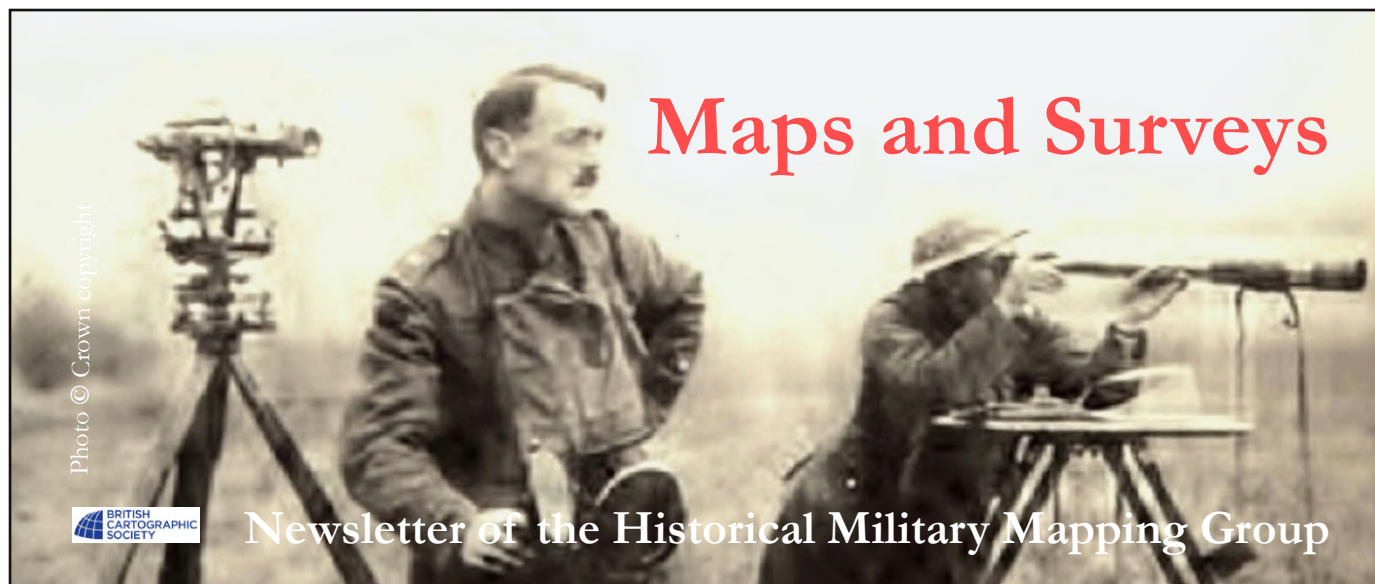




Maps and Surveys appears in spring, summer and autumn. The Newsletter welcomes contributions - please contact Liz Bourne, BCS Administration (admin@cartography.org.uk) for information. Editor: Paul Hesp (Paul.Hesp@dei.at).

Summer 2022

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From the Editor

Volunteer projects can get out of hand. What started as an unpaid cataloguing job for the Imperial War Museum has become a full-fledged georeferencing project for World War I maps. Howard Anderson reports on it in the first contribution to this issue.

I have gone back to my roots in the province of Utrecht, Netherlands, where a massive 19th century engineering project resulted in a defence system that never saw any fighting. It did become a UNESCO World Heritage site, though.

Do you have a volunteer project for the next issue?

Paul Hesp



Fragment of a Turkish 1:5 000 map (scaled up from 1:25 000) of the Ari Burnu ('Anzac Cove') area. Prepared just after Gallipoli's evacuation. British lines in blue, Turkish in red. Some key landmarks: Piers and tramways, with SS Milo serving as a breakwater (1); Plugge's Plateau (2); Shrapnel Valley (3); and Lone Pine (4). Abandoned boats can be seen by the shore. Translations of Turkish toponyms specifically referring to the campaign in red.

See the contribution by Howard Anderson on p. 2-4. Map reproduced by kind permission of the Imperial War Museum. 3D flyover of the area on Youtube: [Flight around Lone Pine in Gallipoli](#). Special thanks to Delia Rahmonova-Schwarz for help with the Turkish text.



