13. The Likelihood of Contamination from Allied Ordnance

13.1. Introduction

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

13.2. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

Allied UXO Records Summary	
Sources of Allied UXO Contamination	**Conclusion**
Military Camps *Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.*	1st Line Defence could find no evidence of a military camp within the site.
Anti-Aircraft Defences *Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.*	1st Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 4.2km south-east of the site, in the vicinity of Thames Ditton. Despite this distance the maximum effective range of an AA projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are generally analogous to those regarding German air delivered ordnance.
Home Guard Activity *The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.*	Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.
Defensive Positions *Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.*	There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.
Training or firing ranges *Areas of ordnance training saw historical ordnance usage in large numbers, often with inadequate disposal of expended and live items. The presence of these ranges significantly impact on the risk of encountering items of ordnance in their vicinity.*	No evidence of training or firing ranges could be found within the site or surrounding area.

Defensive Minefields *Minefields were placed in strategic areas to defend the country in the event of a German invasion. Minefields were not always cleared with an appropriate level of vigilance.*	There is no evidence of defensive minefields affecting the site.
Ordnance Manufacture *Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.*	No information of ordnance being stored, produced, or disposed of within the proposed site could be found.
Military Related Airfields *Military airfields present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training or bombing practice.*	The site was not situated within the perimeters or vicinity of a military airfield.

14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German air delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

UXO Contamination Summary	
Quality of the Historical Record	The research has evaluated pre-WWII and post-WWII Ordnance Survey maps, a WWI map of air raids and naval bombardments, a London WWII bomb density map, Luftwaffe reconnaissance imagery, weekly and consolidated London bomb census mapping, Home Office bombing statistics, a local Richmond bomb census map, Richmond and Twickenham written records, post-WWII high-resolution RAF aerial photography and in-house sources. The record set is of generally good quality, with several sources corroborative of one another regarding bombing incidents and evidence of damage from bomb strikes. Both local bomb mapping and London bomb census mapping do not plot any bomb strikes in a range close enough to the site. Finally, the post-WWII high-resolution 1947 RAF aerial photography allowed for an assessment on the possible wartime condition of the site and immediate surrounding area.
German Air-Delivered Ordnance	• During WWII, the site was situated within the Municipal Borough of Twickenham, which was subject to an overall moderate-high density of bombing according to official Home Office bombing statistics, with an average of 82.8 bombs recorded per 1,000 acres. • During WWII, the site composed predominantly open ground and vegetation; with structures present for storing coal, and a section of railway siding running through the site in the north. The site was bordered by Oldfield Road and the Upper Sunbury branch for the industrial railway between the Metropolitan Water Board's pumping stations and coal wharf.[4] • Despite the moderate-high density recorded in the area, a local bomb map, local written records and London Bomb Census mapping does not record any HE bomb strikes on site, or within the immediate vicinity. The closest recorded strike is plotted approximately 60m south-west of the site within the vicinity of Oldfield Road Grammar School. This is recorded as a UXB, falling on 15th October 1941 in the 'Damage to Properties' record set. This incident is however, too far removed to have had any direct impact on the site boundary. • As the site predominantly comprised undeveloped land, limited structures were present on site to incur observable damage. However, the MCC War Damage Map does not record any damage to the structures that were present on site, or those within the immediate vicinity. Post-war aerial photography also does not indicate any obvious signs of bomb damage, such as severely disturbed ground, cratering or extensive structural changes. While the structures on site do not appear to have any roofs, they match up with historical OS mapping and are thought to comprise the function of coal bunkers/storage for the *Coal Yard* on site. **Annex O2** highlights some potential cases of disturbed ground in the vicinity, however, this does not directly affect the site boundary. • During WWII the terrain on site was predominantly undeveloped. While areas of undeveloped land have the potential to obscure possible evidence of UXB entry holes (in shifting earth and vegetation), sections of the site that were developed would have been more conducive to this. Furthermore, it is anticipated that the site would have experienced somewhat frequent levels of access during the war, due to the fact the site operated as a coal yard and had a section of railway siding running thought the north. Additionally, the site was located adjacent to a railway line and a *Goods Shed*. Items of UXO are more likely to be spotted, recorded and dealt with, within frequently accessed areas. • In summary, no positive evidence has been found of any HE bombing on/adjacent to the site boundary within the available record set and no obvious indicators of bomb damage was found while analysing post-WWII aerial photography and OS mapping. While HE bombing and damage was recorded in the wider area, these cases were of a sufficient distance away from the site to not warrant an increased risk to the site itself. While the predominantly

[4] https://webblocos.co.uk/history/the-railway

	undeveloped nature of the site has the potential to obscure evidence of UXB entry holes, access to the site is thought to have remained frequent throughout the war due to the sites usage as a *Coal Yard*. Items of UXO are more likely to be spotted, recorded and dealt with within frequently accessed areas. • No evidence has therefore been found to suggest that the risk on site would be above the 'background risk' for this area. As a result, it is not deemed necessary to warrant proactive risk mitigation measures, and the site has therefore been assessed to be of **Low Risk** from German aerial delivered UXO contamination.
Allied Ordnance	• No evidence could be found to indicate that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA. • The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.

15. The Likelihood that UXO Remains

15.1. Introduction

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

15.2. UXO Clearance

1st Line Defence has found no evidence in the public domain or within internal records that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from the 33 EOD Regiment Archive (now part of 29 EOD & Search Group). It should also be noted that in addition to 29 EOD & Search Group archival information, 1st Line Defence also do not currently have access to data that may be relevant including 5131(BD)SQN Archive, SD Training Technical Advisory Section (TAS) and MACA Records (bomb disposal callouts).

If such information is available at a later date, it is recommended that it be reviewed as it will assist with understanding both levels and types of contamination likely to be present, and may indicate risk reduction in certain areas.

15.3. Post-War Redevelopment

Recent aerial imagery indicates that the site has experienced noticeable post-war development. The majority of the site boundary is now occupied by a large commercial structure and associated hardstanding ground.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

16. The Likelihood of UXO Encounter

16.1. Introduction

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

16.2. Encountering Air Delivered Ordnance

Since an air delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

17. The Likelihood of UXO Initiation

17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

17.2. Initiating Air Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clock	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

18. Consequences of Initiation/Encounter

18.1. Introduction

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production.

18.2. Consequences of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

20. 1st Line Defence Risk Assessment

20.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

20.2. Assessed Risk Level

1st Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is an assessed **Negligible Risk** from Allied unexploded ordnance.

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Allied Land Service and Small Arms Ammunition	✓			

Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low', this does not mean there is 'no' risk of encountering UXO. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

21. Proposed Risk Mitigation Methodology

21.1. General

The following risk mitigation measures are recommended to support the proposed works at Oldfield Road:

Recommended Risk Mitigation Measures	
Activity	Recommended Risk Mitigation Measure
All Works	• **UXO Risk Management Plan** It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1st Line Defence for help/more information. • **Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.** As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

1st Line Defence Limited **11/08/23**

This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

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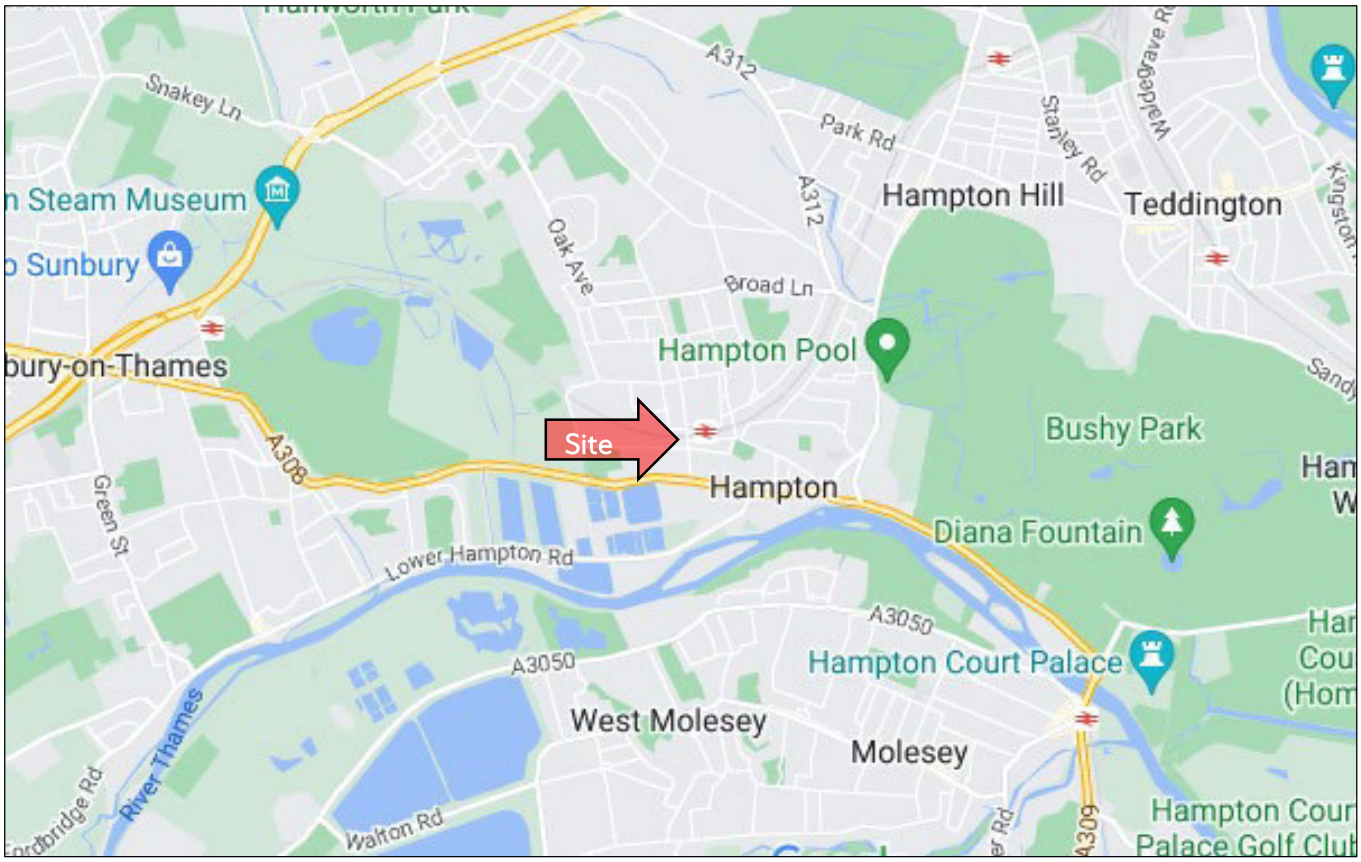
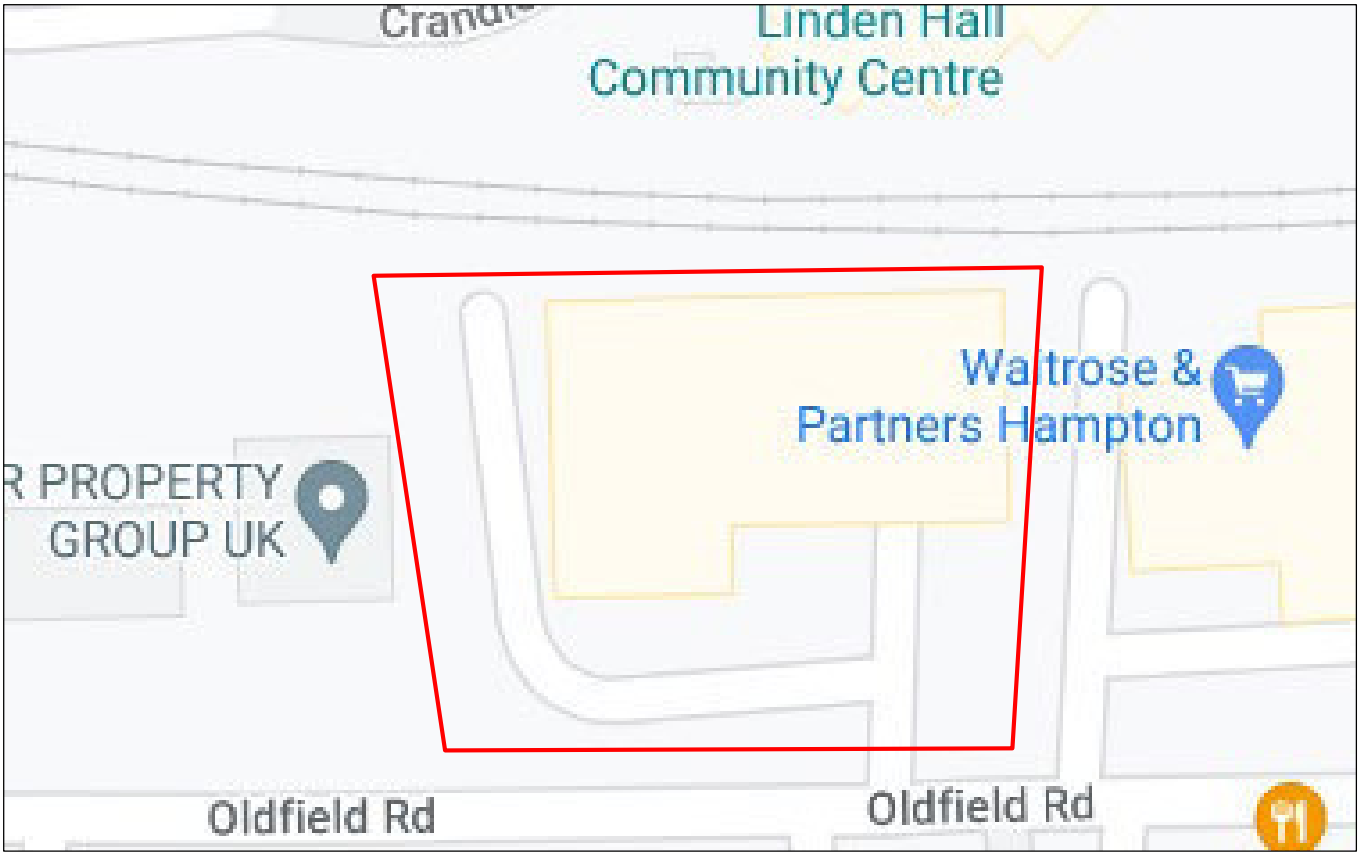
This report has been prepared by 1st Line Defence Limited with all reasonable care and skill. The report contains historical data and information from third party sources. 1st Line Defence Limited has sought to verify the accuracy and comprehensiveness of this information where possible but cannot be held accountable for any inherent errors. Furthermore, whilst every reasonable effort has been made to locate and access all relevant historical information, 1st Line Defence cannot be held responsible for any changes to risk level or mitigation recommendations resulting from documentation or other information which may come to light at a later date.





