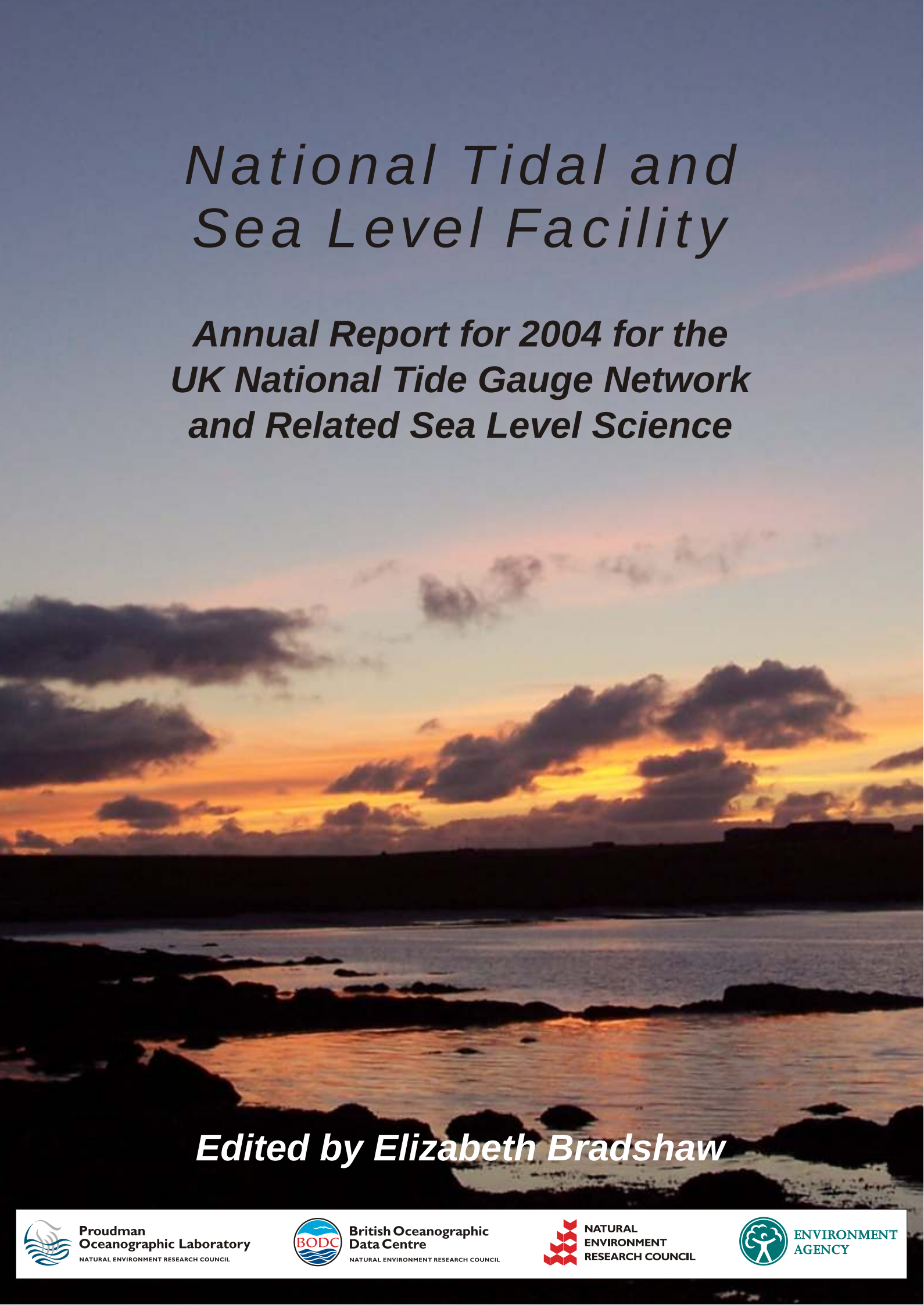
National Tidal and Sea Level Facility

Annual Report for 2004 for the UK National Tide Gauge Network and Related Sea Level Science



Edited by Elizabeth Bradshaw

Proudman Oceanographic Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

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ENVIRONMENT AGENCY

National Tidal and Sea Level Facility

Annual Report for 2004 for the UK National Tide Gauge Network and Related Sea Level Science

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Dave Smith, POL	- Maps and site information
Peter Foden, POL	- South Atlantic Network Management
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Steve Loch, BODC	- Calculating statistics in Edteva
Richard Bingley, Univ. Of Nottingham	- Monitoring Vertical Land Movements at Tide Gauges

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David Blackman, POL	- Tide Gauge Data Products
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Dave Smith, POL	- Leader Tide Gauge Inspectorate
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Philip Woodworth, POL	- Director of the Permanent Service for Mean Sea Level

Thanks also to all those involved in the maintenance of the network, the data retrieval, processing, quality control and delivery.

Foreword

The UK National Tidal & Sea Level Facility (NTSLF) was established in 2002 to reflect the importance of sea level monitoring to the public, the government and the academic community. It brings together much sea level expertise within the Proudman Oceanographic Laboratory (POL) and the British Oceanographic Data Centre (BODC) in collaboration with other groups that have scientific interest in sea level and geodesy (in particular, the University of Nottingham). The launch of the NTSLF was celebrated with a scientific conference at the Royal Society on 16-17 February 2003.

The NTSLF satisfies an important strategic need for the UK where tidal processes, coastal water levels and mean sea level have implications for coastal protection, sustainable housing development, management of the coastal environment, marine industry and leisure. The NTSLF comprises the UK national Tide Gauge Network, geodetic networks for monitoring vertical land movements, and gauges in the British Overseas Territories. It is supported by the skills of BODC in data processing, quality control and dissemination. It is this unique skill base that qualifies the NTSLF to provide technical advice to a wide community. Practical and scientific applications of the data include tidal prediction, flood warning, navigation and climate change studies.

All data are readily accessible, free of charge, via our web pages. We ensure effective knowledge transfer in order to demonstrate value for public money channeled through the Natural Environment Research Council (NERC). This report contains a summary of NTSLF activity for the period January-December 2004. Quality checked tide gauge data for the UK are freely available for download via the BODC web site. This includes 15-minute data values for January 1993 onwards and hourly values prior to 1993. Tide gauge data from Gibraltar are now available, as well as real-time data from Ascension Island and Port Stanley. Information on technological developments, network status, numerical model forecasts and products for tidal analysis and prediction can be obtained from the NTSLF web site.

Presently, the tide-surge models used for coastal flood forecasting are being systematically upgraded. These models are run four times a day at the Met Office, producing predictions up to two days ahead. The 12 km resolution surge model has been extended to reach southwards as far as 45ºN so that it can capture wind-generated surge originating in the Bay of Biscay. A further development is the introduction of a new, finer resolution (3.5 km) inner shelf model covering the Celtic Sea, the Irish Sea, the North Sea and the English Channel. Research is underway to implement the necessary data transfer protocols to allow the numerical models to assimilate real-time data from key tide gauges.

The UK national Tide Gauge Network and operational model developments are funded by the Environment Agency. We would also like to acknowledge the support of all those who contribute scientifically towards and make use of the NTSLF.

Dr Kevin Horsburgh
Chair of NTSLF

Tide gauge instrument information, data processing procedures and gauge location

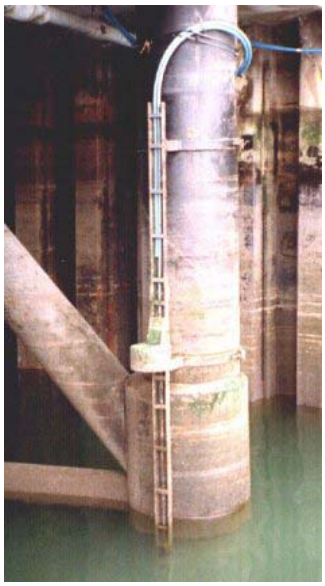
Instrument documentation

Bubbler Tide Gauge

The full tide bubbler system normally consists of two independent measuring systems. The pressure points are mounted approx 1m below Admiralty Chart Datum ACD so that negative surges may be recorded. The pressure points which you can see mounted underwater in the photograph are similar in appearance to an inverted bucket with a copper nozzle mounted on the side. This nozzle is the actual measuring point. A low flow of dry air (normally 7ml/min) is fed down an air tube to the top of the pressure point. When the air pressure in the air line equals the pressure exerted by the column of water above it, then the excess air is released as bubbles through the copper nozzle. This means that the pressure in the air line is proportional to the weight of the water column.

Mid-tide bubbler

The operation of the mid tide bubbler is similar to that of the full tide system, except that the measuring point is mounted at the mid tide height. That means that the pressure point is only immersed for half of the tidal cycle. The reason for this, is that when the measuring point is exposed as in the photograph below it can be accurately levelled into the geodetic network. Once this is accomplished the full tide pressure points can be fitted to match the tidal curve produced by the mid tide pressure point, thereby connecting them to the geodetic network.



Pressure Transducer

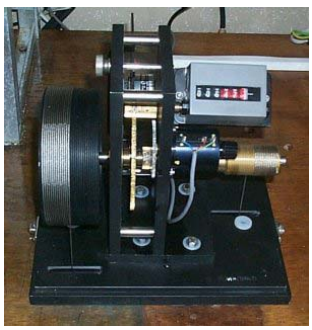
These are differential transducers contained in a watertight housing. The reference port is vented to atmosphere via the power supply and signal cable tube, while the measuring port of the transducer is connected to a copper outlet nozzle on the top of the transducer housing. The copper nozzle, transducer measuring port and connecting tube are filled with oil so the pressure is transmitted to the crystal element via the oil, thus keeping the transducer components free from the effects of the saltwater.

Munro float gauge

The Munro gauge measures sea level by means of a float in a stilling well. The float is about 45cm diameter - the large diameter reduces inevitable errors in buoyancy due to friction of the gearing and small changes in the length of float wire. This wire is coiled round a drum on the end of the gauge and another drum contains the counter balance wire. The drum is geared to a slotted tape attached to a pen carriage which traces the tide curve on the chart during the rise and fall of the tide. A precision potentiometer is attached to the gauge to provide an input to the data logger.

Wellhead float gauge

The Wellhead gauge measures the sea level by means of a float in a stilling well. The float is usually of a smaller diameter than that used on a Munro gauge (about 45cm diameter), and has a counterweight attached to a smaller diameter pulley than that of the float so it is not immersed in the sea when the float rises. The Wellhead unit does not produce a chart but does give a readout of the height. It is interfaced to the data logger via a precision potentiometer.



Data Processing

The data are collected on demand each week at Proudman Oceanographic Laboratory. The weekly files are then screened using our in-house visualisation package, Edteva. Suspect values are flagged and short gaps are interpolated where the accuracy is deemed not to be affected.

The weekly files are then concatenated into monthly files, with the residual added, and these are then edited so that all values fall on the quarter hour and gaps are filled in with null values and marked with an 'N' flag. The files are placed on the web for users to download. Statistics are produced monthly again using Edteva.

The last stage is where the monthly files are concatenated into yearly files and the metadata for the yearly files are then banked in a database.

Calculating Statistics in Edteva

There are essentially four types of summary information determined by Edteva: a history of when the tide gauge has been in operation (“history”), monthly extremes (“extremes”), monthly extreme surges (“surges”) and monthly and daily mean sea level (“MSL”).

Gaps greater than 4.1 hours in the primary channel are registered as gaps in the history.

Extremes are the maximum and minimum calculated over all sampled data during the month. This excludes any interpolated data but may include rapidly sampled data. Extreme surges (residuals) are calculated in the same way from tidal residuals. Tidal residuals are defined to be the measured water level minus the predicted tide. The predictions derive from the database of tidal constants maintained by POL’s Applications Group (as defined at the time of the calculation) for the ports of UK and elsewhere.

Mean Sea Level is calculated from a filter working on quarter-hourly values derived from one or more cubic splines applied to the raw data. The filter is a convolution of Vassie’s 03B filter which converts 15-minute data to hourly values and Doodson’s X0 filter. Splines are not applied across gaps as defined above. Shortish gaps can therefore lead to the loss of a day of output data (the half length of the filter is 91 and a day is 96 samples). Provided there are some daily (@12:00Z) values these are then averaged to provide the monthly value.

Location of Tide Gauges Around the U.K.

Aberdeen Tide Gauge

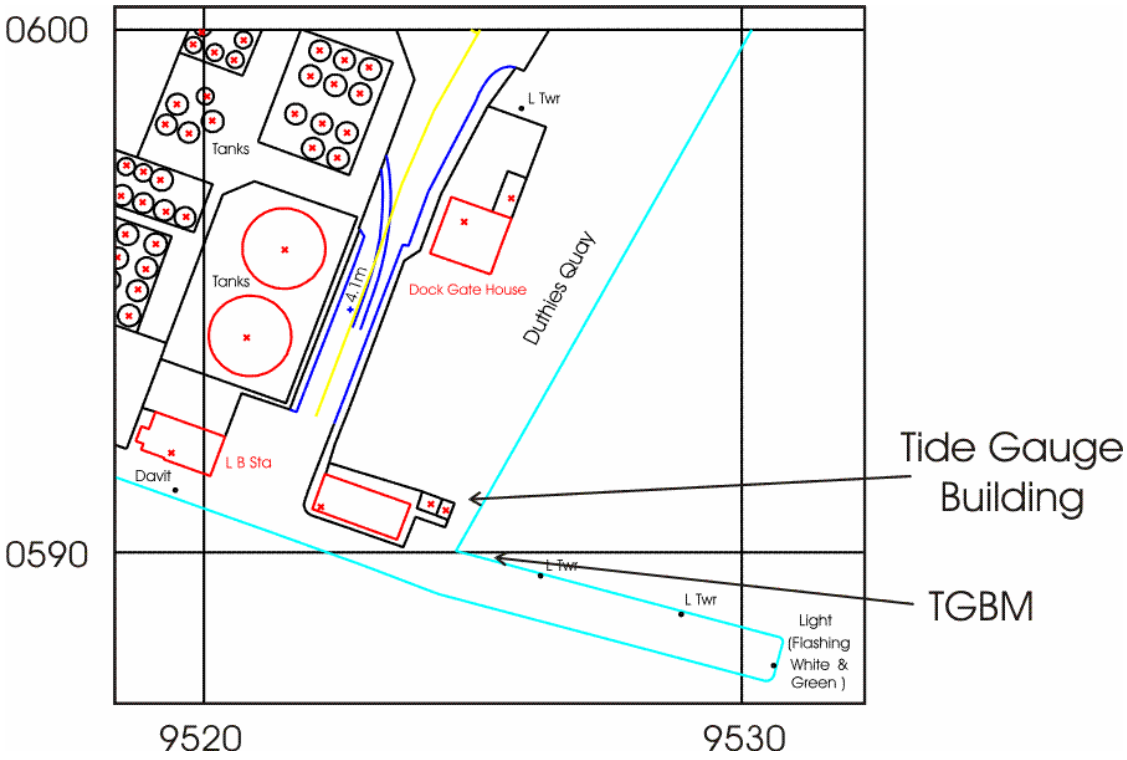
Latitude: 57° 08' 38.5" N Longitude: 02° 04' 48.8" W

Grid Reference: NJ 9524 0591

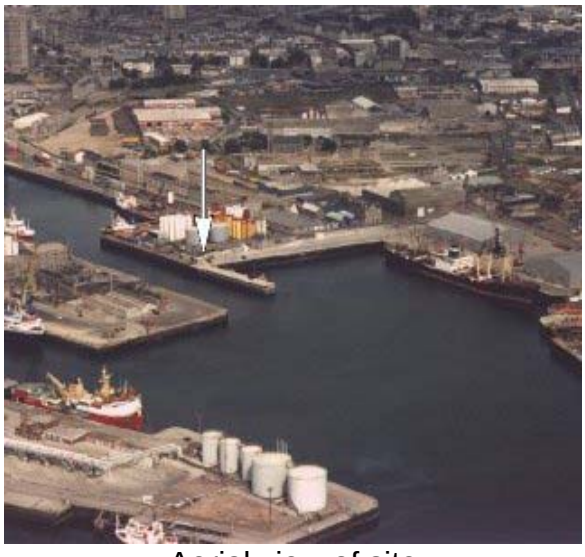
Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on Waterloo Quay and the pressure points are located in the South West corner of Telford Dock.



Tide gauge location



Aerial view of site

Avonmouth Tide Gauge

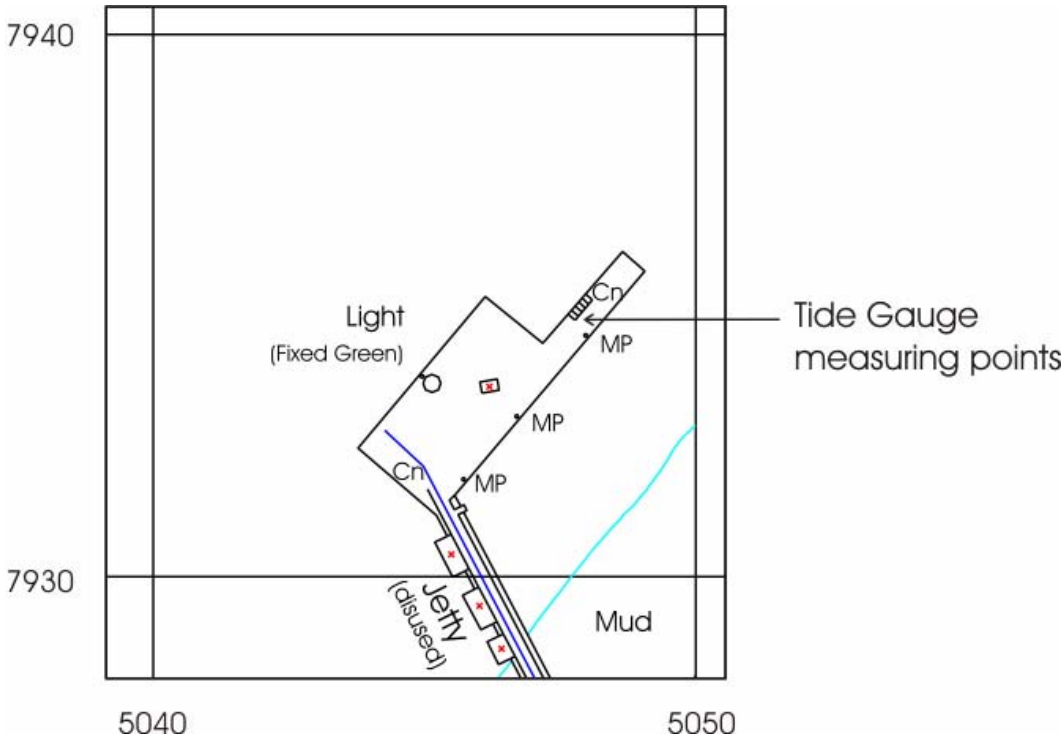
Latitude: 51° 30' 27.9" N Longitude: 02° 42' 45.9" W

Grid Reference: ST 5063 7900

Instrument type: Data acquisition system with dual underwater pressure transducers.

Site of Gauge:

The tide gauge building is located on land between the disused oil jetty and the fuel storage depot, with the measuring points being located at the seaward end of the jetty.



Bangor Tide Gauge

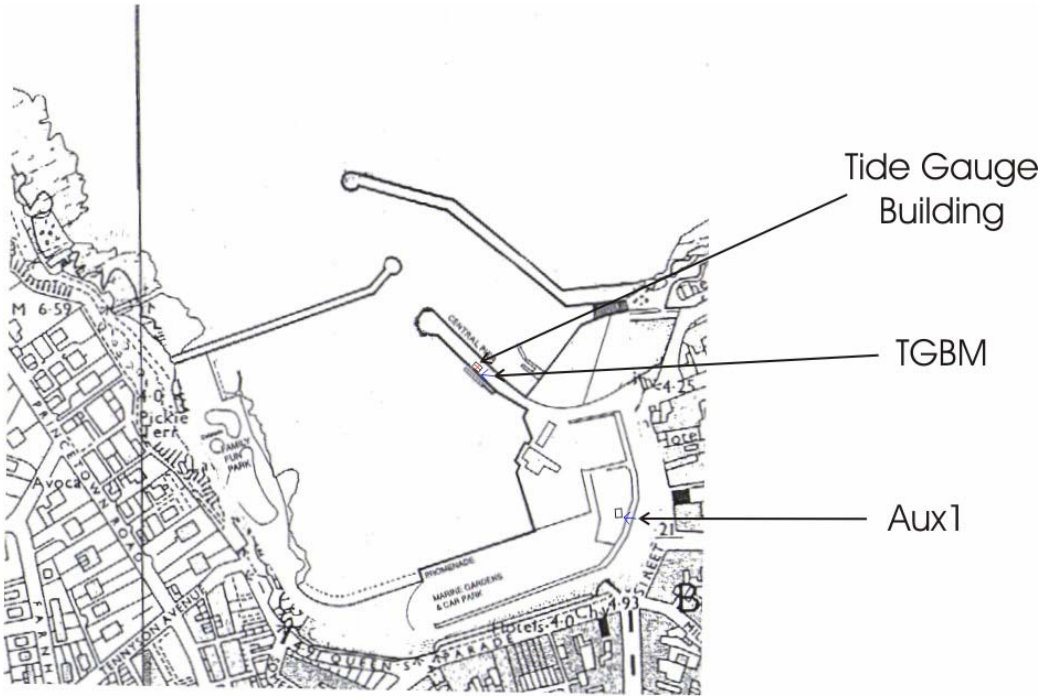
Latitude: 54° 39' 53.1" N Longitude: 05° 40' 10.1" W

Grid Reference: NW 6340 3620

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and pressure points are located on Central Pier at Bangor Marina. The pressure points are on the seaward side of the open pier directly beneath the tide gauge building.



Barmouth Tide Gauge

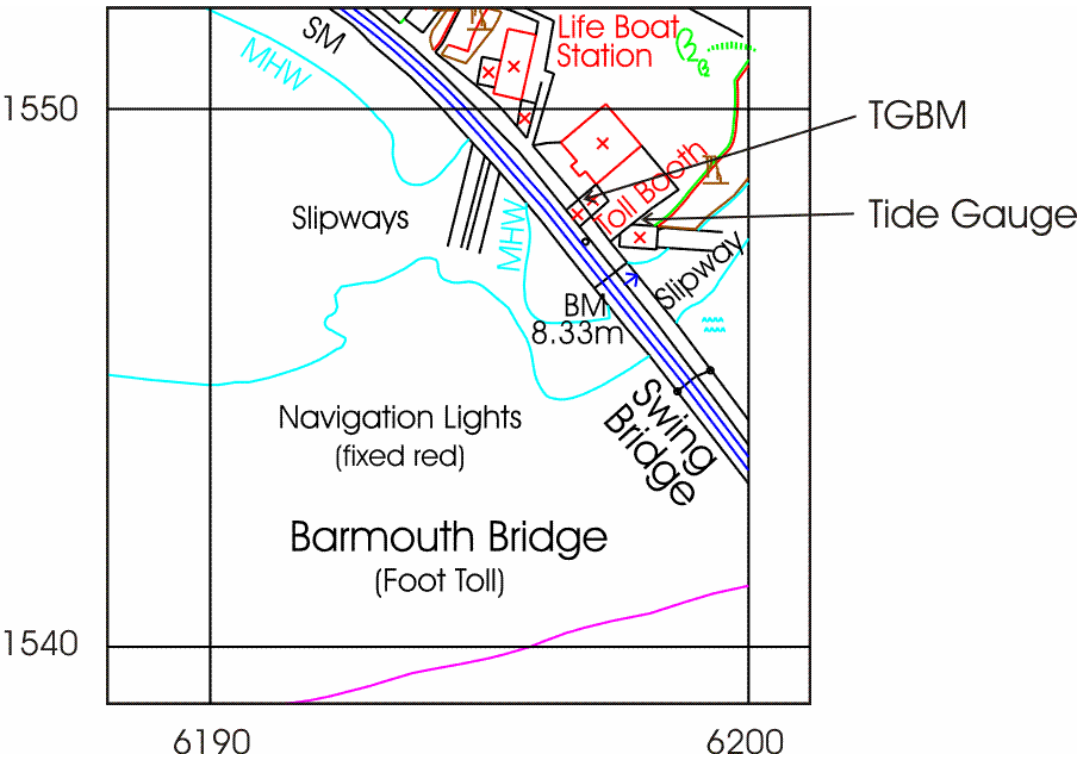
Latitude: 52° 43' 09.6" N Longitude: 04° 02' 42.1" W

Grid Reference: SH 6197 1548

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge cabinet is located in the toll booth on the north end of Barmouth railway bridge which crosses the river Mawddach. The pressure points are attached to the first leg of the railway bridge in the deep channel.



Bournemouth Tide Gauge

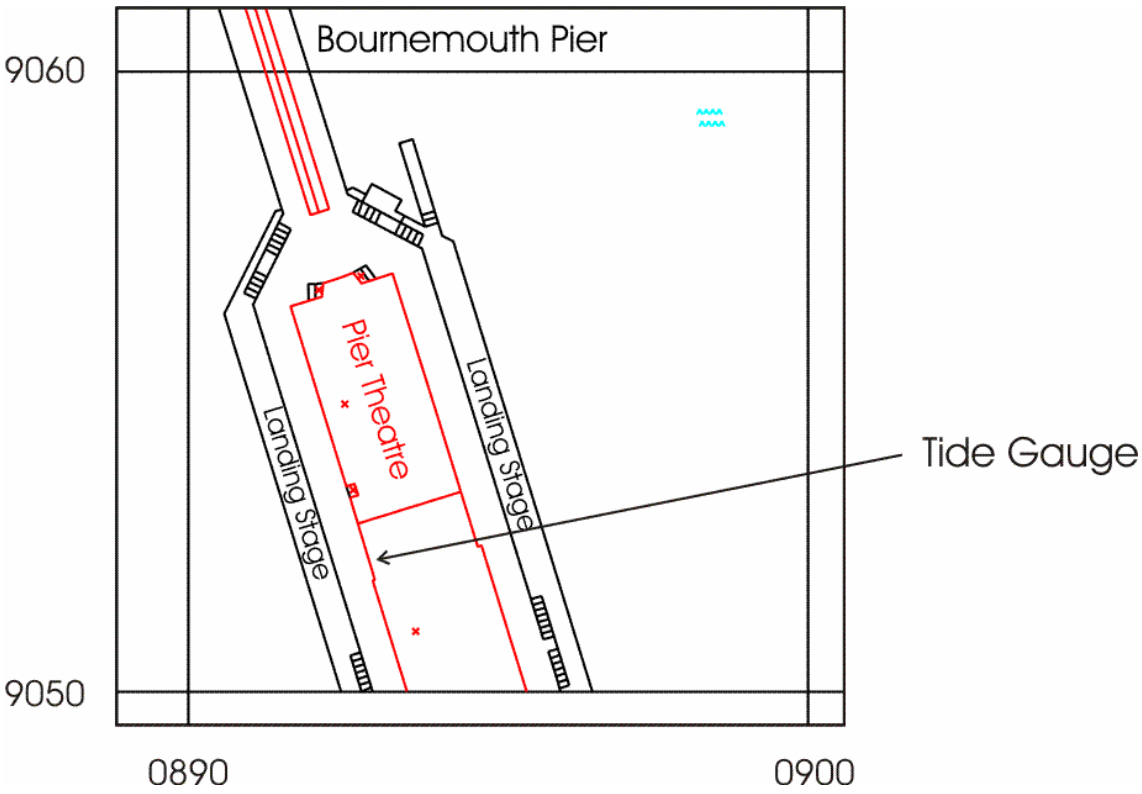
Latitude: 50° 42' 51.6" N Longitude: 01° 52' 29.5" W

Grid Reference: SZ 0893 9053

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment is located in the pier electrical room at the west side of the South Pier. The measuring points are mounted directly below on one of the pier legs.



Cromer Tide Gauge

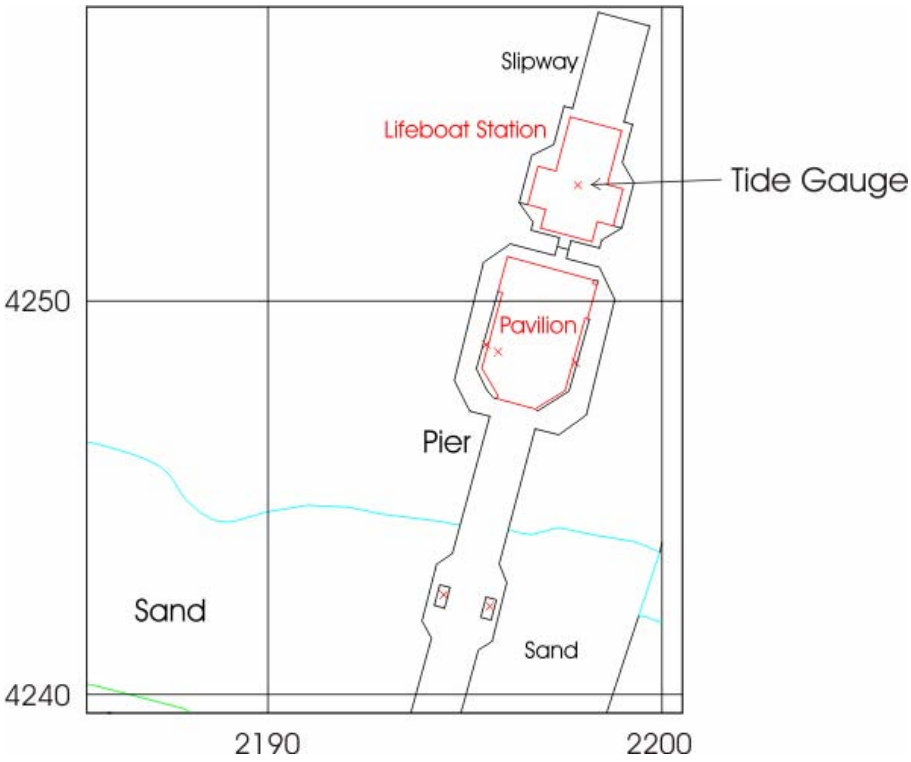
Latitude: 52° 56' 03.1" N Longitude: 01° 18' 05.9" E

Grid Reference: TG 2198 4253

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located within Cromer lifeboat station, with the pressure points attached to a leg of the lifeboat slipway.



Devonport Tide Gauge

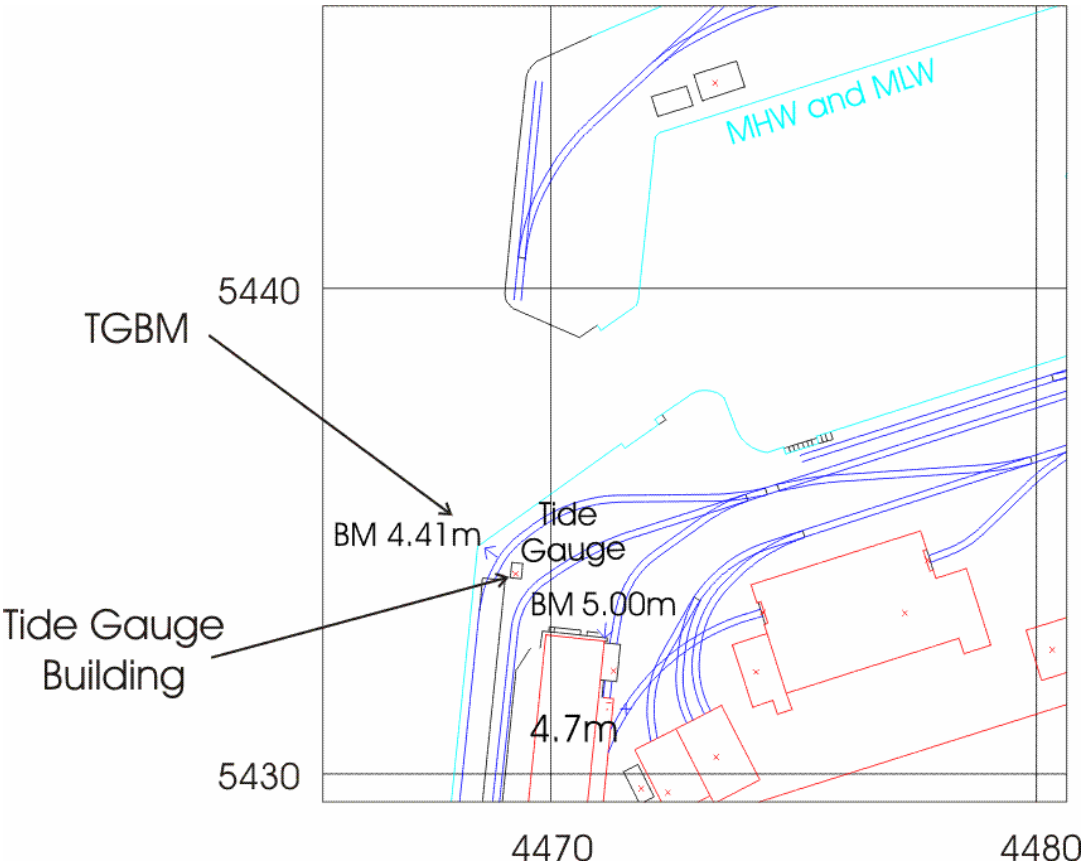
Latitude: 50° 22' 06.2" N Longitude: 04° 11' 06.9" W

Grid Reference: SX 4469 5434

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is situated on No. 1 Jetty in Devonport Royal Naval base. The pressure points are attached to the stilling well beneath the building.



Dover Tide Gauge

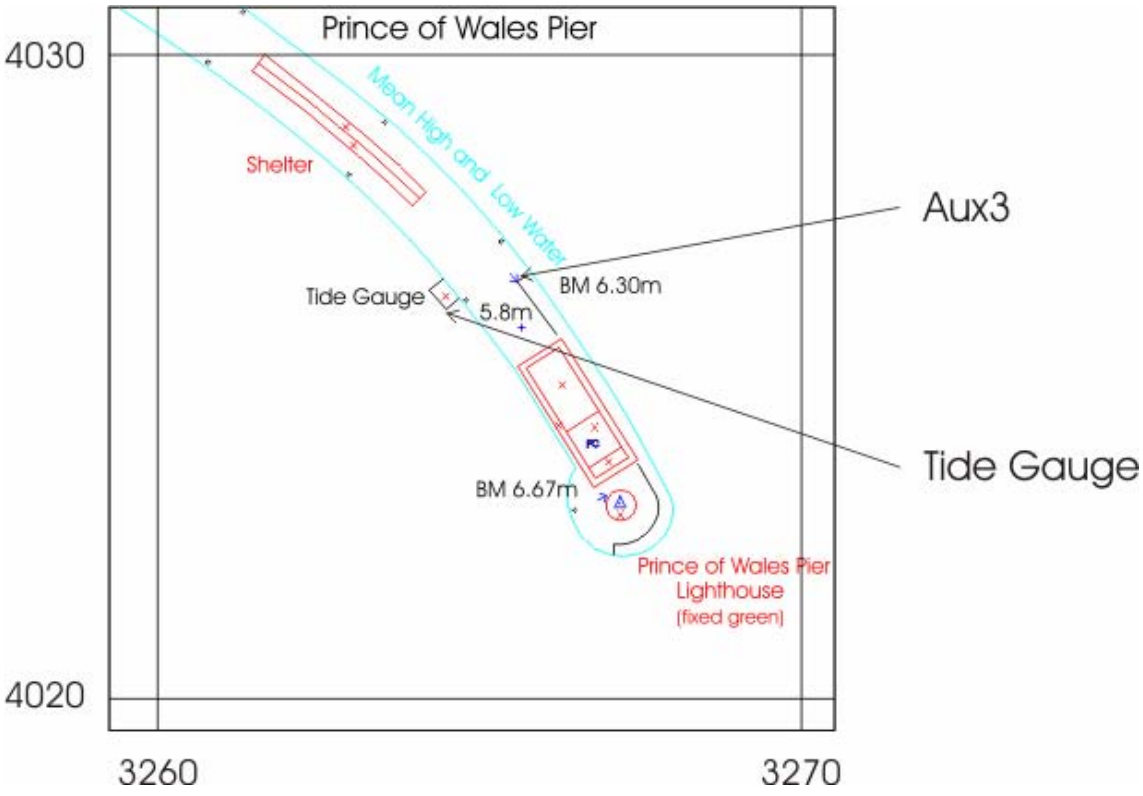
Latitude: 51° 06' 51.8" N Longitude: 01° 19' 21.1" E

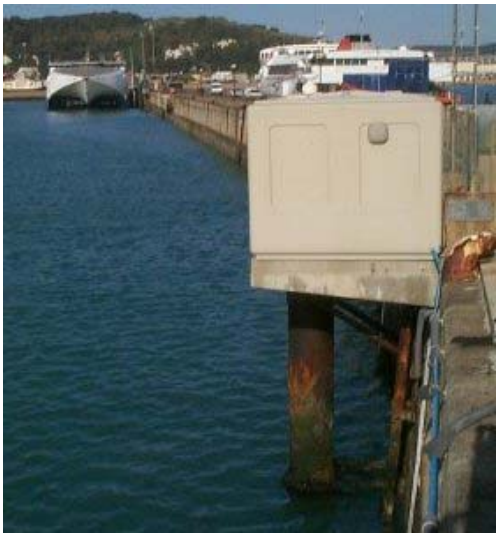
Grid Reference: TR 3264 4026

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is at the seaward end of Prince of Wales Pier, Western Dock, just before the lighthouse. The pressure points are attached to the stilling well.





Felixstowe Tide Gauge

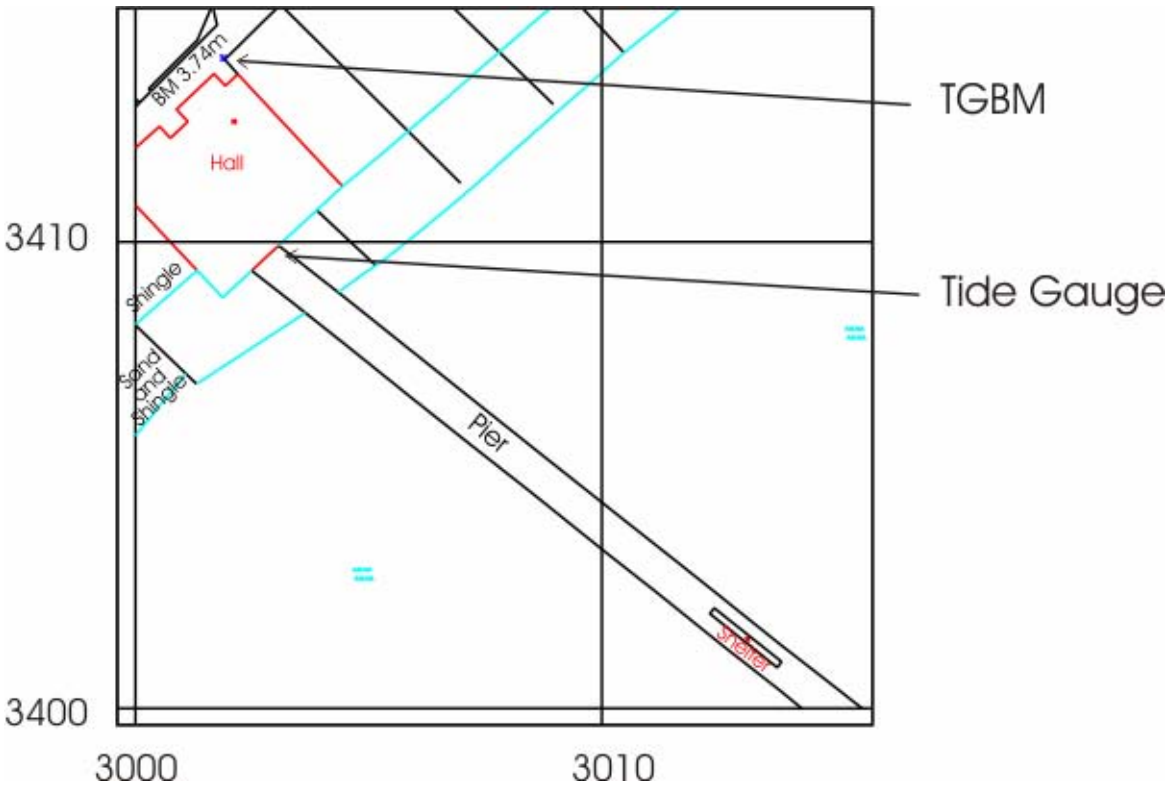
Latitude: 51° 57' 27.7" N Longitude: 01° 20' 47.6" E

Grid Reference: TM 3003 3409

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building and pressure points are located on Felixstowe pier. The equipment is located on the landward end and the pressure points are located in deep water at the seaward end.



Fishguard Tide Gauge

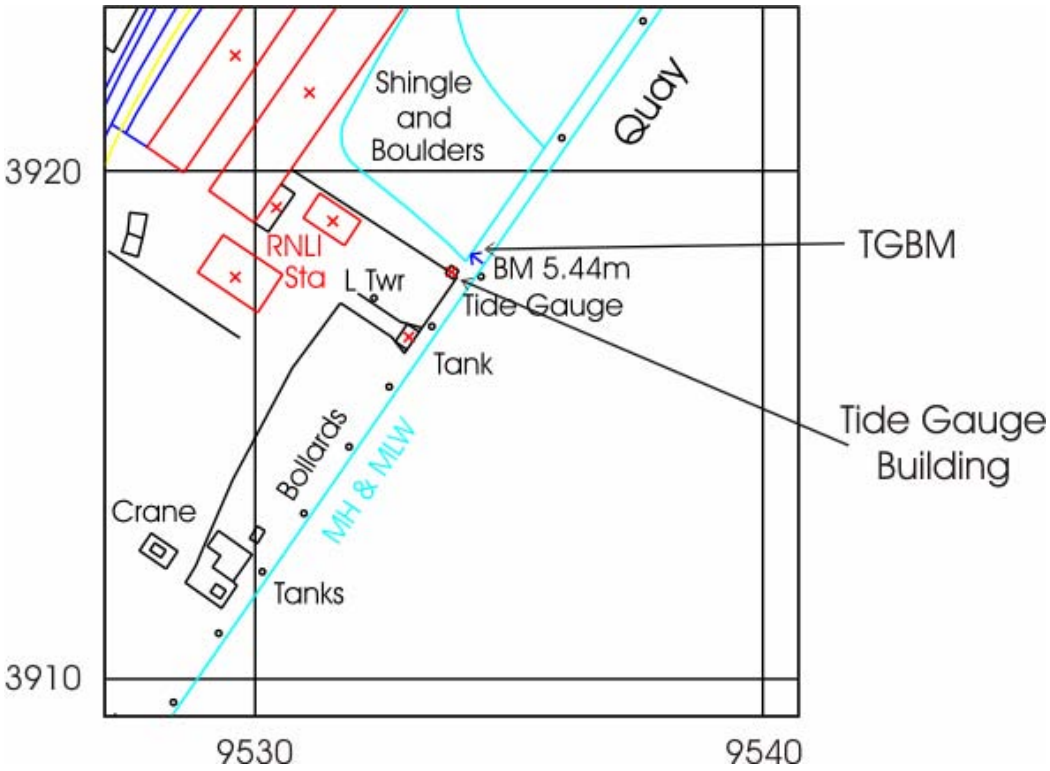
Latitude: 52° 00' 47.6" N Longitude: 04° 59' 01.5" W

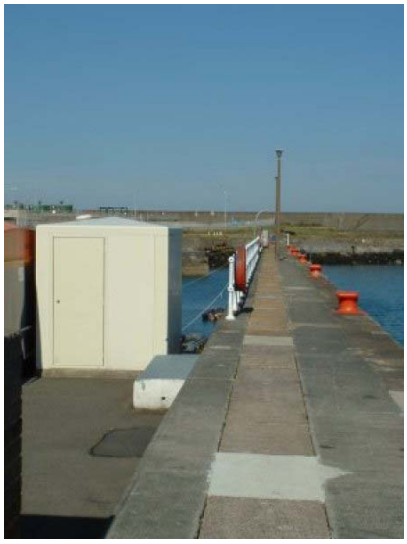
Grid Reference: SM 9534 3918

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on Fishguard Quay adjacent to the RNLI station, and the pressure points are located approximately 10m from the end of the quay.