Building the Western Front Association's Mapping Project Howard Anderson

Early in 2005 a volunteer effort to catalogue the Imperial War Museum (IWM)'s Great War map collection diversified into a much larger project. The Western Front Association (WFA) provided the funds for a large scanner and the volunteers to digitise their entire Great War map collection.

In contrast with other trench map projects that provide what some consider to be the most interesting or significant maps, the decision was made to scan the entire set of maps, there being no way to discover which are the most important and to whom, military historians, cartographers or family history researchers. The only items missed were either too fragile to scan or too large. Over the period 2005-2009,

more than 10,000 scans were made and catalogued then some were made available on the WFA's Mapping the Front DVDs. The site covers the Western Front with British, French and German maps, Gallipoli and parts of the UK. It is hoped that Salonika and other fronts can be added later. We have trench maps, strategic and tactical maps, hand-drawn and official history sheets and aerial photographs.

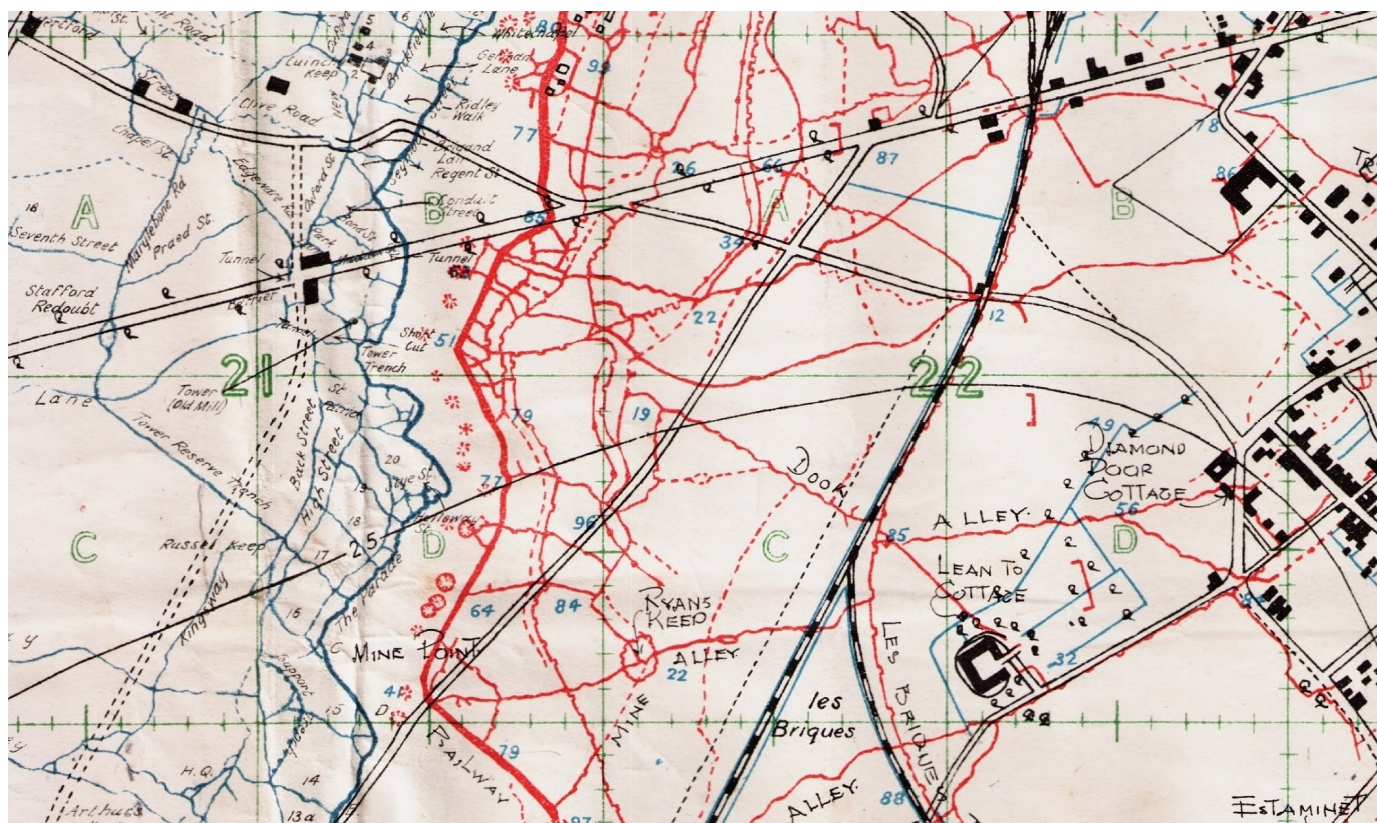
Georeferencing 7,000 maps

A number of years went by before an approach was made to the IWM to licence the maps for presentation on the WFA website. Initially the plan was to provide a simple download page but it was realised

that the WFA team had considerable knowledge and expertise in cartography and web development so the plan was changed to present a selection of maps georeferenced to various modern map layers. This was so successful in the early stages that a team was put together to georeference the rest of the collection. Of the 10,000 scans, at least 7,000 can be georeferenced. As of April 2022, a team of about 90 volunteers were working to present these maps. In-house developed georeferencing tools allow them, as non-GIS specialists, to complete the task.

A volunteer loads a map onto a bespoke webpage, enters the sheet number and marks the four

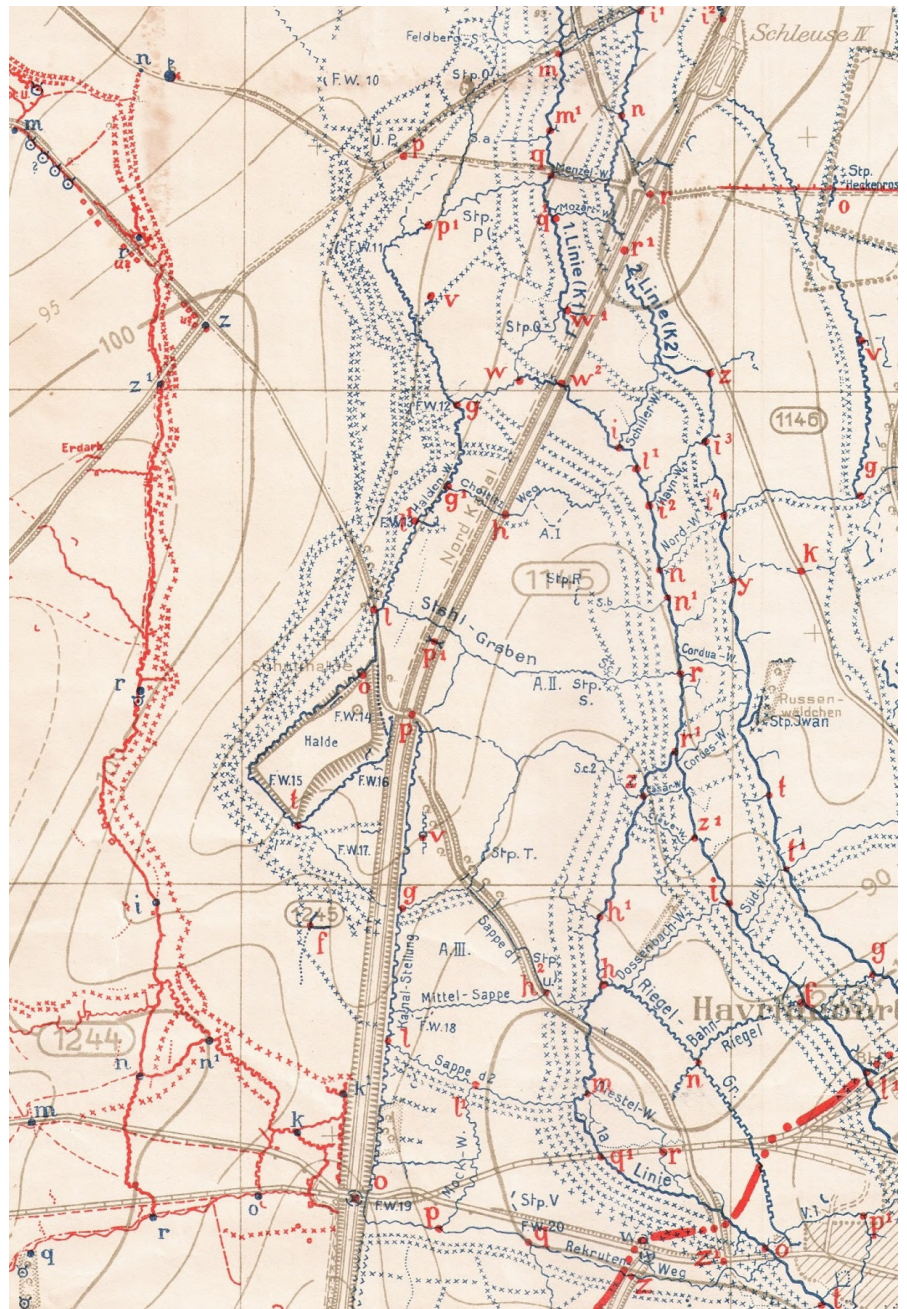
Map 1. Fragment of a secret British 1:10 000 map (36C NW1, 1915) of the Battle of Loos area. British trenches (corrected to 10-9-1915) in blue, German trenches in red. Secret maps were not available below brigade HQ level.