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Client:	Brownfield Solutions Limited	Approximate site boundary	N
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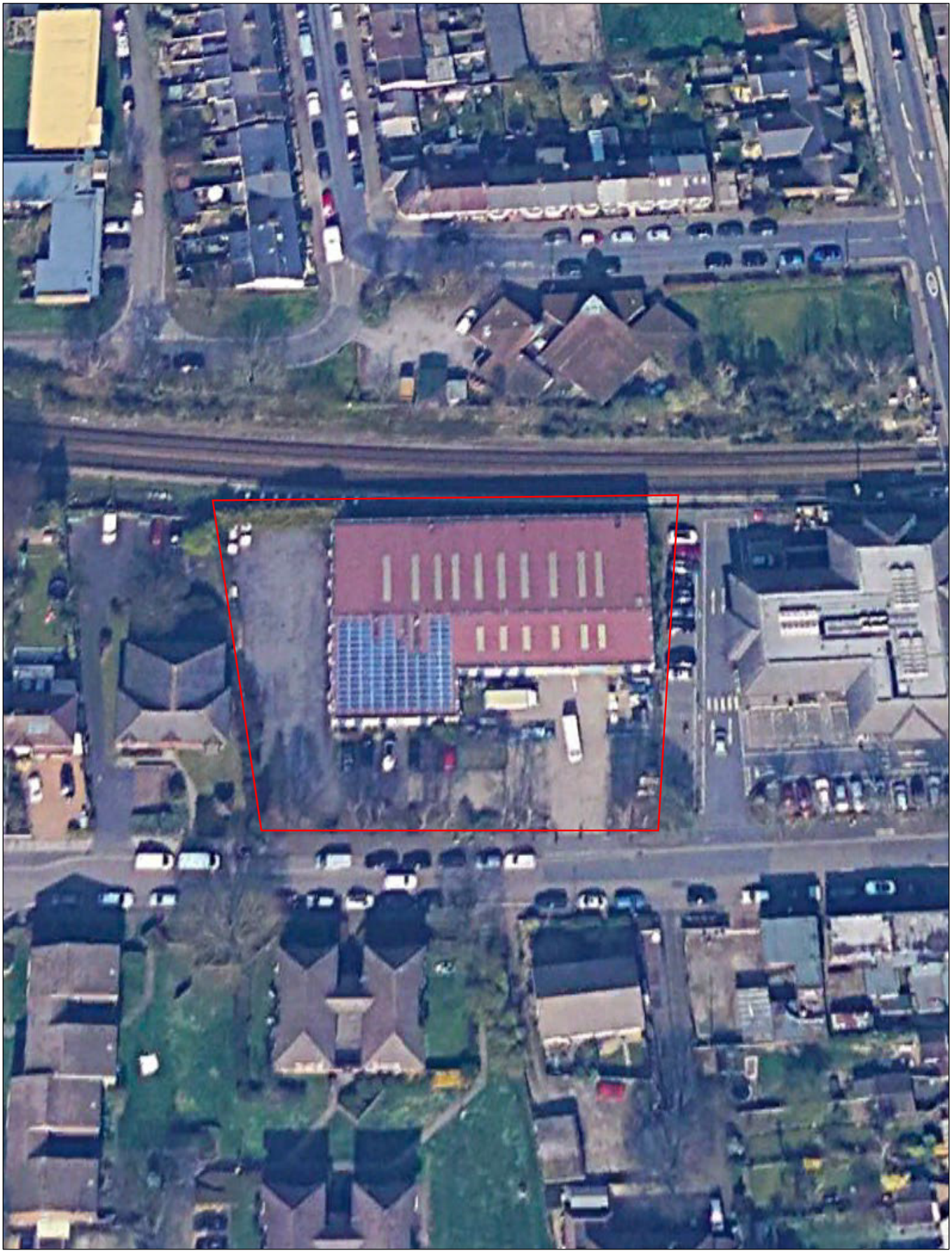
Ref:	DA18413-00	Source: Google Maps	



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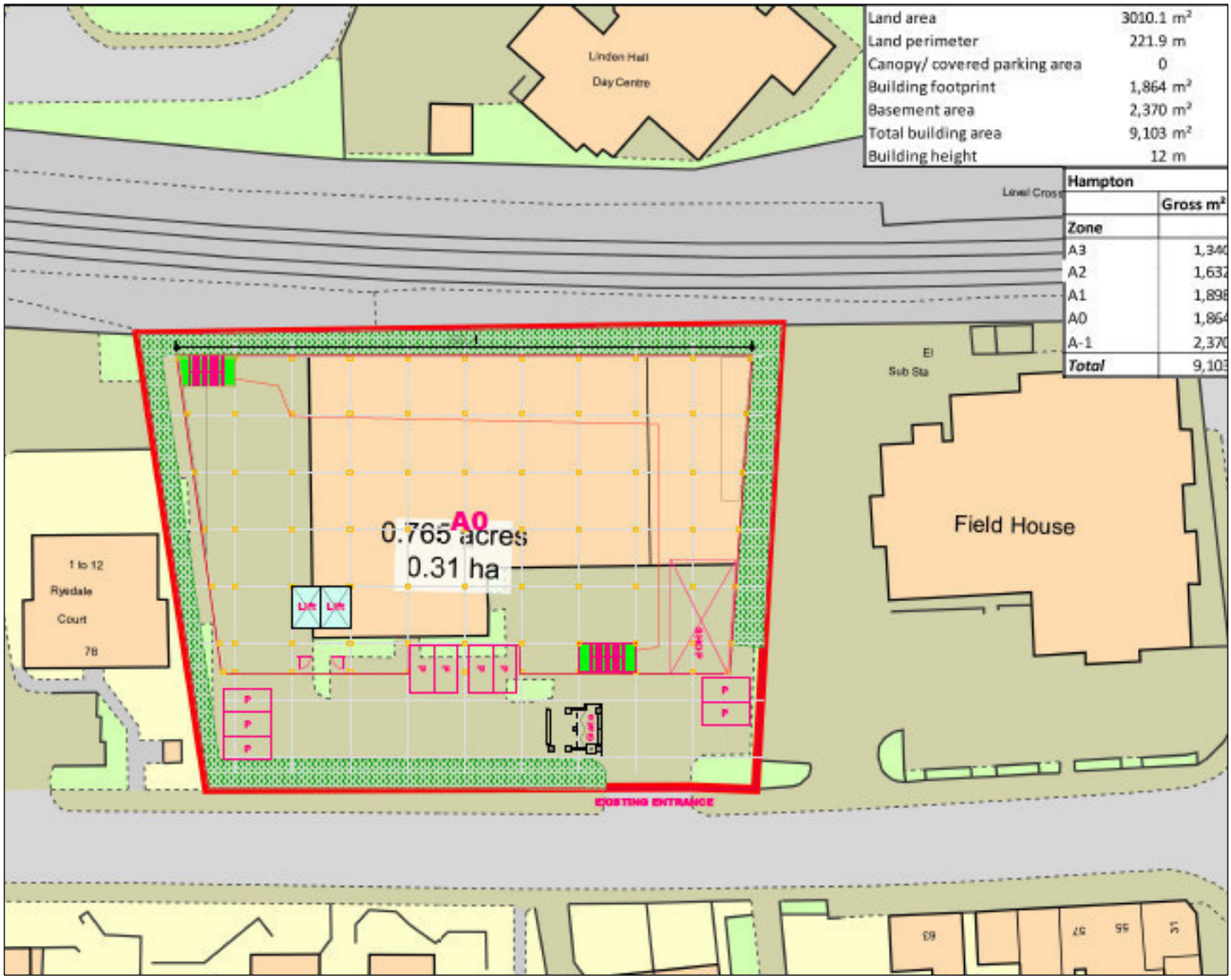
Source: Google Earth



