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# Location of the Brecourt (Normandy, France) WW2 Howitzer Battery Using a Geoforensic Search Strategy

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## ABSTRACT

The assault on D-day by Easy Company of the 101<sup>st</sup> Airborne Corps on a German Howitzer battery at Brecourt Manor (Normandy) that was firing upon Utah Beach, is a famous action of World War 2. Understanding the firefight and disablement of the guns depends on where the four Howitzers and crew were located. Three of the locations are unequivocal with post-WW2 accounts and the search described here in agreement. One Howitzer position (the northernmost of the four) remains in contention, with two different positions described. A geoforensic search strategy (desktop study, geophysics, excavation) was deployed that shows strong evidence for the location of the debated fourth gun, together with aerial photographic and military tactical evidence for why this fourth Howitzer was moved to a second location close to D-day, resolving these debates.

## ARTICLE HISTORY

## KEYWORDS

D-day; Band of Brothers; Geoforensic Search; Geophysics; Howitzer

## Introduction

The 101<sup>st</sup> Airborne Assault on Brecourt, Normandy (a German Howitzer Battery) by Easy Company (101<sup>st</sup> Airborne Corps, US Army) took place on 6<sup>th</sup> June, 1944 as part of Operation Neptune (D-Day) and has been made famous subsequently in publications, television series (most famously – The Band of Brothers) and computer games. Subsequent to WW2, the site has not been geophysically surveyed or excavated for archaeological context, resulting in different and sometimes conflicting accounts and maps being published of the location of the four 105mm leFH Light

Howitzers that are key to reconstructing the action. Providing more robust information on the layout of the site will impact these accounts, and is important as the assault is still used in military training. A television series 'Dig World War 2' by 360 Productions provided the impetus and access to this site, for which the authors carried out a standard (modified for the site) forensic search strategy (Harrison & Donnelly, 2008) to target limited excavation and attempt to establish the layout of parts of the site. This work provides some background on the Brecourt Assault, the pre-search strategy, an account of the survey and excavation results and the most definitive (to date) location of the guns and site layout.

### **The Brecourt Assault**

A very brief summary of the relevant accounts of this famous action is provided here, as there are academic and popular books (Ambrose, 2001, 2016; Brotherton, 2012; Compton, 2009; Guarnere & Heffron, 2008; Landavazo, 2011; Webster, 1994; Winters, 2005); films (the best known being the second episode HBO's 'Band of Brothers' series, based on Ambrose [2001]); websites and action games based on this event. A timeline of events provides the clearest and most succinct form of providing background.

#### *6<sup>th</sup> June 1944: Approximate Timeline*

Company E, (Easy Company) Second Battalion, 506<sup>th</sup> Parachute Infantry Regiment of the 101<sup>st</sup> Airborne (XV111 Airborne Corps) Action as part of Operation Neptune (D-Day)

- 01.30 parachute drops from C-47 (Skytrain) aircraft begin in thick cloud, followed by reorganization of units.
- 06.30 – 07.30 E (Easy) Company command taken by First Lieutenant Richard Winters at Le Grand Chemin, Normandy.
- 08.30 Winters takes 12 men from E Company and others to reconnaissance a battery of German 105mm leFH (light Howitzers), firing upon Utah Beach.
- 09.00- onwards, Winter's company discover Number 6 Battery of the Wehrmacht 90<sup>th</sup> Artillery Regiment, firing light Howitzer 105mm leFH 18s canon onto United States Army disembarkment of troops and associated landing craft at Utah Beach. Their assault begins.

Detailed and sometimes conflicting accounts of the firefight and gun disablement can be found in the sources cited above. This is not

surprising given that mapping enemy positions and taking timings is not a priority in battle, but is afterwards (in order to plan future action), from which changes to the scene may not be apparent. No disagreement occurs in the literature that the assault began at the northern most Howitzer and proceeded in various waves to the other three thereafter, and that the action was over before midday on 6<sup>th</sup> June. Contention revolves around the exact location and orientation of this first captured, northern weapon, the focus of this study, along with the other three Howitzer locations.