Harwich Tide Gauge

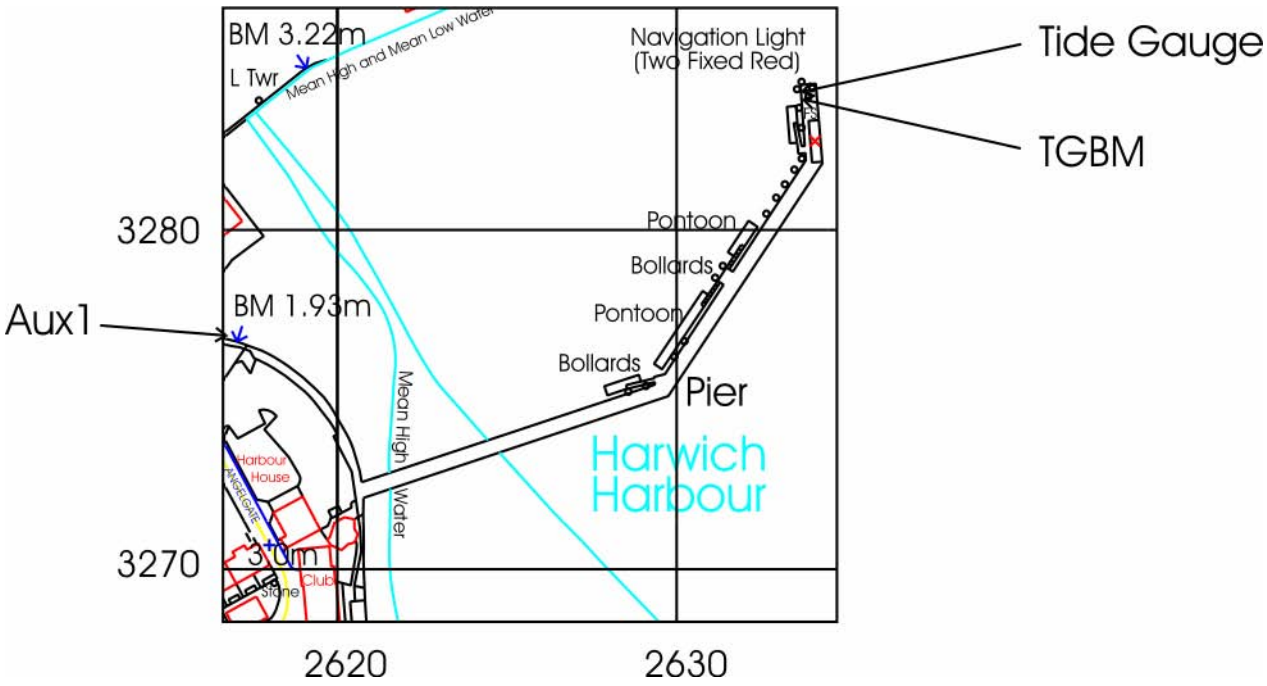
Latitude: 51° 56' 52.8" N Longitude: 01° 17' 31.4" E

Grid Reference: TM 2634 3284

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located on the seaward end of Harwich Haven Authority jetty. The pressure points are directly below the cabinet.



Heysham Tide Gauge

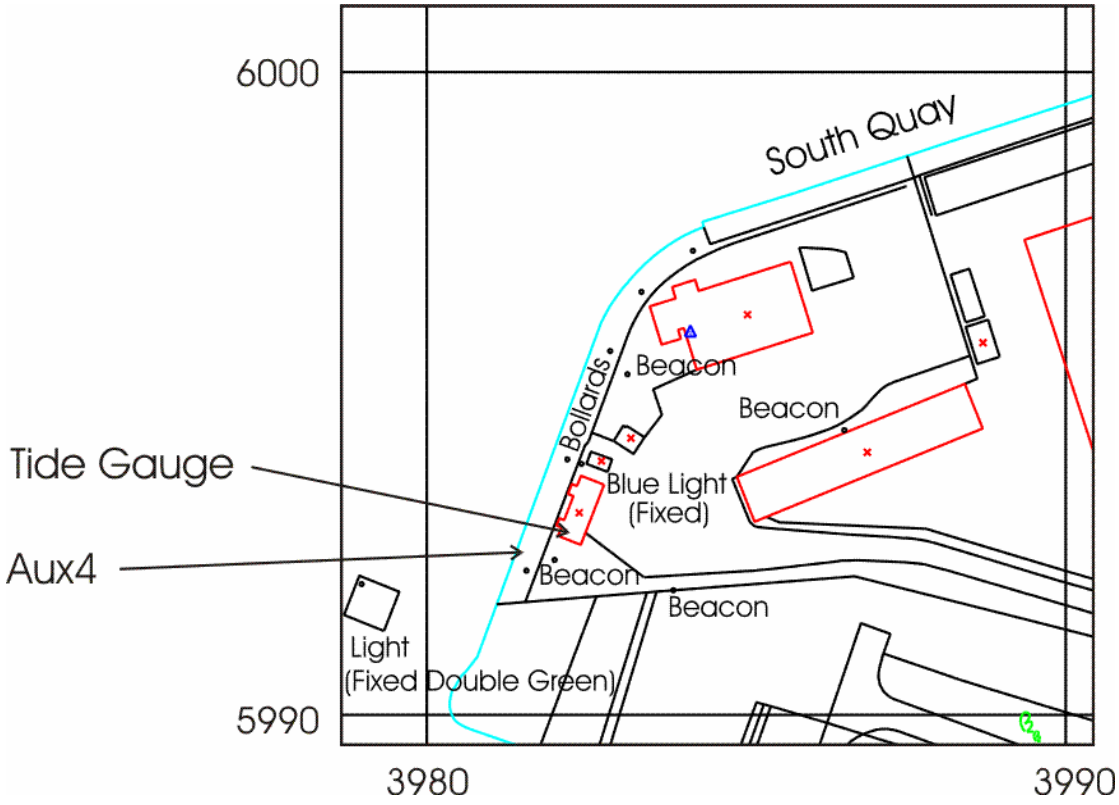
Latitude: 54° 01' 54.6" N Longitude: 02° 55' 12.9" W

Grid Reference: SD 3982 5993

Instrument type: Data acquisition system with two full tide bubbler gauges.

Site of Gauge:

The tide gauge building is located on the south side of the entrance to Heysham harbour.



Hinkley Point Tide Gauge

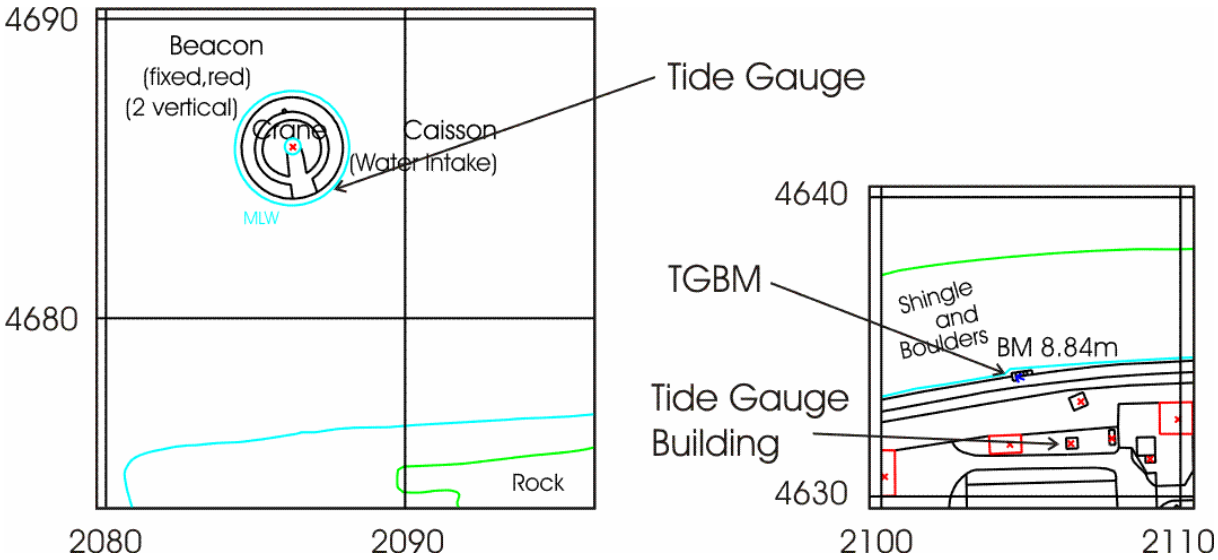
Latitude: 51° 12' 54.9" N Longitude: 03° 08' 04.1" W

Grid Reference: ST 2086 4684

Instrument type: Dataring system with dual underwater pressure transducers.

Site of Gauge:

The tide gauge building is located in the Hinkley Point "A" station. The transducers are located in underwater vented chambers, suspended from a steel pole attached to the structure of the water intake tower, some 400m offshore.



Holyhead Tide Gauge

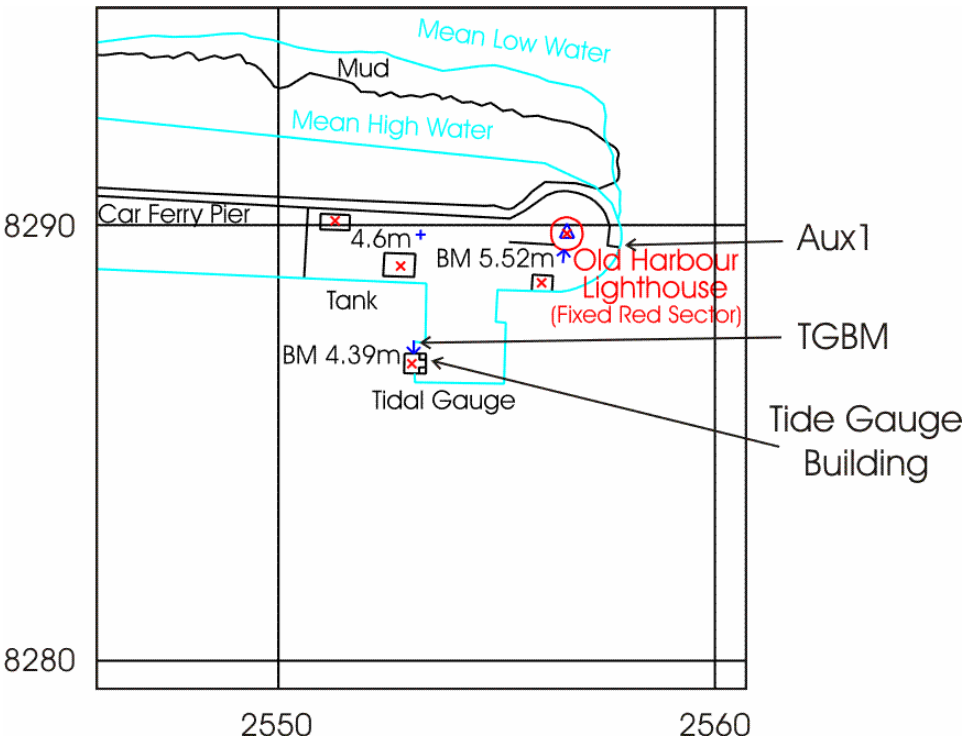
Latitude: 53° 18' 50.2" N Longitude: 04° 37' 13.5" W

Grid Reference: SH 2553 8287

Instrument type: Data acquisition system with a full tide and a mid-tide bubbler gauge and a back-up Munro float gauge installed. Wind speed and wind direction are also recorded.

Site of Gauge:

The tide gauge building, pressure points and stilling well are situated on Salt Island jetty, close to the old harbour lighthouse.



Ilfracombe Tide Gauge

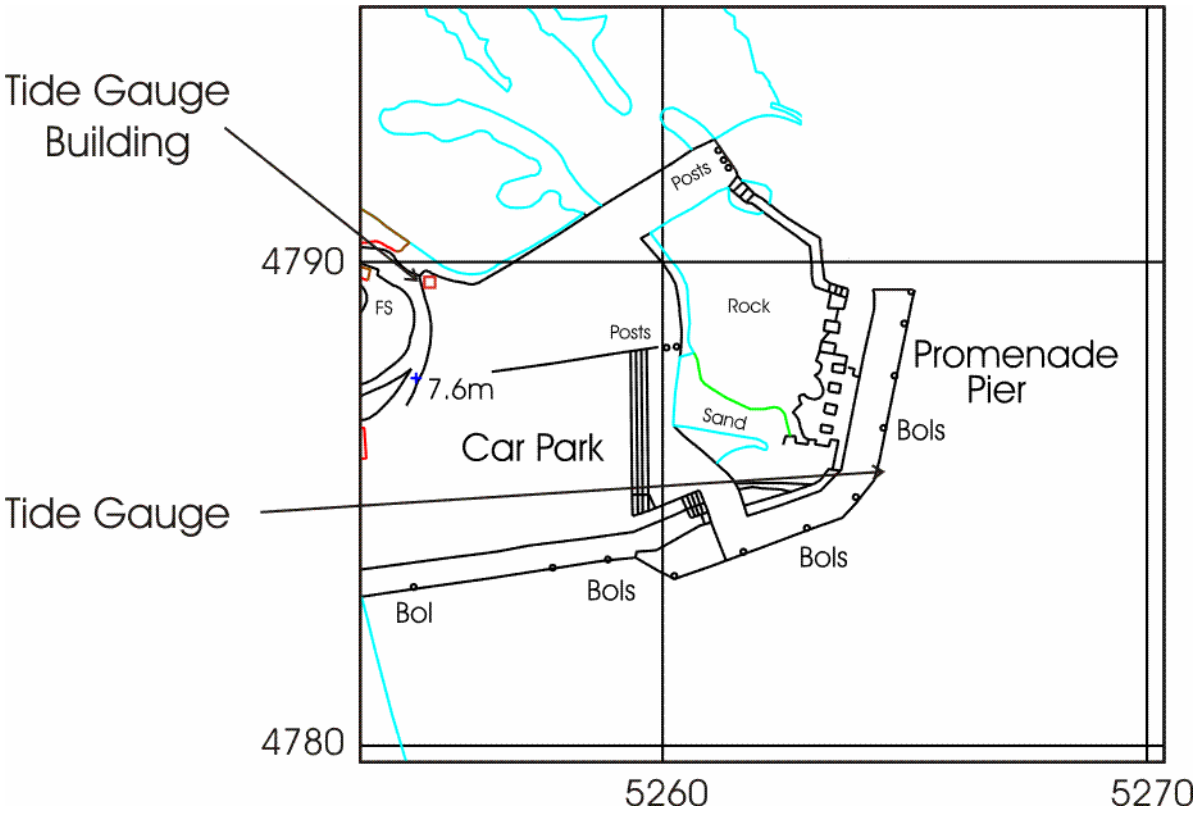
Latitude: 51° 12' 40.1" N Longitude: 04° 06' 44.6" W

Grid Reference: SS 5255 4789

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located in the North West corner of the car park, east of Lantern Hill. The pressure points are located on the seaward side of Ilfracombe pier at the harbour entrance.



Immingham Tide Gauge

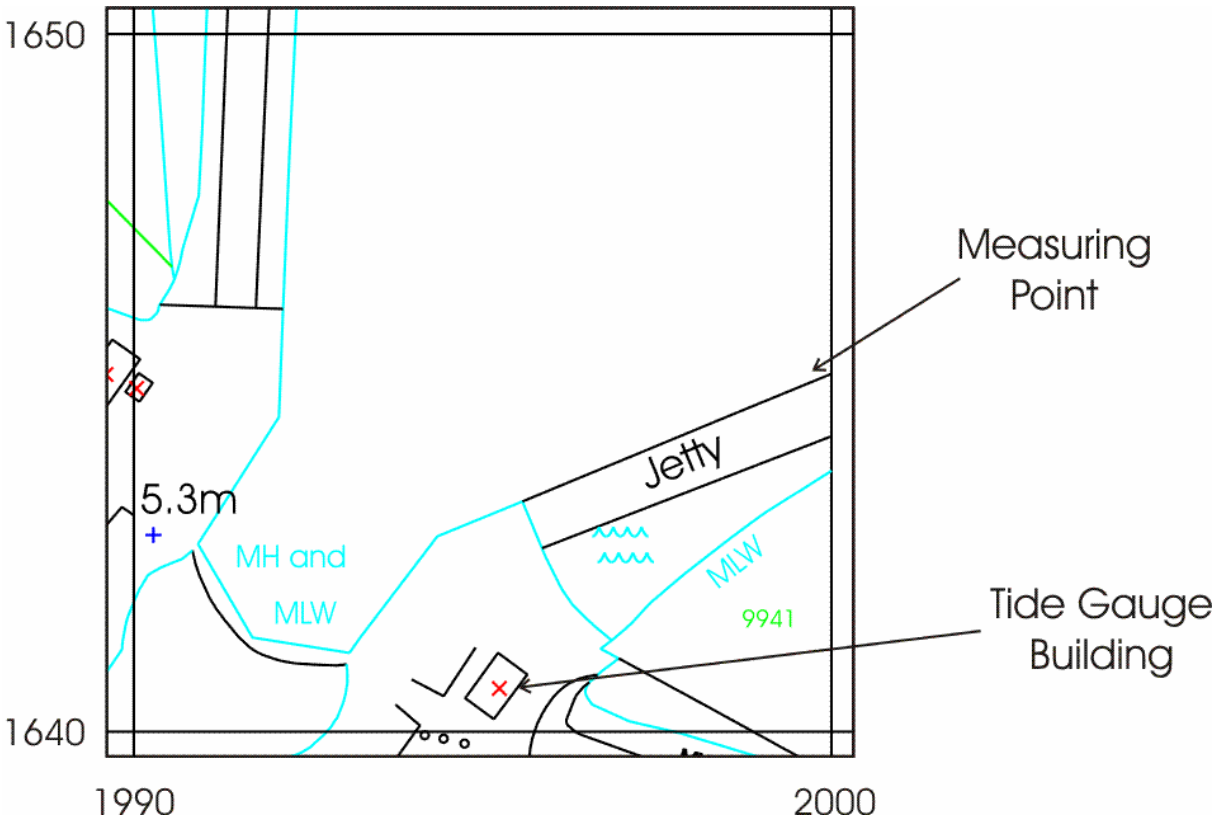
Latitude: 53° 37' 49.5" N Longitude: 00° 11' 15.1" W

Grid Reference: TA 1995 1640

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is east of the lock gates at the entrance to Immingham Docks. The pressure points are fixed to a leg of the lead-in jetty on the east side of the entrance to Immingham Docks.



Port Erin (Isle of Man) Tide Gauge

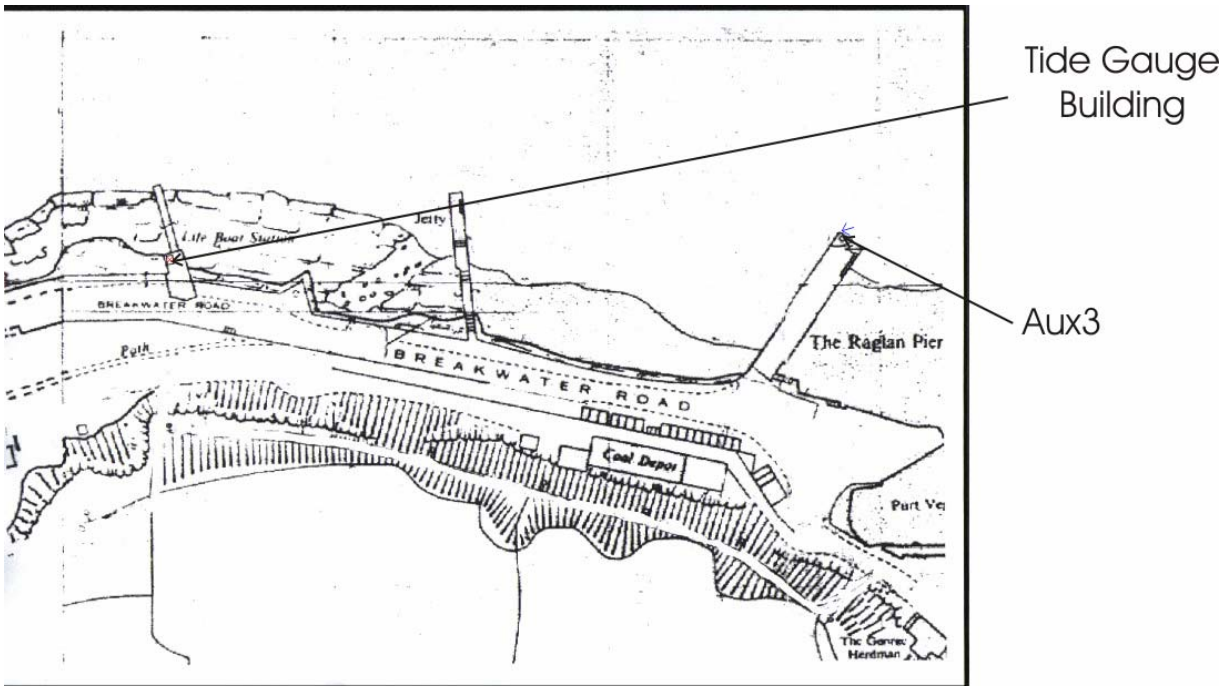
Latitude: 54° 05' 06.8" N Longitude: 04° 46' 05.0" W

Grid Reference: SC 1904 6902

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in Port Erin lifeboat station and the pressure points are mounted close to the end of the lifeboat slipway. The mid-tide pressure point is mounted on steelwork attached to a concrete leg of the boathouse.



Port Ellen (Isle of Islay) Tide Gauge

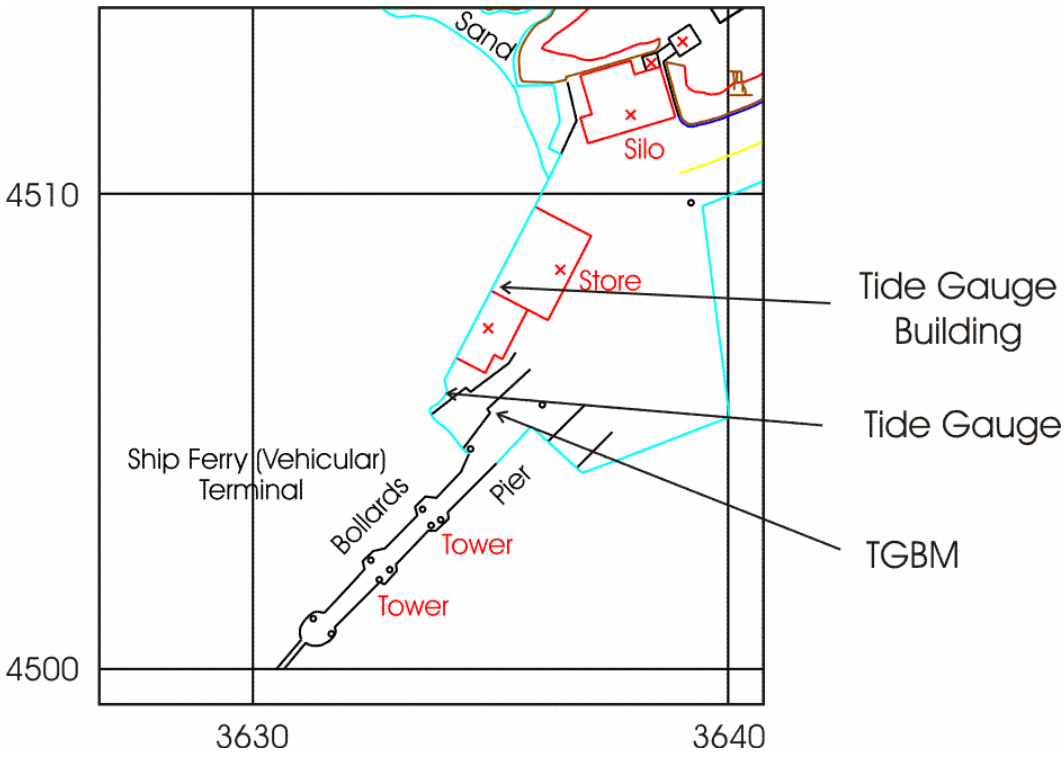
Latitude: 55° 37' 39.3" N Longitude: 06° 11' 23.7" W

Grid Reference: NR 3636 4508

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge cabinet is located in the Caledonian MacBrayne storeroom next to Port Ellen ferry terminal. The pressure points are located south west of the ferry terminal offices.



St. Helier (Jersey) Tide Gauge

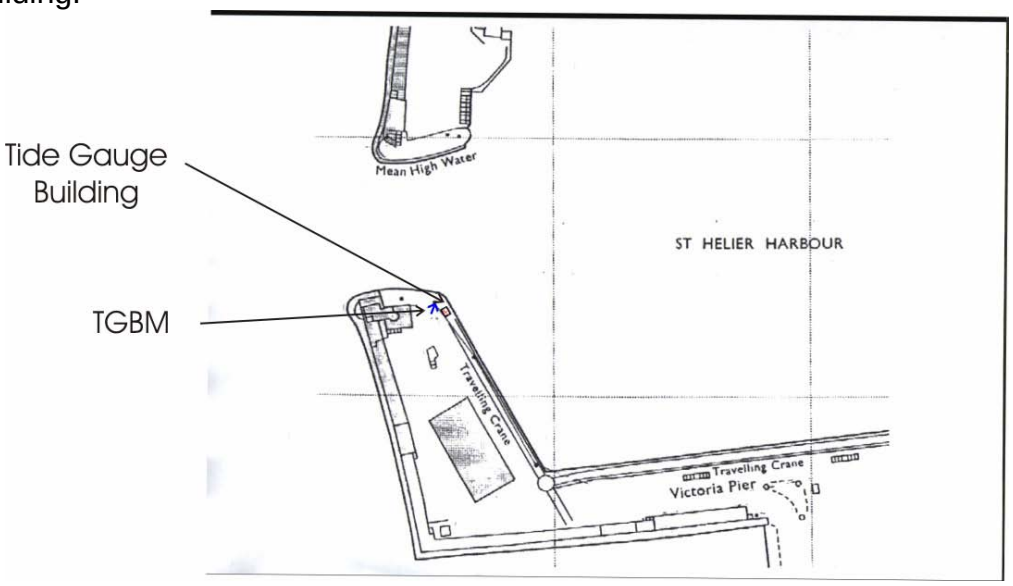
Latitude: 49° 11' 00" N Longitude: 02° 07' 00 " W

Grid Reference: 13/11 6466 4763

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on Victoria Pier, St. Helier, adjacent to the Port Control building. The pressure points are located on the inside wall of the pier, 2m from the tide gauge building.



Kinlochbervie Tide Gauge

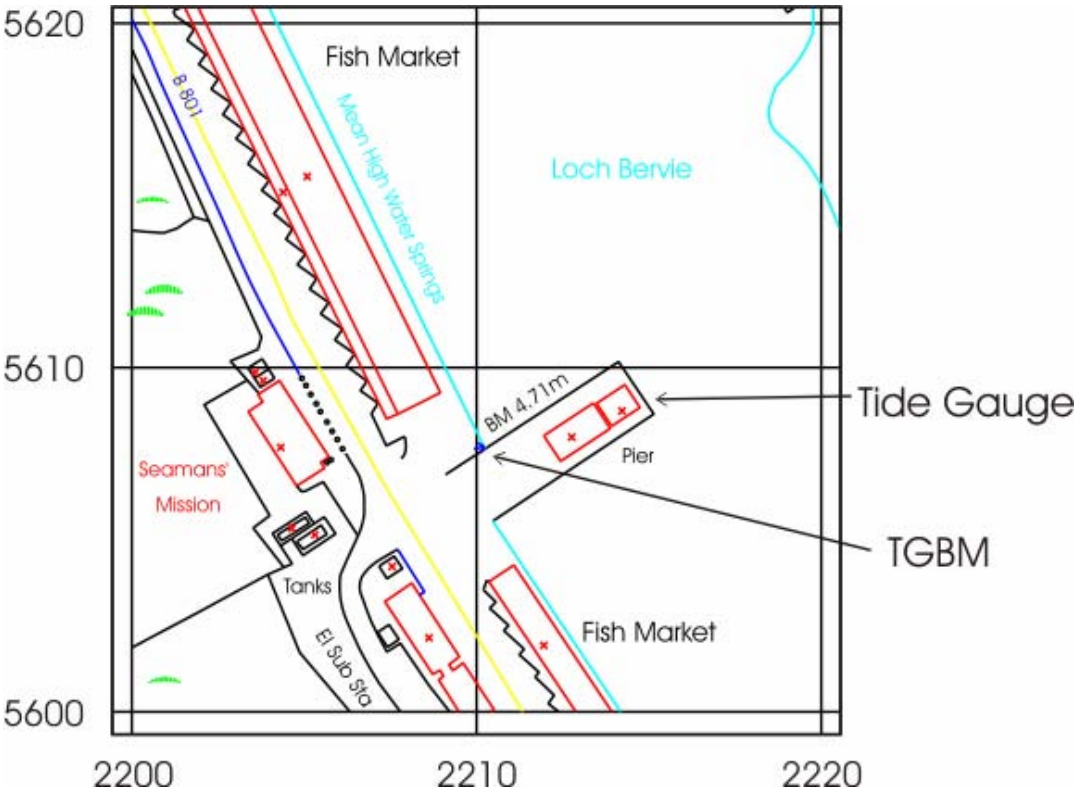
Latitude: 58° 27' 24.1" N Longitude: 05° 03' 00.8" W

Grid Reference: NC 2213 5609

Instrument type: Dataring system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge cabinet is located in the ice plant, on the pier. The pressure points are mounted on a leg of the jetty beneath the ice plant.



Leith Tide Gauge

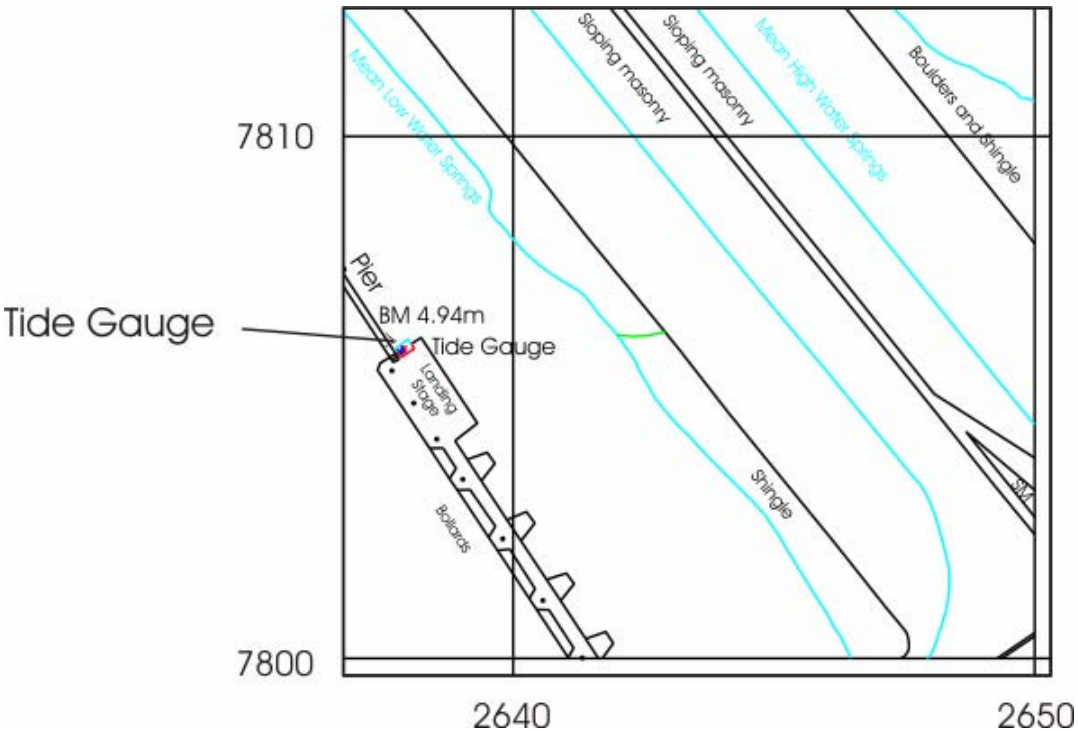
Latitude: 55° 59' 23.4"N Longitude: 03° 10' 54.1"E

Grid Reference: NT 2638 7806

Instrument type: Data acquisition system with a full tide bubbler gauge and a potentiometer connected to a Munro float gauge installed.

Site of Gauge:

The tide gauge building and pressure points are located on the lead-in jetty, east of the entrance to Leith docks.



Lerwick Tide Gauge

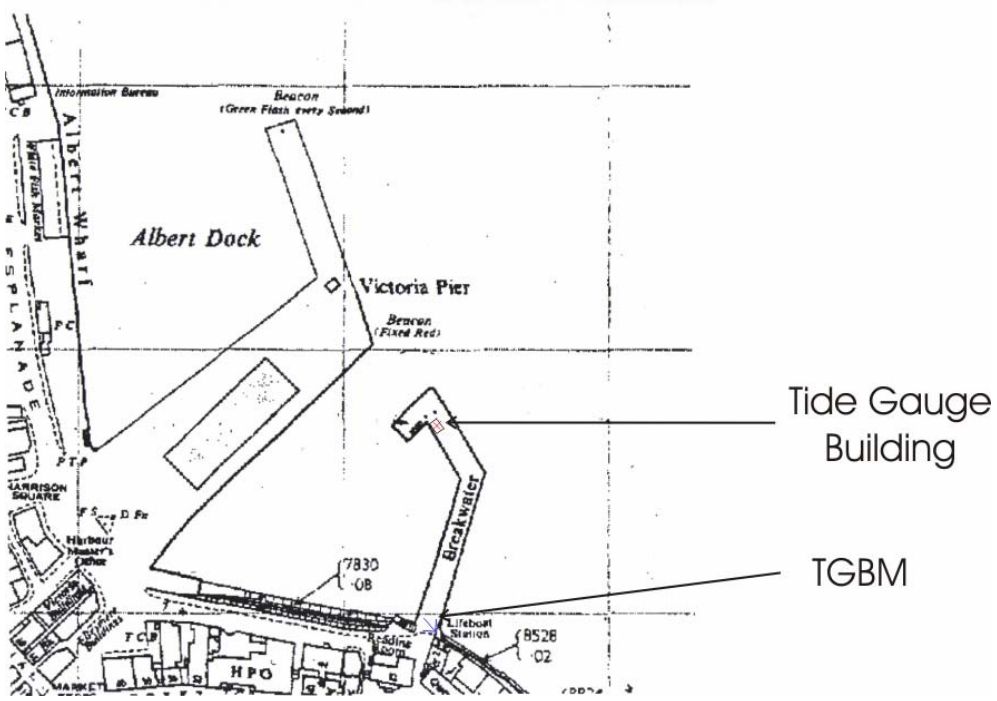
Latitude: 60° 09' 14.5" N Longitude: 01° 08' 25.1" W

Grid Reference: HU 4783 4137

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and measuring points are located on the inner wall at breakwater entrance to the small boat harbour, south of Victoria Pier, Lerwick.



Liverpool Tide Gauge

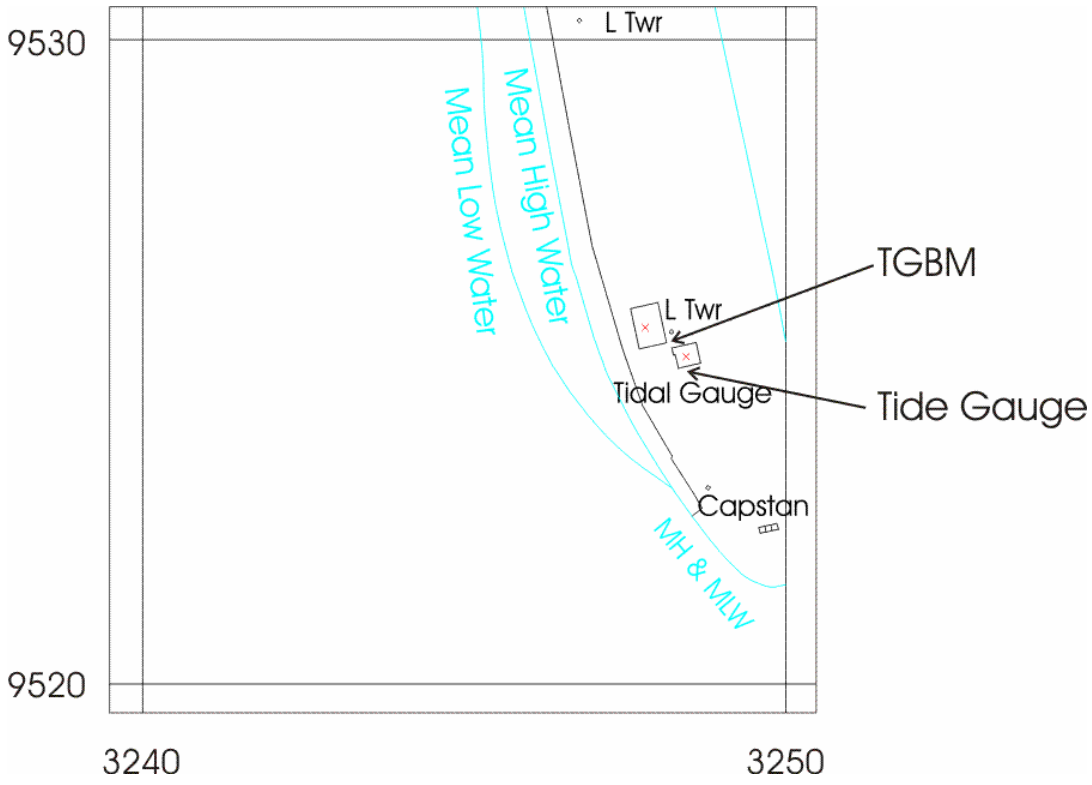
Latitude: 53° 26' 58.9" N Longitude: 03° 01' 05.3" W

Grid Reference: SJ 3248 9525

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed. Wind speed and wind direction also recorded up until June 2004.

Site of Gauge:

The Tide Gauge is located within the old Lock Keepers office at the entrance to Gladstone Dock. The pressure points are located on the seaward side of Gladstone Dock. The wind speed and direction instruments are mounted at the top of the light tower located next to the tide gauge building.



Llandudno Tide Gauge

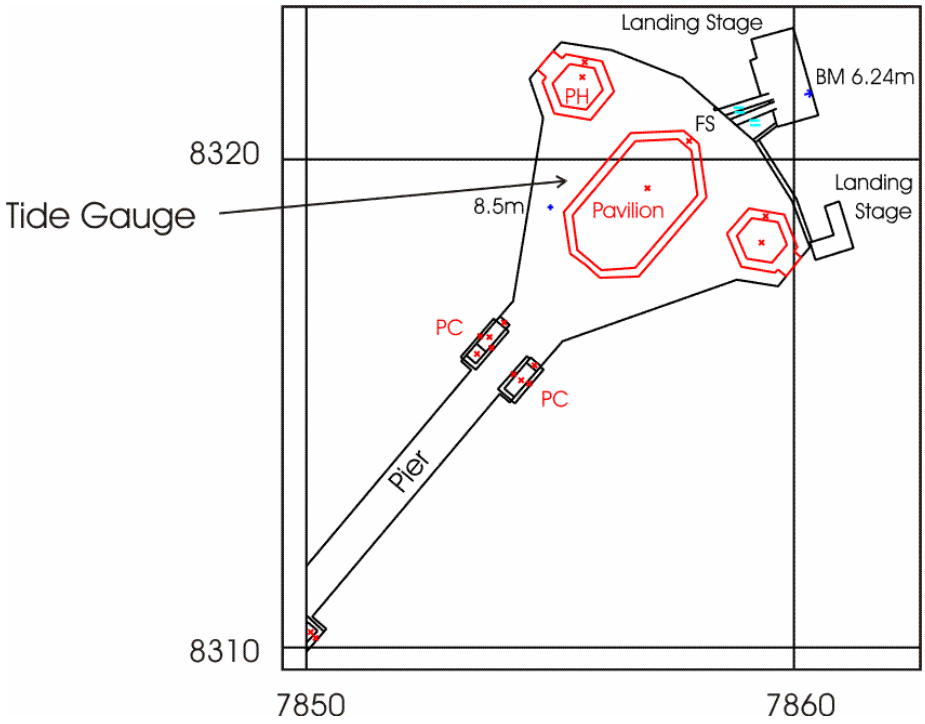
Latitude: 53° 19' 54.0" N Longitude: 03° 49' 30.8" W

Grid Reference: SH 7855 8319

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the sub-platform under the pavilion at the seaward end of Llandudno pier. The pressure points are located on a leg of the pier below the tide gauge building.



Lowestoft Tide Gauge

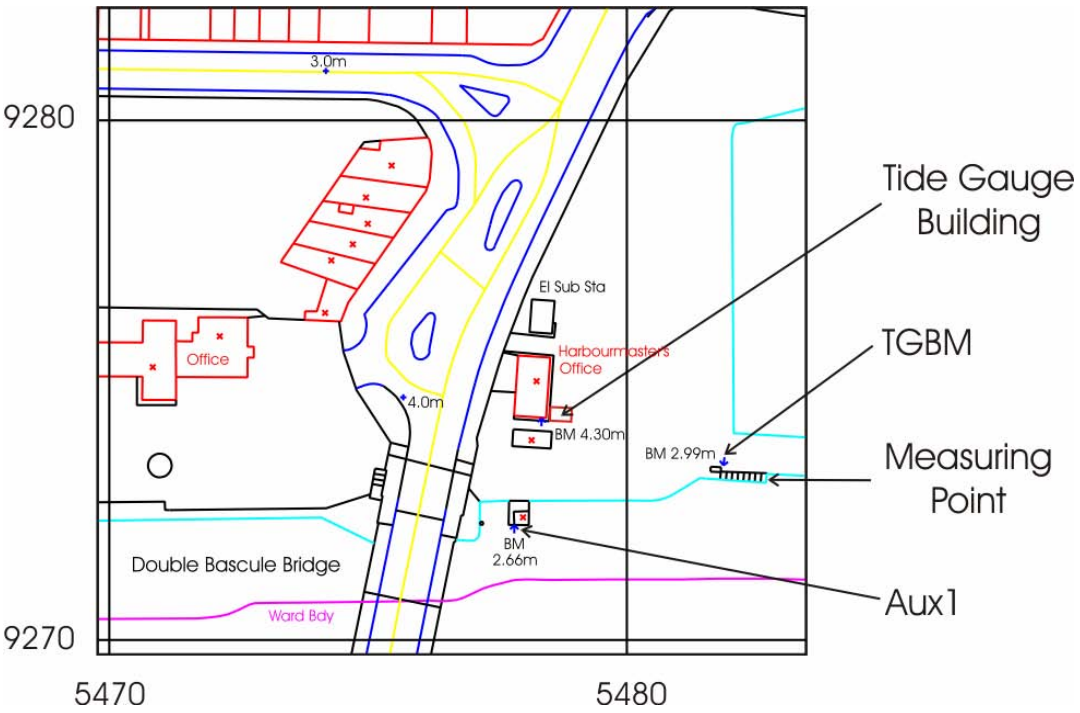
Latitude: 52° 28' 23.1" N Longitude: 01° 45' 00.9" E

Grid Reference: TM 5479 9274

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is situated east of the Harbour Master's Office with the pressure points located on the quay wall, east of the tide gauge building.



