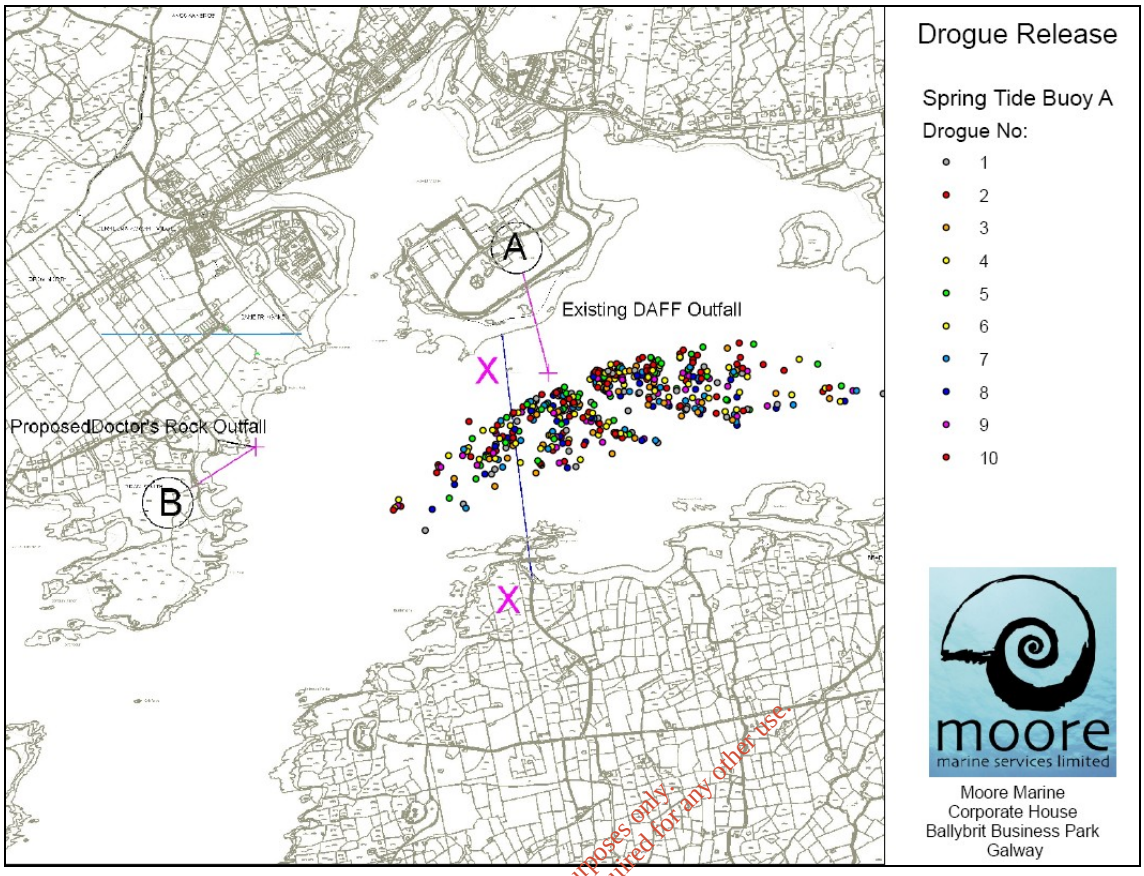


Figure 3. Drogue survey results for Point A on 7th July 2009

4.1.2 Drogue Point B: Spring Tide

Ten individually numbered drogues were released from Point B on the 8th July 2009. They were first deployed at 08:24 and were released on an hourly basis until 19:46 when inclement weather forced the cancellation of the final hour of the survey. Similar to the previous releases, notes were taken as to the movement of the drogues and any outside factors which may have influenced their passage and similar to previous releases; the drogues exhibited a steady northeast – southwest passage through Bere Haven Sound with no obvious impairments. They did not enter the harbour, moved away from the southern shore of Dinish Island and travelled towards the northernwestern tip of Bere Island.

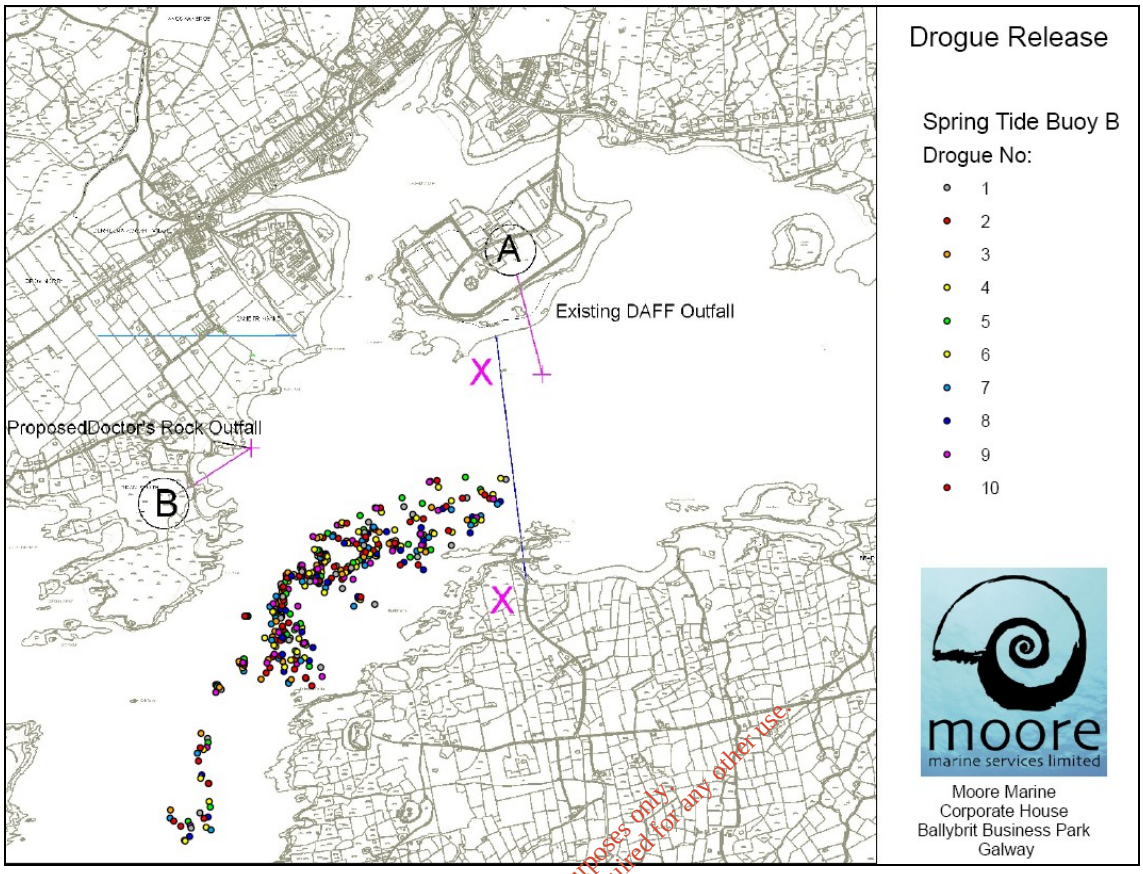


Figure 4. Drogue survey results for Point B on 8th July 2009

4.2 Current measurements

Spring Tide 29-30 June 2009

Point A on 29/06/2009

Current measurements recorded at Point A on 29/06/2009 show a gradual rise and fall in current speeds over the duration of the tide. Speeds increase from 12m/sec in the morning to a maximum 23 m/sec at mid day and low water. They then reduce and rise again thereafter. A similar pattern is visible in the current direction. The ebbing tide flows in a direction towards 300° before stabilising and returning towards 50° with the flooding tide.

Point B on 29/06/2009

The current measurements recorded at Point B on 29/06/2009 are very similar to those recorded at Point A. They show a gradual rise and fall in current spends over the duration of the tide. Speeds increase from 12m/sec in the morning to a maximum 31

m/sec just after mid day. They then reduce with the ebbing tide only to rise again after low water. A similar pattern is visible in the current direction. The flooding tide flows in a direction towards 225° before stabilising and returning towards 50° with the ebbing tide.

Point C on 29/06/2009

The current measurements recorded at Point C on 29/06/2009 show two distinct peaks. The first of these is at 10:30 when a current speed of 28 m/sec is recorded. The speed then drops to a low of 10.5 m/sec before rising steeply again. A similar pattern is visible in the current direction. There is a steady change in the current direction throughout the middle of the day consistent with the fall in tide. It changes from 48° to a steady 200° before returning towards the 50° area again. This appears to be a reflection of the tidal regime in the area.

Point D on 30/06/2009

The current measurements recorded at Point D on 30/06/2009 show fluctuating speeds and directions. Current speeds vary from 15 m/sec in the morning to 5 m/sec in the afternoon and then rise again to 20m/sec in the evening. The current direction throughout this period shows fluctuating movement. Currents vary from 250° to 90° in the space of three hours. They then change another two times during the survey period.

Point E on 30/06/2009

The current measurements recorded at Point E on 30/06/2009 show a steady rising and falling current speed broadly in line with the increase and decrease of the tide in the area. The current begins at 4 m/sec, increasing to 18m/sec at Low water before increasing again with the flooding tide. The current direction throughout this period show a steady change in direction broadly in line with the tidal regime.

Point F on 30/06/2009

The current measurements recorded at Point F on 30/06/2009 show fluctuating speeds and directions. Current speeds vary from 18 m/sec in the morning to 3 m/sec in the afternoon (low tide) and then rise again to over 23m/sec in the evening when the tide is filling again. The current direction throughout this period shows fluctuating movement. Currents vary from 250° to 90° in the space of three hours.

Neap Tide 7 and 8 July 2009

Point A on 07/07/2009

Current measurements recorded at Point A on 07/07/2009 show a gradual rise and fall in current speeds over the duration of the tide. Speeds increase from 8m/sec at low water in the morning to a maximum 25 m/sec at high water. They then reduce and rise again thereafter. Records of the current direction show a change from 250° to 60°. It then remains constant before returning towards 220°in the afternoon with the ebbing tide.

Point B on 07/07/2009

The current measurements recorded at Point B on 07/07/2009 show a fluctuating current speed. They vary from 6m/sec in the morning after low water to 36m/sec towards High water. The current speed then reduces after high water. A similar pattern is visible in the current direction. The flooding tide flows in a direction towards 360° at low water before swinging around and stabilising at c. 200°.

Point C on 07/07/2009

The current measurements recorded at Point C on 07/07/2009 shows two distinct peaks. The first of these is at 10:30 when a current speed of 32 m/sec is recorded. The speed then drops to a low of 17 m/sec before rising steeply again. A similar pattern is visible in the current direction. There is a steady change in the current direction throughout the middle of the day consistent with the fall in tide. It changes steadily from 260° to a 20° before returning towards the 320° area again. This appears to be a reflection of the tidal regime in the area.

Point D on 07/07/2009

The current measurements recorded at Point D on 07/07/2009 shows a clear and distinct rise in current speed in line with the rise in water levels. During this period, the current speeds rise from 8 m/sec to 31 m/sec. This then falls again after high water has been reached. Current directions remain constant throughout much of the tidal regime.

Point E on 07/07/2009

The current measurements recorded at Point E on 07/07/2009 shows a clear and distinct rise and fall in current speed in line with the rise in water levels. During this period, the current speeds fall from a high of 37m/sec recorded close to mid tide. It then falls to 3 m/sec at low water before rising again to 29 m/sec. This speed is reduced again closer to high water. Current directions vary throughout the day they slowly reduce from 270° towards 50° in the afternoon, although there is a brief time at mid day where the wind direction reverts to 250°.

