16.5. Defending the UK From Aerial Attack

During WWII the Ministry of Defence employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

Active Defences	Passive Defences
• Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII.	• Blackouts and camouflaging to hinder the identification of Luftwaffe targets. • Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas. • Barrage balloons forced enemy aircraft to greater altitudes. • Searchlights were often used to track and divert adversary bomber crews during night raids.

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.

16.6. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.

Anti-Aircraft Artillery				
Item	**Description**			
HAA	These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes triggered by impact, area, time delay or a combination of aforementioned mechanisms. The closest HAA was located approximately 3.32km south-west of the site, however the range of a projectile can be up to 15km.			
LAA	These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m.			
Variations in HAA and LSA Ammunition	**Gun type**	**Calibre**	**Shell Weight**	**Shell Dimensions**
	3.0 Inch	76mm	7.3kg	76mm x 356mm
	3.7 Inch	94mm	12.7kg	94mm x 438mm
	4.5 Inch	114mm	24.7kg	114mm x 578mm
	40mm	40mm	0.9kg	40mm x 311mm
Z-AA	The three inch unrotated rocket/projectile known as the UP-3 had initially been developed for the Royal Navy. The UP-3 was also used in ground-based single and 128-round launchers known as ''Z'' batteries. The rocket, containing a high explosive warhead was often propelled by cordite.			

29mm Spigot Mortars (Blacker Bombards)	This was an infantry anti-tank weapon. A heavy steel rod (spigot) would be driven into the hollow tail of a projectile to ignite the explosive charge located in the rear of the projectile, and lead to it being propelled toward a target. It was not an effective method of air defence and was mainly used in defensive positons at key locations. If encountered, a spigot mortar projectile will resemble a mortar round, but with an elongated metal tail rod.
Quick Firing (QF) 1 and 2 Pounder	QF 1 and 2 Pounders, or 'pom poms' were a light battery most often used by the navy. During the beginning of WWII they were used to defend targets in the absence of more effective LAA or HAA.
Machine Gun Posts	These were established at some significant military and industrial positions. Machine guns were a largely ineffective form of AAA. Machine guns usually fired the .303 Round.

The conditions in which an HAA or LAA projectiles may have fallen unnoticed within a site area are analogous to those regarding aerial delivered ordnance. For detailed analysis on the ground conditions and access frequency within the proposed site, see the Evaluation of German Aerial Delivered UXB Risk in, **Section 14.13**.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Annex U**.

16.7. Evaluation of Allied Ordnance Risk

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

Sources of Contamination	Conclusion
Ordnance Manufacture *Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.*	The site of proposed works is known to have been associated with historical ordnance manufacture activities, being situated within the National Filling Factory No.7 during the WWI period. The site boundary was historically situated within a section of the factory that is recorded to have dealt with the manufacture and filling of large quantities of fuzes, friction tubes and C.E. pellets. Two storage magazines are shown to have been situated within the site boundary. Taking the above into account, there is considered to be a potential residual risk of contamination from WWI-era military ordnance at the proposed site. At the time it was likely not anticipated that the land would be later sold for civilian development, and consequently appropriate explosive ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance such as fuzes to be buried or burnt within the wider premises as a means of disposal. Records of such practice were rarely kept. Immediate post-WWI records are not comprehensive, but indicate that the factory was disused shortly following the end of hostilities, and used as storage space. Correspondence from the Ministry of Labour indicates that a section of the factory was used in the 1920s as a Government Instructional Factory to educated demobbed soldiers and sailors in the trade of coach and car building. Ordnance handled at National Filling factories were filled with explosive material, with the site area being situated within a section of the site known to handle the filling of ordnance components. As such there is considered to be an elevated risk of the contamination of the site area with items of Allied ordnance.

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 3.32km south-west of the site, however the range of a projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are analogous to those regarding German aerial 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 training areas and activities is difficult to obtain. 1st Line Defence has no evidence of any Home Guard activities on 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 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.*	There is no evidence of such features affecting the site.
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.
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.
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.

17. Ordnance Clearance and Post-WWII Ground Works

17.1. General

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.

17.2. UXO Clearance

1st Line Defence has no evidence that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from 33 EOD Regiment.

17.3. Post-WWI and WWII Redevelopment

The site has been subject to several periods of extensive redevelopment as described below

Post-WWI, the NFF known to have occupied the site area and surrounding environs was cleared, with the area shown to have been occupied by open vacant land following this development. Additional development is shown to have taken place at some point after this.

Post-WWII, re-development work on site has been minor, with the structures present on site being those erected during the pre-war period.

The risk from deep-buried unexploded bombs is only considered mitigated at locations where post war piling or deep foundations have taken place.

18. 1st Line Defence Risk Assessment

18.1. 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.

UXO Risk Assessment	
Quality of the Historical Record	The research has evaluated pre- and post-WWII Ordnance Survey maps, Luftwaffe reconnaissance imagery, pre-war oblique aerial imagery, London Civil Defence air raid damage reports, MCC Log Book of air raid incident for Hayes and Harlington, local Hayes and Harlington ARP wartime message forms, Ministry of Munitions records, Ministry of Labour correspondence and WWI NFF plans. The WWI record set is of generally good quality. Details of the history of the NFF that had formerly occupied the site area are reasonably comprehensive and covers the items produced at the factory, as well as its extent and the position of the site area within it. The WWII record set is both largely comprehensive, detailed and presents bomb incidents recorded in London bomb census mapping. Bomb incidents affecting the area are accounted for, with the only incident within close proximity being a UXB that was recorded to have been 'disposed of.' The only limitation of the available record set is that MCC War Damage Mapping was missing for this area, as well as the lack of records for the NFF immediately post WWI.
The Risk that the Site was Contaminated with UXO	After considering the following facts, 1st Line Defence has assessed that there is a **Low Risk** that items of unexploded German aerial delivered and anti-aircraft ordnance could have fallen unrecorded within the site boundary. There is considered to be a significant risk of contamination from Allied Ordnance at the site but mitigating factors post-war reduce the overall risk of Allied UXO remaining to **Low-Medium**. **The Likelihood of German Aerial Delivered Ordnance Contamination** • During WWII, the Urban District of Hayes and Harlington sustained an overall low-moderate density bombing campaign, with an average of 40 items falling per 1,000 acres according to Home Office statistics. Most bombing in the local area of Nestle Avenue can be attributed to its location within London and proximity to areas of local industry and the railway. • Whilst London bomb census mapping does record strikes to have affected areas within the vicinity of the site, including a UXB in the Nestle Sports Field, no bombs are recorded to have fallen within the site boundary. Additionally, these strikes in the vicinity are accounted for in an MCC Log Book of Incidents for Hayes and Harlington, which report one bomb to have fallen on the Nestle Factory and a UXB to have landed in the Nestle Sports Field. • It has not been possible to determine the exact composition of the site during the war, although it is thought likely that the site was somewhat developed. Pre-war historic OS mapping suggests a rectangular structure was present within the west of the site, while 1946 post-war aerial photography shows that this area was cleared and the rest of the site was occupied by various warehouse buildings. These structures do not appear to have been recently constructed and are anticipated to

	have been present for the duration of the war, although this cannot be explicitly confirmed. • Post-war 1946 aerial imagery suggests that the site and bordering areas escaped serious bomb damage. No obvious signs of damage are visible in these areas, such as the presence of cratering, ruins, rubble or debris. • It is thought that the site would have sustained a relatively good level of access during the war. Pre-war mapping suggests at least one structure was located on site during the war. No evidence, such as damage or nearby bomb strikes, could be found to suggest that this access would have been significantly impeded over the course of the war, or that the ground cover present could have restricted evidence of UXO. Accordingly it is considered likely that post-raid checks were maintained, and thus items of UXO would have been observed and reported. • One structure in the west of the site does appear to have been cleared post-war. However, this this cleared area appears to have been neatly replaced with a hard-standing yard and it is not thought likely that this clearance was due to bomb damage. • The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are considered analogous to those regarding aerial delivered ordnance. **The Likelihood of Allied Ordnance Contamination** • During the WWI period, the site area was located within the boundary of the National Filling Factory No.7, and as such there is potential for contamination from items of historic Allied ordnance to have occurred. • Available records indicate that the factory was concerned with filling explosive material in a wide variety of ordnance items, in significant quantities during WWI, and later in the war also began to assemble components. Items filled included: HE and shrapnel shells, fuzes, detonators, small arms ammunition and exploders. All of these items were mass-produced in quantity throughout the war by some 10,000 workers. • The site area was situated within the eastern section of the factory which is recorded to have dealt with the filling of fuzes, friction tubes and exploders. Rows of magazine buildings are shown to have been located on site, surrounded by piled earth to insulate damage should an accident occur. • Taking this into account, there is considered to be a residual risk from contamination of WWI-era military ordnance at the site. At the time it was likely not anticipated that the land would be later sold for civilian development, and consequently appropriate explosive ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance such as fuzes to be buried or burnt within the wider premises as a means of disposal. Records of such practice were rarely kept.
The Risk that UXO Remains on Site	The site was demolished and cleared in the inter-war period, as shown in historical OS mapping from 1934, which highlights the site area as vacant unoccupied land, aside from a rectangular structure within its western section. This structure was subsequently also cleared and a number of industrial warehouses built on site circa WWII. Additional warehousing was constructed within the western section of the site in the post war period. This demolition, clearance and subsequent re-development is anticipated to have involved some significant intrusive work into the ground. If UXO had contaminated the site following its WWI use as an NFF, the contamination is only likely to have been present at relatively shallow depths. The risk of UXO remaining is considered to have been mitigated at the location of and down to the depth of post-war foundations and excavations. It is considered likely that the vast majority of the site will have been subject to excavations to shallow depths as a result of post WWI redevelopment.

	Consequently, while the risk of contamination from the National Filling Factory is considered to have been significant, the residual risk of ordnance remaining is considered relatively low, due largely to the clearance and redevelopment work that has taken place.
The Risk that UXO may be Encountered during the Works	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 risk of encountering will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. An aerial delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth. Consequently there is also a possibility that UXBs could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. There is not considered to be any significant risk of encountering UXO during works planned within the footprint and down to the depth of any post-war buildings/excavations. Beyond these depths and away from these areas, a risk of encounter could conceivably remain.
The Risk that UXO may be Initiated	The risk that UXO could be initiated if encountered will depend on its condition, how it is found, and the energy with which it is struck. Certain construction activities such as piling and percussive drilling pose a greater risk of initiating UXO in comparison to machine excavation, where the force of impact is generally lower and the item is more likely to be observed. If piling works are planned at 233-236 Nestles Avenue there is a potential risk that a UXB, if present, could be initiated. The risk of initiation is assessed to be lower for any shallow intrusive works planned.
The Consequences of Encountering or Initiating Ordnance	The repercussions of the inadvertent detonation of items of UXO during intrusive ground works are potentially severe, 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. If appropriate risk mitigation measures are undertaken, the chances of initiating an item of UXO during ground works is comparatively low. The primary consequence of encounter of UXO will therefore be economic. This would be particularly notable in the case of sites with a high-profile or where it is necessary to evacuate the public from the surrounding area. A site may be closed 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 items of UXO during intrusive works (if handled solely through the authorities), may also involve loss of production. Generally, the first action of the police in most cases will be to isolate the locale whilst awaiting military assistance, even if this becomes unnecessary.

18.2. Assessed Risk Level

Taking into consideration the findings of this study, 1st Line Defence has assessed that there is a **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. However, a **Low-Medium Risk** of contamination from WWI-era LSA/SAA has been identified.

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Land Service Ammunition (Grenades, Mortars, Fuzes etc.)		✓		
Small Arms Ammunition		✓		

19. Proposed Risk Mitigation Methodology

19.1. General

The following risk mitigation measures are recommended to support the proposed works at the 233-236 Nestles Avenue site.

Type of Work	Recommended Mitigation Measure
All Works	• **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 **17th April 2019**

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.

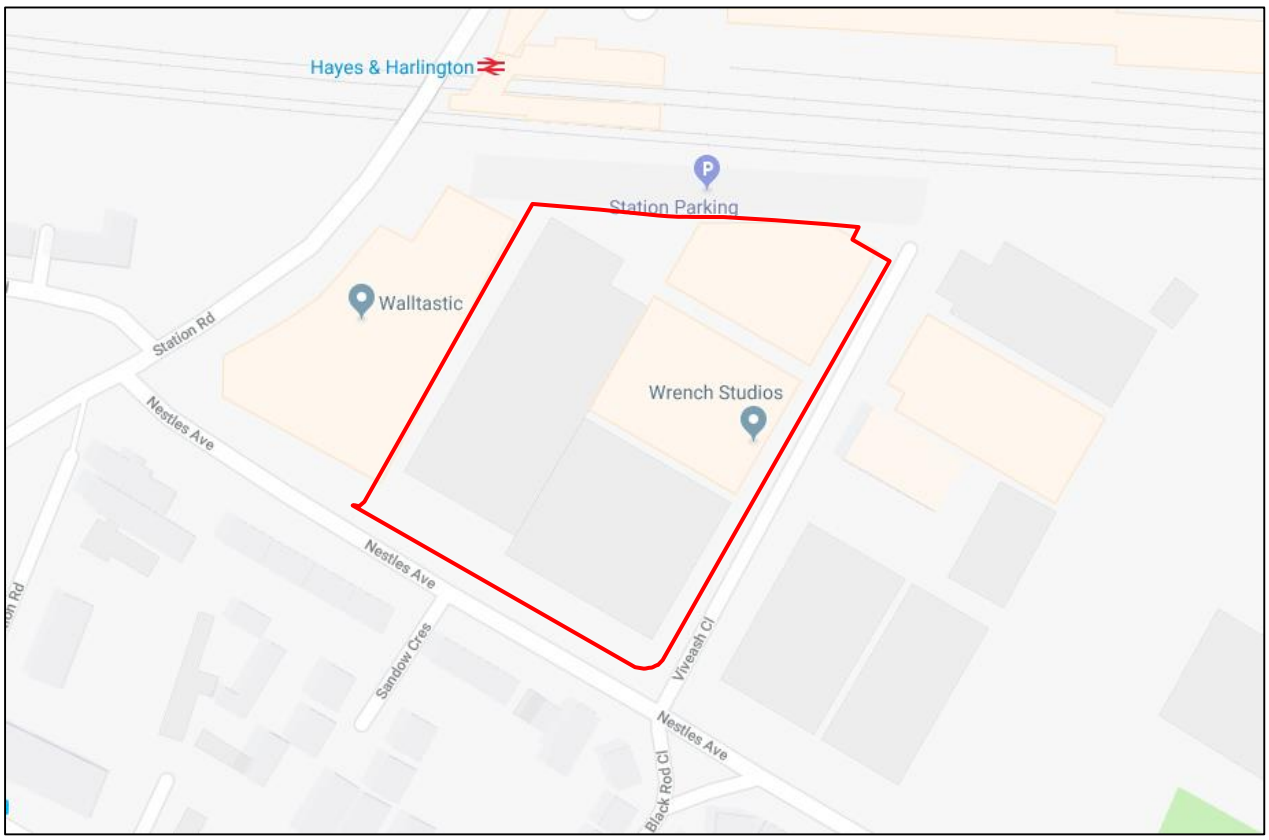
Bibliography

- Bates, H. E., *Flying Bombs over England*, Frogletts Publications Ltd., 1994
- Castle, I., *London 1914-17: The Zeppelin Menace*, Osprey Publications Ltd., 2008
- Castle, I., *London 1917-18: The Bomber Blitz*, Osprey Publications Ltd., 2010
- Clarke, N. J., *Adolf Hitler's Holiday Snaps: German Aerial Reconnaissance Photography of London and the Home Counties 1939 – 1943*, N. J. Clarke Publications., 1996
- Clarke, N. J., *Adolf's British Holiday Snaps: Luftwaffe Aerial Reconnaissance Photographs of England, Scotland and Wales*, Fonthill Media Ltd., 2012
- Dobinson, C., *AA Command: Britain's Anti-Aircraft Defences of the Second World War*, Methuen., 2001
- Fegan, T., *The 'Baby Killers': German Air raids on Britain in the First World War*, Leo Cooper Ltd., 2002
- Fleischer, W., *German Air-Dropped Weapons to 1945,* Midland Publishing., 2004
- Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, Channel 4 Books., 2001
- Morris, J., *German Air Raids on Britain: 1914 – 1918*, The Naval & Military Press., 1993
- Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, Purnell Book Services Ltd., 1977
- Ramsey, W., *The Blitz Then and Now, Volume 1*, Battle of Britain Prints International Ltd., 1987
- Ramsey, W., *The Blitz Then and Now, Volume 2*, Battle of Britain Prints International Ltd., 1988
- Ramsey, W., *The Blitz Then and Now, Volume 3*, Battle of Britain Prints International Ltd., 1990
- Scofield, J., *Modern Military Matters*., Council for British Archaeology., 2004
- Stone, K., et al., *Unexploded Ordnance (UXO) A Guide For The Construction Industry (C681)*., CIRIA, 2009
- Whiting, C., *Britain Under Fire: The Bombing of Britain's Cities 1940-1945*, Pen & Sword Books Ltd., 1999
- Johnston,I., *Beardmore Built, The Rise and Fall of a Clydeside Shipyard*, Cyldesbank District Libraries & Museums Department, 1993
- Cocroft, W., *Dangerous Energy, the Archaeology of Gunpowder and Military Explosives Manufacture*, English Heritage, 2000
- Ministry of Munitions, *The Official History of The Ministry of Munitions,* Ministry of Munitions, 1914

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.