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Client: Brownfield Solutions Limited

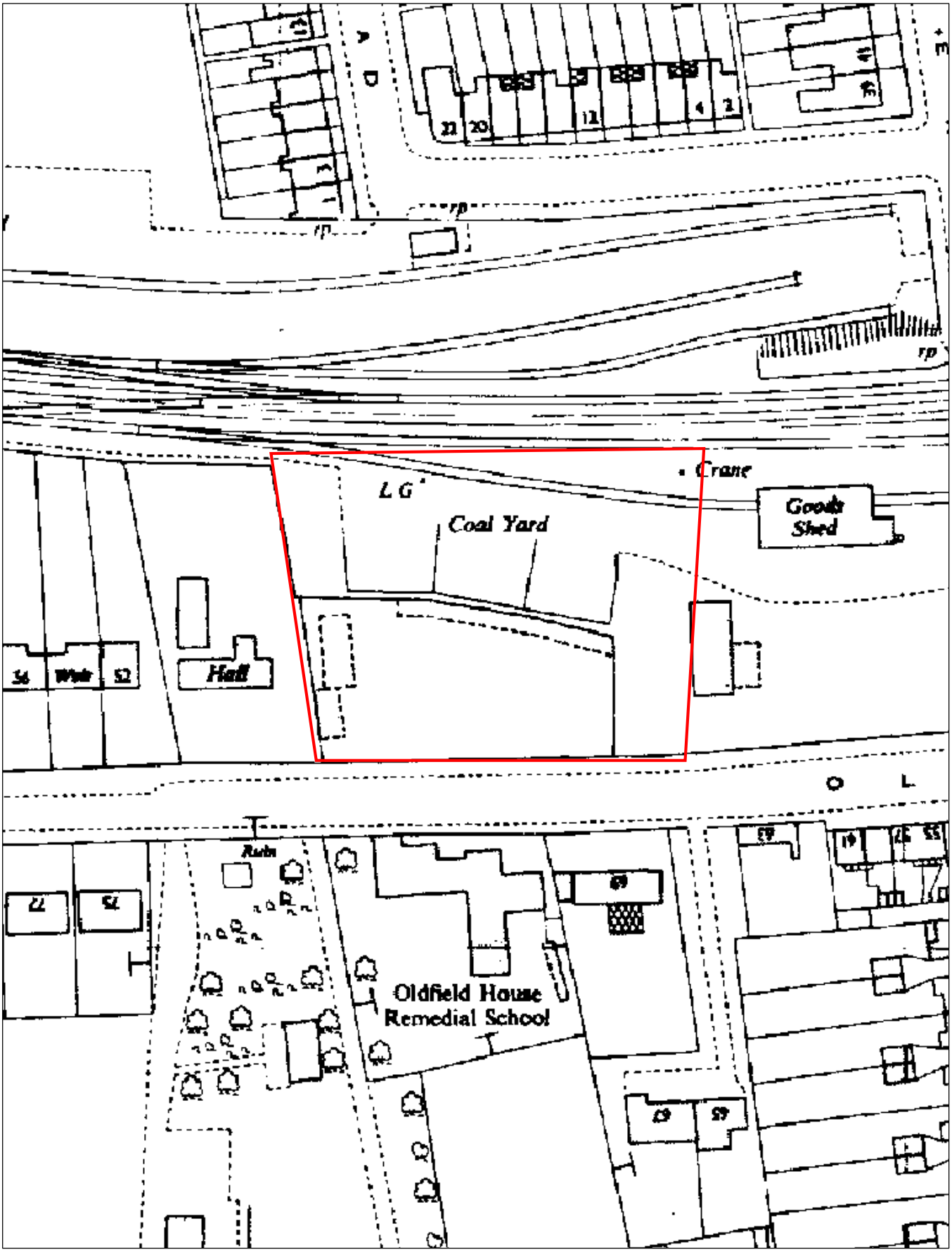
Project: Oldfield Road, Hampton

Ref: DA18413-00

Source: Landmark Maps

Approximate site boundary

N



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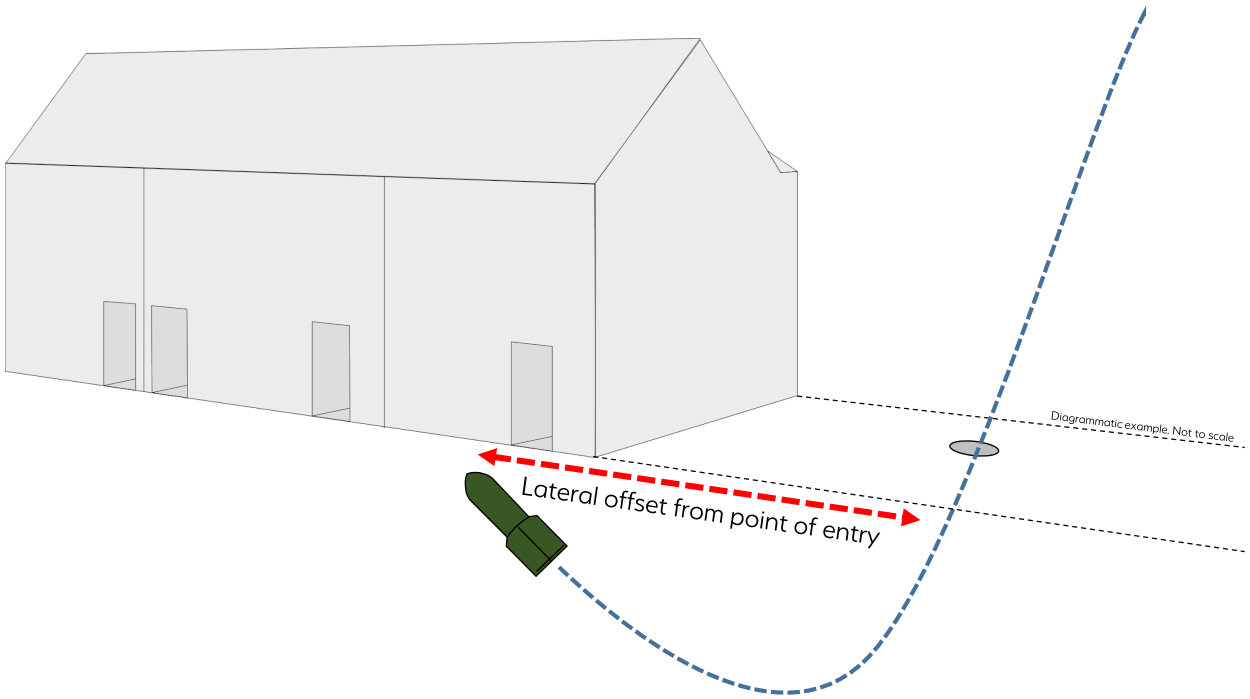

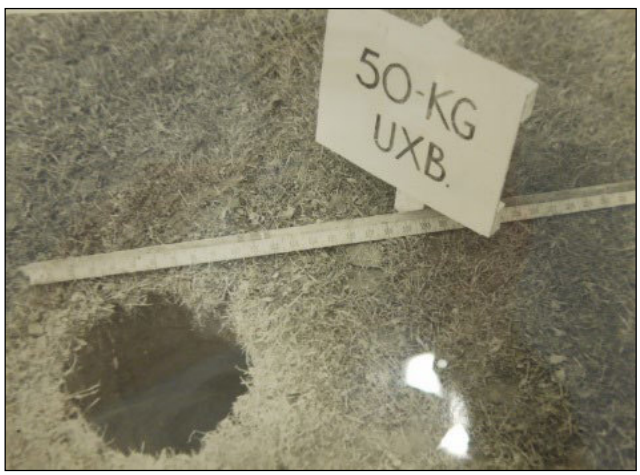

Top: J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites.

The photograph **above** shows a 250kg unexploded bomb found in Bermondsey in 2015, pointing upwards, demonstrating 'J-curve'.

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).

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Project:	Oldfield Road, Hampton
Ref:	DA18413-00
Source:	Various sources

BBC NEWS

Bermondsey bomb: World War Two device safely removed

An unexploded World War Two bomb found in south London has been driven away safely under police and Army escort.

The 500lb (250kg) device was found on a building site in Grange Walk, Bermondsey on Monday.

Two primary schools were closed and hundreds of homes were evacuated as a precaution.

A cordon and 656ft (200m) exclusion zone was lifted at about 18:15 GMT as the bomb was removed to a quarry in Kent to be detonated, police said.

The Metropolitan Police force said the device was a 'SA' 250kg WWII German air-dropped bomb, known to the Army's Royal Logistic Corps bomb disposal experts.

250kg German HE Bomb, March 2015

BBC NEWS

WW2 bomb found near London City Airport blown up

An unexploded World War Two bomb found near London City Airport has been detonated.

The 500kg device was discovered at the King George V Dock on Sunday during planned work at the airport.

It was closed and all flights were cancelled on Monday after an exclusion zone was put in place.

The detonation, which took take place off Shoeburyness, Essex, was postponed on Tuesday because of high winds and dangerous conditions for divers.

The 1.5m-long German bomb - which was found in a bed of silt, 15m underwater - was carefully removed from the Thames and placed in a secure location a mile away from the coast of Essex.

500kg German HE Bomb, February 2018

BBC NEWS

Exeter WW2 bomb is detonated after homes evacuated

More than 2,600 households and 12 university halls of residence were cleared before the 2,200lb (1,000kg) device **was destroyed** on Saturday.

Police said the blast left a crater about the size of a double-decker bus.

Police have reported large pieces of metal debris hitting buildings and said some properties in the 100m (330ft) exclusion zone had sustained "structural damage".

1000kg German HE bomb, February 2021

BBC NEWS

Great Yarmouth: Huge blast after unplanned WW2 bomb detonation

A World War Two bomb found in Great Yarmouth has detonated while work was being done to defuse it, causing a huge blast that was heard for miles.

Army specialists were attempting to disarm it when there was an unplanned detonation at about 17:00 GMT.

People on social media said they heard a loud bang and felt buildings shake 15 miles (24km) away.

There have been no reports of injuries among the Army, emergency services or the public, Norfolk Police said.

Cordons were put in place when the bomb was first discovered close to two gas pipes on Tuesday, and work began to make it safe.

250kg German HE Bomb, February 2023

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Client:	Brownfield Solutions Limited
Project:	Oldfield Road, Hampton
Ref:	DA18413-00
Source:	BBC News

BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.

BASF Provides Some Details

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1st March 2013

WWII bomb injures 17 at Hattingen construction site

Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19th September 2013

SPIEGEL ONLINE

Blast Kills One

World War II Bomb Explodes on German Motorway

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.