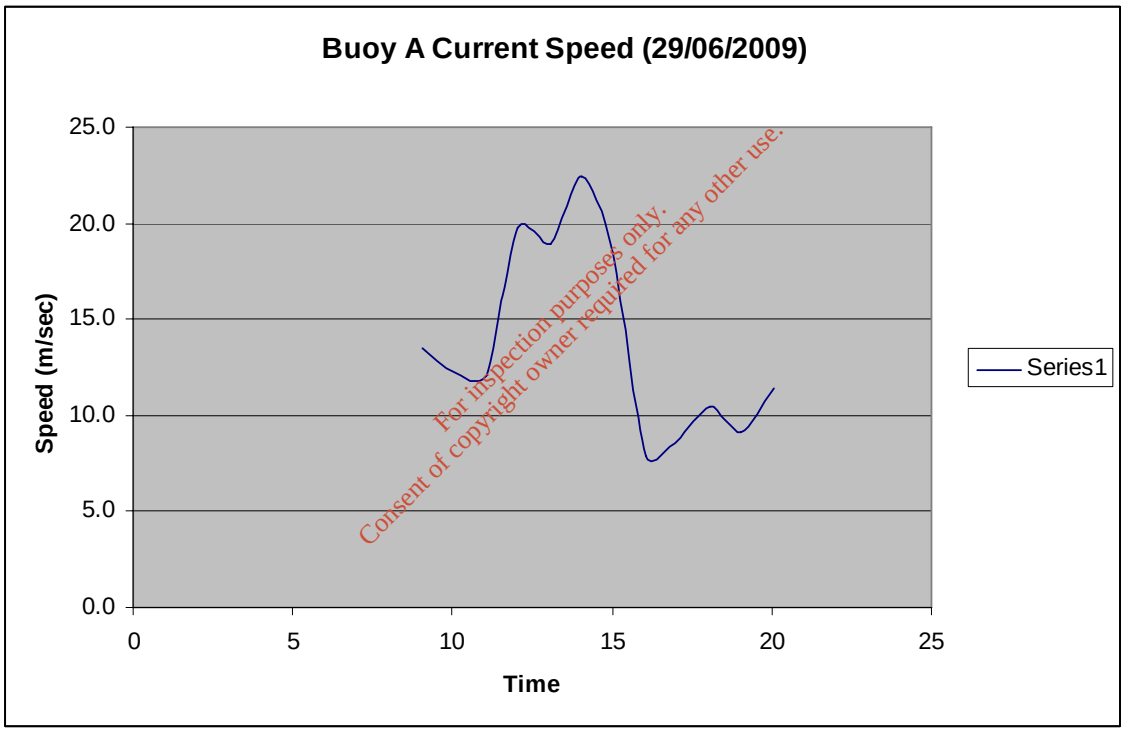


Figure 5. Current Speed for Point A on 29/06/2009

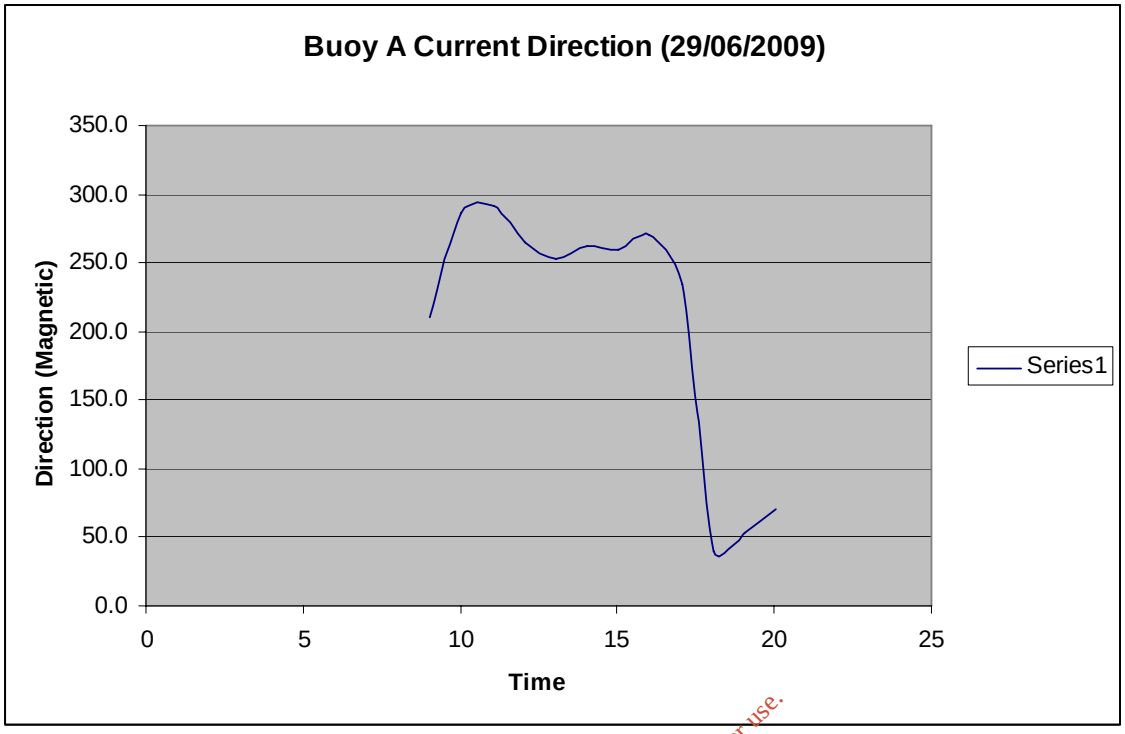


Figure 6. Current Direction for Point A on 29/06/2009

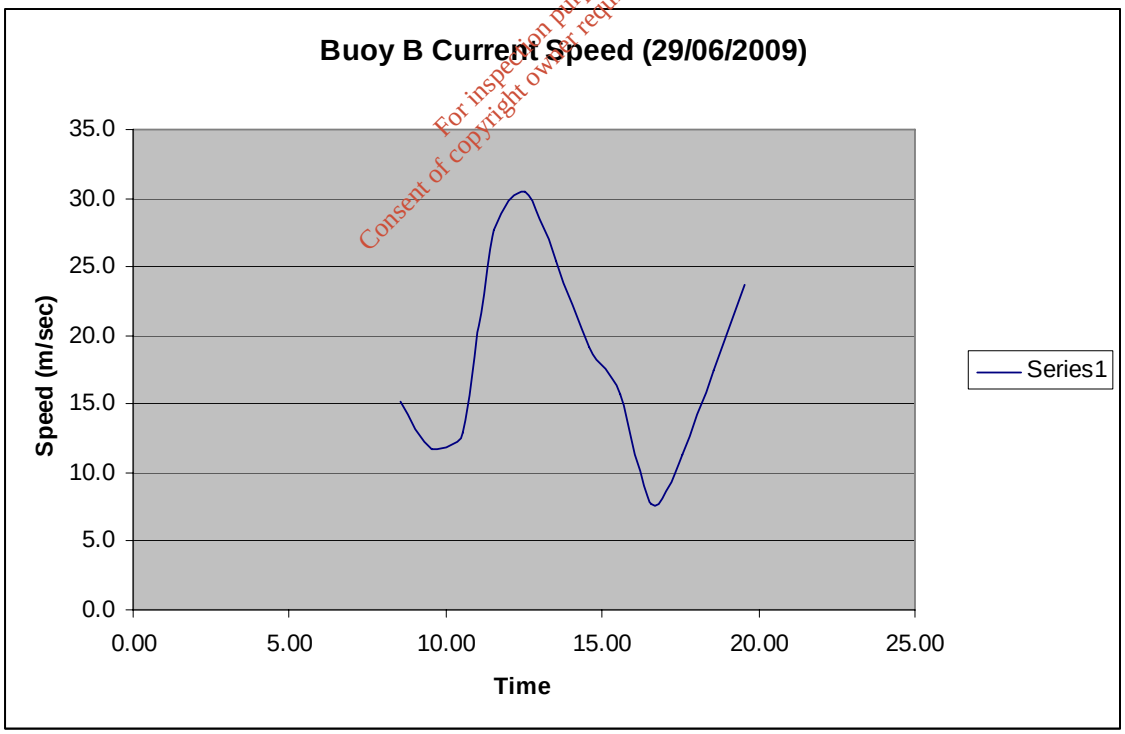


Figure 7. Current Speed for Point B on 29/06/2009

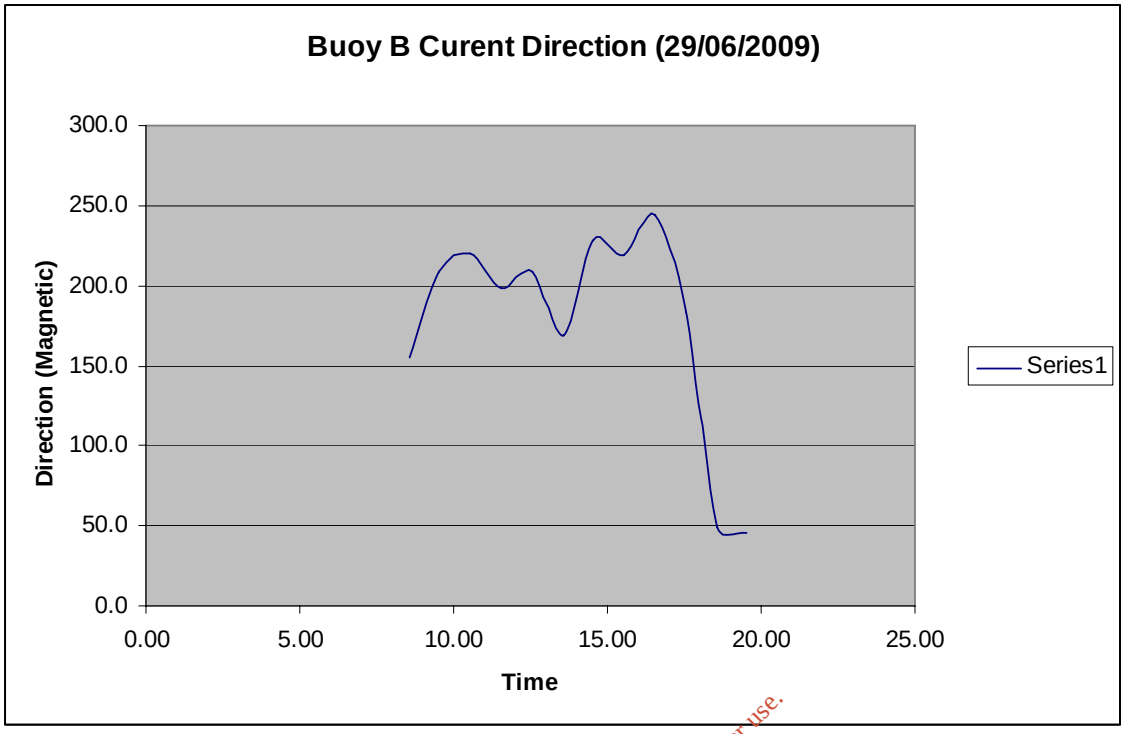


Figure 8. Current Direction for Point B on 29/06/2009

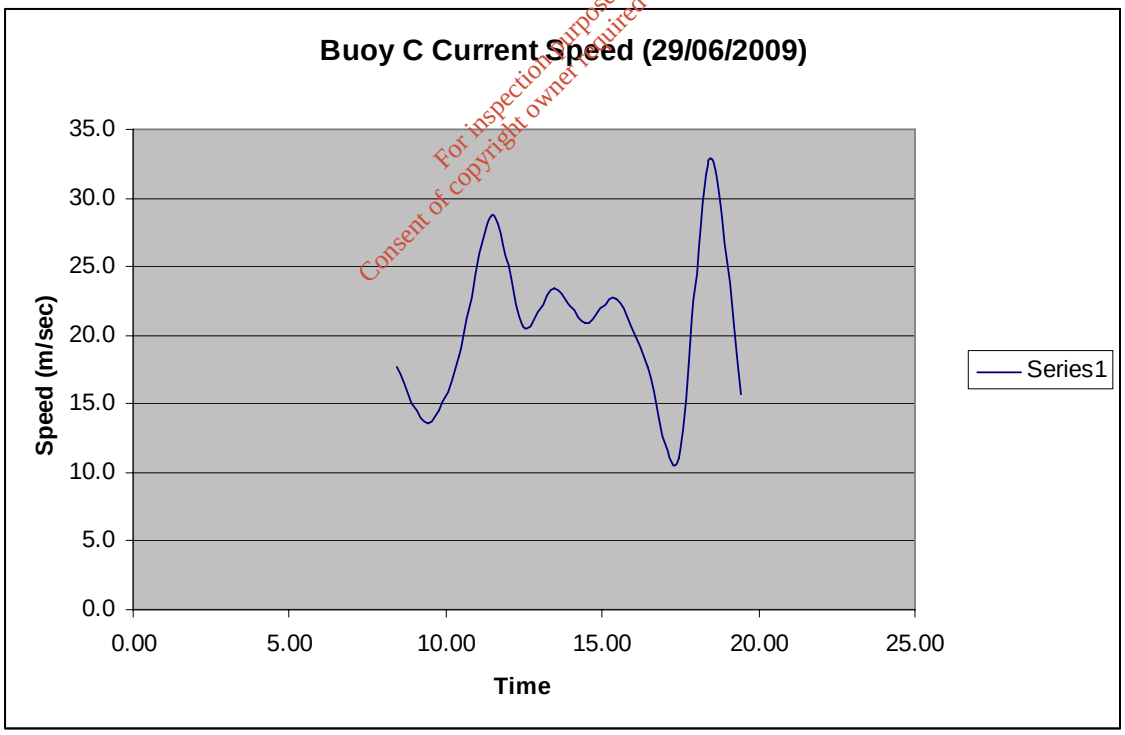


