# Tidal Diamonds

A tidal diamond is a way of describing the average tidal current conditions for a location by referencing them to the time of high water (either at the same location or at a remote location or port). Each diamond gives the average current speed and direction over a complete tidal cycle from six hours before the time of high water to six hours after. Usually two sets of values are given – one for spring tides and another for neap tides.

Traditionally, these values are derived from a very short period (13 or 25 hours) of observations during a meteorologically quiet period from a current meter deployed just below the sea surface from an anchored vessel. The name 'diamond' is derived from the symbol used on Admiralty charts to indicate the location of these observations.

### Observation Diamonds and Modelled Diamonds

There are many disadvantages to tidal diamonds derived in the traditional way:

- Usually based on a very short period of observations (often less than 25 hours).
- Was the period of observation meteorologically quiet?
- Observations must be taken during an average spring and neap tide as there can be significant differences between successive springs and neaps.
- Expensive to generate, hence they can be very sparse and unevenly distributed as one gets further from a harbour.

To increase the accuracy of a diamond by any significant amount would require a minimum of 30 days observations and this is just not feasible. Using computer models of the ocean to generate the diamonds solves all of these problems.

- A longer period of 'virtual observations' can be used to compute the diamond.
- A computer tidal model does not have any meteorological effects.
- Using all the springs and neaps throughout a period of a year produces a diamond for an average spring and neap.
- Once the model has been developed, diamonds can be computed for any location within the model domain.
- Computer models are based on a regular grid, hence computed diamonds can be evenly and regularly spaced.

### Method Used to Calculate the Tidal Diamond

The National Oceanography Centre have the capability to compute tidal diamonds for any location based on a year of data. One year contains at least 24 spring and 24 neap tides which serves to average out any variability. We take each spring tide as pairs to remove any diurnal inequality hence giving 48 spring and 48 neap tides used in the averaging. For each spring tide, a time series of current speed and direction is computed at the diamond location from 6 hours before time of high water to 6 hours after at the selected interval. These are then averaged. The same is done for the times of each neap tide. For more information on tidal diamonds derived from numerical models, see the paper below.

### Additional Information

Bell C., Carlin L. (1998) Generation of UK Tidal Stream Atlases from Regularly Gridded Hydrodynamic Modelled Data. Journal of Navigation, Vol.51 No.1 pp.73-78

### Example of a Tidal Diamond

**Model:** High Resolution UKCS Model (CS20-15HC)
**Position:** 55° 25' 00.0" N 2° 10' 00.0" E
**Reference:** 55° 25' 00.0" N 2° 10' 00.0" E

current speed: metres/sec
direction: degrees true yr: 2000

| Time | Springs | | Neaps | |
|---|---|---|---|---|
| | Spd | Dir | Spd | Dir |
| HW-6hrs | 0.16 | 4 | 0.07 | 350 |
| HW-5hrs | 0.09 | 294 | 0.06 | 275 |
| HW-4hrs | 0.17 | 238 | 0.11 | 243 |
| HW-3hrs | 0.26 | 223 | 0.14 | 230 |
| HW-2hrs | 0.28 | 212 | 0.14 | 216 |
| HW-1hrs | 0.25 | 200 | 0.11 | 198 |
| HW | 0.17 | 181 | 0.09 | 170 |
| HW+1hrs | 0.10 | 133 | 0.07 | 126 |
| HW+2hrs | 0.14 | 66 | 0.08 | 76 |
| HW+3hrs | 0.23 | 42 | 0.12 | 49 |
| HW+4hrs | 0.29 | 31 | 0.15 | 35 |
| HW+5hrs | 0.27 | 23 | 0.14 | 26 |
| HW+6hrs | 0.19 | 11 | 0.10 | 11 |