Site Location Maps

Annex: **A**



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client:	**GEA Ltd**	**Approximate site boundary**	N
Project:	**233-236 Nestles Aveune**		
Ref:	**DA8572-00**	Source: Google Maps	

Recent Aerial Photography

Annex: **B**

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

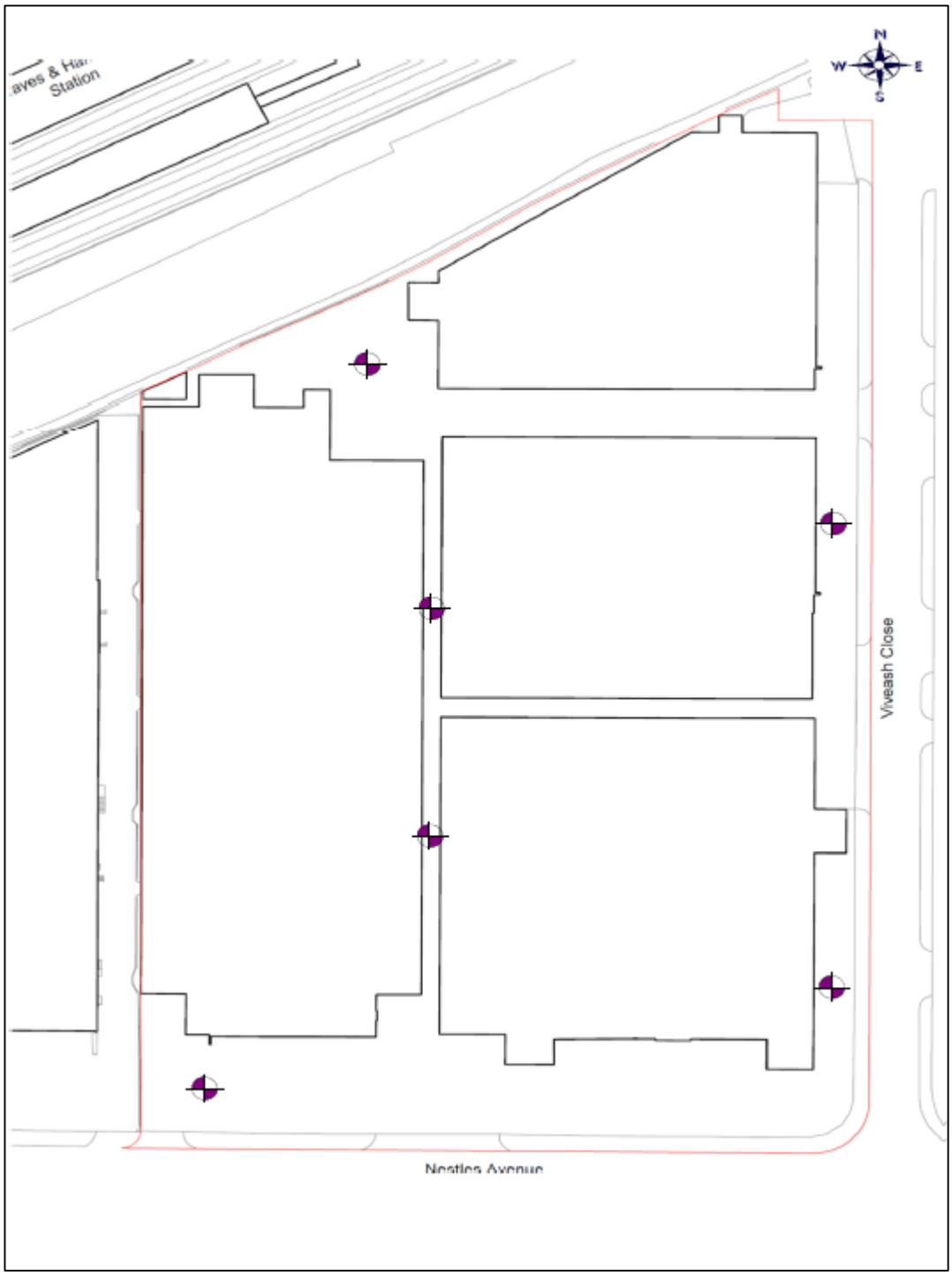
Source: Google Earth ™ Mapping Services

Approximate site boundary

N

Client Provided Site Plan

Annex: C



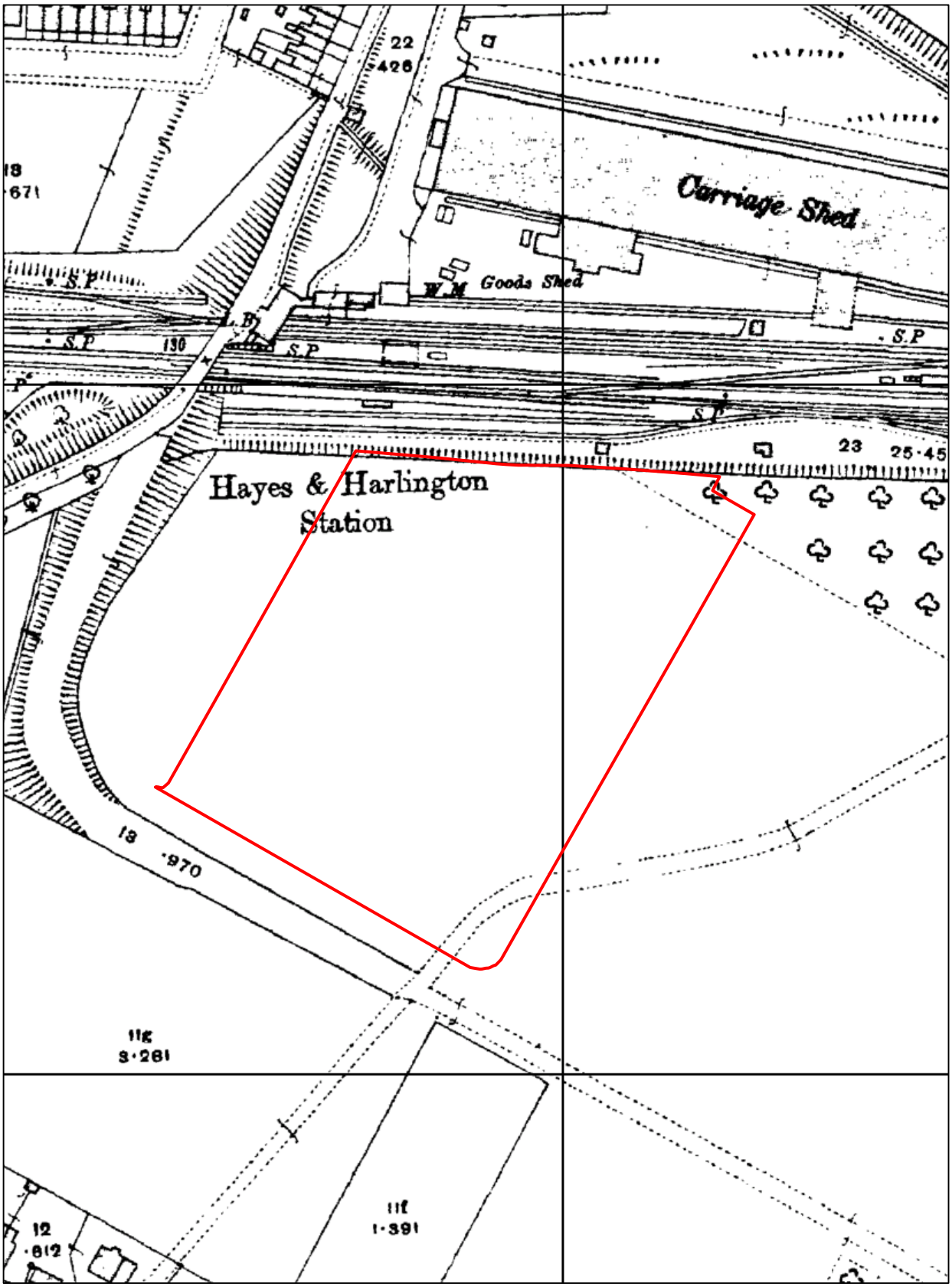
1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client:	**GEA Ltd**	**Approximate site boundary**	N
Project:	**233-236 Nestles Aveune**		
Ref:	**DA8572-00**	Source: GEA Ltd	