Milford Haven Tide Gauge

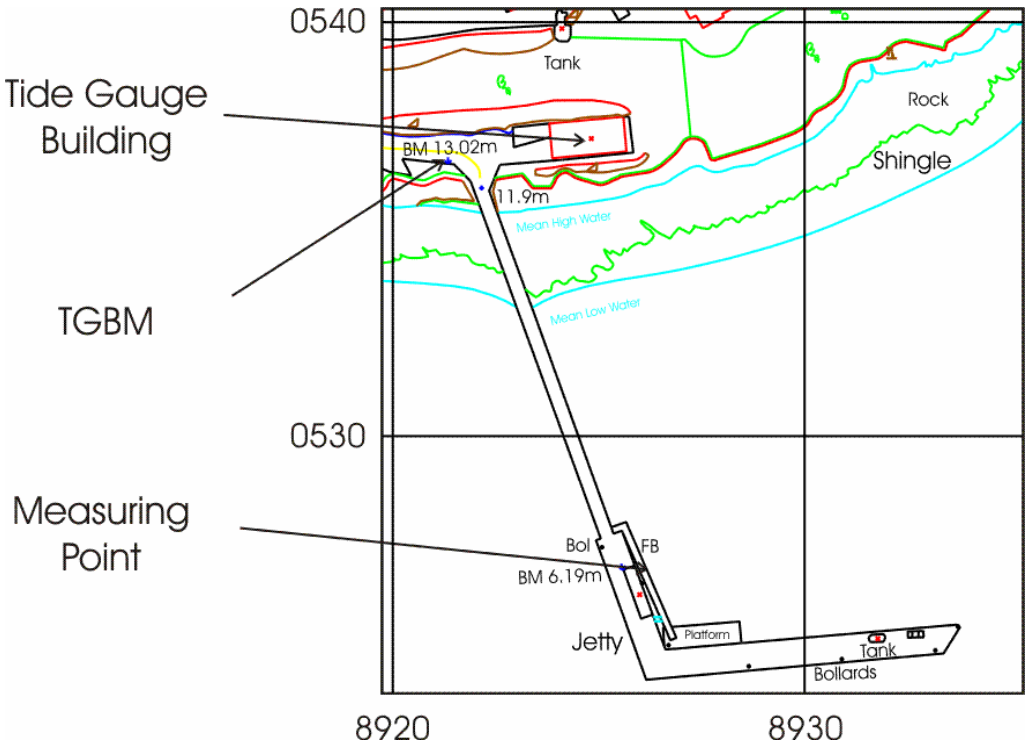
Latitude: 51° 42' 26.6" N Longitude: 05° 03' 06.4" W

Grid Reference: SM 8924 0537

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located in the store room at the shore end of Milford Haven Port Authority jetty. The pressure points are mounted at the seaward end of the jetty.



Millport Tide Gauge

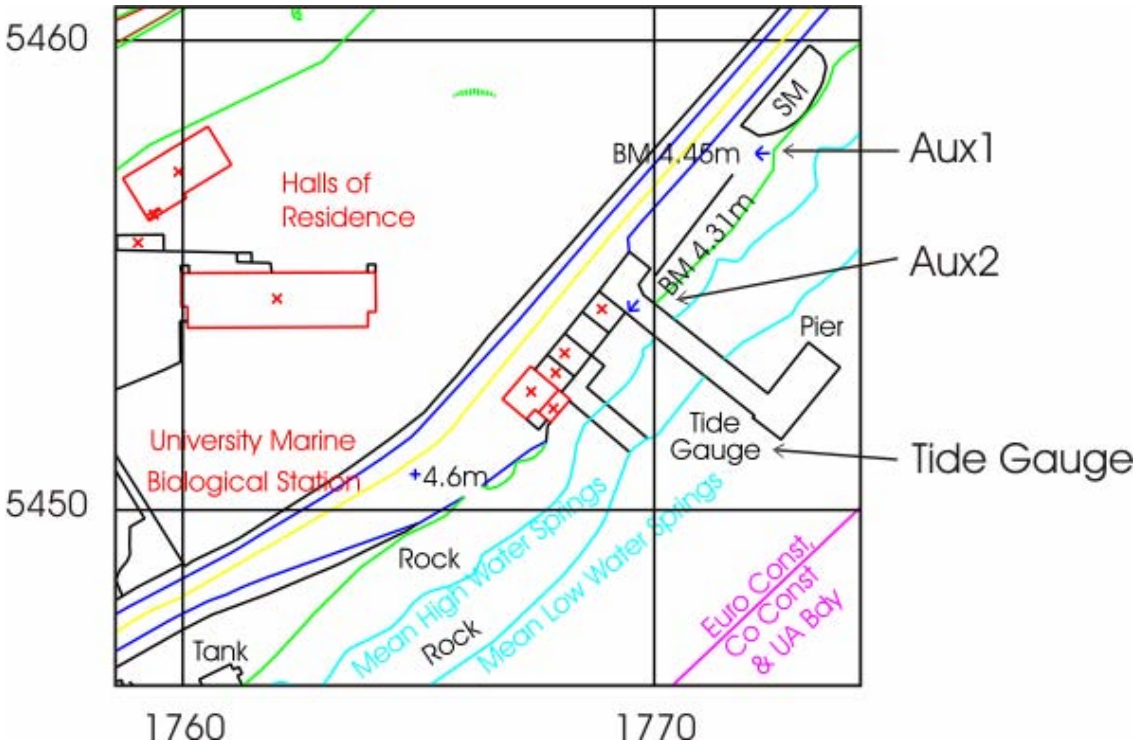
Latitude: 55° 44' 59.3" N Longitude: 04° 54' 22.8" W

Grid Reference: NS 1769 5454

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is housed in a storeroom at the shore end of the University Marine Biological Station pier. The pressure points are mounted at the seaward end of the pier.



Moray Firth Tide Gauge

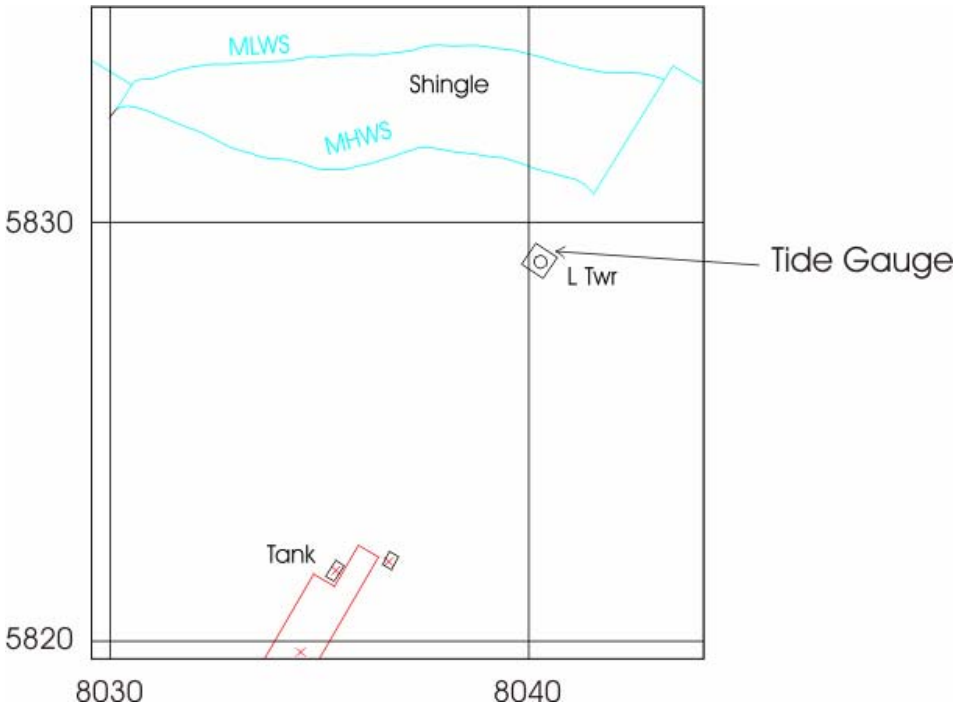
Latitude: 57° 35' 55.3" N Longitude: 04° 00' 08.0" W

Grid Reference: NH 8040 5829

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is sited beneath the light tower at McDermott Base, Ardesier on the south side of the entrance to Whiteness Bay. The pressure points are mounted on the sheet pile wall, north east of the tide gauge building.



Mumbles (West Glamorgan) Tide Gauge

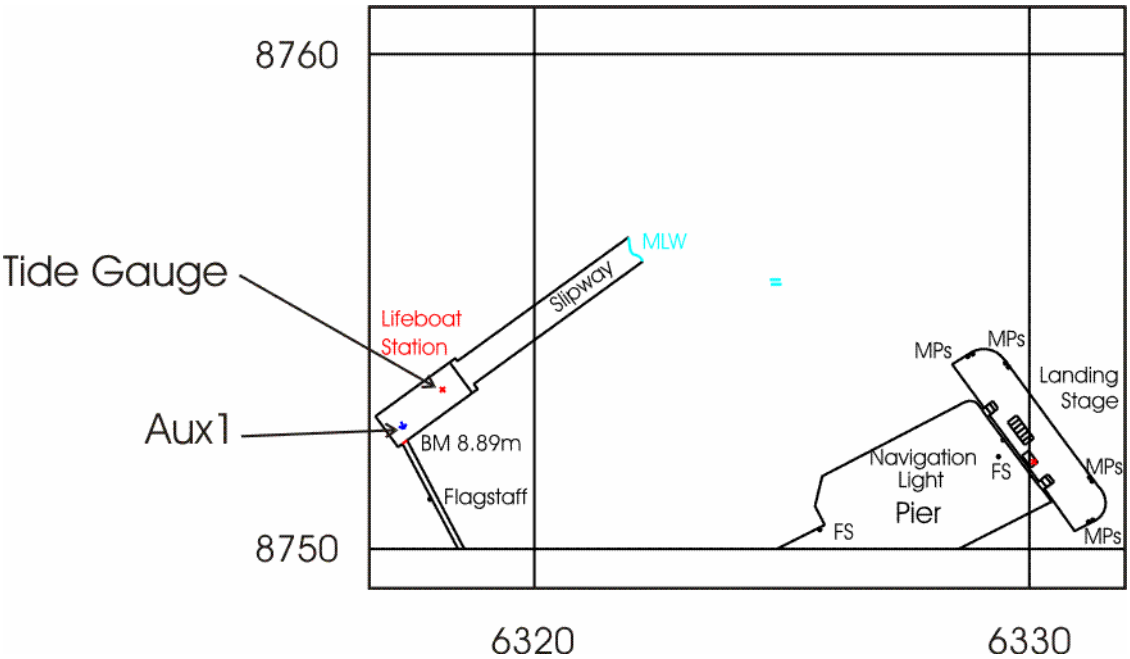
Latitude: 51° 34' 12.0" N Longitude: 03° 58' 31.7" W

Grid Reference: SS 6319 8753

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge cabinet is located in the Mumbles lifeboat station and the pressure points are mounted close to the end of the lifeboat slipway.



Newlyn Tide Gauge

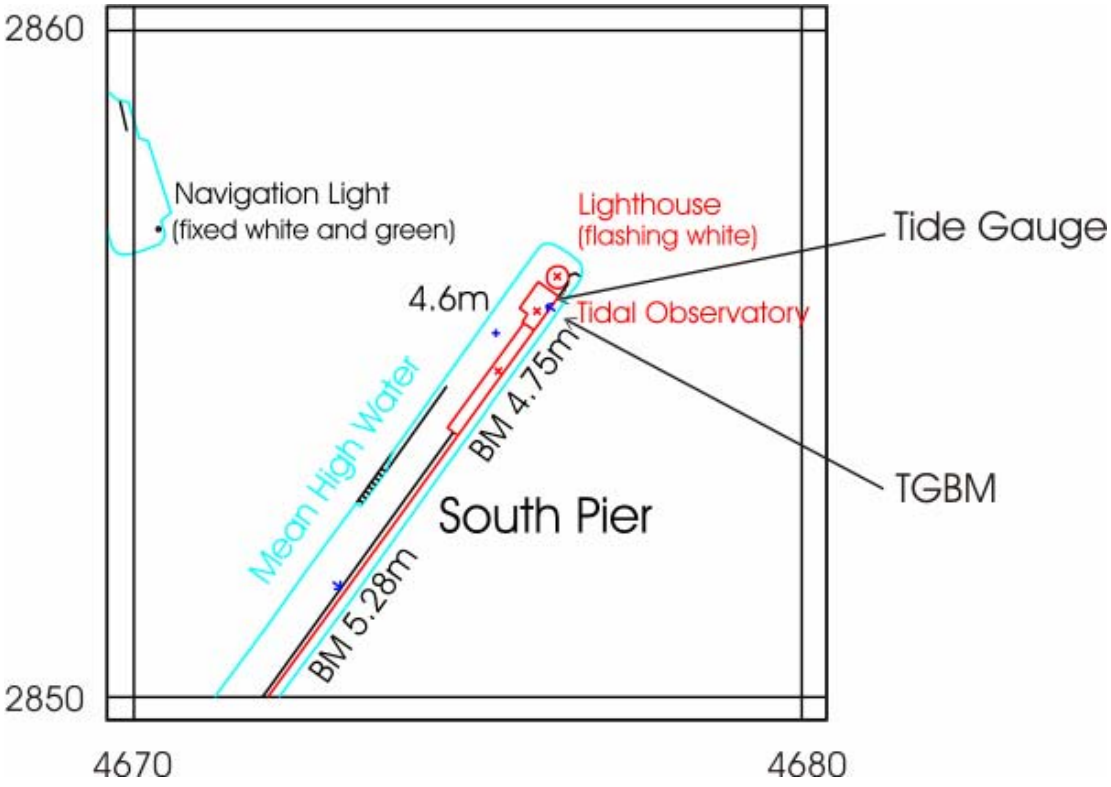
Latitude: 50° 06' 10.8" N Longitude: 05° 32' 33.9" W

Grid Reference: SW 4676 2856

Instrument type: Data acquisition system with a full tide, a mid-tide bubbler gauge and a potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The Tidal Observatory is located at the end of South Pier, Newlyn, next to the lighthouse. The pressure points are located on the seaward side of the pier, behind the lighthouse.



Newhaven (Sussex) Tide Gauge

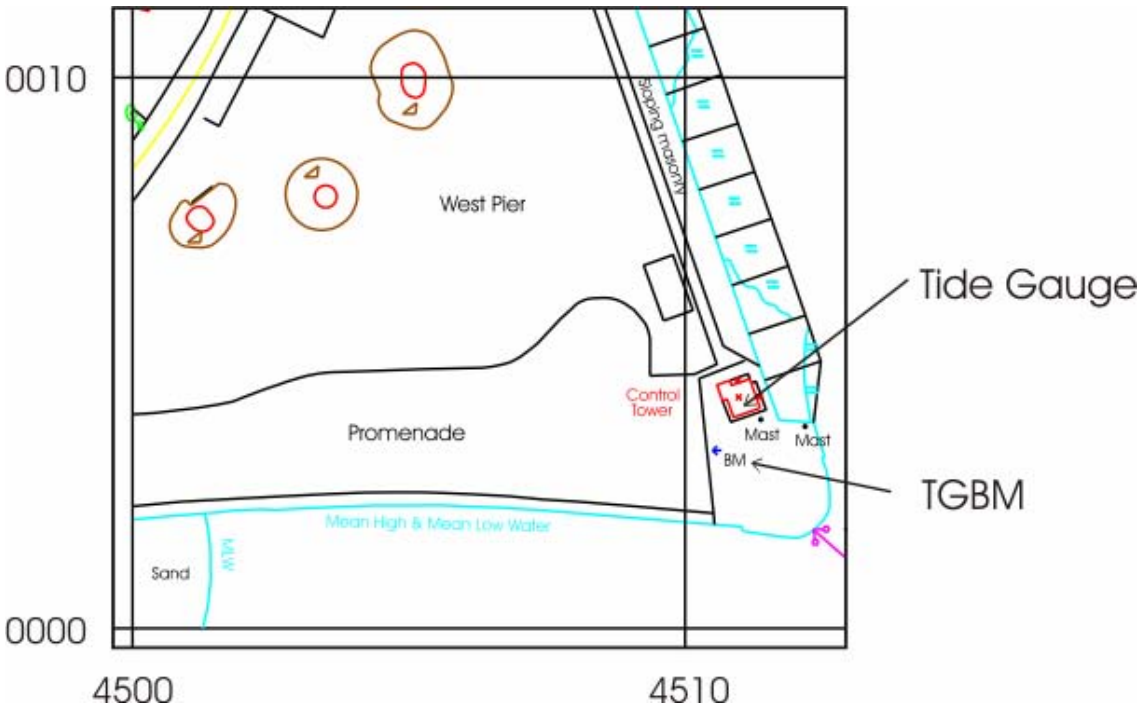
Latitude: 50° 46' 54.4" N Longitude: 00° 03' 25.3" E

Grid Reference: TQ 4511 0004

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located within the Port Control building on West Pier, Newhaven, and the pressure points are located on the pier wall, south east of the Port Control building. The anemometer and wind vane are located on the signals mast.



Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N Longitude: 02° 59' 14.8" W

Grid Reference: ST 3163 8392

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on the west side of the entrance to Newport Docks. The pressure points are attached to the dock wall on the west side of the dock entrance, close to the lock gates.

North Shields (Tyne and Wear) Tide Gauge

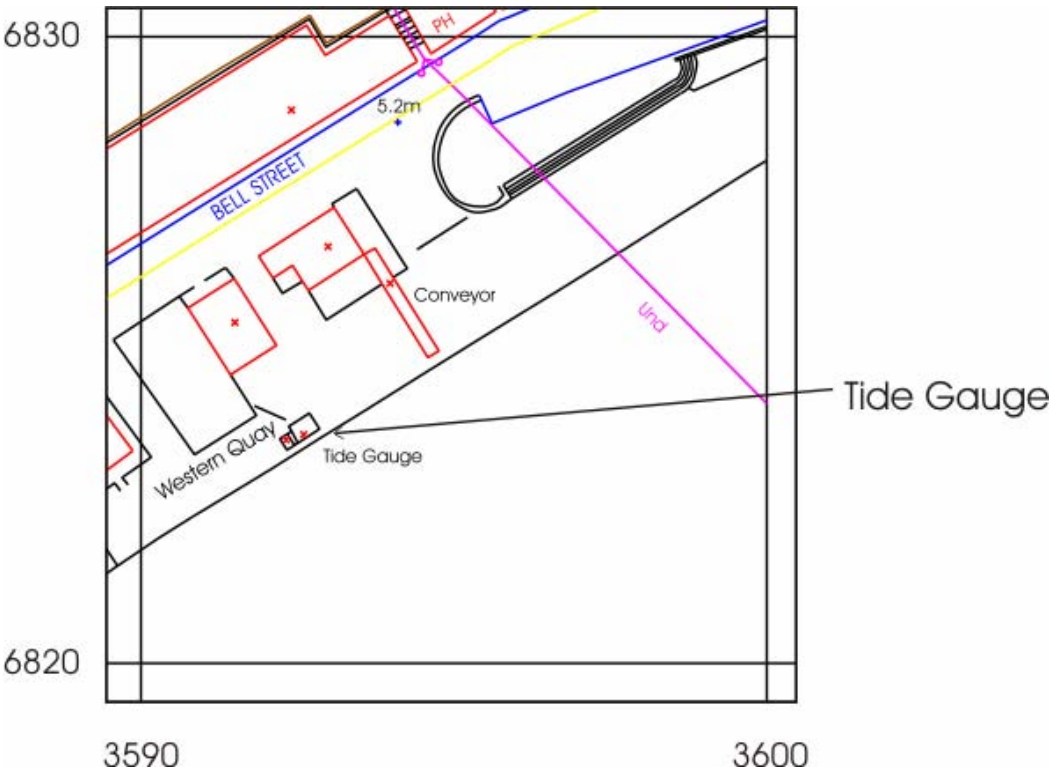
Latitude: 55° 00' 26.8" N Longitude: 01°26' 23.2" W

Grid Reference: NZ 3593 6824

Instrument type: Data acquisition system with potentiometers attached to the Munro float gauge and the Wellhead float gauge installed.

Site of Gauge:

The tide gauge building is located on the north side of the River Tyne, close to the Port of Tyne Authority offices.



Portpatrick (Scotland) Tide Gauge

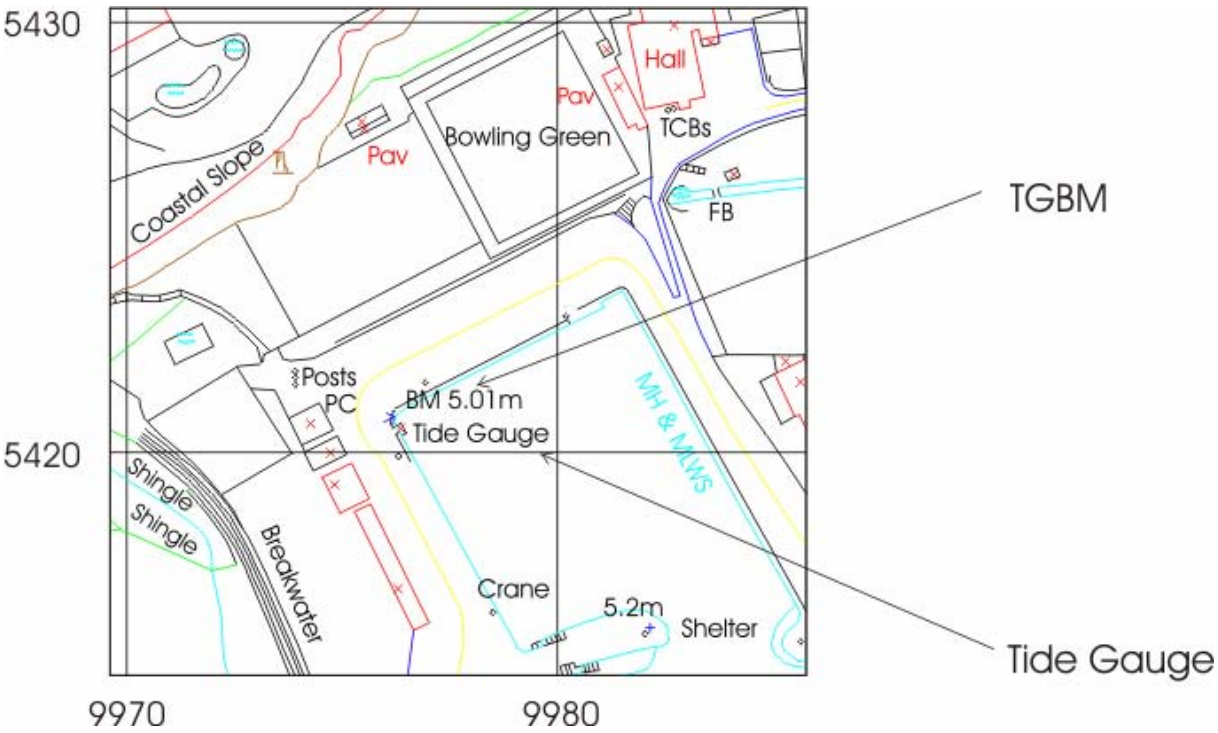
Latitude: 54° 50' 33.2" N Longitude: 05° 07' 12.1" W

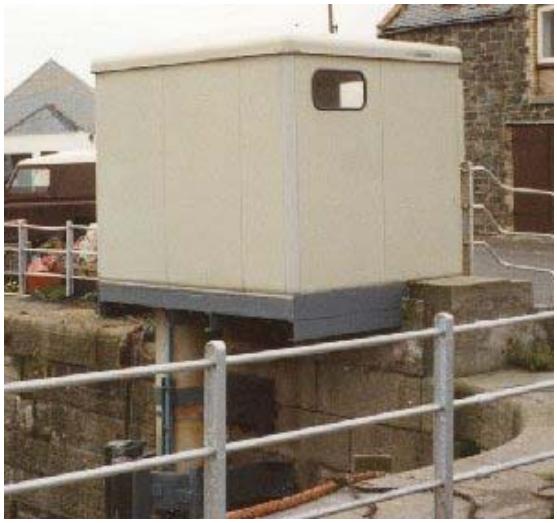
Grid Reference: NW 9976 5421

Instrument type: Data acquisition system with a full tide bubbler gauge and a potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The tide gauge building is mounted over the stilling well in the corner of Portpatrick harbour. The pressure point is located directly beneath the building.





Portrush (Northern Ireland) Tide Gauge

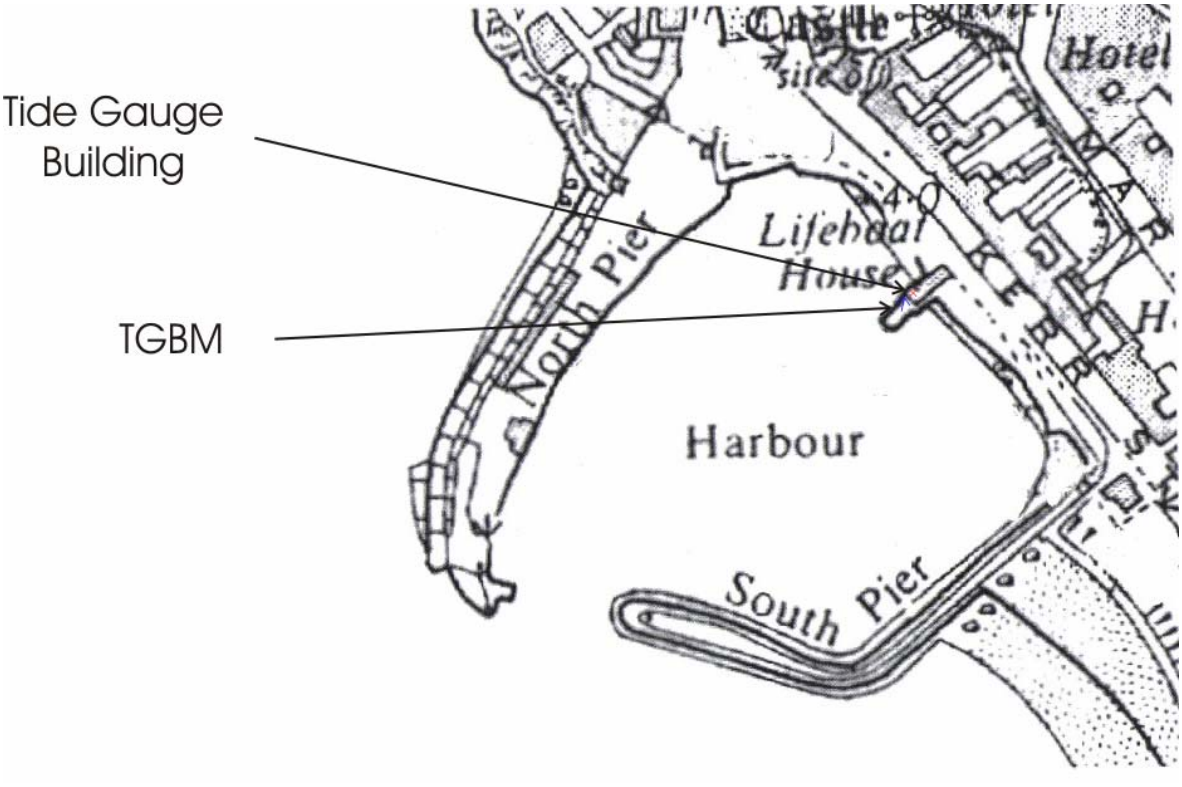
Latitude: 55° 12' 24.4" N Longitude: 06° 39' 24.6" W

Grid Reference: NW 0416 9952

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the RNLI boathouse with the pressure points fixed to a leg of the slipway.



Portsmouth (Hampshire) Tide Gauge

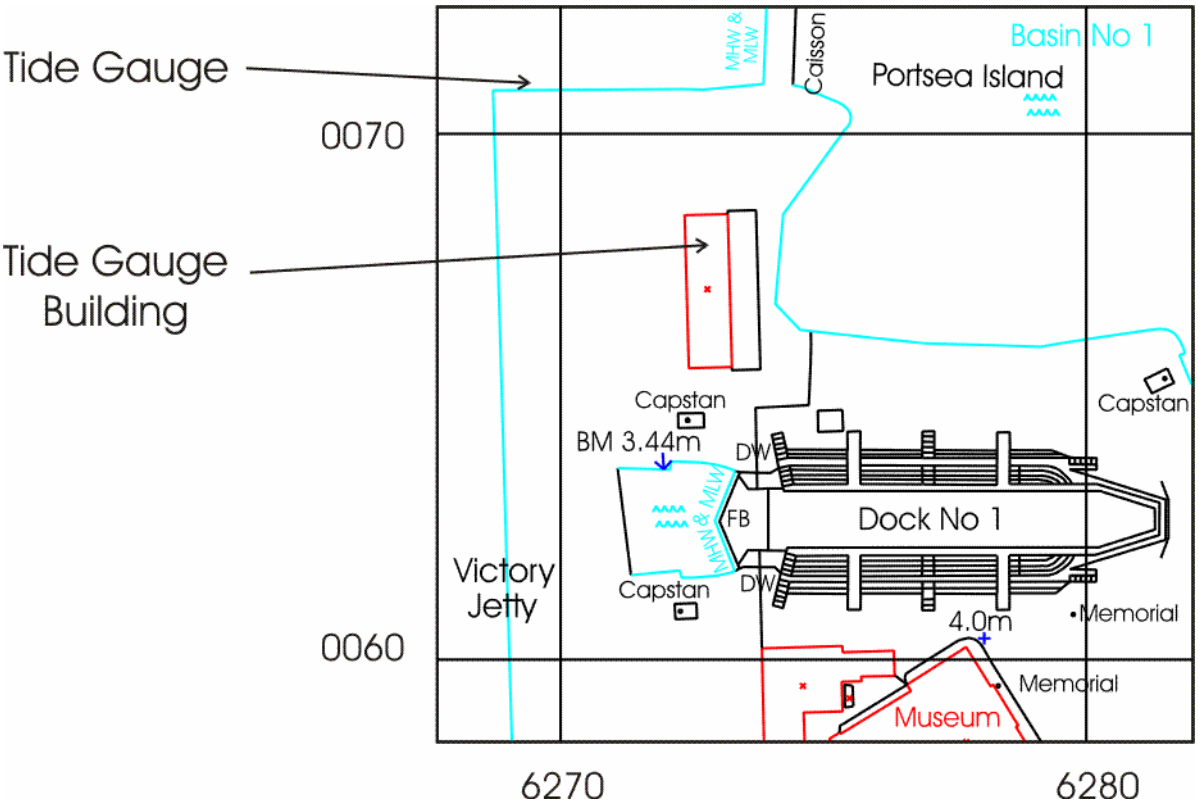
Latitude: 50° 48' 07.9" N Longitude: 01° 06' 40.5" W

Grid Reference: SU 6269 0067

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on Victory Jetty in the Royal Naval base. The pressure points are mounted on a leg at the north west corner of the jetty.



Sheerness (Kent) Tide Gauge

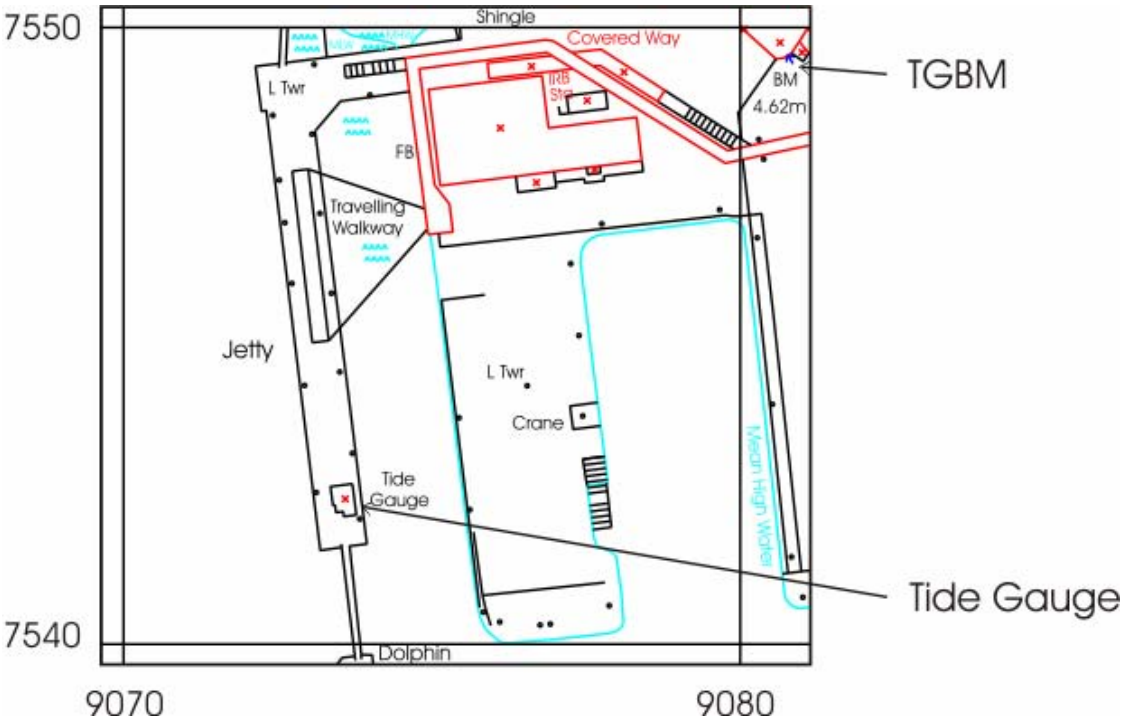
Latitude: 51° 26' 44.3" N Longitude: 00° 44' 36.1" E

Grid Reference: TQ 9074 7542

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the jetty at Garrison Point, in the Port of Sheerness.



St. Mary's (Isles of Scilly) Tide Gauge

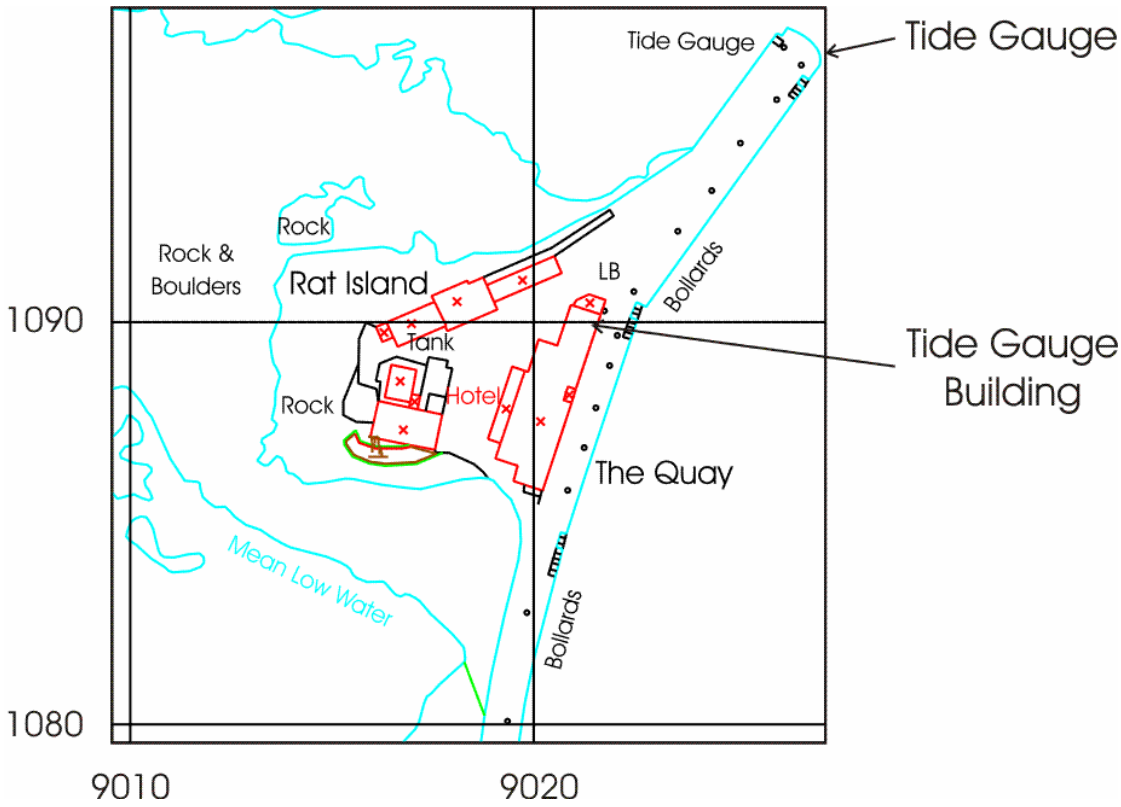
Latitude: 49° 55' 04.2" N Longitude: 06° 19' 01.7" W

Grid Reference: SV 9021 1090

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the Harbour Office storeroom on The Quay, Hugh Town. The pressure points are located on the nose of the quay.



Stornoway (Hebrides) Tide Gauge

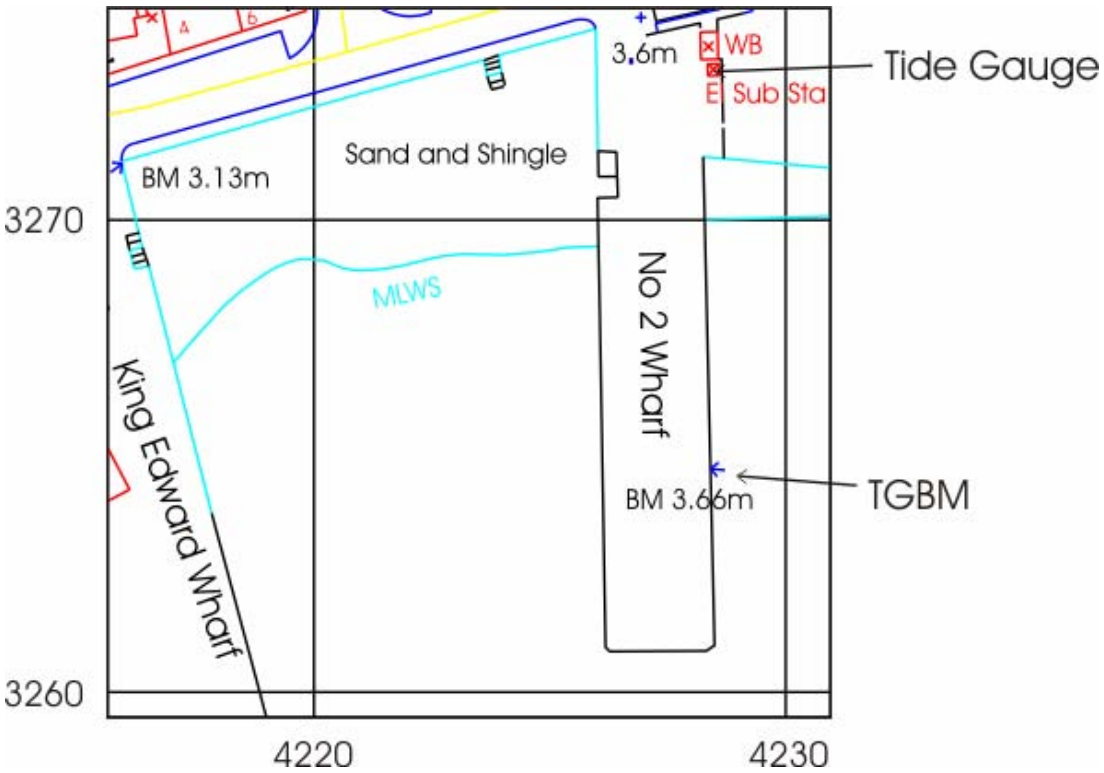
Latitude: 58° 12' 27.8" N Longitude: 06° 23' 20.0" W

Grid Reference: NB 4228 3273

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located by the weighbridge at the entrance to Stornoway Port Authority, No. 2 wharf. The pressure points are attached to a leg on the east side of the wharf.



Tobermory (Mull) Tide Gauge

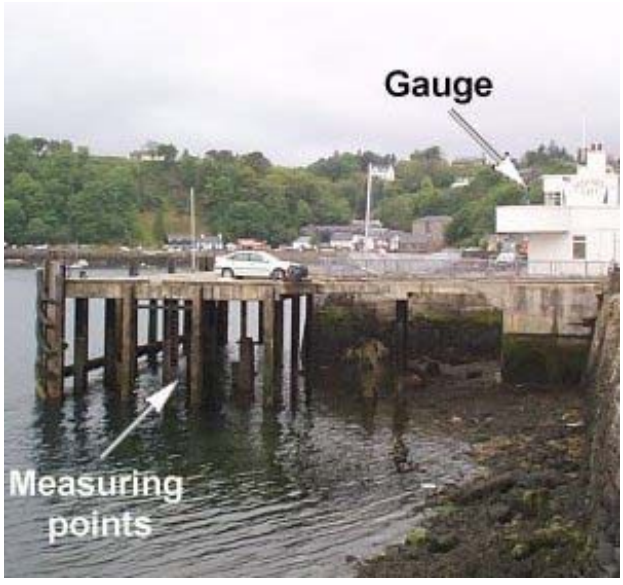
Latitude: 56° 37' 23.2" N Longitude: 06° 03' 51.2" W

Grid Reference: NM 5079 5531

Instrument type: Dataring system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the Caledonian MacBrayne ferry terminal on Mishnish Pier, Tobermory, and the pressure points are located on one of the pier legs.