A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23rd October 2006

BBC NEWS

World War II bomb kills three in Germany

A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2nd June 2010

June 2006

Sunbury 'unexploded World War Two device' found opposite church near Thames

Surrey Police said a member of the public made the discovery with a cordon in place while the incident was dealt with

NEWS By Christy O'Brien Senior multimedia reporter

15:38, 17 MAY 2023 | **UPDATED** 15:39, 17 MAY 2023

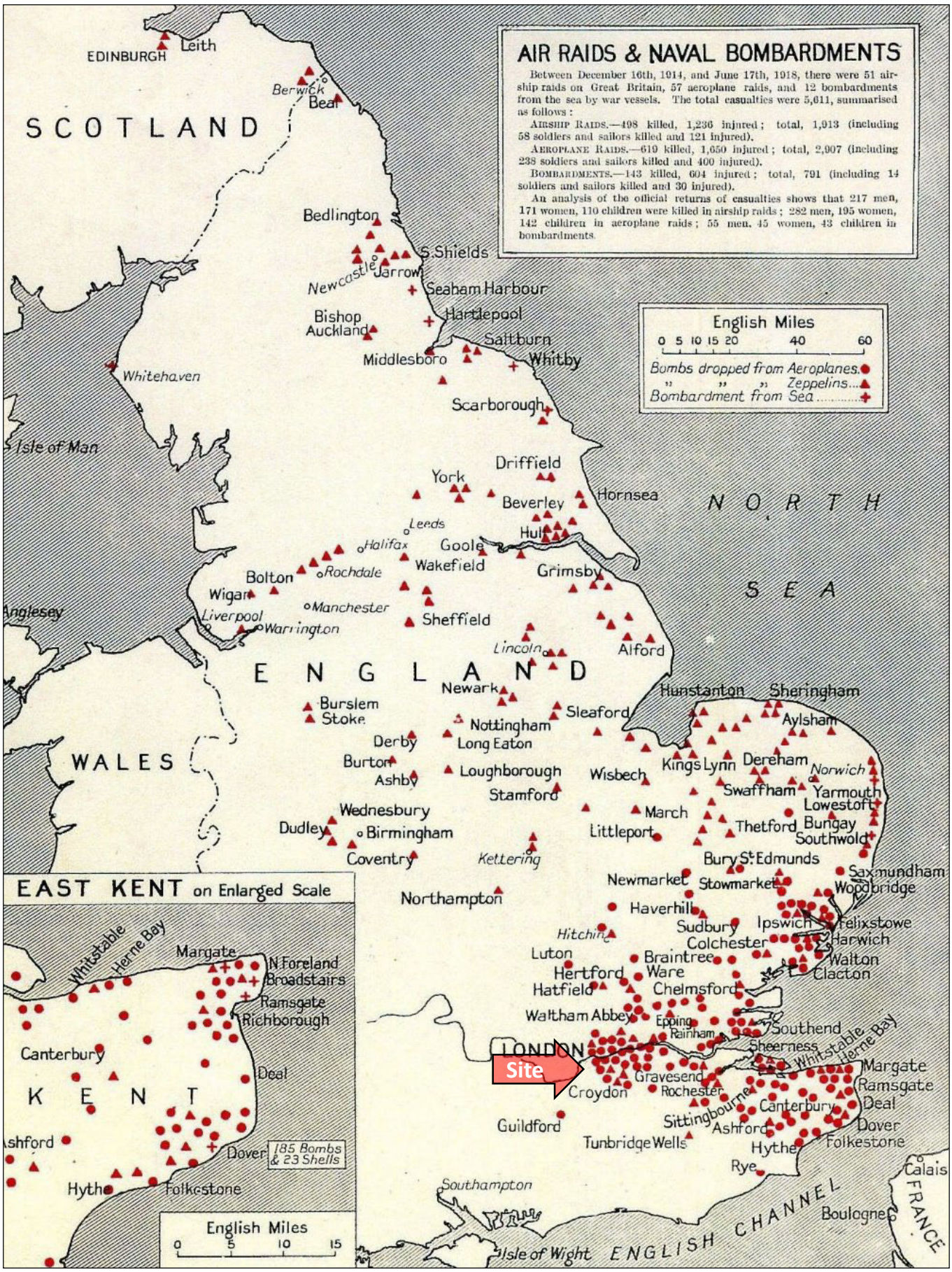
Police were called to the Thames in Surrey after an unexploded World War Two "device" was discovered. Surrey Police said officers were called to a riverside area opposite St Mary's Church, in Sunbury, following the discovery on Wednesday (May 17).

A cordon was put in place and several roads were closed due to the incident with police warning there would be "localised disruption" while they dealt with the incident. Video taken from the scene shows police vehicles at the scene and people in military uniform walking alongside the Thames.

"Officers were called at 12.15pm today (May 17) to the riverside opposite St Mary's Church, Sunbury, after what is suspected to be an unexploded World War Two device was found by a member of the public," a police spokesperson said.

A member of staff at St Mary's said police had made a visit to their vicar to make them aware of the incident, claiming the bomb had been found in the river, although this has not yet been confirmed by the force. They expected the incident would cause disruption in the area with the 216 and 235 buses diverted.

"I've been told it's an unexploded bomb in the river," they said. "There's a 100-metre exclusion zone and the traffic has been redirected up different roads. I wouldn't know anything was going on if I hadn't been told. I had a quick look outside on the road and I could see all the cars coming here so it's going to cause a load of traffic up Green Street."



1ST LINE DEFENCE

Unit 3, Maple Park,
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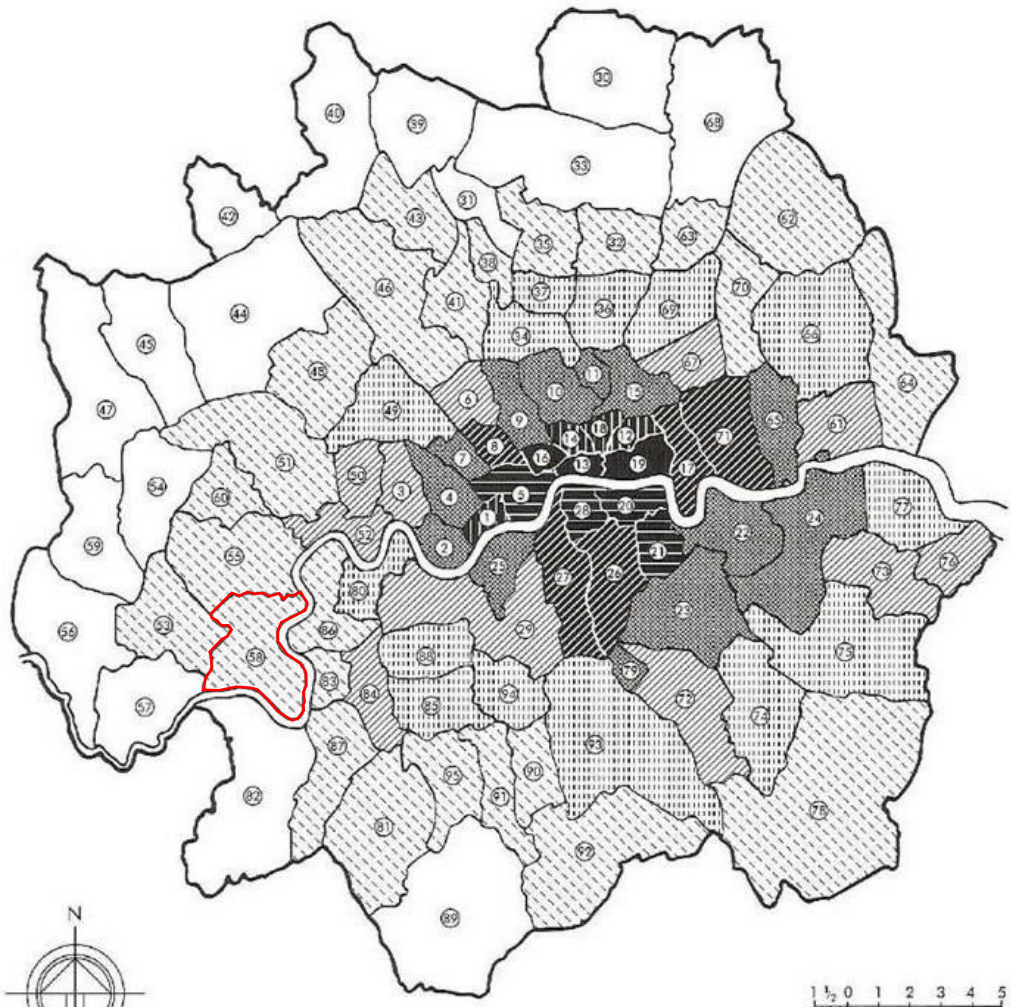
Tel: +44 (0)1992 245 020

Client: Brownfield Solutions Limited

Project: Oldfield Road, Hampton

Ref: DA18413-00

Source: J. Morris, German Air Raids on Britain



No. OF BOMBS PER 1,000 ACRES

OVER 600	300 – 399	100 – 149
500 – 599	200 – 299	50 – 99
400 – 499	150 – 199	UNDER 50

1	Chelsea	25	Battersea	49	Willesden	72	Beckenham
2	Fulham	26	Camberwell	50	Acton	73	Bexley
3	Hammersmith	27	Lambeth	51	Ealing	74	Bromley
4	Kensington	28	Southwark	52	Brentford and Chiswick	75	Chislehurst and Sidcup
5	Westminster	29	Wandsworth	53	Feltham	76	Crayford
6	Hampstead	30	Cheshunt	54	Hayes and Harlington	77	Erith
7	Paddington	31	East Barnet	55	Heston and Isleworth	78	Orpington
8	St. Marylebone	32	Edmonton	56	Staines	79	Penge
9	St. Pancras	33	Enfield	57	Sunbury	80	Barnes
10	Islington	34	Hornsey	58	Twickenham	81	Epsom and Ewell
11	Stoke Newington	35	Southgate	59	Yiewsley and West Drayton	82	Esher
12	Bethnal Green	36	Tottenham			83	Kingston on Thames
13	City of London	37	Wood Green	60	Southall and Norwood	84	Malden and Coombe
14	Finsbury	38	Friern Barnet	61	Barking	85	Merton and Morden
15	Hackney	39	Potters Bar	62	Chigwell	86	Richmond
16	Holborn	40	Elstree	63	Chingford	87	Surbiton
17	Poplar	41	Finchley	64	Dagenham	88	Wimbledon
18	Shoreditch	42	Bushey	65	East Ham	89	Banstead
19	Stepney	43	Barnet U.D.	66	Ilford	90	Beddington and Wallington
20	Bermondsey	44	Harrow	67	Leyton	91	Carshalton
21	Deptford	45	Ruislip and Northwood	68	Waltham Holy Cross	92	Coulsdon and Purley
22	Greenwich	46	Hendon	69	Walthamstow	93	Croydon
23	Lewisham	47	Uxbridge	70	Wanstead and Woodford	94	Mitcham
24	Woolwich	48	Wembley	71	West Ham	95	Sutton and Cheam