1914 Historical Map

Annex: **D1**



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

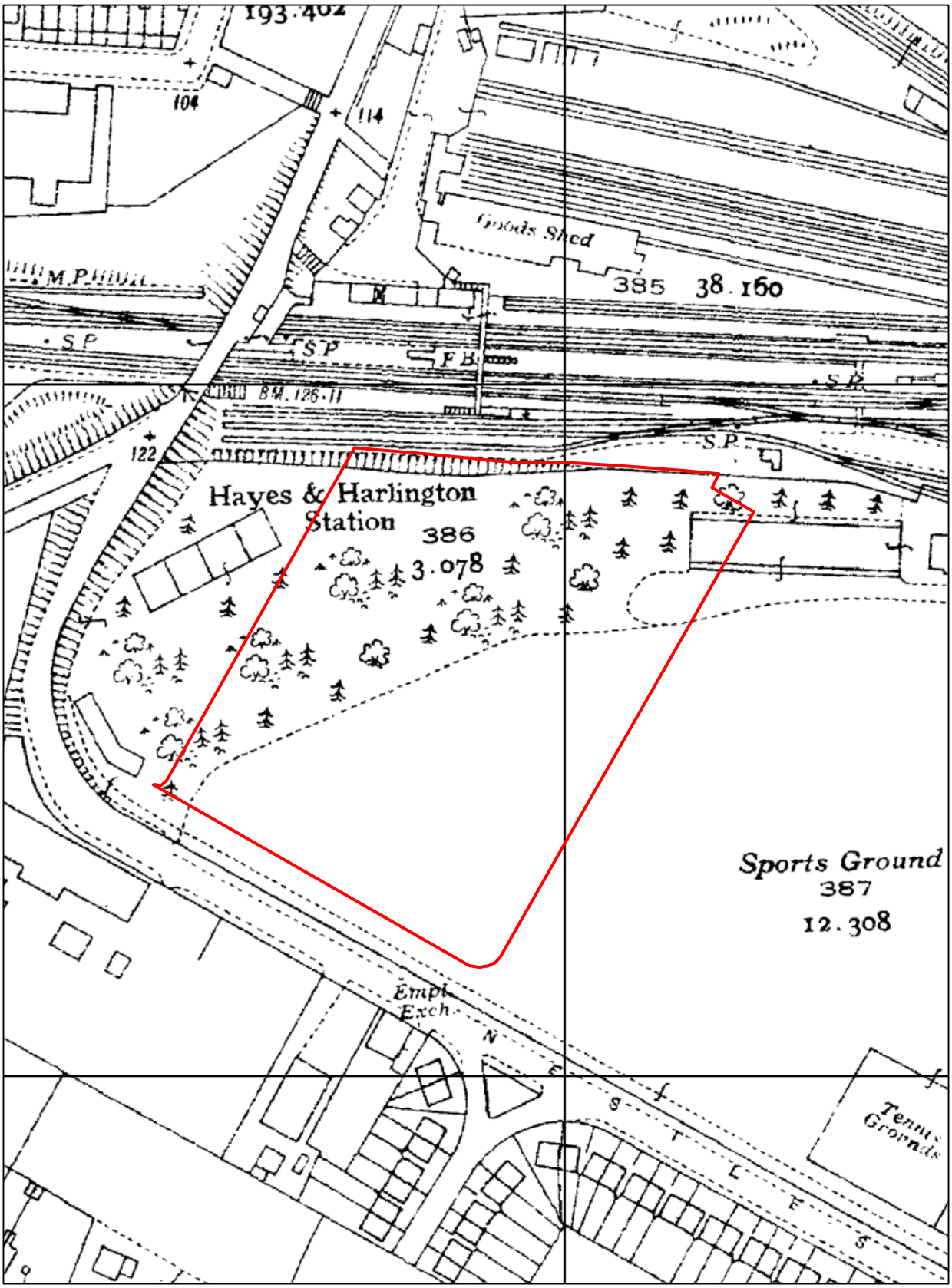
Source: Landmark Maps

Approximate site boundary

N

1934 Historical Map

Annex: D2



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

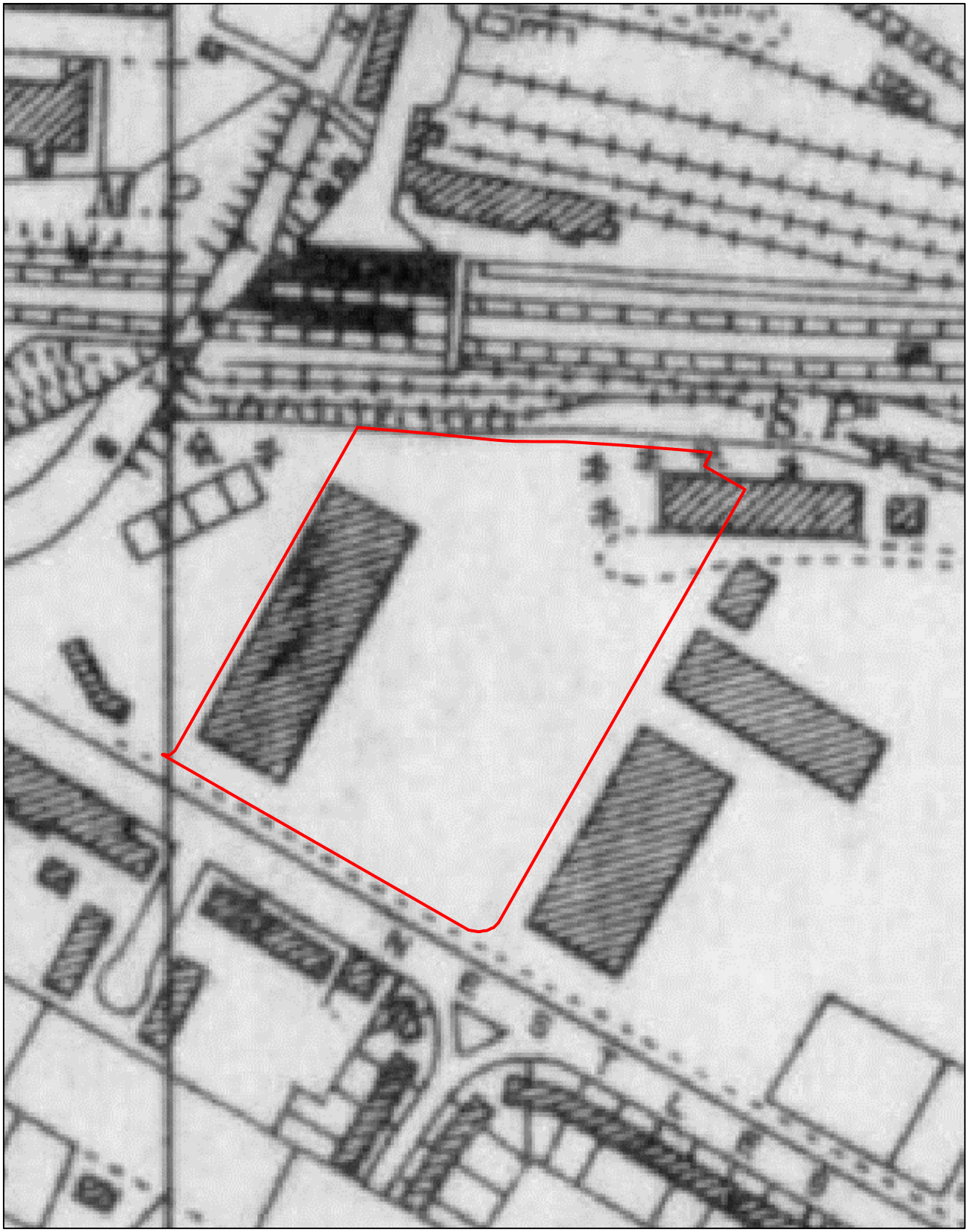
Source: Landmark Maps

Approximate site boundary

N

1938 Historical Map

Annex: **D3**



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

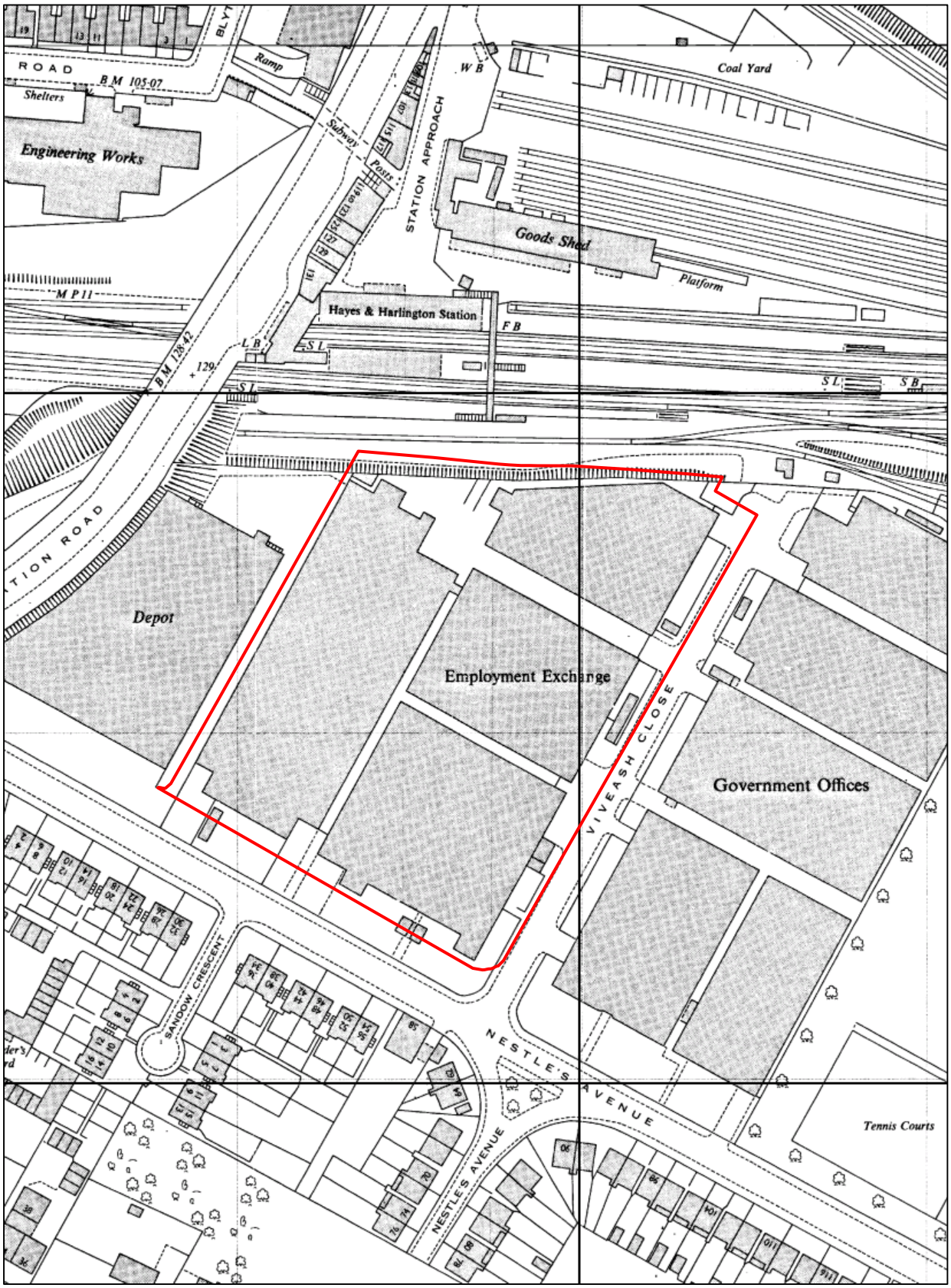
Source: The National Archives, Kew

Approximate site boundary

N

1963 - 1966 Historical Map

Annex: D4



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

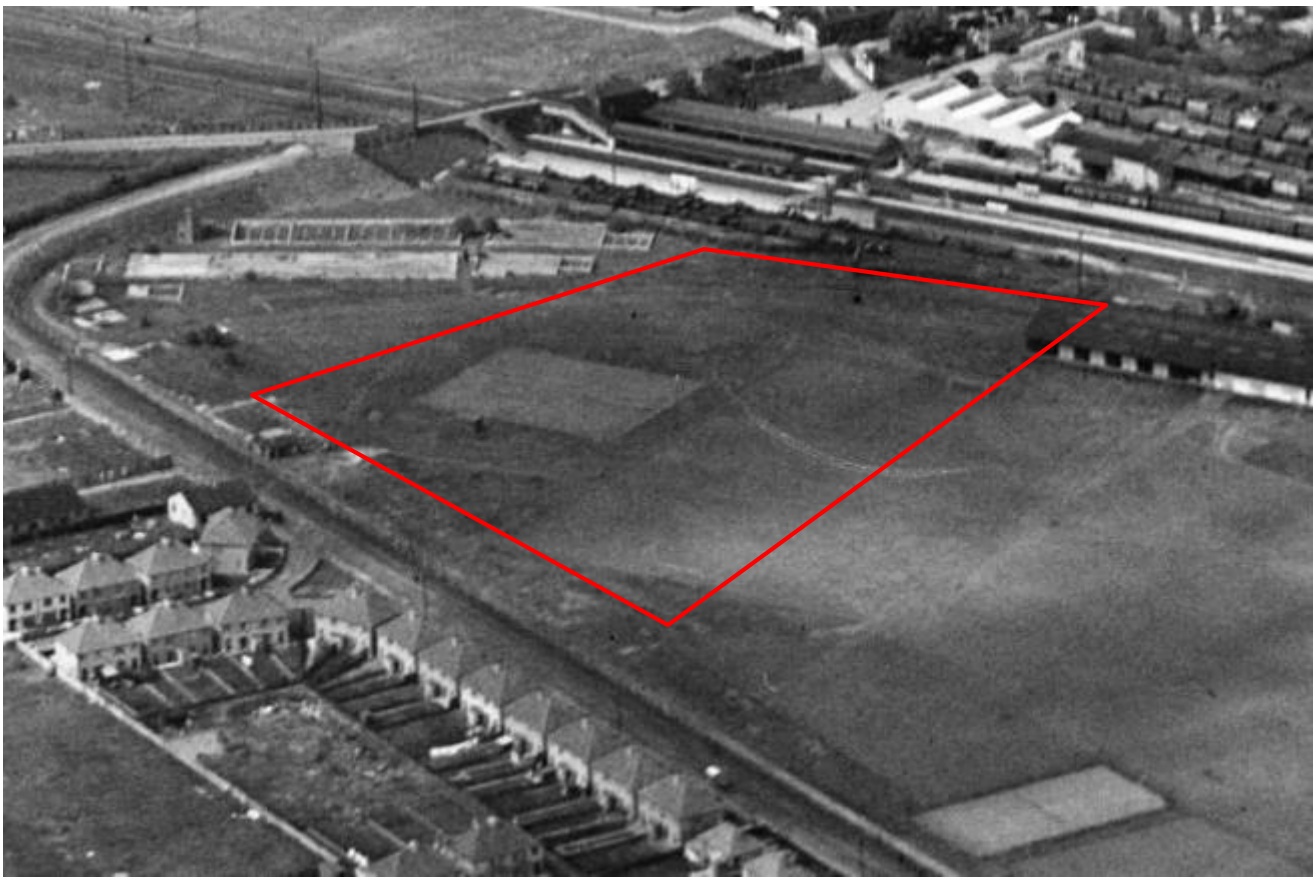
Source: Landmark Maps

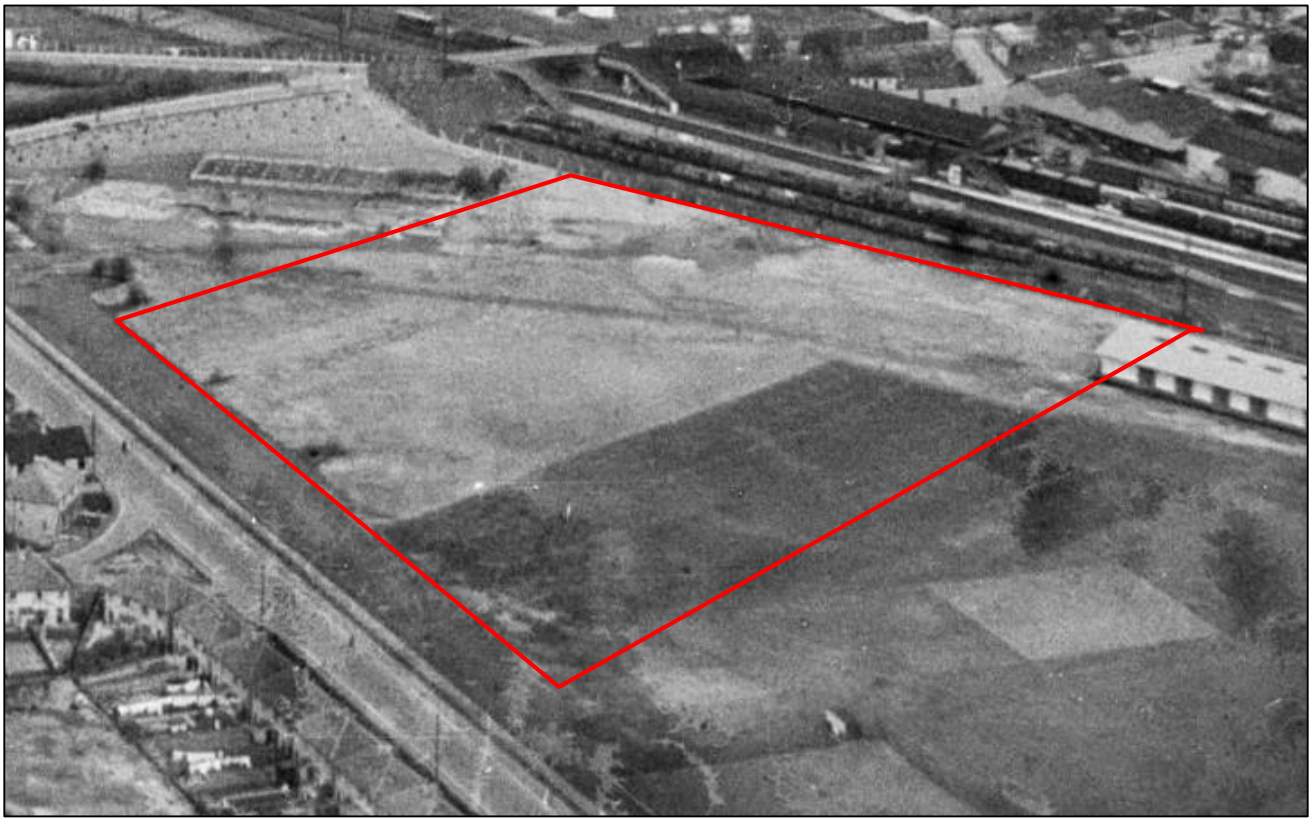
Approximate site boundary

N

Pre-WWII 1930 & 1932 Oblique Imagery

Annex: **E1**





1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Approximate site boundary

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Britain From Above

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

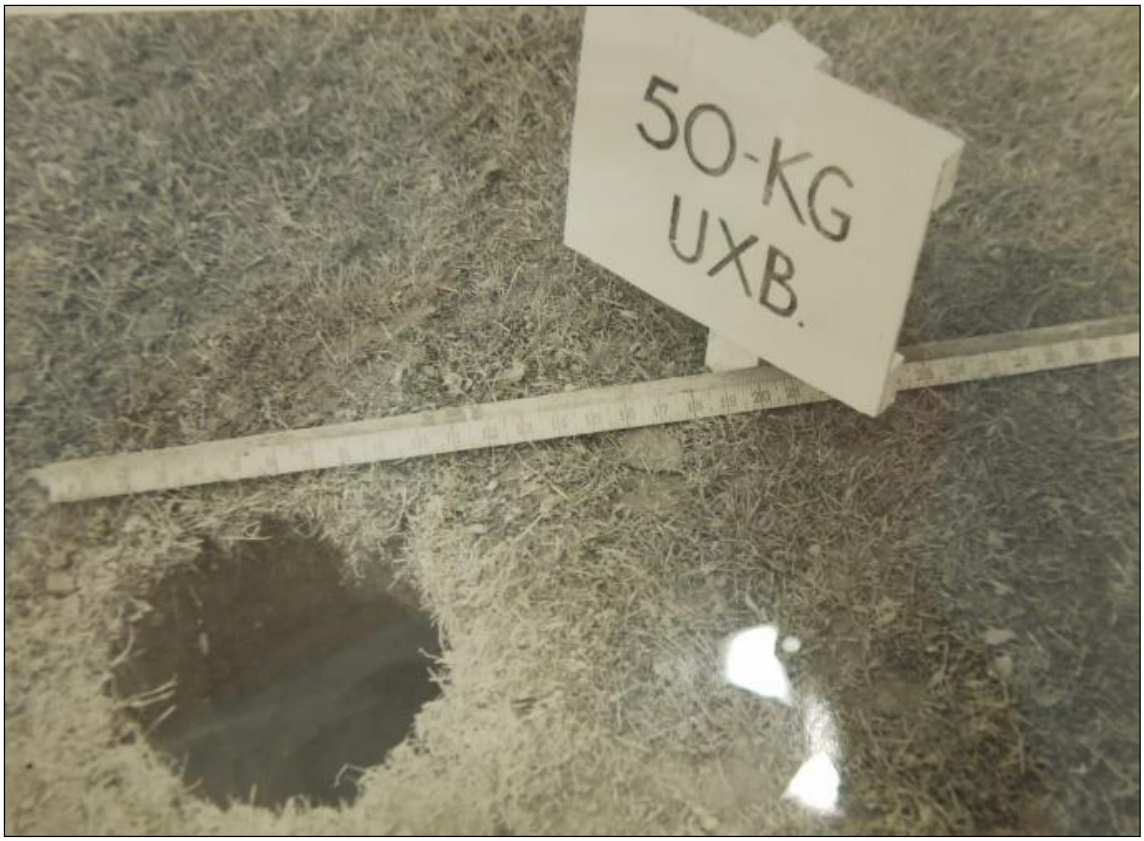
Project: **233-236 Nestles Aveune**

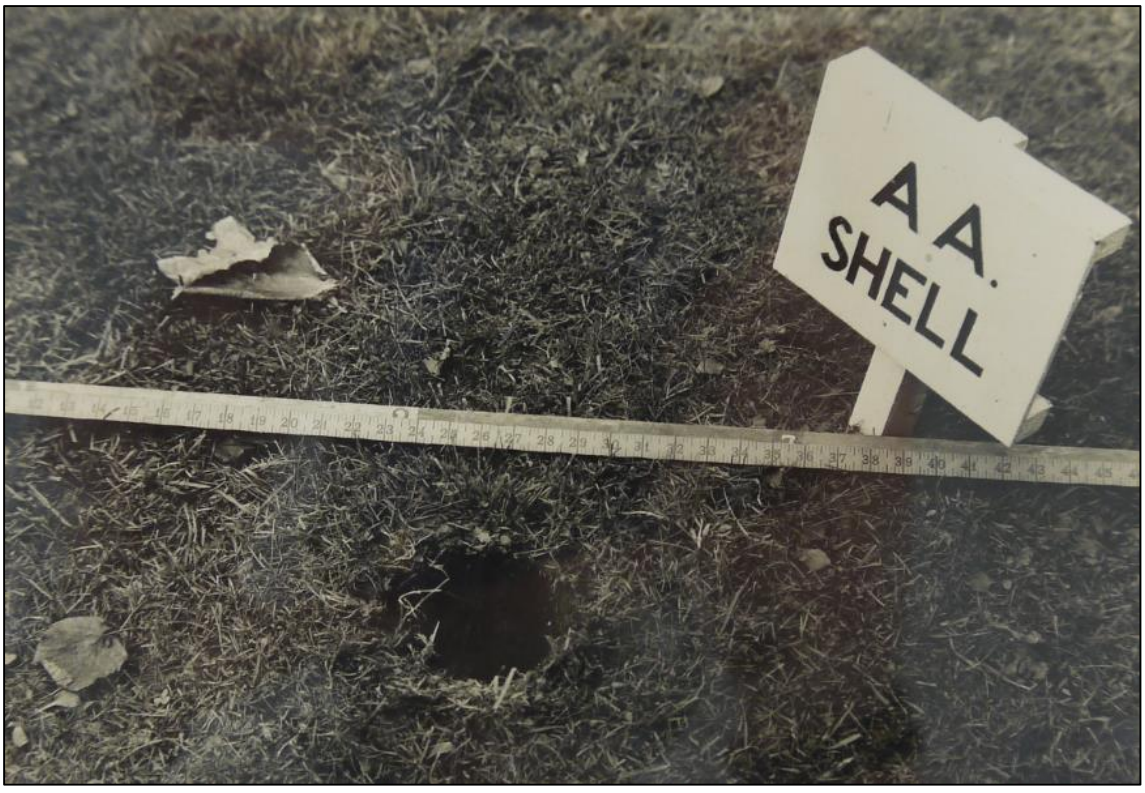
Ref: **DA8572-00**

Source: Britain From Above

Unexploded Bomb Entry Hole Example

Annex: **F**





1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

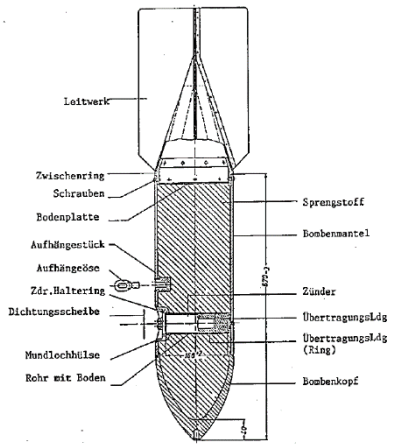
Ref: **DA8572-00**

Source: The National Archives

Examples of German Air-Delivered Ordnance

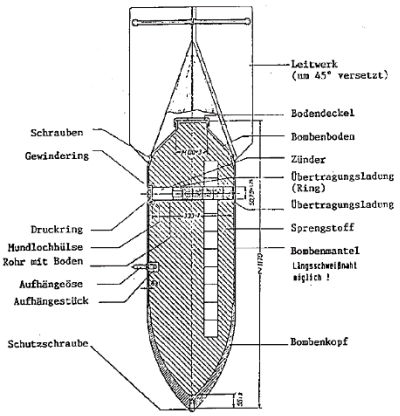
SC 50kg High Explosive Bomb

Bomb Weight	40-54kg (88-119lb)
Explosive Weight	c25kg (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

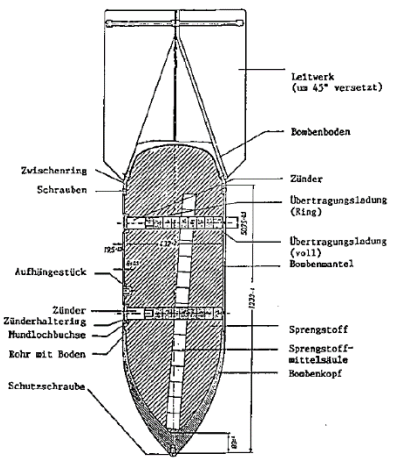
Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground 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).

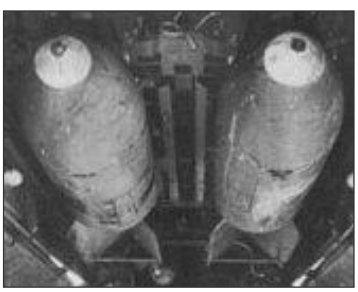



SC250 bomb being loaded onto German bomber

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 1-15/16 in. in length and diameter forming





1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

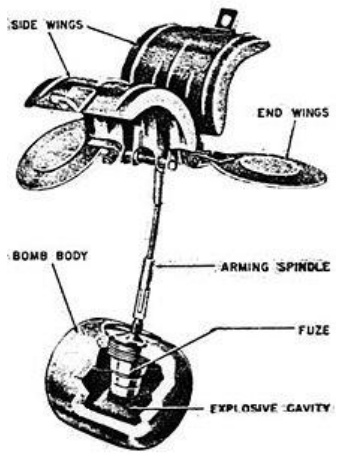
Ref: **DA8572-00**

Source: Various sources

Examples of German Air-Delivered Ordnance

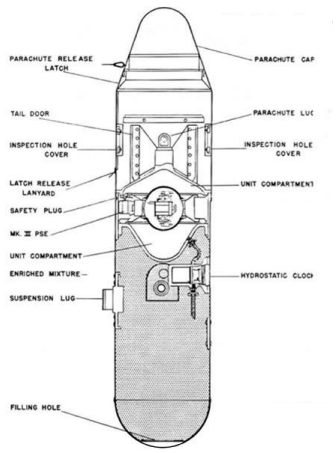
SD2 Anti-Personnel 'Butterfly Bomb'

Bomb Weight	2kg (4.41lb)
Explosive Weight	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	Very 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 by 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.



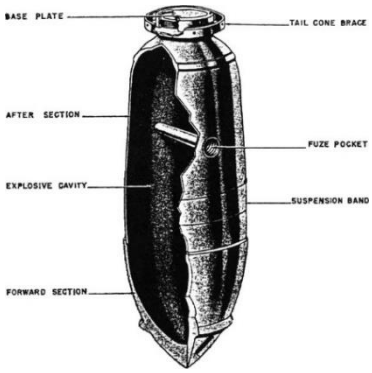
Parachute Mine (Luftmine B / LMB)

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 destroy a whole street of housing in a 100m radius.



SC 1000kg

Bomb Weight	993-1027kg (2,189-2,264lb)
Explosive Weight	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 are 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



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

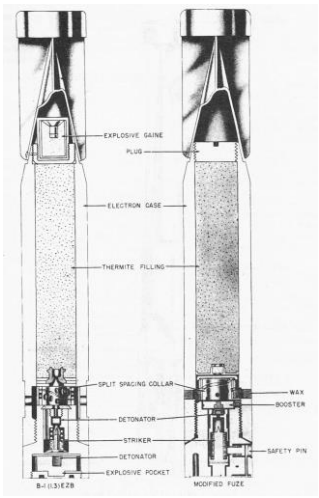
Source: Various sources

German Incendiary Bombs

Annex: G3

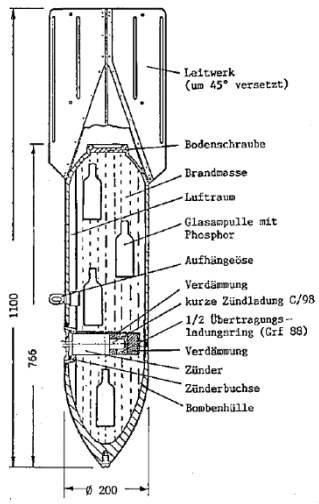
1kg Incendiary Bomb

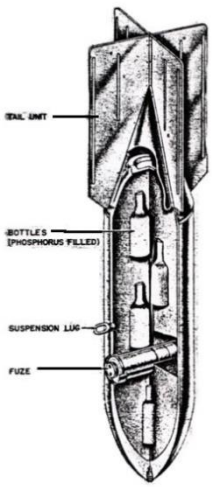
Bomb Weight	1.0 and 1.3kg (2.2 and 2.9lb)
Explosive Weight	680g (1.3lb) Thermite 8-15gm Explosive Nitropenta
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters against towns and industrial complexes
Remarks	Magnesium alloy 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

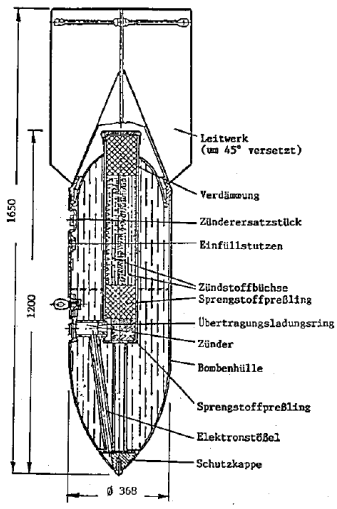
Bomb Weight	c41kg (90.4lb)
Explosive Weight	0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against all targets where an incendiary effect is required
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture





Flam C-250 Oil Bomb

Bomb Weight	125kg (276lb)
Explosive Weight	1kg (2.2lb)
Fuze Type	Super-fast electrical impact fuze
Filling	Mixture of 30% petrol and 70% crude oil
Bomb Dimensions	1,650 x 512.2mm (65 x 20.2in)
Body Diameter	368mm (14.5in)
Use	Often used for surprise attacks on ground troops, against troop barracks and industrial installations. Thin casing – not designed for ground penetration