### **Pre-search Strategy: Desktop Study of Brecourt Manor and surrounding Area, Cherbourg Peninsula, Normandy, France**

#### *The Desktop Study in Geoforensic Search*

Geoforensics comprises application of Earth science techniques to investigations of the Search, the Scene and the Sample for legal (criminal, environmental, humanitarian, engineering and military) purposes (Ruffell & McKinley, 2008). Scene and Sample investigations commonly include the location of an event (maybe a crime scene), its sampling and mapping, and the analysis of evidence (soil, sediment: see Murray, 2011). Geoforensic Search has long-been a primary part of criminal or archaeological investigations, but has increased in visibility over the past 20 years, largely as a result of the pioneering work of Laurance Donnelly, as a strategy for the location of buried objects, commonly victims of homicide as well as drugs, contraband, victims of accidents and disasters. In short, a search strategy comprises planning (pre-search desktop studies), field deployment of personnel in assessing: 'diggability'; geophysics; geomorphology/geology/soil/vegetation mapping and a post-search ('exit strategy') evaluation. Many of the above have been historically used in searching for buried objects (e.g. Popp, 1893), but sometimes implicit and thus not described, or not conveyed in a logical manner. The Geoforensic search is well-defined (Harrison & Donnelly, 2008) with specific publications on its various elements (e.g. diggability [Harrison & Donnelly, 2008]; geomorphology [Ruffell & McKinley, 2014]; geophysics [Pringle et al. 2012] and soils [Fitzpatrick et al. 2008]) or applications (e.g. archaeology [Donnelly, 2013]), GIS (Somma et al., 2017). A general overview for those not familiar with Geoforensics or Forensic Geoscience can be found in Di Maggio et al. (2017).

### *Geographic Location & Topography*

The overall location comprises the mixed arable and grazing lands of the Cherbourg or Contentin Peninsula (Figure 1). The topography is of low relief, with 20-40m high low hills surrounded by flatlands. The former are dissected by ditches that feed some meandering rivers (that occur mainly on the latter, flatland ground, for example to the south of Brecourt is Riviere l'Escalgain (not shown) and to the north the Grand Cirque and la Petite Cirque Rau: Figure 2). More specifically, Brecourt is on a very low sloping plateau of 20-30m height and it's scarp running NW-SE, with some higher ground (40m) to the northwest. Most significantly for this project, the surrounding area to Brecourt, centered on Ste-Marie-du-Mont (hereon Ste-Marie-du-Mont Uplands, or SMMU), comprises a northerly and northeasterly facing hill, rising from roughly sea-level to the 30-40m mentioned (Figure 2). This hill extends in an arcuate fashion from la Vienville in the southeast, northwestwards along the Hartwell Road/ Siezmore Road to le Grand Hard, passing west and then southwestwards to Boutteville, producing a flat-topped spur (Figure 2) overlooking the surrounding flatlands, with Brecourt at its heart and thus an ideal location for a gun battery with which to fire on the beaches to the northeast and east. The lands around Brecourt comprise grassland with hedges and ditches, with some enclosed vegetable plots. Hedges and other field boundaries appear mature, with some having degraded or re-planted to the north of Brecourt Manor since the war.

### *Solid Geology*

The SMMU topography matches the outcropping Middle Jurassic (Jurassique Moyen - Dogger) of the area, these limestones with subordinate shales forming a resistant upland (Figure 3) surrounded by a veneer of Quaternary (Quaternaire Récent) alluvium that may overlay some Palaeogene/Neogene sands, clays and gravels), in turn overlain by coastal deposits of sand (Utah Beach) to the east and estuarine silts and clays (Bancs du Grand Vey).

### *Drift Geology and Soils*

The Middle Jurassic strata produce thin, clay-rich soils. Extensive working of the land will have modified such and mapping of any exposed drift, so digging/augering a safe section in the survey site was recommended. Further information on soil type and drift geology was

ascertained on site with a diggability survey (see Harrison & Donnelly, 2008) which is/was probably unnecessary, as the ground has dug ditches and could have had the batteries dug in, although these could be in preexisting ditches, soft drift geology or dug into strata of softer Jurassic bedrock (shales interbedded with the limestones of the Brecourt area and SMMU plateau).

### *Possible Search Strategy*

This is strongly dependent on the above, but considered:

- witness statements of location, in this case mainly historical books written by men of Easy Company and associated soldiers, plus military historians thereafter.
- changes to the area in the last 60 years (post-battle aerial imagery [1947], compared to recent).
- field survey nature of the geology, drift, engineering and geography of the location, obvious depressions in the ground (both fields and hedgerow ditches).
- nature of the agricultural use of the land.
- diggability of the ground.
- geophysical response (see below) such as number of metal detector hits (there will be many in such ground, but frequency may reflect the position of most use and burial of metalliferous materials).

