Advanced tides and plotting

Prawle Point NCI

Objectives

Re-cap and practice;

- Tidal theory
- Time and Range of local tides
- Tidal streams
- Plotting tidal and wind drift
- Eddies, races and overfalls

Plotting Refresher Exercise

Determine the Range and Bearing, and Latitude and Longitude of tidal diamonds A and C on the chart.

Answers

A

- 8.7 NM 240 °
- Lat. 50° 07’.8 N Long. 003° 55’.3 W

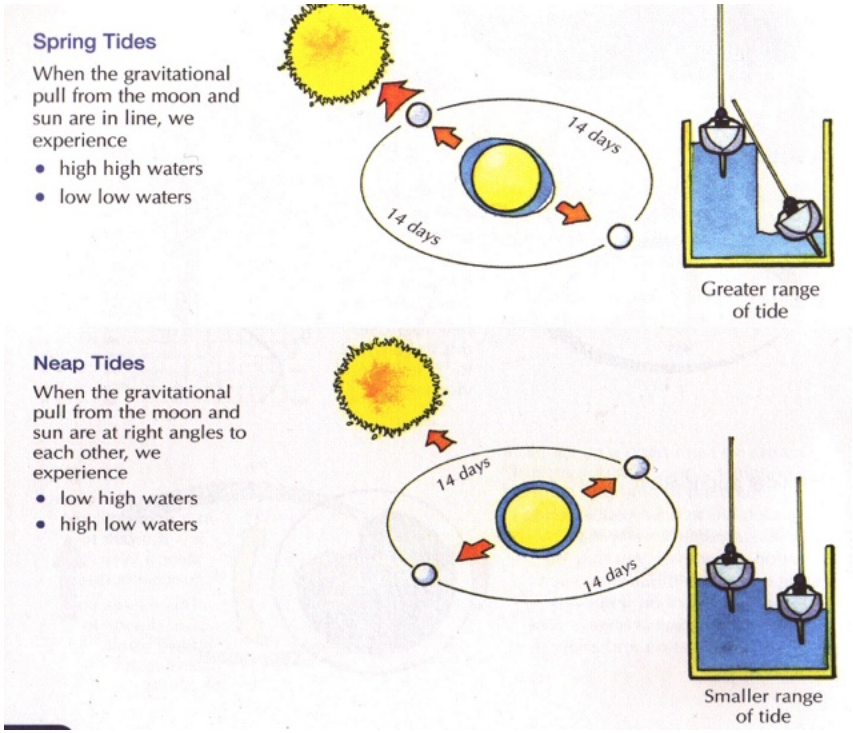
C

- 14.0 NM 271 °
- Lat. 50° 12’.5 N Long. 004° 05’.3 W

Tides: the basics

- Caused by the gravitational attraction of the moon and, to a lesser extent, the sun
- Pull of the moon causes sea level to bulge both sides of the earth- produces high tide
- Two complete tidal cycles in a lunar day: 24 hours 50 minutes
- High Water: Approximately 12 hours 25 minutes after preceding high water.
- Gets later by about an hour per day

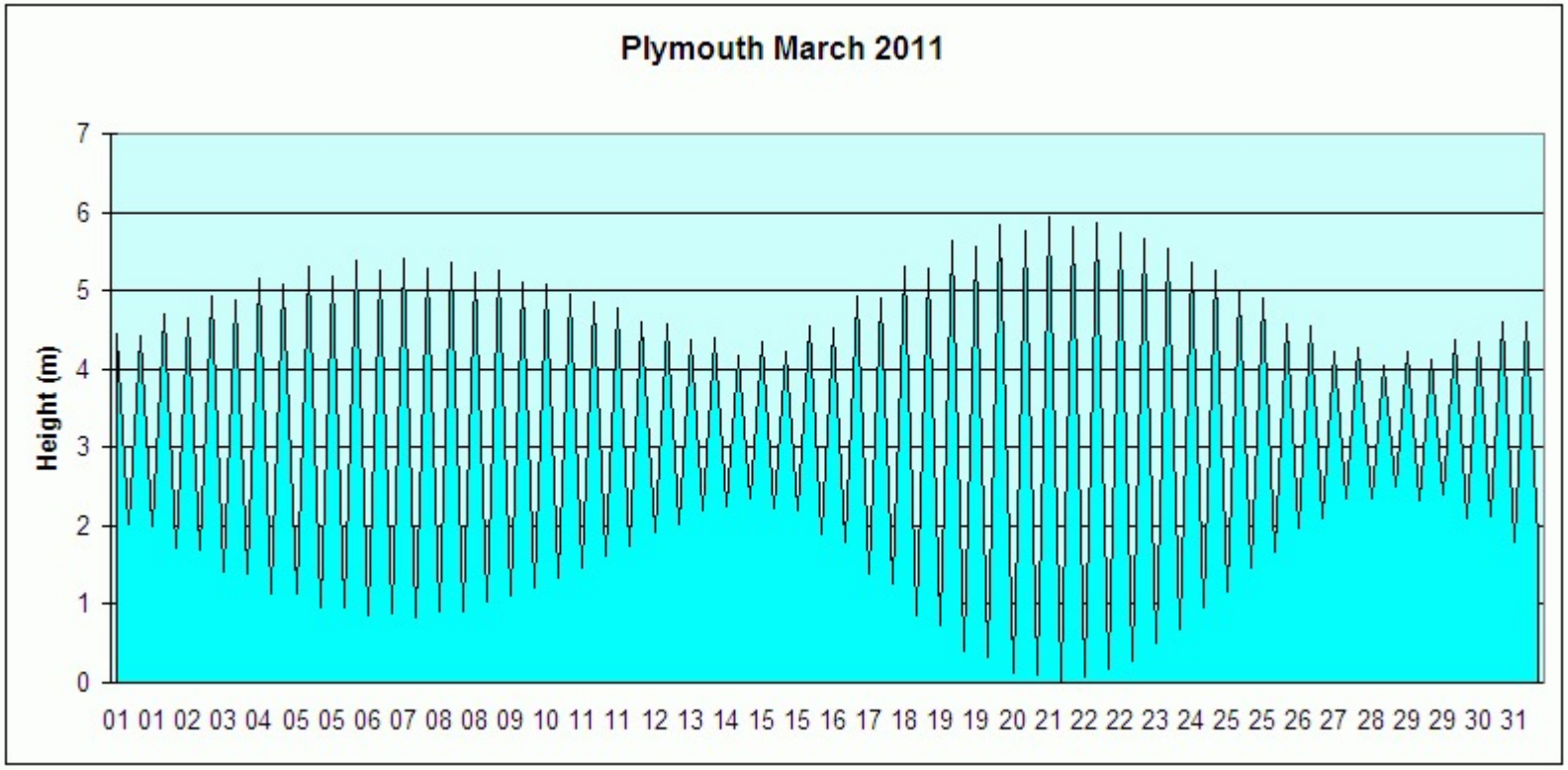
Spring/Neap Tides



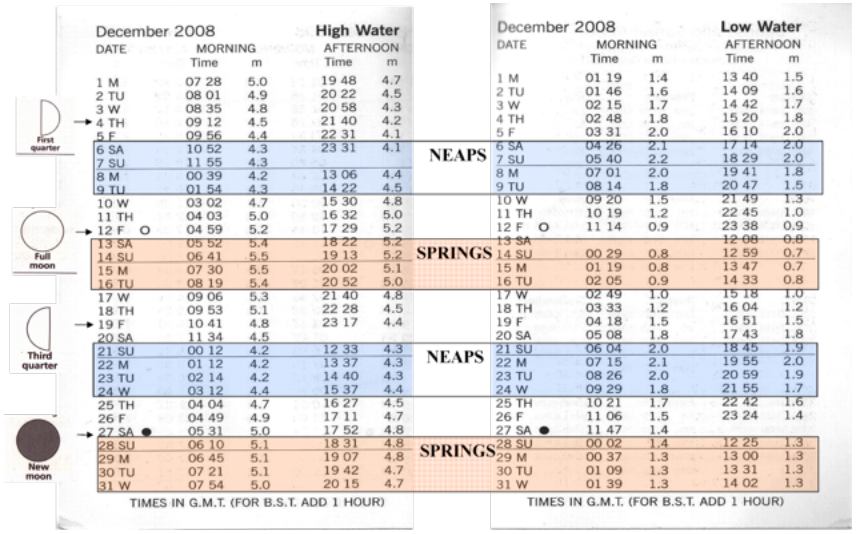
- Spring tides
  - Highest HIGH tidal height and lowest LOW tidal height
- Neap tides
  - Lowest HIGH tidal height
  - Highest LOW tidal height