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Various sources

BBC Sign in News Sport Weather iPlayer TV Radio

NEWS

Home UK World Business Politics Tech Science Health Education Entertain

England Regions London

Bermondsey bomb: World War Two device safely removed

24 March 2015 | London Share

The bomb measured about 5ft (1.5m) in length

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.

250kg HE bomb found in Bermondsey March 2015

BBC Sign in News Sport Weather iPlayer TV Radio

NEWS

Home UK World Business Politics Tech Science Health Education Entertain

England Regions London

Bethnal Green WW2 bomb: Experts remove unexploded device

11 August 2015 | London Share

The MoD said the German WW2 air delivered bomb could have caused "mass destruction" if it had detonated

An unexploded World War Two bomb that prompted the evacuation of 700 people in east London has been made safe and removed by the military.

Families spent the night in a school hall after the 500lb bomb was found in the basement of a building site on Temple Street, in Bethnal Green, on Monday afternoon.

250kg HE bomb found in Bethnal Green, Aug 2016

BBC Sign in News Sport Weather iPlayer TV Radio

NEWS

Home UK World Business Politics Tech Science Health Education Entertain

England Regions Somerset

Bath WW2 bomb scare: Device defused, police say

13 May 2016 | Somerset Share

The bomb was found on the site of a former school on Thursday

A 500lb World War Two bomb found on the site of a former school in Bath has been defused and made safe.

250kg HE bomb found in Bath, May 2016

BBC Sign in News Sport Weather iPlayer TV Radio

NEWS

Home UK World Business Politics Tech Science Health Education Entertain

England Regions London

Wembley WW2 live bomb posed 'risk to life'

22 May 2015 | London Share

A blast wall was put up around the bomb to minimise damage if it exploded

An unexploded World War Two bomb uncovered by builders near Wembley Stadium posed "a genuine risk to life", the Army has said.

50kg HE bomb found in Wembley, May 2015

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00** Source: BBC News

Examples of Unexpected Detonation of WWII Bombs

Annex: **H2**

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.

1st March 2013

BASF is expanding their its Ludwigshafen location by expanding several plants and building a TDI plant, which was the site of an explosion on Tuesday (Feb. 26). One person was injured in the blast, which BASF believes was caused when excavation work detonated a bomb.

Early reports had speculated that excavation work had detonated a bomb from World War II. While the age of the bomb has not been confirmed, BASF has said that an explosive device was detonated.

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."

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.

Tweet 0 Recommend 1

23rd October 2006

AP

A cutting machine lies wrecked by the side of the A3 motorway next to a small crater left by the explosion.

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.

The A3 Autobahn linking the cities of Frankfurt and Würzburg has been blocked in both directions.

More than 60 years since the end of World War II, construction workers still frequently unearth unexploded bombs and it is not uncommon for whole city districts to be cordoned off and even evacuated while bomb disposal experts defuse them.

Indeed, just last week, some 22,000 people were evacuated from their homes in Hanover when three World War II bombs were discovered.

Allied pilots rained nearly 2 million tons of explosives on Germany during the war. Landmines, hand grenades, mortar bombs and anti-tank devices from the fighting on German soil at the end of the war are also found, and authorities say it will take decades before the country is cleared of duds.

Between 400 and 600 bombs are discovered a year in the state of North Rhine-Westphalia alone, where the heavily industrialized Ruhr region was a major target for Allied bombers.

