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“OS Tidal observatories at Felixstowe
and Dunbar”

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The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

The Ordnance Survey tidal observatories at Felixstowe and Dunbar

Michael Spencer

In *Sheetlines* 114, Richard Oliver reviewed a new book about the Newlyn Tidal Observatory, whose observations from 1915 to 1921 were used to fix the datum level for altitudes throughout Great Britain. The book refers to the two other such establishments, on the east coast of Great Britain, which did not last long; and at the end of the review Richard wonders what became of them.

All three sites were established because it had become apparent that the First Geodetic Levelling of 1840 to 1860, using bench-marks mounted mainly on buildings, did not meet the twentieth-century standards of accuracy. A Second Levelling, using Fundamental Bench-Marks mounted in solid rock, was undertaken from 1912 to 1921, and new measurements of tidal levels were required at the same time, because the old datum based on ten days of readings at Liverpool was strongly affected by the flow of the Mersey at the port. The sites of the three new tide gauges were chosen to be well away from any major estuary.

Dunbar



The observatory building, erected in 1913, is now the harbourmaster's office. It is a small stone building on the edge of the very narrow entrance to the harbour, tucked closely under the steep cliff topped by the ruined Dunbar Castle. Although the site is not shown explicitly on the map, *figure 1* is an extract from Haddingtonshire Sheet 7.NW, annotated to show the position. The interior comprises a single room about ten feet square, with a linoleum floor tacked and screwed down to near immovability. Under it is the shaft in which the measuring device floats on the water surface, connected to the water in the harbour by a narrow pipe always below water level. This

arrangement is designed to permit the water level in the shaft (the 'stilling well') to respond to the diurnal tidal variations in the harbour entrance, but to be much less affected by very short-term fluctuations such as are produced by strong waves. Unfortunately, the actual readings obtained are to some extent affected by the domestic habits of various eels and crabs.