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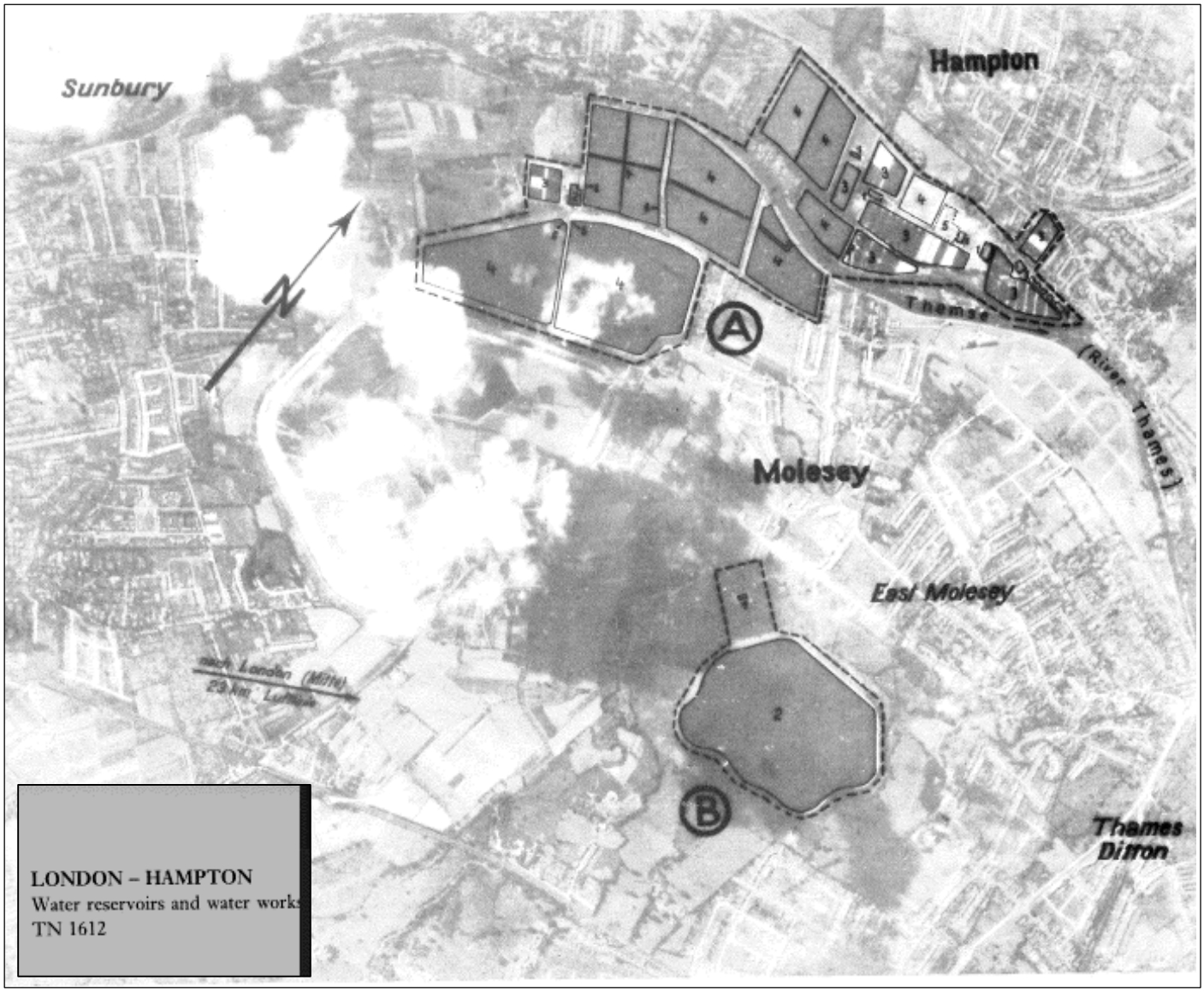
N

Ref: DA18413-00

Source: The London Metropolitan Archives



London – Hampton

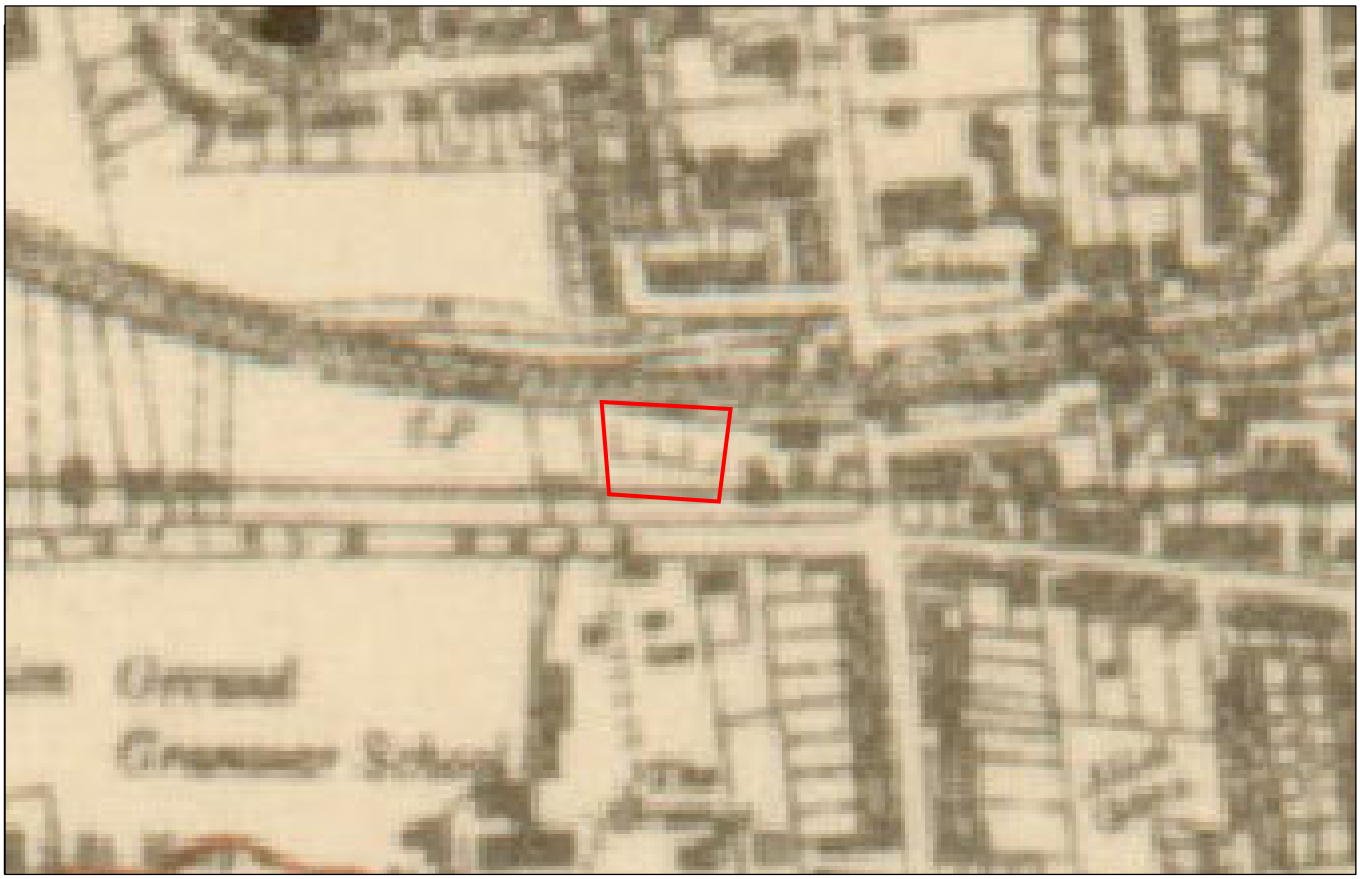
A. Water Works

B. Water Reservoirs

TN 1612 – Designated Luftwaffe targets

The Mosley Water Works outlined above was located approximately 1.4km south-west of the site.

Night Bombing up to 7th October 1940



Night Bombing - 7th October 1940 to 28th July 1941

Recorded bomb strike

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Client: Brownfield Solutions Limited

Project: Oldfield Road, Hampton

Ref: DA18413-00

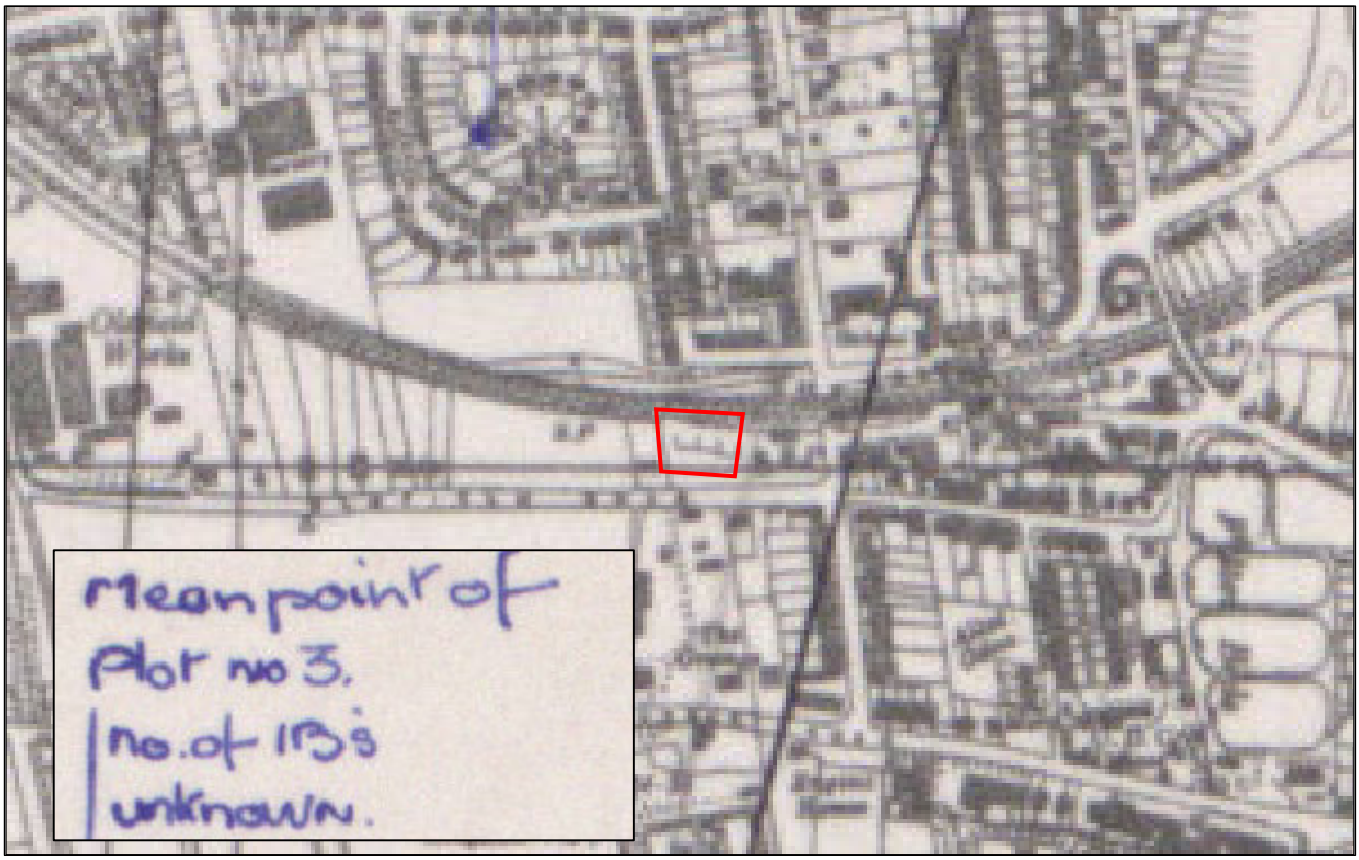
Source: The National Archives, Kew

Approximate site boundary

N

4th -11th November 1940

21st – 27th February 1944



Recorded HE bomb strike
Recorded UXB strike
Recorded incendiary bomb shower
Recorded oil bomb strike