19th September 2013

WWII bomb injures 17 at Hattingen construction site

Published: 19 Sep 08 16:53 CET

Share +1 0 Tweet 0

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

- Liberals grit teeth ahead of May state election (17 Mar 12)
- Nazi death camp guard Demjanjuk dies (17 Mar 12)
- Stupid stunt causes bomb scare chaos (16 Mar 12)

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."

BBC Mobile | News | Sport | Weather | iPlayer | TV

NEWS EUROPE

Home | World | UK | England | N. Ireland | Scotland | Wales | Business | Politics | Health | Education | Sci/Env

Africa | Asia | Europe | Latin America | Middle East | US & Canada

2 June 2010 Last updated at 15:37

Share

World War II bomb kills three in Germany

Three people have been killed and six injured trying to defuse a World War II bomb in central Germany.

Workers building a sports stadium had earlier unearthed the bomb in the town of Goettingen.

It was not immediately clear why the bomb, reportedly weighing 500kg (1,100lb), had detonated.

Unexploded WWII bombs dropped by Allied planes are frequently found in Germany, though it is unusual for them to explode unexpectedly.

2nd June 2010

AFP

All the victims were involved in an operation to defuse the bomb

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.

June 2006

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Various news sources

News › London

Unexploded WWII bomb found in park in Feltham

FIONA SIMPSON | Wednesday 3 August 2016 10:57 | 0 comments

Unexploded bomb: police have sealed off roads in Feltham after workmen found an explosive believed to date back to WW2 *(Google maps)*

Police sealed off roads in Houslow this morning after workmen found an unexploded bomb in a nearby recreation ground.

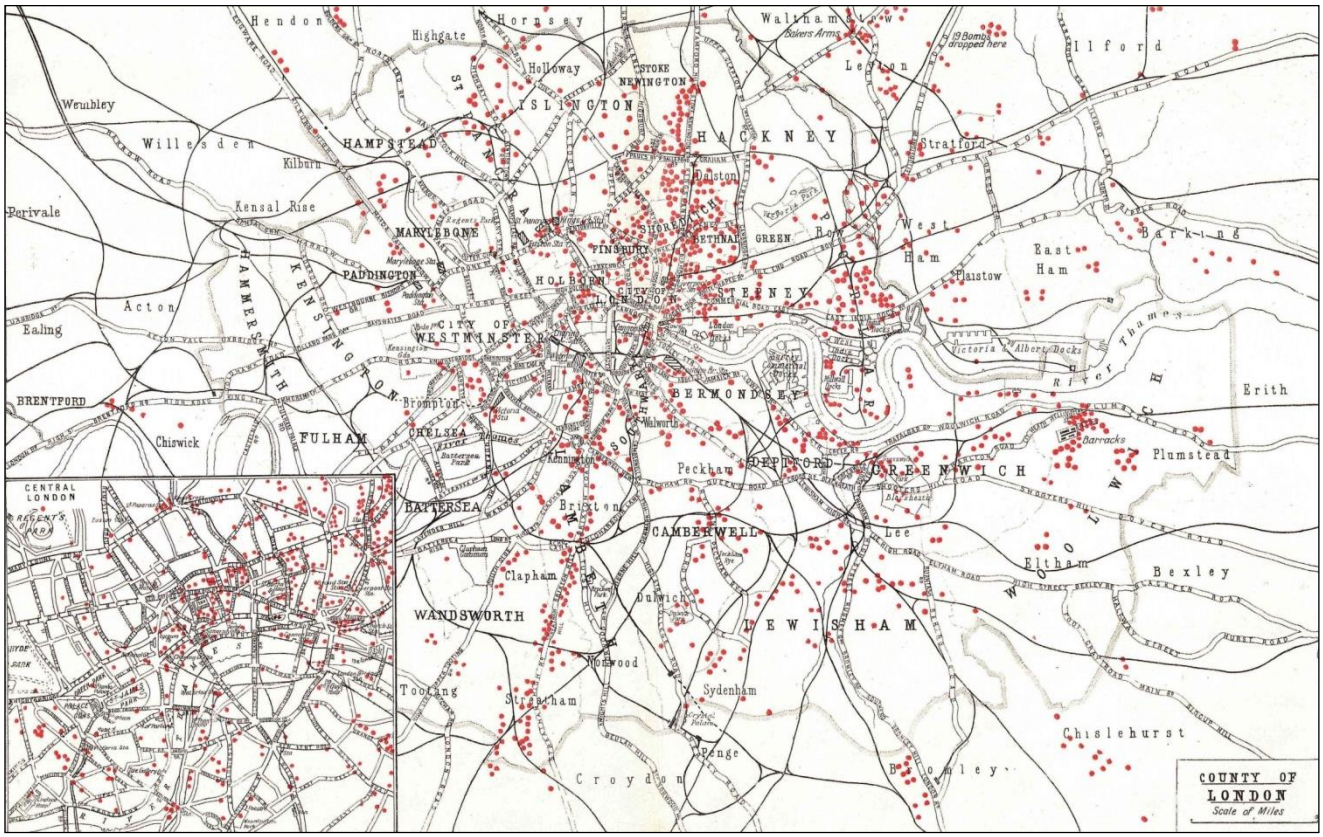
Major road closures were put in place in Feltham around Causeway, Green Lane, Hatton Road and Faggs Road.

Hounslow Police urged motorists to "avoid all areas in the vicinity of Causeway" while the device, believed to date back to WWII, was dealt with.

A Met Police spokesman confirmed that workman found the explosive while digging in a park shortly before 9.30am.

WWI Bomb Plot Map, London

Annex: I



Examples of 50 and 100kg German WWI bombs

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

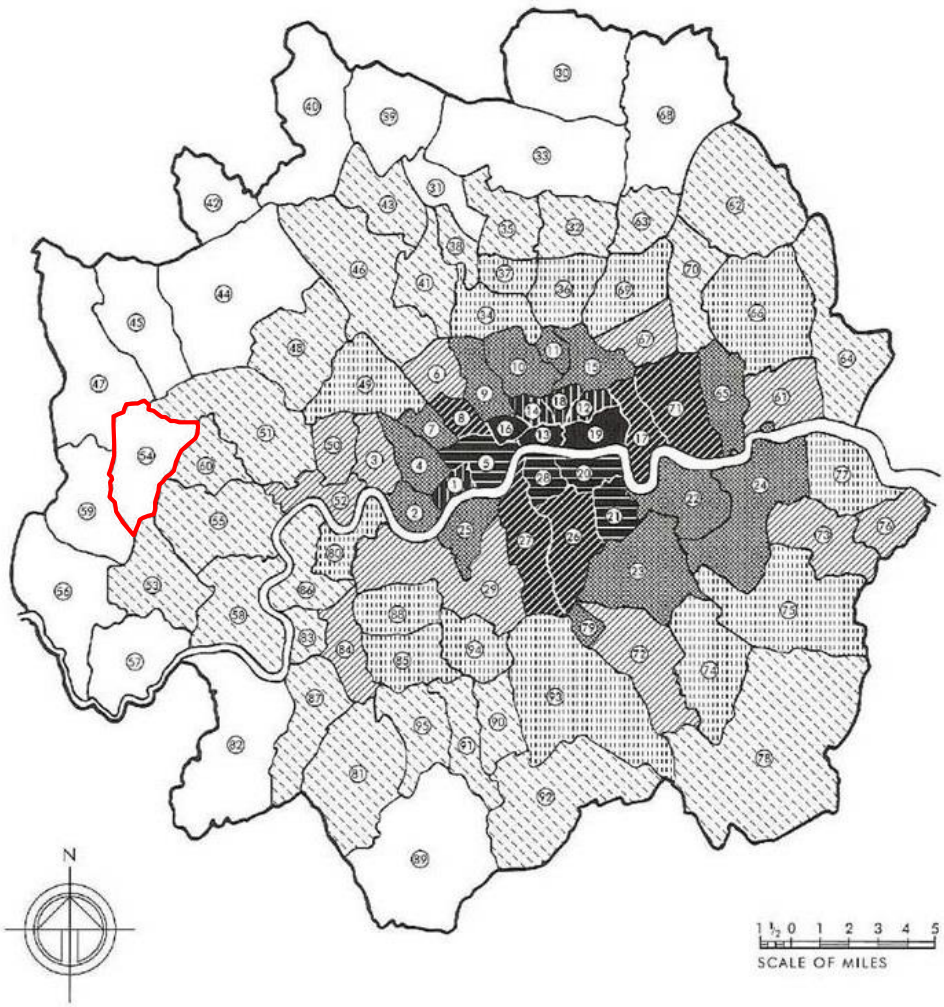
Ref: **DA8572-00**

Source: The National Archives, Kew

N

London WWII Bomb Density Map

Annex: J



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	60 Southall and Norwood	83 Kingston on Thames
13 City of London	37 Wood Green	61 Barking	84 Malden and Coombe
14 Finsbury	38 Friern Barnet	62 Chigwell	85 Merton and Morden
15 Hackney	39 Potters Bar	63 Chingford	86 Richmond
16 Holborn	40 Elstree	64 Dagenham	87 Surbiton
17 Poplar	41 Finchley	65 East Ham	88 Wimbledon
18 Shoreditch	42 Bushey	66 Ilford	89 Banstead
19 Stepney	43 Barnet U.D.	67 Leyton	90 Beddington and Wallington
20 Bermondsey	44 Harrow	68 Waltham Holy Cross	91 Carshalton
21 Deptford	45 Ruislip and Northwood	69 Walthamstow	92 Coulsdon and Purley
22 Greenwich	46 Hendon	70 Wanstead and Woodford	93 Croydon
23 Lewisham	47 Uxbridge	71 West Ham	94 Mitcham
24 Woolwich	48 Wembley		95 Sutton and Cheam

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: The London Metropolitan Archives

Luftwaffe Photograph, 1940

Middlesex- Uxbridge RAF Depot

The site located approximately 5.6km south-east of the Uxbridge RAF Depot

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

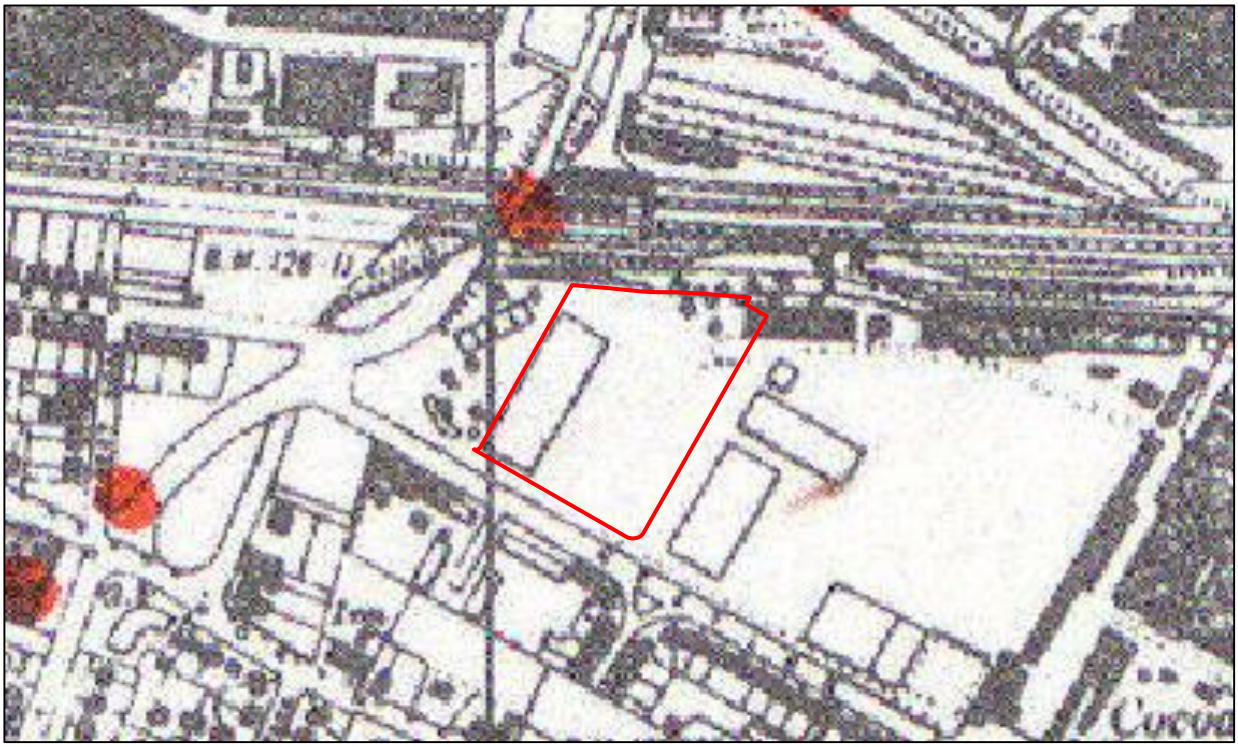
Ref: **DA8572-00**

Source: Nigel J. Clarke, "Adolf Hitler's Home Counties Holiday Snaps"