## **Results**

### *Historical Accounts and Reconstructions*

The multitude of maps and accounts given for the Howitzer positions is almost as exhaustive as those of the nature of the action (above). To summarise these, we have divided accounts into three options, outlined below.

*Option 1* – all four Howitzers along the hedge (guns 1 to 4, below, with Gun 1 furthest south), opening fire onto Utah Beach to the east. These are all available online, and a search of the titles below provides a link to the appropriate site.

- Winter's map (at the memorial on Le Grand Chemin, numerous images are available online, for example that by Jeroen Gijsselhart on Flickr.com.). Alexander (2011) suggests that this is not Winter's map, but that he inscribed/signed one drawn by the owner of Brecourt Manor at the time, Michel de Vallavielle.
- Normandie44.canalblog by Paul Woodage

*Option 2* – three Howitzers along the hedge (guns 1-3), one facing north (conjectured Gun 5)

- MHweb
- Boardgame Geek
- Atlantic Wall in Normandy
- Jay's Wargaming Madness
- Tripline
- Snakebyte but overlain onto aerial imagery from Tripline
- desperataferres but from Tripline
- Perry's Heroes: includes models of the Howitzers and assault, but no NE corner MG42 position (see below).
- DAY Overlord Le forum du débarquement et de la bataille de Normandie.

*Option 3* – three Howitzers along the hedge, 1 facing north, but with a German MG42 in the NE corner, either where or next to, the northernmost, fourth Howitzer may have been in Option 1.

- Matt Fife (writing as Graphicassault06)
- Tom Carter (writing as FReeper Foxhole -
- Heroesforever
- Gettysburg Museum of History

A summary of the options provided above is given in Figure 4, with the contentious northmost position shown as ?4 and ?5.

Anecdotal information from the current landowner, provided when on site, stated that following the assault by the 101<sup>st</sup> Airborne, the field to the north-east of that with the Howitzer battery was used as an Allied field hospital, and that any excavations associated could have been filled with damaged/useless German artillery materials and hospital debris.

#### *Changes to the Area*

A 1947 overflight (available online via the Gettysburg Museum of History website) of the area is critical in this regard (Fig. 4) which shows the three unequivocal locations for the southernmost Howitzers (red dots, placed to the east to allow the field marks to be seen). To the west of the red dots are the large white patches where the Howitzers were in 1944, or moved out of the hedgerow after D-day and closer to the date

of the 1947 imagery. To the west of each large white patches there are small white patches, some in a row of two or three, running west. A white line can be seen parallel to the hedge, connecting each of the larger white patches. The northernmost (fourth, contentious) Howitzer location (marked with yellow dot labelled 4? on Fig. 4) is shown on the 1947 overflight as a white patch, like its unequivocal neighbours (guns 1-3) to the south. However, the contentious northmost position does not have the row of smaller patches, running to the west, or indeed smaller white patches emanating in any direction, including south (see below). Even more tantalizing is a fifth white patch (marked with yellow dot -5? on Fig. 4) in the position conjectured by some to have been the fourth Howitzer, facing north. Neither contentious (yellow dots, ?4 and ?5) positions are as obvious as those (red dots 1-3) to the south. The MG42 machine gun position could also be seen as a pale patch, between positions 4? And 5? (Fig. 4).

Subsequent to 1947, the area returned to arable land with varied grazing animals through the next 65 years. At the time of the survey (2011), the field was used for hay harvesting and racehorse grazing.

#### *The Field Survey and Diggability*

Soil maps at a detail sufficient for the field in question (Figure 4) were not available prior to, or during the survey. To characterize the soil for predicted geophysical response, 'window' or gouge-type augers were sunk (at safe locations) and logged to the south and west of the main area of study. One of these holes showed the soil to 120cm depth to comprise variable dry silts and organic silts, with a void at 50cm depth (Auger Hole 1 - Figure 5). The ground was thus considered suitable for geophysics and would have been diggable, yet also coherent should any gun positions have been excavated in the field or into the hedge bank. Soil type was confirmed in an excavation pit (see below and log in Fig. 5)