corners. On completion, the system crops the image, notes the image size in pixels and stores those along with pre-calculated corner coordinates in a file ready to be georeferenced using QGIS, an open-source desktop GIS. The map is cropped to be able to move seamlessly to the next sheet. Although QGIS will produce the large number of small PNG map tiles for web presentation, it was found that they often suffered from too many random no-data/transparent pixels, so Maptiler is used instead, very successfully. The team is also schooled in georeferencing using ground control points, a technique useful when the map is not a regular sheet or for the French *Système Lambert* sheets with unknown corner coordinates; however, this is far slower.

The British maps were generally drawn in Bonne projection referred to the Brussels observatory but are georeferenced in Web Mercator/World Geodetic System (WGS) 84. It was found after considerable experimentation that treating the Bonne maps as plain rectangular sheets with the pre-calculated corner coordinates in WGS84 resulted in a re-projection error to Web Mercator of the same order as the paper distortion of the original maps. This greatly simplifies the production process. Users are generally unaware that any transformation error exists.

The task of converting the Great War map references to WGS84 took a long time and a great deal of research and experimentation. Initially two people worked on this problem independently, Bill Frost in Australia and BCS-member Howard Anderson in London. After discovering the parallel effort via discussion on the Great War Forum, Bill and Howard met in London and agreed to share results. Howard Anderson took responsibility for scanning and cartography, Bill Frost



Map 2. Fragment of a German map 1:10 000 dated 11-11-1917, showing the front line with trenches, barbed wire, targets, etc. Blue: German lines; red: British lines.

for web development and cartography.

Improving accuracy

On the face of it, when using modern software, it should be a trivial task to transform Belgian Bonne coordinates to WGS84 but that always failed to produce a useful accuracy: the displacement was not consistent across the graticule. Documents of the period included on the website show there was considerable confusion and

error in the French trig tables and 19th century 1:80 000 French maps used to prepare maps for the British army so it was clear that a normal approach to transformation would not work. The British army had gone to war in 1914 without any adequate large-scale maps so, lacking a good quality survey for new mapping, they set about redrawing from the 1:80 000 French sheets; any errors in those were retained. In 1915, some features were displaced by as much as 150 yards so the project conversion effort concentrated on later maps.

Paul Hesp - THE NEW WATER LINE

Three Roles of a Dutch Defence System

According to recent data of the Dutch Ministry of Transport and Water Management, the house in Utrecht where I was born stands at 2.20 m. above sea level; the house where I grew up 10 k. to the east, in the municipality of de Bilt, at 5.12 m. The lowest point on a straight line between the two is 0.54 m. above sea level. These differences in elevation were once of strategic importance.