Figure 9. Current Speed for Point C on 29/06/2009

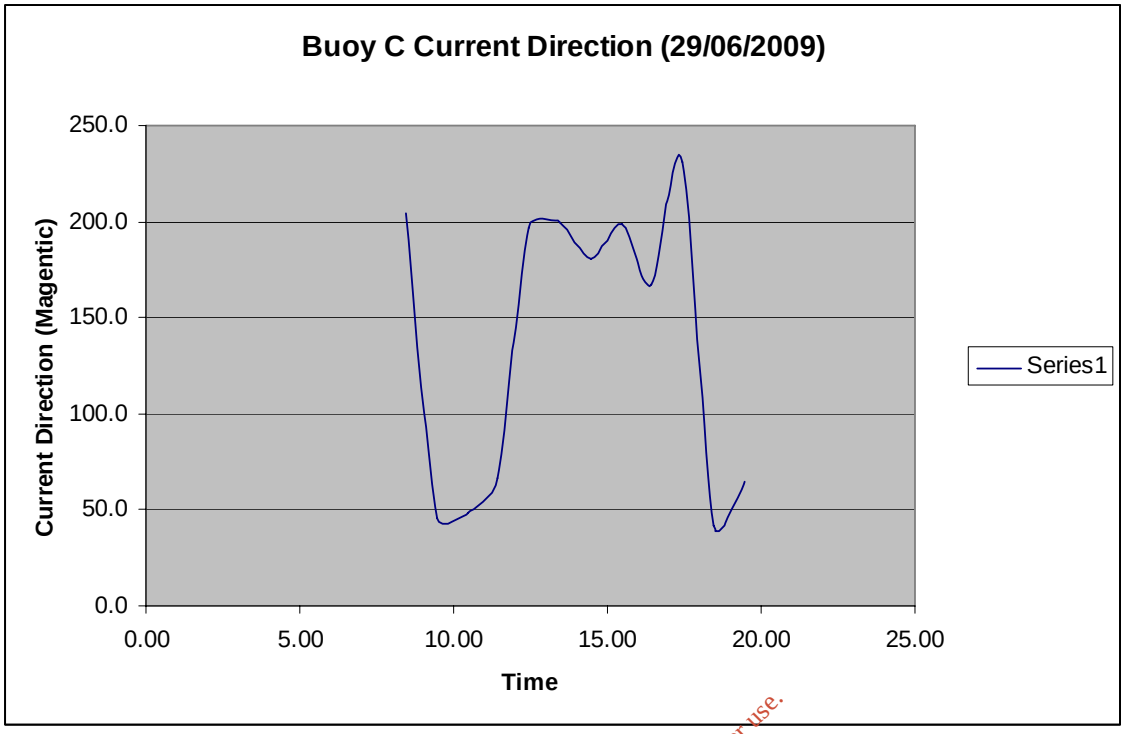


Figure 10. Current direction for Point C on 29/06/2009

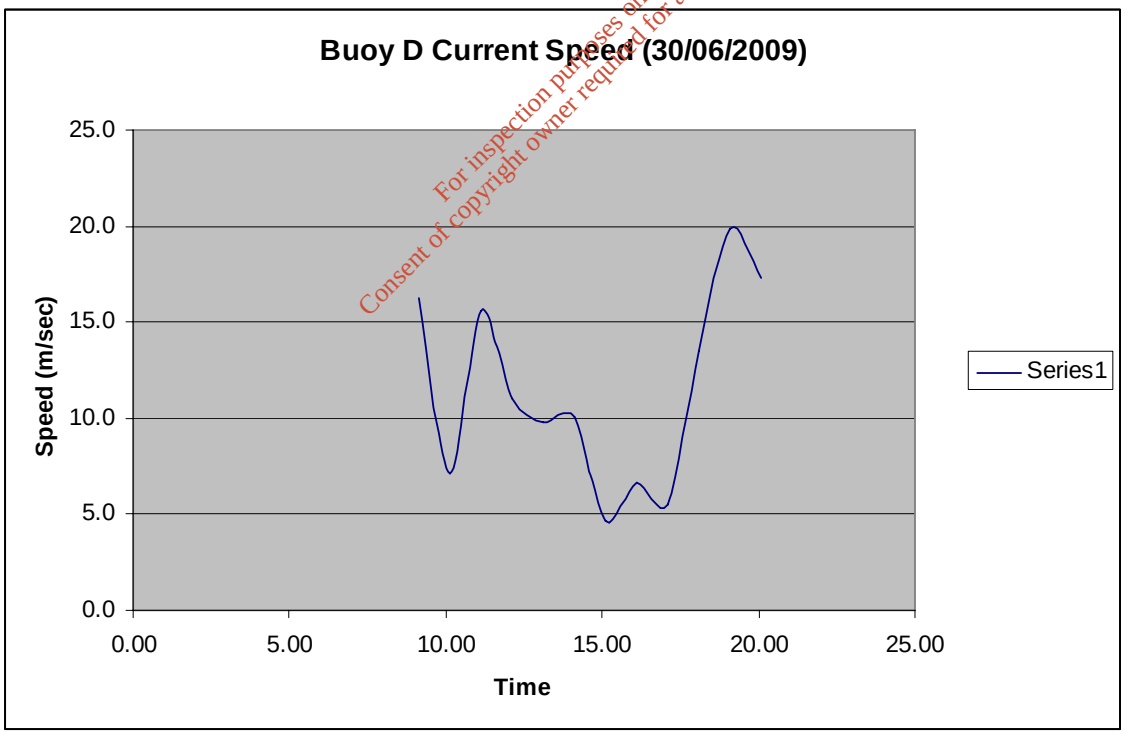


Figure 11. Current Speed for Point D on 30/06/2009

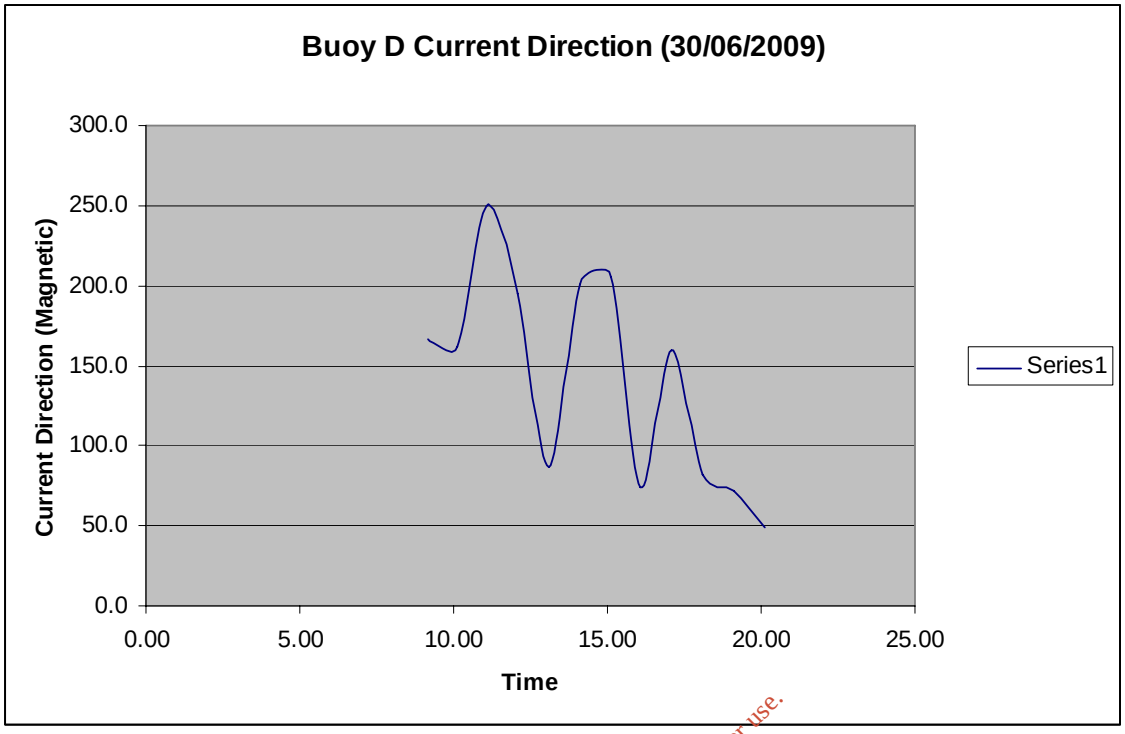


Figure 12. Current Direction for Point D on 30/06/2009

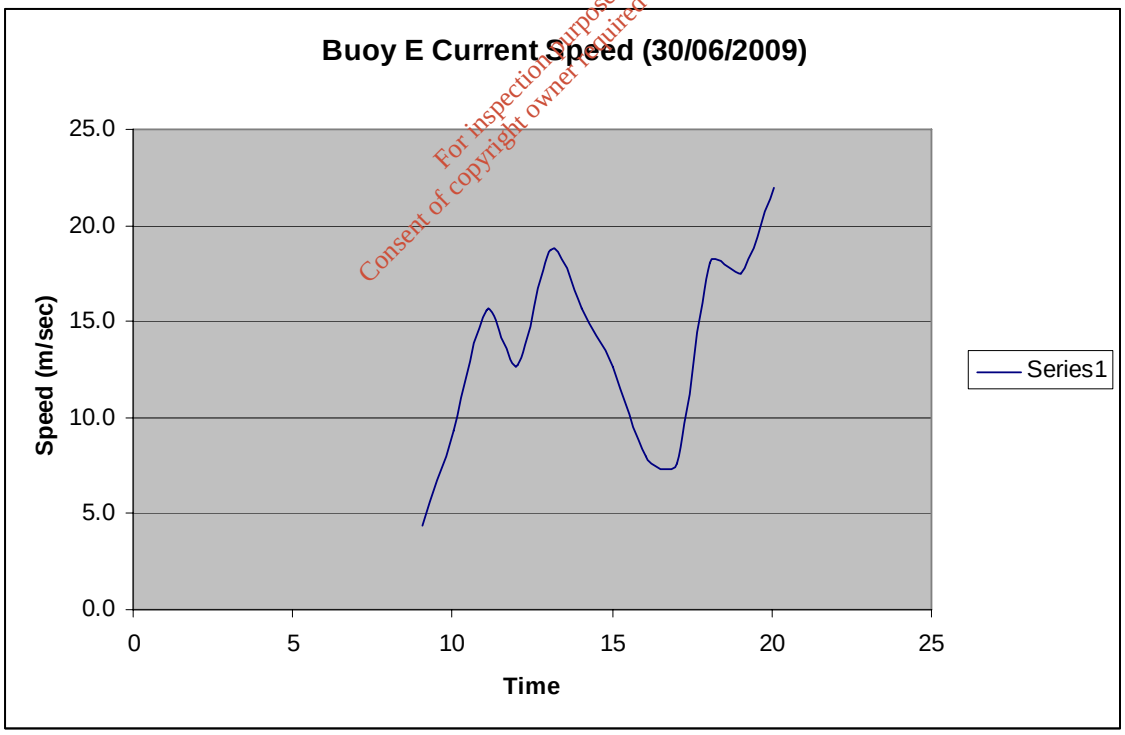


Figure 13. Current Speed for Point E on 30/06/2009