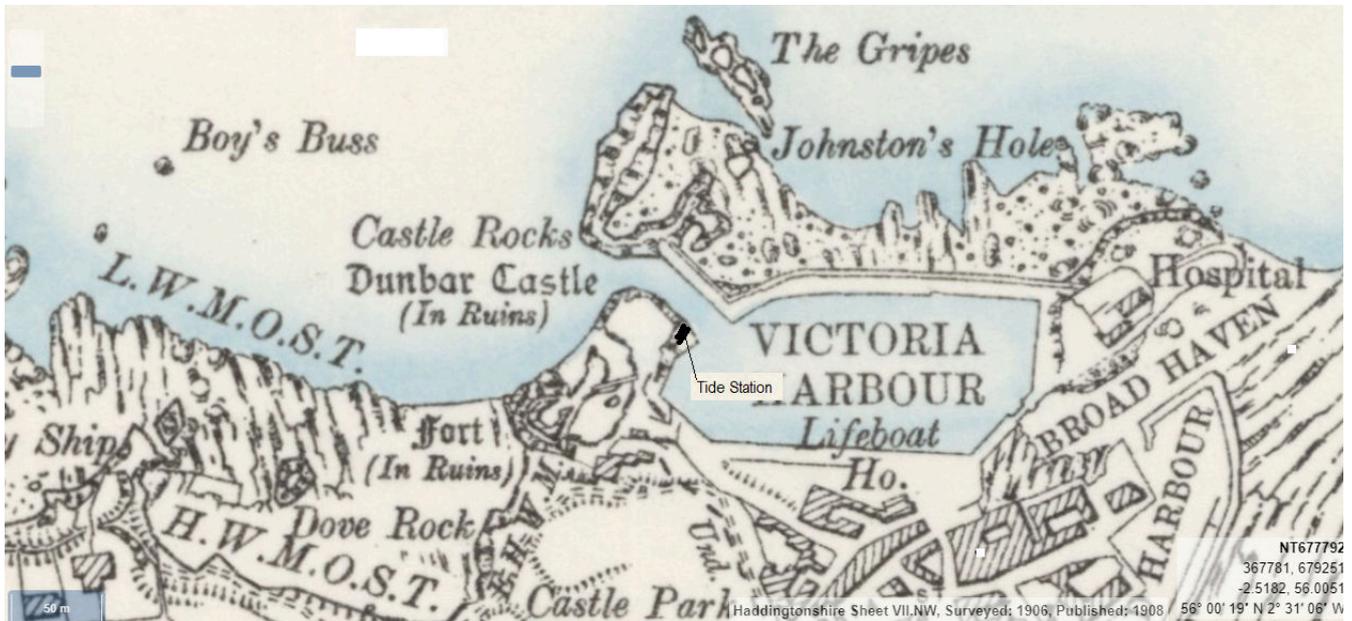


Figure 1

Although there is what appears to be a data logger sitting on the windowsill of the office, it is not part of the National Tide Gauge Network, a series of 43 stations throughout the UK controlled and monitored by the National Oceanography Centre for the Environment Agency. I have not been able to discover where, if anywhere, the readings at Dunbar are now sent, and it seems fair to discount it entirely for anything more than historical interest. The situation at Felixstowe is even worse.

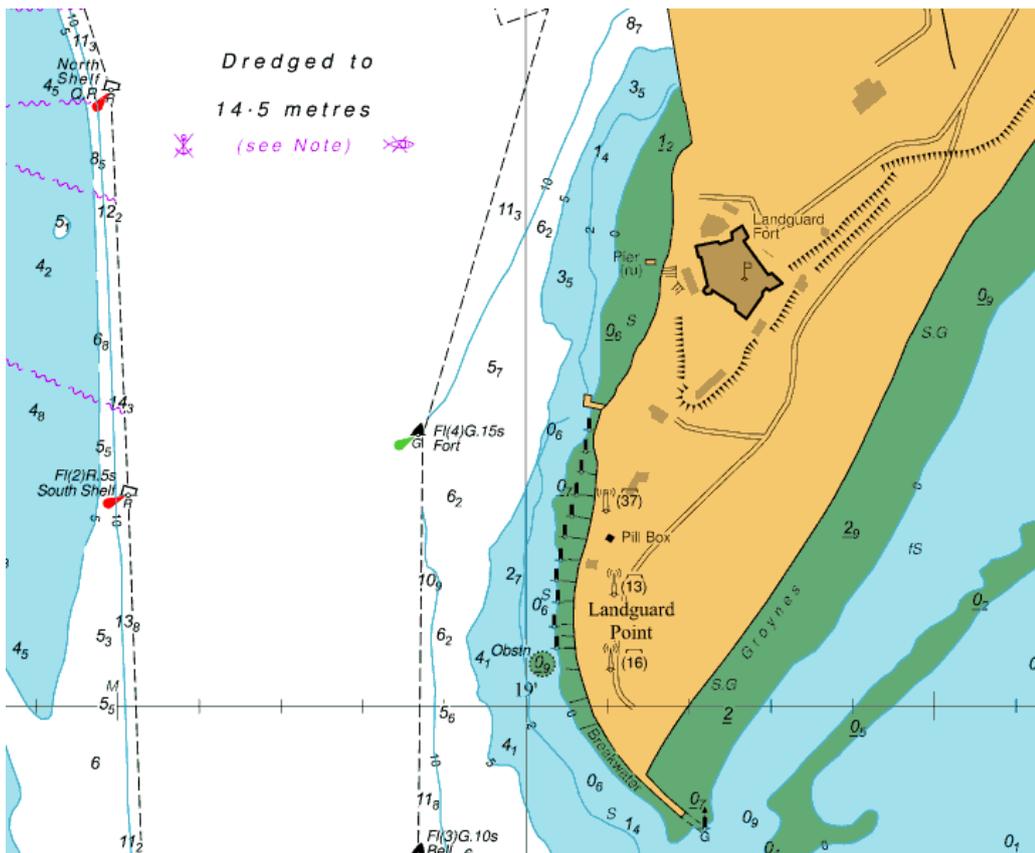
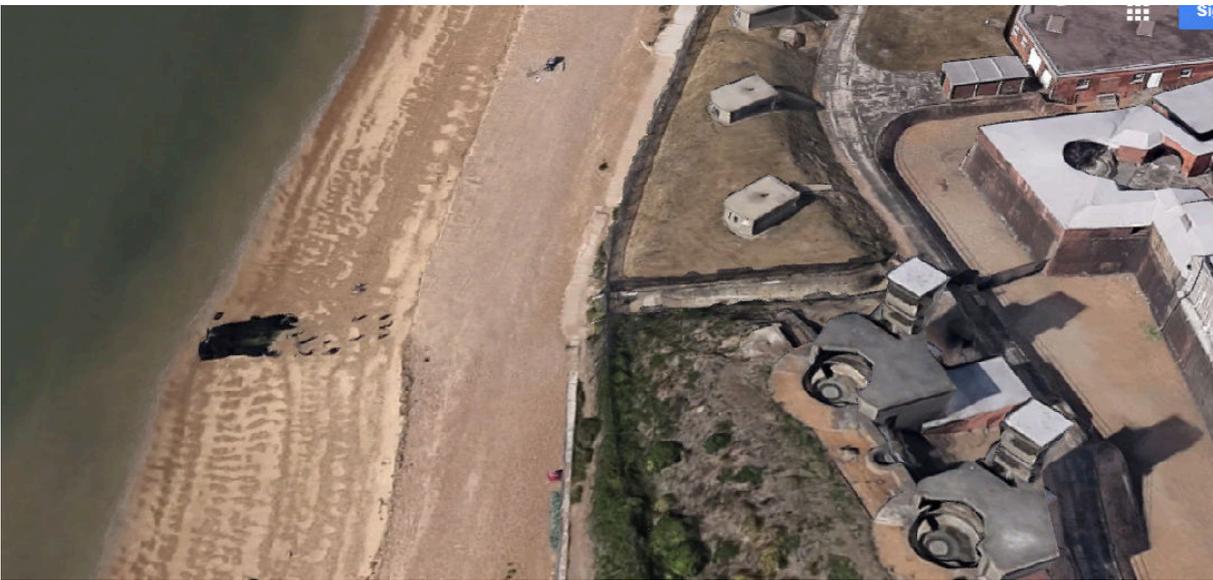
Felixstowe

