

Recording Positions for Marine Sites Guidance for use with the Home Front Legacy and CITiZAN apps

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Introduction

This guidance has been prepared to provide support for people who are using the Home Front Legacy (HFL) or CITiZAN apps to record sites of archaeological interest at sea. The guidance has been prepared during projects by Fjordr Ltd. for Historic England on the East Coast War Channels and the Dover Sector.

Information about using the HFL and CITiZAN apps can be found in an accompanying document. Please see Fjordr's web pages for further information www.fjordr.com.

One of the biggest differences between recording sites on land and at sea is the difference in the way that positions are referred to. This applies to documentary and cartographic sources (i.e. maps/charts), to secondary sources such as books, to online sources, and to position-fixing using hand-held GPS and mobile phones, for example.

These notes are intended to highlight key features of different ways of recording position, and their implications for recording sites of archaeological interest.

National Grid References (NGRs)

On land, it is usual to record archaeological sites using National Grid References (NGRs). Both the HFL and CITiZAN apps use NGRs.

NGRs are x and y co-ordinates from an origin to the south west of England. NGRs count in metres. In their fullest form, NGRs consist of a six-figure easting and a six-figure northing, giving 12 figures all together. For example: NGR 583054 173471 is a position 583.054 km east and 173.471 km north of the Ordnance Survey origin. CITiZAN uses 12 figure NGRs in this format.

In archaeological practice, it has been common to use the Ordnance Survey's grid letters for 100km squares, which take the place of the first figure in each six-figure easting/northing, hence:

12 figure NGR:	583054	173471
can be represented as:	TQ 83054	73471

HFL uses 10 figure NGRs with grid letters in this format.

Please bear in mind that it has also been common practice to present less precise positions by using shorter grid references. For example, TQ 830 734 would indicate a position precise only to a 100m square.

These short grid references are sometimes made up to a longer grid reference by exchanging the grid letters for numbers and filling in with zeros at the end, hence TQ 830 734 might also be represented as 583000 173400, even though the position is still only known to a 100m square. In general terms, if there are several zeros at the end of an NGR it usually implies that the position is not accurately known, not that the site is within a metre of the precisely stated point.

NGRs are based on a datum known as OSGB/OSGB36 (Ordnance Survey Great Britain 1936) or BNG (British National Grid).

Marine positions differ from NGRs for two reasons. First, marine position-fixing often uses a different datum – commonly one known as WGS84 – rather than OSGB. Second, marine positions are often presented as latitude and longitude – in degrees – rather than in metres.

WGS84

WGS84 covers the whole globe and is commonly used in GPS units, including those used at sea. Because OSGB36 and WGS84 are different datums, they use different mathematical representations of the globe. Using the wrong datum can make something appear in the wrong place on a map, perhaps by as much as 80 metres around the UK. This is too big a difference for archaeological purposes, hence it is very important to be aware of datums (sometimes referred to as projections) when representing positions.

There are various online apps that can be used to transform positions from one datum to another, such as between WGS84 and OSGB36. For example, the Ordnance Survey provides a transformation tool at <https://www.ordnancesurvey.co.uk/gps/transformation/> which can be used for converting single points. They also have a transformation tool for doing 'batch transformation' of multiple points.

Please note that the OS co-ordinate transformation tool refers to ETRS89 rather than WGS84, but for the purpose of recording the position of archaeological sites OSGB and ETRS89 can be regarded as synonymous. Also, the OS co-ordinate transformation tool includes provision for adding the height; this can be entered as 0 for marine sites as most are at or close to sea level.

There is another useful co-ordinate transformation site at 'Nearby' (<http://www.nearby.org.uk/coord.cgi?f=conv>) and there are several mobile apps available.

Latitude and Longitude: degrees, minutes and seconds

Degrees, minutes and seconds are the traditional unit for measuring positions at sea, obtaining an x, y co-ordinate by measuring the angle east or west from the Prime (Greenwich) Meridian for x (longitude); and the angle north or south of the equator for y (latitude).

Latitude and Longitude are measurements of angle not of distance, even though they appear as distances when mapped on a chart. Although the relationship between latitude

and distance is practically constant (1 minute of latitude = 1 nautical mile), degrees longitude equate to different distances depending on how far north (or south) you are from the equator. Consequently, it very important to remember that degrees (and minutes and seconds) of longitude (x) do not represent the same distance on the ground as degrees (and minutes and seconds) of latitude (y). Hence when using Lat Long the x and y axes have different scales, even though they count in the same units.