Plymouth tides

- 14 day cycle from NEAP to SPRING



Tide Tables



December 2008

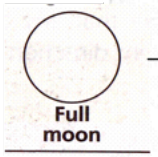
DATE	High Water MORNING Time	m	High Water AFTERNOON Time	m		Low Water MORNING Time	m	Low Water AFTERNOON Time	m
1 M	07 28	5.0	19 48	4.7		01 19	1.4	13 40	1.5
2 TU	08 01	4.9	20 22	4.5		01 46	1.6	14 09	1.6
3 W	08 35	4.8	20 58	4.3		02 15	1.7	14 42	1.7
4 TH	09 12	4.5	21 40	4.2		02 48	1.8	15 20	1.8
5 F	09 56	4.4	22 31	4.1		03 31	2.0	16 10	2.0
6 SA	10 52	4.3	23 31	4.1	NEAPS	04 26	2.1	17 14	2.0
7 SU	11 55	4.3				05 40	2.2	18 29	2.0
8 M	00 39	4.2	13 06	4.4		07 01	2.0	19 41	1.8
9 TU	01 54	4.3	14 22	4.5		08 14	1.8	20 47	1.5
10 W	03 02	4.7	15 30	4.8		09 20	1.5	21 49	1.3
11 TH	04 03	5.0	16 32	5.0		10 19	1.2	22 45	1.0
12 F ○	04 59	5.2	17 29	5.2		11 14	0.9	23 38	0.9
13 SA	05 52	5.4	18 22	5.2	SPRINGS			12 08	0.8
14 SU	06 41	5.5	19 13	5.2		00 29	0.8	12 59	0.7
15 M	07 30	5.5	20 02	5.1		01 19	0.8	13 47	0.7
16 TU	08 19	5.4	20 52	5.0		02 05	0.9	14 33	0.8
17 W	09 06	5.3	21 40	4.8		02 49	1.0	15 18	1.0
18 TH	09 53	5.1	22 28	4.5		03 33	1.2	16 04	1.2
19 F	10 41	4.8	23 17	4.4		04 18	1.5	16 51	1.5
20 SA	11 34	4.5				05 08	1.8	17 43	1.8
21 SU	00 12	4.2	12 33	4.3	NEAPS	06 04	2.0	18 45	1.9
22 M	01 12	4.2	13 37	4.3		07 15	2.1	19 55	2.0
23 TU	02 14	4.2	14 40	4.3		08 26	2.0	20 59	1.9
24 W	03 12	4.4	15 37	4.4		09 29	1.8	21 55	1.7
25 TH	04 04	4.7	16 27	4.5		10 21	1.7	22 42	1.6
26 F	04 49	4.9	17 11	4.7		11 06	1.5	23 24	1.4
27 SA ●	05 31	5.0	17 52	4.8		11 47	1.4		
28 SU	06 10	5.1	18 31	4.8	SPRINGS	00 02	1.4	12 25	1.3
29 M	06 45	5.1	19 07	4.8		00 37	1.3	13 00	1.3
30 TU	07 21	5.1	19 42	4.7		01 09	1.3	13 31	1.3
31 W	07 54	5.0	20 15	4.7		01 39	1.3	14 02	1.3

TIMES IN G.M.T. (FOR B.S.T. ADD 1 HOUR)

TIMES IN G.M.T. (FOR B.S.T. ADD 1 HOUR)

SALCOMBE TIDE TABLES: DECEMBER 2008

- Black circle – New Moon
- White circle – Full Moon
- Spring Tide 2-3 days after full or new moon
- Neap Tide 4-5 days before full or new moon



December 2008 — High Water

DATE	MORNING Time	m	AFTERNOON Time	m	
1 M	07 28	5.0	19 48	4.7	
2 TU	08 01	4.9	20 22	4.5	
3 W	08 35	4.8	20 58	4.3	
→ 4 TH	09 12	4.5	21 40	4.2	
5 F	09 56	4.4	22 31	4.1	
6 SA	10 52	4.3	23 31	4.1	NEAPS
7 SU	11 55	4.3			
8 M	00 39	4.2	13 06	4.4	
9 TU	01 54	4.3	14 22	4.5	
10 W	03 02	4.7	15 30	4.8	
11 TH	04 03	5.0	16 32	5.0	
→ 12 F ○	04 59	5.2	17 29	5.2	
13 SA	05 52	5.4	18 22	5.2	
14 SU	06 41	5.5	19 13	5.2	SPRINGS
15 M	07 30	5.5	20 02	5.1	
16 TU	08 19	5.4	20 52	5.0	
17 W	09 06	5.3	21 40	4.8	
18 TH	09 53	5.1	22 28	4.5	
→ 19 F	10 41	4.8	23 17	4.4	
20 SA	11 34	4.5			
21 SU	00 12	4.2	12 33	4.3	NEAPS
22 M	01 12	4.2	13 37	4.3	
23 TU	02 14	4.2	14 40	4.3	
24 W	03 12	4.4	15 37	4.4	
25 TH	04 04	4.7	16 27	4.5	
26 F	04 49	4.9	17 11	4.7	
→ 27 SA ●	05 31	5.0	17 52	4.8	
28 SU	06 10	5.1	18 31	4.8	SPRINGS
29 M	06 45	5.1	19 07	4.8	
30 TU	07 21	5.1	19 42	4.7	
31 W	07 54	5.0	20 15	4.7	

TIMES IN G.M.T. (FOR B.S.T. ADD 1 HOUR)

December 2008 — Low Water

DATE	MORNING Time	m	AFTERNOON Time	m	
1 M	01 19	1.4	13 40	1.5	
2 TU	01 46	1.6	14 09	1.6	
3 W	02 15	1.7	14 42	1.7	
4 TH	02 48	1.8	15 20	1.8	
5 F	03 31	2.0	16 10	2.0	
6 SA	04 26	2.1	17 14	2.0	
7 SU	05 40	2.2	18 29	2.0	
8 M	07 01	2.0	19 41	1.8	
9 TU	08 14	1.8	20 47	1.5	
10 W	09 20	1.5	21 49	1.3	
11 TH	10 19	1.2	22 45	1.0	
12 F ○	11 14	0.9	23 38	0.9	
13 SA			12 08	0.8	
14 SU	00 29	0.8	12 59	0.7	
15 M	01 19	0.8	13 47	0.7	
16 TU	02 05	0.9	14 33	0.8	
17 W	02 49	1.0	15 18	1.0	
18 TH	03 33	1.2	16 04	1.2	
19 F	04 18	1.5	16 51	1.5	
20 SA	05 08	1.8	17 43	1.8	
21 SU	06 04	2.0	18 45	1.9	
22 M	07 15	2.1	19 55	2.0	
23 TU	08 26	2.0	20 59	1.9	
24 W	09 29	1.8	21 55	1.7	
25 TH	10 21	1.7	22 42	1.6	
26 F	11 06	1.5	23 24	1.4	
27 SA ●	11 47	1.4			
28 SU	00 02	1.4	12 25	1.3	
29 M	00 37	1.3	13 00	1.3	
30 TU	01 09	1.3	13 31	1.3	
31 W	01 39	1.3	14 02	1.3	

TIMES IN G.M.T. (FOR B.S.T. ADD 1 HOUR)

SALCOMBE TIDE TABLES: DECEMBER 2008

PQ Rule of Thumb

At Prawle:

- HIGH WATER SPRINGS are generally between 0600 - 0830 hours and 1830 -2100 hours GMT.