#### *Geophysical Results*

Magnetometry (MTADS: Nelson & McDonald, 2001), electro-magnetics (EM-34 and a CEIA Systems military metal detector) were run over the aerial image targets along (and in) the hedgerow in order to define any high metal concentrations and locate any potentially hazardous unexploded ordnance. Hundreds of large and small metalliferous and ferrous objects were detected. Ground penetrating radar (Mala Geoscience 100MHz/ 200MHz (unshielded antennas) and

250MHz/500MHz (shielded antennas) was run as individual lines along and into the eastern and northern hedgerows, in transects running east-west from the hedgerow into the field (location of those referred to are shown on Figure 6) and grids of data gathered over the contentious area of Howitzer positions 4? (Figures 6 and 7) and 5?. Four long lines at all frequencies were gathered parallel to the hedgerow (roughly south – north); and 42 short lines (again, at all frequencies) collected perpendicular to the hedgerow (roughly east – west). Control lines were also shot within the field, near Brecourt Manor, along nearby roads and at nearby Founcroup Manor. Two frequencies are shown as examples on Figure 7 in order to demonstrate the consistency of GPR returns over each Howitzer position and associated earthworks. On each, a 1 to 2m deep and 4 to 6m wide anomaly is seen (marked A1 on each radargram of Figure 7) to the west of the Howitzer locations (as indicated from the Desktop Study, above). A shallow (1m deep) anomaly occurs close to the hedgerow (marked A2 on Figure 7, insets a. – d.) Anomaly A1 on Figure 7a has a circular bright spot at 75cm depth, likely a significant, isolated and (given metal detector response) a large (50cm+) metalliferous object. Anomaly A1 on Figure 7d is a hyperbola, such as if often seen on GPR data where a larger, possibly air-filled object or culvert is traversed. This observation, coupled with the void seen in the auger core (Figure 5), suggests that voids occur beneath the site. On 2D GPR transects over the contentious position of Gun 5, no similar anomalies (like A1 or A2, as in Figure 7a, b, c, or d) were observed. The 3D survey (Figure 7e) conducted over the position of Gun 4, showed an anastomosing series of linear anomalies running north – south and emanating east – west, coincident with Anomaly A1 of Figure 7d. A circular anomaly was detected adjacent to, and partly in, the hedgerow. No similar anomalies were detected over the area of conjectured Gun 5.

### **Conclusions – Location of the Northern Howitzer**

Our survey (primarily GPR, but substantiated by EM/metal detection and the 1947 aerial imagery) strongly suggests that all four Howitzer positions left a geophysical and landscape footprint along the eastern hedgerow, north of Brecourt Manor. From this, these weapons were primarily positioned to fire upon Utah Beach to the east. However, the 1947 aerial imagery indicates activity that left a similar white patch to the unequivocal Howitzer positions to the south, at the location of Gun ?5, albeit that this location has no significant geophysical anomalies. This supports Alexander's (2011, p. p106) conjecture that Gun 4 was turned

and possibly repositioned, to direct fire to the north. This work supports the re-positioning theory, in order to satisfy both the 1947 aerial imagery observations, as well as not leave a significant geophysical footprint. Alexander (2011) and others have doubted the existence of a trench system linking the Howitzer positions, suggesting that the Wehrmacht division would have used the ditch in the treeline/hedgerow to facilitate covert and protected movement between guns, and also facilitate cover for the weapons and locations from pre-invasion aerial photography. While undoubtedly the latter is correct, given the proximity to the current hedge of the anomalies marked A2 on Figure 7, the trench idea is given some credence from this work. The linear white anomaly, running from Breccourt Manor to the Howitzers (Figure 4) indicates a path of some kind in 1947; the consistent position of anomalies at A1 on 2D GPR data could be the gun positions themselves, but is contradicted by the 3D survey over Gun 4, where the circular feature, interpreted as such, has the connecting, east – west and north – south features to the west, implying significant paths/tracks or trench/ditches, as would be expected (U.S. Army Center of Military History, 2015). The interpretation of a void on the radargram in Figure 7d, and observation of the same in the auger hole, could be the result of incomplete backfill following WW2, or more significant voids infilling dug positions. A mole tunnel was suggested at the time of sediment logging, which at 40cm is deep for such an animal, or small badger burrow. If infilling was not complete, it would have been in subsequent years to facilitate farm machinery and prevent animals such as valuable racehorses from leg damage. Furthermore, even if the actual Howitzer positions were in any pre-existing hedgerow ditch, or maybe in extended parts of a ditch and a little above ground, the German troops had been on site for some time, and expecting an assault, would have excavated protective routes between guns. Finally, since the inception of cannon in warfare, it has been practice to keep magazines separate from firing positions, and below ground-level if possible: perhaps the east – west linear feature along distance marker '30m' on Figure 7e is one such magazine access? One feature on Figure 7e appears to contradict the above – the continuation of the linear anomaly to the north of the supposed Howitzer position (circular anomaly). Could this represent the geophysical footprint of an access route to Position ?5, or to the MG42 position? Perhaps incomplete at the time of the D-day invasion? Further excavation would provide the answer.