Monday - Brown
Tuesday - Vermilion
Wednesday - Blue
Thursday - Black
Friday - Green
Saturday - Violet
Sunday - Yellow

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Client: Brownfield Solutions Limited

Approximate site boundary

N

Project: Oldfield Road, Hampton

Ref: DA18413-00

Source: The National Archives, Kew

London V-1 'Flying Bomb' Map

Annex: K

V-1 Flying Bomb

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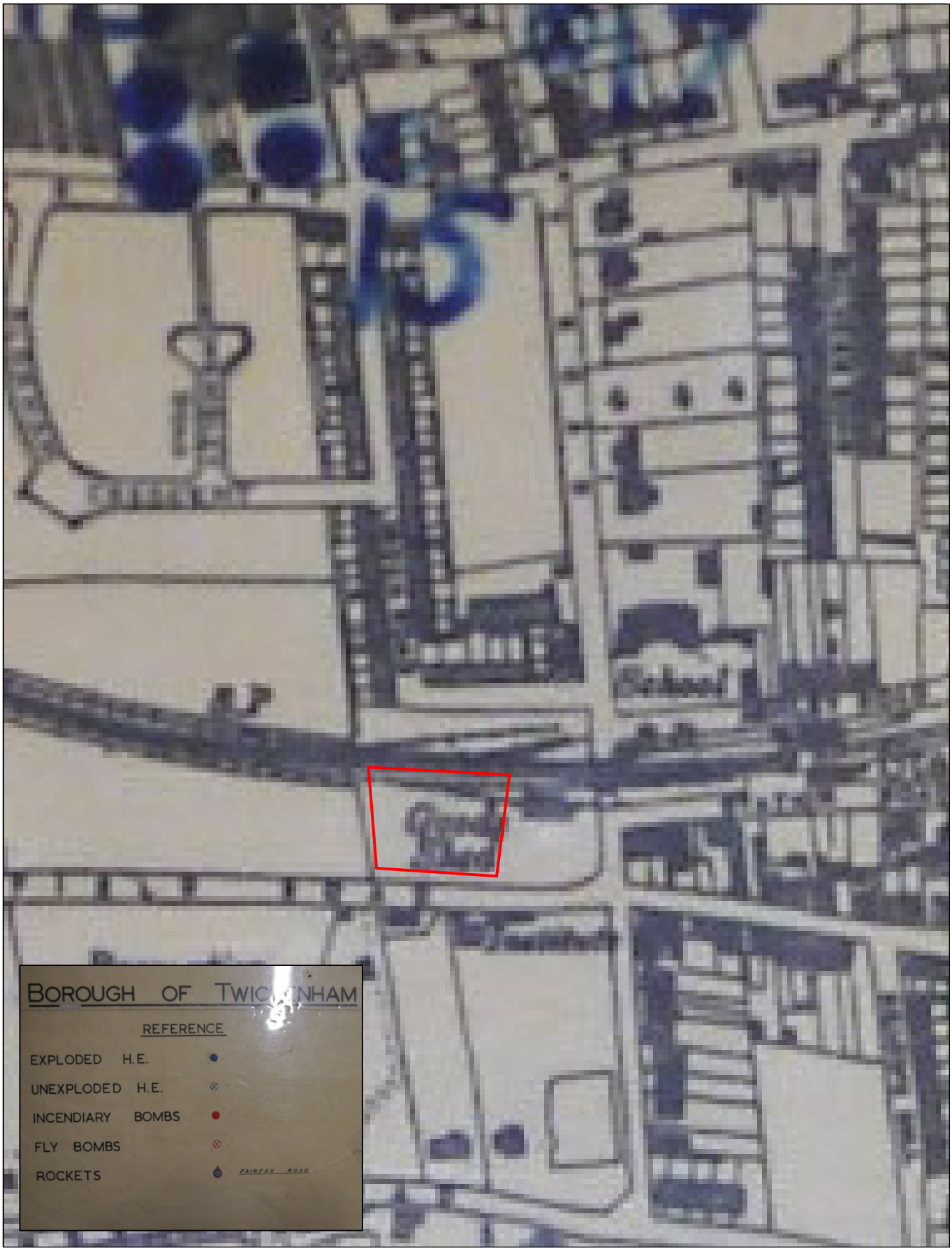
Client:	Brownfield Solutions Limited	Approximate site boundary	N
Project:	Oldfield Road, Hampton		
Ref:	DA18413-00	Source: The National Archives, Kew	



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Tel: +44 (0)1992 245 020

Client: Brownfield Solutions Limited

Approximate site boundary

N

Project: Oldfield Road, Hampton

Ref: DA18413-00

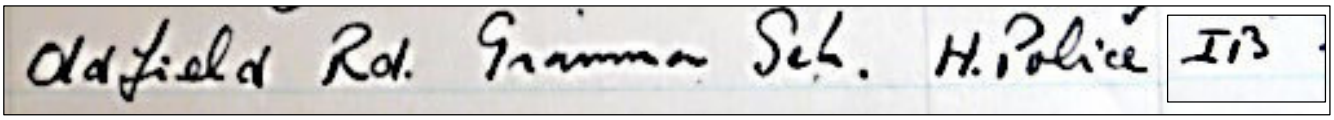
Source: Richmond Archives

23th September 1940

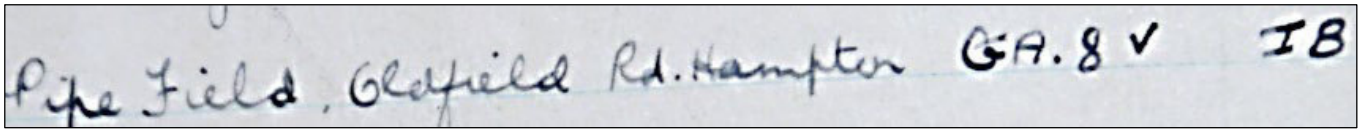
29th September 1940

15th October 1941

23th February 1944



24th February 1944



29th November 1944

Middlesex County Council War Damage Map

Annex: N

Category 1 - "Total damage, building to be demolished."

Category 2 - "Some repairs possible, but could become Cat 1."

Category 3 - "Border line areas, uncertain whether repairs possible, might have to be demolished."

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Source: London Metropolitan Archives

Approximate site boundary

N

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Tel: +44 (0)1992 245 020

Client: Brownfield Solutions Limited

Approximate site boundary

N

Project: Oldfield Road, Hampton

Ref: DA18413-00

Source: National Monuments Record Office (Historic England)

RAF Aerial Photography 14th April 1947 – Potential Damage Overlay

Annex: O2

Potential Ground Disturbance

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Client: Brownfield Solutions Limited

Approximate site boundary

N

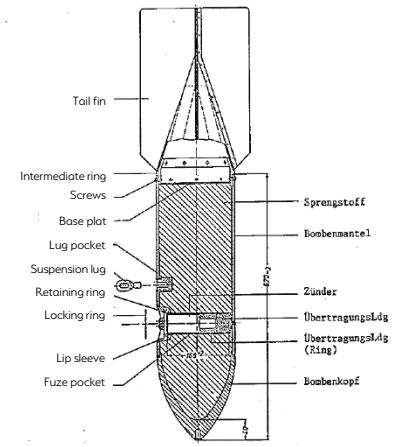
Project: Oldfield Road, Hampton

Ref: DA18413-00

Source: National Monuments Record Office (Historic England)

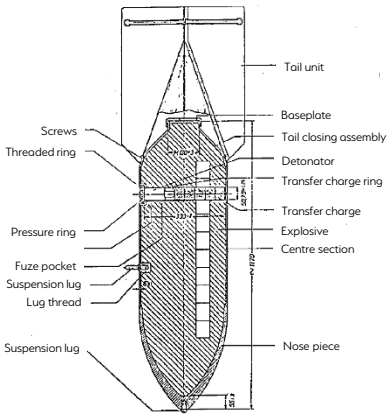
SC 50kg High Explosive Bomb

Bomb Weight	40-54kg (88-119lb)
Explosive Weight	25kg (55lb)
Fuze Type	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions	1,090 x 280mm (42.9 x 11.0in)
Body Diameter	200mm (7.87in)
Use	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.



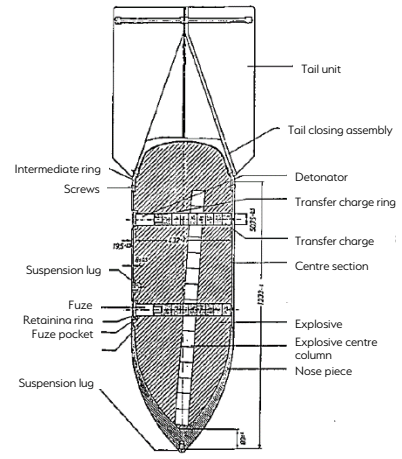
SC 250kg High Explosive Bomb

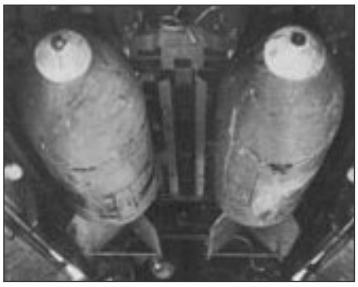
Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.
Remarks	It could be carried by almost all German bomber aircraft and was used to notable effect by the Junkers Ju-87 Stuka (*Sturzkampfflugzeug*, or dive-bomber).



SC 500kg High Explosive Bomb

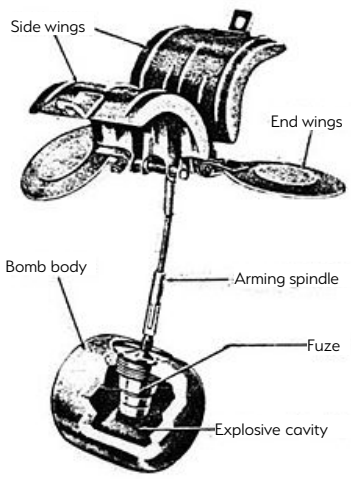
Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialen filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter.