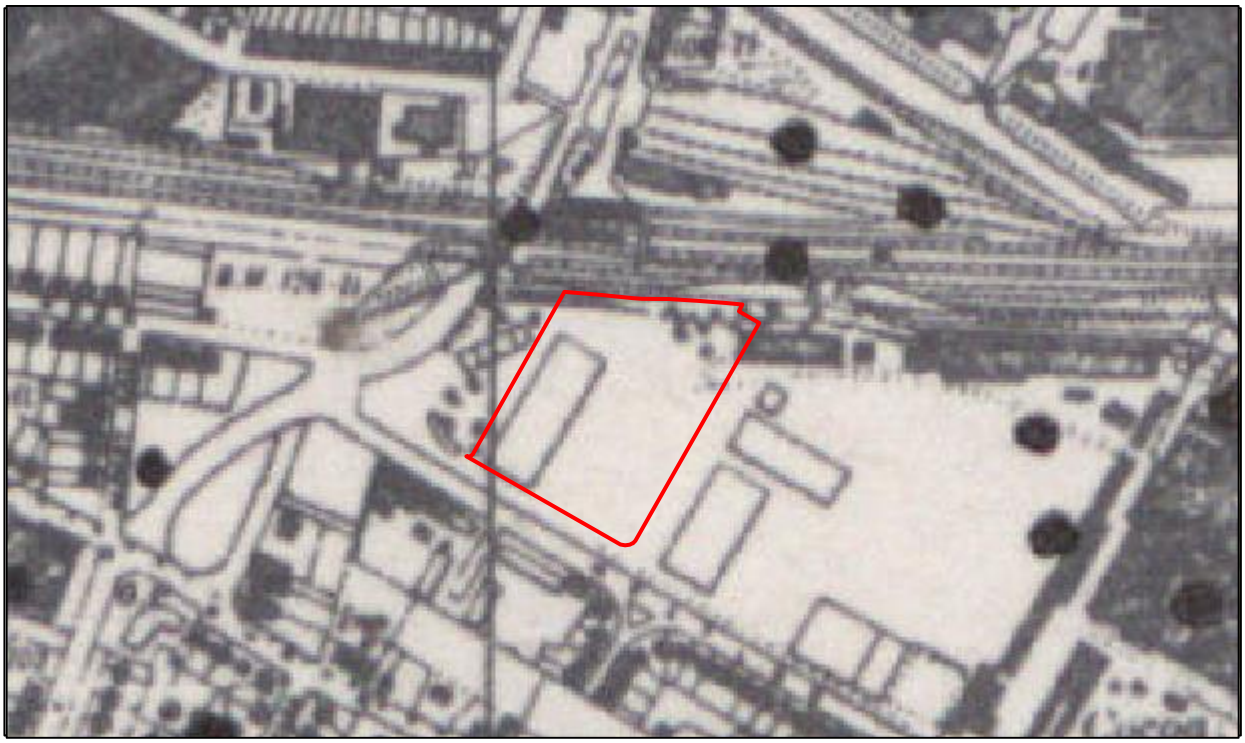
Consolidated London Bomb Census Mapping

Annex: **L1**

Day bombing 8th October to 31st December 1940



Night Bombing 7th October 1940 to June 1941



Recorded bomb strike

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Approximate site boundary

N

Project: **233-236 Nestles Aveune**

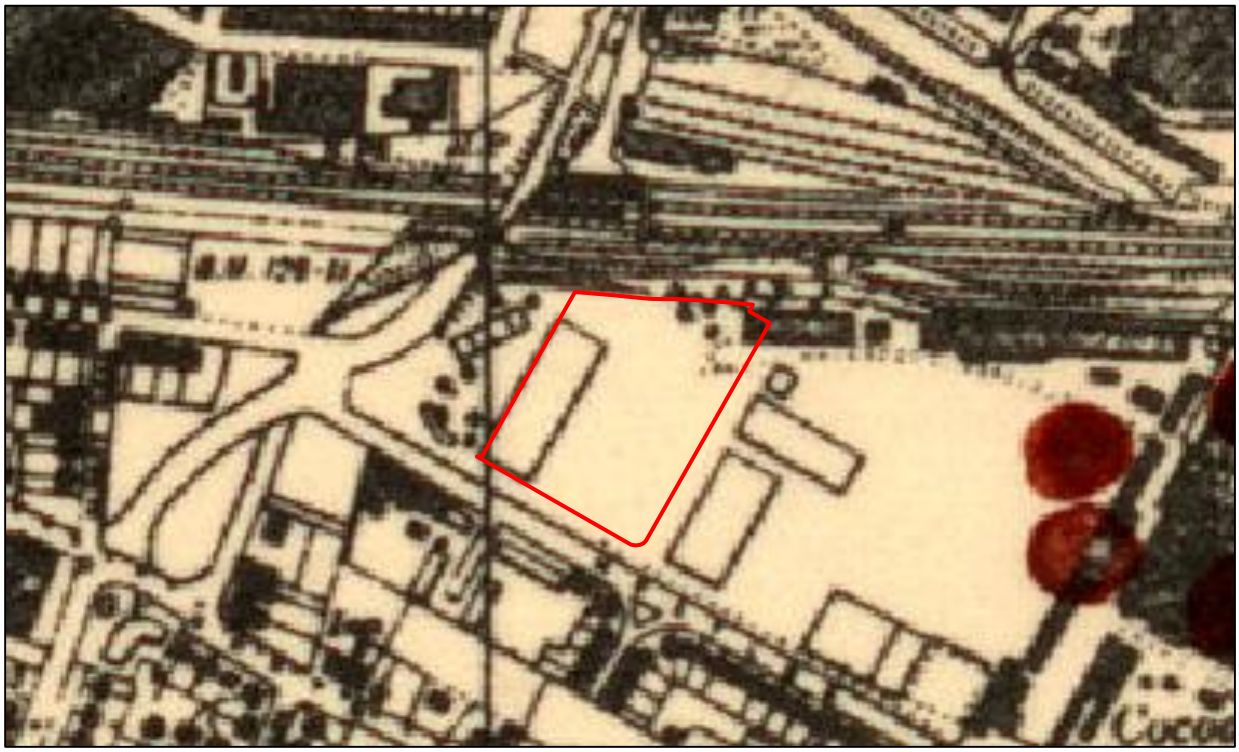
Ref: **DA8572-00**

Source: The National Archives, Kew

Weekly London Bomb Census Mapping

Annex: **L2**

Bombing 7th to 14th October 1940



Bombing 11th 18th November 1940

Recorded HE bomb strike

Recorded UXB strike

Recorded incendiary bomb shower

Recorded oil bomb strike

Colour refers to day of the week.

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Approximate site boundary

N

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: The National Archives, Kew

London V-1 Flying Bomb Map

Annex: **M**

⊗ V-1 flying bomb

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

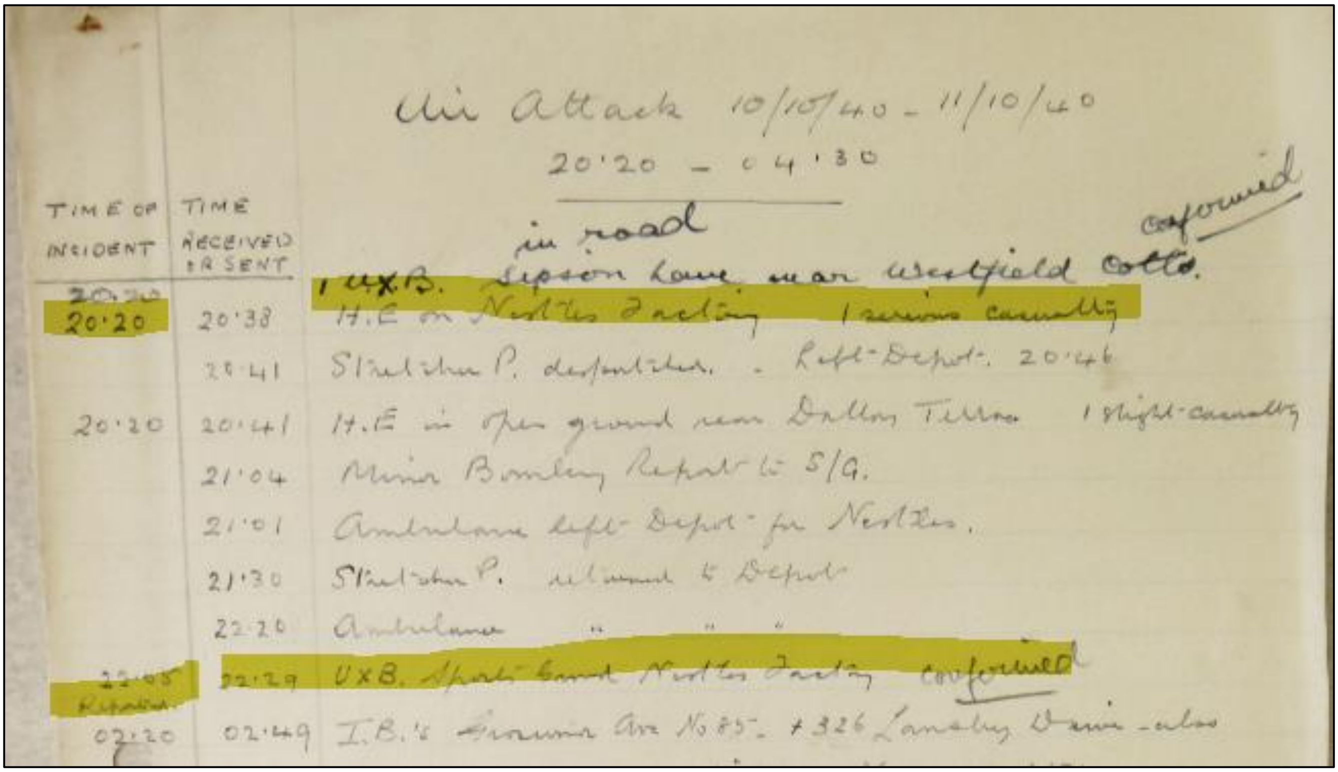
Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: The National Archives, Kew

Approximate site boundary

N



Air Attack 10/10/40 – 11/10/40

20'20 – 04'30

TIME OF INCIDENT	TIME RECEIVED OR SENT	
		1 UXB. Sipson Lane in road near Westfield Cotts. confirmed
~~20.20~~ 20'20	20'38	H.E on Nestles Factory 1 serious casualty
	20'41	Stretcher P. despatched. Left Depot. 20'46
20'20	20'41	H.E in open ground near Dallas Terrace 1 slight casualty
	21'04	Minor Bombing Report to S/G.
	21'01	Ambulance left Depot for Nestles.
	21'30	Stretcher P. returned to Depot
	22'20	Ambulance " "
22'05 Reported	22'29	UXB. Sports Ground Nestles Factory confirmed
02'20	02'49	I.B.'s Granville Ave No 85 + 326 Lansbury Drive – also

RAF Aerial Photography 22nd June 1946

Annex: **O1**

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Approximate site boundary

N

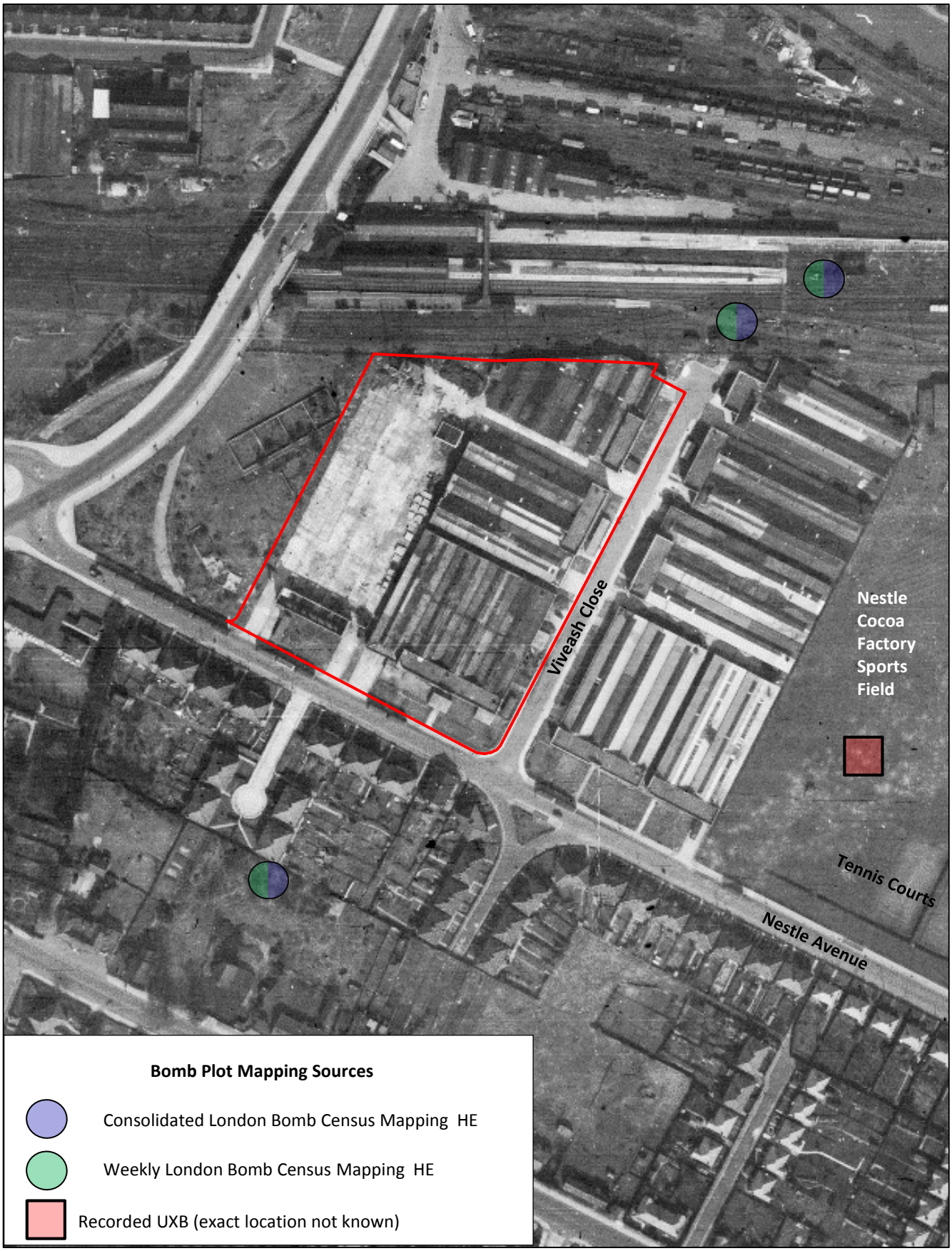
Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: National Monuments Record Office (Historic England)

RAF Aerial Photography 22nd June 1946

Annex: O2



1ST LINE DEFENCE

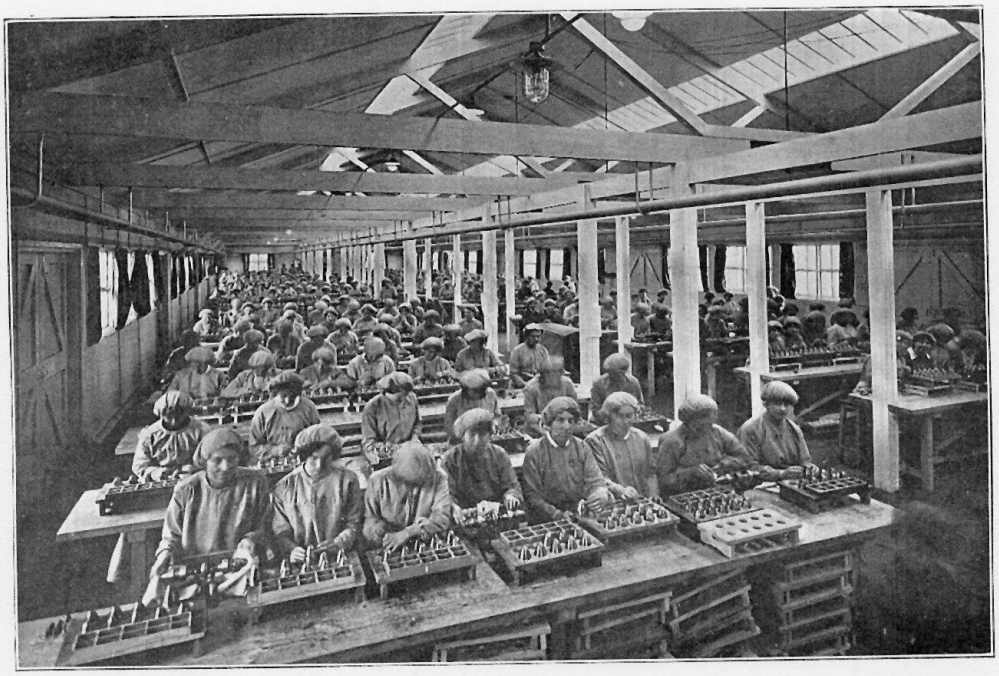
Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: National Monuments Record Office (Historic England)



Assembling Fuzes, East Section.

Mechanical Shell Filling, Amatol Section. Shells are filled by extruder machines inside the armoured concrete chambers on the right, so that in the event of an explosion no one would be injured.

1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Middx.net/articles/munitionsgallery

MINISTRY OF LABOUR.
INDUSTRIAL TRAINING DEPARTMENT.

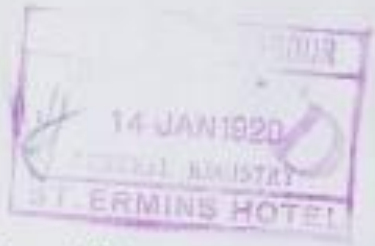
Letters should be addressed—
DIVISIONAL DIRECTOR OF
INDUSTRIAL TRAINING,
Guildhall,
Westminster,
S.W. 1.