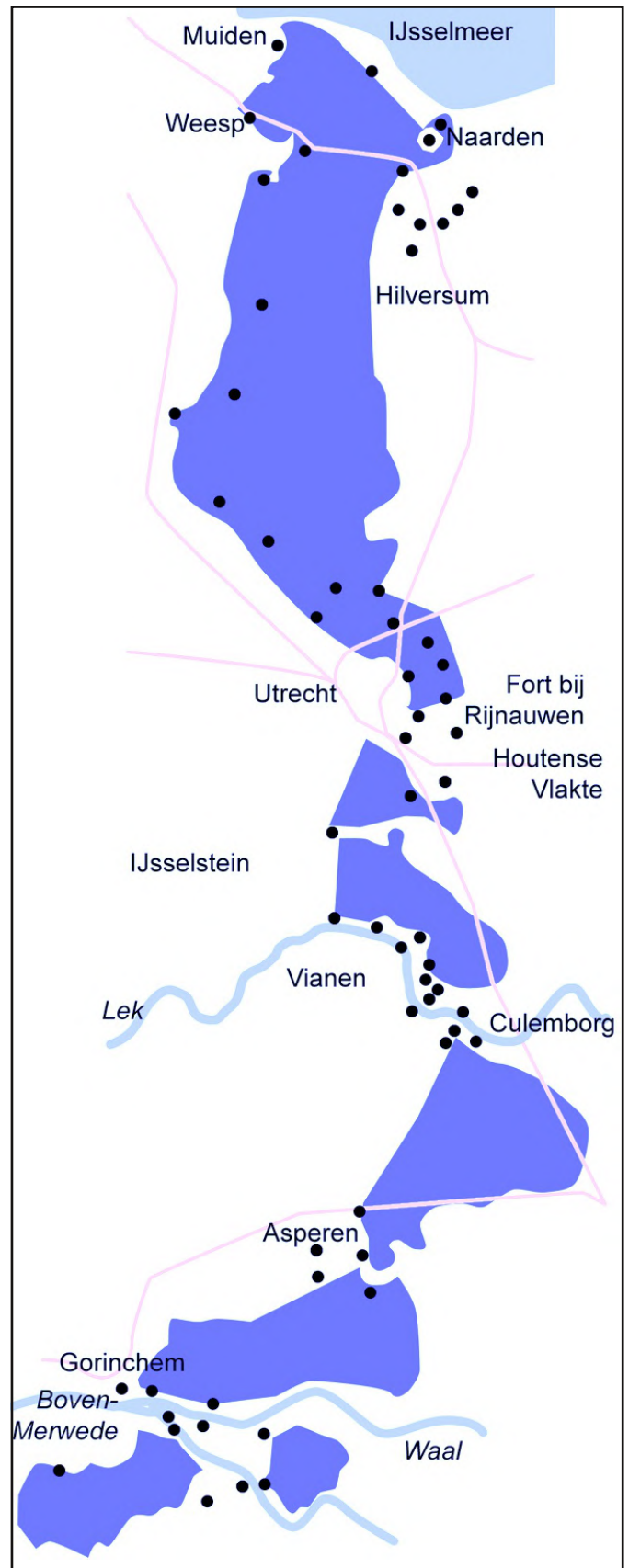
The author surveying terrain at 5.12 m. above sea level, 20 August 1944. Source: collection author.

When you draw a line from the southwest to the northeast of the Netherlands, most of the country west of that line would be under water without dikes. Because land subsidence was an inevitable side effect of draining the vast Rhine/Meuse delta bogs for farming from the early Middle Ages onwards, dikes not only keep the sea out but also prevent the rivers from flooding the polders.