- HIGH WATER NEAPS (daytime) are generally between 1200 - 1500 hours GMT.

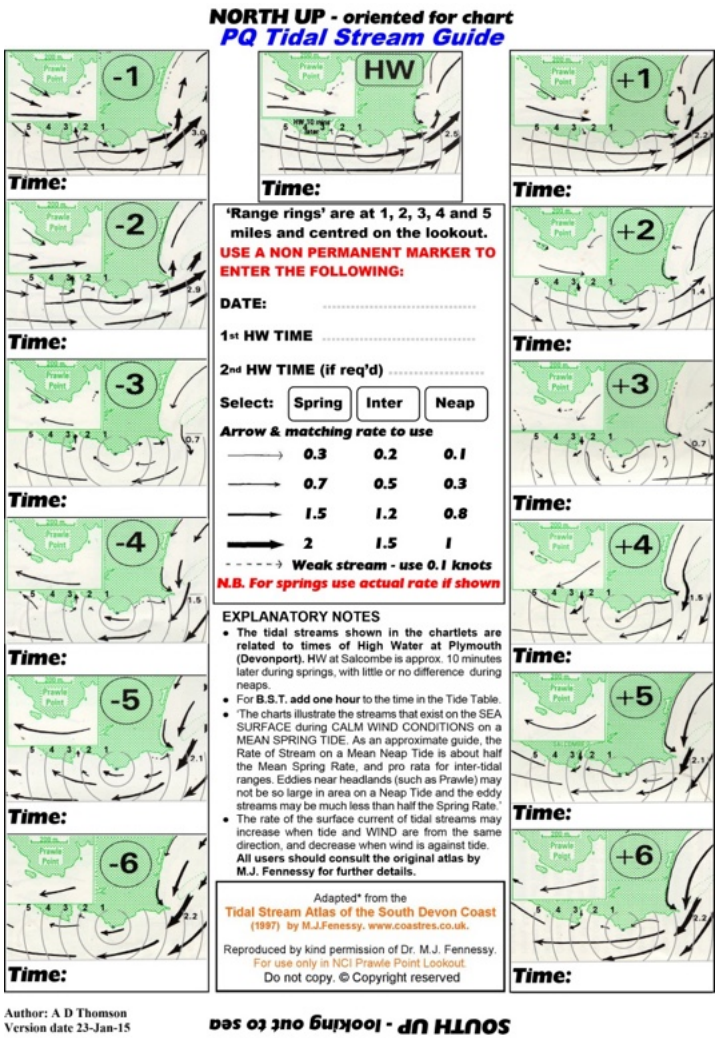
Tidal Streams

- It helps to look out the window
- Which direction (or set) is the tide flowing?

Tidal Streams

- **Set -**The direction in which a tidal stream flows:
- A tidal stream flows TO…unlike wind which blows FROM…
- A West setting (flowing) tide and a Westerly wind, you will hear the phrase ‘Wind against tide’.
- **Rate -**The speed in knots at which a tidal stream flows.
- **Drift -**The distance the stream carries in a period of time.

PQ Customized
Tidal Stream Guide

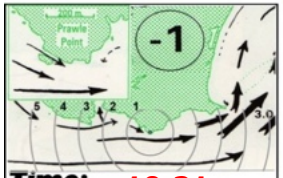


Let's fill one in for 15th Aug 2021 with 1st High Water at 11:21hrs and the 2nd High Water at 23:46hrs

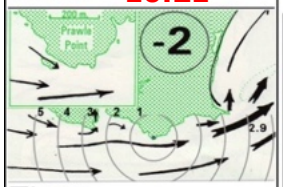
Note: that the times are in BST and the lookout stays open until 20:00

NORTH UP - oriented for chart

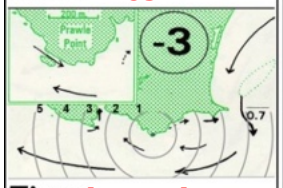
PQ Tidal Stream Guide



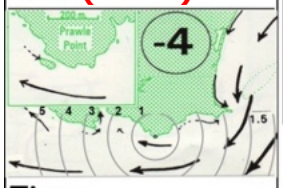
Time: 10:21



Time: 09:21

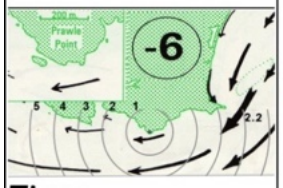


Time: (20:46)08:21

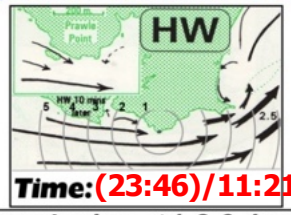


Time: (19:46)

Time: (18:46)



Time: (17:46)



Time: (23:46)/11:21

'Range rings' are at 1, 2, 3, 4 and 5 miles and centred on the lookout.

USE A NON PERMANENT MARKER TO ENTER THE FOLLOWING:

DATE: 15th Aug 21

1st HW TIME 11:21

2nd HW TIME (if req'd) 23:46

Select: Spring | Inter X | Neap

Arrow & matching rate to use

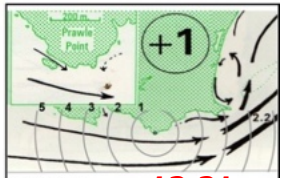
→	0.3	0.2	0.1
→	0.7	0.5	0.3
→	1.5	1.2	0.8
→	2	1.5	1
- - - →	Weak stream - use 0.1 knots		

N.B. For springs use actual rate if shown

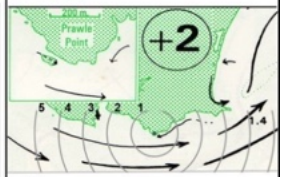
EXPLANATORY NOTES

- **The tidal streams shown in the chartlets are related to times of High Water at Plymouth (Devonport).** HW at Salcombe is approx. 10 minutes later during springs, with little or no difference during neaps.
- For **B.S.T. add one hour** to the time in the Tide Table.
- 'The charts illustrate the streams that exist on the SEA SURFACE during CALM WIND CONDITIONS on a MEAN SPRING TIDE. As an approximate guide, the Rate of Stream on a Mean Neap Tide is about half the Mean Spring Rate, and pro rata for inter-tidal ranges. Eddies near headlands (such as Prawle) may not be so large in area on a Neap Tide and the eddy streams may be much less than half the Spring Rate.'
- The rate of the surface current of tidal streams may increase when tide and WIND are from the same direction, and decrease when wind is against tide.

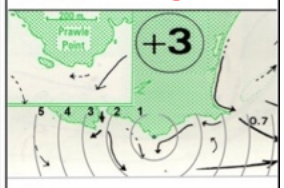
All users should consult the original atlas by M.J. Fennessy for further details.