GUILDHALL,
WESTMINSTER,
S.W. 1.

VICTORIA 4400.
In your reply please quote
Ref. ITRD. 169.

12th January 1920.

Lieut. Col. C. Macnaughten,
Ministry of Labour,
St. Ermin's,
Westminster.



Dear Sir,

re Hayes National Filling Factory, Middlesex.

With reference to your minute dated January 6th I beg to inform you that I have visited the above Depot and desire to submit the following report:-

The manager of the factory reported that the majority of the buildings were absolutely full of stores and that he anticipated no likelihood of their being cleared within a reasonable time. I would suggest that the large canteen near the Amatol Gate which at present has large stores of wool should be entirely cleared and acquired for training purposes. This canteen with offices is a self-contained unit off the road and cut off from the factory proper. It would, therefore, be possible to run this canteen as a training centre without the trainees having access, in the first instance, to the remainder of the factory. The Canteen has [redacted] of floor space, well built and comfortable and when cleared could be immediately used once stoves for heating purposes have been installed. Extension of training accommodation could be made by the requisition of suitable buildings near by, and steps should be taken to acquire these when possession of the canteen has been granted.

I would recommend that the offer of the Disposal Board to lease these buildings be accepted and that the stores of wool should be at once cleared. I propose to use these buildings for training in vehicle building and other heavy trades.

Yours faithfully,

Divisional Director of Trg. for Middlesex.

Indexed 31/1 D

NOTIFICATION OF HIRING.

the Commissioners of H.M. Works and Public Buildings.

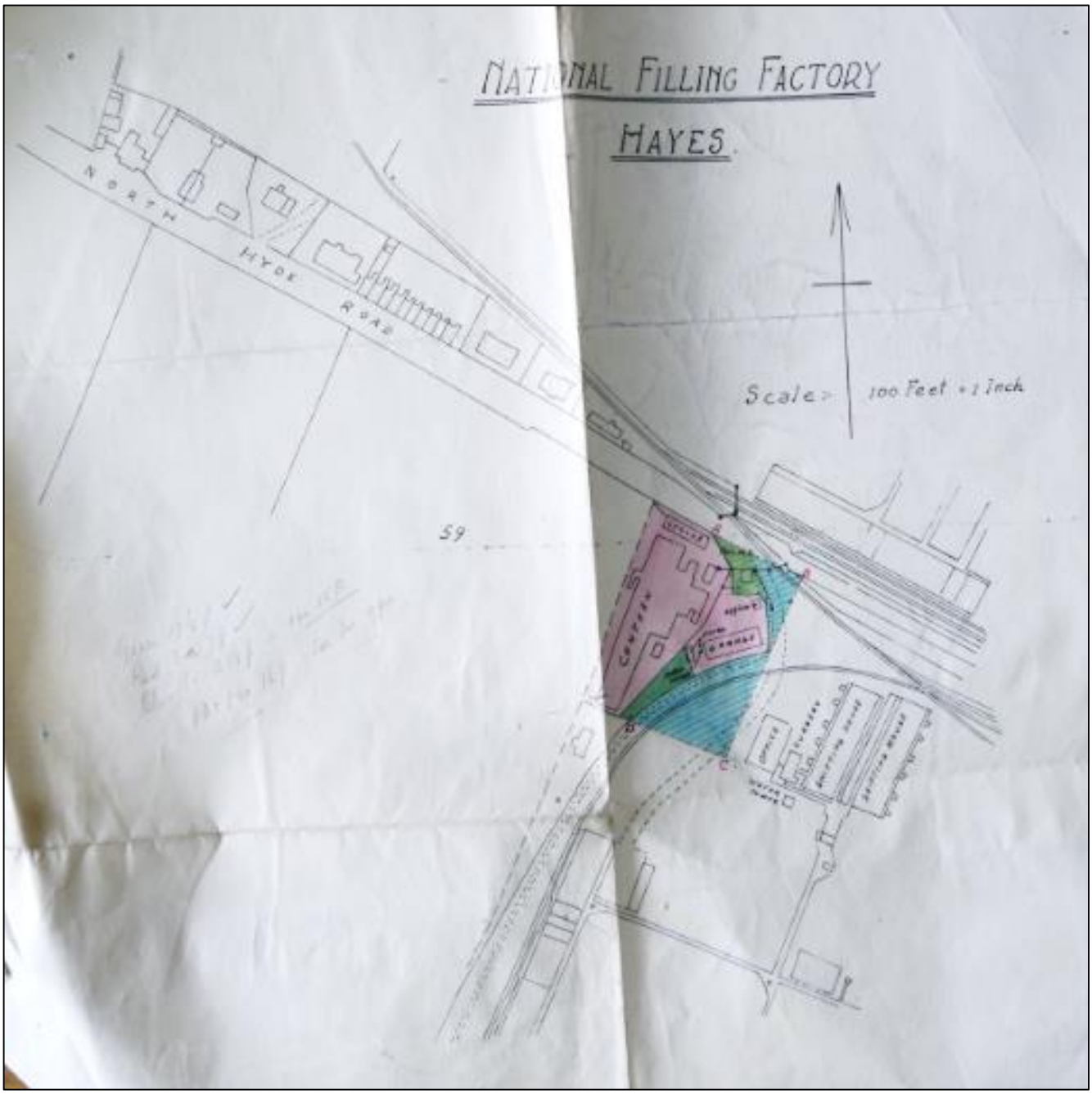
...vice	Ministry of Labour (Training Department).
..W. File No.	56070/20.
Town.	Hayes.
Description of Premises.	Portion of National Filling Factory No. 7. Canteen Block and Garage.
Nature and Date on Instrument.	-
Parties.	-
Name and Address of Rent Payee.	-
Date of ~~Commencement of Term.~~ Possession.	16/9/20.
Date of Occupation.	6/10/1920.
Term.	
Expiration of Term.	
Annual Rent.	Commencing from
Repairs—	External Internal
Rates and Taxes paid by	except
Water.	
Insurances, if any	
Special Covenants.	The buildings have been transferred to this Department from the Ministry of Munitions in consideration of the sum of £6,450. The site is to be acquired by the Ministry of Munitions on behalf of this Department.

1ST LINE DEFENCE
Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: GEA Ltd

Project: 233-236 Nestles Aveune

Ref: DA8572-00 Source: The National Archives



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

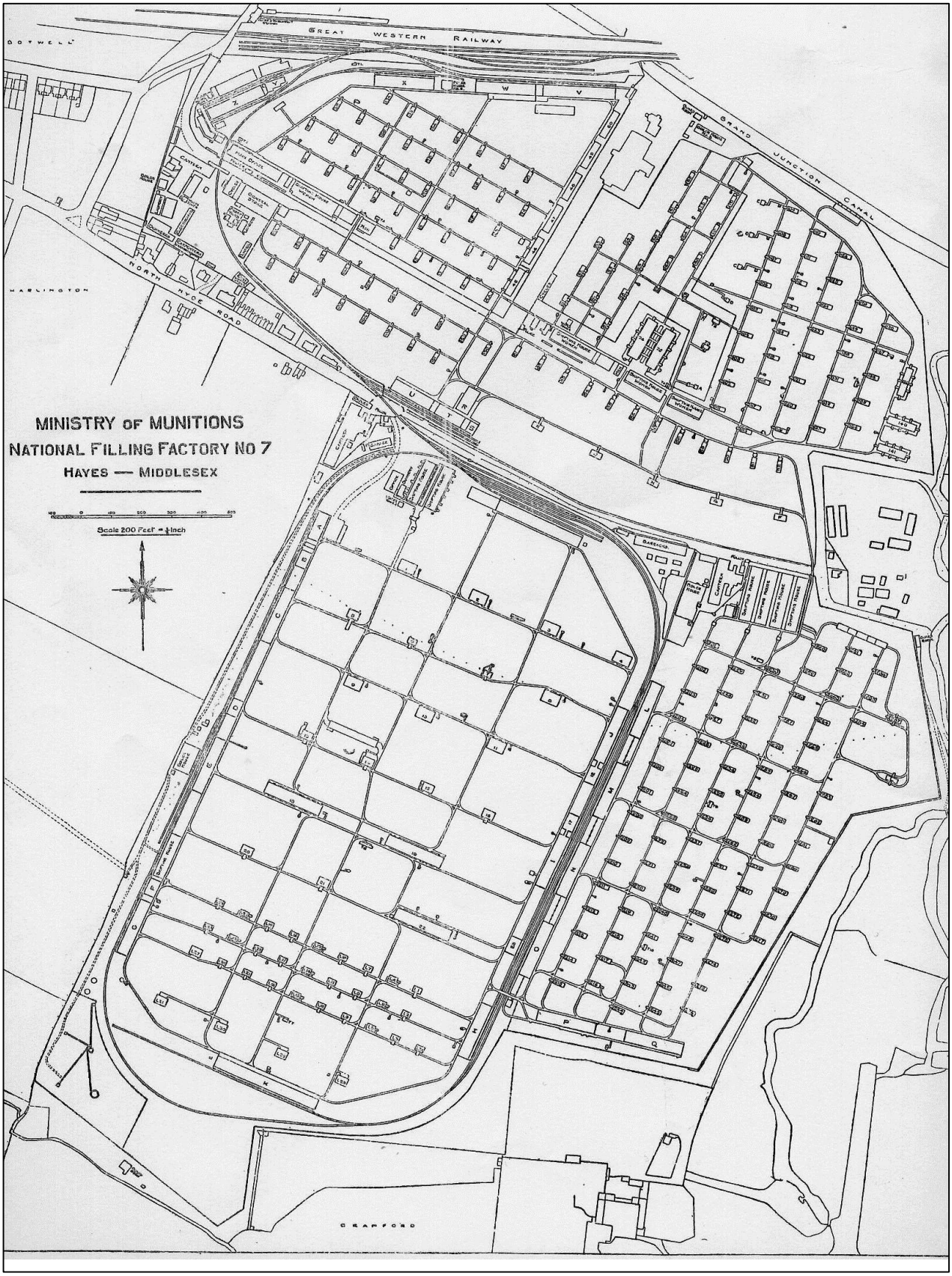
Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: The National Archives

Site plan of NFF No.7 Hayes

Annex: **R1**



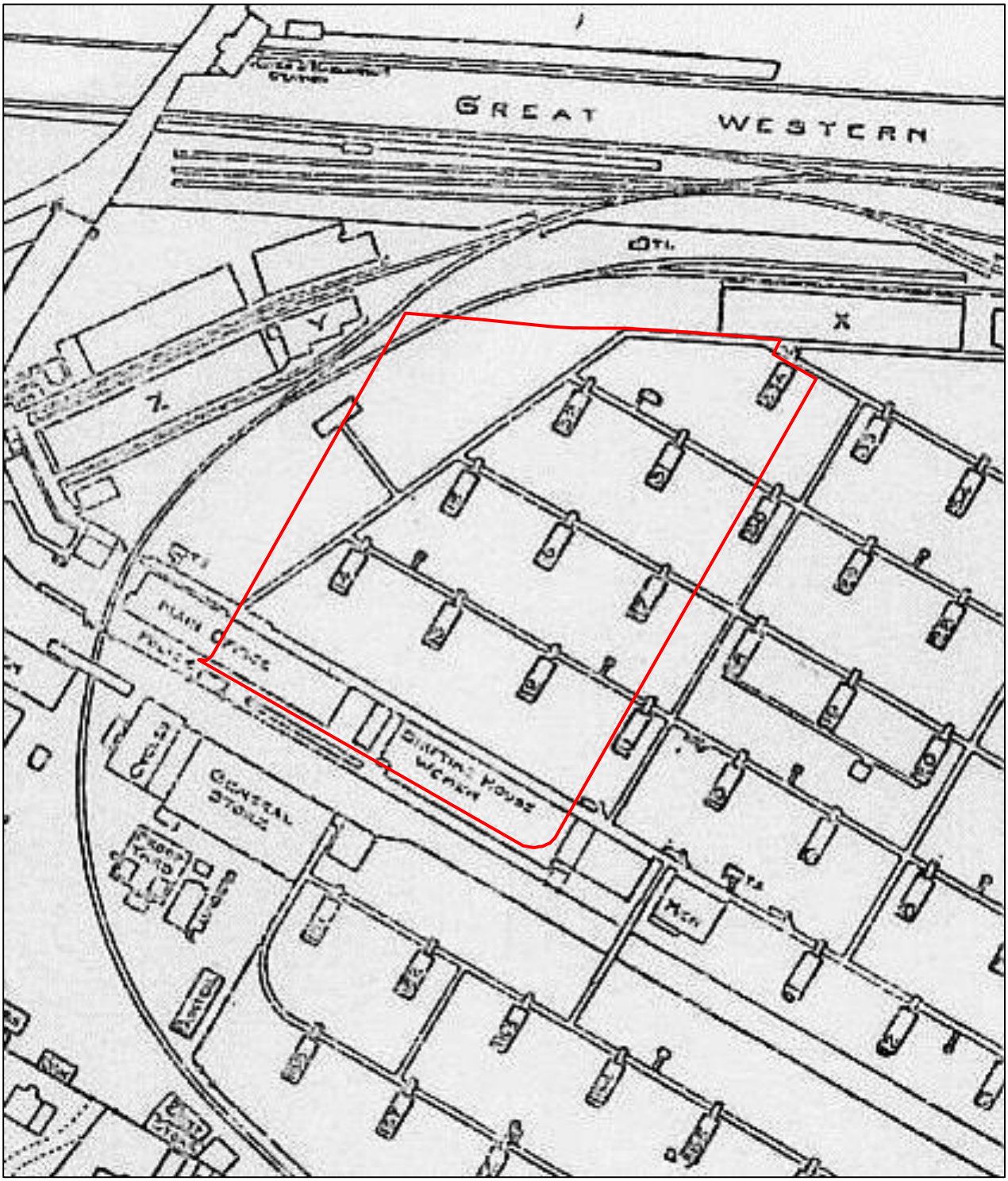
1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client:	**GEA Ltd**		
Project:	**233-236 Nestles Aveune**		
Ref:	**DA8572-00**	Source:	Middx.net/articles/munitionsgallery