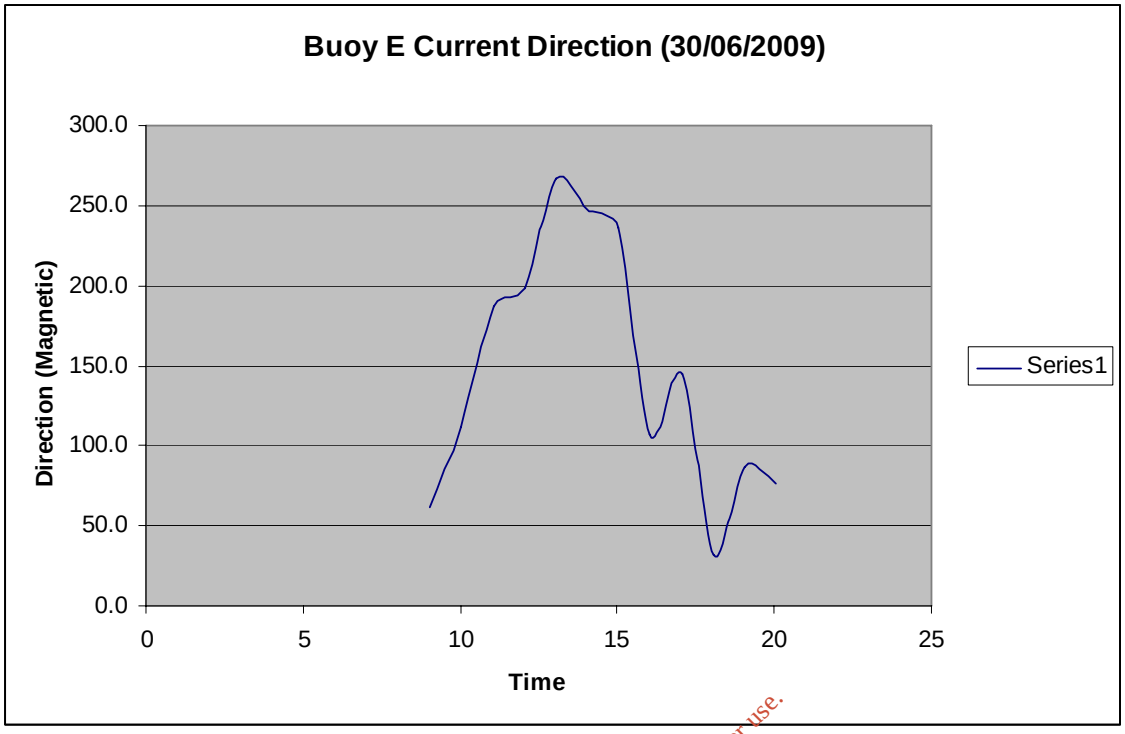


Figure 14. Current Direction for Point E on 30/06/2009

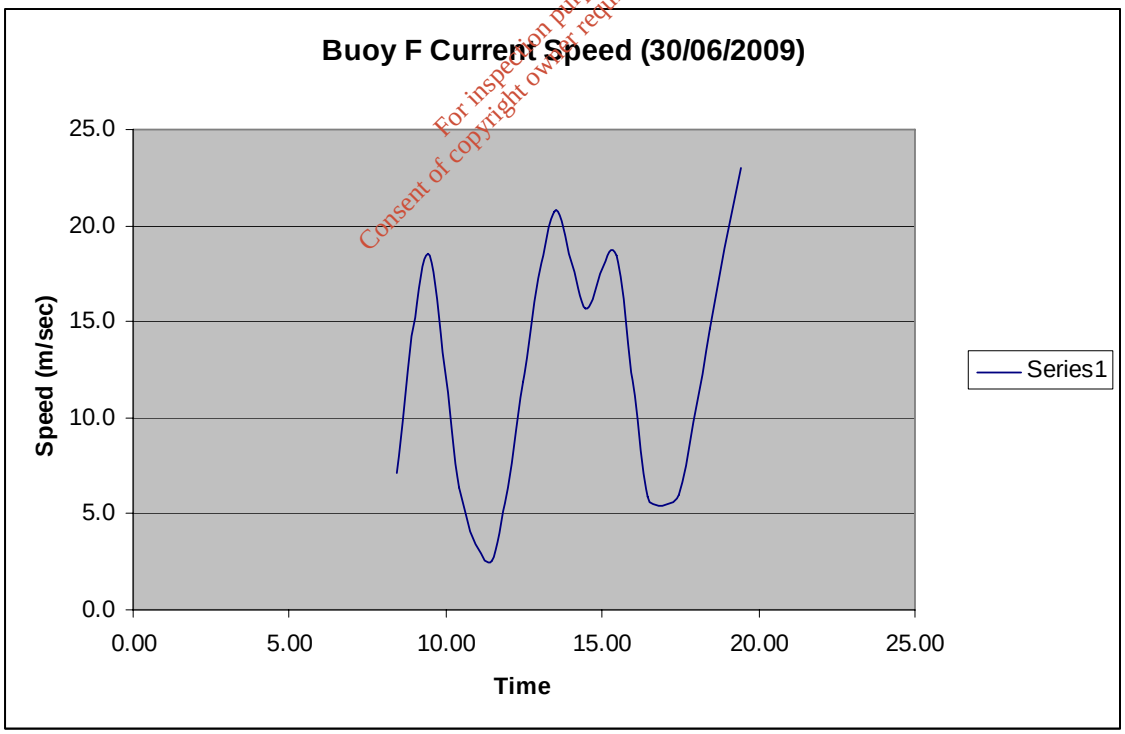


Figure 15. Current Speed for Point F on 30/06/2009

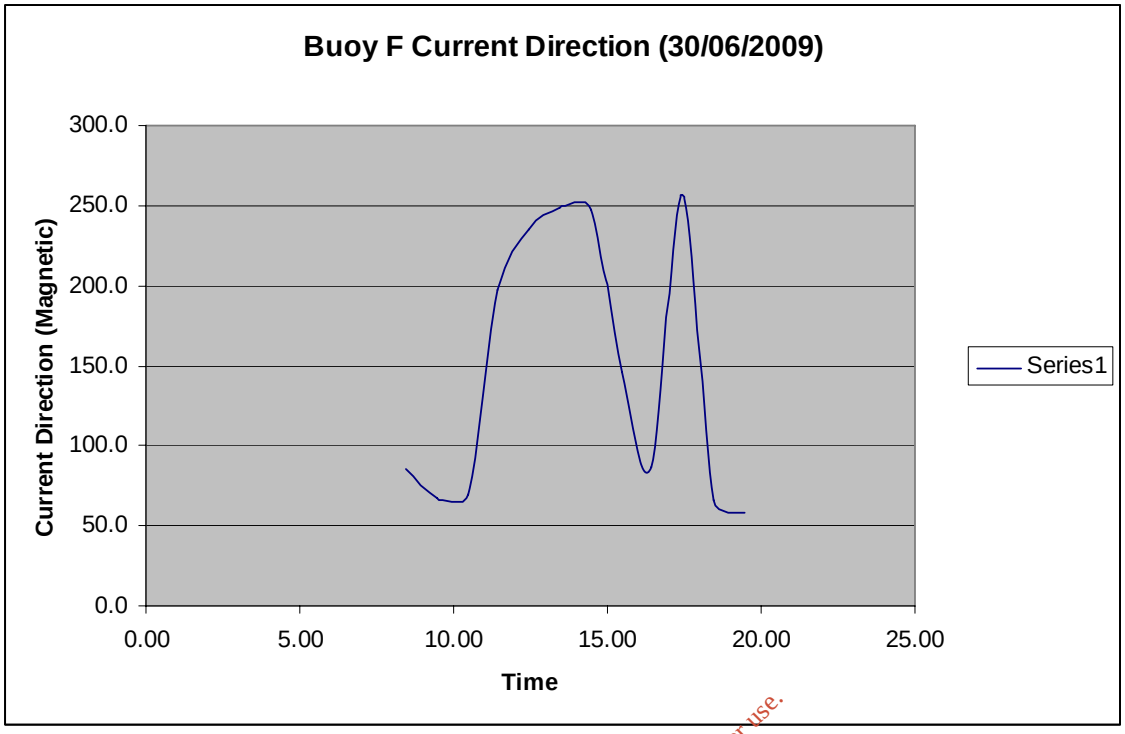
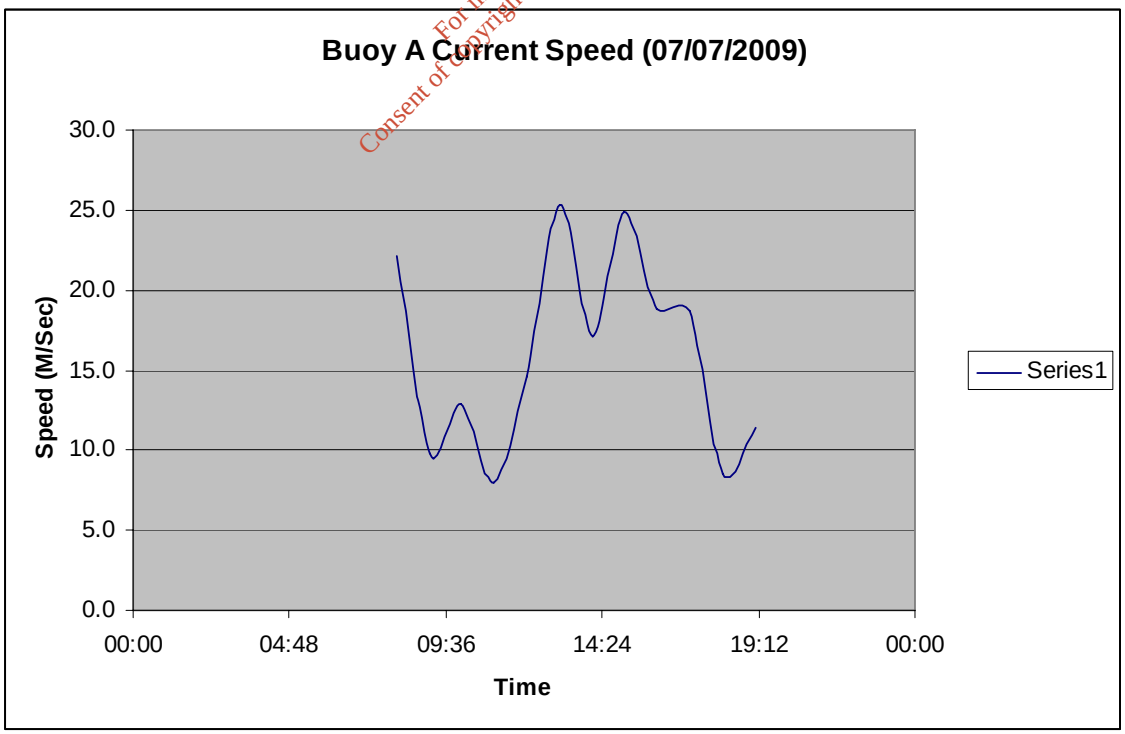
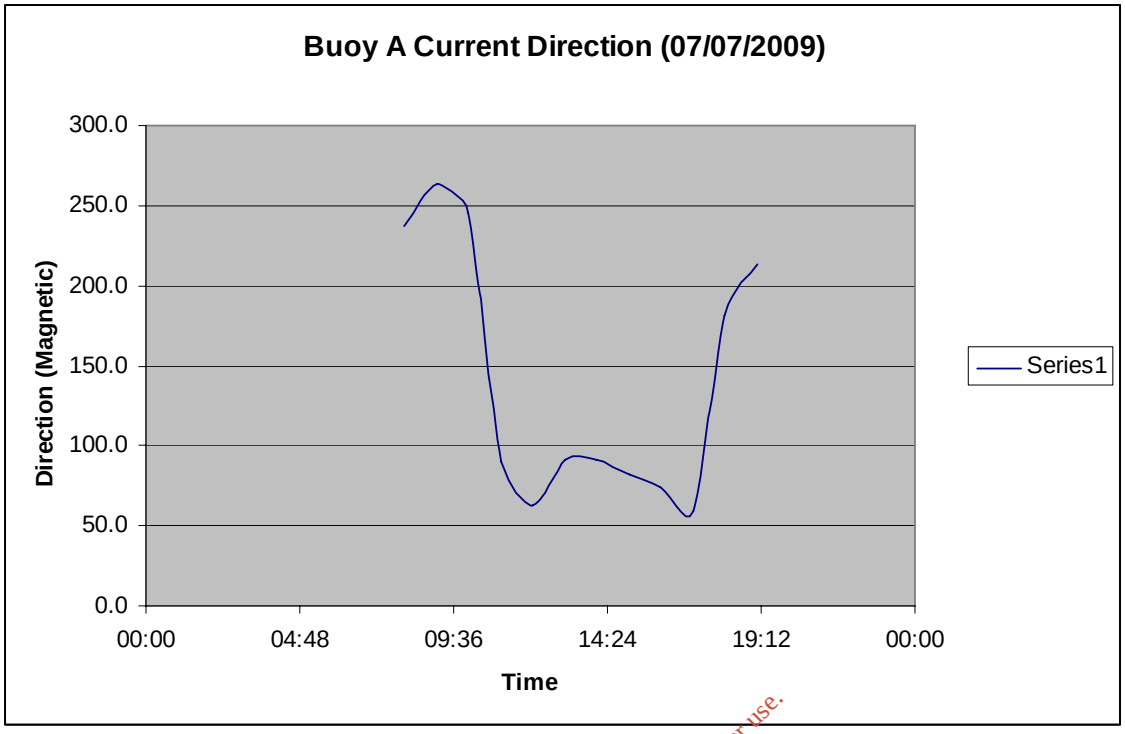
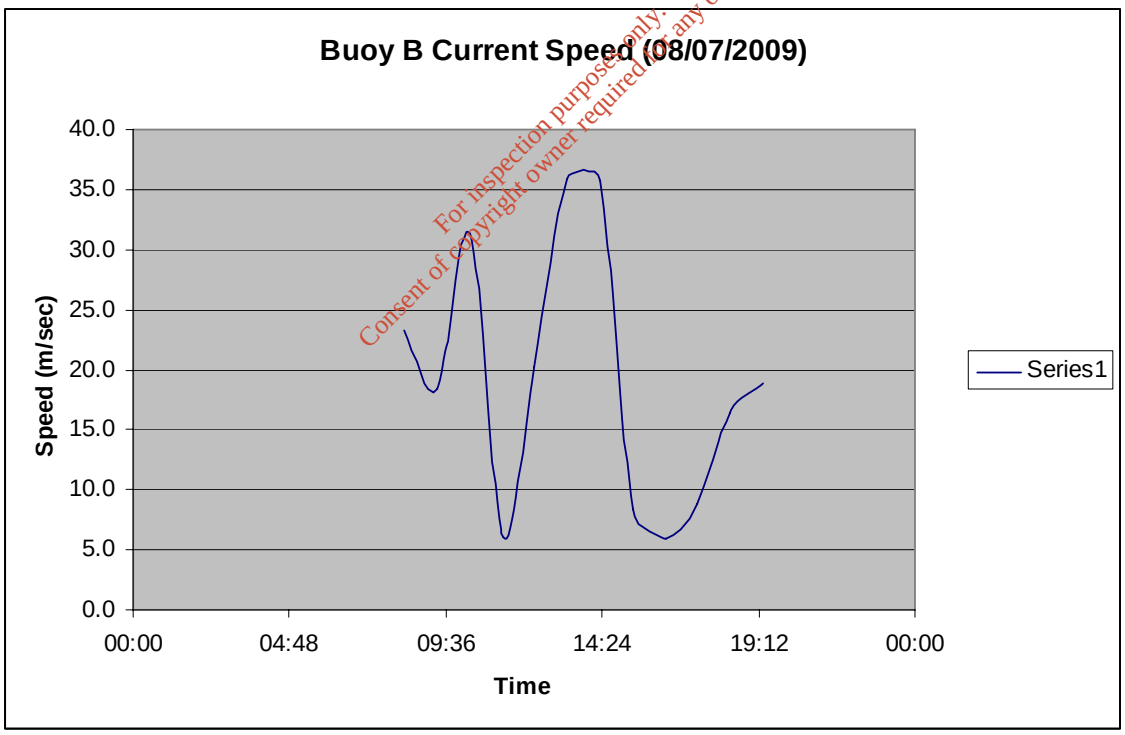
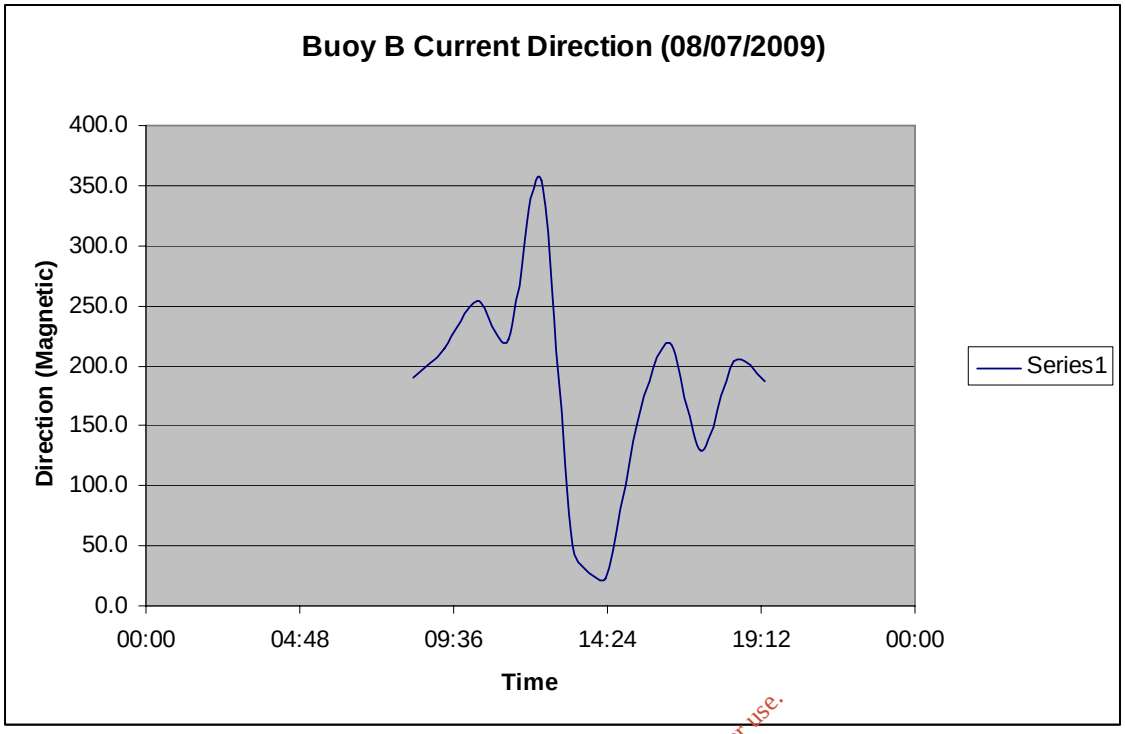