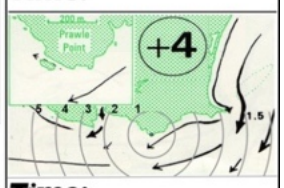
Time: 12:21



Time: 13:21

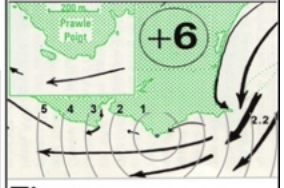


Time: 14:21



Time: 15:21

Time: 16:21



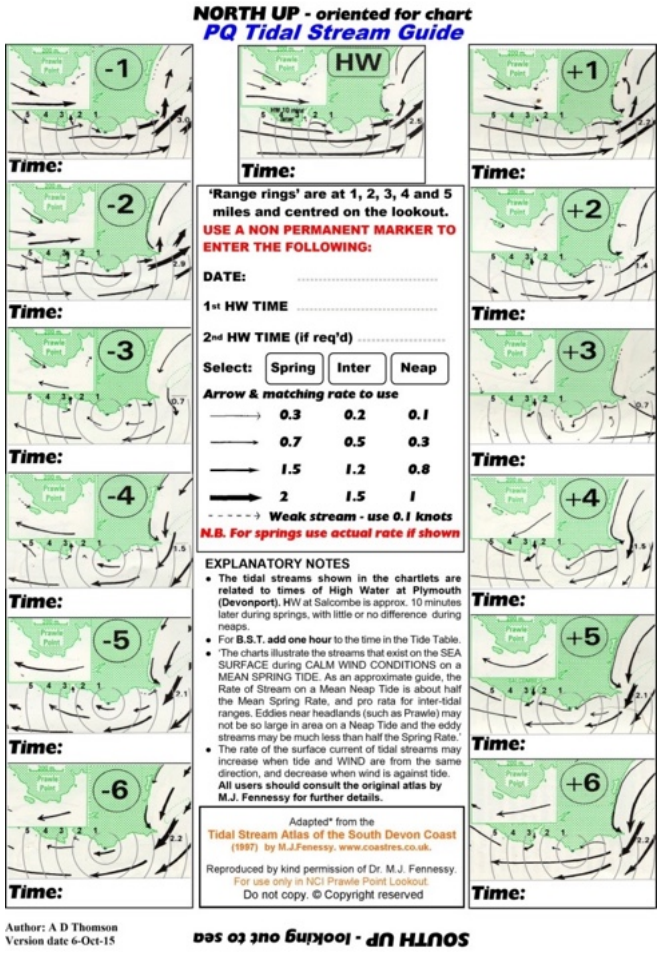
Time: 17:21

Author: A D Thomson
Version date 6-Oct-15

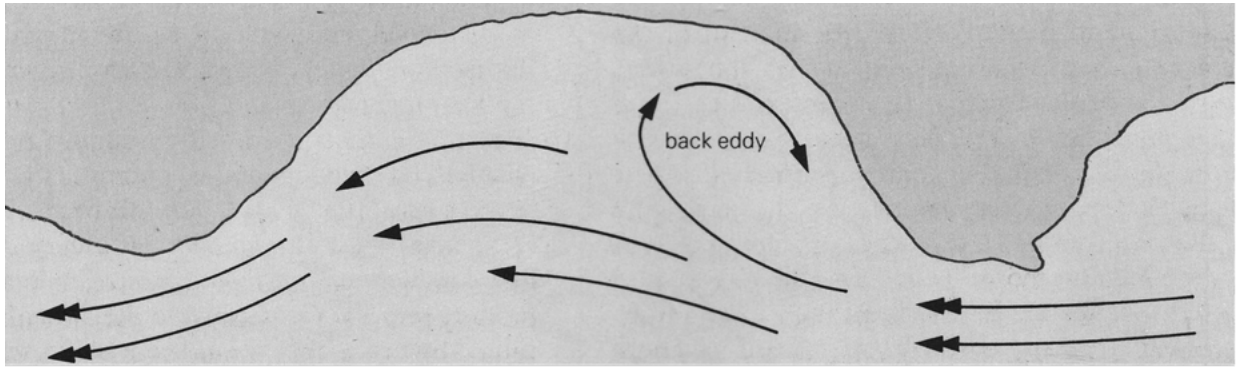
SOUTH UP - looking out to sea

Tidal Streams off PQ

- Tidal stream sets (flows) easterly (up-channel)
- HW -2.5 to HW + 3
- Tidal stream sets (flows) westerly (down-channel)
- HW + 3.5 to HW - 3 hours
- Slack water
- HW-3 to – 2.5 HW +3 to HW +3.5 (so very short)