The authors hope that, while one of us is a geophysicist (AR), the need for a multi-disciplinary investigation, based on forensic search strategies, and including a desktop study and ground-truthing, provides a more complete analysis of such an important site in WW2 history and in the reconstruction of such assaults for history, military training and even war-games.

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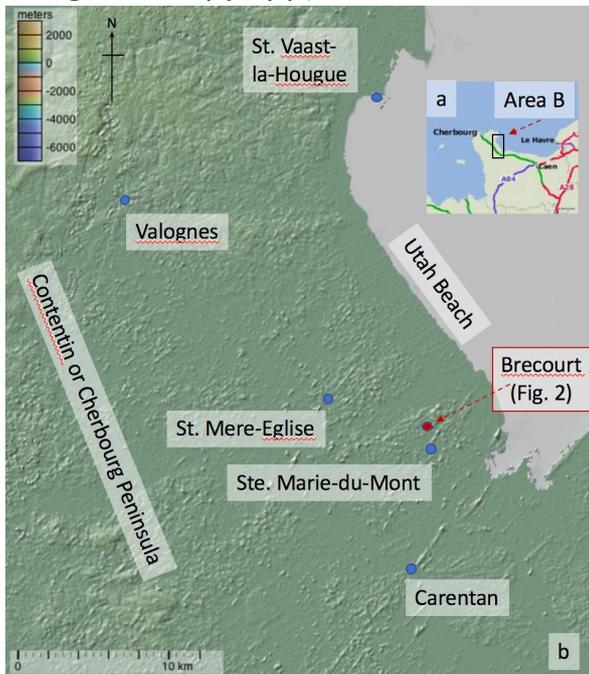
### Websites

(<http://perrysheroes.free.fr/spip.php?article81>)