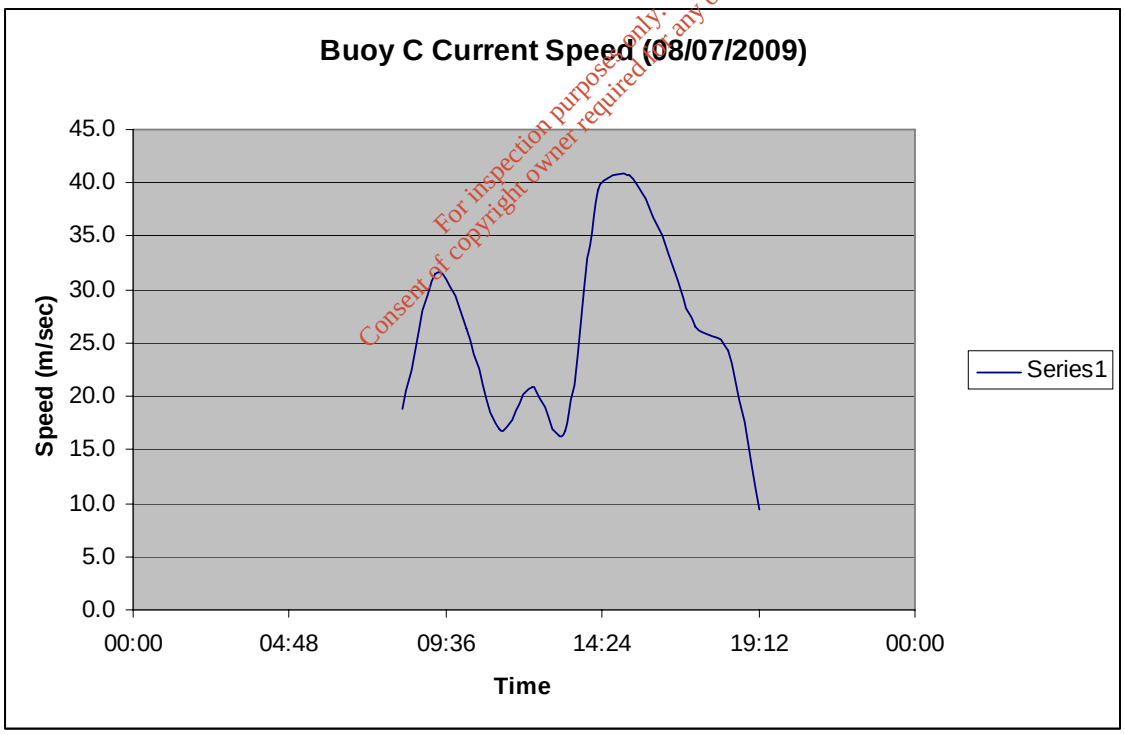
Figure 16. Current Direction for Point F on 30/06/2009