Ullapool (Scotland) Tide Gauge

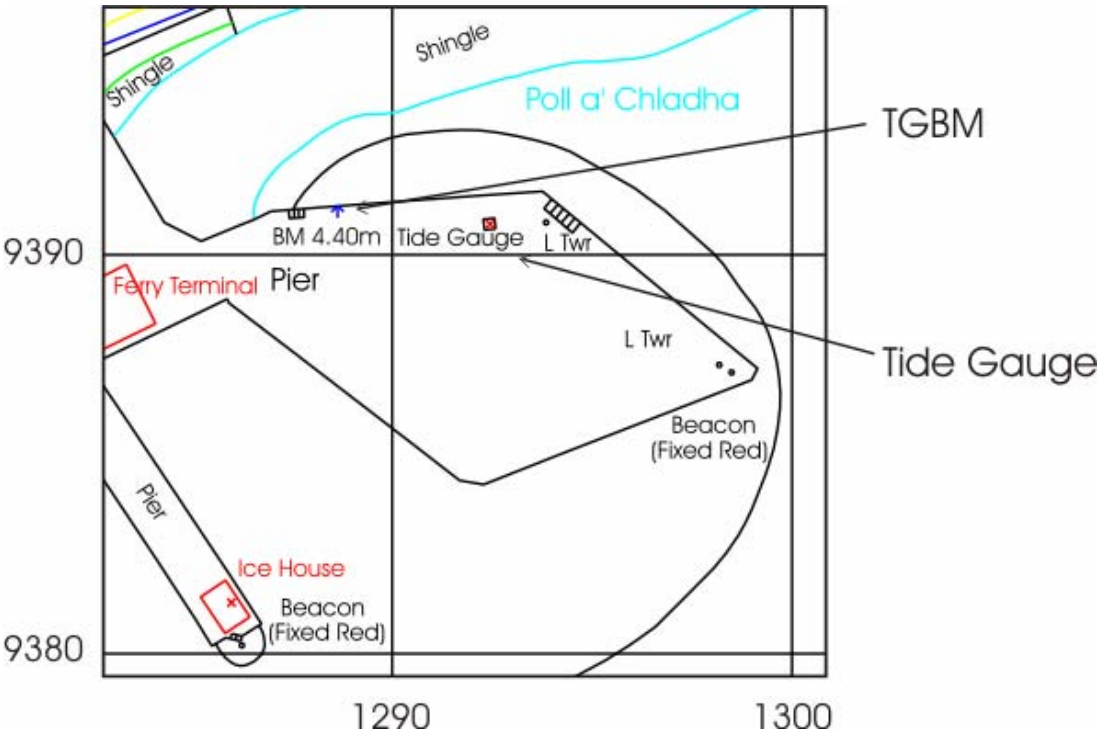
Latitude: 57° 53' 42.9" N Longitude: 05° 09' 29.0" W

Grid Reference: NH 1292 9391

Instrument type: Data acquisition system with a full tide, a mid-tide bubbler gauge and a potentiometer attached to a Munro float gauge installed. Wind speed and wind direction also recorded.

Site of Gauge:

The tide gauge building is located on the pier, Ullapool harbour. The pressure points are mounted below the tide gauge building.



Weymouth (Dorset) Tide Gauge

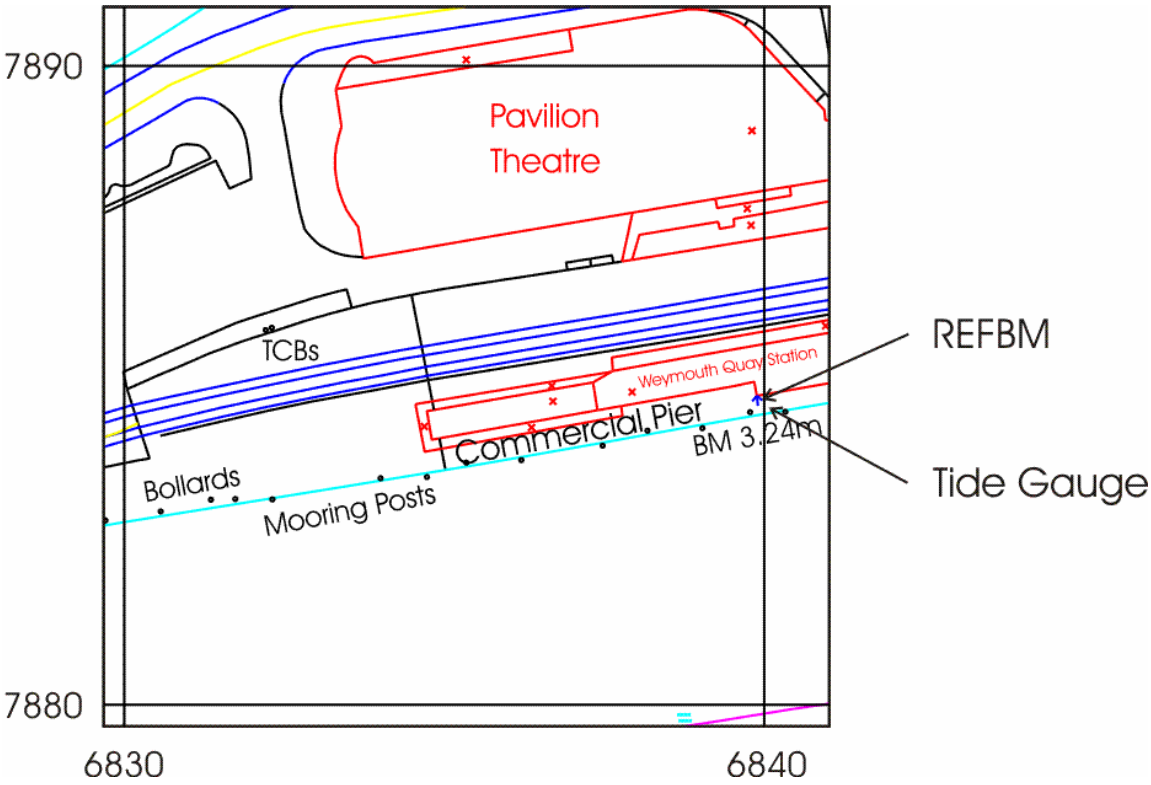
Latitude: 50° 36' 30.6" N Longitude: 02° 26' 52.6" W

Grid Reference: SY 6840 7885

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on Commercial Pier adjacent to the ferry terminal, and the pressure points are located on the pier wall directly in front of the tide gauge building.



Whitby (Yorkshire) Tide Gauge

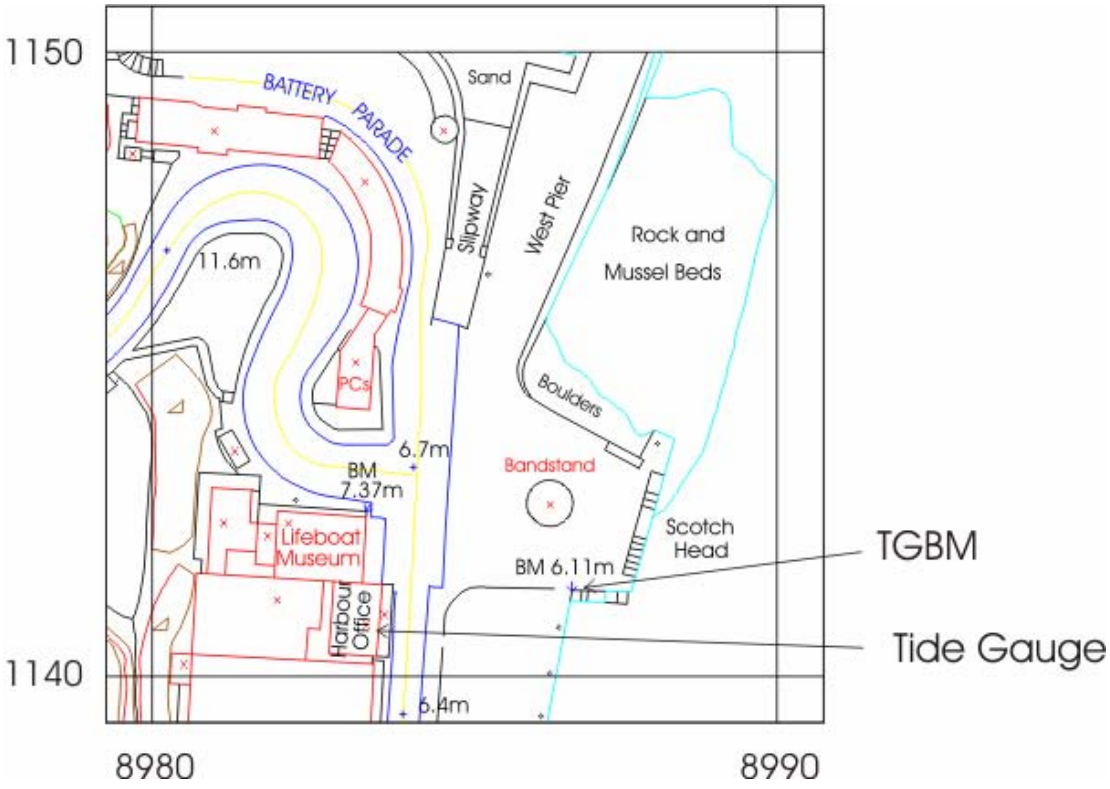
Latitude: 54° 29' 24.0" N Longitude: 00° 36' 52.9" W

Grid Reference: NZ 8986 1140

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located in the Harbour Master's Office, Pier Road. The pressure points are positioned underneath the quay adjacent to the Harbour Office.



Wick (Scotland) Tide Gauge

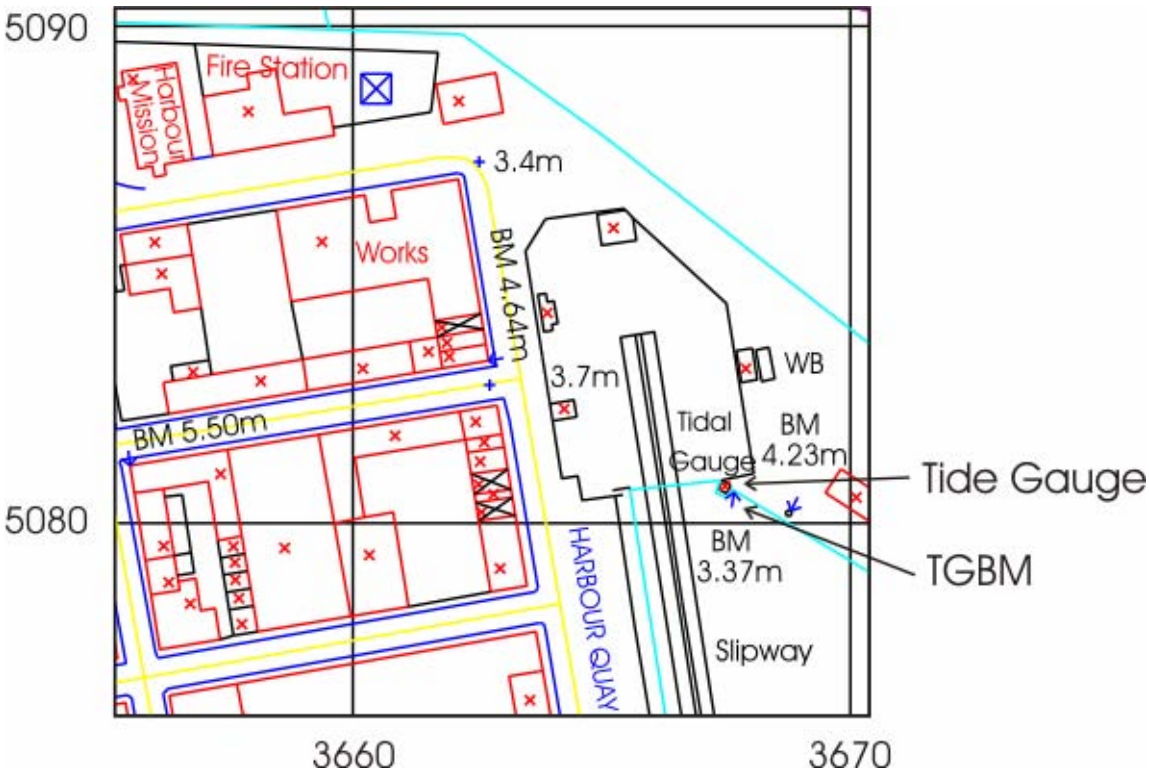
Latitude: 58° 26' 27.5" N Longitude: 03° 05' 11.0" W

Grid Reference: ND 3667 5081

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is sited in the north west corner of Wick harbour next to the ship repair slipway. The pressure points are attached to an unused stilling well beneath the building.



Workington (Cumbria) Tide Gauge

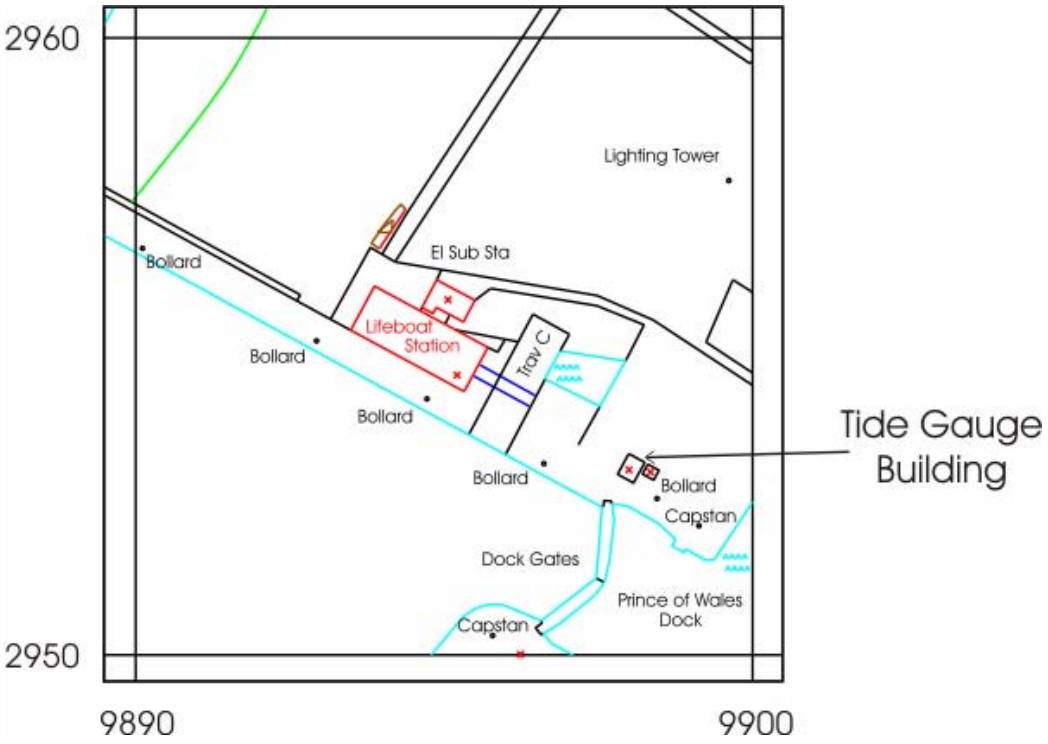
Latitude: 54° 39' 02.6" N Longitude: 03° 34' 01.8"W

Grid Reference: NX 9898 2953

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

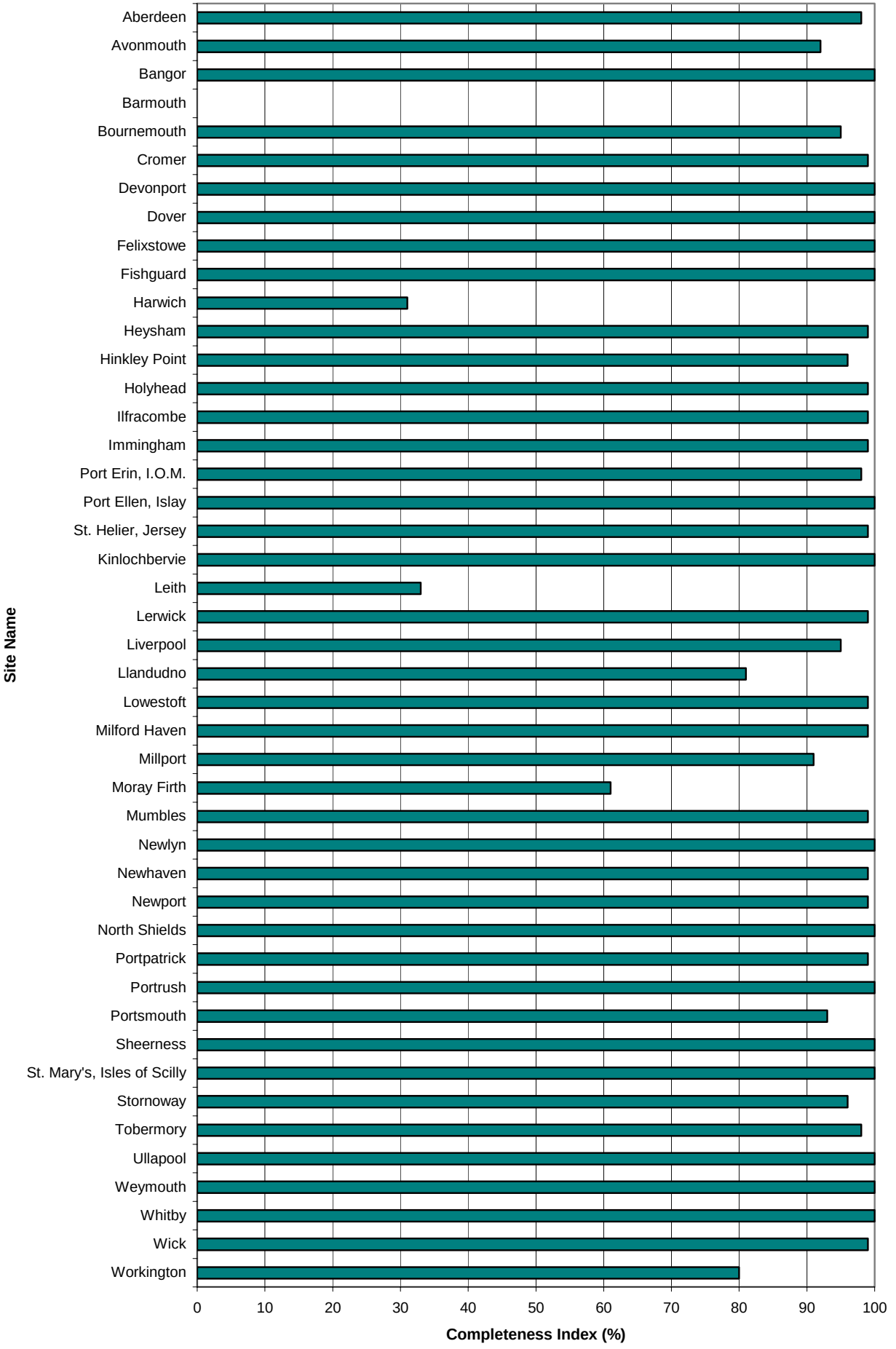
Site of Gauge:

The tide gauge is located in a concrete building on the north side of the dock entrance. The pressure points are located behind fender piles on the north seaward side of the dock gates. The wind speed and direction instruments are mounted at the top of the mast located next to the tide gauge building.



Report for 2004 on Data Quality and visits to sites

Histogram of Completeness Index (CI%) for UK Tide Gauge sites



Aberdeen Tide Gauge

Latitude: 57° 08' 38.5" N
Longitude: 02° 04' 48.8" W
Grid Reference: NJ 9524 0591

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NJ 9525 0590	New bolt N side jetty Waterloo Quay.
Aux1	NJ 9572 0593	Building NW side York Place SE face E angle
Aux2	NJ 9586 0571	Observatory Pocra Quay N face NW angle.
Aux3	NJ 9524 0600	Building NE side Waterloo Quay SW face S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.25m below Ordnance Datum Newlyn (ODN)
TGZ = 6.318m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 230 New datalogger fitted enabling the mid tide sensor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	224-230,252	230-234

Statistics:

Surge maxima	Value	Day	Time
January	0.563	11	10:45:00
February	0.612	4	11:30:00
March	0.517	15	12:00:00
April	0.54	18	09:15:00
May	0.354	4	21:15:00
June	0.402	23	21:00:00
July	0.245	1	08:15:00
August	0.254	27	18:30:00
September	0.526	26	21:45:00
October	0.396	4	13:15:00
November	0.52	18	00:45:00
December	0.646	23	15:00:00

Surge minima	Value	Day	Time
January	-0.501	2	11:00:00
February	-0.342	9	20:00:00
March	-0.273	25	17:15:00
April	-0.225	30	19:45:00
May	-0.21	1	08:30:00
June	-0.108	2	17:45:00
July	-0.144	7	15:30:00
August	-0.107	1	19:00:00
September	-0.297	7	17:30:00
October	-0.278	21	15:00:00
November	-0.341	23	15:45:00
December	-0.517	29	12:30:00

Extreme maxima	Value	Day	Time
January	4.609	24	15:00:00
February	4.47	22	14:45:00
March	4.714	21	13:30:00
April	4.541	18	12:30:00
May	4.482	5	01:15:00
June	4.458	4	14:00:00
July	4.45	3	14:00:00
August	4.581	30	01:00:00
September	4.66	17	02:30:00
October	4.615	15	01:30:00
November	4.51	15	15:00:00
December	4.656	14	14:45:00

Extreme minima	Value	Day	Time
January	0.573	24	21:15:00
February	0.311	20	19:45:00
March	0.172	8	20:45:00
April	0.17	7	20:45:00
May	0.383	5	19:30:00
June	0.443	2	18:30:00
July	0.369	5	09:15:00
August	0.255	2	08:15:00
September	0.321	1	08:30:00
October	0.513	15	07:30:00
November	0.413	13	07:45:00
December	0.565	13	20:00:00

Mean sea level	No days	MSL
January	31	2.656
February	29	2.542
March	31	2.507
April	30	2.48
May	31	2.475
June	30	2.544
July	31	2.546
August	19	2.573
September	30	2.644
October	31	2.663
November	30	2.606
December	31	2.676
	Sum	Avg
	354	2.576

Avonmouth Tide Gauge

Latitude: 51° 30' 27.9" N
Longitude: 02° 42' 45.9" W
Grid Reference: ST 5063 7900

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 5057 7881	OSBM bolt at base of bollard
Aux1	ST 5072 7859	Rivet adjacent to transit shed NW face W angle
Aux2	ST 5063 7898	Rivet base building NW side S angle
Ref M	ST 5047 7934	Ref mark on seaward end of jetty

TGZ = Admiralty Chart Datum (ACD)
TGZ = 6.50 m below Ordnance Datum Newlyn (ODN)
TGZ = 15.711 m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site:

Day 231	General maintenance.
Day 106	Cable fault on jetty.
Day 355	BT cable fault.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	335-366	None

Statistics:

Surge maxima	Value	Day	Time
January	1.791	31	19:30:00
February	1.129	29	07:30:00
March	1.801	20	15:00:00
April	1.081	18	02:45:00
May	1.058	4	17:15:00
June	1.304	23	06:00:00
July	0.919	3	03:45:00
August	1.184	19	05:00:00
September	1.046	18	07:30:00
October	1.623	28	03:15:00
November	1.172	18	19:30:00

Surge minima	Value	Day	Time
January	-0.72	1	16:00:00
February	-0.763	17	23:15:00
March	-0.733	30	01:15:00
April	-0.598	30	22:00:00
May	-0.644	21	22:00:00
June	-0.616	2	13:00:00
July	-0.722	8	01:45:00
August	-0.685	31	12:45:00
September	-0.773	7	13:15:00
October	-0.992	9	09:15:00
November	-1.19	19	03:45:00

Extreme maxima	Value	Day	Time
January	13.622	23	08:15:00
February	13.479	22	08:45:00
March	13.821	21	07:45:00
April	14.008	7	08:30:00
May	14.251	5	19:45:00
June	13.563	4	20:15:00
July	13.584	4	20:45:00
August	14.06	31	20:15:00
September	13.908	29	19:45:00
October	13.897	15	20:00:00
November	13.505	13	07:15:00

Extreme minima	Value	Day	Time
January	0.943	23	15:15:00
February	0.475	21	15:15:00
March	0.536	9	03:45:00
April	0.451	8	04:00:00
May	0.753	7	03:30:00
June	0.803	5	03:15:00
July	0.915	5	04:00:00
August	0.72	31	02:45:00
September	0.703	1	03:30:00
October	0.909	1	03:30:00
November	0.674	13	02:00:00

Mean sea level	No days	MSL
January	31	7.075
February	29	6.912
March	31	6.931
April	30	6.946
May	31	6.931
June	30	6.98
July	31	6.971
August	31	7.106
September	30	7.07
October	31	7.201
November	28	6.919
	Sum	Avg
	333	7.004

Bangor Tide Gauge

Latitude: 54° 39' 53.1" N
Longitude: 05° 40' 10.1" W
Grid Reference: NW 6340 3620

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	5043 8212 (Sheet 115)	S S Pin Tide gauge building Central Pier
Aux1	5038 8200 (Sheet 115)	Cut mark Clock tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.01m below Ordnance Datum Belfast (ODB)
TGZ = 5.592m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	055,061-064,066-067,162,201-204,239,241-245,255-261,266-317,319-329,331-366

Statistics:

Surge maxima	Value	Day	Time
January	0.76	1	02:15:00
February	0.698	3	15:00:00
March	0.773	20	15:30:00
April	0.588	21	18:30:00
May	0.499	4	09:15:00
June	0.415	26	14:30:00
July	0.283	1	22:45:00
August	0.469	18	12:45:00
September	0.56	14	04:15:00
November	0.201	25	19:30:00

Surge minima	Value	Day	Time
January	-0.419	2	06:45:00
February	-0.366	8	14:30:00
March	-0.351	25	19:00:00
April	-0.291	28	07:00:00
May	-0.251	22	19:15:00
June	-0.155	7	21:00:00
July	-0.324	8	15:15:00
August	-0.168	26	01:15:00
September	-0.312	6	20:00:00
November	-0.524	13	03:00:00

Extreme maxima	Value	Day	Time
January	3.993	11	13:30:00
February	3.757	6	11:30:00
March	3.994	20	10:45:00
April	3.83	21	12:15:00
May	3.939	4	10:30:00
June	3.641	23	02:00:00
July	3.577	2	23:00:00
August	3.803	19	00:45:00
September	3.898	18	01:00:00
November	3.536	25	22:15:00

Extreme minima	Value	Day	Time
January	0.335	24	19:00:00
February	0.124	22	18:30:00
March	0.21	7	17:30:00
April	0.175	7	18:15:00
May	0.421	15	15:00:00
June	0.334	6	07:00:00
July	0.221	5	07:00:00
August	0.274	30	05:00:00
September	0.417	28	04:30:00
November	0.061	13	04:30:00

Mean sea level	No days	MSL
January	31	2.148
February	25	1.993
March	29	2.006
April	30	1.995
May	31	1.965
June	28	2.011
July	26	1.997
August	24	2.118
September	9	2.056
	Sum	Avg
	233	2.032

Barmouth Tide Gauge

Latitude: 52° 43' 09.6" N
Longitude: 04° 02' 42.1" W
Grid Reference: SH 6197 1548

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 6197 1548	NBM rivet concrete 2.9M NE wall junction
Aux 1	SH 6173 1558	Rivet step NE side of road NW entrance path
Aux 2	SH 6186 1556	Rivet wall SE side road 17.6M E steps
Aux 3	SH 6196 1550	Rivet step E side lifeboat station

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 10.363m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
0	15 minutes	No Data	No Data

Bournemouth Tide Gauge

Latitude: 50° 42' 51.6" N
Longitude: 01° 52' 29.5" W
Grid Reference: SZ 0893 9053

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	SZ 0869 9066	Cut mark Wall
Aux2	SZ 0893 9083	Cut mark Pillar
REF A	SZ 0893 9052	Steelwork clamp
REF B	SZ 0893 9052	Mid-tide pressure point nozzle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.40m below ODN
TGZ = 5.96m below Aux1

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 259-260 New battery charger & general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	238-259	231-232

Statistics:

Surge maxima	Value	Day	Time
January	0.664	31	13:15:00
February	0.422	1	08:15:00
March	0.395	20	02:15:00
April	0.529	18	02:15:00
May	0.349	5	04:45:00
June	0.551	22	22:00:00
July	0.194	1	10:30:00
August	0.38	18	07:30:00
September	0.253	27	12:45:00
October	0.666	27	15:30:00
November	0.309	18	16:45:00
December	0.454	17	09:30:00

Surge minima	Value	Day	Time
January	-0.377	1	08:00:00
February	-0.403	19	23:00:00
March	-0.268	15	01:15:00
April	-0.203	14	04:15:00
May	-0.246	22	06:00:00
June	-0.247	13	19:30:00
July	-0.265	7	14:00:00
August	-0.099	1	11:45:00
September	-0.287	26	22:15:00
October	-0.363	9	06:30:00
November	-0.403	14	19:30:00
December	-0.492	30	01:00:00

Extreme maxima	Value	Day	Time
January	2.665	8	08:30:00
February	2.34	22	10:00:00
March	2.508	21	09:15:00
April	2.393	6	09:15:00
May	2.545	5	21:15:00
June	2.372	22	22:00:00
July	2.305	4	22:15:00
August	2.467	2	21:45:00
September	2.39	29	21:15:00
October	2.853	27	20:15:00
November	2.368	13	08:15:00
December	2.414	19	06:15:00

Extreme minima	Value	Day	Time
January	0.339	23	16:45:00
February	0.119	21	16:30:00
March	0.114	8	16:45:00
April	0.234	7	17:00:00
May	0.49	7	05:00:00
June	0.267	4	04:00:00
July	0.299	5	05:30:00
August	0.251	2	04:30:00
September	0.257	28	03:15:00
October	0.449	1	04:45:00
November	0.134	14	16:45:00
December	0.269	14	17:15:00

Mean sea level	No days	MSL
January	31	1.655
February	29	1.538
March	31	1.525
April	30	1.564
May	31	1.563
June	30	1.557
July	31	1.565
August	21	1.688
September	14	1.608
October	31	1.749
November	30	1.542
December	31	1.558
	Sum	Avg
	340	1.593

Cromer Tide Gauge

Latitude: 52° 56' 03.1" N
Longitude: 01° 18' 05.9" E
Grid Reference: TG 2198 4253

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TG 2193 4233	S Steel bolt on top of wall opposite E side of pier
Aux1	TG 2198 4253	Rivet on steps of catwalk NE angle of LB station
Aux2	TG 2195 4233	S Steel bolt bottom ramp S side at W corner

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn
TGZ = 10.117m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 104-106 Gap in data following a site visit.
Day 300 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	105-106,294-295	None

Statistics:

Surge maxima	Value	Day	Time
January	1.153	29	04:00:00
February	1.915	8	15:45:00
March	0.625	21	03:45:00
April	0.532	22	17:00:00
May	0.564	7	17:30:00
June	0.53	15	13:45:00
July	0.512	1	02:30:00
August	0.649	20	18:45:00
September	0.804	27	02:45:00
October	0.632	4	19:00:00
November	1.274	18	06:30:00
December	0.848	28	11:15:00

Surge minima	Value	Day	Time
January	-1.475	1	04:15:00
February	-0.278	3	01:45:00
March	-0.406	14	19:30:00
April	-0.316	2	12:15:00
May	-0.257	4	10:15:00
June	-0.13	26	11:15:00
July	-0.035	20	21:15:00
August	-0.298	27	06:30:00
September	-0.541	20	05:30:00
October	-0.909	21	20:15:00
November	-0.58	21	12:00:00
December	-0.972	29	17:30:00

Extreme maxima	Value	Day	Time
January	5.437	24	20:15:00
February	5.837	22	19:45:00
March	5.474	21	18:45:00
April	5.396	6	19:00:00
May	5.306	7	20:15:00
June	5.229	4	19:15:00
July	5.152	5	08:15:00
August	5.554	31	07:00:00
September	5.638	27	05:15:00
October	5.399	16	07:30:00
November	5.693	13	06:15:00
December	5.525	17	22:30:00

Extreme minima	Value	Day	Time
January	0.555	24	02:15:00
February	0.403	10	03:30:00
March	0.391	9	02:45:00
April	0.543	9	03:15:00
May	0.466	6	02:00:00
June	0.622	3	00:30:00
July	0.61	5	15:30:00
August	0.463	2	14:15:00
September	0.327	16	14:15:00
October	0.599	15	13:45:00
November	0.561	14	14:00:00
December	0.53	14	02:15:00

Mean sea level	No days	MSL
January	31	3.004
February	29	3.042
March	31	2.877
April	27	2.877
May	31	2.907
June	30	2.955
July	31	2.968
August	31	3.009
September	30	3.019
October	28	2.978
November	30	3.055
December	31	3.036
	Sum	Avg
	360	2.977

Devonport Tide Gauge

Latitude: 50° 22' 06.2" N
Longitude: 04° 11' 06.9" W
Grid Reference: SX 4469 5434

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SX 4468 5434	Bolt on jetty wall. 6.6m NW angle T G building
Aux1	SX 4471 5433	Building N face NE angle
Aux2	SX 4487 5425	Bldg NW face W angle
Aux3	SX 4501 5454	Fl Br 11818 bldg W face NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.22m below ODN
TGZ = 7.631m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.565	31	07:45:00
February	0.417	1	16:15:00
March	0.305	11	16:45:00
April	0.446	17	22:45:00
May	0.257	5	14:00:00
June	0.47	23	01:45:00
July	0.209	2	00:30:00
August	0.401	18	15:00:00
September	0.296	13	02:45:00
October	0.791	27	15:30:00
November	0.154	18	18:00:00
December	0.302	19	07:15:00

Surge minima	Value	Day	Time
January	-0.352	2	13:15:00
February	-0.272	18	09:45:00
March	-0.284	29	12:00:00
April	-0.246	13	03:30:00
May	-0.234	15	16:30:00
June	-0.228	13	16:15:00
July	-0.264	7	23:45:00
August	-0.154	30	08:00:00
September	-0.268	25	19:30:00
October	-0.171	9	08:15:00
November	-0.471	14	23:15:00
December	-0.377	30	02:15:00

Extreme maxima	Value	Day	Time
January	5.765	8	06:15:00
February	5.71	22	07:00:00
March	5.702	21	06:00:00
April	5.683	6	06:15:00
May	5.873	5	18:15:00
June	5.59	5	19:30:00
July	5.653	4	19:15:00
August	5.857	31	18:45:00
September	5.842	1	19:15:00
October	6.35	27	17:15:00
November	5.518	13	05:45:00
December	5.593	13	06:15:00

Extreme minima	Value	Day	Time
January	0.625	24	13:45:00
February	0.572	21	12:45:00
March	0.436	9	13:45:00
April	0.399	7	13:15:00
May	0.68	6	00:30:00
June	0.568	4	00:15:00
July	0.63	5	01:45:00
August	0.536	31	00:30:00
September	0.55	1	01:15:00
October	0.713	1	01:15:00
November	0.451	14	12:45:00
December	0.693	14	13:30:00

Mean sea level	No days	MSL
January	31	3.451
February	29	3.329
March	31	3.324
April	30	3.356
May	31	3.346
June	30	3.336
July	31	3.347
August	31	3.476
September	30	3.389
October	31	3.6
November	30	3.338
December	31	3.366
	Sum	Avg
	366	3.388

Dover Tide Gauge

Latitude: 51° 06' 51.8" N
Longitude: 01° 19' 21.1" E
Grid Reference: TR 3264 4026

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TR 3193 4074	Fl Br G4868 building. East side of works entrance
Aux 1	TR 3195 4095	No 29 Waterloo Crescent SW face S angle
Aux 2	TR 3228 4053	Rivet pier wall NE side of pier F junction
Aux 3	TR 3265 4026	Rivet steps NE side P of W pier 1.0M SE W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.67m below Ordnance Datum Newlyn (ODN)
TGZ = 10.491m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 273 TGI on site. Purged system, general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.823	11	23:15:00
February	1.025	8	20:00:00
March	0.701	21	09:00:00
April	0.526	18	19:30:00
May	0.518	5	09:00:00
June	0.442	23	11:15:00
July	0.446	2	08:30:00
August	0.545	20	23:45:00
September	0.687	23	16:15:00
October	0.653	21	01:15:00
November	0.791	13	02:45:00
December	0.938	17	13:30:00

Surge minima	Value	Day	Time
January	-0.997	1	05:30:00
February	-0.582	19	20:30:00
March	-0.385	14	23:30:00
April	-0.269	11	11:45:00
May	-0.249	4	17:00:00
June	-0.29	23	14:30:00
July	-0.418	7	12:30:00
August	-0.228	27	09:15:00
September	-0.427	13	10:15:00
October	-0.57	4	13:45:00
November	-0.442	9	05:15:00
December	-0.713	29	22:00:00

Extreme maxima	Value	Day	Time
January	6.922	25	01:00:00
February	7.387	9	00:45:00
March	6.952	21	23:45:00
April	7.046	6	23:45:00
May	7.032	8	00:45:00
June	6.858	5	00:00:00
July	6.773	5	13:00:00
August	7.156	31	11:45:00
September	7.064	27	10:00:00
October	7.053	16	12:00:00
November	7.3	12	22:45:00
December	6.897	17	15:30:00

Extreme minima	Value	Day	Time
January	0.736	24	07:45:00
February	0.587	21	07:00:00
March	0.527	10	08:30:00
April	0.604	8	08:15:00
May	0.622	6	07:00:00
June	0.668	3	18:15:00
July	0.734	4	19:45:00
August	0.629	2	19:45:00
September	0.545	16	19:30:00
October	0.758	15	19:00:00
November	0.607	14	19:15:00
December	0.695	14	20:00:00

Mean sea level	No days	MSL
January	31	3.818
February	29	3.764
March	31	3.67
April	30	3.69
May	31	3.711
June	30	3.731
July	31	3.745
August	31	3.826
September	30	3.802
October	31	3.824
November	30	3.797
December	31	3.784
	Sum	Avg
	366	3.764

Felixstowe Tide Gauge

Latitude: 51° 57' 27.7" N
Longitude: 01° 20' 47.6" E
Grid Reference: TM 3003 3409

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 3001 3414	Bolt on the SE side of prom NE face of arcade
Aux1	TM 2956 3393	Flush Bracket 2071 on No. 25 Langer Road W angle NW face.
Aux3	TM 3003 3409	Rivet outside TG building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.95m below ODN
TGZ = 5.69m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 299 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	323

Statistics:

Surge maxima	Value	Day	Time
January	0.839	29	07:00:00
February	1.625	8	19:45:00
March	0.718	19	21:15:00
April	0.305	22	20:30:00
May	0.376	7	20:30:00
June	0.352	25	00:30:00
July	0.321	11	16:15:00
August	0.443	27	19:45:00
September	0.746	27	08:00:00
October	0.452	4	23:00:00
November	1.13	13	00:15:00
December	0.899	22	18:15:00

Surge minima	Value	Day	Time
January	-1.402	1	07:15:00
February	-0.481	3	05:30:00
March	-0.675	20	18:30:00
April	-0.467	2	05:15:00
May	-0.435	4	19:15:00
June	-0.407	23	16:45:00
July	-0.214	8	08:30:00
August	-0.401	27	04:45:00
September	-0.511	20	11:00:00
October	-0.839	22	00:30:00
November	-0.557	21	17:30:00
December	-0.941	29	22:15:00

Extreme maxima	Value	Day	Time
January	4.116	24	13:30:00
February	4.479	22	13:30:00
March	4.143	21	12:00:00
April	4.087	6	12:15:00
May	4.128	8	01:30:00
June	4.045	5	00:30:00
July	4.041	5	01:15:00
August	4.246	31	00:00:00
September	4.183	1	00:45:00
October	4.138	16	12:45:00
November	4.685	13	00:15:00
December	4.219	17	15:30:00

Extreme minima	Value	Day	Time
January	0.078	1	12:30:00
February	0	10	08:00:00
March	0.086	10	07:30:00
April	0.137	4	04:45:00
May	0.202	6	06:00:00
June	0.23	3	05:00:00
July	0.208	6	20:45:00
August	0.137	2	18:45:00
September	-0.009	16	18:45:00
October	0.212	14	17:30:00
November	0.22	11	16:15:00
December	0.122	16	08:30:00

Mean sea level	No days	MSL
January	31	2.078
February	29	2.096
March	31	1.961
April	30	1.969
May	31	2.018
June	30	2.037
July	31	2.064
August	31	2.125
September	30	2.121
October	31	2.071
November	28	2.1
December	31	2.098
	Sum	Avg
	364	2.062

Fishguard Tide Gauge

Latitude: 52° 00' 47.6" N
Longitude: 04° 59' 01.5" W
Grid Reference: SM 9534 3918

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 9534 3918	OSBM bolt on quay 3.6M NE end of railings (1987)
Aux1	SM 9513 3874	OS bolt con base railings 6.4M NW angle TG hut
Aux2	SM 9489 3849	Rivet step top of Goodwick Quay
Aux3	SM 9455 3820	Fl Br 11518 blding SW side railway bridge SE Face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 7.88m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	275-280

Statistics:

Surge maxima	Value	Day	Time
January	0.819	13	04:15:00
February	0.505	3	11:30:00
March	0.655	20	14:15:00
April	0.538	21	04:30:00
May	0.502	4	05:00:00
June	0.576	23	04:00:00
July	0.281	20	16:45:00
August	0.575	18	15:30:02
September	0.538	13	00:15:02
October	0.878	27	23:30:00
November	0.353	18	17:15:00
December	0.448	27	23:00:00

Surge minima	Value	Day	Time
January	-0.334	2	01:15:00
February	-0.189	19	20:15:00
March	-0.205	25	20:15:00
April	-0.128	13	03:45:00
May	-0.126	15	16:30:00
June	-0.116	14	03:00:00
July	-0.208	8	11:00:00
August	-0.049	30	08:00:02
September	-0.199	23	18:30:02
October	-0.094	6	23:30:02
November	-0.419	12	23:30:00
December	-0.412	26	16:15:00

Extreme maxima	Value	Day	Time
January	5.107	23	08:15:00
February	5.032	21	08:00:00
March	5.099	20	07:00:00
April	5.128	6	07:45:00
May	5.286	4	06:30:00
June	4.919	4	20:15:00
July	4.999	4	20:45:00
August	5.251	31	20:15:02
September	5.219	1	21:00:02
October	5.572	27	18:45:00
November	4.867	13	19:30:00
December	5.002	14	08:30:00

Extreme minima	Value	Day	Time
January	0.699	24	15:45:00
February	0.568	21	14:30:00
March	0.595	9	15:30:00
April	0.468	7	15:00:00
May	0.755	5	01:30:00
June	0.7	4	01:45:00
July	0.705	5	03:45:00
August	0.595	31	02:15:02
September	0.684	29	01:45:02
October	0.826	15	02:00:02
November	0.491	13	01:15:00
December	0.787	13	14:15:00

Mean sea level	No days	MSL
January	31	2.831
February	29	2.692
March	31	2.715
April	30	2.722
May	31	2.709
June	30	2.721
July	31	2.721
August	31	2.849
September	29	2.779
October	25	2.992
November	30	2.702
December	31	2.746
	Sum	Avg
	359	2.765

Harwich Tide Gauge

Latitude: 51° 56' 52.8" N
Longitude: 01° 17' 31.4" E
Grid Reference: TM 2634 3284

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 2634 3284	Bolt at base of flag staff
Aux1	TM 2617 3277	Cut mark quay edge
Aux2	TM 2608 3271	Cut mark NW face of Bank building
Aux3	TM 2610 3258	Cut mark N side of ent St Nicholas's church

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.02m below ODN
TGZ = 6.17m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Levelling was carried out in 2004.