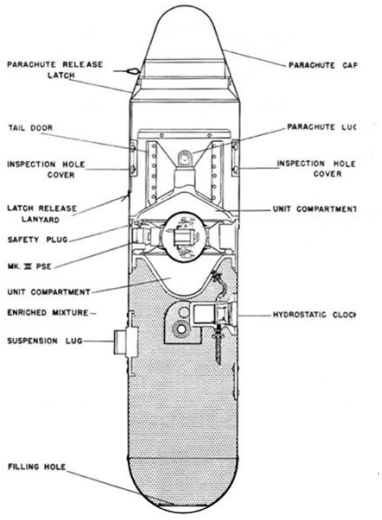
SD2 Anti-Personnel 'Butterfly Bomb'

Bomb Weight	Approx. 2kg (4.41lb)
Explosive Weight	Approx. 7.5oz (225 grams) of Amatol surrounded by a layer of bituminous composition.
Fuze Type	41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuze (anti-handling device)
Body Diameter	3in (7.62 cm) diameter, 3.1in (7.874) long
Use	Designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers of 23-144 sub-munitions that opened at a predetermined height, thus scattering the bombs.
Remarks	Quite rare. First used against Ipswich in 1940, but were also dropped on Kingston upon Hull, Grimsby and Cleethorpes in June 1943, amongst various other targets in UK. As the bombs fell the outer case flicked open via springs which caused four light metal drogues with a protruding 5 inch steel cable to deploy in the form of a parachute & wind vane, which armed the device as it span.



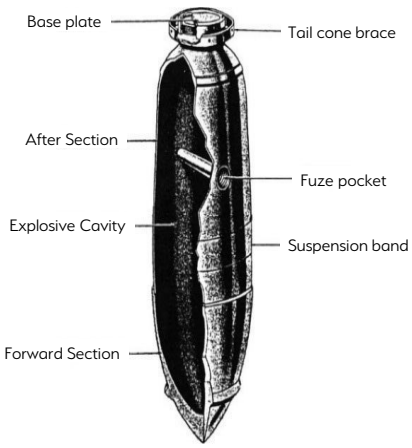
Parachute Mine (Luftmine B / LMB)

Bomb Weight	Approx. 990kg (2176lb)
Explosive Weight	Approx. 705kg (1,554lb)
Fuze Type	Impact/time delay/hydrostatic pressure fuze
Dimensions	2.64m x 0.64m (3.04m with parachute housing)
Use	Against civilian, military and industrial targets. Used as blast bombs and designed to detonate above ground level to maximise damage to a wider area.
Remarks	Deployed a parachute when dropped in order to control its descent. Had the potential to cause extensive damage within a 100m radius.



SC 1000kg High Explosive Bomb

Bomb Weight	Approx. 993-1027kg (2,189-2,264lb)
Explosive Weight	Approx. 530-620kg (1168-1367lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Filling	Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Trialen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.
Bomb Dimensions	2800 x 654mm (110 x 25.8in)
Body Diameter	654mm (18.5in)
Use	SC-type bombs were General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses, they are usually of three-piece welded construction.



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Client: Brownfield Solutions Limited

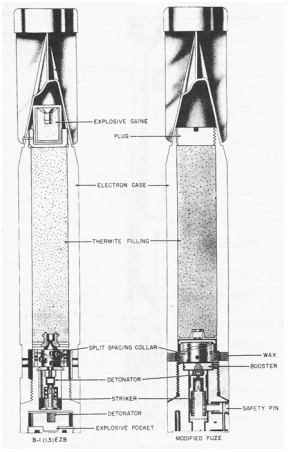
Project: Oldfield Road, Hampton

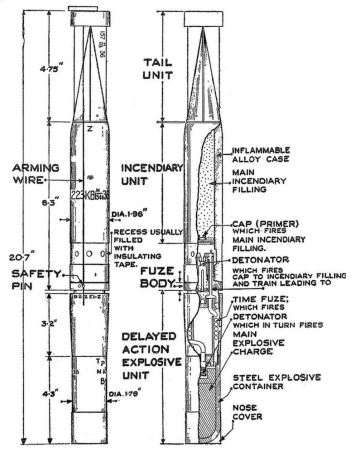
Ref: DA18413-00

Source: Various sources

1kg Incendiary Bomb

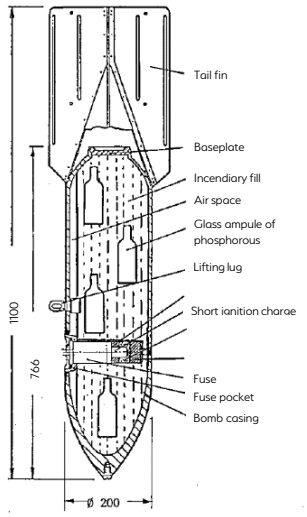
Bomb Weight	Approx. 1.0 - 1.3kg (2.2 and 2.9lb)
Explosive Weight	Approx. 680g (1.5lb) Thermite 8-15gm Explosive Nitropenta
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters on towns and industrial complexes.
Remarks	Magnesium alloy case. Sometimes fitted with high explosive charge. The body is a cylindrical alloy casting threaded internally at the nose to receive the fuze holder and fuze.

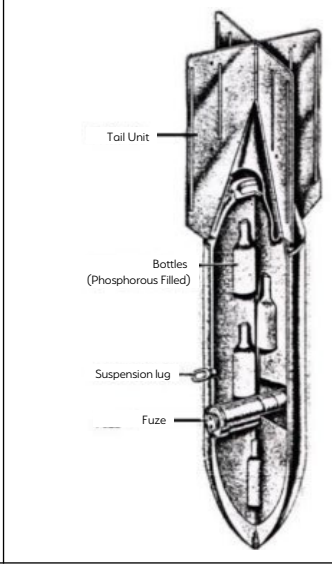




C50 A Incendiary Bomb

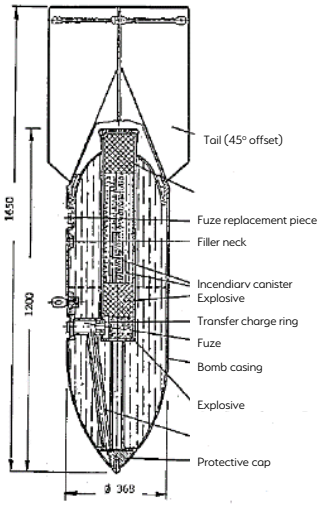
Bomb Weight	Approx. 41kg (90.4lb)
Explosive Weight	Approx. 0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against any targets where an incendiary effect is required.
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture.





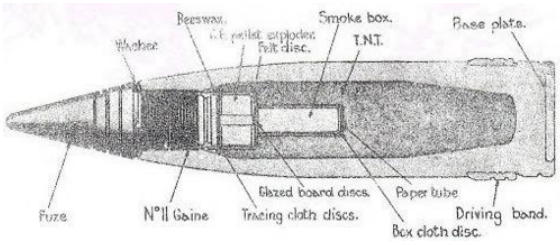
Flam C-250 Oil Bomb

Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialen filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter.



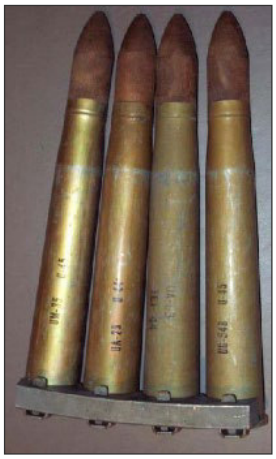
3.7 Inch QF Anti-Aircraft Projectile

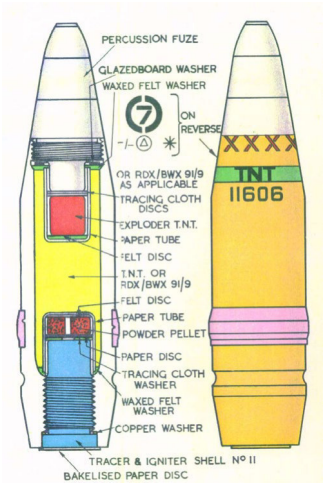
Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	The 3.7in AA Mks 1-3 were the standard Heavy Anti-Aircraft guns of the British Army and were commonly used on the Home Front.
Ceiling	30,000ft to 59,000ft



40mm Bofors Projectile

Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Impact Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40 x 180mm
Ceiling	23,000ft (7000m)
Remarks	Light quick fire high explosive anti-aircraft projectile. Each projectile fitted with small tracer element. If no target hit, shell would explode when tracer burnt out. Designed to engage aircraft flying below 2,000ft.





3in Unrotated Projectile (UP) Anti-Aircraft Rocket ("Z" Battery)

HE Projectile Weight	3.4kg (7.6lb)
Explosive Weight	0.96kg (2.13lb)
Filling	High Explosive – TNT. Fitted with aerial burst fuzing
Dimensions of projectile	236 x 83mm (9.29 x 3.25in)
Remarks	As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries. Shell consists of a steel cylinder reduced in diameter at the base and threaded externally to screw into the shell ring of the rocket motor.

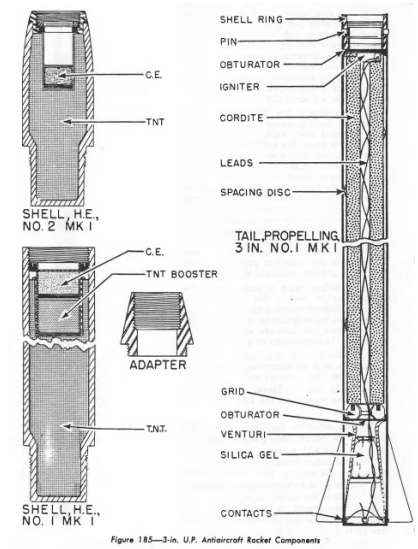


Figure 185.—3-in. U.P. Antiaircraft Rocket Components

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Email info@1stlinedefence.co.uk
Web www.1stlinedefence.co.uk

1ST LINE DEFENCE

Front cover image credit: London Bomb Census Mapping, The National Archives (HO 193)

APPENDIX E

Exploratory Hole Logs

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No. BH01

Sheet 1 of 2

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type:** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale:** 1:50
CLIENT:	SHURGARD LTD	**DATES:**	14/08/23 - 15/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.09	-0.09		MADE GROUND: Asphalt.
		0.30	B		0.30	-0.30		MADE GROUND: Brown gravelly sand with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone. Cobbles are subangular to subrounded of brick.
		0.50	ES					
		0.70	B					
		1.00	ES					MADE GROUND: Soft greyish brown slightly gravelly slightly sandy clay. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone.
		1.10	B		1.20	-1.20		
		1.50	SPT	N=29 (2,3/4,7,8,10)				Light brown gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of flint and sandstone.
		2.00	ES					*Becoming brownish from 2.00m bgl.*
		2.00-2.50	LB					
		2.50-3.00	LB					
		2.50	SPT	N=15 (4,5/4,3,4,4)				
		3.50-4.00	LB					*Pockets of clay present from 3.50m bgl.*
		3.50	SPT	N=16 (4,5/3,5,4,4)				
		4.50	SPT	N=10 (2,3/2,3,3,2)	4.40	-4.40		Soft brownish grey slightly gravelly slightly sandy CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of flint and sandstone.
		5.00-5.50	LB					
		6.00	B					*Becoming firm from 6.00m bgl*
			SPT	N=12 (1,2/3,2,3,4)				
		7.00	B					
		7.50-7.95	U					
		8.00	B					
		9.00	B					*Becoming stiff from 9.00m bgl.*
			SPT	N=25 (3,5/5,6,7,7)				
		10.00	B					