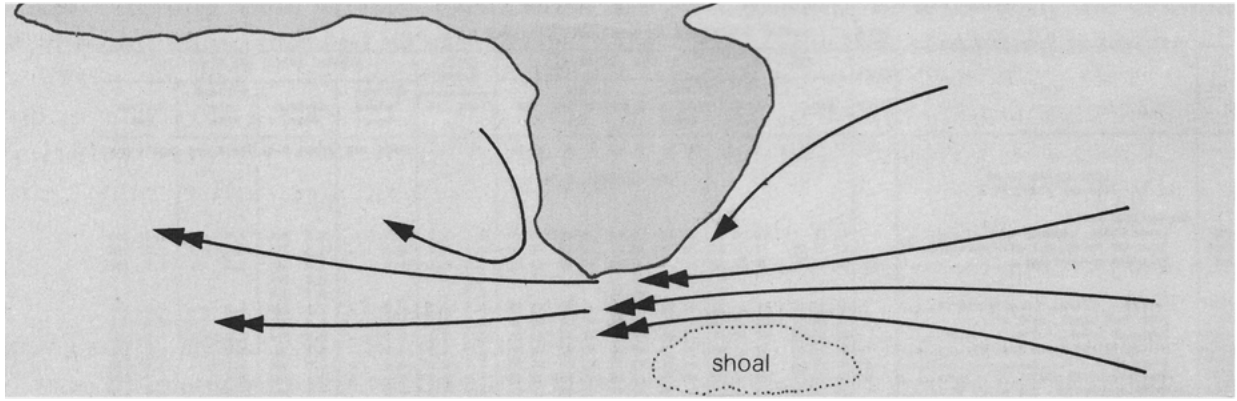


Tidal Stream with back eddy



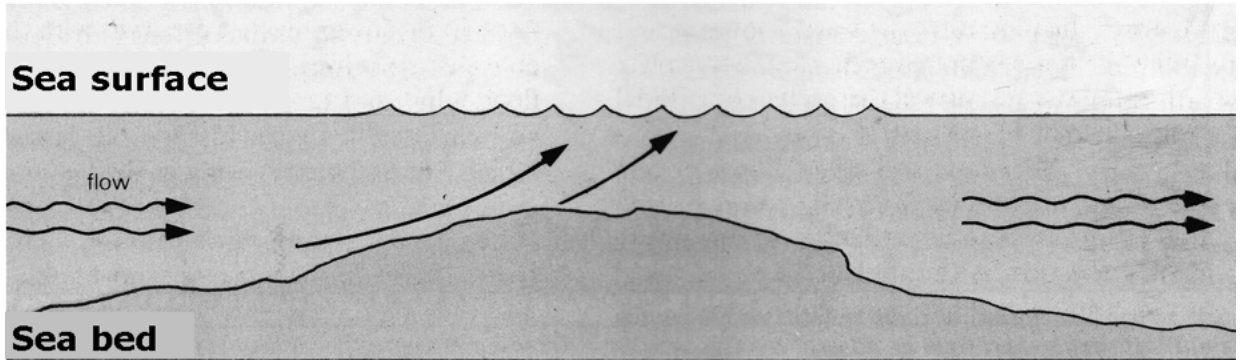
Tidal Race

Where a fast Moving current passes through a constriction



Overfalls

Moving currents over a rough sea bed



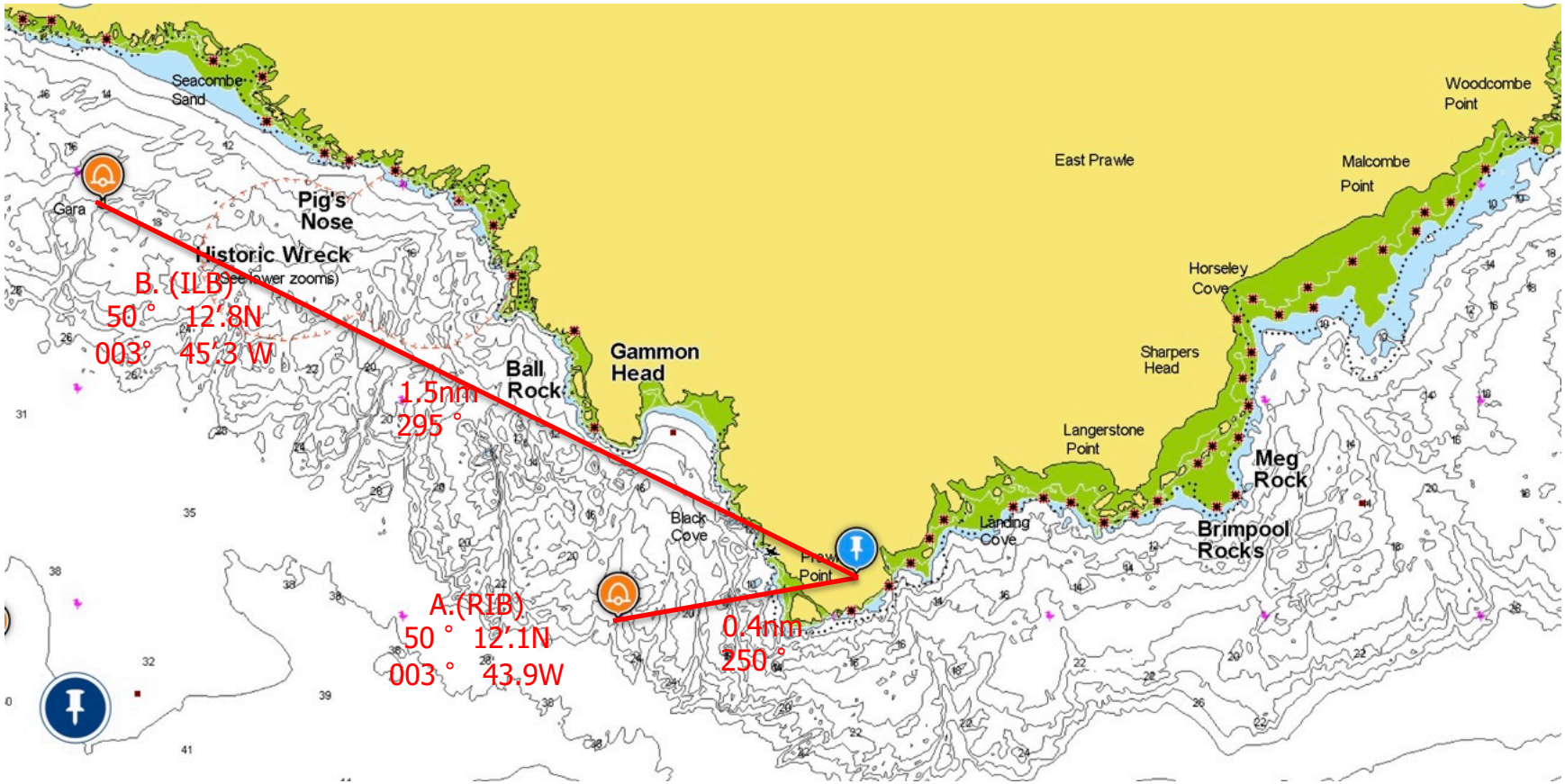
Overfalls at Start Point

Exercise

Plot the following and record the range and bearing from PQ:

- ? 👂 Rib A
- ? 👂 Inshore lifeboat (ILB) B

Plotted Position



Plotting the target

1. Plot position
2. Plot tidal drift
3. Plot wind drift

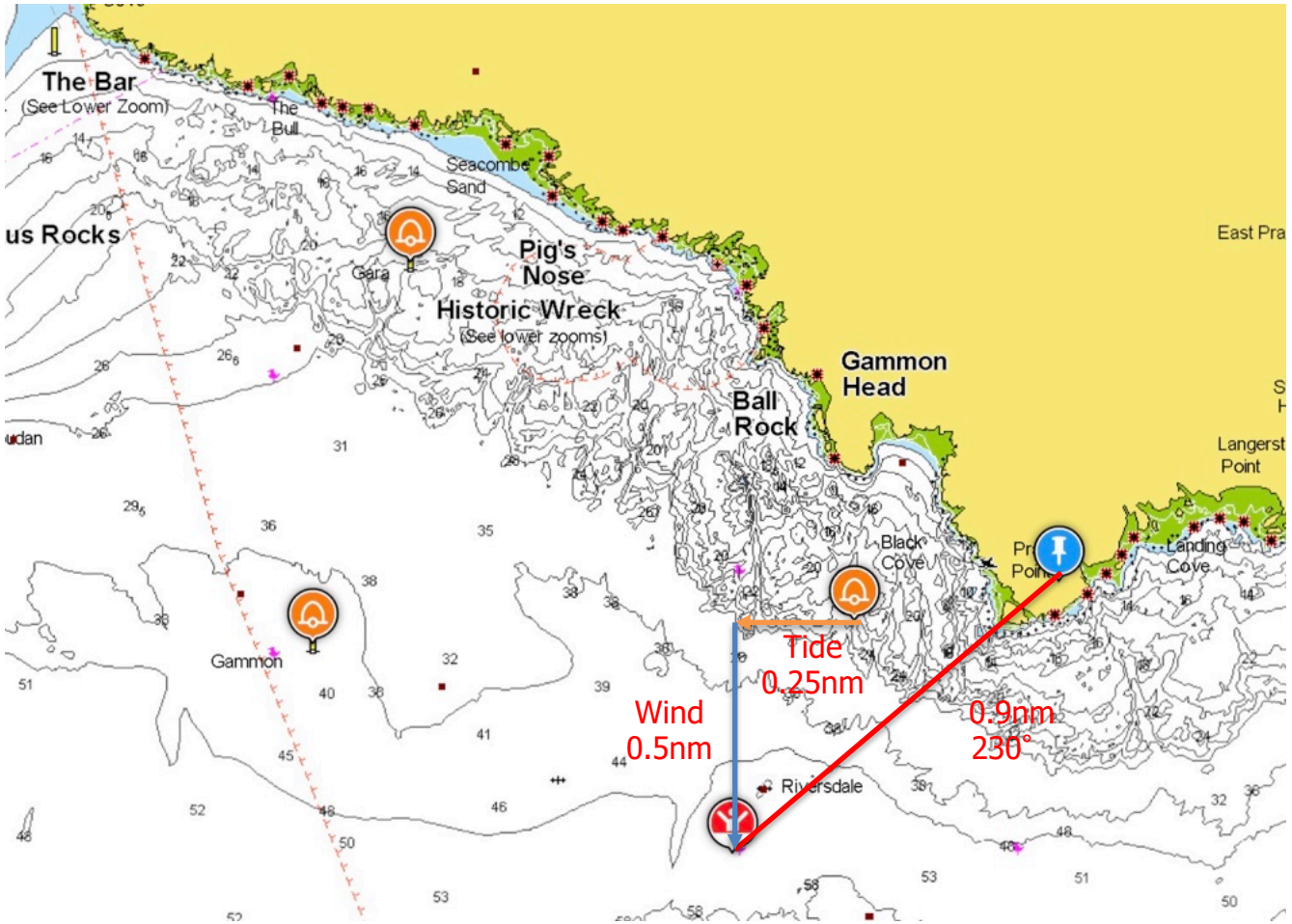
ANNOTATE YOUR PLOT AT EACH STEP

Wind and tidal drift

If the tidal set is 1 knot to the West and the wind is blowing at 40 knots from the North where will you estimate the rib to be in 15 minutes?

Note; assume the wind drift is 5% of the wind speed in knots.