T.G.I. visits to site: Day 114 New installation. 2 full and 1 mid tide channels.
Day 299 TGI on site. General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
31	15 minutes	001-114	None

Statistics:

Surge maxima	Value	Day	Time
April	0.346	29	06:45:00
May	0.515	7	20:45:00
June	0.502	25	01:00:00
July	0.413	1	05:15:00
August	0.561	27	20:00:00
September	0.851	27	08:45:00
October	0.578	5	00:30:00
November	1.064	18	09:00:00
December	1.033	22	18:30:00

Surge minima	Value	Day	Time
April	-0.131	25	22:30:00
May	-0.522	4	12:30:00
June	-0.361	3	13:00:00
July	-0.352	3	01:00:00
August	-0.434	27	10:15:00
September	-0.59	17	02:30:00
October	-0.789	4	10:45:00
November	-0.435	21	17:45:00
December	-0.865	22	09:45:00

Extreme maxima	Value	Day	Time
April	3.725	24	02:00:00
May	4.334	8	01:45:00
June	4.263	5	00:45:00
July	4.293	5	01:30:00
August	4.462	31	00:15:00
September	4.404	1	01:00:00
October	4.384	16	12:45:00
November	4.879	13	00:15:00
December	4.452	28	12:30:00

Extreme minima	Value	Day	Time
April	0.541	23	19:30:00
May	0.231	6	06:15:00
June	0.256	3	05:00:00
July	0.25	6	20:45:00
August	0.183	2	19:00:00
September	0.019	16	18:45:00
October	0.243	14	17:30:00
November	0.259	14	18:15:00
December	0.174	16	08:30:00

Mean sea level	No days	MSL
April	6	2.103
May	31	2.125
June	30	2.15
July	31	2.175
August	31	2.235
September	30	2.229
October	31	2.198
November	30	2.242
December	31	2.215
	Sum	Avg
	251	2.186

Heysham Tide Gauge

Latitude: 54° 01' 54.6" N
Longitude: 02° 55' 12.9" W
Grid Reference: SD 3982 5993

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SD 4030 6012	OSBM bolt on south quay 40.8m SW from SE angle of dock.
Aux1	SD 4141 6005	Bridge parapet, E side of road.
Aux2	SD 4026 6033	Pivot pin harbour wall 6.1M SW N angle of harbour.
Aux3	SD 4026 6033	Rivet harbour wall 5.7M SW of N angle of Harbour.
Aux4	SD 3982 5992	Brass bolt quay edge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.90m below Ordnance Datum Newlyn (ODN)
TGZ = 12.098m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	244	None

Statistics:

Surge maxima	Value	Day	Time
January	1.113	13	07:30:00
February	0.938	3	13:30:00
March	1.488	20	16:00:00
April	0.731	17	19:00:00
May	0.836	4	07:15:00
June	0.528	23	21:15:00
July	0.471	25	08:30:00
August	0.655	27	01:15:00
September	0.883	14	07:00:00
October	1.349	21	04:15:00
November	0.318	22	02:15:00
December	0.781	24	02:00:00

Surge minima	Value	Day	Time
January	-0.556	2	05:30:00
February	-0.491	22	17:00:00
March	-0.469	25	17:45:00
April	-0.425	28	08:00:00
May	-0.204	21	22:15:00
June	-0.154	12	21:45:00
July	-0.552	8	08:15:00
August	-0.168	30	14:00:00
September	-0.374	6	17:45:00
October	-0.357	9	04:00:00
November	-0.613	19	06:00:00
December	-0.62	26	19:30:00

Extreme maxima	Value	Day	Time
January	10.042	23	12:15:00
February	10.039	8	00:30:00
March	10.628	19	10:15:00
April	10.135	6	11:45:00
May	10.158	5	23:30:00
June	9.88	5	00:15:00
July	9.917	2	23:15:00
August	10.212	3	00:30:00
September	10.275	1	00:15:00
October	10.158	28	23:15:00
November	9.875	12	10:45:00
December	10.169	14	12:30:00

Extreme minima	Value	Day	Time
January	1.026	24	20:00:00
February	0.498	21	18:45:00
March	0.637	9	19:45:00
April	0.494	7	19:15:00
May	0.846	6	18:45:00
June	0.885	5	07:00:00
July	0.84	5	07:45:00
August	0.695	31	06:30:00
September	0.79	1	07:00:00
October	0.909	16	06:45:00
November	0.626	13	05:45:00
December	1.071	13	18:30:00

Mean sea level	No days	MSL
January	31	5.319
February	29	5.132
March	31	5.144
April	30	5.13
May	31	5.109
June	30	5.167
July	31	5.155
August	31	5.262
September	30	5.289
October	31	5.406
November	30	5.143
December	31	5.249
	Sum	Avg
	366	5.209

Hinkley Point Tide Gauge

Latitude: 51° 12' 54.9” N
Longitude: 03° 08' 04.1” W
Grid Reference: ST 2086 4684

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 2104 4634	Bolt on wall 0.962m NE of SE corner of steps.
Aux1	ST 2078 4626	Rivet on sea wall 41.28m SW of corner of outfall.
Aux2	ST 2094 4631	Bolt on sea wall 31.245m SW of end of railings.
Aux3	ST 2123 4634	Bolt sea defence wall.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.80m below Ordnance Datum Newlyn (ODN)
TGZ = 14.639m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 231 TGI site inspection with a view to moving GRP building.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	083,105,126-139	None

Statistics:

Surge maxima	Value	Day	Time
January	1.38	31	18:44:59
February	0.835	1	18:14:59
March	1.041	20	13:44:59
April	0.568	18	13:14:59
May	0.647	4	06:14:59
June	0.876	23	15:14:59
July	0.474	28	12:59:59
August	0.535	18	04:59:59
September	0.557	14	10:59:59
October	0.921	20	22:44:59
November	0.604	18	19:59:59
December	0.707	17	09:59:59

Surge minima	Value	Day	Time
January	-0.524	1	15:29:59
February	-0.502	17	20:59:59
March	-0.546	1	02:29:59
April	-0.368	23	21:44:59
May	-0.326	21	21:14:59
June	-0.293	3	12:44:59
July	-0.486	8	00:14:59
August	-0.306	2	11:44:59
September	-0.544	7	23:59:59
October	-0.617	9	23:14:59
November	-0.833	19	02:14:59
December	-0.767	26	16:14:59

Extreme maxima	Value	Day	Time
January	12.085	23	07:44:59
February	11.972	22	08:14:59
March	12.191	21	07:14:59
April	12.362	6	07:29:59
May	12.338	4	06:14:59
June	12.001	4	19:44:59
July	12	4	20:14:59
August	12.426	31	19:44:59
September	12.324	1	20:29:59
October	12.298	15	19:29:59
November	11.941	13	06:59:59
December	11.847	14	07:59:59

Extreme minima	Value	Day	Time
January	0.767	23	14:14:59
February	0.48	21	13:59:59
March	0.351	9	02:29:59
April	0.274	8	02:44:59
May	0.917	5	00:29:59
June	0.709	5	01:59:59
July	0.792	5	02:44:59
August	0.496	31	01:44:59
September	0.47	1	02:14:59
October	0.735	1	02:14:59
November	0.567	14	13:59:59
December	0.773	13	13:44:59

Mean sea level	No days	MSL
January	31	6.317
February	29	6.158
March	28	6.171
April	30	6.189
May	16	6.141
June	30	6.2
July	31	6.197
August	31	6.315
September	30	6.274
October	31	6.428
November	30	6.168
December	31	6.204
	Sum	Avg
	348	6.23

Holyhead Tide Gauge

Latitude: 53° 18' 50.2" N
Longitude: 04° 37' 13.5" W
Grid Reference: SH 2553 8287

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 2553 8287	Bolt on concrete foundation, N side of T G building.
Aux1	SH 2556 8289	Cut mark lighthouse.
Aux3	SH 2506 8292	Bolt Salt Island bridge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.436m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 155 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	041,083	None

Statistics:

Surge maxima	Value	Day	Time
January	0.862	13	04:45:00
February	0.602	3	14:15:00
March	0.76	20	15:45:00
April	0.534	21	06:45:00
May	0.562	4	05:15:00
June	0.428	23	02:00:00
July	0.26	1	20:45:00
August	0.439	18	15:30:00
September	0.579	12	23:15:00
October	0.707	28	05:30:00
November	0.109	25	23:00:00
December	0.434	28	00:00:00

Surge minima	Value	Day	Time
January	-0.455	2	01:45:00
February	-0.304	8	13:15:00
March	-0.355	25	19:00:00
April	-0.258	28	10:45:00
May	-0.145	15	21:45:00
June	-0.161	13	21:00:00
July	-0.341	8	05:15:00
August	-0.153	30	17:30:00
September	-0.238	26	00:15:00
October	-0.186	9	01:45:00
November	-0.576	10	15:45:00
December	-0.542	26	18:00:00

Extreme maxima	Value	Day	Time
January	5.991	23	11:15:00
February	5.819	21	11:00:00
March	6.098	20	10:00:00
April	5.912	6	10:45:00
May	6.083	4	09:30:00
June	5.743	4	23:15:00
July	5.81	5	00:00:00
August	6.091	31	23:15:00
September	6.089	16	23:15:00
October	6.287	27	21:45:00
November	5.645	14	11:00:00
December	5.978	14	11:30:00

Extreme minima	Value	Day	Time
January	0.5	24	18:15:00
February	0.22	21	17:15:00
March	0.334	8	17:30:00
April	0.203	7	17:45:00
May	0.541	5	16:30:00
June	0.457	5	05:15:00
July	0.417	5	06:15:00
August	0.336	31	04:45:00
September	0.454	1	05:30:00
October	0.591	15	04:30:00
November	0.27	13	04:00:00
December	0.601	15	18:30:00

Mean sea level	No days	MSL
January	31	3.372
February	26	3.214
March	31	3.238
April	30	3.226
May	31	3.213
June	30	3.233
July	31	3.232
August	31	3.352
September	30	3.315
October	31	3.481
November	30	3.216
December	31	3.29
	Sum	Avg
	363	3.282

Ilfracombe Tide Gauge

Latitude: 51° 12' 40.1" N
Longitude: 04° 06' 44.6" W
Grid Reference: SS 5255 4789

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 5263 4791	OSBM Bolt on concrete pier, S.angle of T G hut.
Aux1	SS 5245 4782	Pier Hotel, The Quay
Aux2	SS 5251 4789	St Nicholas chapel N face 6.1M from NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.80m below Ordnance Datum Newlyn (ODN)
TGZ = 12.379m below TGBM
TGZ = 10.76m below Aux1
TGZ = 32.541m below Aux2

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 231 New compressor, system purged and calibrated.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	231	081-082,187-190

Statistics:

Surge maxima	Value	Day	Time
January	0.812	13	03:00:00
February	0.66	1	17:45:00
March	0.619	20	14:15:00
April	0.537	21	02:45:00
May	0.445	4	05:00:00
June	0.718	23	04:45:00
July	0.329	20	14:45:00
August	0.526	18	16:45:00
September	0.457	14	01:00:00
October	0.927	28	01:30:00
November	0.391	18	19:00:00
December	0.7	17	09:00:00

Surge minima	Value	Day	Time
January	-0.398	2	02:00:00
February	-0.321	19	21:00:00
March	-0.262	25	19:30:00
April	-0.224	27	13:00:00
May	-0.199	16	04:45:00
June	-0.175	14	03:00:00
July	-0.322	7	23:15:00
August	-0.124	2	10:00:00
September	-0.325	23	16:00:00
October	-0.234	31	22:15:00
November	-0.558	19	01:45:00
December	-0.562	26	15:00:00

Extreme maxima	Value	Day	Time
January	9.525	23	07:00:00
February	9.437	21	06:45:00
March	9.505	21	06:30:00
April	9.681	7	07:00:00
May	9.87	5	18:15:00
June	9.389	4	18:45:00
July	9.434	4	19:30:00
August	9.802	31	19:00:00
September	9.721	1	19:30:00
October	9.829	27	17:30:00
November	9.354	13	06:00:00
December	9.334	14	07:15:00

Extreme minima	Value	Day	Time
January	0.776	24	13:45:00
February	0.449	21	12:45:00
March	0.45	9	01:15:00
April	0.336	7	00:45:00
May	0.614	6	00:30:00
June	0.671	4	00:00:00
July	0.816	4	00:45:00
August	0.539	31	00:30:00
September	0.573	1	01:00:00
October	0.798	15	12:30:00
November	0.566	12	23:45:00
December	0.833	13	12:30:00

Mean sea level	No days	MSL
January	31	5.067
February	29	4.917
March	31	4.925
April	30	4.946
May	31	4.933
June	30	4.951
July	27	5.036
August	28	5.052
September	30	5.009
October	31	5.206
November	30	4.929
December	31	4.969
	Sum	Avg
	359	4.995

Immingham Tide Gauge

Latitude: 53° 37' 49.5" N
Longitude: 00° 11' 15.1" W
Grid Reference: TA 1995 1640

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TA 1989 1630	Docks office, north angle, north east face
Aux1	TA 2005 1631	Customs house, east angle, north east face
Aux2	TA 1994 1640	Bolt on concrete base of tide gauge building
Aux3	TA 2000 1648	Stud in camera tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.90m below ODN
TGZ = 9.131m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: All Immingham data from 02/11/2000 - 24/06/2004 to be raised by 38mm.

T.G.I. visits to site: Day 175-176 Gap in data. New software fitted, mid tide enabled.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	175-176	None

Statistics:

Surge maxima	Value	Day	Time
January	0.73	13	16:15:00
February	1.242	8	14:30:00
March	0.432	21	03:00:00
April	0.49	18	13:30:00
May	0.307	5	01:45:00
June	0.293	30	23:45:00
July	0.478	8	06:00:00
August	0.402	20	17:15:00
September	0.813	27	03:00:00
October	0.602	4	17:45:00
November	1.152	18	06:30:00
December	0.842	22	13:15:00

Surge minima	Value	Day	Time
January	-1.315	1	01:15:00
February	-0.499	1	23:15:00
March	-0.534	20	17:15:00
April	-0.455	2	12:45:00
May	-0.35	16	04:15:00
June	-0.298	8	23:15:00
July	-0.156	24	17:30:00
August	-0.461	27	06:15:00
September	-0.414	20	06:00:00
October	-0.742	21	21:00:00
November	-0.523	21	14:15:00
December	-0.848	29	17:00:00

Extreme maxima	Value	Day	Time
January	7.448	24	19:45:00
February	7.743	22	19:30:00
March	7.551	21	18:30:00
April	7.434	6	18:30:00
May	7.354	6	19:00:00
June	7.236	4	18:45:00
July	7.292	5	07:45:00
August	7.645	31	06:30:00
September	7.726	27	04:30:00
October	7.609	16	07:00:00
November	7.568	13	05:45:00
December	7.411	15	20:15:00

Extreme minima	Value	Day	Time
January	0.71	24	01:45:00
February	0.57	10	02:45:00
March	0.539	9	01:45:00
April	0.53	7	01:15:00
May	0.605	6	01:00:00
June	0.753	2	23:45:00
July	0.754	5	14:30:00
August	0.614	2	13:30:00
September	0.469	16	13:30:00
October	0.854	15	13:00:00
November	0.75	14	13:00:00
December	0.772	14	01:15:00

Mean sea level	No days	MSL
January	31	4.163
February	29	4.164
March	31	4.068
April	30	4.052
May	31	4.075
June	26	4.122
July	31	4.21
August	31	4.249
September	30	4.241
October	31	4.248
November	30	4.249
December	31	4.247
	Sum	Avg
	362	4.174

Port Erin (Isle of Man) Tide Gauge

Latitude: 54° 05' 06.8" N
Longitude: 04° 46' 05.0" W
Grid Reference: SC 1904 6902

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SC 1904 6901	Bolt SE corner of the RNLI boathouse
Aux 2		Bolt on seawall NW of Marine labs
Aux 3	SC 1928 6903	Bolt base of light tower Raglan pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Local (ODL)
TGZ = 9.288m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: New Ordnance Datum to be levelled for IOM, at present some confusion so all CHs flagged.
Day 032-040 TGI adjusted datum remotely from Bidston.

T.G.I. visits to site: Day 027-028 Gap in data. TGI on site, new software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	027-028,133-141	028-040

Statistics:

Surge maxima	Value	Day	Time
January	0.7	13	06:30:00
February	-0.148	10	07:15:00
March	0.578	20	15:15:00
April	0.425	17	20:15:00
May	0.285	4	09:30:00
June	0.195	23	00:30:00
July	0.032	1	22:00:00
August	0.176	27	04:30:00
September	0.344	14	04:00:00
October	0.459	28	07:45:00
November	-0.04	25	21:15:00
December	0.174	22	05:00:00

Surge minima	Value	Day	Time
January	-0.516	2	05:45:00
February	-0.518	22	16:30:00
March	-0.548	25	19:45:00
April	-0.469	28	08:00:00
May	-0.376	21	10:45:00
June	-0.329	12	21:00:00
July	-0.543	8	06:45:00
August	-0.368	30	17:30:00
September	-0.461	6	18:15:00
October	-0.416	9	05:00:00
November	-0.784	10	16:15:00
December	-0.727	26	19:15:00

Extreme maxima	Value	Day	Time
January	5.561	23	12:15:00
February	5.188	23	13:15:00
March	5.599	20	11:15:00
April	5.367	21	12:15:00
May	5.519	4	10:30:00
June	5.156	6	01:00:00
July	5.222	5	00:45:00
August	5.468	3	00:30:00
September	5.486	17	00:15:00
October	5.69	27	22:45:00
November	5.049	15	12:45:00
December	5.5	14	12:45:00

Extreme minima	Value	Day	Time
January	0.154	24	19:15:00
February	-0.249	21	18:15:00
March	-0.153	8	18:30:00
April	-0.272	7	18:30:00
May	0.05	5	17:30:00
June	-0.019	5	06:30:00
July	-0.083	5	07:15:00
August	-0.141	31	05:45:00
September	-0.032	1	06:30:00
October	0.088	15	05:30:00
November	-0.269	13	05:00:00
December	0.113	15	19:45:00

Mean sea level	No days	MSL
January	25	2.937
February	19	2.521
March	31	2.664
April	30	2.647
May	21	2.653
June	30	2.663
July	31	2.656
August	31	2.767
September	30	2.749
October	31	2.898
November	30	2.645
December	31	2.729
	Sum	Avg
	340	2.711

Port Ellen (Isle of Islay) Tide Gauge

Latitude: 55° 37' 39.3" N
Longitude: 06° 11' 23.7" W
Grid Reference: NR 3636 4508

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NR 3635 4507	Bolt SE side Booking Office
Aux1	NR 3642 4515	Rivet angle wall NW side entrance to pier
Aux2	NR 3651 4526	Police Station SE side of road SW face W angle
Aux3	NR 3635 4521	Sea Farm C gable NW face W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 0.19m below Ordnance Datum Newlyn (ODN)
TGZ = 2.839m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.702	1	01:29:59
February	0.722	3	13:29:59
March	0.76	20	14:44:59
April	0.781	21	12:14:59
May	0.507	4	10:14:59
June	0.527	26	14:14:59
July	0.331	20	22:44:59
August	0.435	18	21:59:59
September	0.593	18	03:14:59
October	0.56	28	09:44:59
November	0.214	21	18:29:59
December	0.573	16	11:59:59

Surge minima	Value	Day	Time
January	-0.545	2	00:59:59
February	-0.459	8	14:29:59
March	-0.354	24	05:29:59
April	-0.289	29	08:29:59
May	-0.2	21	17:29:59
June	-0.146	2	05:44:59
July	-0.324	8	12:29:59
August	-0.2	30	16:14:59
September	-0.286	23	20:14:59
October	-0.161	9	05:14:59
November	-0.546	10	17:44:59
December	-0.571	26	09:14:59

Extreme maxima	Value	Day	Time
January	1.344	13	06:14:59
February	1.315	3	12:14:59
March	1.326	14	18:44:59
April	1.397	21	15:14:59
May	1.134	4	03:44:59
June	0.893	26	20:44:59
July	0.918	20	19:14:59
August	1.135	18	18:59:59
September	1.285	13	17:29:59
October	1.296	28	17:59:59
November	0.956	25	16:29:59
December	1.338	16	08:29:59

Extreme minima	Value	Day	Time
January	-0.226	2	01:29:59
February	-0.433	22	00:14:59
March	-0.372	7	23:29:59
April	-0.436	6	23:44:59
May	-0.108	21	11:44:59
June	-0.07	2	21:44:59
July	-0.433	8	12:29:59
August	-0.233	30	10:59:59
September	-0.167	15	10:44:59
October	-0.057	16	11:44:59
November	-0.281	10	08:59:59
December	-0.172	26	22:14:59

Mean sea level	No days	MSL
January	31	0.562
February	29	0.383
March	31	0.432
April	30	0.404
May	31	0.367
June	30	0.421
July	31	0.42
August	31	0.521
September	30	0.532
October	31	0.644
November	30	0.42
December	31	0.519
	Sum	Avg
	366	0.469

St. Helier (Jersey) Tide Gauge

Latitude: 49° 11' 00" N
Longitude: 02° 07' 00 " W
Grid Reference: 13/11 6466 4763

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	6465 4764 Plan 13/11	Pin bollard Victoria Pier
Aux1	6516 4764 Plan 13/11	Cut mark wall N side of road Mount Bingham
Aux2	6509 4780 Plan 13/11	"J" stone E face wall car park South Hill
Aux3	6507 4779 Plan 13/11	Cut mark S face wall car park South Hill
Aux4	6506 4784 Plan 13/11	Cut mark E face wall E side Commercial Rd

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.88m below Ordnance Datum Local (ODL)
TGZ = 13.658m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Mid-tide appears to be 2cm higher (now 6.908 & before 6.887). DES confirmed present level correct & in fact level from (17/10/2002 (290) of 6.887) was incorrect. All files have been adjusted

T.G.I. visits to site: Day 146 TGI on site to fit new 'slave unit' for Port Authority, new processor and flash card also fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	146	146-166

Statistics:

Surge maxima	Value	Day	Time
January	0.72	31	08:00:00
February	0.465	1	19:00:00
March	0.545	20	14:45:00
April	0.7	18	13:15:00
May	0.567	5	03:30:00
June	0.663	23	04:45:00
July	0.423	2	03:15:00
August	0.582	18	16:45:00
September	0.355	18	06:45:00
October	0.841	27	14:30:00
November	0.301	18	20:00:00
December	0.608	17	12:15:00

Surge minima	Value	Day	Time
January	-0.376	2	15:30:00
February	-0.348	19	21:30:00
March	-0.335	1	01:00:00
April	-0.249	23	22:00:00
May	-0.259	22	09:30:00
June	-0.186	14	17:30:00
July	-0.242	7	23:00:00
August	-0.165	1	09:15:00
September	-0.411	7	11:30:00
October	-0.404	9	09:30:00
November	-0.445	14	01:00:00
December	-0.468	19	13:15:00

Extreme maxima	Value	Day	Time
January	11.219	23	07:30:00
February	11.289	22	07:45:00
March	11.309	21	06:45:00
April	11.548	6	19:15:00
May	11.667	5	19:00:00
June	9.974	18	18:45:00
July	11.104	4	20:00:00
August	11.576	31	19:30:00
September	11.495	1	20:15:00
October	11.522	15	19:15:00
November	11.079	12	18:00:00
December	11.047	13	07:00:00

Extreme minima	Value	Day	Time
January	1.116	23	14:15:00
February	0.9	22	14:30:00
March	0.811	9	14:45:00
April	0.749	7	14:30:00
May	1.109	6	01:45:00
June	2.189	30	23:00:00
July	1.138	5	02:45:00
August	0.884	31	01:45:00
September	0.85	1	02:15:00
October	1.22	1	02:15:00
November	0.859	14	14:00:00
December	1.14	13	13:45:00

Mean sea level	No days	MSL
January	31	6.125
February	29	5.958
March	31	5.967
April	30	6.021
May	30	6.004
June	16	6.038
July	31	6
August	31	6.119
September	30	6.027
October	31	6.239
November	30	5.977
December	31	6.012
	Sum	Avg
	351	6.401

Kinlochbervie Tide Gauge

Latitude: 58° 27' 24.1" N
Longitude: 05° 03' 00.8" W
Grid Reference: NC 2213 5609

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NC 2206 5613	Bolt S side harbour 19.5M SE angle of building
Aux1	NC 2210 5612	Rivet iceplant 7.45M from S angle of building
Aux2	NC 2210 5614	Rivet inside iceplant 3.5M E door
Aux3	NC 2203 5626	Rivet 12.3M SE N angle of building
Aux4	NC 2213 5621	Rivet 2.5M NW inside corner NE steps

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.50m below Ordnance Datum Newlyn (ODN)
TGZ = 7.213m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 305 TGI on site, system purged CH2 OK, but CH1 still u/s.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	277-305

Statistics:

Surge maxima	Value	Day	Time
January	0.626	11	04:30:00
February	0.787	3	14:30:00
March	0.83	14	20:45:00
April	0.619	21	16:00:00
May	0.365	4	14:00:00
June	0.359	26	20:45:00
July	0.282	2	03:00:00
August	0.457	27	03:15:00
September	0.704	18	05:45:00
October	0.513	2	04:00:00
November	0.265	21	17:45:00
December	0.581	23	04:15:00

Surge minima	Value	Day	Time
January	-0.557	2	03:45:00
February	-0.559	8	11:30:00
March	-0.418	23	22:00:00
April	-0.326	7	15:00:00
May	-0.211	21	09:15:00
June	-0.129	2	09:30:00
July	-0.251	8	13:30:00
August	-0.258	30	15:45:00
September	-0.298	24	07:00:00
October	-0.108	31	19:15:00
November	-0.513	12	20:00:00
December	-0.601	26	07:30:00

Extreme maxima	Value	Day	Time
January	5.28	23	08:00:00
February	5.091	6	07:30:00
March	5.264	21	07:30:00
April	5.033	5	07:15:00
May	5.123	4	19:00:00
June	4.979	3	19:00:00
July	5.014	2	19:00:00
August	5.195	2	20:15:00
September	5.313	16	20:30:00
October	5.109	1	21:00:00
November	5.066	14	08:00:00
December	5.535	14	08:30:00

Extreme minima	Value	Day	Time
January	0.638	25	15:45:00
February	0.08	22	15:00:00
March	0.173	8	14:45:00
April	-0.052	7	14:45:00
May	0.149	5	13:45:00
June	0.448	2	12:30:00
July	0.437	5	03:15:00
August	0.202	31	01:45:00
September	0.252	29	01:30:00
October	0.563	1	02:45:00
November	0.16	13	01:15:00
December	0.766	13	01:45:00

Mean sea level	No days	MSL
January	31	2.984
February	29	2.805
March	31	2.849
April	30	2.803
May	31	2.75
June	30	2.823
July	31	2.825
August	31	2.863
September	30	2.949
October	2	3.138
November	29	2.874
December	31	3.001
	Sum	Avg
	336	2.889

Leith Tide Gauge

Latitude: 55° 59' 23.4"N
Longitude: 03° 10' 54.1"E
Grid Reference: NT 2638 7806

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NT 2643 7797	OSBM Bolt SE end of TG pier 0.9m N angle of pier.
Aux1	NT 2648 7797	Rivet on top step SW side of road 1.6m S angle of building.
Aux2	NT 2653 7789	Rivet top step SW side of road 11.9M W angle of building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.84mm below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 125 TGI informed of fire in TG building.
Day 131 TGI visit. All equipment removed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
33	15 minutes	119-366	None

Statistics:

Surge maxima	Value	Day	Time
January	0.502	31	14:00:00
February	0.697	4	10:00:00
March	0.528	19	10:15:00
April	0.582	18	10:30:00

Surge minima	Value	Day	Time
January	-0.732	1	00:00:00
February	-0.453	9	20:00:00
March	-0.383	25	16:15:00
April	-0.329	2	23:00:00

Extreme maxima	Value	Day	Time
January	5.718	23	03:15:00
February	5.668	22	04:00:00
March	5.933	21	14:45:00
April	5.784	5	14:30:00

Extreme minima	Value	Day	Time
January	0.486	23	22:00:00
February	0.259	21	21:45:00
March	0.117	8	21:45:00
April	0.14	6	21:30:00

Mean sea level	No days	MSL
January	31	3.185
February	29	3.082
March	31	3.044
April	26	3.077
	Sum	Avg
	117	3.097

Lerwick Tide Gauge

Latitude: 60° 09' 14.5" N
Longitude: 01° 08' 25.1" W
Grid Reference: HU 4783 4137

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	HU 4783 4129	OSBM bolt on breakwater wall.
Aux1	HU 4784 4125	Queen's Hotel 7.5m SW face south angle.
Aux2	HU 4777 4110	Lerwick Parish Church North face NW angle.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.22m below Ordnance Datum Local (ODL)
TGZ = 4.57m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 226 TGI on site, general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	064,105-106	None

Statistics:

Surge maxima	Value	Day	Time
January	0.466	11	19:45:00
February	0.459	4	01:30:00
March	0.463	15	02:00:00
April	0.471	18	08:00:00
May	0.403	4	20:15:00
June	0.26	23	20:30:00
July	0.243	1	07:45:00
August	0.274	27	11:15:00
September	0.469	20	11:30:00
October	0.369	4	13:30:00
November	0.193	17	19:30:00
December	0.456	16	16:00:00

Surge minima	Value	Day	Time
January	-0.413	2	15:15:00
February	-0.296	9	05:30:00
March	-0.275	25	16:00:00
April	-0.199	7	17:00:00
May	-0.129	22	15:30:00
June	-0.089	2	14:30:00
July	-0.127	7	14:15:00
August	-0.135	1	01:15:00
September	-0.256	8	04:15:00
October	-0.202	9	17:15:00
November	-0.268	13	09:30:00
December	-0.302	26	17:30:00

Extreme maxima	Value	Day	Time
January	2.528	11	13:15:00
February	2.372	7	11:30:00
March	2.506	21	11:00:00
April	2.424	18	10:15:00
May	2.411	4	22:30:00
June	2.223	4	11:15:00
July	2.293	2	23:00:00
August	2.38	29	22:15:00
September	2.486	19	01:15:00
October	2.346	14	23:00:00
November	2.334	15	12:15:00
December	2.663	16	14:00:00

Extreme minima	Value	Day	Time
January	0.32	21	16:15:00
February	0.077	22	18:30:00
March	-0.016	8	18:00:00
April	0.02	7	18:00:00
May	0.261	6	18:00:00
June	0.252	2	16:00:00
July	0.213	5	06:45:00
August	0.106	2	06:00:00
September	0.197	29	05:00:00
October	0.382	15	05:15:00
November	0.277	13	17:00:00
December	0.387	13	17:30:00

Mean sea level	No days	MSL
January	31	1.408
February	29	1.257
March	29	1.253
April	27	1.232
May	31	1.219
June	30	1.277
July	31	1.29
August	31	1.316
September	30	1.392
October	31	1.405
November	30	1.342
December	31	1.452
	Sum	Avg
	361	1.32

Liverpool Tide Gauge

Latitude: 53° 26' 58.9" N
Longitude: 03° 01' 05.3" W
Grid Reference: SJ 3248 9525

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SJ 3249 9525	NBM rivet NE face E angle base of building
Aux1	SJ 3250 9523	Rivet E side of quay above hinge SW dock gate
Aux2	SJ 3244 9538	Building wall E face SE angle
Aux3	SJ 3294 9558	Rivet concrete adjacent to building No 335

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.93m below Ordnance Datum Newlyn (ODN)
TGZ = 14.475m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site:		
	Day 051	TGI on site to repair fuse.
	Day 156	TGI site visit to reinstate gauge. Wind instruments removed.
	Day 356	BT cable fault.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	049-051,083,105-111,148-156,329-331	282

Statistics:

Surge maxima	Value	Day	Time
January	1.259	13	09:00:00
February	1.156	8	02:15:00
March	1.5	20	18:00:00
April	0.679	21	20:45:00
May	0.909	4	06:00:00
June	1.14	23	20:30:00
July	0.614	3	08:00:00
August	0.68	27	03:30:00
September	0.885	14	07:30:00
October	1.171	4	09:00:00
November	0.433	12	12:30:00
December	1.017	24	02:45:00

Surge minima	Value	Day	Time
January	-0.536	2	22:00:00
February	-0.535	21	20:15:00
March	-0.515	25	16:15:00
April	-0.464	28	07:15:00
May	-0.313	22	02:45:00
June	-0.044	4	19:30:00
July	-0.339	8	07:30:00
August	-0.111	31	16:00:00
September	-0.278	6	18:00:00
October	-0.308	9	03:45:00
November	-0.555	10	17:00:00
December	-0.566	26	19:15:00

Extreme maxima	Value	Day	Time
January	9.645	23	12:00:00
February	9.654	8	00:30:00
March	10.035	19	10:15:00
April	9.819	6	11:30:00
May	9.735	5	23:30:00
June	9.673	5	00:00:00
July	9.673	5	00:45:00
August	9.948	31	23:45:00
September	10.032	1	00:00:00
October	9.914	28	23:00:00
November	9.584	12	10:30:00
December	9.84	14	12:30:00

Extreme minima	Value	Day	Time
January	0.903	24	20:00:00
February	0.417	21	19:00:00
March	0.528	8	19:15:00
April	0.382	7	19:30:00
May	0.693	5	18:15:00
June	0.92	5	07:00:00
July	0.904	5	07:45:00
August	0.759	31	06:30:00
September	0.811	1	07:15:00
October	0.983	16	07:00:00
November	0.686	13	05:45:00
December	1.072	13	18:30:00

Mean sea level	No days	MSL
January	31	5.288
February	25	5.149
March	29	5.134
April	22	5.09
May	26	5.086
June	25	5.356
July	31	5.317
August	31	5.419
September	30	5.432
October	31	5.532
November	25	5.311
December	31	5.4
	Sum	Avg
	337	5.293

Llandudno Tide Gauge

Latitude: 53° 19' 54.0" N
Longitude: 03° 49' 30.8" W
Grid Reference: SH 7855 8319

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 7834 8292	Rivet stone butt gate entrance
Aux1	SH 7827 8255	OSBM bolt concrete step SE side of slipway
Aux2	SH 7840 8243	OSBM bolt bottom concrete step
Aux3	SH 7864 8229	OSBM bolt concrete ramp 6.5M NW C slipway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.85m below Ordnance Datum Newlyn (ODN)
TGZ = 12.558m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site:		
	Day 095	Gauge temporarily removed from network.
	Day 168	Gauge reinstated plus mid tide channel.
	Day 260	Replaced faulty board.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
81	15 minutes	112-168,245-260	None

Statistics:

Surge maxima	Value	Day	Time
January	0.848	13	08:00:00
February	0.535	3	15:00:00
March	0.778	20	17:00:00
April	0.481	17	19:15:00
June	0.371	23	04:15:00
July	0.278	1	20:30:00
August	0.392	27	06:15:00
September	0.521	18	07:30:00
October	0.779	28	07:00:00
November	0.157	25	20:30:00
December	0.506	27	23:00:00

Surge minima	Value	Day	Time
January	-0.782	1	20:45:00
February	-0.715	8	10:45:00
March	-0.549	25	16:30:00
April	-0.361	13	00:30:00
June	-0.111	18	06:45:00
July	-0.54	8	06:45:00
August	-0.252	30	16:15:00
September	-0.432	24	01:30:00
October	-0.341	10	04:45:00
November	-0.783	10	06:15:00
December	-0.656	26	18:30:00

Extreme maxima	Value	Day	Time
January	7.933	23	11:45:00
February	7.75	21	11:15:00
March	8.064	19	10:00:00
April	7.896	6	11:15:00
June	7.208	30	20:45:00
July	7.854	5	00:15:00
August	8.178	31	23:45:00
September	8.128	1	00:00:00
October	8.155	28	22:45:00
November	7.69	14	11:15:00
December	8.015	14	12:00:00

Extreme minima	Value	Day	Time
January	0.194	24	19:15:00
February	-0.202	22	18:30:00
March	-0.013	8	18:15:00
April	-0.248	6	17:45:00
June	1.046	30	15:00:00
July	0.155	5	07:00:00
August	0.023	31	05:45:00
September	0.175	29	05:15:00
October	0.287	16	06:00:00
November	-0.086	13	05:00:00
December	0.401	13	18:00:00

Mean sea level	No days	MSL
January	31	4.062
February	29	3.883
March	31	3.93
April	19	3.94
June	13	4.1
July	31	4.04
August	30	4.155
September	14	4.111
October	31	4.255
November	30	4.006
December	31	4.086
	Sum	Avg
	290	4.052

Lowestoft Tide Gauge

Latitude: 52° 28' 23.1" N
Longitude: 01° 45' 00.9" E
Grid Reference: TM 5479 9274

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 5482 9273	Bolt on quay wall S side of pier.
Aux1	TM 5477 9272	Bolt on concrete jetty at SW corner of TG building
Aux2	TM 5478 9274	CM Harbour Masters Office SE angle S face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.50m below Ordnance Datum Newlyn (ODN)
TGZ = 4.483m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 301 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	301	None

Statistics:

Surge maxima	Value	Day	Time
January	1.04	29	06:00:00
February	1.5	8	18:00:00
March	0.547	19	21:30:00
April	0.351	6	00:45:00
May	0.438	7	19:00:00
June	0.411	24	22:15:00
July	0.405	7	19:15:00
August	0.432	30	15:45:00
September	0.751	21	09:30:00
October	0.542	4	20:15:00
November	1.223	13	00:15:00
December	0.956	17	21:45:00

Surge minima	Value	Day	Time
January	-1.294	1	05:30:00
February	-0.328	3	05:15:00
March	-0.491	14	18:30:00
April	-0.342	2	17:00:00
May	-0.321	4	13:30:00
June	-0.207	9	01:45:00
July	-0.148	28	15:30:00
August	-0.288	27	05:30:00
September	-0.367	16	20:15:00
October	-0.725	21	20:30:00
November	-0.491	21	17:00:00
December	-0.742	29	21:15:00

Extreme maxima	Value	Day	Time
January	3.007	14	00:45:00
February	3.503	8	22:00:00
March	2.884	19	20:45:00
April	2.758	5	21:30:00
May	2.781	7	23:15:00
June	2.681	4	22:15:00
July	2.65	5	11:15:00
August	2.975	31	09:45:00
September	3.243	27	08:00:00
October	2.815	16	10:30:00
November	3.355	12	21:30:00
December	3.32	18	01:00:00

Extreme minima	Value	Day	Time
January	-0.093	1	10:00:00
February	0.149	10	06:15:00
March	0.231	10	05:45:00
April	0.267	4	02:45:00
May	0.335	6	04:15:00
June	0.353	6	18:15:00
July	0.294	6	19:00:00
August	0.257	2	17:00:00
September	0.136	16	16:45:00
October	0.292	25	13:30:00
November	0.347	11	14:30:00
December	0.172	16	06:45:00

Mean sea level	No days	MSL
January	31	1.696
February	29	1.726
March	31	1.57
April	30	1.565
May	31	1.607
June	30	1.654
July	31	1.67
August	31	1.722
September	30	1.73
October	31	1.671
November	30	1.75
December	31	1.724
	Sum	Avg
	366	1.674

Milford Haven Tide Gauge

Latitude: 51° 42' 26.6" N
Longitude: 05° 03' 06.4" W
Grid Reference: SM 8924 0537

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 8921 0536	OSBM Bolt on wall W side of entrance to jetty
Aux1	SM 8918 0541	Fl Br G4977 office buildings. SW face NW angle.
Aux2	SM 9001 0601	OSBM bolt wall Victoria Road

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.71m below Ordnance Datum Newlyn (ODN)
TGZ = 16.734m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 050 TGI at site to repair tubing.
Day 231 Changed flow meters on both channels.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	048-050	001-048,064-065,117,212-218,224-230

Statistics:

Surge maxima	Value	Day	Time
January	0.433	8	08:15:00
February	0.126	29	08:15:00
March	0.562	20	13:15:00
April	0.477	21	02:15:00
May	0.375	4	03:30:00
June	0.6	23	04:15:00
July	0.232	20	16:15:00
August	0.505	18	15:15:00
September	0.468	13	00:15:00
October	0.892	28	01:15:00
November	0.218	18	17:45:00
December	0.389	17	07:00:00

Surge minima	Value	Day	Time
January	-0.455	2	01:45:00
February	-0.295	19	20:00:00
March	-0.292	25	20:00:00
April	-0.246	27	12:15:00
May	-0.221	15	18:30:00
June	-0.23	13	18:45:00
July	-0.318	8	02:15:00
August	-0.135	30	06:30:00
September	-0.29	23	18:15:00
October	-0.188	6	23:00:00
November	-0.497	10	13:30:00
December	-0.506	26	15:00:00

Extreme maxima	Value	Day	Time
January	6.418	7	19:00:00
February	7.171	21	07:00:00
March	7.152	21	06:45:00
April	7.281	6	06:45:00
May	7.467	5	18:30:00
June	7.114	4	19:00:00
July	7.142	4	19:45:00
August	7.438	31	19:15:00
September	7.39	1	19:45:00
October	7.648	27	17:45:00
November	7.046	13	06:15:00
December	7.13	14	07:30:00

Extreme minima	Value	Day	Time
January	1.402	10	14:00:00
February	0.42	21	13:15:00
March	0.379	9	01:45:00
April	0.228	7	13:45:00
May	0.497	6	01:00:00
June	0.515	5	01:30:00
July	0.578	5	02:00:00
August	0.414	31	00:45:00
September	0.474	1	01:30:00
October	0.661	15	00:45:00
November	0.399	13	00:15:00
December	0.649	13	13:00:00

Mean sea level	No days	MSL
February	9	3.714
March	28	3.768
April	30	3.779
May	31	3.769
June	30	3.779
July	29	3.785
August	16	3.896
September	30	3.84
October	31	4.053
November	30	3.773
December	31	3.816
	Sum	Avg
	295	3.816

Millport Tide Gauge

Latitude: 55° 44' 59.3" N
Longitude: 04° 54' 22.8" W
Grid Reference: NS 1769 5454

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NS 1757 5449	Fl Br G4602 Marine station
Aux1	NS 1772 5457	OSBM bolt rock SE side Rd 5M NE end wall
Aux2	NS 1769 5454	Rivet pier 0.8M prod SE face of TG building
Aux3	NS 1718 5451	No 45 Marine Parade NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.62m below Ordnance Datum Newlyn (ODN)
TGZ = 7.825m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Levelling was carried out in 2004.

T.G.I. visits to site: Day 289-290 TGI & divers on site to install new steelwork, new pressure points, pneumatic tubing & mid tide sensor. Temporary gauge removed from seabed. New gauge and new software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
91	15 minutes	289-322,329-330	322-329

Statistics:

Surge maxima	Value	Day	Time
January	1.021	1	02:30:00
February	0.81	3	13:45:00
March	0.909	20	16:15:00
April	0.753	21	11:30:00
May	0.558	4	10:15:00
June	0.453	26	14:00:00
July	0.289	20	22:00:00
August	0.449	26	22:45:00
September	0.685	12	23:00:00
October	0.472	5	10:30:00
November	0.194	30	09:30:00
December	0.589	16	11:00:00

Surge minima	Value	Day	Time
January	-0.653	2	00:15:00
February	-0.55	8	14:30:00
March	-0.494	25	19:45:00
April	-0.366	29	08:00:00
May	-0.269	22	07:15:00
June	-0.242	24	05:15:00
July	-0.467	8	06:30:00
August	-0.281	30	17:45:00
September	-0.372	6	19:15:00
October	-0.281	9	06:30:00
November	-0.472	28	12:00:00
December	-0.678	26	08:00:00

Extreme maxima	Value	Day	Time
January	3.987	11	14:15:00
February	3.749	6	12:45:00
March	4.041	20	12:15:00
April	3.916	21	13:15:00
May	3.764	4	11:30:00
June	3.457	23	03:00:00
July	3.53	21	02:15:00
August	3.728	19	02:00:00
September	4.04	18	02:15:00
October	3.819	2	02:15:00
November	3.622	30	14:00:00
December	4.03	16	14:45:00

Extreme minima	Value	Day	Time
January	0.165	24	19:45:00
February	-0.12	22	19:15:00
March	0	22	19:00:00
April	-0.066	6	18:15:00
May	0.212	6	06:30:00
June	0.092	5	07:00:00
July	-0.017	5	07:45:00
August	-0.029	31	06:15:00
September	0.103	27	04:30:00
October	0.314	15	06:00:00
November	0.377	28	18:30:00
December	0.231	17	22:00:00

Mean sea level	No days	MSL
January	31	2.075
February	29	1.886
March	31	1.927
April	30	1.912
May	31	1.871
June	30	1.917
July	31	1.914
August	31	2.013
September	30	2.038
October	13	2.107
November	4	1.977
December	31	2.035
	Sum	Avg
	322	1.973

Moray Firth Tide Gauge

Latitude: 57° 35' 55.3" N
Longitude: 04° 00' 08.0" W
Grid Reference: NH 8040 5829

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Concrete corner of compound (JC 1)
Aux 1	N/A	Sheet piling quay edge (SP5)
Aux 2	N/A	Top of steelwork above pressure point
Aux 3	N/A	Bolt corner of light tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.10m below Ordnance Datum Newlyn (ODN)
TGZ = 6.619m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 224 Gauge removed from network.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
61	15 minutes	224-366	None

Statistics:

Surge maxima	Value	Day	Time
January	0.555	11	07:30:00
February	0.597	4	09:00:00
March	0.497	15	10:45:00
April	0.614	18	06:15:00
May	0.434	4	17:00:00
June	0.403	27	11:30:00
July	0.322	2	05:00:00
August	0.379	9	12:15:00

Surge minima	Value	Day	Time
January	-0.476	2	08:45:00
February	-0.472	8	21:30:00
March	-0.52	7	20:15:00
April	-0.461	6	20:30:00
May	-0.29	1	06:15:00
June	-0.195	2	18:30:00
July	-0.22	7	11:15:00
August	-0.264	2	08:45:00

Extreme maxima	Value	Day	Time
January	4.649	22	12:15:00
February	4.477	22	13:30:00
March	4.76	21	12:15:00
April	4.663	18	11:15:00
May	4.629	4	11:30:00
June	4.515	4	12:45:00
July	4.551	3	12:45:00
August	4.607	3	01:15:00

Extreme minima	Value	Day	Time
January	0.575	24	20:30:00
February	0.356	21	19:30:00
March	0.32	8	20:00:00
April	0.299	7	20:00:00
May	0.487	5	19:00:00
June	0.551	2	17:30:00
July	0.531	5	08:45:00
August	0.457	2	07:45:00

Mean sea level	No days	MSL
January	31	2.641
February	29	2.492
March	31	2.49
April	30	2.467
May	31	2.448
June	30	2.516
July	31	2.527
August	9	2.534
	Sum	Avg
	222	2.514

Mumbles (West Glamorgan) Tide Gauge

Latitude: 51° 34' 12.0" N
Longitude: 03° 58' 31.7" W
Grid Reference: SS 6319 8753

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 6298 8743	OSBM bolt living rock S side of road
Aux1	SS 6317 8752	OSBM bolt lifeboat station Mumbles Pier
Aux2	SS 6284 8750	OSBM bolt concrete base bollard Lifeboat Cottages
Aux3	SS 6258 8760	Rivet SE side concrete chamber

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.00m below Ordnance Datum Newlyn (ODN)
TGZ = 13.821m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	175	None

Statistics:

Surge maxima	Value	Day	Time
January	0.81	13	03:15:00
February	0.582	1	18:15:00
March	0.585	20	13:45:00
April	0.411	18	00:45:00
May	0.435	4	07:45:00
June	0.59	23	04:15:00
July	0.205	14	09:45:00
August	0.43	18	02:15:00
September	0.354	14	01:45:00
October	0.854	28	02:00:00
November	0.243	18	18:45:00
December	0.519	17	08:15:00

Surge minima	Value	Day	Time
January	-0.555	2	02:45:00
February	-0.551	19	21:45:00
March	-0.452	1	02:00:00
April	-0.373	27	13:00:00
May	-0.325	22	00:00:00
June	-0.35	15	03:15:00
July	-0.452	7	23:45:00
August	-0.286	1	10:45:00
September	-0.492	7	13:30:00
October	-0.468	9	23:15:00
November	-0.721	19	01:30:00
December	-0.701	26	15:15:00

Extreme maxima	Value	Day	Time
January	9.732	23	07:15:00
February	9.648	21	07:00:00
March	9.759	21	06:45:00
April	9.899	7	07:30:00
May	10.088	5	18:45:00
June	9.626	4	19:15:00
July	9.651	4	19:45:00
August	10.015	31	19:15:00
September	9.941	1	20:00:00
October	10.07	27	17:45:00
November	9.581	13	06:15:00
December	9.573	14	07:30:00

Extreme minima	Value	Day	Time
January	0.909	24	14:15:00
February	0.642	21	13:00:00
March	0.582	9	01:30:00
April	0.492	7	01:00:00
May	0.746	6	00:45:00
June	0.81	4	00:30:00
July	0.914	5	02:00:00
August	0.662	31	00:45:00
September	0.703	1	01:15:00
October	0.918	15	12:45:00
November	0.697	14	13:00:00
December	0.973	13	13:00:00

Mean sea level	No days	MSL
January	31	5.267
February	29	5.121
March	31	5.14
April	30	5.154
May	31	5.14
June	30	5.146
July	31	5.148
August	31	5.277
September	30	5.217
October	31	5.412
November	30	5.13
December	31	5.172
	Sum	Avg
	366	5.194

Newlyn Tide Gauge

Latitude: 50° 06' 10.8" N
Longitude: 05° 32' 33.9" W
Grid Reference: SW 4676 2856

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SW 4677 2856	Brass bolt in the floor of the recorder hut.
Aux1	SW 4673 2851	Flush Bracket 1565 on wall S pier NW face 17.8m SW
Aux2	SW 4659 2841	F Bracket 1520 wall SE side of S Pier Rd NW face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.801m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Ordnance Datum Newlyn (ODN) is based on mean sea level at Newlyn between 1915 and 1921 (inclusive).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	071

Statistics:

Surge maxima	Value	Day	Time
January	0.555	12	05:30:00
February	0.432	1	15:00:00
March	0.4	11	20:00:00
April	0.391	21	00:15:00
May	0.251	5	14:45:00
June	0.463	22	15:30:00
July	0.188	20	17:00:00
August	0.428	18	16:30:00
September	0.281	12	23:45:00
October	0.866	27	15:00:00
November	0.113	30	23:45:00
December	0.313	19	07:15:00

Surge minima	Value	Day	Time
January	-0.283	2	00:30:00
February	-0.167	10	09:15:00
March	-0.205	22	20:30:00
April	-0.181	12	17:15:00
May	-0.167	15	17:15:00
June	-0.197	13	16:00:00
July	-0.213	8	00:45:00
August	-0.092	26	05:30:00
September	-0.226	25	17:15:00
October	-0.128	6	20:15:00
November	-0.347	15	00:45:00
December	-0.316	26	14:00:00

Extreme maxima	Value	Day	Time
January	5.786	23	05:45:00
February	5.782	22	06:00:00
March	5.647	11	07:30:00
April	5.705	7	05:45:00
May	5.877	5	17:00:00
June	5.628	4	17:30:00
July	5.698	4	18:15:00
August	5.912	31	17:45:00
September	5.89	1	18:15:00
October	6.422	27	16:15:00
November	5.554	13	04:45:00
December	5.65	13	05:00:00

Extreme minima	Value	Day	Time
January	0.603	24	13:00:00
February	0.693	21	12:15:00
March	0.532	8	12:15:00
April	0.435	7	00:00:00
May	0.676	5	11:30:00
June	0.591	3	23:30:00
July	0.655	5	01:00:00
August	0.57	30	23:45:00
September	0.638	1	00:30:00
October	0.774	15	11:45:00
November	0.508	14	12:00:00
December	0.719	14	12:45:00

Mean sea level	No days	MSL
January	31	3.261
February	29	3.156
March	28	3.137
April	30	3.181
May	31	3.174
June	30	3.162
July	31	3.172
August	31	3.307
September	30	3.213
October	31	3.427
November	30	3.16
December	31	3.184
	Sum	Avg
	363	3.211

Newhaven (Sussex) Tide Gauge

Latitude: 50° 46' 54.4" N
Longitude: 00° 03' 25.3" E
Grid Reference: TQ 4511 0004

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 4510 0003	Bolt concrete 7.4M SW of SW angle of tower
Aux1	TQ 4495 0001	OSBM bolt concrete sea wall 154.3M SW of tower
Aux2	TQ 4503 0008	Steel ball Gun mount

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.52m below Ordnance Datum Newlyn (ODN)
TGZ = 8.783m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 272 TGI on site. General maintenance. System purged.
Day 307 TGI on site fixing OTT gauge.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	013	013

Statistics:

Surge maxima	Value	Day	Time
January	0.748	31	11:30:00
February	0.504	9	00:15:00
March	0.536	21	09:00:00
April	0.398	18	19:45:00
May	0.413	5	09:45:00
June	0.462	23	11:15:00
July	0.316	11	14:15:00
August	0.344	20	12:00:00
September	0.392	21	01:30:00
October	0.613	21	02:00:00
November	0.575	18	13:45:00
December	0.806	17	15:30:00

Surge minima	Value	Day	Time
January	-0.438	1	10:45:00
February	-0.441	19	20:30:00
March	-0.284	1	06:15:00
April	-0.214	14	01:15:00
May	-0.204	16	12:45:00
June	-0.209	13	23:45:00
July	-0.257	7	18:30:00
August	-0.164	2	04:45:00
September	-0.348	8	06:45:00
October	-0.4	9	04:30:00
November	-0.387	14	20:30:00
December	-0.481	30	01:15:00

Extreme maxima	Value	Day	Time
January	6.819	24	13:00:00
February	7.036	9	00:45:00
March	6.934	21	11:45:00
April	7.037	7	00:00:00
May	7.066	7	00:15:00
June	6.85	5	00:00:00
July	6.752	5	00:45:00
August	7.038	31	12:00:00
September	6.979	29	11:30:00
October	7.116	16	12:15:00
November	7.019	13	11:15:00
December	6.89	17	15:30:00

Extreme minima	Value	Day	Time
January	0.609	23	18:45:00
February	0.483	21	18:30:00
March	0.407	9	19:15:00
April	0.503	8	07:00:00
May	0.615	6	06:00:00
June	0.506	4	05:45:00
July	0.619	4	06:30:00
August	0.542	2	06:15:00
September	0.6	1	06:45:00
October	0.726	1	06:45:00
November	0.416	14	18:30:00
December	0.517	14	19:00:00

Mean sea level	No days	MSL
January	31	3.715
February	29	3.601
March	31	3.558
April	30	3.592
May	31	3.598
June	30	3.607
July	31	3.619
August	31	3.724
September	30	3.672
October	31	3.776
November	30	3.63
December	31	3.637
	Sum	Avg
	366	3.644

Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N
Longitude: 02° 59' 14.8" W
Grid Reference: ST 3163 8392

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 3163 8392	Brass bolt adjacent to TG building
Aux1	ST 3160 8414	Pin in quay west side of South Lock
Aux2	ST 3160 8426	Pin in quay east side of South Lock
Aux3	ST 3147 8427	Pin in quay south west corner of South Dock

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.81m below Ordnance Datum Newlyn (ODN)
TGZ = 14.525m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site:

Day 126	TGI on site to investigate CH 2 problem. There is a leak on pneumatic system.
Day 188	On site to fit new pneumatic panel.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	126	015-018,021,029,037-038,040-043,045-047,051-054,063,069-072,074,082,094-103,108-111,113-114,120-121,122-130,133-135,139,142,147-150,153-156,172-175,179,185-188

Statistics:

Surge maxima	Value	Day	Time
January	1.615	31	19:15:00
February	0.912	1	19:00:00
March	1.49	20	15:00:00
April	0.933	18	02:00:00
May	0.701	4	17:00:00
June	1.165	23	05:30:00
July	0.701	3	03:15:00
August	0.947	18	04:15:00
September	0.793	12	23:15:00
October	1.321	28	02:45:00
November	0.765	18	19:30:00
December	0.828	17	10:30:00

Surge minima	Value	Day	Time
January	-0.604	29	00:15:00
February	-0.684	21	15:30:00
March	-0.771	10	04:30:00
April	-0.653	9	04:45:00
May	-0.574	3	13:00:00
June	-0.599	2	00:30:00
July	-0.824	7	17:30:00
August	-0.472	21	17:00:00
September	-0.629	15	14:45:00
October	-0.783	9	09:00:00
November	-1.078	10	12:00:00
December	-0.738	9	11:00:00

Extreme maxima	Value	Day	Time
January	12.393	23	08:00:00
February	12.154	21	07:45:00
March	12.558	21	07:30:00
April	12.522	6	20:00:00
May	11.696	4	05:30:00
June	12.342	4	20:00:00
July	12.186	2	19:00:00
August	12.888	31	20:15:00
September	12.739	1	20:45:00
October	12.678	16	08:15:00
November	12.316	13	07:15:00
December	12.196	14	08:30:00

Extreme minima	Value	Day	Time
January	0.481	23	15:30:00
February	0.198	21	15:30:00
March	0.125	10	04:30:00
April	0.264	8	16:15:00
May	0.339	6	15:15:00
June	0.253	4	02:30:00
July	0.392	6	04:45:00
August	0.306	2	03:15:00
September	0.227	29	02:30:00
October	0.307	1	03:30:00
November	0.313	15	03:30:00
December	0.449	14	03:15:00

Mean sea level	No days	MSL
January	23	6.183
February	16	6.034
March	19	6
April	19	6.028
May	18	5.965
June	22	6.051
July	30	6.08
August	31	6.222
September	30	6.189
October	31	6.328
November	30	6.044
December	31	6.098
	Sum	Avg
	300	6.102

North Shields (Tyne and Wear) Tide Gauge

Latitude: 55° 00' 26.8" N
Longitude: 01°26' 23.2" W
Grid Reference: NZ 3593 6824

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 3592 6823	Bolt adjacent to tide gauge building
Aux1	NZ 3626 6842	PA Bolt low lighthouse W face SW angle
Aux2	NZ 3630 6895	PA Bolt butt N side railway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.60m below Ordnance Datum Newlyn (ODN)
TGZ = 6.754m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.5	31	16:30:00
February	0.751	4	13:30:00
March	0.514	19	10:30:00
April	0.537	18	11:15:00
May	0.401	5	00:00:00
June	0.426	23	22:30:00
July	0.265	1	00:00:00
August	0.394	20	17:45:00
September	0.638	27	00:00:00
October	0.416	20	16:30:00
November	0.805	18	03:30:00
December	0.796	23	16:30:00

Surge minima	Value	Day	Time
January	-0.889	1	00:45:00
February	-0.239	9	20:45:00
March	-0.195	25	19:00:00
April	-0.24	2	10:45:00
May	-0.139	1	10:30:00
June	-0.099	2	20:15:00
July	-0.056	28	15:30:00
August	-0.113	27	02:15:00
September	-0.233	8	09:45:00
October	-0.414	21	13:30:00
November	-0.349	23	21:00:00
December	-0.6	29	14:15:00

Extreme maxima	Value	Day	Time
January	5.395	24	17:15:00
February	5.518	22	16:30:00
March	5.607	21	15:45:00
April	5.371	6	16:00:00
May	5.374	5	15:30:00
June	5.331	4	16:00:00
July	5.293	3	16:00:00
August	5.501	31	03:45:00
September	5.555	1	04:30:00
October	5.465	16	04:15:00
November	5.438	13	03:00:00
December	5.338	15	17:30:00

Extreme minima	Value	Day	Time
January	0.564	23	23:00:00
February	0.433	21	22:45:00
March	0.247	8	23:00:00
April	0.27	6	22:30:00
May	0.382	5	22:15:00
June	0.487	2	21:00:00
July	0.466	5	11:45:00
August	0.296	2	10:45:00
September	0.338	16	10:30:00
October	0.55	15	10:00:00
November	0.559	14	10:15:00
December	0.5	13	22:30:00

Mean sea level	No days	MSL
January	31	3.065
February	29	3.017
March	31	2.927
April	30	2.901
May	31	2.908
June	30	2.972
July	31	2.98
August	31	3.045
September	30	3.047
October	31	3.076
November	30	3.043
December	31	3.066
	Sum	Avg
	366	3.004

Portpatrick (Scotland) Tide Gauge

Latitude: 54° 50' 33.2" N
Longitude: 05° 07' 12.1" W
Grid Reference: NW 9976 5421

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NW 9976 5421	Bolt Harbour wall 13.84M NE angle of building
Aux1	NW 9977 5411	Rivet E side of Jetty wall 16.6M SE angle Lifeboat HQ
Aux2	NW 9995 5412	Rivet S angle No 53 Main St
Aux3	NX 0006 5423	Church hall SE side of Rd W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.80m below Ordnance Datum Newlyn (ODN)
TGZ = 6.827m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 194 General maintenance.
Day 309 New modem sent up & fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	231	182

Statistics:

Surge maxima	Value	Day	Time
January	0.825	1	01:30:00
February	0.779	3	14:30:00
March	0.845	20	15:30:00
April	0.673	21	11:15:00
May	0.508	4	09:15:00
June	0.431	26	14:00:00
July	0.296	20	21:30:00
August	0.452	18	12:45:00
September	0.617	12	22:30:00
October	0.638	28	09:00:00
November	0.171	21	19:00:00
December	0.421	16	12:45:00

Surge minima	Value	Day	Time
January	-0.511	2	00:00:00
February	-0.382	8	11:45:00
March	-0.364	25	19:30:00
April	-0.282	28	07:15:00
May	-0.167	22	00:15:00
June	-0.132	12	21:30:00
July	-0.336	8	15:15:00
August	-0.189	30	16:45:00
September	-0.267	24	00:00:00
October	-0.215	9	05:45:00
November	-0.563	10	17:15:00
December	-0.55	26	10:15:00

Extreme maxima	Value	Day	Time
January	4.34	11	14:00:00
February	4.084	6	12:00:00
March	4.479	20	11:15:00
April	4.282	21	12:45:00
May	4.31	4	10:45:00
June	3.955	6	01:30:00
July	4.009	2	23:30:00
August	4.215	19	01:15:00
September	4.349	18	01:30:00
October	4.423	27	23:00:00
November	3.925	30	13:30:00
December	4.419	16	14:30:00

Extreme minima	Value	Day	Time
January	0.183	24	19:45:00
February	-0.063	22	19:15:00
March	0.083	8	18:45:00
April	0.018	7	19:00:00
May	0.294	7	07:00:00
June	0.175	5	06:45:00
July	0.087	5	07:30:00
August	0.068	31	06:15:00
September	0.18	29	05:45:00
October	0.327	16	06:30:00
November	-0.018	13	05:00:00
December	0.303	15	20:15:00

Mean sea level	No days	MSL
January	31	2.268
February	29	2.09
March	31	2.131
April	30	2.12
May	31	2.087
June	30	2.135
July	31	2.128
August	31	2.239
September	30	2.234
October	31	2.366
November	30	2.125
December	31	2.211
	Sum	Avg
	366	2.178

Portrush (Northern Ireland) Tide Gauge

Latitude: 55° 12' 24.4" N
Longitude: 06° 39' 24.6" W
Grid Reference: NW 0416 9952

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	Sheet 6 C 8556 4079	Pin RNLI slipway
Aux1	Sheet 6 C 8567 4070	Cut mark wall Kerr St
Aux2	Sheet 6 C 8580 4055	Cut mark wall Kerr St

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.24m below Ordnance Datum Belfast (ODB)
TGZ = 2.844m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	364-366

Statistics:

Surge maxima	Value	Day	Time
January	0.564	1	01:15:00
February	0.588	3	13:45:00
March	0.746	20	14:30:00
April	0.71	21	15:00:00
May	0.483	4	01:00:00
June	0.425	26	14:00:00
July	0.281	1	23:30:00
August	0.373	9	02:45:00
September	0.537	18	02:45:00
October	0.393	1	22:30:00
November	0.147	25	17:45:00
December	0.624	16	12:30:00

Surge minima	Value	Day	Time
January	-0.427	2	01:15:00
February	-0.463	8	15:15:00
March	-0.337	24	05:00:00
April	-0.279	30	16:45:00
May	-0.275	1	01:45:00
June	-0.144	24	04:00:00
July	-0.261	8	14:45:00
August	-0.258	30	15:45:00
September	-0.328	7	08:45:00
October	-0.3	9	04:00:00
November	-0.521	13	02:45:00
December	-0.515	26	15:30:00

Extreme maxima	Value	Day	Time
January	2.464	22	06:45:00
February	2.434	6	06:45:00
March	2.514	20	06:30:00
April	2.41	18	05:45:00
May	2.493	4	05:45:00
June	2.214	5	20:15:00
July	2.372	2	18:30:00
August	2.587	29	18:00:00
September	2.606	16	19:45:00
October	2.638	28	18:30:00
November	2.231	25	17:45:00
December	2.753	16	10:00:00

Extreme minima	Value	Day	Time
January	0.365	25	02:30:00
February	0.031	23	01:45:00
March	0.023	23	01:30:00
April	-0.049	7	01:15:00
May	0.23	5	12:30:00
June	0.22	2	11:45:00
July	0.365	5	02:15:00
August	0.151	30	12:30:00
September	0.221	29	12:30:00
October	0.299	16	13:15:00
November	0.037	13	00:15:00
December	0.35	13	00:45:00

Mean sea level	No days	MSL
January	31	1.374
February	29	1.212
March	31	1.236
April	30	1.22
May	31	1.181
June	30	1.243
July	31	1.241
August	31	1.326
September	30	1.339
October	31	1.419
November	30	1.244
December	28	1.353
	Sum	Avg
	363	1.282

Portsmouth (Hampshire) Tide Gauge

Latitude: 50° 48' 07.9" N
Longitude: 01° 06' 40.5" W
Grid Reference: SU 6269 0067

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SU 6269 0053	Bolt in concrete jetty TG building S angle
Aux1	SU 6330 9996	GP N side entrance to HMS Vernon
Aux2	SU 6274 0039	Building SW face 0.6M S angle
Aux3	SU 6283 0050	Building SW side of Main Rd NE face N angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.73m below Ordnance Datum Newlyn (ODN)
TGZ = 6.007m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 126 Data logger fault repaired and compressor replaced.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	105-129	001-002

Statistics:

Surge maxima	Value	Day	Time
January	0.746	31	11:15:00
February	0.512	1	23:15:00
March	0.413	21	11:00:00
April	0.361	3	23:30:00
May	0.227	9	04:00:00
June	0.552	22	23:15:00
July	0.235	11	12:30:00
August	0.365	19	00:00:00
September	0.368	14	03:15:00
October	0.653	27	21:30:00
November	0.409	18	15:15:00
December	0.645	17	16:00:00

Surge minima	Value	Day	Time
January	-0.535	1	08:45:00
February	-0.39	19	16:15:00
March	-0.312	10	06:00:00
April	-0.245	11	07:45:00
May	-0.238	22	05:45:00
June	-0.239	13	19:15:00
July	-0.229	7	14:45:00
August	-0.129	30	00:15:00
September	-0.399	25	13:45:00
October	-0.381	4	17:15:00
November	-0.433	14	16:45:00
December	-0.603	30	02:30:00

Extreme maxima	Value	Day	Time
January	4.833	23	12:30:00
February	4.914	9	01:00:00
March	4.919	21	11:30:00
April	4.929	5	23:30:00
May	4.734	9	02:00:00
June	4.781	5	00:15:00
July	4.751	4	12:45:00
August	4.888	31	12:15:00
September	4.891	27	10:30:00
October	5.129	27	22:45:00
November	4.966	12	23:15:00
December	4.949	17	15:45:00

Extreme minima	Value	Day	Time
January	0.593	23	17:45:00
February	0.365	21	17:30:00
March	0.309	8	17:45:00
April	0.403	8	06:15:00
May	0.87	19	04:30:00
June	0.459	4	05:00:00
July	0.562	5	06:30:00
August	0.484	2	05:30:00
September	0.52	28	04:15:00
October	0.669	1	06:00:00
November	0.321	14	17:30:00
December	0.509	13	17:15:00

Mean sea level	No days	MSL
January	30	2.914
February	29	2.792
March	31	2.767
April	12	2.805
May	22	2.755
June	30	2.806
July	31	2.82
August	31	2.934
September	30	2.87
October	31	3.006
November	30	2.816
December	31	2.832
	Sum	Avg
	338	2.843

Sheerness (Kent) Tide Gauge

Latitude: 51° 26' 44.3" N
Longitude: 00° 44' 36.1" E
Grid Reference: TQ 9074 7542

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 9080 7549	Flush bracket 11859, Garrison Fort, S angle, SW building.
Aux1	TQ 9133 7532	Flush bracket G.4790, on house, NW angle, N face
Aux2	TQ 9115 7533	Wall on SW side of road, NE angle.
Aux3	TQ 9147 7516	Bolt Ch. Dis, SW side of road, E face, NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.532m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 273 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.875	29	09:15:00
February	1.926	8	21:30:00
March	0.88	19	22:15:00
April	0.379	22	22:15:00
May	0.37	7	22:15:00
June	0.443	25	02:30:00
July	0.497	7	14:00:00
August	0.636	21	02:00:00
September	0.93	27	08:00:00
October	0.518	26	08:30:00
November	1.095	18	13:00:00
December	1.103	22	18:45:00

Surge minima	Value	Day	Time
January	-1.394	1	09:00:00
February	-0.683	3	07:00:00
March	-0.896	20	20:00:00
April	-0.495	4	07:00:00
May	-0.59	4	19:15:00
June	-0.626	23	17:15:00
July	-0.266	8	09:00:00
August	-0.489	27	05:45:00
September	-0.848	20	11:00:00
October	-0.952	4	11:15:00
November	-0.622	21	19:15:00
December	-1.115	29	23:45:00

Extreme maxima	Value	Day	Time
January	6.121	24	14:30:00
February	6.685	22	14:30:00
March	6.074	21	13:00:00
April	6.077	6	13:15:00
May	6.137	7	01:45:00
June	6.014	5	01:30:00
July	6.045	5	02:15:00
August	6.175	31	01:15:00
September	6.168	1	01:45:00
October	6.142	16	13:45:00
November	6.555	13	00:30:00
December	6.209	28	13:30:00

Extreme minima	Value	Day	Time
January	0.426	24	08:30:00
February	0.062	8	08:00:00
March	0.142	20	19:00:00
April	0.245	4	06:15:00
May	0.276	4	18:30:00
June	0.434	6	21:15:00
July	0.429	4	20:30:00
August	0.309	19	21:15:00
September	0.139	16	20:15:00
October	0.386	14	19:15:00
November	0.357	14	19:45:00
December	0.254	16	10:15:00

Mean sea level	No days	MSL
January	31	3.056
February	29	3.103
March	31	2.96
April	30	2.948
May	31	3.001
June	30	3.005
July	31	3.039
August	31	3.095
September	30	3.079
October	31	3.049
November	30	3.109
December	31	3.074
	Sum	Avg
	366	3.043

St. Mary's (Isles of Scilly) Tide Gauge

Latitude: 49° 55' 04.2" N
Longitude: 06° 19' 01.7" W
Grid Reference: SV 9021 1090

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Bolt by VTS
Aux1	N/A	Bolt by VTS 2
Aux2	N/A	Bolt by top of steps
Aux3	N/A	Bolt by top of steps
Aux4	SV 9028 1097	Point above pressure points
Aux5	SV 9014 1071	Cut Mark east angle Mermaid Inn
Aux6	SV 9007 1065	Cut Mark Guard House top of Garrison Hill
VTS	SV 9023 1091	Tide staff 7.210 metre mark
VTS2	N/A	Tide staff 7.245 metre mark

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.91m below Ordnance Datum Local (ODL)
TGZ = 7.425m below TGBM
TGZ = 7.399m below Aux 1
TGZ = 6.776m below Aux 2

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.447	31	06:15:00
February	0.367	1	14:45:00
March	0.292	11	20:15:00
April	0.382	21	04:15:00
May	0.276	5	15:15:00
June	0.407	22	14:45:00
July	0.161	20	17:00:00
August	0.405	18	04:30:00
September	0.276	12	23:45:00
October	0.766	27	14:45:00
November	0.052	2	15:45:00
December	0.174	17	07:45:00

Surge minima	Value	Day	Time
January	-0.263	2	13:15:00
February	-0.178	10	09:00:00
March	-0.191	26	09:30:00
April	-0.176	13	06:15:00
May	-0.13	15	17:00:00
June	-0.149	13	16:45:00
July	-0.1	8	00:15:00
August	-0.124	26	05:00:00
September	-0.211	25	19:45:00
October	-0.1	6	21:15:00
November	-0.419	14	22:45:00
December	-0.326	30	08:45:00

Extreme maxima	Value	Day	Time
January	5.902	23	05:30:00
February	5.939	22	06:00:00
March	5.803	21	05:15:00
April	5.882	7	05:45:00
May	6.083	5	17:00:00
June	5.765	4	17:30:00
July	5.811	4	18:15:00
August	6.002	31	17:30:00
September	5.978	1	18:15:00
October	6.4	27	16:15:00
November	5.65	13	04:30:00
December	5.732	13	05:00:00

Extreme minima	Value	Day	Time
January	0.542	24	12:45:00
February	0.581	21	11:45:00
March	0.453	9	12:45:00
April	0.359	7	12:15:00
May	0.611	5	23:30:00
June	0.521	3	23:15:00
July	0.592	5	00:45:00
August	0.454	30	23:30:00
September	0.503	1	00:15:00
October	0.696	14	23:15:00
November	0.372	14	11:45:00
December	0.592	13	11:30:00

Mean sea level	No days	MSL
January	31	3.245
February	29	3.145
March	31	3.138
April	30	3.167
May	31	3.164
June	30	3.157
July	31	3.139
August	31	3.251
September	30	3.165
October	31	3.383
November	30	3.1
December	31	3.133
	Sum	Avg
	366	3.182

Stornoway (Hebrides) Tide Gauge

Latitude: 58° 12' 27.8" N
Longitude: 06° 23' 20.0" W
Grid Reference: NB 4228 3273

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NB 4228 3264	OSBM bolt E side of No 2 wharf
Aux1	NB 4215 3271	OSBM bolt STS NE angle King Edwards Wharf
Aux2	NB 4212 3275	Amity House E side of Espl Rd N face NW angle
Aux3	NB 4223 3280	BK S side Worth Beach NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.71m below Ordnance Datum Local (ODL)
TGZ = 6.368m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 160 Gauge back on line and mid tide sensor working.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	076,147-160	114-147,185-189,270-275,286-293,331-341,364-366

Statistics:

Surge maxima	Value	Day	Time
January	0.609	11	04:00:00
February	0.572	4	00:45:00
March	0.603	14	20:15:00
April	0.585	21	15:30:00
June	0.34	27	04:15:00
July	0.309	1	16:15:00
August	0.356	27	03:45:00
September	0.552	18	04:00:00
October	0.465	22	02:00:00
November	0.226	21	23:45:00
December	0.557	16	12:45:00

Surge minima	Value	Day	Time
January	-0.427	2	04:00:00
February	-0.494	8	15:30:00
March	-0.398	23	22:15:00
April	-0.258	7	14:45:00
June	-0.077	12	16:30:00
July	-0.202	8	13:15:00
August	-0.206	30	14:30:00
September	-0.265	7	09:45:00
October	-0.225	9	15:45:00
November	-0.443	13	02:00:00
December	-0.508	26	09:15:00

Extreme maxima	Value	Day	Time
January	5.276	24	08:30:00
February	5.052	21	07:30:00
March	5.282	21	07:00:00
April	5.036	5	06:30:00
June	4.656	30	17:00:00
July	5.014	2	18:45:00
August	5.285	2	20:00:00
September	5.307	16	19:45:00
October	5.158	27	18:15:00
November	4.958	14	07:30:00
December	5.399	14	08:15:00

Extreme minima	Value	Day	Time
January	0.687	24	15:00:00
February	0.222	22	14:45:00
March	0.225	8	14:15:00
April	0.004	7	14:15:00
June	1.227	19	01:45:00
July	0.82	3	13:30:00
August	0.296	31	01:45:00
September	0.406	1	02:15:00
October	0.907	28	00:45:00
November	0.236	13	01:00:00
December	0.783	12	00:30:00

Mean sea level	No days	MSL
January	31	3.011
February	29	2.83
March	28	2.858
April	21	2.873
June	21	2.879
July	25	2.906
August	31	2.933
September	25	2.995
October	20	3.02
November	24	2.896
December	20	3.022
	Sum	Avg
	275	2.929

Tobermory (Mull) Tide Gauge

Latitude: 56° 37' 23.2"
N Longitude: 06° 03' 51.2" W
Grid Reference: NM 5079 5531

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NM 5069 5530	F bracket G5186 on SW angle of Royal bldg
Aux2	NM 5077 5529	NBM rivet in sea wall of Mishnish Pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.39m below Ordnance Datum Newlyn (ODN)
TGZ = Chart Datum = 6.856m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Levelling was carried out in 2004.

T.G.I. visits to site: Day 291-292 TGI and divers on site.
New steelwork, pressure points and pneumatic tubing.
Day 310 TGI on site to fit new datalogger.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	062-064,289-295,309-310	001-062,064-289,295-309

Statistics:

Surge maxima	Value	Day	Time
November	0.205	21	17:00:00
December	0.729	16	12:00:00

Surge minima	Value	Day	Time
November	-0.481	12	17:30:00
December	-0.532	26	05:30:00

Extreme maxima	Value	Day	Time
November	4.676	14	06:30:00
December	5.087	14	07:00:00

Extreme minima	Value	Day	Time
November	0.374	13	00:00:00
December	0.736	13	00:30:00

Mean sea level	No days	MSL
November	25	2.682
December	31	2.806
	Sum	Avg
	56	2.744

Ullapool (Scotland) Tide Gauge

Latitude: 57° 53' 42.9" N
Longitude: 05° 09' 29.0" W
Grid Reference: NH 1292 9391

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NH 1288 9391	OSBM Pier NW Para 8.2M NE steps
Aux1	NH 1303 9425	PA bolt Church SW side of road NE face N angle
Aux2	NH 1288 9398	No 8 Shore Street SE face 0.3M S angle
Aux3	NH 1253 9376	Rivet Fnd No 21 West Shore Street S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn (ODN)
TGZ = 7.155m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 306 TGI on site.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	001-014,019-024,147-154,273-306

Statistics:

Surge maxima	Value	Day	Time
February	0.762	3	14:30:00
March	0.818	14	20:30:00
April	0.683	21	15:45:00
May	0.425	4	13:45:00
June	0.359	26	20:45:00
July	0.292	2	03:45:00
August	0.397	27	03:00:00
September	0.757	18	04:45:00
November	0.266	21	17:15:00
December	0.613	16	12:45:00

Surge minima	Value	Day	Time
February	-0.525	8	16:45:00
March	-0.423	23	22:15:00
April	-0.303	7	09:45:00
May	-0.21	1	02:00:00
June	-0.127	2	11:30:00
July	-0.286	8	13:30:00
August	-0.228	30	13:30:00
September	-0.282	7	00:30:00
November	-6.186	1	10:30:00
December	-0.617	26	09:15:00

Extreme maxima	Value	Day	Time
February	5.371	6	07:00:00
March	5.57	21	07:00:00
April	5.369	5	06:45:00
May	5.503	4	18:45:00
June	5.291	3	19:00:00
July	5.322	2	18:45:00
August	5.581	31	19:45:00
September	5.704	16	20:00:00
November	5.327	14	07:45:00
December	5.792	14	08:15:00

Extreme minima	Value	Day	Time
February	0.237	22	14:45:00
March	0.269	8	14:15:00
April	0.02	7	14:30:00
May	0.261	5	13:30:00
June	0.575	2	12:30:00
July	0.529	5	03:00:00
August	0.326	31	01:45:00
September	0.439	1	02:30:00
November	-1.991	1	11:00:00
December	0.823	13	01:30:00

Mean sea level	No days	MSL
February	29	3.034
March	31	3.07
April	30	3.029
May	24	2.98
June	28	3.051
July	31	3.046
August	31	3.091
September	27	3.253
November	29	3.082
December	31	3.2
	Sum	Avg
	291	3.084

Weymouth (Dorset) Tide Gauge

Latitude: 50° 36' 30.6" N
Longitude: 02° 26' 52.6" W
Grid Reference: SY 6840 7885
.
Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SY 6826 7882	Bolt corner of quay wall NW side N angle
Aux1	SY 6822 7886	Bolt sea wall 5.5M W steps
Aux2	SY 6813 7888	Right base NW pillar NE entrance Alexandra gardens
Aux3	SY 6810 7893	Bolt sea wall 10.1M NW shelter
Aux4	SY 6806 7908	Bolt N base STS aquarium E side of esplanade
REFBM	SY 6837 7884	Bolt concrete SW corner of building adjacent to Tide Gauge Hut

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.02m below Ordnance Datum Newlyn (ODN)
TGZ = 4.334m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 259 General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.64	31	12:45:00
February	0.368	26	16:15:00
March	0.347	20	02:00:00
April	0.557	18	01:30:00
May	0.381	4	15:30:00
June	0.536	23	05:30:00
July	0.214	2	01:15:00
August	0.387	18	13:45:00
September	0.317	14	03:45:00
October	0.729	27	16:30:00
November	0.278	18	16:15:00
December	0.394	19	05:30:00

Surge minima	Value	Day	Time
January	-0.358	2	16:00:00
February	-0.336	19	23:15:00
March	-0.212	15	02:15:00
April	-0.227	13	03:00:00
May	-0.205	22	06:15:00
June	-0.22	13	20:00:00
July	-0.179	7	23:00:00
August	-0.1	1	09:45:00
September	-0.282	25	08:45:00
October	-0.235	9	06:30:00
November	-0.392	14	12:00:00
December	-0.406	30	01:30:00

Extreme maxima	Value	Day	Time
January	2.552	8	07:45:00
February	2.365	22	08:30:00
March	2.485	21	07:00:00
April	2.4	18	06:00:00
May	2.54	5	19:15:00
June	2.381	22	21:45:00
July	2.362	4	20:30:00
August	2.544	31	20:00:00
September	2.508	1	20:45:00
October	2.954	27	18:00:00
November	2.453	13	07:00:00
December	2.414	17	10:00:00

Extreme minima	Value	Day	Time
January	0.115	24	16:45:00
February	-0.077	21	15:45:00
March	-0.074	8	16:00:00
April	0.02	7	16:15:00
May	0.213	17	10:30:00
June	0.066	4	03:15:00
July	0.083	5	04:45:00
August	0.048	2	03:45:00
September	0.069	28	02:15:00
October	0.167	1	00:45:00
November	-0.017	14	15:45:00
December	0.083	14	16:30:00

Mean sea level	No days	MSL
January	31	1.22
February	29	1.094
March	31	1.087
April	30	1.125
May	31	1.121
June	30	1.12
July	31	1.131
August	31	1.251
September	30	1.174
October	31	1.347
November	30	1.119
December	31	1.144
	Sum	Avg
	366	1.161

Whitby (Yorkshire) Tide Gauge

Latitude: 54° 29' 24.0" N
Longitude: 00° 36' 52.9" W
Grid Reference: NZ 8986 1140

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 8986 1141	E side of Pier Rd
Aux1	NZ 8992 1105	Bolt butt of Whitby Bridge
Aux2	NZ 8985 1134	Rivet quayside SE side of Pier Rd
Aux3	NZ 8983 1142	Rivet wall angle S side of road angle of lifeboat museum

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.00m below Ordnance Datum Newlyn (ODN)
TGZ = 9.105m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: Day 316 Survey for new pneumatic system.
Tubes are broken and need to be replaced.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	322-366

Statistics:

Surge maxima	Value	Day	Time
January	0.717	29	00:30:00
February	1.067	8	12:15:00
March	0.463	15	09:30:00
April	0.495	18	10:45:00
May	0.387	5	00:30:00
June	0.44	24	00:45:00
July	0.273	1	02:00:00
August	0.35	20	18:00:00
September	0.664	27	00:30:00
October	0.384	20	16:45:00
November	0.809	12	21:30:00

Surge minima	Value	Day	Time
January	-1.062	1	00:30:00
February	-0.261	10	02:30:00
March	-0.229	11	18:30:00
April	-0.278	2	10:45:00
May	-0.137	16	00:15:00
June	-0.106	3	09:15:00
July	-0.068	28	17:15:00
August	-0.175	27	02:45:00
September	-0.262	8	10:45:00
October	-0.482	21	14:15:00
November	-0.294	14	01:15:00

Extreme maxima	Value	Day	Time
January	5.866	24	17:45:00
February	6.072	22	17:30:00
March	5.985	21	16:15:00
April	5.833	6	16:30:00
May	5.785	6	17:00:00
June	5.77	4	16:45:00
July	5.716	3	16:30:00
August	5.98	31	04:30:00
September	6.025	27	02:45:00
October	5.92	16	04:45:00
November	5.964	13	03:45:00

Extreme minima	Value	Day	Time
January	0.801	23	23:30:00
February	0.654	10	00:30:00
March	0.486	8	23:15:00
April	0.556	6	23:00:00
May	0.628	5	22:30:00
June	0.736	2	21:30:00
July	0.694	5	12:15:00
August	0.527	2	11:15:00
September	0.518	16	11:00:00
October	0.79	15	10:45:00
November	0.809	14	10:45:00

Mean sea level	No days	MSL
January	31	3.435
February	29	3.418
March	31	3.296
April	30	3.278
May	31	3.295
June	30	3.358
July	31	3.363
August	31	3.408
September	30	3.429
October	31	3.432
November	15	3.437
	Sum	Avg
	320	3.377

Wick (Scotland) Tide Gauge

Latitude: 58° 26' 27.5" N
Longitude: 03° 05' 11.0" W
Grid Reference: ND 3667 5081

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ND 3667 5081	New OSBM bolt quay E angle tide gauge building
Aux1	ND 3670 5084	Rivet base of wall 15.5M NE angle of building
Aux2	ND 3670 5083	NBM rivet base SE end of wall NE side of N pier
Aux3	ND 3705 5055	Wall base of steps SE side of pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.71m below Ordnance Datum (ODN)
TGZ = 5.084m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site: There were no visits to site in 2004.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	106-110	100-101

Statistics:

Surge maxima	Value	Day	Time
January	0.603	11	06:45:00
February	0.618	3	22:45:00
March	0.528	15	09:45:00
April	0.4	22	07:45:00
May	0.416	4	19:30:00
June	0.284	30	18:30:00
July	0.269	1	20:30:00
August	0.285	29	10:45:00
September	0.564	20	14:30:00
October	0.461	5	07:45:00
November	0.416	17	22:45:00
December	0.514	16	15:15:00

Surge minima	Value	Day	Time
January	-0.455	2	08:00:00
February	-0.374	8	19:30:00
March	-0.306	24	02:15:00
April	-0.229	30	11:30:00
May	-0.166	1	06:15:00
June	-0.103	2	14:00:00
July	-0.144	7	14:00:00
August	-0.134	30	17:45:00
September	-0.296	7	14:00:00
October	-0.221	8	01:00:00
November	-0.356	13	12:15:00
December	-0.452	26	15:30:00

Extreme maxima	Value	Day	Time
January	3.842	24	12:45:00
February	3.717	6	11:45:00
March	3.902	21	11:30:00
April	3.677	5	11:15:00
May	3.724	4	10:45:00
June	3.631	4	12:00:00
July	3.647	2	23:15:00
August	3.761	29	22:45:00
September	3.917	17	00:30:00
October	3.759	27	22:45:00
November	3.742	15	00:30:00
December	4.041	14	12:45:00

Extreme minima	Value	Day	Time
January	0.511	25	20:00:00
February	0.177	22	18:45:00
March	0.11	8	18:15:00
April	0.086	7	18:30:00
May	0.315	5	17:45:00
June	0.403	2	16:15:00
July	0.306	5	07:15:00
August	0.186	31	05:45:00
September	0.272	29	05:30:00
October	0.457	16	06:00:00
November	0.303	13	05:15:00
December	0.61	13	18:00:00

Mean sea level	No days	MSL
January	31	2.176
February	29	2.027
March	31	2.035
April	21	1.974
May	31	1.969
June	30	2.034
July	31	2.042
August	31	2.071
September	30	2.152
October	31	2.175
November	30	2.1
December	31	2.204
	Sum	Avg
	357	2.08

Workington (Cumbria) Tide Gauge

Latitude: 54° 39' 02.6" N
Longitude: 03° 34' 01.8"W
Grid Reference: NX 9898 2953

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	NX 9917 2928	Building SW face 3.7M from S angle Workington Dock
Aux2	NX 9948 2967	NBM works building S side Rd N face NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.20m below Ordnance Datum Newlyn (ODN)
TGZ = 11.59m below Aux1

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2004.