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Water added from 1.70m bgl to 2.50m bgl.
4. Slow seepage groundwater encountered at 12.0m bgl, rising to 11.70m after 20 minutes.
5. Monitoring well installed upon completion. 0.00m to 1.50m bgl plain pipe. 1.50m to 4.50m bgl slotted pipe. Bentonite seal between 4.50m and 5.50m bgl. 5.50m to 20.0m bgl backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No.
BH01
Sheet 2 of 2

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:50
CLIENT:	SHURGARD LTD	**DATES:**	14/08/23 - 15/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50-10.95	U					
		11.00	B					*Becoming very stiff from 11.00m bgl.*
	▼	12.00	B SPT	N=32 (4,5/7,7,9,9)				
		13.00	B SPT	N=43 (5,7/9,10,12,12)				
		14.00	B					
		15.00	B SPT	N=45 (4,8/9,11,12,13)				
		16.00	B					
		16.50	SPT	N=49 (6,9/11,12,12,14)				
		17.00	B					
		18.00	B SPT	N≥50 (7,10/11,13,13,13)				
		19.00	B SPT	N≥50 (7,10/11,13,14,12)				
		20.00	B SPT	N≥50 (8,12/12,14,16,8)	20.00	-20.00		End of Borehole at 20.00m

11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Water added from 1.70m bgl to 2.50m bgl.
4. Slow seepage groundwater encountered at 12.0m bgl, rising to 11.70m after 20 minutes.
5. Monitoring well installed upon completion. 0.00m to 1.50m bgl plain pipe. 1.50m to 4.50m bgl slotted pipe. Bentonite seal between 4.50m and 5.50m bgl. 5.50m to 20.0m bgl backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No.
BH02
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:50
CLIENT:	SHURGARD LTD	**DATES:** 16/08/23	**Logged** CO / **Checked** AT

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.09	-0.09		MADE GROUND: Asphalt
		0.30	ES		0.26	-0.26		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone.
					0.70	-0.70		MADE GROUND: Soft yellowish brown slightly sandy slightly gravelly silty clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone.
		1.00	ES					Firm yellowish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of flint, and sandstone.
					1.20	-1.20		End of Borehole at 1.20m

1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Location terminated at 1.20m bgl due to presence of suspected underground services.
4. Location backfilled with arisings upon completion.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No. BH03

Sheet 1 of 3

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:50
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23 - 16/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.19	-0.19		MADE GROUND: Concrete
		0.30	B		0.30	-0.30		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, concrete, flint, and sandstone.
		0.40	ES					
		0.50	B		0.60	-0.60		MADE GROUND: Soft yellowish brown slightly sandy slightly gravelly silty clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, concrete, flint, and sandstone.
		0.70	ES					
			LB					
		1.00-1.50	LB		1.00	-1.00		Soft yellowish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint, and sandstone.
		1.50	ES					
		1.50-2.00	LB					Yellowish brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint and sandstone.
		1.50	SPT	N=45 (5,7/9,11,12,13)				
		2.50-3.00	LB					
		2.50	SPT	N=16 (5,4/5,6,3,2)				
		3.00-3.50	LB		3.00	-3.00		Soft brownish grey slightly gravelly slightly sandy CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of flint and sandstone.
		3.50	SPT	N=3 (1,0/1,0,1,1)				
		4.00	B					
		4.50-5.00	LB					
		6.00	B					*Becoming firm from 6.00m bgl.*
			SPT	N=17 (2,3/3,4,5,5)				
		7.00	B					*Becoming stiff from 7.00m bgl.*
		7.50	SPT	N=19 (3,3/4,4,5,6)				
		8.00	B					
		9.00	B					*becoming very stiff from 9.00m bgl.*
		9.00-9.45	U					
		9.50	B					
		10.00	B					

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Water added from 1.50m bgl to 2.50m bgl.
4. Slow seepage groundwater encountered at 11.70m bgl, rising to 11.40m after 20 minutes.
5. Monitoring well installed upon completion. 0.00m to 1.00m bgl plain pipe. 1.00m to 3.00m bgl slotted pipe. Bentonite seal between 3.00m and 4.00m bgl. 4.00m to 25.0m bgl backfilled with arisings

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No. BH03

Sheet 2 of 3

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:50
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23 - 16/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	SPT	N=25 (4,5/5,6,7,7)				
		11.00	B					
	▼	12.00	B SPT	N=33 (5,5/7,8,8,10)				
		13.00	B					
		13.50	SPT	N=31 (5,5/6,7,8,10)				
		14.00	B					
		15.00	B SPT	N=34 (4,5/5,7,9,13)				
		16.00	B					
		16.50	SPT	N=47 (5,7/10,11,12,14)				
		17.00	B					
		18.00	B SPT	N=41 (5,5/7,10,12,12)				
		19.00	B					
		19.50	SPT	N=48 (6,7/10,12,13,13)				
		20.00	B					

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Water added from 1.50m bgl to 2.50m bgl.
4. Slow seepage groundwater encountered at 11.70m bgl, rising to 11.40m after 20 minutes.
5. Monitoring well installed upon completion. 0.00m to 1.00m bgl plain pipe. 1.00m to 3.00m bgl slotted pipe. Bentonite seal between 3.00m and 4.00m bgl. 4.00m to 25.0m bgl backfilled with arisings

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Borehole No. BH03

Sheet 3 of 3

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** CP
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:50
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23 - 16/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		21.00	B SPT	N=49 (6,6/9,12,14,14)				
		22.00	B					
		22.50	SPT	N=45 (6,7/8,10,13,14)				
		23.00	B					
		24.00	B SPT	N≥50 (6,8/11,14,14,11)				
		25.00	B SPT	N≥50 (8,12/12,15,14,9)	25.00	-25.00		End of Borehole at 25.00m

21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl.
3. Water added from 1.50m bgl to 2.50m bgl.
4. Slow seepage groundwater encountered at 11.70m bgl, rising to 11.40m after 20 minutes.
5. Monitoring well installed upon completion. 0.00m to 1.00m bgl plain pipe. 1.00m to 3.00m bgl slotted pipe. Bentonite seal between 3.00m and 4.00m bgl. 4.00m to 25.0m bgl backfilled with arisings

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.	WS01
	Sheet 1 of 1
PROJECT NO:	M5478
CO-ORDS:	
Hole Type	WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON
LEVEL:	
Scale	1:30
CLIENT:	SHURGARD LTD
DATES:	15/08/23
Logged	CO
Checked	AT

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.19	-0.19		MADE GROUND: Concrete with rebar.
		0.50	ES		0.40	-0.40		MADE GROUND: Brown gravelly sand with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, concrete, flint, and sandstone. Cobbles are subangular of brick.
		1.10	ES					MADE GROUND: Soft dark grey slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, concrete, flint, and sandstone. *Becoming yellowish brown from 0.60m bgl to 1.20m bgl.*
		1.20	SPT	N=19 (1,1/4,5,3,7)	1.20	-1.20		Brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint and sandstone.
		2.00	ES SPT	N=24 (5,7/6,6,6,6)				
		3.00	SPT	N=12 (4,5/4,3,3,2)				
					3.70	-3.70		Firm dark grey slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of flint and sandstone.
		4.00	ES SPT	N=23 (3,3/4,6,6,7)				
		5.00	SPT	N=30 (6,7/7,7,8,8)	5.00	-5.00		End of Borehole at 5.00m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl
3. Wet sand encountered from 2.00m bgl to 3.00m bgl.
4. borehole collapsed from 5.00m to 2.80m bgl.
5. Monitoring well installed upon completion. 0.00m to 1.50m bgl plain pipe. 1.50m to 2.80m bgl slotted pipe.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS02
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:30
CLIENT:	SHURGARD LTD	**DATES:** 15/08/23	**Logged** CO / **Checked** AT

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.09	-0.09		MADE GROUND: Asphalt
					0.40	-0.40		MADE GROUND: Dark brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, and sandstone.
								End of Borehole at 0.40m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 0.40m bgl.
3. No groundwater encountered.
4. Location terminated at 0.40m bgl due to concrete obstruction.
5. Location backfilled with arising upon completion.
6. Asphalt surfacing repaired with cold lay.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS03
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:30
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.09	-0.09		MADE GROUND: Asphalt
					0.27	-0.27		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone.
		0.70	ES		0.80	-0.80		MADE GROUND: Soft yellowish brown slightly gravelly slightly sandy clay. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of asphalt, concrete, flint, and sandstone.
					1.10	-1.10		Soft yellowish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint, and sandstone.
								End of Borehole at 1.10m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.10m bgl.
3. No groundwater encountered.
4. Location terminated at 1.10m bgl due to concrete obstruction.
5. Location backfilled with arisings upon completion. .
6. Asphalt surfacing repaired with cold lay.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS03A
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:30
CLIENT:	SHURGARD LTD	**DATES:** 15/08/23	**Logged** CO / **Checked** AT

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.09	-0.09		MADE GROUND: Asphalt
		0.30	ES		0.30	-0.30		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, flint, and sandstone. *Becoming yellowish brown from 0.14m bgl to 0.30m bgl.*
		0.60	ES					MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay. Sand is fine to medium. Gravel is subangular to rounded fine to coarse of asphalt, brick, concrete, flint, and sandstone.
					1.10	-1.10		End of Borehole at 1.10m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.10m bgl.
3. No groundwater encountered.
4. Location terminated at 1.10m bgl due to concrete obstruction.
5. Locations backfilled with arisings completion.
6. Asphalt surfacing repaired with cold lay.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS03B
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:30
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	-0.10		MADE GROUND: Asphalt
		0.25	ES		0.25	-0.25		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of asphalt, brick, concrete, and sandstone.
								End of Borehole at 0.25m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 0.25m bgl.
3. No groundwater encountered.
4. Location terminated at 0.25m bgl due to concrete obstruction.
5. Location backfilled with arisings upon completion.
6. Tarmac repaired with cold lay.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS04
Sheet 1 of 1

PROJECT NO:	M5478	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	OLDFIELD ROAD, HAMPTON	**LEVEL:**	**Scale** 1:30
CLIENT:	SHURGARD LTD	**DATES:**	15/08/23

Logged	Checked
CO	AT

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.09	-0.09		MADE GROUND: Asphalt
					0.26	-0.26		MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of asphalt, brick, concrete, flint, and sandstone.
		0.40	ES					MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay with rare rootlet. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of asphalt, concrete, flint, and sandstone.
		0.70	ES					*Becoming yellowish brown from 0.70m bgl to 1.30m bgl.*
		1.20	SPT	N=24 (2,2/2,7,7,8)				*Becoming firm from 0.80m bgl to 1.30m bgl.*
					1.30	-1.30		Light brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint and sandstone.
		1.70	ES					
		2.00	SPT	N≥50 (5,6/11,13,15,14)	2.00	-2.00		End of Borehole at 2.00m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR methods.
2. Hand dug inspection pit to 1.20m bgl
3. No groundwater encountered.
4. SPT refusal at 2.00m bgl, location followed on by dynamic probing (see log WS04A).
5. Monitoring well installed upon completion. 0.00m to 0.50m bgl plain pipe. 0.50m to 1.00m bgl slotted pipe. Bentonite seal between 1.00m and 2.00m bgl.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane