

APPENDIX N: UXO RISK MANAGEMENT

PRELIMINARY UXO RISK ASSESSMENT PEER REVIEW

REPORT REF: PRAPR-21-13 | Revision: 0



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Client: Tetra Tech
Project: A1307 Cambridge South East Study Phase 2, Cambridgeshire
Date: 05/02/2021

INTRODUCTION

Tetra Tech has commissioned Brimstone Site Investigation to carry out a Peer Review of a Preliminary UXO Risk Assessment (PRA):
Publisher: **6 Alpha** | Publication Date: **11/06/19** | Report Ref No: **P7401** | Client: **Mott MacDonald**
This Peer Review will assess the accuracy of observations therein, the accuracy of analysis therein, the breadth of sources reviewed and the report’s compliance with the CIRIA guidelines for writing PRAs.
The PRA has been read through in full and all comments are listed below, referenced by their position in the PRA.
The A1307 Cambridge South East Study Phase 2 site will be referred to hereon in as the Site, Brimstone Site Investigation as BSI, and 6 Alpha as the Author. All direct quotes from the DRA are in *italics*.

PEER REVIEW

Comment 1.1: THREAT POTENTIAL AND RECOMMENDATIONS (Page 1)
The potential for unexploded WWI and WWII ordnance.
This suggests that the Author has considered WWI German bombing and corresponding UXB risk. However, there is no mention of WWI Zeppelin or fixed-wing air raids within this PRA. NB: Cambridgeshire experienced at least three air raids during 1916.

Comment 1.2: THREAT POTENTIAL AND RECOMMENDATIONS (Page 1)
The potential for a UXO hazard to occur, and more specifically, the potential for unexploded WWI and WWII ordnance to exist at this site is assessed as being LIKELY.
This statement is confusing. A UXO hazard cannot ‘occur’. Different items of UXO represent varying types of hazard and if encountered via aggressive intrusive works can cause an initiation / detonation to occur.

Comment 2.1: REPORT SUMMARY (Page 1)
Cambridge was bombed approximately 20 times during WWII. Although these were all small-scale raids, it is perhaps misleading to state that the borough experienced a very low bombing density. This puts it in the same bombing density category as rural Scotland for example, where Luftwaffe activity was extremely infrequent.

Comment 2.2: REPORT SUMMARY (Page 1)
Luftwaffe aerial reconnaissance photography associated with the Site did not identify any primary bombing targets within 1,000m of the Site. However, official records indicated that two military camps associated with Operation Overlord were located in the vicinity of the Site.
This suggests that the Author is highlighting local Operation Overlord army camps as Luftwaffe bombing targets. By the time these temporary camps were erected (1944), Luftwaffe target reconnaissance flights in the region had ceased. Furthermore, only two raids (involving solitary bombers) were recorded in south Cambridgeshire during 1944. This, combined with the fact that Overlord camps were usually established in woodland to help avoid detection from the air, indicates an extremely low likelihood that any Luftwaffe pilots could have identified and then attacked these camps.
NB: historic OS mapping confirms that these locations two camp did indeed contain sufficiently large areas of woodland.

Comment 3
The Author has not considered the extent of post-war development, as a risk mitigation factor. This is a factor specifically discussed within the CIRIA guidelines on preliminary UXO risk assessment. This factor can be assessed and described by using freely available historic OS mapping and aerial photography.

<p>Comment 4</p> <p>The Author has not considered the extent of the proposed ground works. This is a factor specifically discussed within the CIRIA guidelines on preliminary UXO risk assessment. Consequently, they have not been able to comment on the likelihood of a UXO encounter during the proposed works and therefore the risk of any UXO initiation event occurring.</p> <p>NB: it is not known whether 6 Alpha failed to request such information at the time of writing or whether the client was unable to provide any detailed information.</p>
<p>Comment 5: Data Findings (Page 2)</p> <p><i>WWII Bomb Strikes Near Site Boundary</i></p> <p>The Author has put a red cross in the <i>identified</i> column. Although original ARP bombing incident records were not immediately available to the Author, they have noted bombing within 1km of the Site elsewhere in the PRA: <i>multiple incendiary bomb (IB) strikes fell in the area between Hill Road and Trumpington Road (520m north)</i>.</p> <p>These two parts of the PRA appear to contradict one another.</p>
<p>Comment 6: Probability of UXO Encounter (Figure 2)</p> <p>It is not common practice or CIRIA recommended practice to draw a risk zone map at Stage 1 (PRA). Any such map would be based on preliminary (incomplete) research and therefore could mislead the reader. The 6 Alpha <i>Probability of UXO Encounter</i> map is confusing firstly because it suggests that there is an equal risk across the entire Site, when actually the Author has based their Site-wide elevated risk level entirely on the presence of two army camps near the south-eastern corner of the Site and anti-invasion defence measures near the centre of the Site. Their concluding text does not state that there is in fact a low likelihood of UXO remaining across the vast majority of the Site (a vast area).</p> <p>Secondly, this map would be better described as a ‘Probability of UXO Remaining’ map, because 6 Alpha do not take into account (at PRA stage) the type(s) of intrusive methodology and volume of soil disturbance associated with the proposed works.</p>
<p>CONCLUSIONS</p>
<ul style="list-style-type: none">BSI has identified examples that confirm a lack of adherence to the CIRIA guidelines for UXO risk assessment.As 6 Alpha have not considered any proposed works, the accuracy of their analysis cannot be fully assessed.Tetra Tech have provided up to date details on the types, extent, and locations of the proposed intrusive works, which do not correspond to the Site boundary used by 6 Alpha.

<p>RECOMMENDATION</p>
<p>BSI recommends the commissioning of a new Stage 1 Preliminary UXO Risk Assessment to accurately assess the likelihood of a UXO encounter during the proposed works.</p>

<p>STAGE 1 PRELIMINARY UXO RISK ASSESSMENT</p> <p>REPORT REF: PRA-21-1392 Revision: 0</p>	 <p>The Joiner’s Shop, The Historic Dockyard Chatham, Kent, ME4 4TZ 0207 117 2492 www.brimstoneuxo.com</p>
<p>Client: Tetra Tech</p> <p>Project: A1307 Cambridge South East, Cambridgeshire</p> <p>Date: 15/02/2021</p>	

INTRODUCTION

The Stage 1 Preliminary Risk Assessment is an initial screening assessment designed to highlight any sources of unexploded ordnance (UXO) with the potential to contaminate a given site.

The aim of the Stage 1 assessment is to identify or discount the need for further detailed research - a Stage 2 Detailed UXO Risk Assessment.

This desktop assessment has been researched and written by a dedicated Researcher / Risk Assessor and produced in accordance with the CIRIA C681 Guidelines: ‘Unexploded Ordnance, a Guide for the Construction Industry’ (published in 2009).

In preparation for this assessment, original wartime records, historic OS mapping and the *Brimstone UXO Sources Database* have been reviewed. The latter incorporates multiple datasets plotting the positions of a variety of domestic military sites and confirmed historic German bombing targets.

The Stage 1 Preliminary Risk Assessment considers the following:

1.

The Proposed Works

2.

Enemy Action during WWI and WWII

3.

British / Allied Military Activity

4.

Historic Site Occupancy

5.

Risk Mitigating Factors

THE SITE

The Site is located between Addenbooke’s Road in the north-west (approximate National Grid Ref: TL 46042 54494) and the A11 junction with the A1307 in the south-east (approximate National Grid Ref: TL 52090 50179), in southern Cambridgeshire. The Site stretches for approximately 9km through agricultural land to the south of Babraham, to the north of Sawston, and to the east of Stapleford and Great Shelford. For the purposes of this risk assessment, the Site is not analysed as a demarcated polygonal area, as the proposed works are multiple isolated SI positions.

THE PROPOSED WORKS

An SI broadly comprising 61No. boreholes (between 8.0 and 30.0m bgl), 62No. machine excavated trial pits, 8No cone penetration tests, and localised TRRL DCP probing. NB: the investigation scope and locations will be subject to variation based on local constraints and ground conditions.

ENEMY ACTION DURING WWI AND WWII

Potential Source of UXO	Significant?	Details	
WWI German Bombing	✗	The study area did not experience any air raids during WWI.	
WWII German Bombing	✓	British District Bombing Density Statistics	The Site passes through the WWII-era Rural Districts of South Cambridgeshire and Chesterton, which sustained 7.6 and 5.0 bombs / 1,000 acres respectively (both low bombing densities). NB: the very north-western extent (three SI positions) is situated within WWII-era Cambridge Municipal Borough which sustained 12.5 bomb / 1,000 acres (a low-to-moderate bombing density).
		Evidence of bomb strikes / damage	Confirmed bombing incidents within 500m of the north-western extent of the Site identified. No OS mapped evidence of potential bomb damage identified in the vicinity.