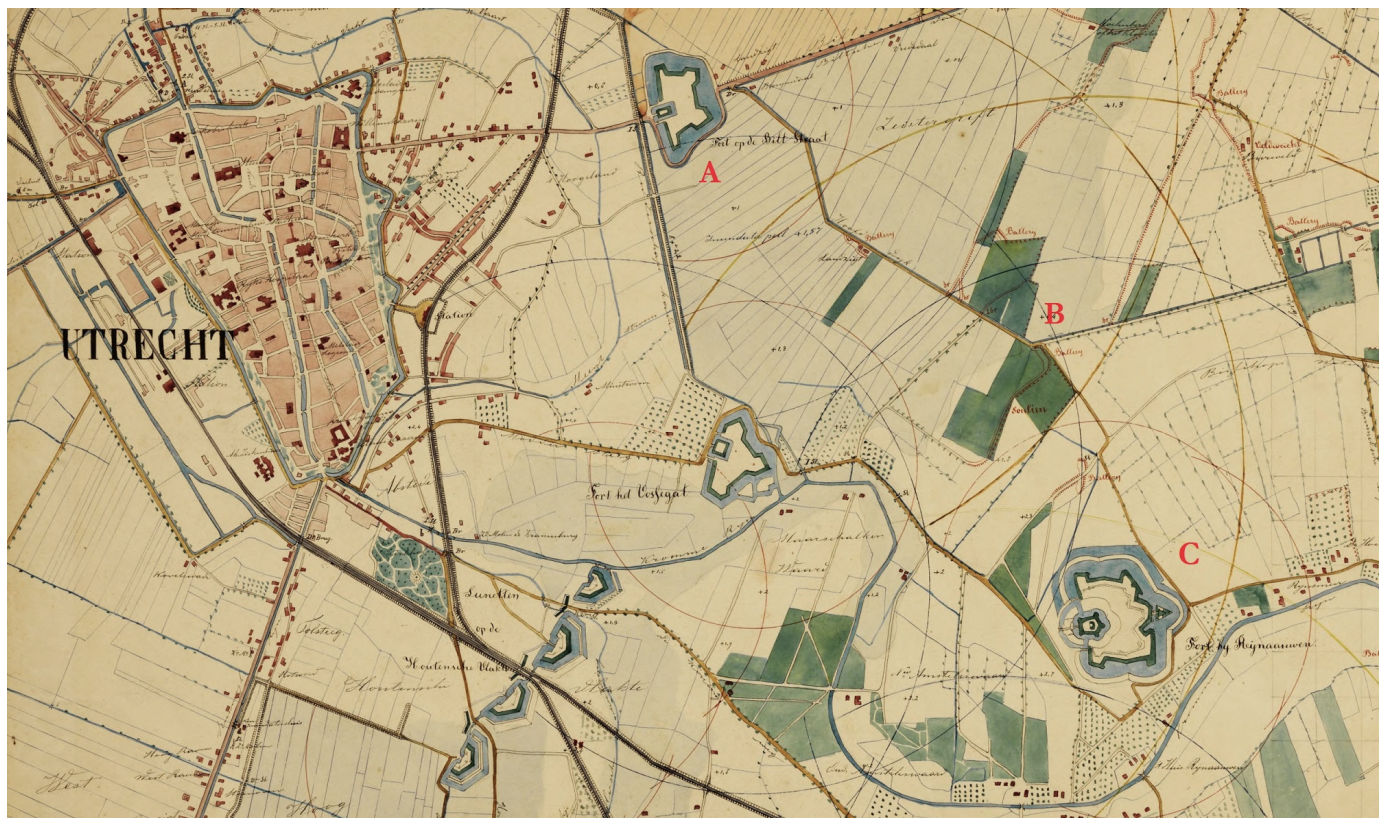
An instrument of war...

Re-flooding was first used as a defence method in the 1570s, during the long war of independence against the Spanish Habsburgs. The French invasion of the Dutch Republic in 1672 prompted the creation of a permanent water-based defense system for the economic and political heartland, the coastal provinces North and South Holland.

Part of the defence system was ready-made: Rhine and Meuse protected the south. The so-called Old Water Line faced east, where invading armies had the classical benefit of high ground (in Dutch terms: all ground not liable to flooding). Through a complex system of sluices, the polders could be inundated to a point where the water was too deep for infantry yet too shallow for boats. As settlements were built on slightly higher ground such as natural river levees, most people kept their feet dry. Key access points were fortified.