Allowing for wind and tidal drift

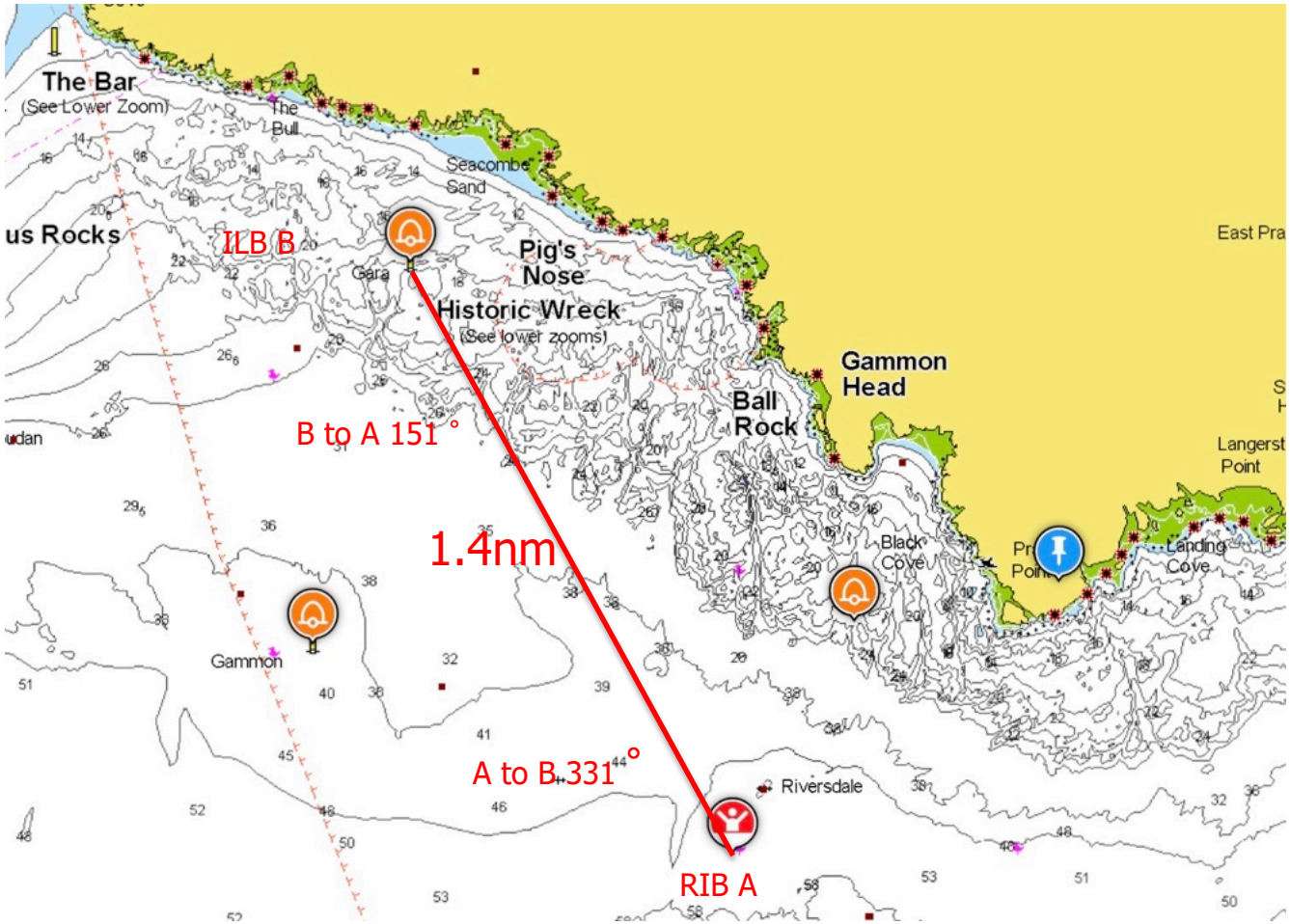


Range and bearing between vessels

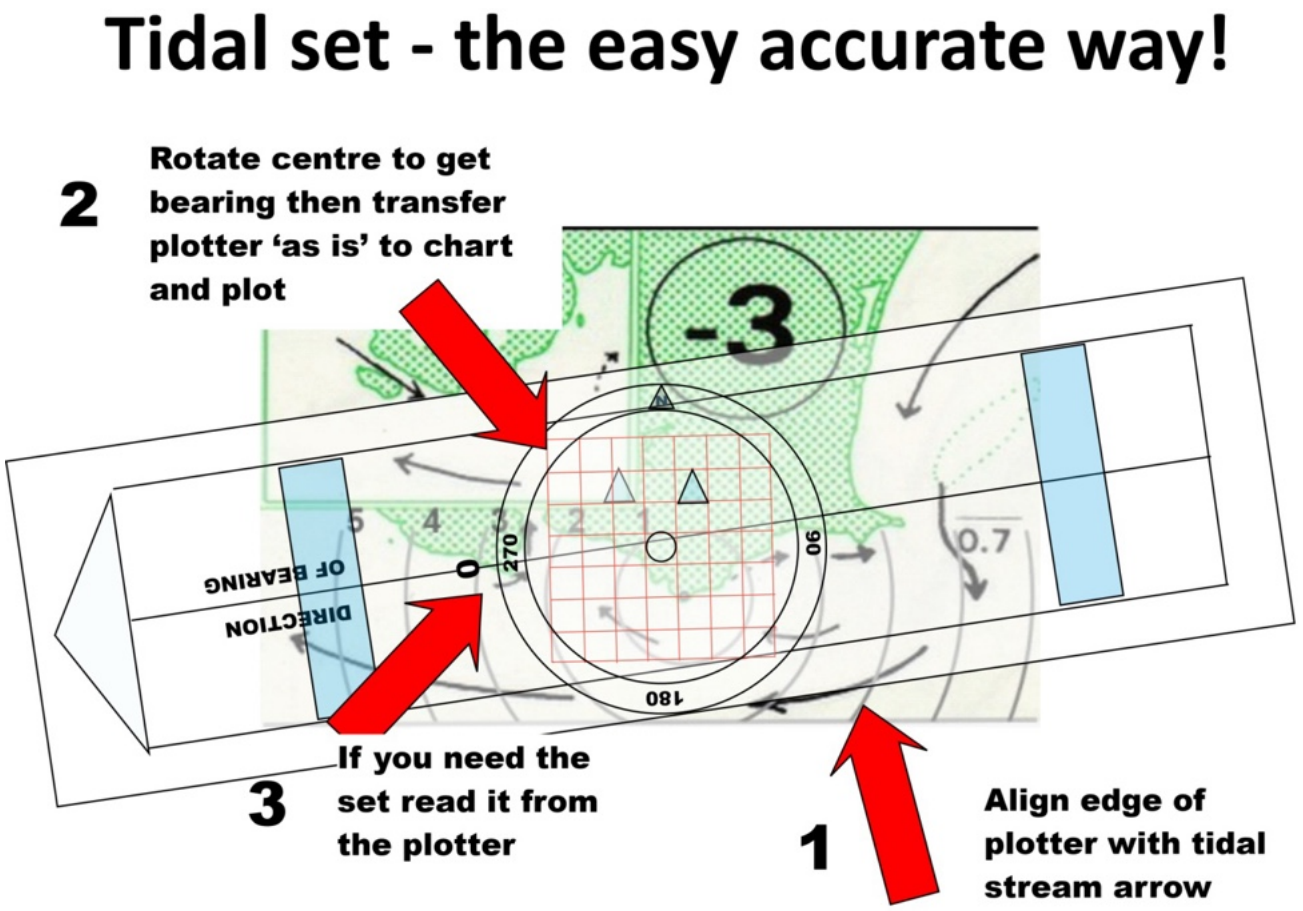
What is the range and bearing between the ILB and the estimated position of the Rib?

What is the reciprocal bearing from the Rib to the ILB?