The site of the 'Ordnance Survey Tidal Station' is clearly marked on the six-inch Sheet 89SE of Suffolk (*figure 2*). Although not published until 1928, this map was revised in 1925 and "Adjusted to the New Geodetic Levelling and Newlyn Datum in 1925 and 1927" – this was the Second Geodetic Levelling already referred to. The Station was established in 1917 on a jetty extending into Harwich Harbour, and readings were taken for a short time only. It may have been already out of use by the time the map was published.

Figure 3, kindly provided by our member Michiel Rademakers, shows an extract from the 25-inch ESRI World Imagery layer ¹ used by the National Library of Scotland, overlaid with the transparent 25-inch Sheet Suffolk 89.12 of 1902. This sheet already shows the jetty with its distinctive shape, but of course without the Tidal Observatory. Notice in particular the walled walkway leading from the fort towards the jetty, which Michiel points out is an indicator of the location of the jetty.

¹ ESRI is the American company Environmental Systems Research Institute, a supplier of geographic information systems software.

Comparisons between the readings taken at the three sites showed that Newlyn and Felixstowe were very closely in agreement, to about half an inch; but Dunbar was well away from this result, differing from Newlyn by about 10 inches, about five times the estimated likely difference due to the probable errors in the levelling. It was therefore concluded that there was some kind of north-south ‘slope’ to the average sea surface around England, and the readings at Dunbar were discounted as being irrelevant to any kind of ‘standard’. Newlyn was then fixed as the basis for the OS Datum. The station at Felixstowe, giving results so close to those from Newlyn, was declared surplus to requirements, and was taken over by Harwich Harbour, who had a similar jetty nearby. It would appear that it was soon allowed to go to rack’n’rooney, and the present-day Google satellite view (*figure 4*) shows almost no trace of it at all. The walled walkway from the fort is still noticeable.



Above:
Figure 4

Left:
Figure 5

A further confirmation of the position is given by *figure 5*, which is an extract from Admiralty Chart 1491 dated Dec 2017, on the six-inch scale (well, all right, 1:10,000). This is not coy about showing the Landguard Fort, and also marks a “ruined pier” in what I would like to think is exactly the right position relative to it.

The idea of the ‘slope’ has been disproved by modern research, and it is now considered to be an artifact of errors in the Second Geodetic Levelling. This in turn may have been the wellspring of the Third Geodetic Levelling of 1951 to 1959. Nevertheless, there will be no further such levelling exercises, since it is now possible to determine the heights of MSL above the reference ellipsoid at tide gauges using GPS measurements of their benchmarks. (This should provide an answer to the question I raised ² about establishing the difference between Newlyn and other local datums, such as Stornoway.)

² *Sheetlines* 114, 10.