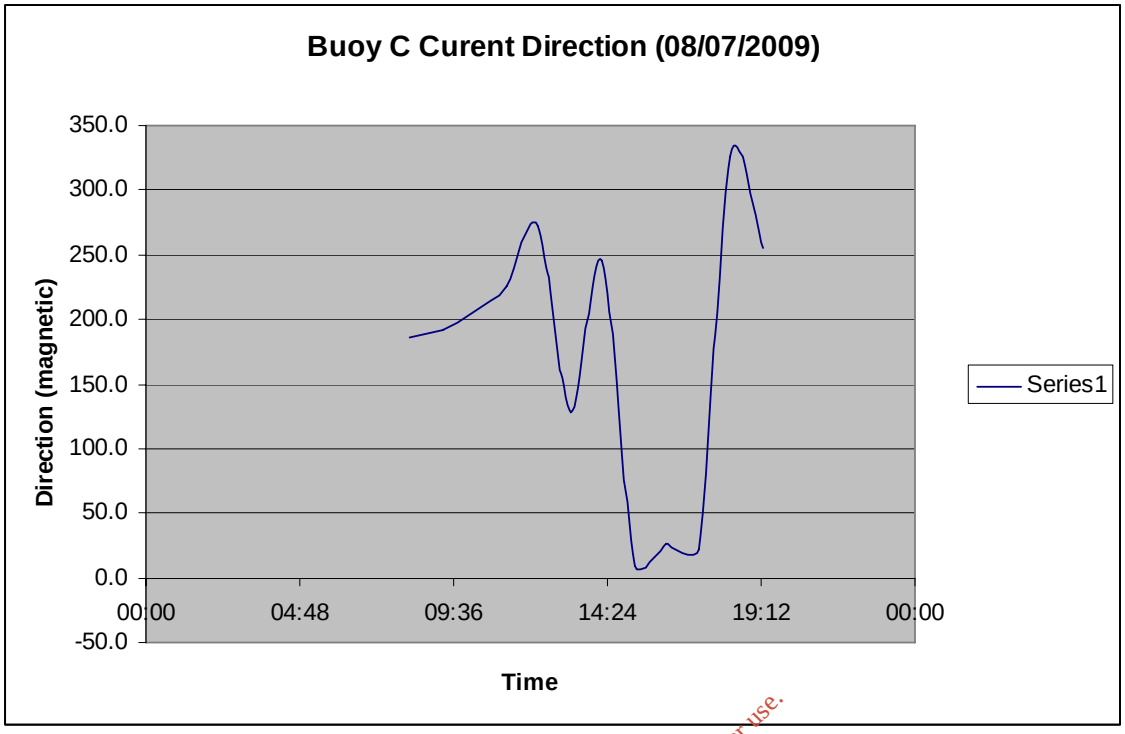


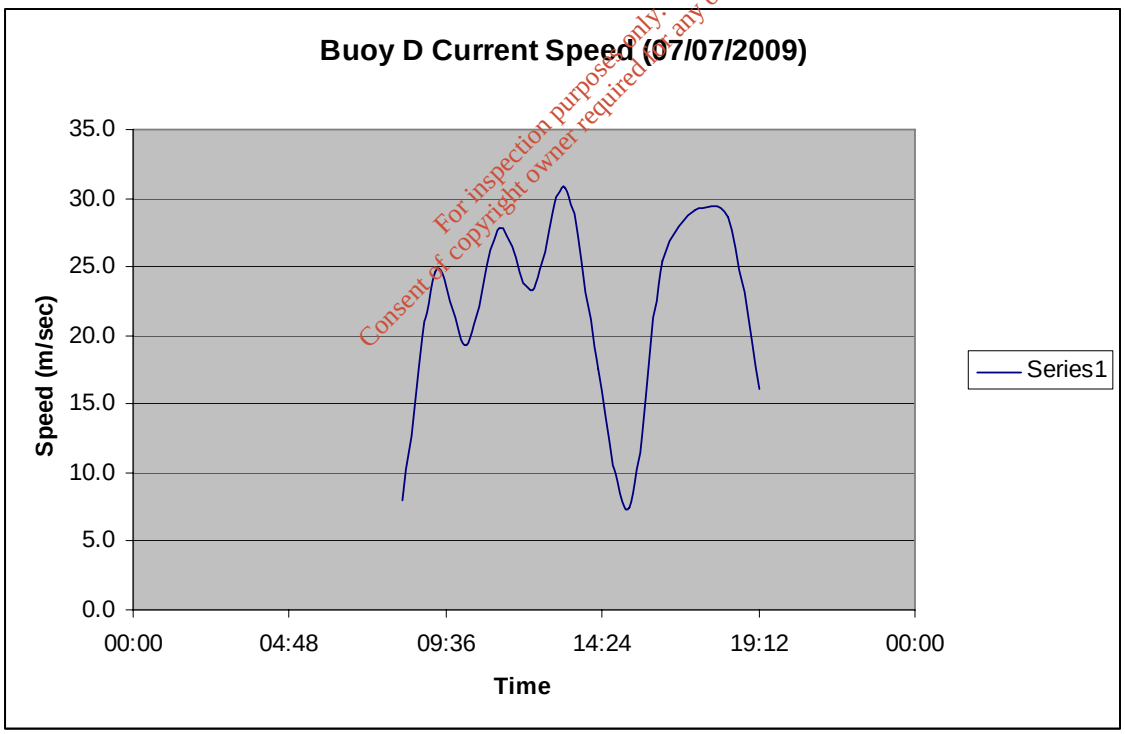


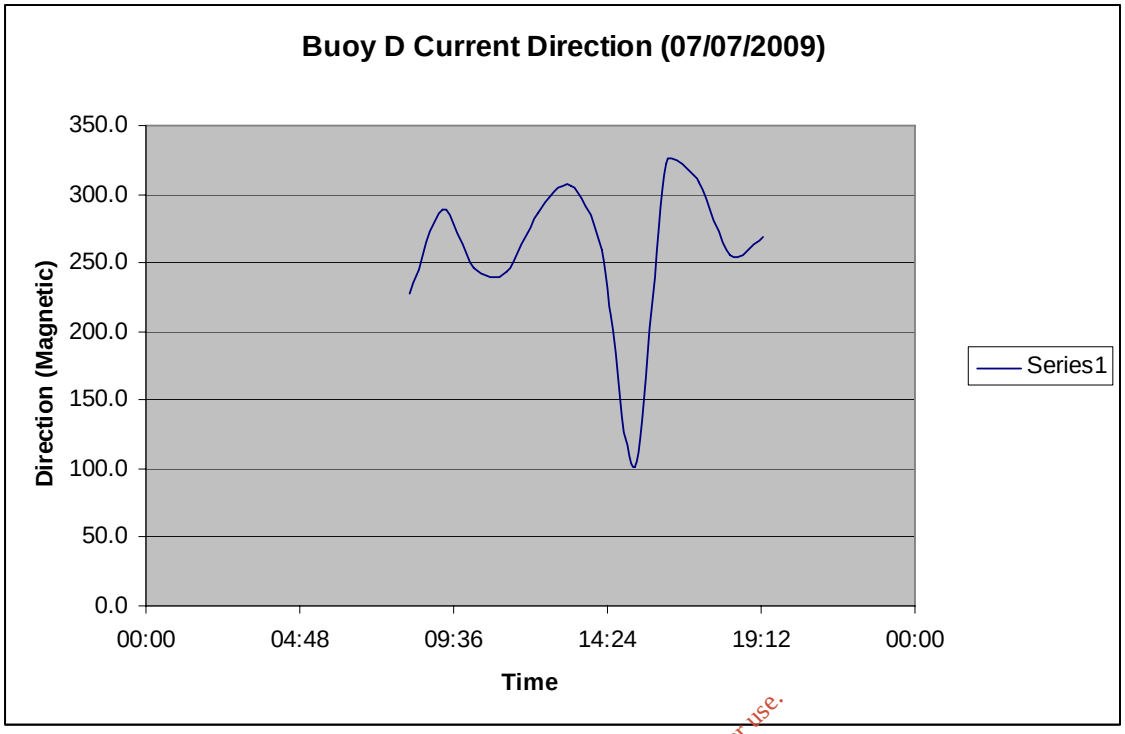


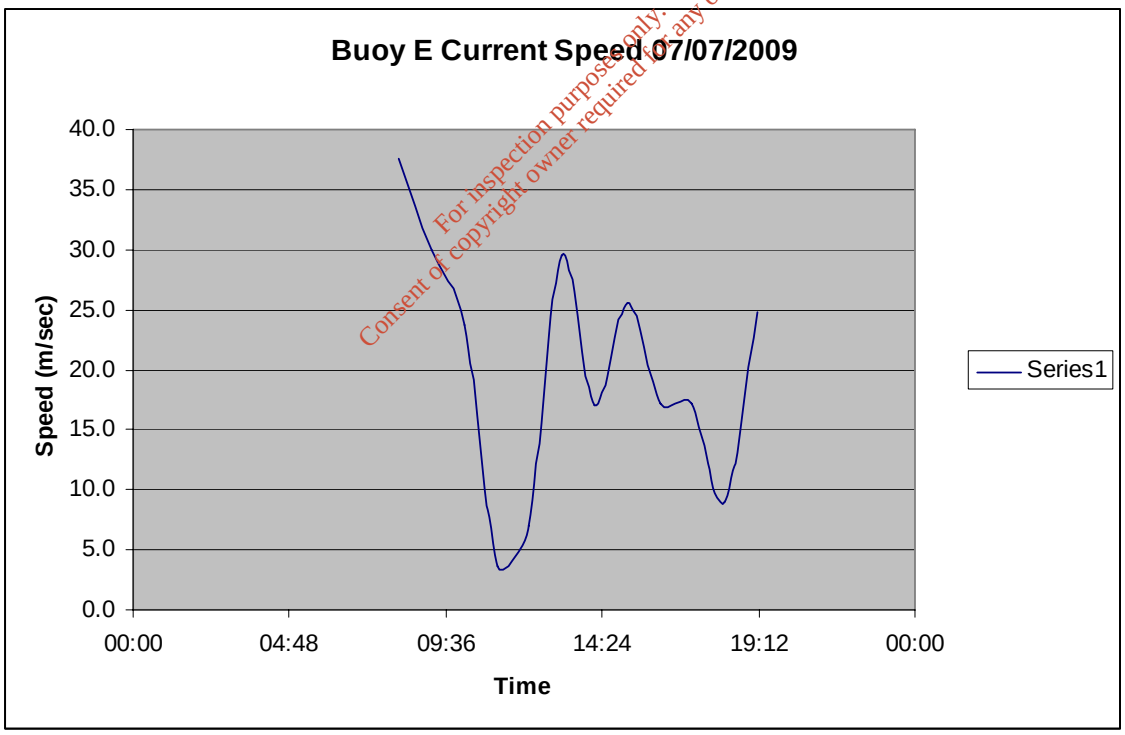


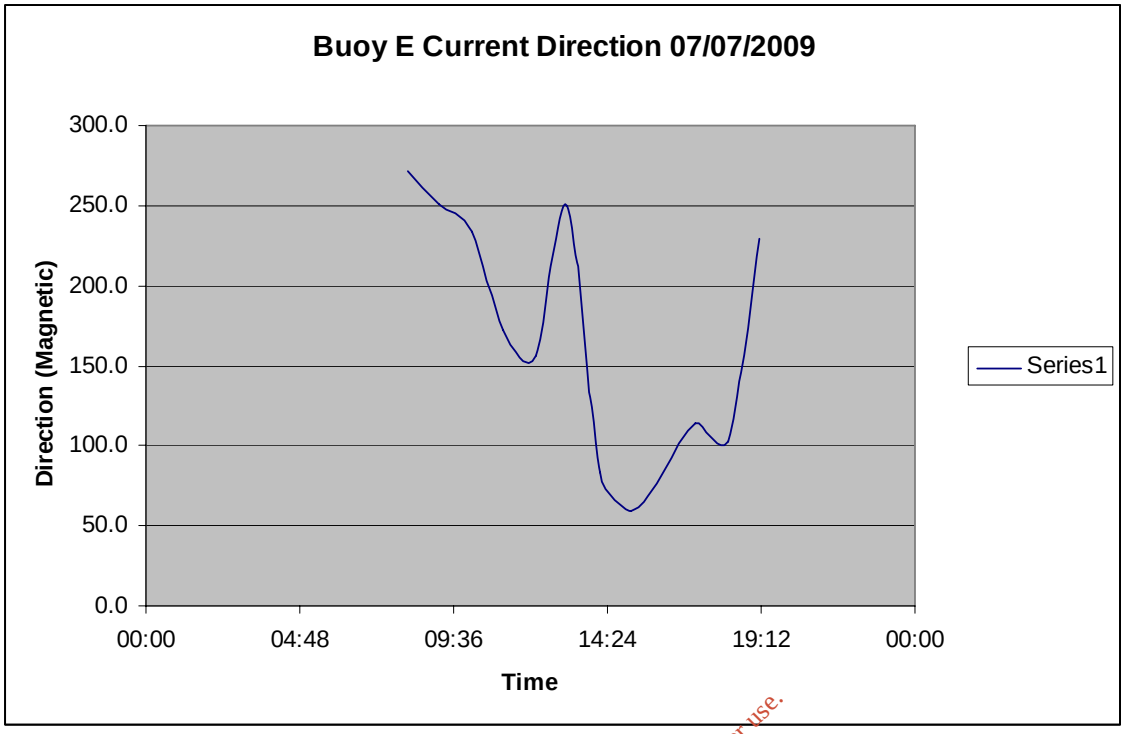












4.3 Wind measurements

The anemometer readings were plotted using Kestrel software. They demonstrate that on both 29th and 30th June there were gusting winds on 29th ranging rising in speed from 2.5 in the morning to an average of 6m/sec in the afternoon. There was a steady wind direction of 120° to 160° (true). On 30th June wind speeds were decreased. They were steadily high in the morning and then reduced in the afternoon. There was a predominant wind direction of 140° to 170° throughout the entire day.

Wind speed for 7th June 2009 rose steadily in the morning to an average in the afternoon of 8 m/sec. Similarly, wind direction was steady between 250° and 350°.

Wind speed for 8th June 2009 rose steadily for an average of 5m/sec in the morning to 7m/sec in the afternoon. Concurrent with this increase in wind speed was a slight change in wind direction, where it veered from an average of 320° in the morning to 270° in the afternoon.