Bearing and reciprocal bearing

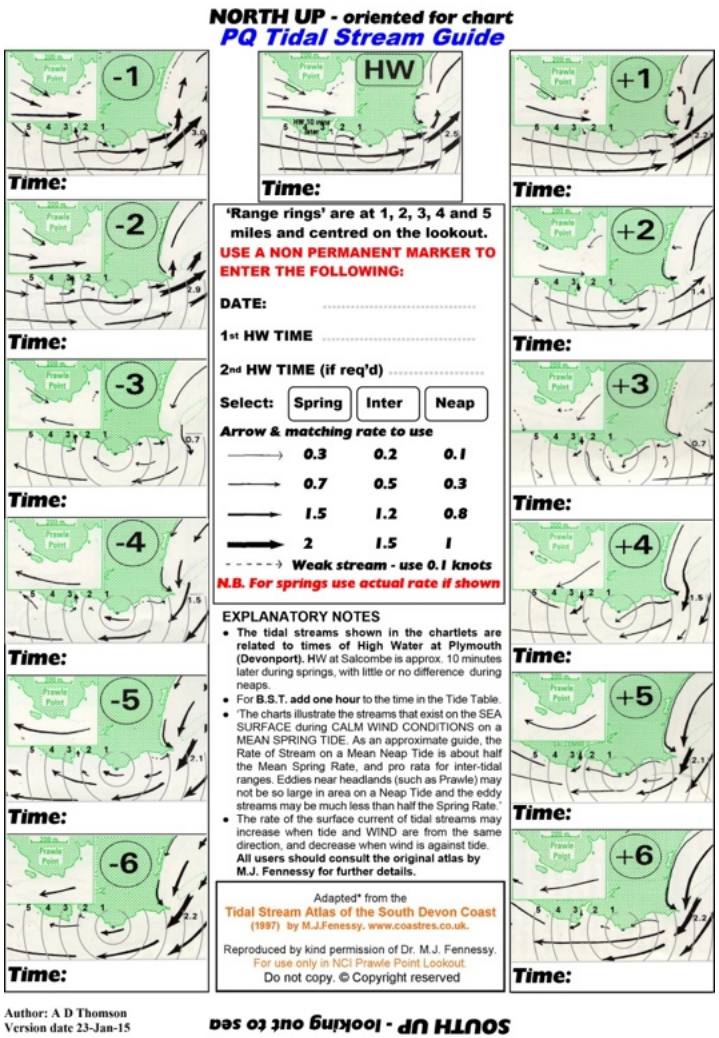


Plotter and Tidal Streams



Exercise

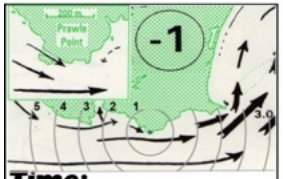
start with PQ Customized Tidal Stream Guide

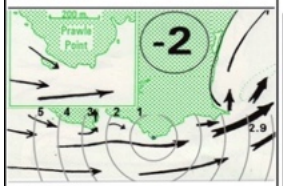


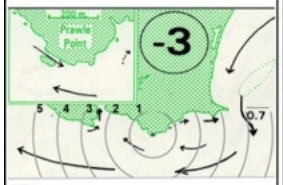
Fill Tidal Stream Guide in with High Water at 0700hrs. Assume tide rate between springs and neaps

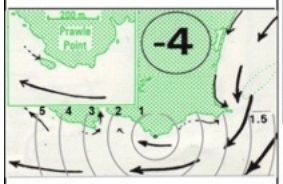
NORTH UP - oriented for chart

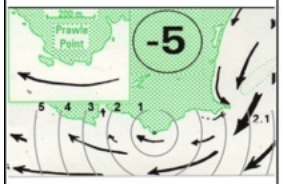
PQ Tidal Stream Guide

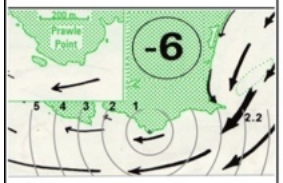












'Range rings' are at 1, 2, 3, 4 and 5 miles and centred on the lookout.

USE A NON PERMANENT MARKER TO ENTER THE FOLLOWING:

DATE: .....

1st HW TIME 7:00

2nd HW TIME (if req'd) .....

Select: Spring | Inter ✔ | Neap

Arrow & matching rate to use

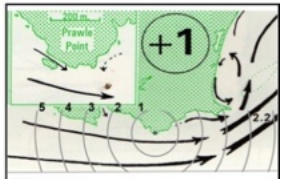
→	0.3	0.2	0.1
→	0.7	0.5	0.3
→	1.5	1.2	0.8
→	2	1.5	1
- - - →	Weak stream - use 0.1 knots		

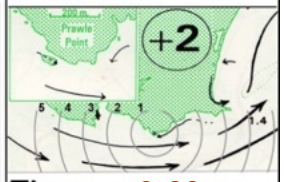
N.B. For springs use actual rate if shown

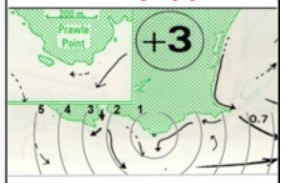
EXPLANATORY NOTES

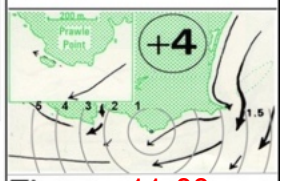
- **The tidal streams shown in the chartlets are related to times of High Water at Plymouth (Devonport).** HW at Salcombe is approx. 10 minutes later during springs, with little or no difference during neaps.
- For **B.S.T. add one hour** to the time in the Tide Table.
- 'The charts illustrate the streams that exist on the SEA SURFACE during CALM WIND CONDITIONS on a MEAN SPRING TIDE. As an approximate guide, the Rate of Stream on a Mean Neap Tide is about half the Mean Spring Rate, and pro rata for inter-tidal ranges. Eddies near headlands (such as Prawle) may not be so large in area on a Neap Tide and the eddy streams may be much less than half the Spring Rate.'
- The rate of the surface current of tidal streams may increase when tide and WIND are from the same direction, and decrease when wind is against tide.

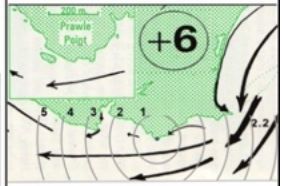
All users should consult the original atlas by M.J. Fennessy for further details.











Author: A D Thomson
Version date 6-Oct-15

SOUTH UP - looking out to sea

Plot our target

- On the chart plot initial position of a casualty at 110T at 2.8 nm from PQ at 11.00hrs. **Pos. A**
- Use the PQ Tidal Stream Guide with the time you have just put in to work out **set and rate.**
- Look at the Tidal Drift Ready Reckoner.
  - How far will the casualty move in 30 mins?
- Add this by plotting the tidal set and drift FROM position A to get new position. **Pos. B**
- Save the information.

You've now plotted the effect of the tide on a stationary vessel

Wind also moves our target

- Things blow downwind

BUT

- How fast and in what direction?
- Do we need to bother?
  - Strong winds
  - Type of craft