Map 1. The New Water Line. Black dots: fortifications. Pink lines: railways. Source: Wikimedia Commons/Niels Bosboom.



Map 2: The Utrecht area on a 1:10 000 map from 1875/76. A: Fort de Bilt; B: location of Fort Hoofddijk (built 1877-79); C: Fort Rijnnaarden. Source: Utrechts Archief, cat. no. 216126.

In the 1820s, work started on the New Water Line further east to include Utrecht, the country's fourth largest town, which the railways would soon make a major transport and commercial centre. Land in the new line could be inundated to about 1 m. above sea level.

However, the deposits of an old Rhine course just east of Utrecht rose to a level of 2.2 m., leaving a gap in the defences, the Houtense Vlake (see Map 1). Map 2 shows the fortifications built to cover it. The circles around them indicate areas where buildings could be levelled to improve the field of fire. Only wooden buildings were allowed within 300 m.; wooden buildings with brick foundations and chimneys were allowed between 300 and 600 m., and buildings in all other materials between 600 and 1000 m. Owners of existing farms would be out of luck in case of war, and eastward expansion of Utrecht was hampered until the 1960s.

The first reliable large-scale maps of the country were published as the line was under construction, and the

military topographers soon realised that the new maps showed sensitive details of the fortifications. On maps for general use, they were therefore first blanked out and later replaced by landscape elements that were often obviously fake. On Map 3, for example, the Utrecht - de Bilt road splits in two around a butterfly of meadows. Map 2 shows that this is the location of Fort de Bilt (A). Satellite images put an end to these cartographic forgeries in the 1980s.



Map 3: Location of Fort de Bilt on a 1:25 000 topographic map from the 1920s. Source: CC-BY Kadaster.

... becomes a tourist attraction

The New Water Line never saw any fighting. Theoretically, forcing an enemy to follow narrow corridors on dike-top roads in flat, open country

would give the defenders a great advantage; but in 1940 the Germans had paratroops and bombers. After defence further east had collapsed and Rotterdam had been bombed on May 14, a German parliamentary handed over a message at Fort De Bilt: Utrecht and other major towns would also be bombed if the country did not capitulate. With virtually no air defence left, the Netherlands did so. Towards the end of the war the land was inundated again, by the occupiers. But the system wouldn't be put to the test. The Allies, whose main thrust was north and east into Germany, stopped at a German line 25 k. east of Utrecht in late April 1945. Two weeks later the country was free.

Postwar, the fortresses were still used as military depots, barracks, etc., for a couple of decades. The water line concept and the relevant legislation were finally scrapped in 1963. The eastern approaches to the country were now defended in Germany, where Dutch forces were part of NATO's presence on the Iron Curtain. The New Water Line

became a UNESCO World Heritage site and a tourist attraction. Rare plants and animals have benefited from restricted access to the fortifications, as at a number of military training grounds. Fort Hoofddijk (B on Map 2), has even become part of Utrecht University's botanic garden.

Sources

AHN Viewer | AHN (online official map showing the minute differences in elevation that play such a large role in the Netherlands).

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Rijnaauwen fortress as a green oasis. The original purpose of the trees was to strengthen the earthen embankments with their roots. Source: Wikimedia Commons/Johan Bakker.



Notice Board

Civil War maps in the US National Archives

[https://unwritten-record.blogs.archives.gov/2021/09/21/Civil War Maps from the Army Corps of Engineers Now Digitized – The Unwritten Record \(archives.gov\).](https://unwritten-record.blogs.archives.gov/2021/09/21/Civil-War-Maps-from-the-Army-Corps-of-Engineers-Now-Digitized-The-Unwritten-Record/)
Blog by Armanda R. Pritchard on Civil War era and related maps that are available to view online and download (with links).

US battle map reproductions

<https://battlearchives.com/collections>.
High-quality prints of maps of US military campaigns – Bunker Hill to Baghdad.