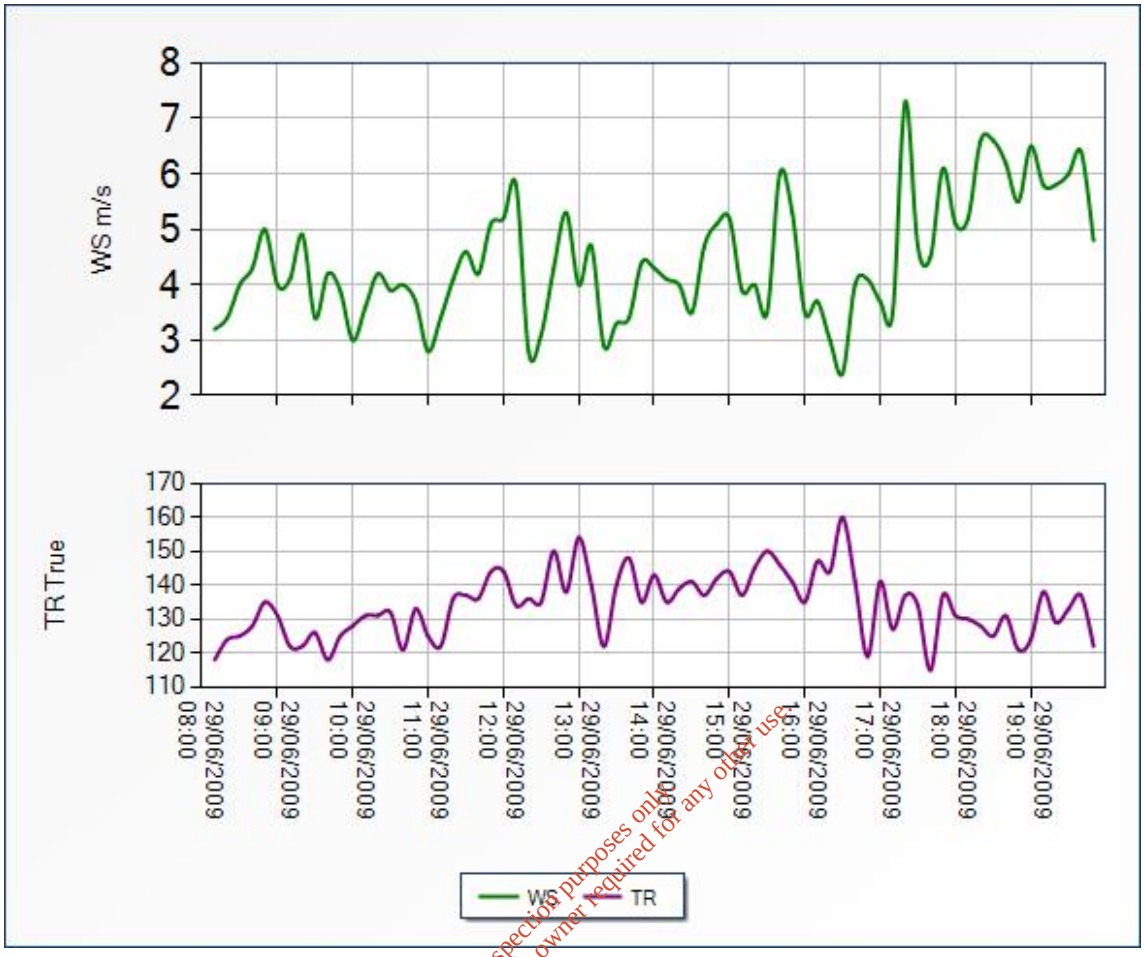


Figure 17. Wind Speed and direction for 29 June 2009

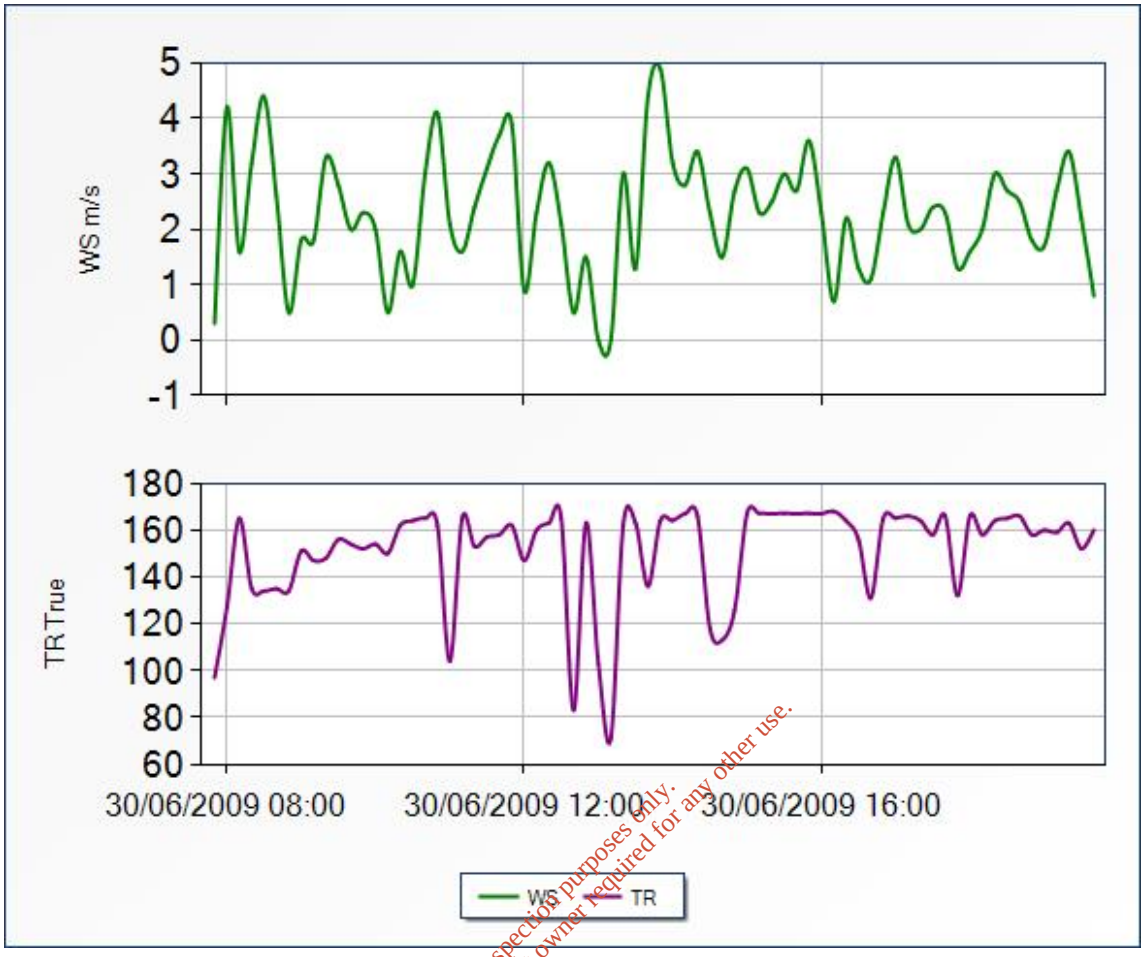


Figure 18. Wind speed and direction for 30 June 2009

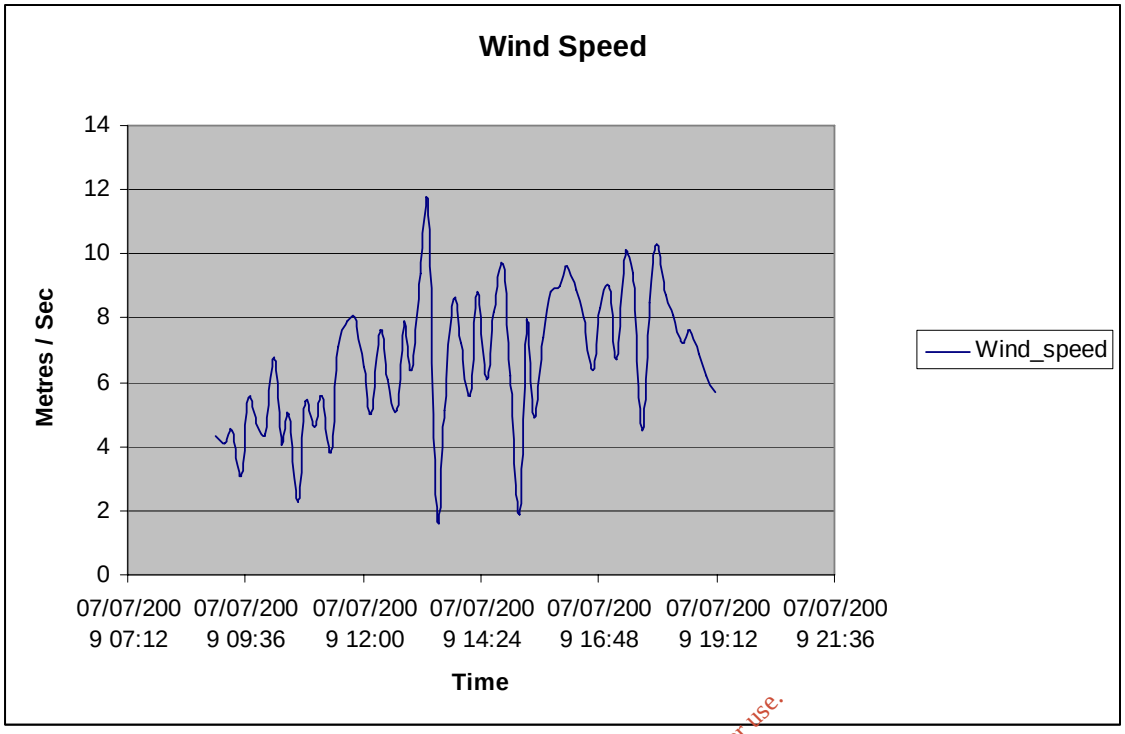


Figure 19. Wind speed for 07 June 2009

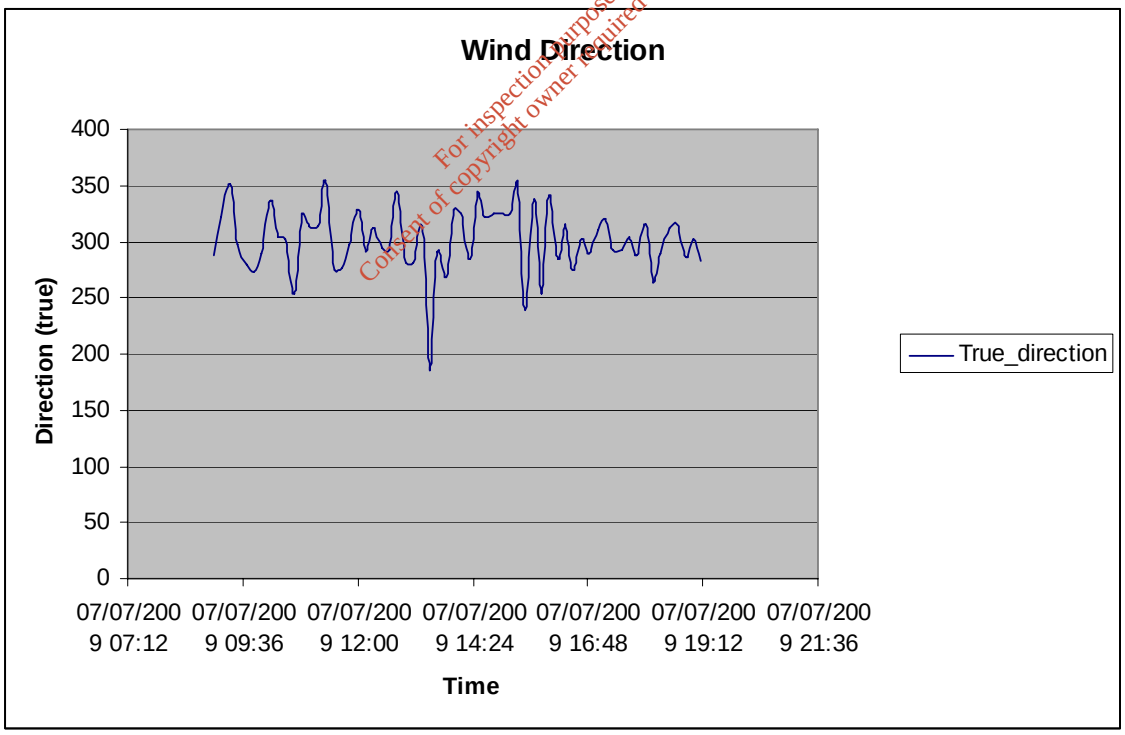


Figure 20. Wind direction for 07June 2009

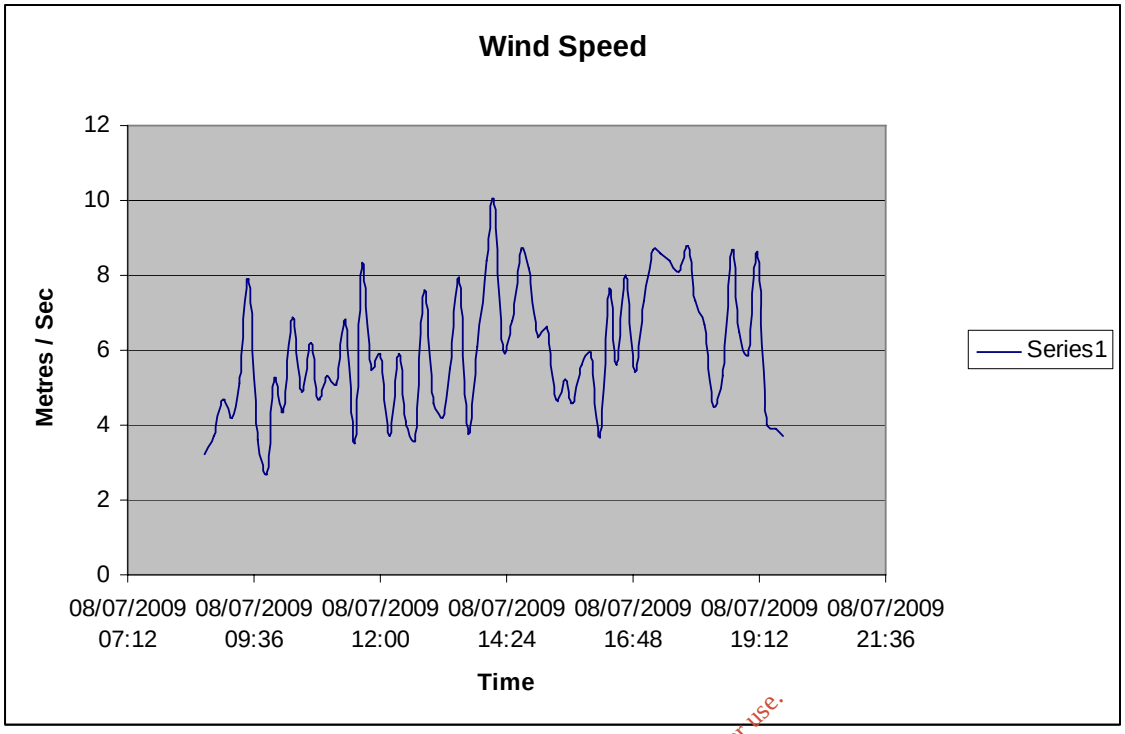


Figure 21. Wind speed for 8th August 2009

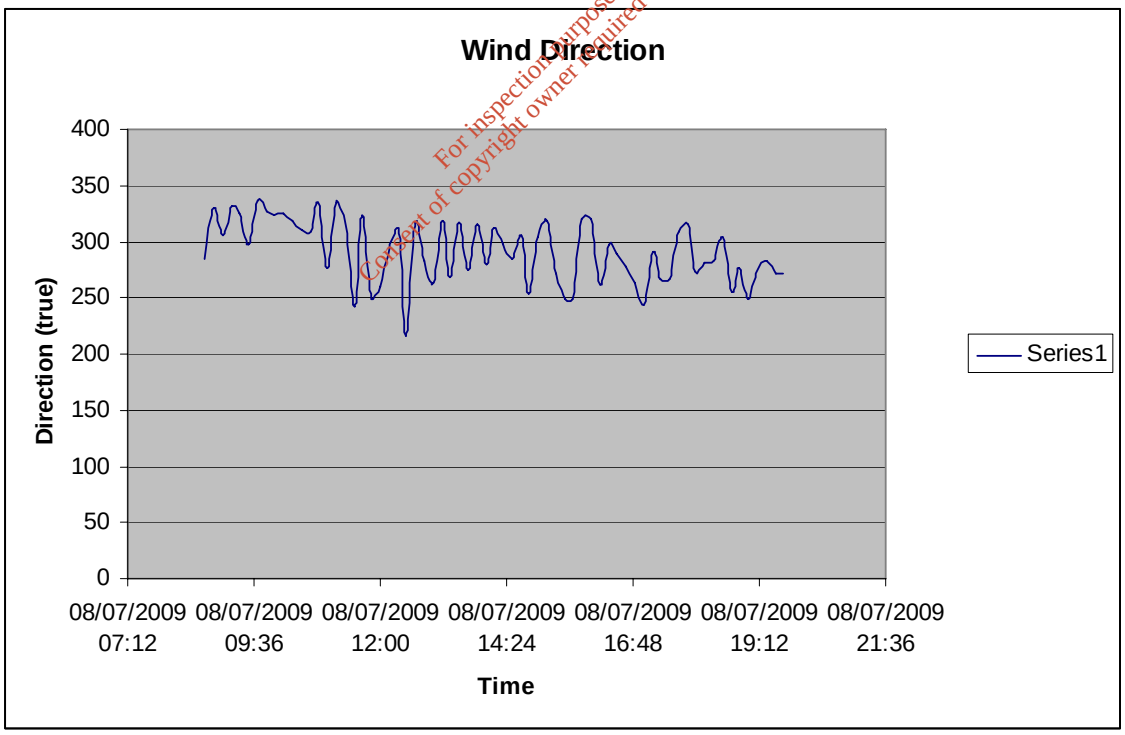
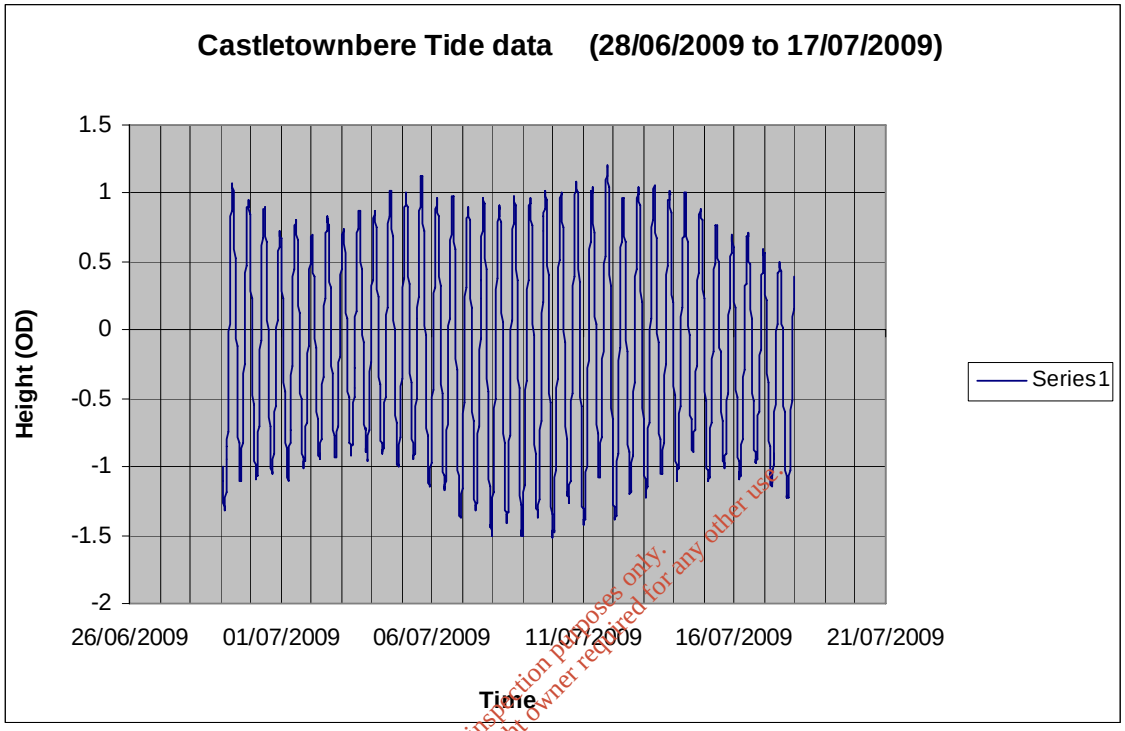


Figure 22. Wind Direction for 8th August 2009

4.4 Tidal measurements

The tidal measurements for Castletownbere show a uniform rise and fall. No irregularities were noted.