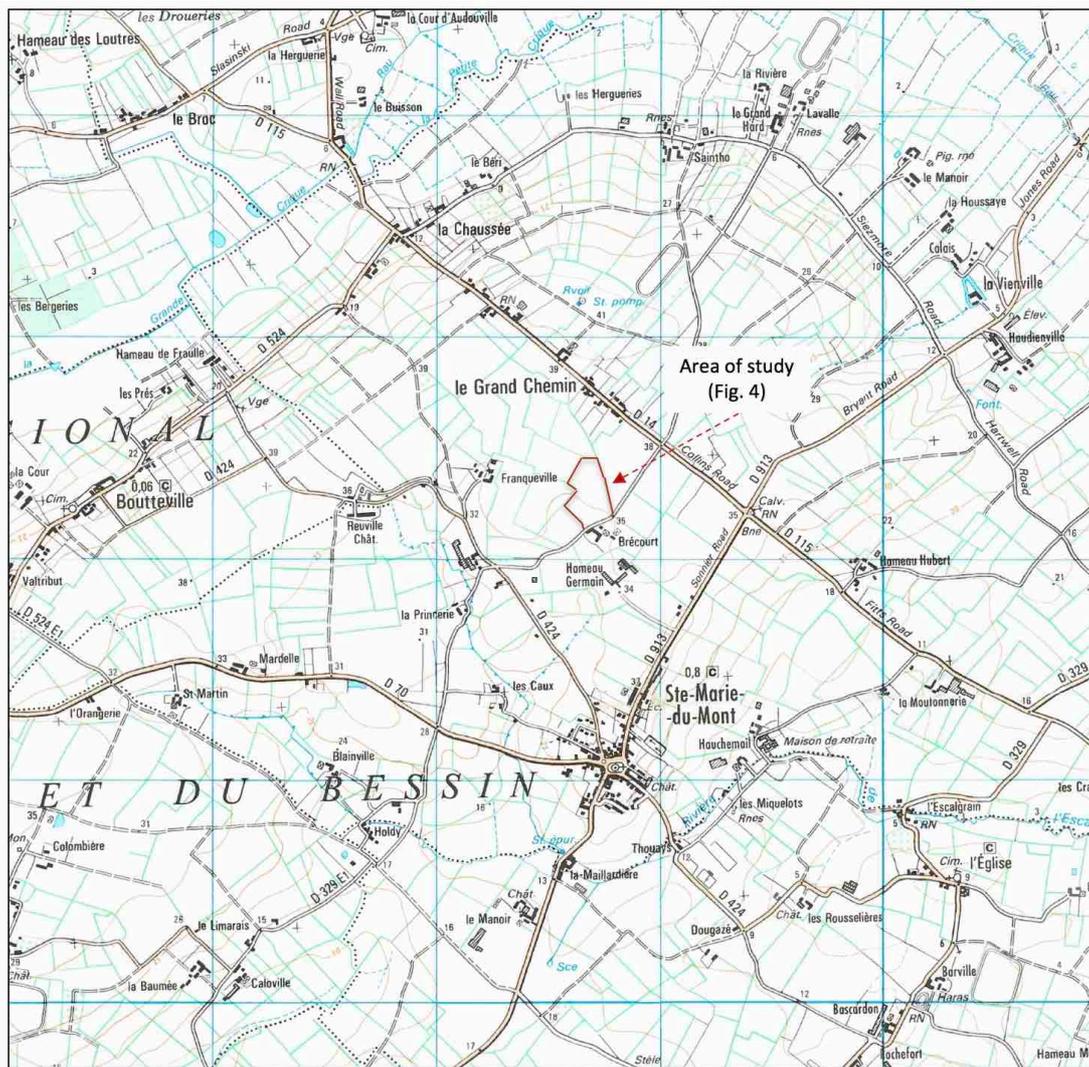
- (Matt Fife - <http://mattfife.com/?p=449>)
- <https://web.archive.org/web/20050204154846/http://www.freerpublic.com/focus/f-vetscor/1062013/posts>
- [www.brecourtassault.com](http://www.brecourtassault.com)
- [Heroesforever.nl](http://Heroesforever.nl)
- <https://www.dday-overlord.com/forum/viewtopic.php?t=3399>

### Figure captions

**Figure 1.a.** Location of the study in NW France. **Figure 1.b.** Digital Terrain Model of the area shown in Figure 1.a., using shaded relief (created using GeoMappApp), with main towns and the location of Brecourt.



**Figure 2.** Annotated section of Carte Randonnee 1311E Ste-Mere-Eglise Utah Beach, 1:25,000 Serie Bleue Institut Geographique National, France, purchased online 5-5-2011. Red inset shows the outline of the field surveyed and shown in subsequent figures. Note the arcuate escarpment from Boutteville in the west, with its tip at Saintho/le Grand Hard, running to la Vienville in the east, proximal to Utah Beach (Jones Road). This escarpment encloses the Saint-Marie-du-Mont (SMMU plateau of text), with le Grand Chemin and Brecourt at its centre.



**Figure 3.** Bedrock (or Solid) geology of the Cherbourg/Contentin Peninsula, with relevant (referred to) geological strata in the key, other geological formations are shown on the map that are not relevant to this study. Adapted from BRGM, 1980 and Debelmas, 1974.

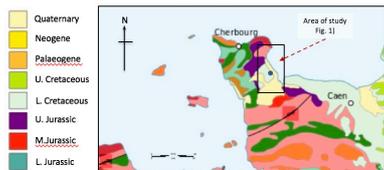


Figure 4. 1947 aerial imagery (from Gettysburg Museum of History) overlain onto 2011 GeoMappApp aerial photograph (after AppleMaps). The red dots are positioned to the west (right) of the unequivocal Howitzer positions to facilitate the large and row of small white patches and pale linear feature (parallel to the hedgerow) to be observed. This is the same for the yellow dots adjacent to the contentious locations of Gun 4 and Gun 5, where minimal pale/white patches are occur.