As a reminder, there are 60 seconds in a minute, and 60 minutes in a degree. Even this can feel unusual if you are used to counting in tens using NGRs.

There are three different ways to refer to positions represented in degrees, all of which are quite common. The same position can appear very different according to how it is displayed. For example, all these positions refer to the same point:

Degrees Minutes Seconds	(DMS)	51° 25' 50.4" N	00° 37' 54.9" E
Degrees Decimal Minutes	(DDM)	51° 25.840' N	00° 37.915' E
Decimal Degrees	(DD)	51.43067° N	0.63193° E

There are many variations in how these formats are punctuated, so please take care. For example, the survey history section of UK Hydrographic Office records does not punctuate DMS at all, so they appear as two 6-figure references. For example, 51° 25' 50" N 00° 37' 54" E might be represented 512550N, 003754E – almost like an NGR.

Whatever the format, Lat Long positions must always denote whether they are North or South of the Equator, and East or West of the Prime Meridian. This is simple for Latitude, as all UK sites are North (N). However, the Prime Meridian cuts straight through Britain, so it is extremely important to be clear as whether your co-ordinate is to the east or the west of the Meridian. The scope for confusion is considerable, especially as the Meridian crosses the east coast in Holderness, East Yorkshire. This means that positions of sites north of Holderness will often be 'West' even though they are on the east coast. On the south coast, the Prime Meridian passes just to the west of Newhaven in Sussex: everywhere east of Newhaven is 'E'; everywhere west is 'W'.

Please also bear in mind that positions to the west of the Meridian count upwards to the left; this can take some getting used to if you more commonly use OS maps that count upwards to the right. Sometimes, Longitude is represented as a negative number if in the west, i.e. -0.63193 in place of 0.63193 W.

Please note that Lat Long positions are traditionally presented as Latitude then Longitude, or northing before easting (y before x), rather than easting then northing (x,y). Yet another thing to bear in mind!

UTM Co-ordinates

There is a further way in which positions in WGS84 are sometimes displayed, known as UTM (for Universal Transverse Mercator). UTM co-ordinates are like NGRs in that they count in metres, they represent the same distances on both x and y axes, they always count

upwards to the right (and the top) and the easting is usually presented before the northing (i.e. x,y).

Unlike NGRs, however, UTM covers the whole world, so to make the numbers manageable the globe is split into zones. As UTM co-ordinates repeat in each zone, you must specify which zone you are referring to. The UTM zones use the Prime Meridian as a dividing line, so the east coast falls into two different zones: 30U if to the north (i.e. west) of Holderness; 31U if to the south (i.e. east). On the south coast, UTM zone 30U encompasses the area west of Newhaven; 31U encompasses the area east of Newhaven (see https://en.wikipedia.org/wiki/Universal_Transverse_Mercator_coordinate_system#/media/File:LA2-Europe-UTM-zones.png).

Hence the UTM co-ordinate for the position referred to above is:

31U 335386 5700379

Precision

When making conversions, please avoid the spurious precision that can arise from calculators. If you are using an online tool, it will often calculate the transformation to many decimal places. If converting to NGRs, then it is simply a case of rounding up to a whole number because the last figure of 12 figure NGR (or 10 figure with letter codes) gives precision to one metre, which is quite adequate for recording site positions.

Precision is less apparent when working with degrees, minutes and seconds and their variants. It also should be borne in mind that the 'distance on the ground' of degrees, minutes and seconds is different in latitude and longitude. Nevertheless, the following rules of thumb can be used to indicate satisfactory precision for recording marine site positions to within a few metres:

Form	Satisfactory Precision	Distance on the ground (lat)	Distance on the ground (long)
Degrees Minutes Seconds	0.1 second	c. 3.0m	c. 1.9m
Degrees Decimal Minutes	0.001 minutes	c. 1.8m	c. 1.1m
Decimal Degrees	0.00001 degrees	c. 1.1m	c. 0.7m

If you are conducting a higher resolution survey within a site using differential GPS then greater precision is warranted, but if the purpose is simply to record the location of a site then there is little value in recording more decimal places than suggested here.

Also bear in mind that a calculation may lend spurious precision to a less precise source. If the source provides a position accurate to a minute, e.g. 54°21' it can be misleading to represent it to a metre in an NGR by virtue of co-ordinate transformation.

If you have any questions about positions at sea, then please don't hesitate to get in touch.