T.G.I. visits to site:

Day 112	Data logger over heating returned to POL for repair.
Day 177	Data logger refitted and recalibrated.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
80	15 minutes	105-177	004-005

Statistics:

Surge maxima	Value	Day	Time
January	0.83	1	03:00:00
February	0.925	3	13:30:00
March	1.075	20	16:00:00
April	0.393	3	13:45:00
June	0.331	26	14:15:00
July	0.226	1	21:00:00
August	0.409	26	23:45:00
September	0.731	13	00:15:00
October	0.842	21	04:00:00
November	0.138	22	02:30:00
December	0.472	23	05:15:00

Surge minima	Value	Day	Time
January	-0.715	1	22:45:00
February	-0.6	8	15:45:00
March	-0.542	25	16:45:00
April	-0.309	13	01:15:00
June	-0.187	29	06:30:00
July	-0.645	8	07:30:00
August	-0.324	30	15:15:00
September	-0.477	23	23:15:00
October	-0.422	9	04:15:00
November	-0.795	13	03:00:00
December	-0.698	26	12:00:00

Extreme maxima	Value	Day	Time
January	8.71	23	12:30:00
February	8.469	23	13:30:00
March	9.069	20	11:15:00
April	8.648	6	12:00:00
June	7.809	30	09:15:00
July	8.46	2	23:15:00
August	8.779	3	00:45:00
September	8.812	1	00:30:00
October	8.775	28	23:30:00
November	8.362	14	12:15:00
December	8.856	14	12:45:00

Extreme minima	Value	Day	Time
January	0.792	24	19:45:00
February	0.32	21	18:45:00
March	0.464	8	19:00:00
April	0.333	7	19:15:00
June	1.526	30	15:45:00
July	0.572	5	07:45:00
August	0.442	31	06:30:00
September	0.567	1	07:00:00
October	0.641	16	06:45:00
November	0.363	13	05:30:00
December	0.844	13	06:15:00

Mean sea level	No days	MSL
January	28	4.652
February	29	4.456
March	31	4.501
April	12	4.472
June	5	4.553
July	31	4.451
August	31	4.563
September	30	4.581
October	31	4.701
November	30	4.438
December	31	4.551
	Sum	Avg
	289	4.538

Monitoring Vertical Land Movements at Tide Gauges

Dr Richard Bingley,

Institute of Engineering Surveying and Space Geodesy,
University of Nottingham

Monitoring Vertical Land Movements at Tide Gauges

Monitoring Vertical Land Movements at Tide Gauges

Global sea level has risen by 10 to 20 cm during the 20th century. Much of the evidence for this rise came from mean sea level (MSL) measurements obtained at tide gauges, which measure MSL with respect to a local tide gauge bench mark (TGBM). However, it is impossible to distinguish between any 'true sea level variations' and any changes in the level of the land at a tide gauge using these measurements alone. Around Britain sea levels have risen by different amounts over the last century, from a 7cm rise at Aberdeen to a 21cm rise at Sheerness. This is because different parts of the British Isles are rising and subsiding at different rates, due mainly to the removal of ice from the land at the end of the last ice age – so called, glacial isostatic adjustment (GIA). Therefore, to measure the climate related component of changes in sea level using a tide gauge, the rate of any vertical land movements at the specific tide gauge must be determined.

In recent years, modern geodetic techniques have developed to the stage where they can be used to measure such vertical land movements, which are typically of the order of 1 to 2 mm/yr for the British Isles. The two most suitable techniques for this purpose are measurements using the Global Positioning System (GPS) and measurements of absolute gravity.

With funding from Defra and the Environment Agency, POL, together with the Institute of Engineering Surveying and Space Geodesy (IESSG) at the University of Nottingham, have been carrying out research on these geodetic techniques since 1990. This has resulted in the establishment of a network of continuous GPS (CGPS) stations at, or close to, the tide gauges of Aberdeen, Liverpool, Lowestoft, Newlyn, North Shields, Portsmouth and Sheerness, and a network of absolute gravity stations close to the tide gauges of Aberdeen, Lerwick and Newlyn, some of which have been operational since 1996.

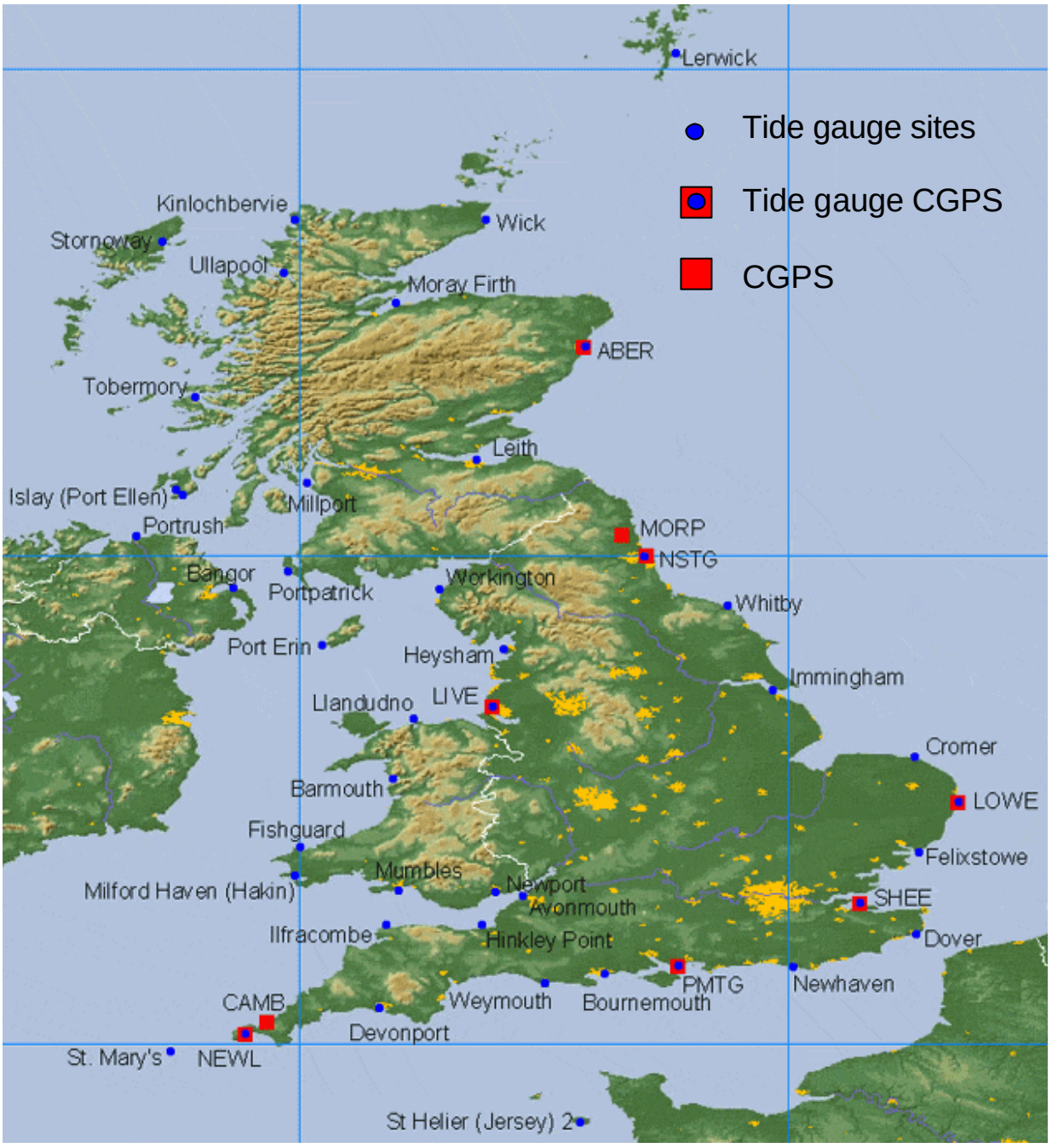
The data from the seven CGPS stations at, or close to, tide gauges are archived as part of the British Isles GPS archive Facility (BIGF), which is also operated by the IESSG at the University of Nottingham. By the end of 2004, BIGF contained data for a total of 90 CGPS stations (a significant increase on the 55 CGPS stations reported last year), some of which are also used to help to understand vertical land movements at non-coastal locations in the British Isles.

The data from all of the CGPS stations at, or close to, tide gauges are also contributed to European initiatives, notably the European Sea Level Service (ESEAS), and data from four of the CGPS stations at, or close to, tide gauges (namely Newlyn, Sheerness, North Shields and Aberdeen) are contributed to international initiatives, notably the International GPS Service (IGS) Tide Gauge Pilot Project (TIGA).

This report includes copies of the log files for the seven CGPS stations at, or close to, tide gauges along with a summary of their daily data availability and quality, based on the TEQC program available through the IGS. The plots show the time window length (taken as the period between the first and last epoch of data recorded on a single day), the number of observations (along with the maximum number of satellites available for a particular day), the multipath characteristics for the dual-frequency pseudo-range observables (given as MP1 and MP2 values), and the number of cycle slips on the carrier phase observables (given as slips per thousand observations).

The data from the absolute gravity stations are processed and analysed by POL. The data from the CGPS stations are combined with data from other CGPS stations in Europe that form part of the IGS global network and processed by the IESSG using both in-house and third party scientific GPS software. The resultant time series are then analysed by POL and IESSG using in-house software.

The trends in the CGPS and absolute gravity time series so far appear to support the idea that GIA is the main contribution to current vertical land movements in the British Isles, with stations in Scotland rising with respect to stations in Southern England. The results are still preliminary; more reliable estimates of vertical land movements will be obtained after an extended monitoring period. However, it is clear that such estimates of vertical land movements should enable 'true sea level variations' around the British Isles to be measured to allow comparisons with predictions and observations of global sea levels and to enable a better understanding of the space- and time- variations.



Aberdeen

```
     ABER Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Aberdeen Tide Gauge
     Four Character ID        : ABER
     Monument Inscription     :
     IERS DOMES Number        : 13231M001
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 4.0m
       Monument Foundation    : QUAY
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1998-09-17T12:00Z
     Geologic Characteristic  : GLACIAL SAND AND GRAVEL
       Bedrock Type           : METAMORPHIC (QUARTZ-MICA-SCHIST)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted adjacent to the
                              : tide gauge building, which is located on a
                              : concrete quay, with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 4m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the concrete
                              : quay.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Aberdeen
     State or Province        :
     Country                  : Scotland
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3466272.4
       Y coordinate (m)       : -125904.3
       Z coordinate (m)       : 5334662.3
       Latitude (N is +)      : +570838.42
       Longitude (E is +)     : -0020448.80
       Elevation (m,ellips.)  : 53.4
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03140
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1998-09-18T00:00Z
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
```

```
     Additional Information   : Full receiver serial number is LP 03140.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03140
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03140.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14767
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   3.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1998-09-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 14767.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)
```

```
6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-09-17/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
```

```
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.1 Radio Interferences     : ANTENNA
       Observed Degradations  : SN RATIO/DATA GAPS
       Effective Dates        : 1998-09-17/2001-05-01
       Additional Information : Harbour antenna transmitting DGPS corrections.
                              : Fault on antenna repaired on 2001-05-01.

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Aberdeen Harbour Board
     Preferred Abbreviation   : (A10)
     Mailing Address          : 16 Regents Quay
                              : Aberdeen AB511SS
                              : UK
     Primary Contact
       Contact Name           : Port Surveyor
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
```

```
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : ABER is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department of Environment, Flooding
                              : and Rural Affairs (DEFRA)


13.  More Information

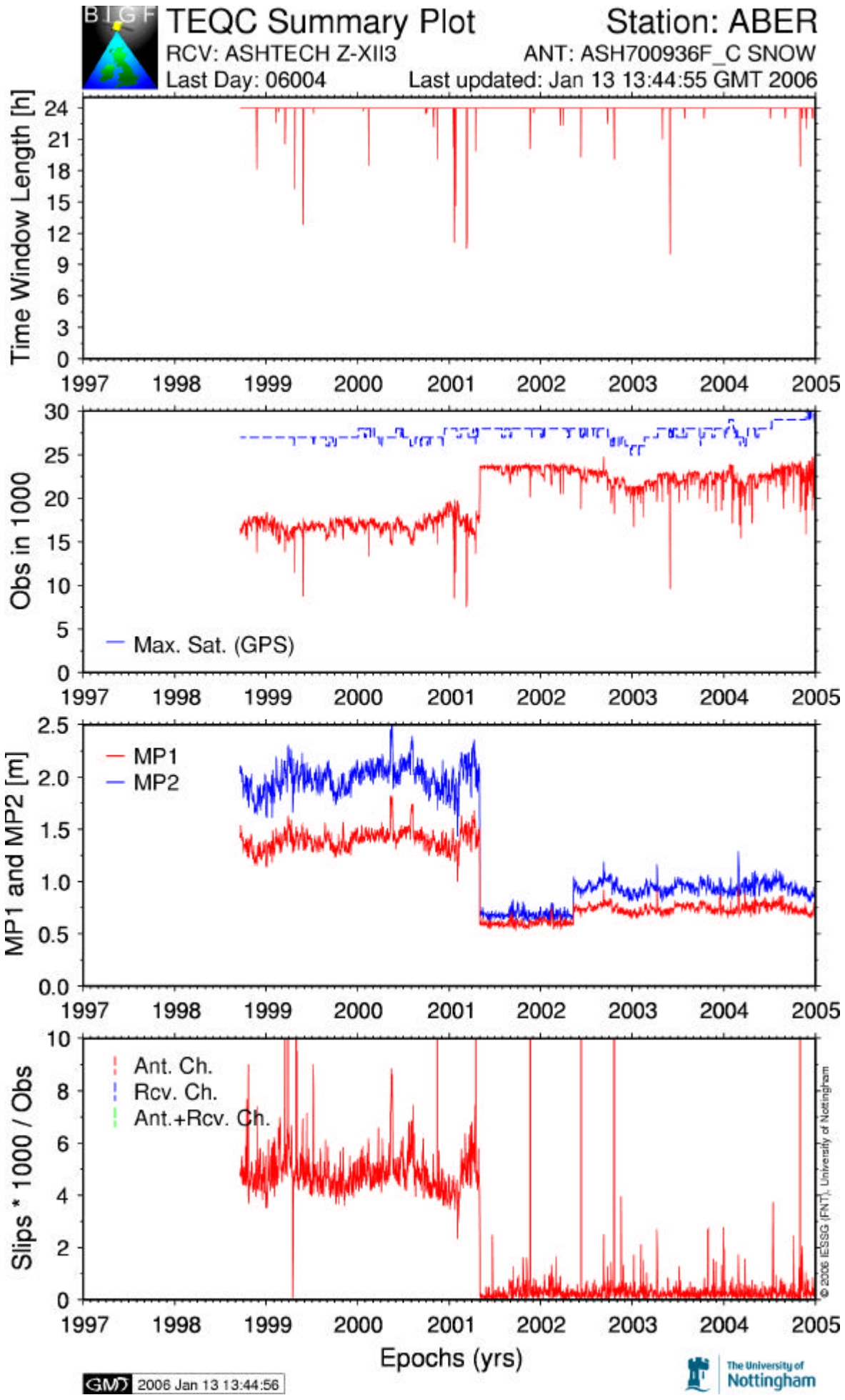
     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C


                      +---------+
                     /     +     \                      <--  0.1280 L2
                    |      +      |                     <--  0.1100 L1
    +---------------+-------------+-----------------+   <--  0.1008 TCR
    |                                               |
    |                                               |
    |                                               |
    |                                               |
  +-+-----------------------------------------------+-+ <--  0.0378
  +-------------------+-------------+-----------------+ <--  0.0348 BCR
                      |             |
                      |             |
                      +------x------+                   <--  0.0000 BPA=ARP

  <--                     0.3794                     -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                L2 : L2 Phase Center
   TCR: Top of Chokering               BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: ABER
RCV: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Day: 06004
Last updated: Jan 13 13:44:55 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2006 Jan 13 13:44:56
The University of Nottingham

Liverpool

```
     LIVE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2005-03-15
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : live_20011212.log
      Modified/Added Sections : 4.2


1.   Site Identification of the GNSS Monument

     Site Name                : Liverpool Tide Gauge
     Four Character ID        : LIVE
     Monument Inscription     :
     IERS DOMES Number        : 13233M001
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND STEEL PIPE
       Height of the Monument : 0.07m
       Monument Foundation    : CONCRETE PILLAR
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1999-02-03T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on a 5m high
                              : concrete pillar which forms part of a
                              : wind-break and is about 5m from the
                              : tide gauge building, which is located
                              : on a stone pier, with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 0.07m steel pipe mounted on
                              : a steel plate.
                              : The GPS antenna is attached to the steel pipe
                              : using a 5/8" thread.
                              : The steel pipe is attached to the steel plate
                              : using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Liverpool
     State or Province        : Merseyside
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3801351.8
       Y coordinate (m)       : -200433.1
       Z coordinate (m)       : 5100558.2
       Latitude (N is +)      : +532658.90
       Longitude (E is +)     : -0030105.62
       Elevation (m,ellips.)  : 66.0
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03145
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-02-04T00:00Z
     Date Removed             : 1999-08-15T23:59Z
```

```
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03145.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03145
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03145.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0)

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14774
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0310
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1999-02-04T00:00Z
     Date Removed             : 2005-02-22T12:00Z
     Additional Information   : Full antenna serial number is CR 14774.

4.2  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 13141
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0310
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2005-03-15T09:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 13141.
                                The antenna cable was not replaced.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1999-02-04/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
```

```
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Mersey Docks and Harbour Company
     Preferred Abbreviation   : (A10)
     Mailing Address          : Maritime Centre
                              : Port of Liverpool
                              : Merseyside L21 1LA
                              : UK
```

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     Primary Contact
       Contact Name           : Marine Operations Manager
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : LIVE is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department of Environment, Flooding
                              : and Rural Affairs (DEFRA)


13.  More Information

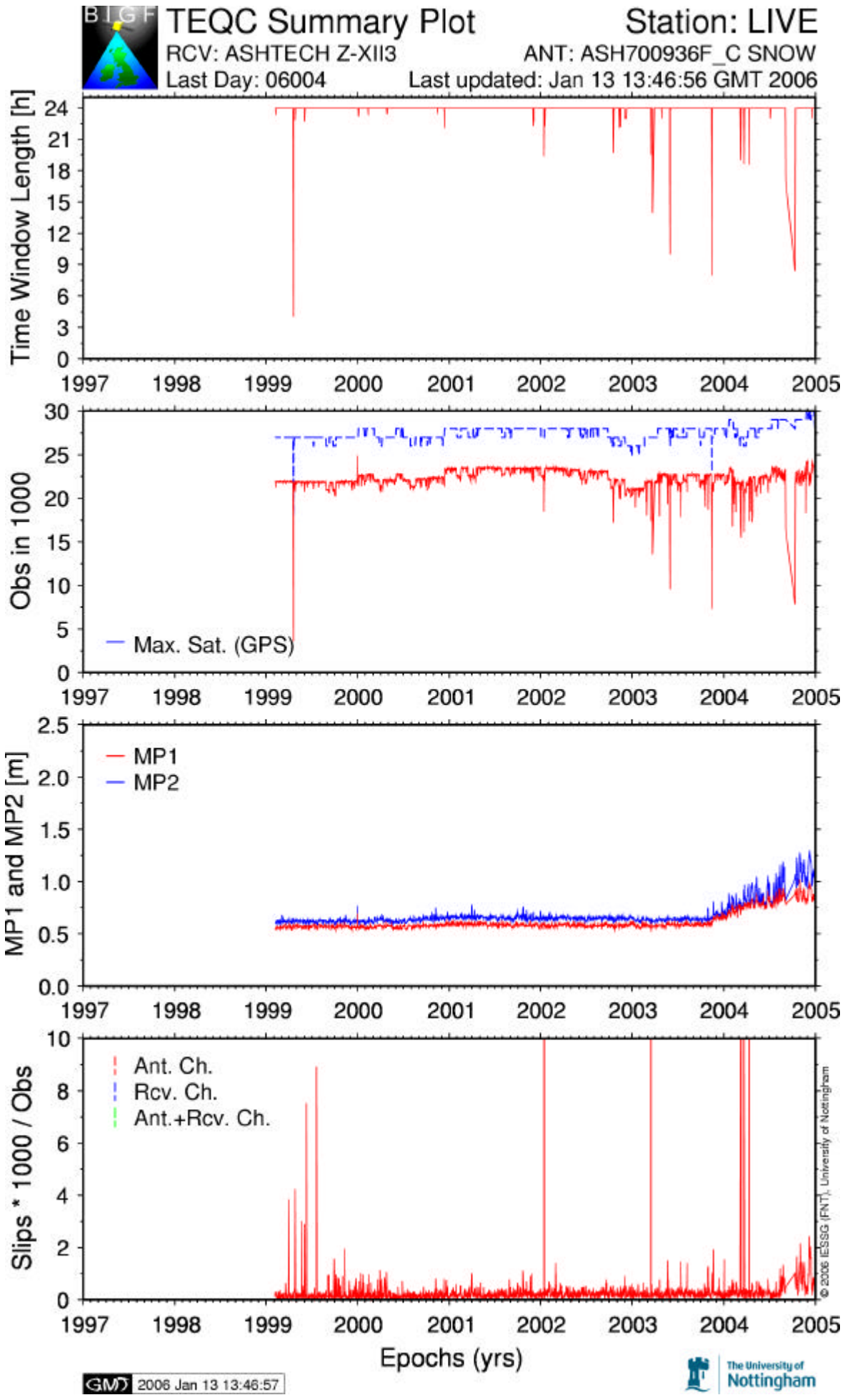
     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C


                      +---------+
                     /     +     \                      <--  0.1280 L2
                    |      +      |                     <--  0.1100 L1
    +---------------+------------+-----------------+    <--  0.1008 TCR
    |                                                |
    |                                                |
    |                                                |
    |                                                |
  +-+------------------------------------------------+-+  <--  0.0378
  +------------------+------------+-------------------+  <--  0.0348 BCR
                     |            |
                     |            |
                     +------x-----+                      <--  0.0000 BPA=ARP

  <--                     0.3794                     -->

   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: LIVE
RCV: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Day: 06004
Last updated: Jan 13 13:46:56 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2006 Jan 13 13:46:57
The University of Nottingham

Lowestoft

```
     LOWE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Lowestoft Tide Gauge
     Four Character ID        : LOWE
     Monument Inscription     :
     IERS DOMES Number        : 13232M001
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET AND CARBON FIBRE PIPE
       Height of the Monument : 0.80m
       Monument Foundation    : BUILDING
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL BRACKET
     Date Installed           : 1999-02-12T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (CRAG)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the side
                              : wall of a two storey brick office
                              : building, adjacent to the tide gauge
                              : building, so that the antenna is raised
                              : above the roof
                              : The GPS antenna is located on the monument
                              : which consists of a 0.8m carbon fibre pipe
                              : mounted on a steel bracket.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : bracket using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel bracket and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Lowestoft
     State or Province        : Suffolk
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3891549.7
       Y coordinate (m)       : 118910.8
       Z coordinate (m)       : 5035092.8
       Latitude (N is +)      : +522823.60
       Longitude (E is +)     : +0014500.70
       Elevation (m,ellips.)  : 53.8
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03141
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-02-13T00:00Z
     Date Removed             : 1999-08-15T23:59Z
```

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     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03141.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03141
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : The full receiver serial number is LP 03141.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14769
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.7620
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1999-02-13T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 14769.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1999-02-13/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Associated British Ports
     Preferred Abbreviation   : (A10)
     Mailing Address          : Port House
                              : Lowestoft
                              : Suffolk NR32 1BG
                              : UK
     Primary Contact
       Contact Name           : Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)

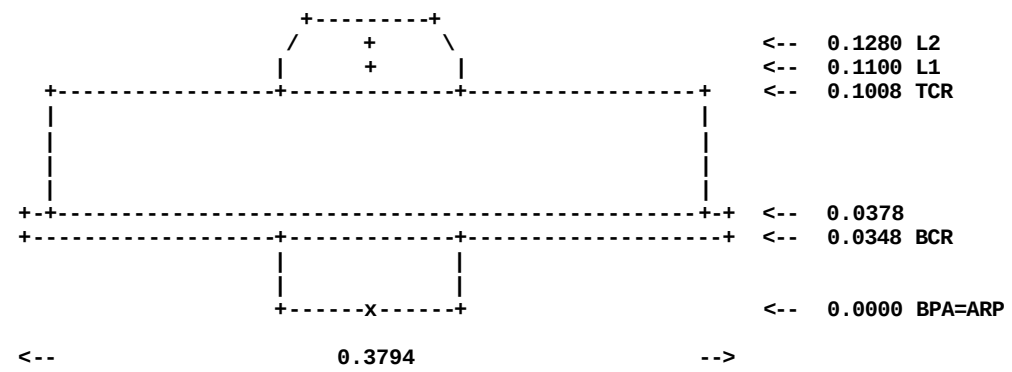

12.  Responsible Agency (if different from 11.)
```

```
     Agency                    : IESSG
     Preferred Abbreviation    : IESSG
     Mailing Address           : University of Nottingham
                               : University Park
                               : Nottingham NG72RD
                               : UK
     Primary Contact
       Contact Name            : Richard Bingley
       Telephone (primary)     : +44 (0)115 9513932
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name            : IESSG Experimental Officers
       Telephone (primary)     : +44 (0)115 9513921
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : iessg@nottingham.ac.uk
     Additional Information    : LOWE is operated by the IESSG for the
                               : Proudman Oceanographic Laboratory and
                               : the UK Department of Environment, Flooding
                               : and Rural Affairs (DEFRA)

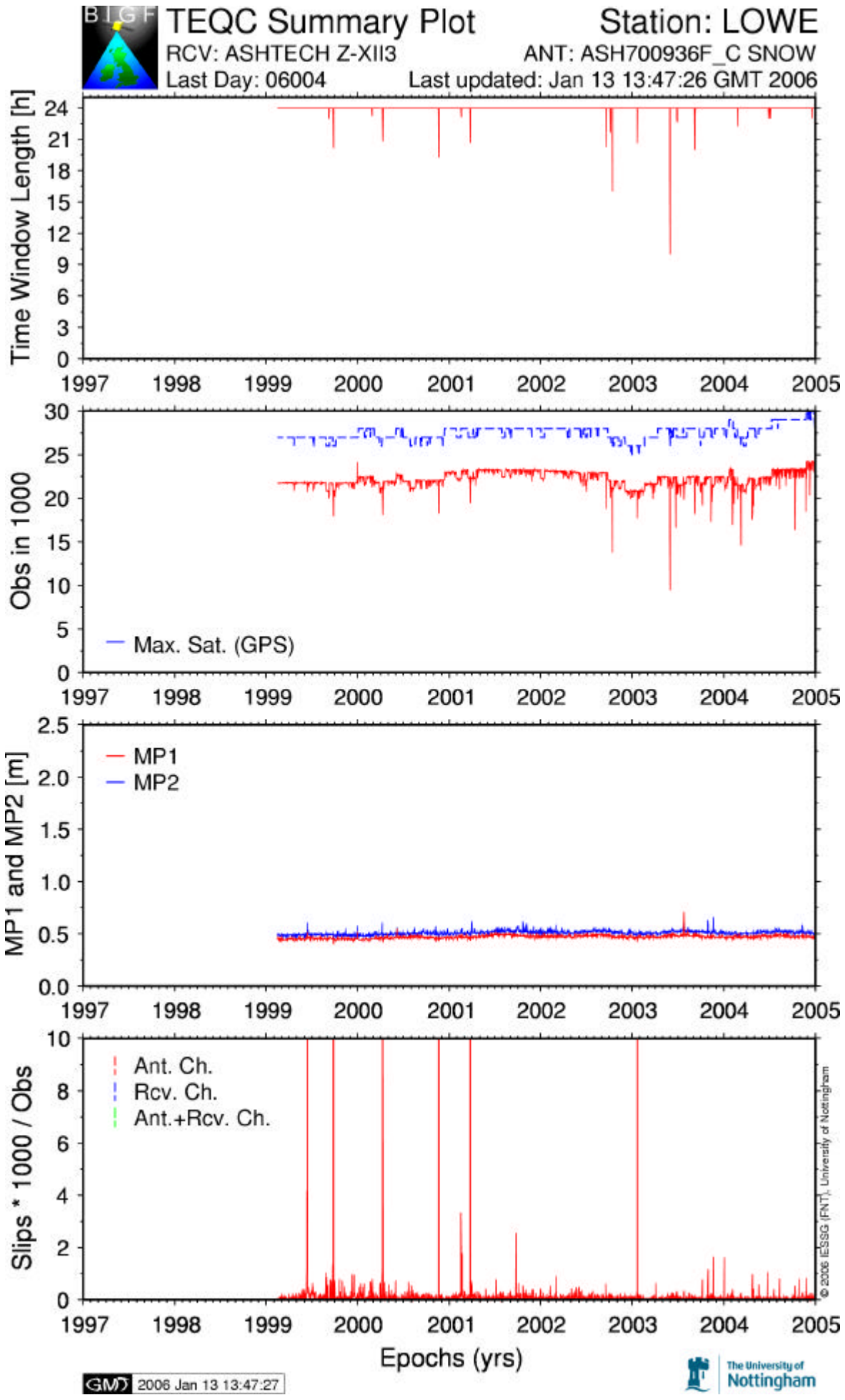

13.  More Information

     Primary Data Center       :
     Secondary Data Center     :
     URL for More Information  : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map                : Y
       Site Diagram            : Y
       Horizon Mask            : Y
       Monument Description    : Y
       Site Pictures           : Y
     Additional Information    : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C
```




```
   ARP: Antenna Reference Point
   L1 : L1 Phase Center                L2 : L2 Phase Center
   TCR: Top of Chokering               BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: LOWE
RCV: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Day: 06004
Last updated: Jan 13 13:47:26 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
2006 Jan 13 13:47:27
The University of Nottingham

Newlyn

```
     NEWL Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2003-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Newlyn Tide Gauge
     Four Character ID        : NEWL
     Monument Inscription     :
     IERS DOMES Number        : 13273M103
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 3.0m
       Monument Foundation    : LIGHTHOUSE
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1998-09-29T12:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the
                              : observation platform of a steel
                              : lighthouse adjacent to the tide gauge
                              : building, which is located at the end
                              : of a stone pier, which is founded
                              : on the Sandstone bedrock
                              : The GPS antenna is located on the monument
                              : which consists of a 3m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the
                              : observation platform.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Newlyn
     State or Province        : Cornwall
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 4079954.1
       Y coordinate (m)       : -395930.4
       Z coordinate (m)       : 4870196.8
       Latitude (N is +)      : +500610.90
       Longitude (E is +)     : -0053234.04
       Elevation (m,ellips.)  : 64.5
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
```

```
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0)

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 2001-01-17T23:59Z
     Additional Information   : Full antenna serial number is CR 15042.
                              : Antenna cable damaged in 2001-01

4.2  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2001-02-09T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 15042.
                              : New antenna cable installed

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
```

```
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-09-30/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
```

```
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Newlyn Pier and Harbour Commissioners
     Preferred Abbreviation   : NPHC
     Mailing Address          : Newlyn
```

```
                              : Penzance
                              : Cornwall
                              : UK

     Primary Contact
       Contact Name           : Andrew Munson (Harbour Master)
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Richard Turner (Tide Gauge)
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : NEWL is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department of Environment, Flooding
                              : and Rural Affairs (DEFRA)

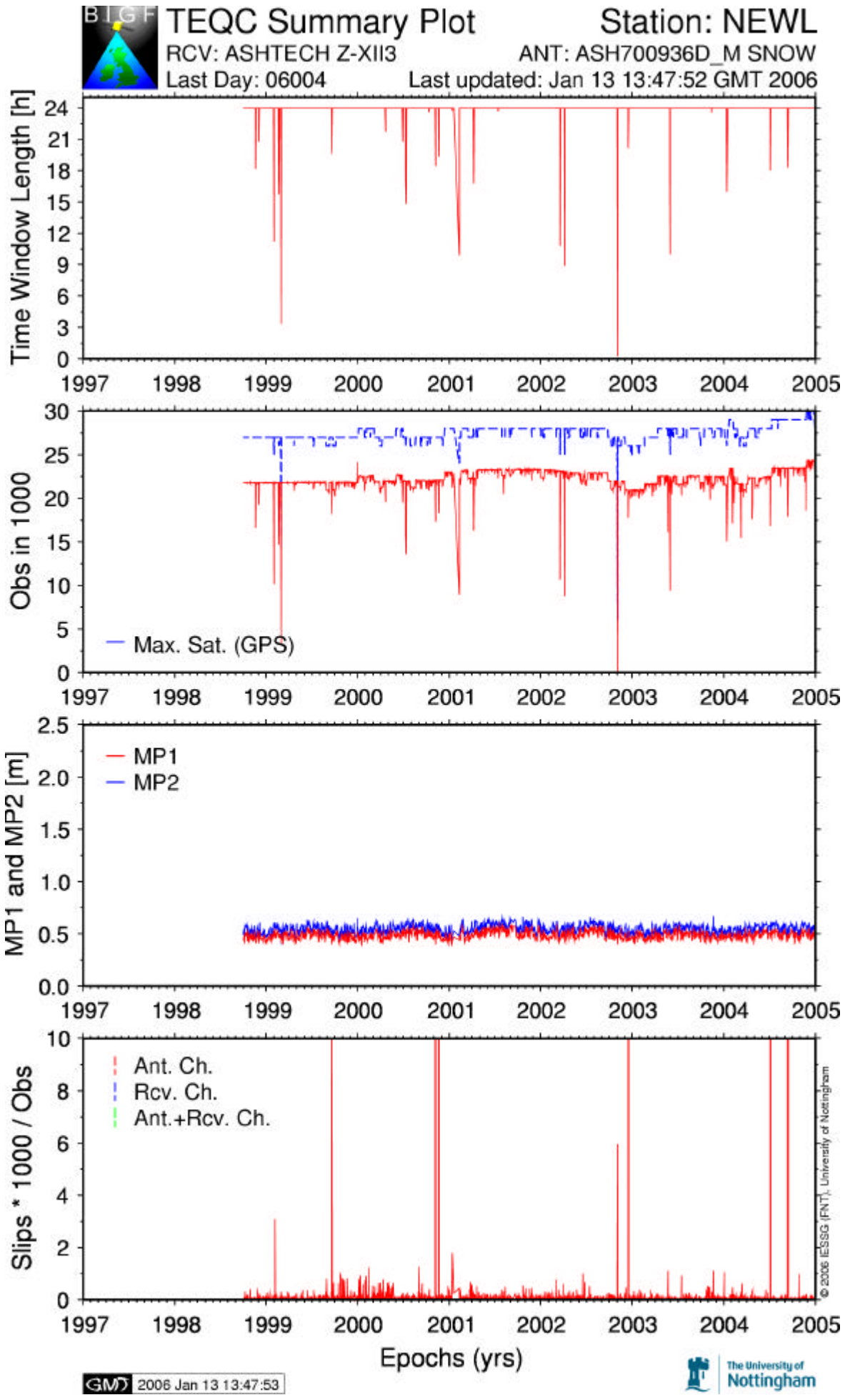

13.  More Information

     Primary Data Center      : BKGE
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936D_M
                       -----
                     /     +     \                      <--  0.128  L2
                    |      +      |                     <--  0.110  L1
   +-------------------------------------------------+    <--  0.102  TCR
   |                                                 |
   |                                                 |
   |                                                 |
   |                                                 |
+-+-------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                      <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: NEWL
RCV: ASHTECH Z-XII3
ANT: ASH700936D_M SNOW
Last Day: 06004
Last updated: Jan 13 13:47:52 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
1997
1998
1999
2000
2001
2002
2003
2004
2005
Epochs (yrs)
2006 Jan 13 13:47:53
The University of Nottingham

North Shields

```
     NSTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2003-11-??
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : nstg_20031021.log
      Modified/Added Sections : 4.10


1.   Site Identification of the GNSS Monument

     Site Name                : North Shields Tide Gauge
     Four Character ID        : NSTG
     Monument Inscription     :
     IERS DOMES Number        : 13216M001
     CDP Number               : (A4)
     Monument Description     : ALUMINIUM POLE
       Height of the Monument : 4.00m
       Monument Foundation    : QUAY
       Foundation Depth       : 2.4m
     Marker Description       : BOTTOM OF 5/8" THREAD ON 4m ALUMINIUM POLE
     Date Installed           : 1998-03-07T12:00Z
     Geologic Characteristic  : BOULDER CLAY
       Bedrock Type           : SEDIMENTARY (WESTPHALIAN)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted in the
                              : tide gauge building, which is located
                              : on a concrete quay, with piled
                              : foundations
                              : The GPS antenna is located on the monument
                              : which consists of a 4m aluminium pole, which is
                              : fixed to the concrete quay, in the tide gauge
                              : building.
                              : The GPS antenna is attached to the aluminium
                              : pole using a 5/8" thread.
                              : The male part of the 5/8" thread is on the
                              : aluminium pole and the bottom of the thread
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : North Shields
     State or Province        : Northumbria
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3664792.2
       Y coordinate (m)       : -92117.3
       Z coordinate (m)       : 5201903.7
       Latitude (N is +)      : +550026.70
       Longitude (E is +)     : -0012623.53
       Elevation (m,ellips.)  : 56.9
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : ??????
     Firmware Version         : 1I00
     Elevation Cutoff Setting : 5
     Date Installed           : 1998-03-15T00:00Z
     Date Removed             : 1998-08-23T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number not known.
```

```
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 982
     Firmware Version         : 1I00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-10T00:00Z
     Date Removed             : 1999-08-13T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number not known.
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.3  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : ??????
     Firmware Version         : 1L00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-12-03T00:00Z
     Date Removed             : 1999-12-09T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number not known.
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.4  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : 1L00
     Elevation Cutoff Setting : 5
     Date Installed           : 2000-02-12T00:00Z
     Date Removed             : 2000-10-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.

3.5  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-05-15T00:00Z
     Date Removed             : 2002-04-03T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.
                              : Operation using a direct modem connection
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.6  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 01845
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2002-04-05T00:00Z
     Date Removed             : 2002-05-16T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 01845.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.7  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2002-05-18T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
```

```
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936B_M
     Serial Number            : ?????
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1998-03-15T00:00Z
     Date Removed             : 1998-08-23T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.2  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 146
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1999-08-10T00:00Z
     Date Removed             : 1999-08-13T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.3  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : ?????
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1999-12-03T00:00Z
     Date Removed             : 1999-12-09T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.4  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 2000-02-12T00:00Z
     Date Removed             : 2000-10-15T23:59Z
     Additional Information   : Full antenna serial number is CR 13570.
```

```
4.5  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 10m
     Date Installed           : 2001-05-15T00:00Z
     Date Removed             : 2001-06-12T12:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.6  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2001-06-12T13:00Z
     Date Removed             : 2002-03-11T23:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.7  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10213
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2002-03-13T00:00Z
     Date Removed             : 2002-04-03T23:59Z
     Additional Information   : Full antenna serial number is CR5 2001 0213.

4.8  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2002-04-05T00:00Z
     Date Removed             : 2003-10-20T15:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.9  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2003-10-20T16:00Z
     Date Removed             : 2003-11-18T10:00Z
     Additional Information   : Full antenna serial number is CR 13570.
                              : Antenna cable replaced.

4.10 Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
```

```
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2003-11-18T11:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 13570.
                              : Antenna cable replaced.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-03-22/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)
```

```
9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Port of Tyne Authority
     Preferred Abbreviation   :
     Mailing Address          : Neville House
                              : Bell Street
                              : North Shields NE30 1LJ
                              : UK
     Primary Contact
       Contact Name           : Port Control
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Martin Robertson
       Telephone (primary)    : +44 (0)191 2227834
       Telephone (secondary)  : +44 (0)191 2226445
       Fax                    : +44 (0)191 2228691
       E-mail                 : Martin.Robertson@newcastle.ac.uk
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

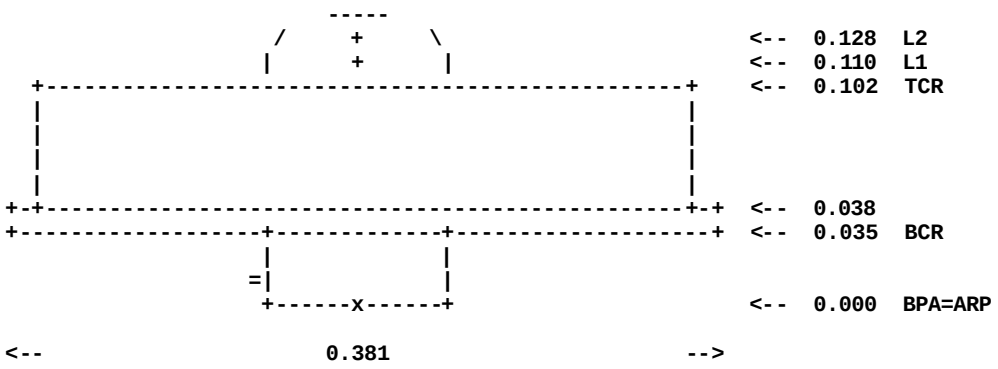
     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : NSTG is operated jointly by the
                              : University of Newcastle-upon-Tyne and
                              : the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department of Environment, Flooding
                              : and Rural Affairs (DEFRA)

13.  More Information

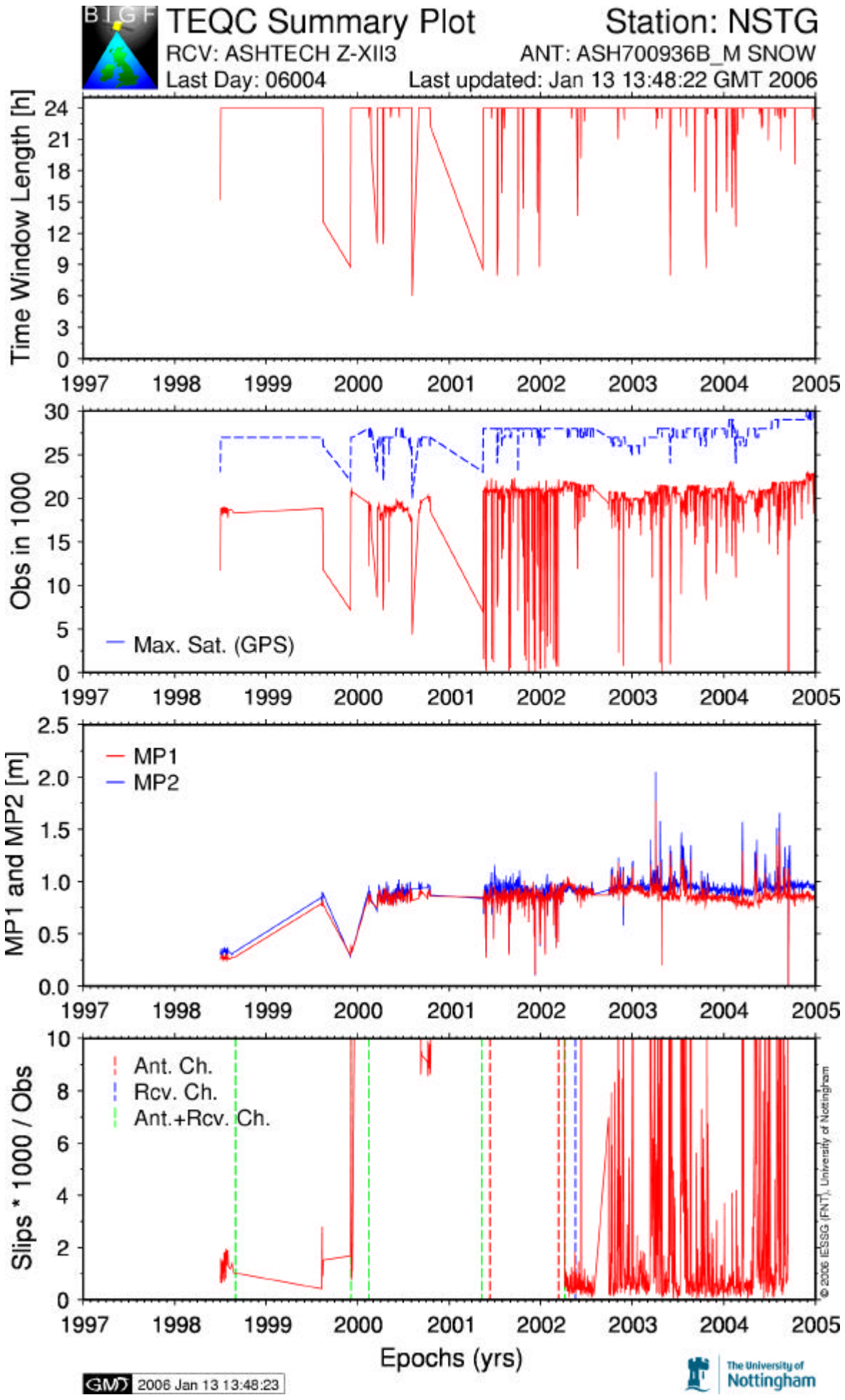
     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
```