4.4 Bathymetric survey

The bathymetric survey of the subject site does not depict any significant changes to the seafloor when compared to the relevant Admiralty Chart (1804).

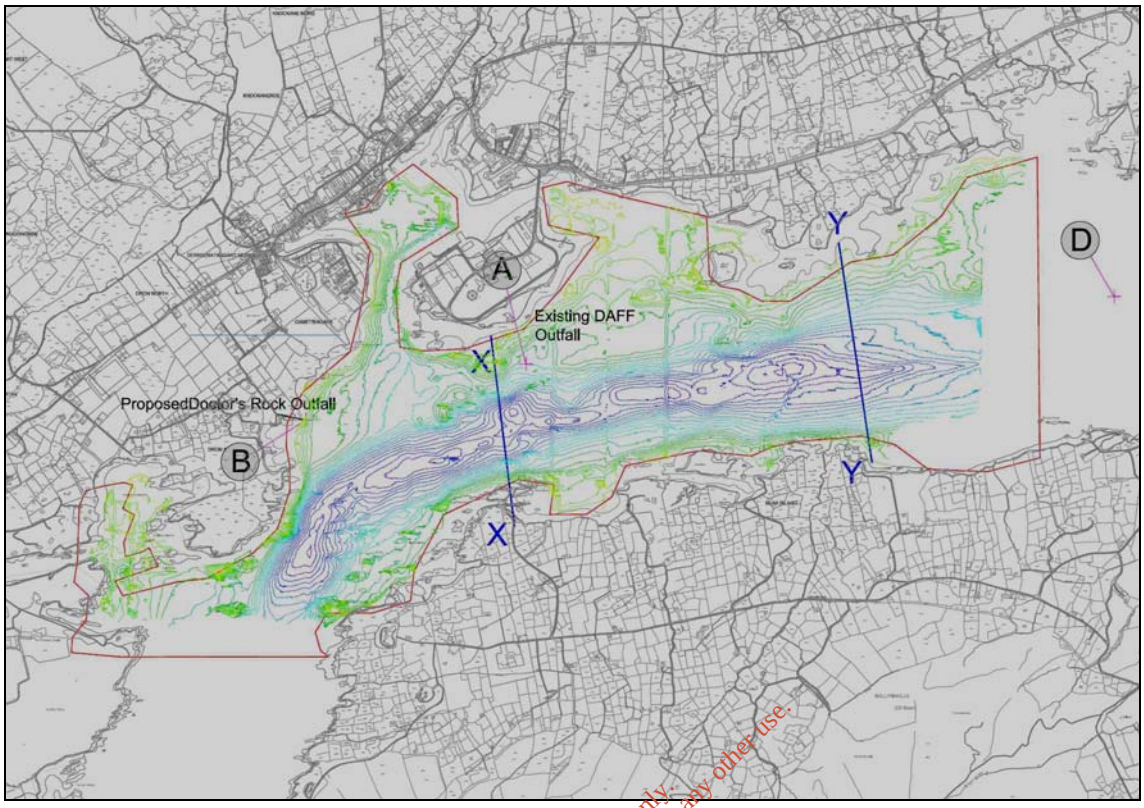


Figure 23. Bathymetric Survey

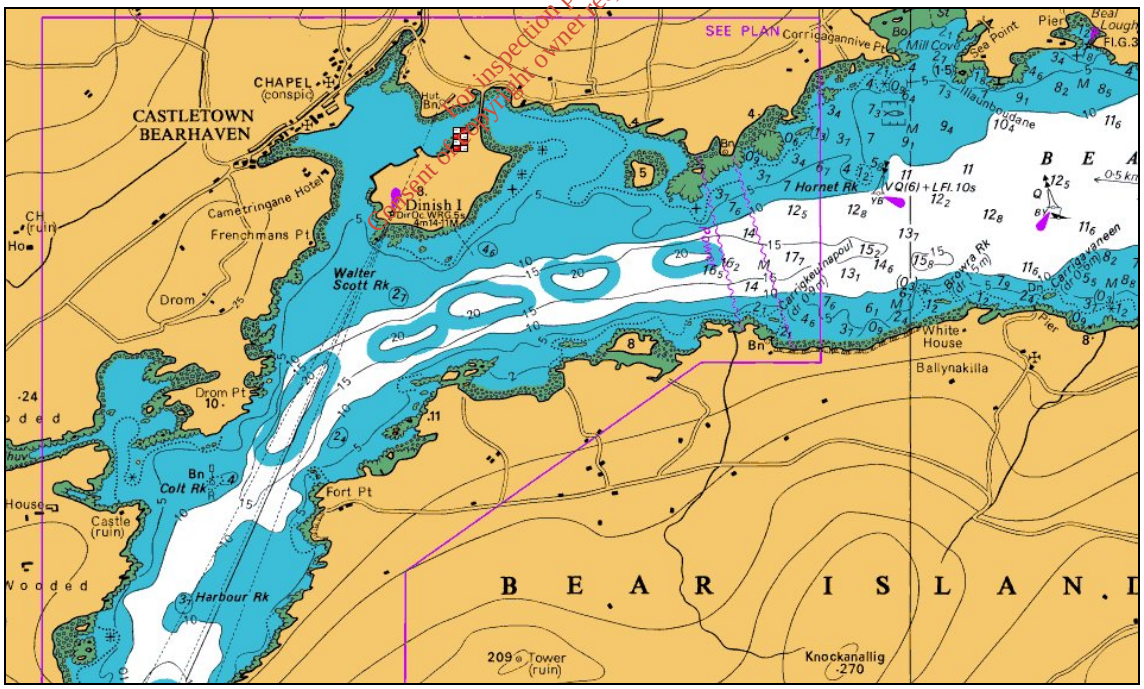


Figure 24. Extract from Admiralty Chart 1840

4.5 Bed Surveys

The diver probe recorded the following results for the bed survey:

Easting	Northing	Depth
67720	45070	over 2.5m
67802	45072	over 2.5m
67702	45091	over 2.5m
67693	45101	Hard Substrate at 1.5m
67685	45111	Gravel Horizon at 1.65m
67677	45122	Compact Gravel Horizon at 1m
67670	45131	over 2.5m
67662	45141	Gravel and Stones at 0.2m
67653	45152	Bare Rock