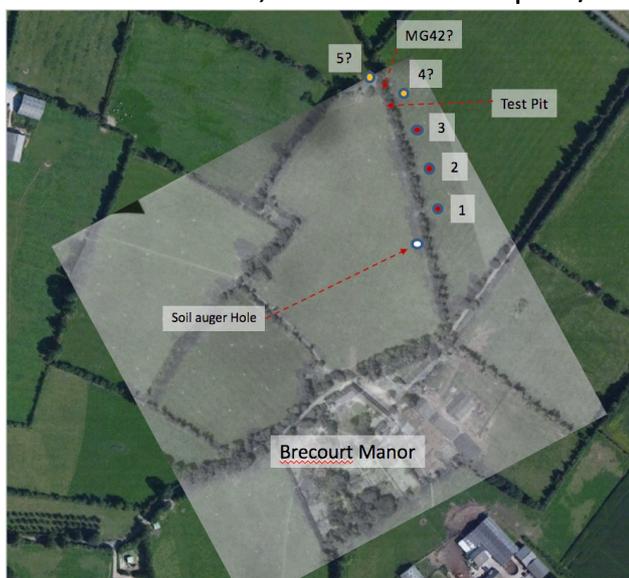


Figure 5. Sedimentary logs of a representative soil auger hole and deepest side of the test pit/Gun 4 excavation. Notes are interpretations of the horizons examined.

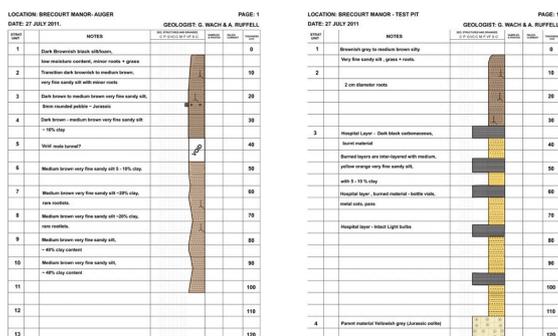
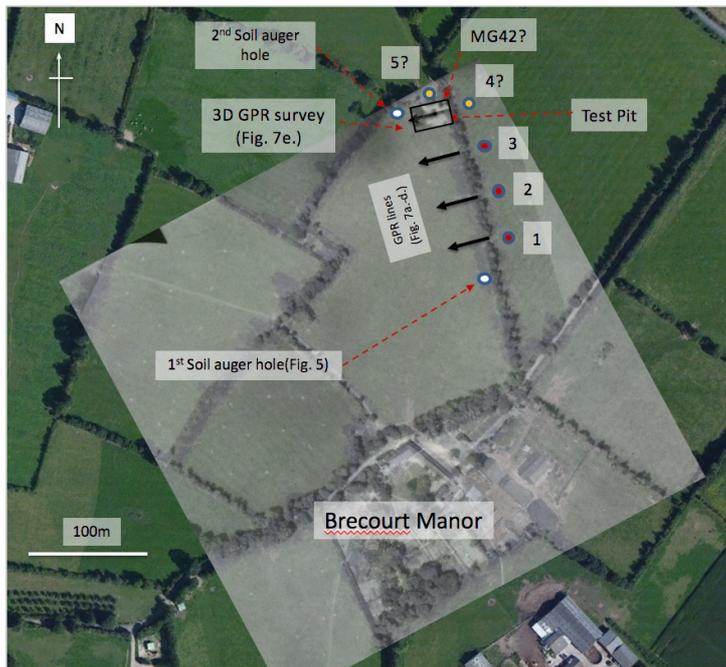


Figure 6. Location (on Figure 4 imagery) of the 2D ground penetrating radar data discussed in text and shown in Figure 7 (black arrowed lines);

the 3D GPR survey (inset); test pit and soil auger holes (one is shown on Figure 5), north of Breccourt Manor (shown).



**Figure 7.** Ground penetrating radar data, with possible location of Howitzer Gun 4 and associated geophysical footprint. Figures 7a and 7b are 250MHz shielded antenna data (hence deeper penetration), whilst figures 7c and 7d are 500MHz shielded antenna data, with less depth penetration: all 2D images show consistent (eastern side) anomalies (A1 and A2). Figure 7e is a 3D slice at 75cm depth, with the Test Pit excavation indicated (not in exact position), distance markers referred to in text (30m and 20m) and the location of GPR Line 7d, to allow cross-section anomalies A1 and A2 to be seen at 75cm depth in plan view. All data available on request to the authors.