		Local Bombing Decoy Sites	The Babraham Decoy ('SF' Series Decoy No. SF54) was located ~2km north of the south-eastern Site extent.
		Local German Bombing Targets	No primary Luftwaffe targets or known secondary targets in the wider study area. No well-established military bases / installations or civil infrastructure that could have been identified as a profitable target in the wider study area. A railway line that ran close to and parallel with part of the Site would have represented an opportunistic target for any aircraft in the area.
WWII German Cross Channel Artillery Shelling	✘		
BRITISH / ALLIED MILITARY ACTIVITY			
Potential Source of UXO	Significant?	Details	
WWII Home Guard (HG) activity	✘/✓	Soldiers of the 3 rd Cambridgeshire (Hildersham) Battalion would have been active locally. Armed HG troops are likely to have accessed the Site whilst on patrol. However, as agricultural land, the Site is unlikely to have been requisitioned for signfiacnt HG use, e.g. ad-hoc weapons training area.	
Site requisitioned for wartime military use	✘	No such evidence found at this stage. The possibility that part of the Site was requisitioned for temporary wartime use cannot be ruled out entirely at this stage (e.g. tented military camp, LAA gun battery, searchlight battery, RAF barrage balloon site).	
Existing or historic Army or RAF training area / weapons range	✘	A WWI-era army trench warfare training area was located >1.3km from the Site, at Gog Magog Golf Course.	
Existing or historic military bases and other installations	✘	Babraham Park Camp was a temporary WWII-era army camp established within the Babraham Park estate. As an Operation Overlord camp it is likely to have only existed during the Spring and Summer of 1944. Furthermore, at its closest point, the camp was located at least 600m from the Site and separated from the Site by farmland. This army activity is therefore unlikely to be significant.	
Existing or historic munitions or explosives factories	✘	n/a	
Existing or historic military storage depots	✘	n/a	
Existing or historic military defensive fortifications	✓	The WWII GHQ defensive stop line passed through the centre of the Site. Although its exact alignment is not currently known, it is known to have comprised an anti-tank ditch, roadblock and pillbox within 300m of the Site. The anti-tank ditch appears to have passed very close a central section of the Site between SI positions <i>TP-PTR-16</i> and <i>TP-PTR-27</i> .	
WWII light and / or heavy anti-aircraft (LAA and HAA) fire	✓	Seven permanent HAA batteries were active within approximate HAA gun range of the Site during WWII. No known or likely 'vulnerable points' were present within LAA gun range of the Site. Temporary AA gun deployments are unlikely to have occurred in the local area. The Luftwaffe were infrequently active in the wider area and therefore these guns probably did not expend a large quantity of ammunition. Although unlikely, it is conceivable that an unexploded AA shell struck the Site.	
WWII pipe-mined locations and beach minefields	✘	n/a	

SITE HISTORY	
What was the Site occupancy historically, especially during WWI and WWII?	During WWI and WWII, the Site exclusively passed through agricultural land. A few of the proposed SI positons occupied hedgerows separating fields. A significant portion of the Site passed very close to and parallel to a railway line and the Site also crossed four roads.
RISK MITIGATING FACTORS	
Post-conflict ground works	Agricultural ploughing will have continually turned over the toposil (~0.5m) within the vast majority of the Site.
Likelihood of UXO remaining	The risk associated with (any) very shallow buried UXO will have been largely mitigated. The risk associated with (any) shallow buried UXO will have been partly mitigated. The risk associated with (any) deep buried UXO will remain unmitigated.
CONCLUSIONS	
German UXO: <ul style="list-style-type: none">The Site occupied an insignificant rural area during WWII with no known or potential Luftwaffe bombing targets in the vicinity. Nearby Cambridge was bombed approximately 20 times during WWII, however these were all small-scale raids and therefore the bombing density in the north-west of the Site is unlikely to have been significantly elevated.A WWII bombing decoy site was situated in the wider area. It is quite possible that this decoy attracted additional German aircraft to the Babraham area, however Luftwaffe activity in rural Cambridgeshire is known to have been low throughout WWII and therefore it probably did not have great success in drawing bomb strikes.Any bombing affecting the Site will therefore have been the result of indiscriminate ‘tip and run’ incidents. These incidents consisted of single aircraft bombloads, i.e. a very small number of bombs dropped and therefore a low likelihood of UXB strikes.Although it is conceivable that bombs (potential UXBs) fell in the vicinity of the proposed SI works, the low bombing density indicates a low likelihood of UXB strikes.As agricultural land, any UXB strike(s) on Site could have occurred unnoticed and the resulting entry hole could have been overlooked (obscured by vegetation).However, as the proposed works will disturb small volumes of soil, there is a low likelihood of a UXB encounter.	
British / Allied UXO: <ul style="list-style-type: none">The WWII defensive stop line that passed through / along part of the Site will have been manned by HG and army troops for part of WWII. There is an elevated likelihood of associated UXO contamination (small arms ammunition and land service ammunition) at WWII defended localities. Some ammunition caches appear to have been forgotten / left behind and unwanted or faulty ammunition was sometimes simply discarded.As the proposed works will disturb small volumes of soil, the likelihood of a UXO encounter is limited. However, UXO contamination (British WWII-era ammunition) in the vicinity of the stop line could consist of multiple contamination locations and multiple UXO items at each location. This elevates the risk of UXO encounter.NB: there is a low likelihood of unexploded British AA ammunition remaining buried on Site today.	

RECOMMENDATION(S)	
SI Works	A Stage 2 Detailed Risk Assessment is recommended to elucidate the potentially elevated UXO risk between SI positions <i>TP-PTR-15</i> and <i>TP-PTR-28</i> (approx. TL 47250 53136 and TL 48106 51667), see risk zone map below. Alternative option: EOD Engineer - Watching Brief .
Development Works	n/a