- Use the Ready Reckoner

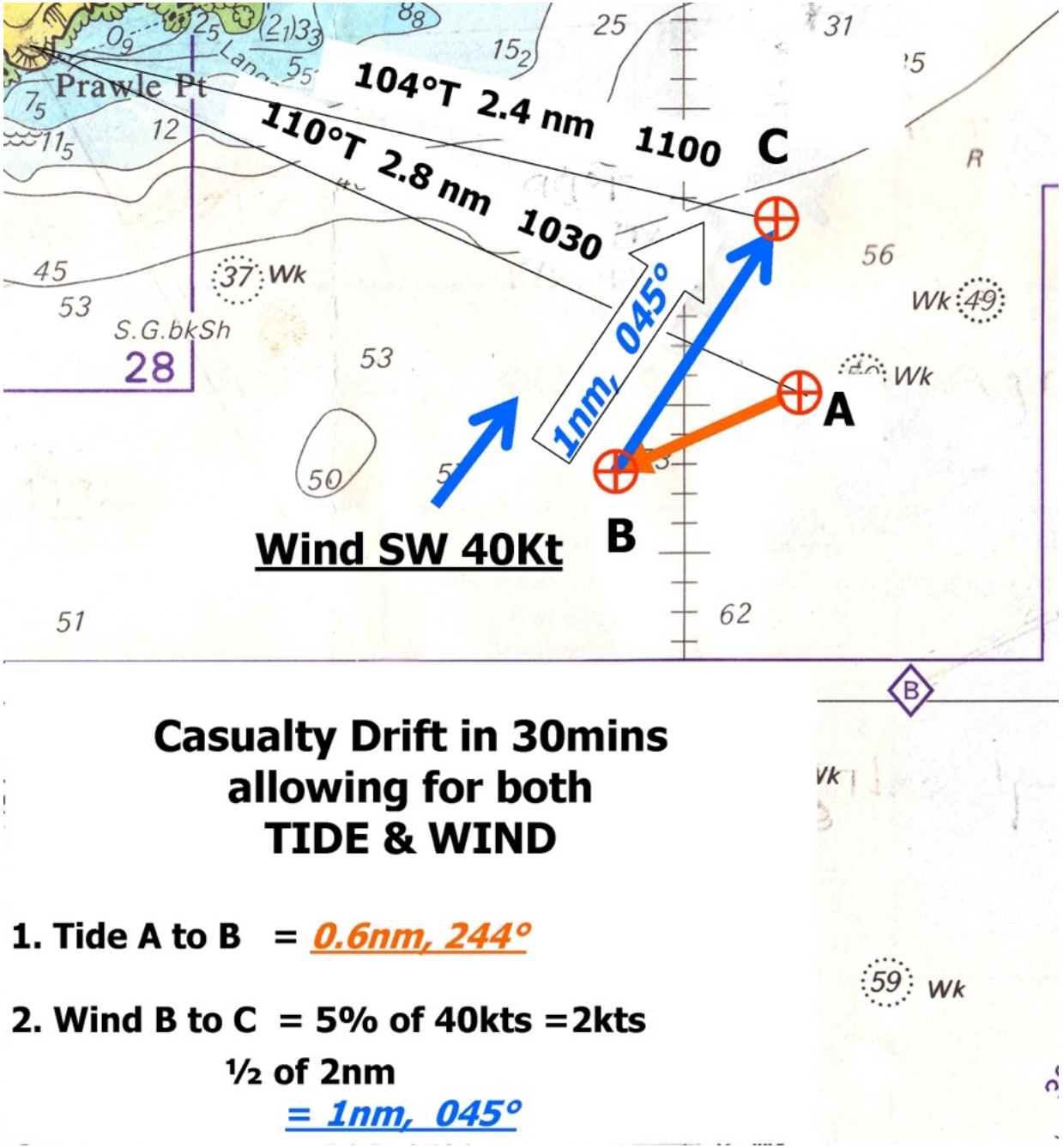
Plot wind drift

- **Assume wind is SW force 8 (40kts).**
- **Use ready reckoner to work out WIND DRIFT**
- **From position B plot the wind drift direction**
  - **Wind is blowing from the SW so will the vessel be blown in SW or NE direction?**
  - **Draw a line in the right direction from point B**
  - **Mark in the distance for 30 minutes**
  - **Note it as Point C**

Now we know where the casualty will probably be allowing for wind and tide

Allowing for **Wind**

In addition to tidal drift, boats and life rafts will also be affected by the wind, drifting down-wind (±60˚) at about 5% of wind speed



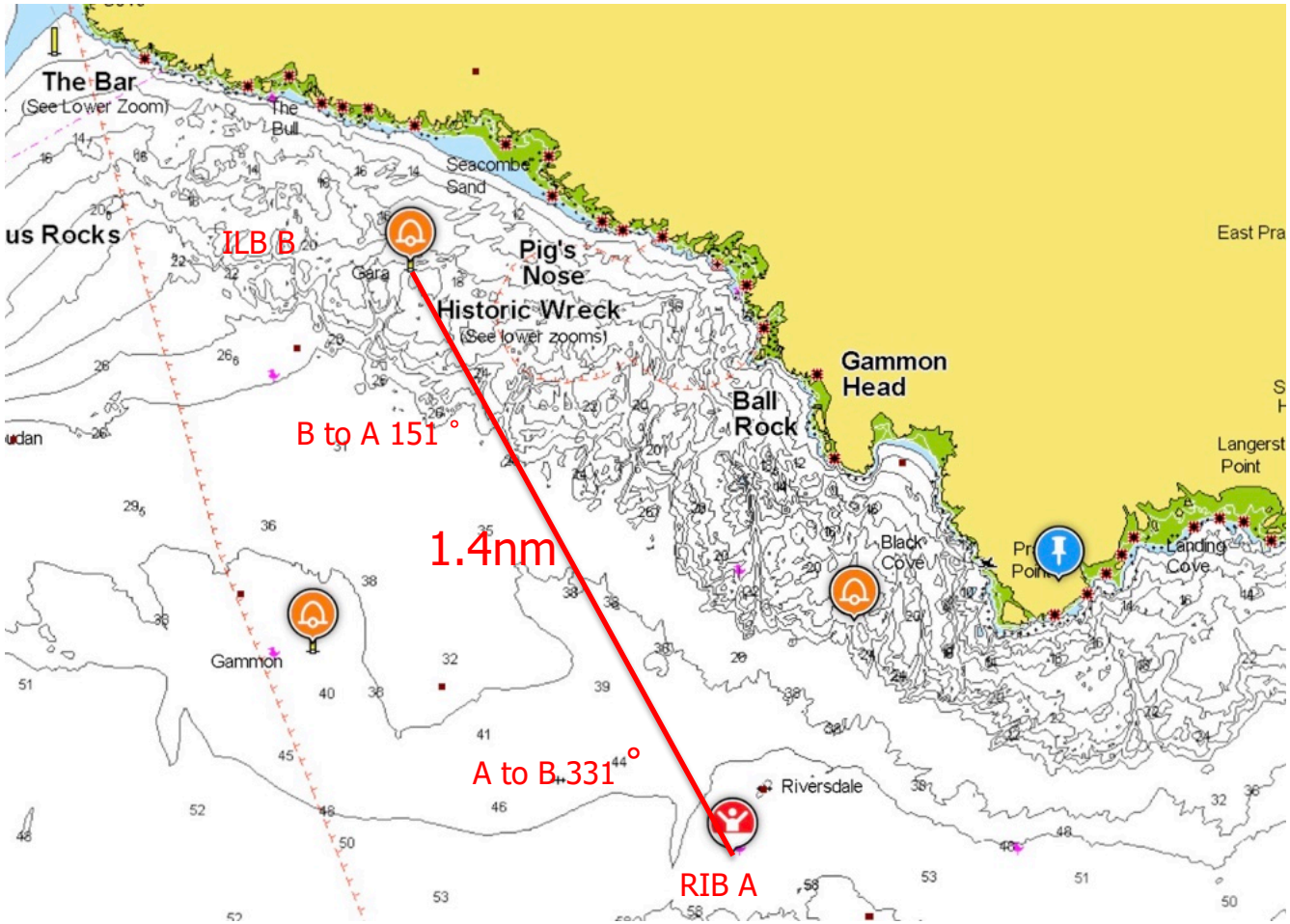
Estimating time of arrival

1 Knot = 1 NM per hour

The **AWLB** maximum operating speed is 25 Knots
The **ILB** maximum operating speed is 35 Knots

Time (in minutes) = 60 x distance (in NM) / speed (in Knots)

Estimating time of arrival



Estimating time of arrival

- How long will the ILB take to get to the rib?
- At full speed (35 knots)?
- At 20 knots?

Estimating time of arrival answers

- At full speed (35 knots) 2.4 minutes
- At 20 knots? 4.2 minutes

Tides: Review Questions

1. High tides get later by about .....…….each day?
2. Spring tides give rise to *high/low* high waters and *high/low* low waters?
3. The highest spring tides occur about two days *before/after* a new or full moon?
4. At Prawle, spring high tides occur about……. in the morning?
5. With the wind in the west and the tide setting east we have wind against tide. True or false?
6. At high water and around three hours either side the tide sets *east/west?*
7. At low water and two or three hours either side the tide sets *up/ down* channel?
8. In which of the following locations do tidal races and overfalls occur? Salcombe Bar Prawle Point Starehole Bay Frogmore Creek Start Point Bolt Head