Antenna Graphics with Dimensions

ASH700936B_M



ARP: Antenna Reference Point
L1 : L1 Phase Center **L2 : L2 Phase Center**
TCR: Top of Chokering **BCR: Bottom of Chokering**


TEQC Summary Plot
Station: NSTG
RCV: ASHTECH Z-XII3
ANT: ASH700936B_M SNOW
Last Day: 06004
Last updated: Jan 13 13:48:22 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
2006 Jan 13 13:48:23
© 2006 IESSG (FNT), University of Nottingham
The University of Nottingham

Portsmouth

```
     PMTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-09-25
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Portsmouth Tide Gauge
     Four Character ID        : PMTG
     Monument Inscription     :
     IERS DOMES Number        : 13289M003
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET
       Height of the Monument : 1.5m
       Monument Foundation    : BUILDING
       Foundation Depth       : (m)
     Marker Description       : TOP OF 5/8" THREAD ON 1.5m STEEL POLE/BRACKET
     Date Installed           : 2001-09-25T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (BAGSHOT BEDS)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the North end
                              : wall of a single storey brick building,
                              : which houses the tide gauge equipment,
                              : so that the antenna is raised above the
                              : roof apex.
                              : The GPS antenna is located on the monument
                              : which consists of a steel bracket with a 1.5m
                              : pole.
                              : The GPS antenna is attached to the steel pole
                              : using a 5/8" thread.
                              : The antenna height is taken as 0.000m (ie the
                              : survey marker is on the pole and is coincident
                              : with the GPS ARP).


2.   Site Location Information

     City or Town             : Portsmouth
     State or Province        : Hampshire
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 4038372.3
       Y coordinate (m)       : -78330.6
       Z coordinate (m)       : 4919718.8
       Latitude (N is +)      : +504808.36
       Longitude (E is +)     : -0010640.33
       Elevation (m,ellips.)  : 55.4
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 10206
     Firmware Version         : CJ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-09-25T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
```

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                              : Full receiver serial number is ZR 2001 0206.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10214
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2001-09-25T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 0214.
                              : The antenna radome is painted black.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2001-09-26/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)
```

```
7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
```

```
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Queen's Harbour Master
     Preferred Abbreviation   :
     Mailing Address          : HM Naval Base
                              : Portsmouth
                              : Hampshire
                              : UK
     Primary Contact
       Contact Name           : CPO Surveyor for Queen's Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
```

```
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : PMTG is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department of Environment, Flooding
                              : and Rural Affairs (DEFRA)


13.  More Information

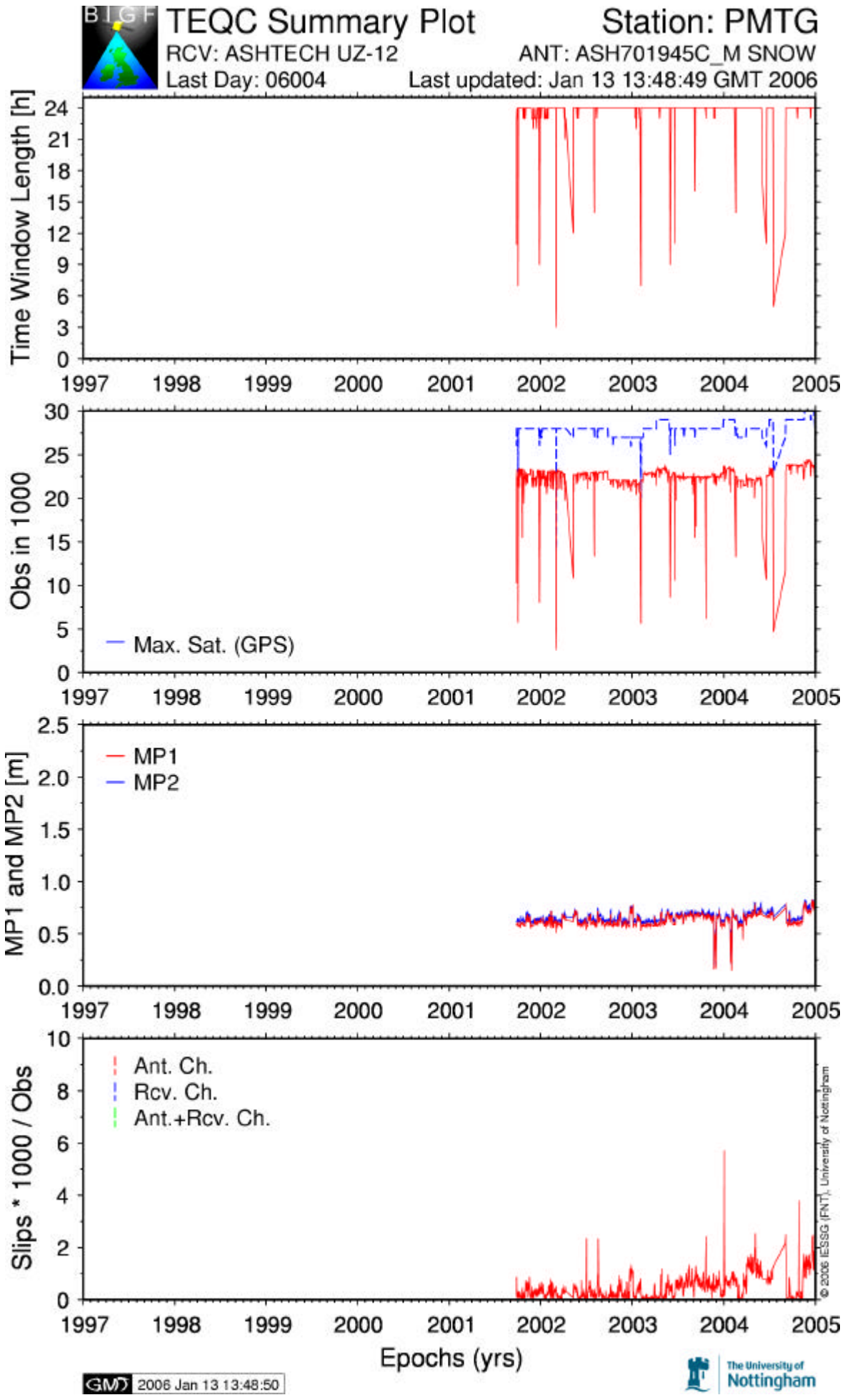
     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH701945C_M

                      -----
                    /     +     \                      <--  0.128  L2
                   |      +      |                     <--  0.110  L1
  +-------------------------------------------------+    <--  0.102  TCR
  |                                                 |
  |                                                 |
  |                                                 |
  |                                                 |
+-+-------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                     <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: PMTG
RCV: ASHTECH UZ-12
ANT: ASH701945C_M SNOW
Last Day: 06004
Last updated: Jan 13 13:48:49 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
2006 Jan 13 13:48:50
The University of Nottingham

Sheerness

```
     SHEE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-06-01
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Sheerness Tide Gauge
     Four Character ID        : SHEE
     Monument Inscription     :
     IERS DOMES Number        : 13236M001
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET
       Height of the Monument : 0.16m
       Monument Foundation    : ROOF
       Foundation Depth       : (m)
     Marker Description       : TOP OF 5/8" THREAD ON STEEL BRACKET
     Date Installed           : 1997-03-05T12:00Z
     Geologic Characteristic  : ALLUVIUM (CLAY, SILT, PEAT)
       Bedrock Type           : SEDIMENTARY (CHALK)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the concrete
                              : slab roof of the tide gauge building,
                              : which is a single storey brick building
                              : located on a jetty with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 0.16m high steel bracket
                              : fixed to the concrete roof of the tide gauge
                              : building.
                              : The GPS antenna is attached to the steel bracket
                              : using a 5/8" thread.
                              : The male part of the 5/8" thread is on the steel
                              : bracket and has a domed top, which serves as the
                              : survey marker.


2.   Site Location Information

     City or Town             : Sheerness
     State or Province        : Isle of Sheppey
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position (ITRF)
       X coordinate (m)       : 3983074.5
       Y coordinate (m)       : 51683.0
       Z coordinate (m)       : 4964639.6
       Latitude (N is +)      : +512644.44
       Longitude (E is +)     : +0004436.27
       Elevation (m,ellips.)  : 53.3
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : TRIMBLE 4000SSI
     Satellite System         : GPS
     Serial Number            : 16407
     Firmware Version         : 7.21
     Elevation Cutoff Setting : 15
     Date Installed           : 1997-03-27T00:00Z
     Date Removed             : 1999-08-19T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is 3628A16407.
```

```
                              : Operation using a direct modem connection.
                              : Download using RFILE v2.31 [21-MAR-97 TEST].
                              : Conversion to RINEX using DAT2RIN v2.20b.

3.2  Receiver Type            : TRIMBLE 4000SSI
     Satellite System         : GPS
     Serial Number            : 16407
     Firmware Version         : 7.29
     Elevation Cutoff Setting : 15
     Date Installed           : 1999-08-21T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is 3628A16407.
                              : Operation using a direct modem connection.
                              : Download using RFILE v2.35 (20 DEC 99).
                              : Conversion to RINEX using DAT2RIN v2.35a.

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : TRM29659.00     NONE
     Serial Number            : 66923
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :  -0.0070
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       : TRIMBLE 14553-00
     Antenna Cable Length     : 10m
     Date Installed           : 1997-03-27T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is 0220066923.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
```

```
       Input Frequency        : (if external)
       Effective Dates        : 2001-03-27/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
```

```
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Medway Ports
     Preferred Abbreviation   : (A10)
     Mailing Address          : Sheerness Docks
                              : Sheerness
                              : Kent ME121RX
                              : UK
     Primary Contact
       Contact Name           : Mike Hillier
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Phillip Woodgate
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
```

```
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : SHEE is operated by the IESSG for the
                              : Environment Agency of England and Wales


13.  More Information

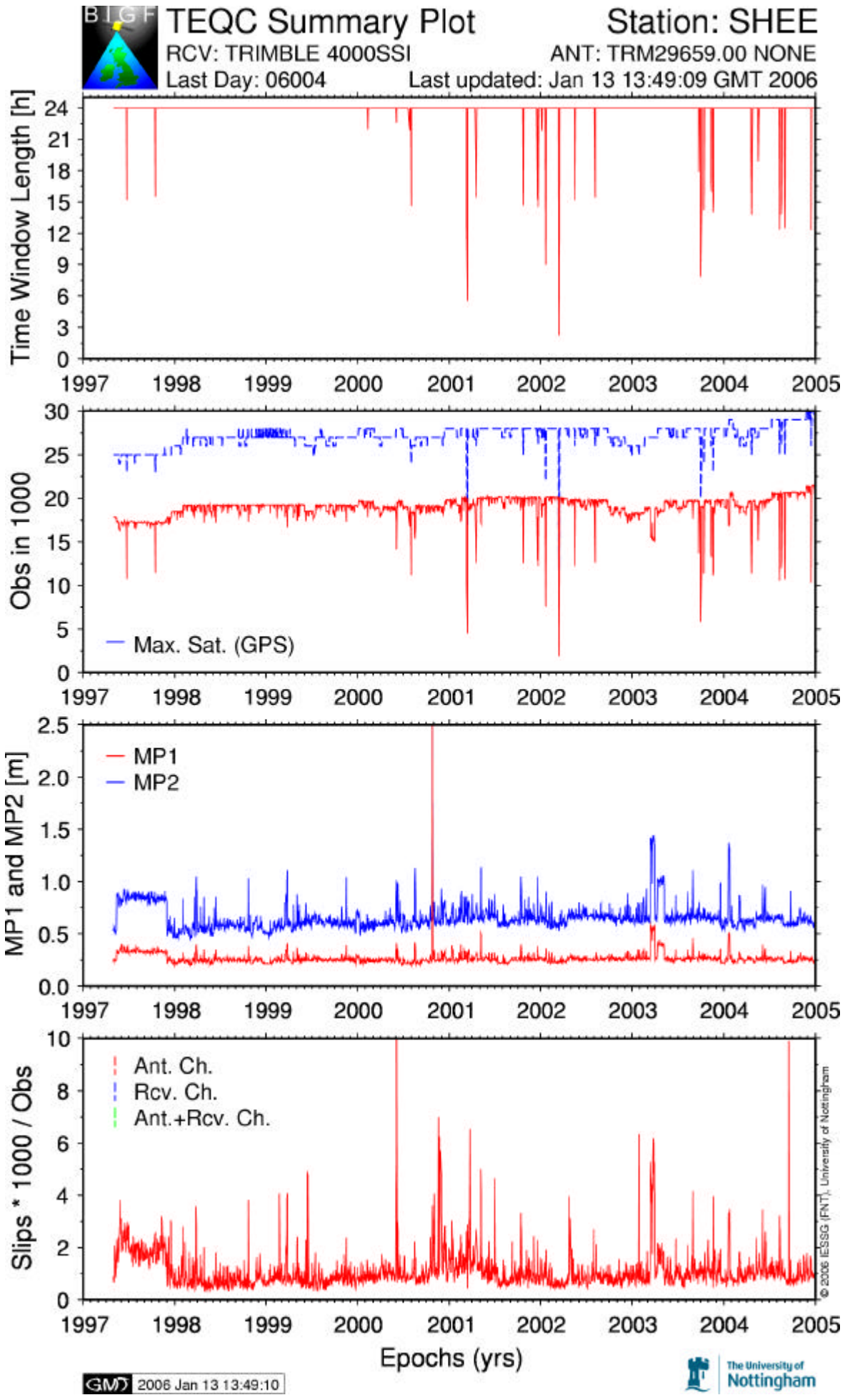
     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

TRM29659.00

                     -----
                    /     +     \                      <--  0.128  L2
                   |      +      |                     <--  0.110  L1
  +------------------------------------------------+    <--  0.102  TCR
  |                                                |
  |                                                |
  |                                                |
  |                                                |
+-+------------------------------------------------+-+  <--  0.038
+------------------+-------------+--------------------+  <--  0.035  BCR
                   |             |
                  =|             |
                   +------x------+                     <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: SHEE
RCV: TRIMBLE 4000SSI
ANT: TRM29659.00 NONE
Last Day: 06004
Last updated: Jan 13 13:49:09 GMT 2006
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2006 Jan 13 13:49:10
The University of Nottingham

Report on gauges in the South Atlantic

Gauges in the South Atlantic

The ACCLAIM (Antarctic Circumpolar Current Levels by Altimetry and Island Measurements) programme in the South Atlantic and Southern Oceans consists of measurements from coastal tide gauges and bottom pressure stations, together with an ongoing research programme in satellite altimetry.

Phase 1 of ACCLAIM Coastal Gauges

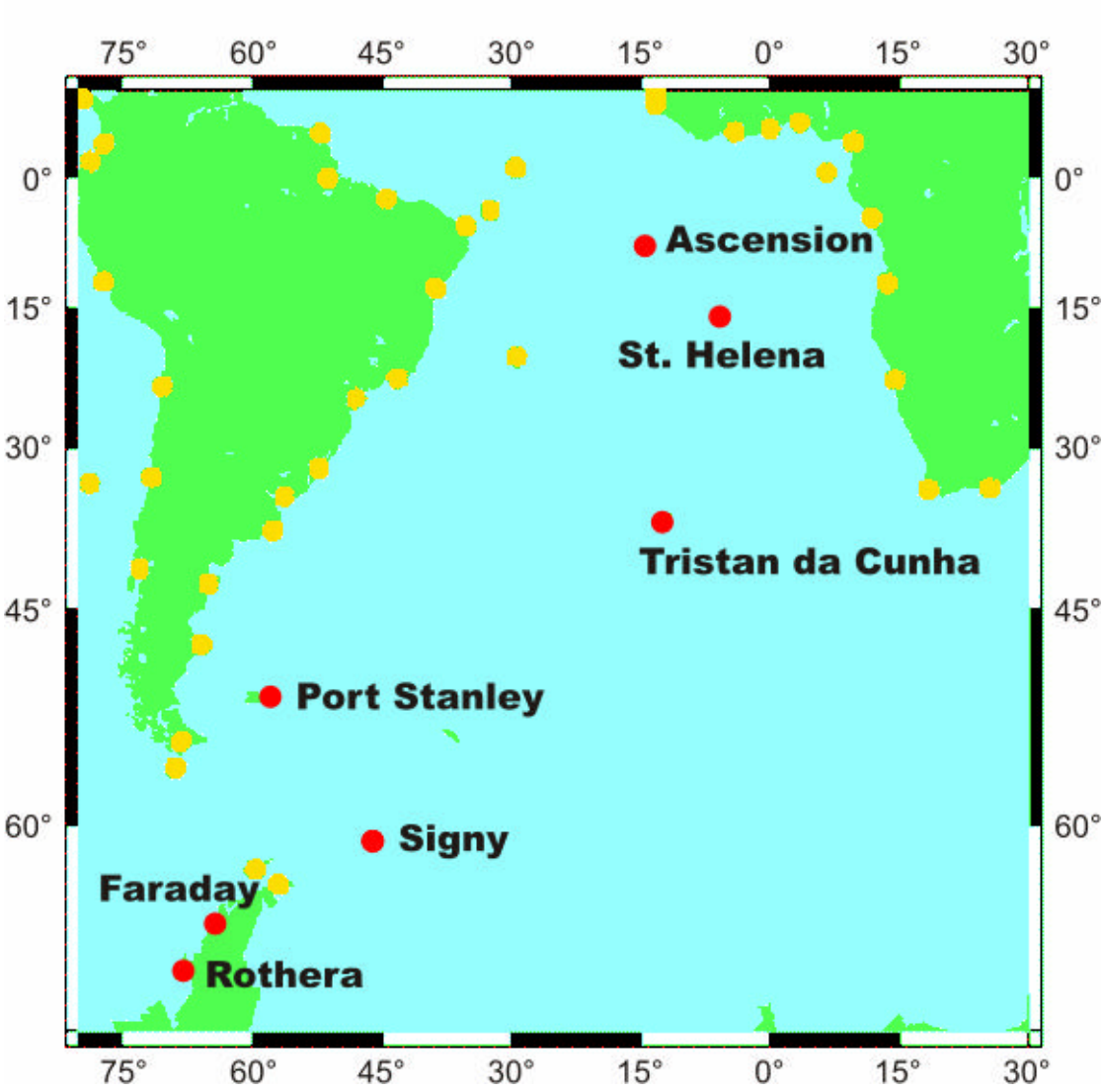
In Phase 1 of ACCLAIM from 1983, measurements at coastal tide gauge sites took the form of sub-surface pressure (SSP) measurements (units of pressure e.g. mbar) rather than sea level (units of length e.g. centimetres). SSP is here defined as the total, measured pressure recorded by a sub-surface pressure transducer, a measurement which includes the pressure load from the atmosphere as well as from the water column. It is absolutely essential that any user of ACCLAIM data realises which data type (either SSP or sea level) is being analysed.

The Phase 1 coastal SSP data were acquired in different ways (e.g. with a diver-replaced Aanderaa pressure gauge at Ascension, or with a Digiquartz in the sea sensor at St. Helena, see Spencer et al. 1993 for details) and with different pressure integration periods (e.g. quarter hour, half hour, one hour). For some data sets, the original data have been filtered to give one hour sampling. However, common to all records is an uncertainty connected with potential offset biases and drifts in the pressure sensors. At some sites (e.g. St. Helena) extensive tide pole data are also available and biases and long term drifts in the sensor data may eventually be rectified (this is under study at present). However, the drifts in general mean that in most cases the records should not be used, without further careful attention in particular studies, for the study of timescales seasonal or longer.

Phase 2 of ACCLAIM Coastal Gauges

From around early 1993, the gauges at several sites were replaced by 'B gauges' which record SSP, air pressure and sea level. These gauges have precise datum control and are used to provide long term sea level change data to the PSMSL.

Some Phase 1 and all Phase 2 coastal data will contain ancillary information on air pressures and sea temperatures from ACCLAIM sensors. Several of these records contain large gaps. However, POL has collected extensive sets of such ancillary data from meteorological agencies for its own analysis purposes, and should be able to provide further advice.



Red dots on the above map indicate sites of POL's South Atlantic coastal tide gauge network (ACCLAIM), while the yellow dots show gauges (not necessarily operational) committed to the GLOSS programme by other countries in the region.

At the present time the tide gauge sites at Ascension, St. Helena and Port Stanley can be considered to be complete 'Phase 2' sites, while Tristan, Signy and Rothera remain 'Phase 1' (i.e. simple pressure transducer sites). At Faraday (which contains the longest tide gauge record in Antarctica and which is now called Vernadsky and operated by groups from the Ukraine) there is a conventional float gauge together with a 'Phase 1' transducer.

Information on data presented below is from the latest series collected. More information on this and previous data collected can be found at the ACCLAIM website:

http://www.pol.ac.uk/psmslh

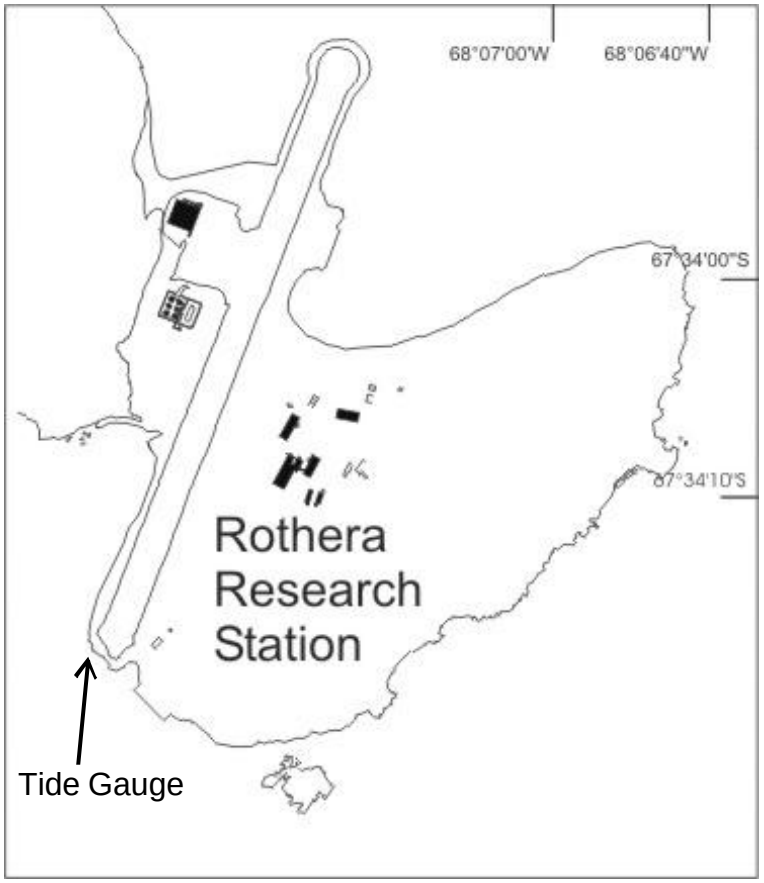
There are three directories: bprs, phase1 and phase2. Each has an inventory file, giving more information about the tide gauges.

Rothera Tide Gauge

Latitude: 67° 34.3' S Longitude: 068° 07.7' W

Instrument type: Full tide pressure gauge and half tide pressure gauge.

Site of Gauge: The tide gauge is mounted in a sea water well, approximately 100 metres shorewards of the main jetty.

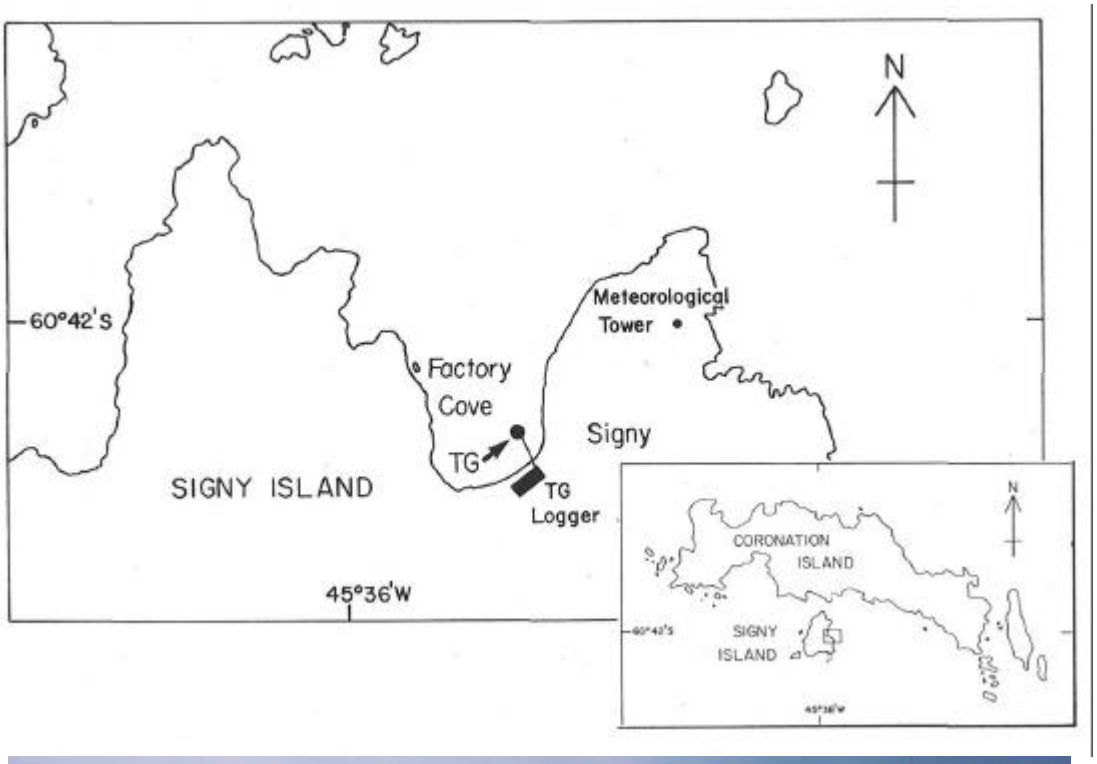


Signy (South Orkney Islands)

Latitude: 60° 43.0' S Longitude: 045° 34.0' W

Instrument type: Digiquartz pressure sensor

Site of Gauge: Data logger in nearby British Antarctic Survey boat house / generator building.

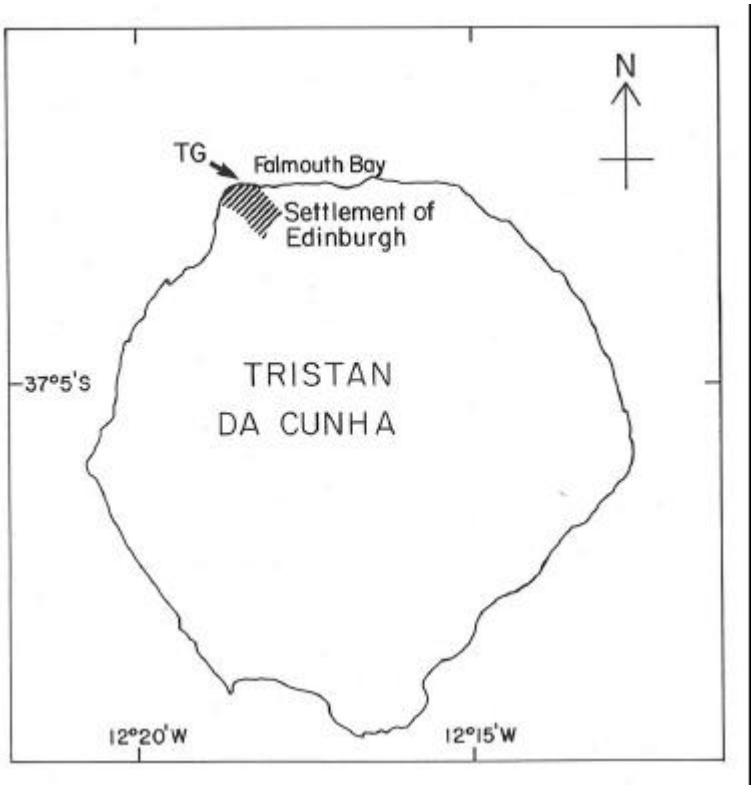


Tristan da Cunha

Latitude: 37° 03.0' S Longitude: 012° 18.0' W

Instrument type: Digiquartz pressure sensor

Site of Gauge: Tristan da Cunha harbour (data logger in the nearby settlement of Edinburgh).



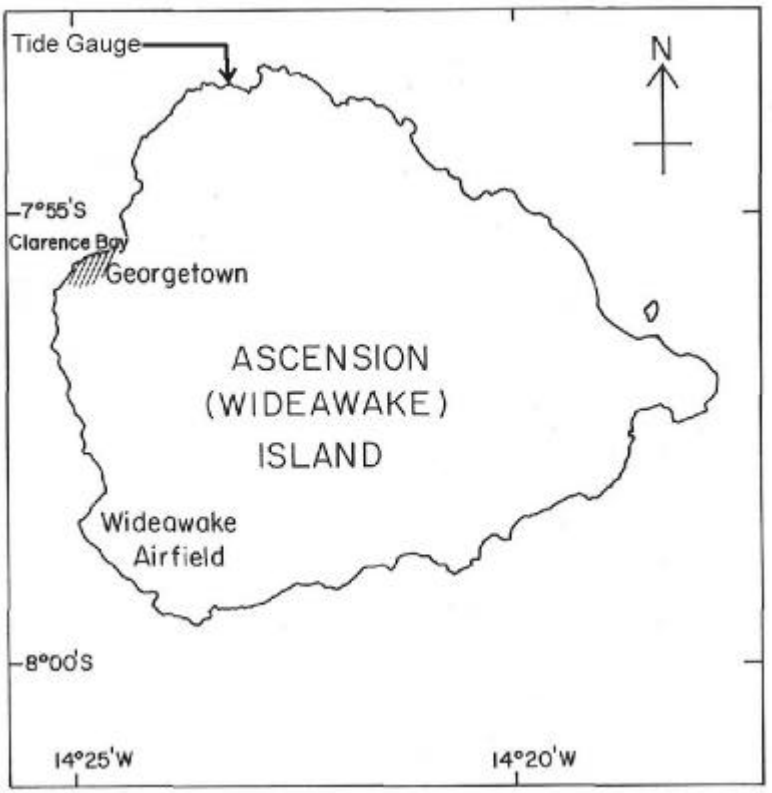
Ascension

Latitude: 07° 54.0' S Longitude: 014° 23.0' W

Instrument type: B gauge (pressure gauge)

Site of Gauge: English Bay, Hook Jetty.

Benchmarks and Benchmark relationships:
“Ascension B-datum March 1999” is 3.176m below benchmark POL13 (POL13 BM).



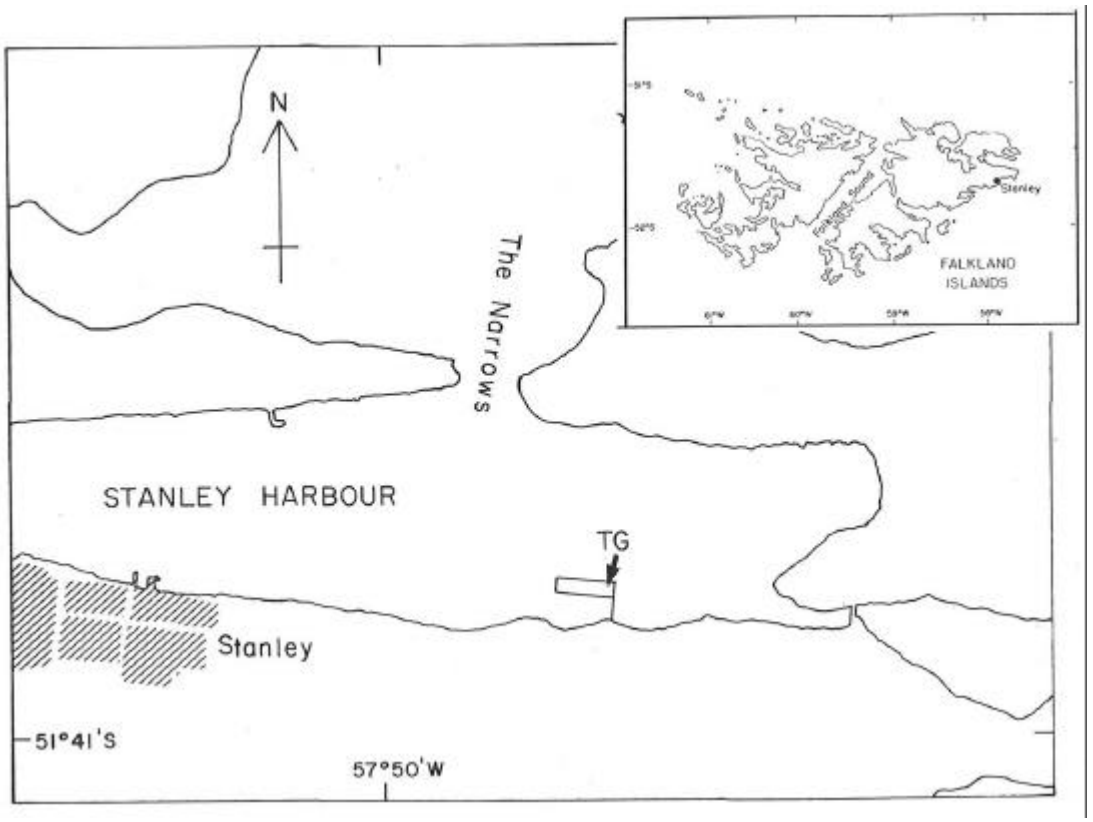
Port Stanley

Latitude: 51° 41.0' S Longitude: 057° 49.0' W

Instrument type: B gauge (pressure gauge)

Site of Gauge: Eastern end of Port Stanley harbour by the 'floating warehouses' (FIPASS).

Benchmarks and Benchmark relationships:
“Stanley B-datum November 1998” is 2.935m below benchmark A (BM A).



St. Helena

Latitude: 15° 55.0' S Longitude: 005° 43.0' W

Instrument type: B gauge (pressure gauge)

Site of Gauge: Jamestown Harbour, by the landing steps.

Benchmarks and Benchmark relationships:
“St. Helena B-datum April 1997” is 2.871m below the top step benchmark (BM top step).

In October 2001 a rock fall destroyed power supplies to the gauge so that there will be a gap until August 2002. In addition, the gauge was taken out by the local people and reinstalled in the gap. Special attention must be paid to the reinstalled datum in the next batch of data.

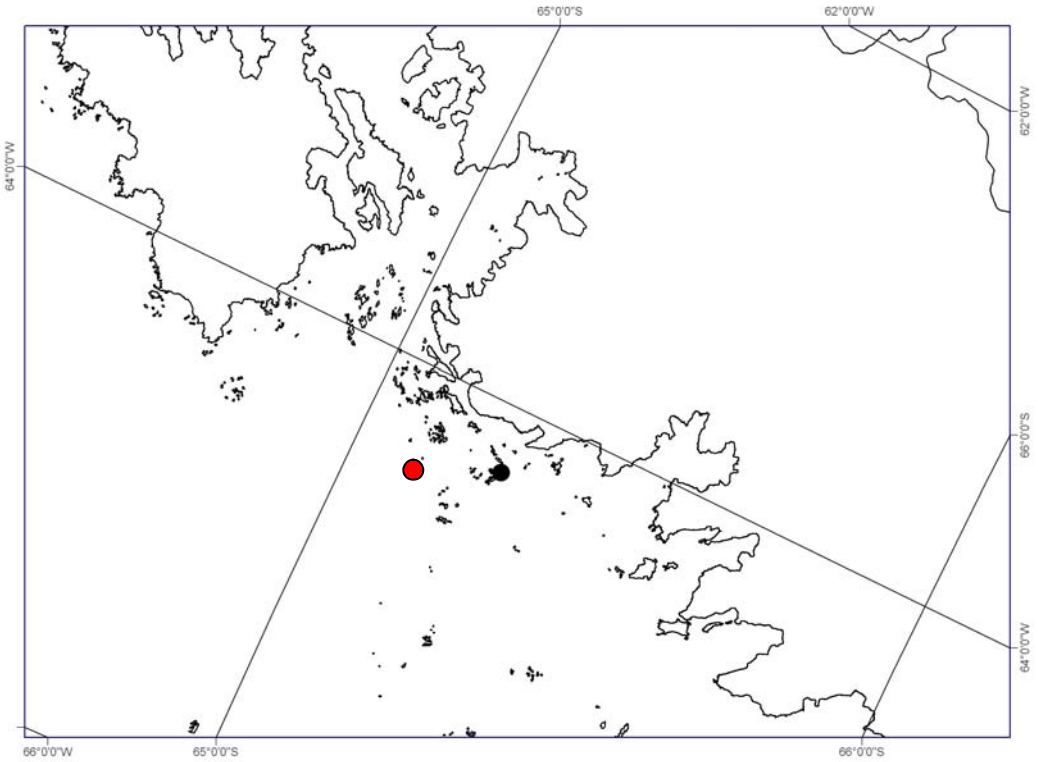
Faraday / Vernadsky

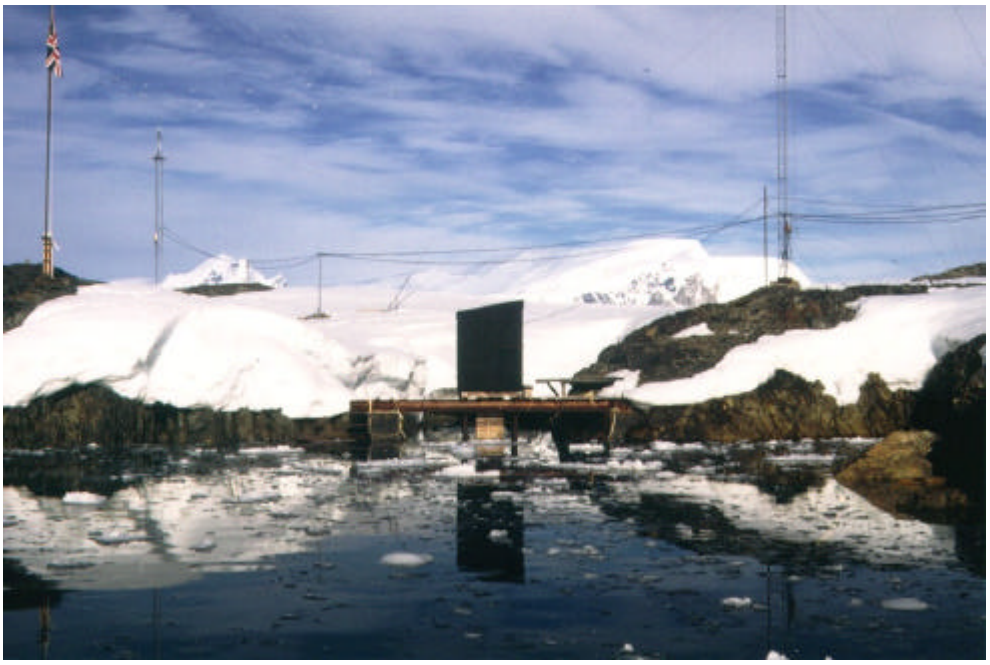
Latitude: 65° 15.0' S Longitude: 064° 16.0' W

Instrument type: Float gauge and digiquartz pressure sensor.

Site of Gauge: Located in tide gauge hut near to camp.

Benchmarks and Benchmark relationships:
TGZ = 2.750m below benchmark C (BM C).





South Atlantic Activities in 2004

Maintenance activities were kept to a minimum in 2004 as we were heavily involved in the RAPID project. A short visit was made to Port Stanley to replace the memory card. However, we were unable to visit either Rothera or Vernadsky due to ice conditions. Local scientists at both Rothera and Vernadsky were able to replace the memory cards for us and send them back for data processing. At Rothera the card change caused some problems which we were fortunately able to resolve with guidance by FAX and email.

No other stations were visited during this year.