Site location within NFF No.7

Annex: **R2**



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Approximate site boundary

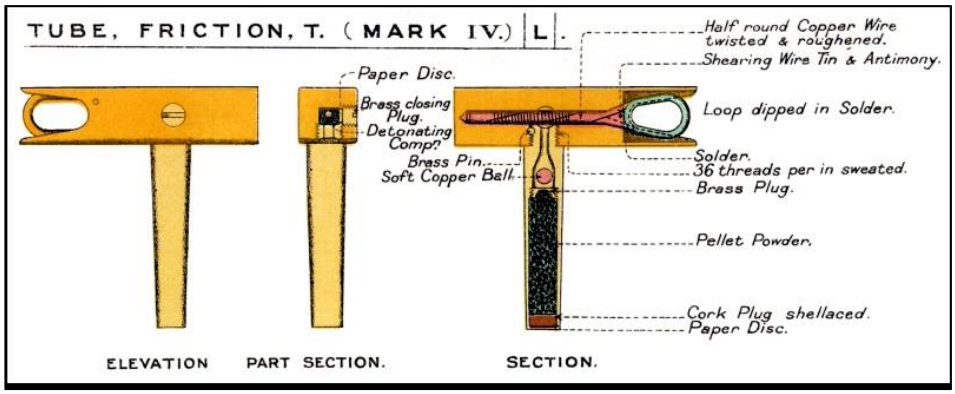
N

Project: **233-236 Nestles Aveune**

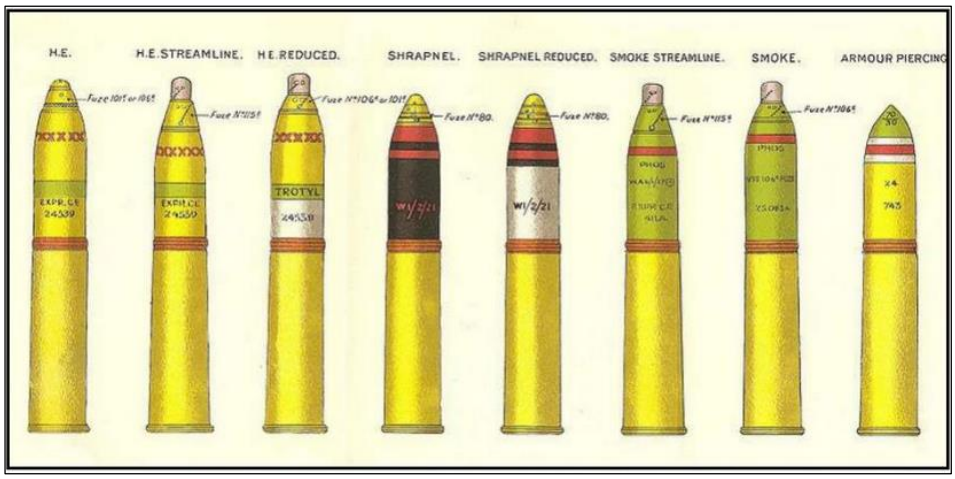
Ref: **DA8572-00**

Source: Middx.net/articles/munitionsgallery

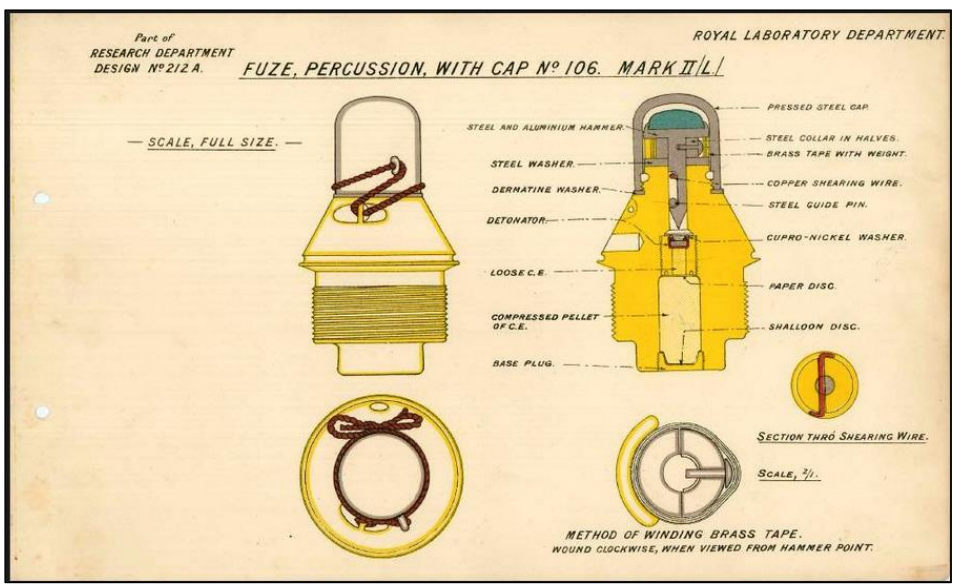
Mk IV Friction Tube



18 Pounder shells



Percussion Fuse No. 106 MkII

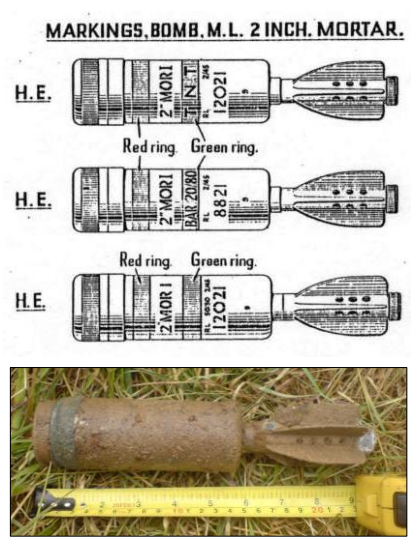


Examples of Land Service Ammunition – Mortars

Annex: **T1**

2 inch Mortar High Explosive

Weight	1.02kg (2.25lb)
Maximum Range	460m (500yards)
Filling	200g RDX/TNT
Dimensions	51 x 290mm (2in x 11.4 in)
Fuze Type	An impact fuze which detonates the fuze booster charge and in turn the high explosive charge.
Use	It had greater range and firepower over hand and rifle grenades, and was used to attack targets behind cover with high explosive rounds.
Identification	HE has a rounded edge to a flat back. Can either be a black body colour with red and yellow band or dark green with yellow band. Brass cap on top. Practice will have hole all the way through the top.



2 inch Mortar Smoke

Weight	910g (2lb)
Maximum Range	460m (500yards)
Filling	White phosphorus and smoke fill
Dimensions	51 x 290mm (2in x 11.4 in)
Fuze Type	An impact fuze which initiates a bursting charge. This ruptures the mortar bomb's body and disperses the phosphorus filler
Identification	Smoke mortars have a recess and emission holes. May still see light green body paint. Look for stained ground around munition.
Use	As a screening devices for unit movement or to impair enemy field of vision.

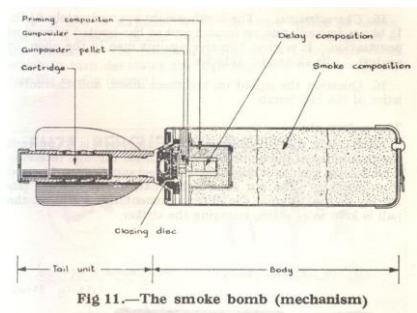
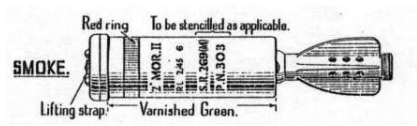
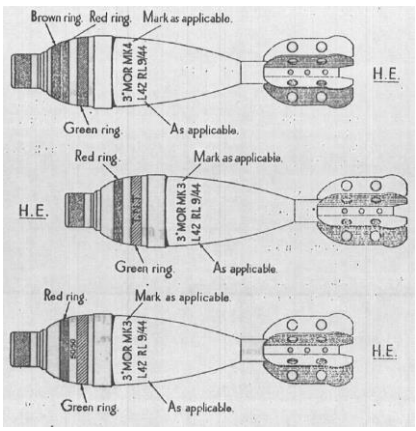


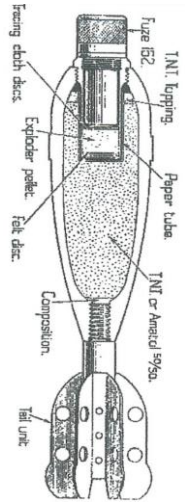
Fig 11.—The smoke bomb (mechanism)



3 inch Mortar High Explosive

Weight	4.5kg (10lb)
Maximum Range	1,460 (Mk1) – 2,560m (Mk2) (1,600 – 2,800yds)
Dimensions	81mm (3in)
Filling	Amatol
Firing Mechanism	Drop, fixed striker
Remarks	Fin-stabilised bomb fired by means of a charge consisting of a primary cartridge in the tail and four secondary cartridges
Identification	An old style mortar. No way of telling if HE or practice so treat as HE





1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

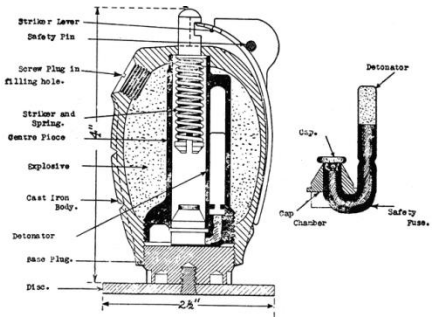
Source: Various sources

Examples of Land Service Ammunition – Grenades

Annex: T2

No. 36 'Mills' Grenade

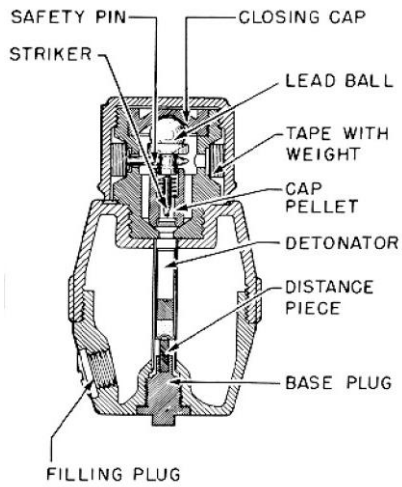
Weight	765g filled (1lb 11.25oz)
Explosive Weight	71g (2oz) filling.
Fuze Type	4-7 second delay hand-throwing fuze. No. 6 Detonator
Dimensions	95 x 61mm (4 x 2.4in)
Use	Fragmentation explosive at approx. 30m range 100m range of damage.
Remarks	First introduced in 1915 its classic grooved, cast-iron 'pineapple' design was designed to provide uniform fragmentation. The detonator is inserted before use after removing the base plug.



Left: baseplate and detonator removed

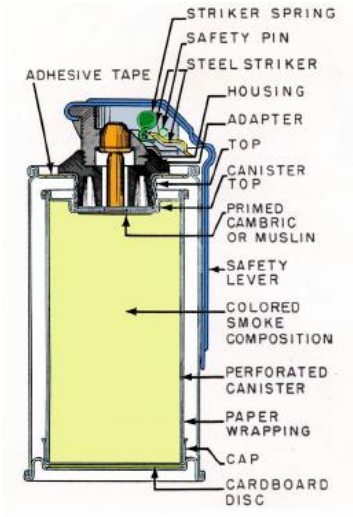
No. 69 Grenade

Weight	383g (13.5oz)
Fill Weight	93g (3.25 oz) of either Amatol, Baratol or Lyddite
Fuze Type	'All-ways' Fuze. Compromised of a safety cap, a weighted streamer attached to a steel ball bearing and a safety bolt designed to detonate from any point of impact.
Dimensions	115 x 60mm (4.5 x 2 .4 in)
Use	A blast grenade for use as an offensive weapon. Detonator was inserted before use.
Remarks	Introduced December 1940 and made from the plastic Bakelite as opposed to conventional metals. Detection is difficult due to this low metal content.



No. 83 Smoke Grenade

Weight	Approx. 680g (1.5lb)
Explosive Weight	Approx. 170-200g. (6-7 oz)
Fuze Type	Originally used a friction system using a match head composition. Later developed to a striker lever ignition system.
Dimensions	Approx. 62 x 140mm (2.44 x 5.5 in)
Use	Use as a target or landing zone marking device and as a screening method for troop / unit movement.
Remarks	This basic design stayed relatively unchanged up to the 1980's. The letters CCC were often etched into the body of the grenade in the colour of the smoke.



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Various sources

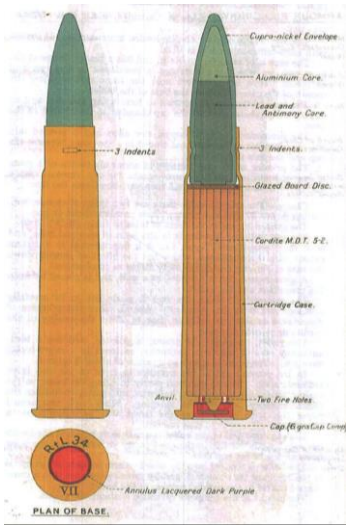
Examples of Small Arms Ammunition

Examples of British Small Arms Ammunition

.303 Rifle

Bullet Diameter	7.92mm
Case length	56.44mm
Overall length	78.11mm
Type	Rifle Ammunition
Propellant	Originally black powder. Later Cordite followed by Nitrocellulose
Remarks	First produced in 1889 and still in use today, the .303inch cartridge has progressed through ten 'marks' which eventually extended to a total of around 26 variations.

Bullet Type	Colour of tip	Colour of Annulus
Armour Piercing	Green	Green
Ball	None	Purple
Incendiary	Blue	Blue
Observing	Black	Black
Proof	None	Yellow
Tracer Short Range	White	Red
Tracer Dark Ignition	Grey	Red
Tracer Long Range	Red	Red



Buried and Decayed Ammunition

1ST LINE DEFENCE
Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

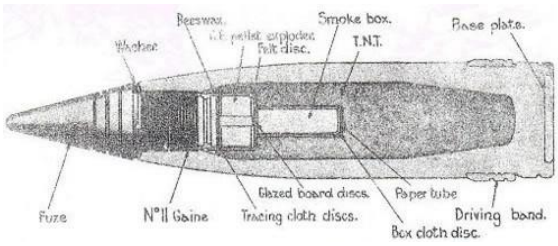
Source: Various sources

Examples of Anti-Aircraft Projectiles

Annex: U

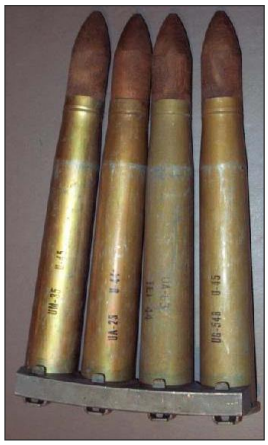
3.7 Inch QF Anti-Aircraft Projectile

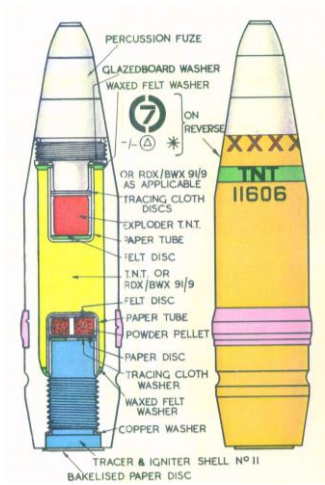
Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	The 3.7in AA Mks 1-3 were the standard Heavy Anti-Aircraft guns of the British Army.
Ceiling	30,000ft to 59,000ft



40mm Bofors Projectile

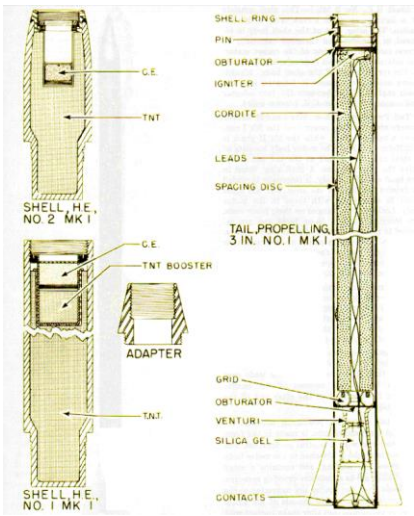
Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Impact Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40 x 180mm
Ceiling	23,000ft (7000m)
Remarks	Light quick fire high explosive anti-aircraft projectile. Each projectile fitted with small tracer element. If no 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



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **GEA Ltd**

Project: **233-236 Nestles Aveune**

Ref: **DA8572-00**

Source: Various sources

1ST LINE DEFENCE
Unit 3, Maple Park
Essex Road
Hoddesdon
Hertfordshire
EN11 0EX
Tel: 01992 245020

www.1stlinedefence.co.uk

1ST LINE DEFENCE

GEA

www.gea-ltd.co.uk

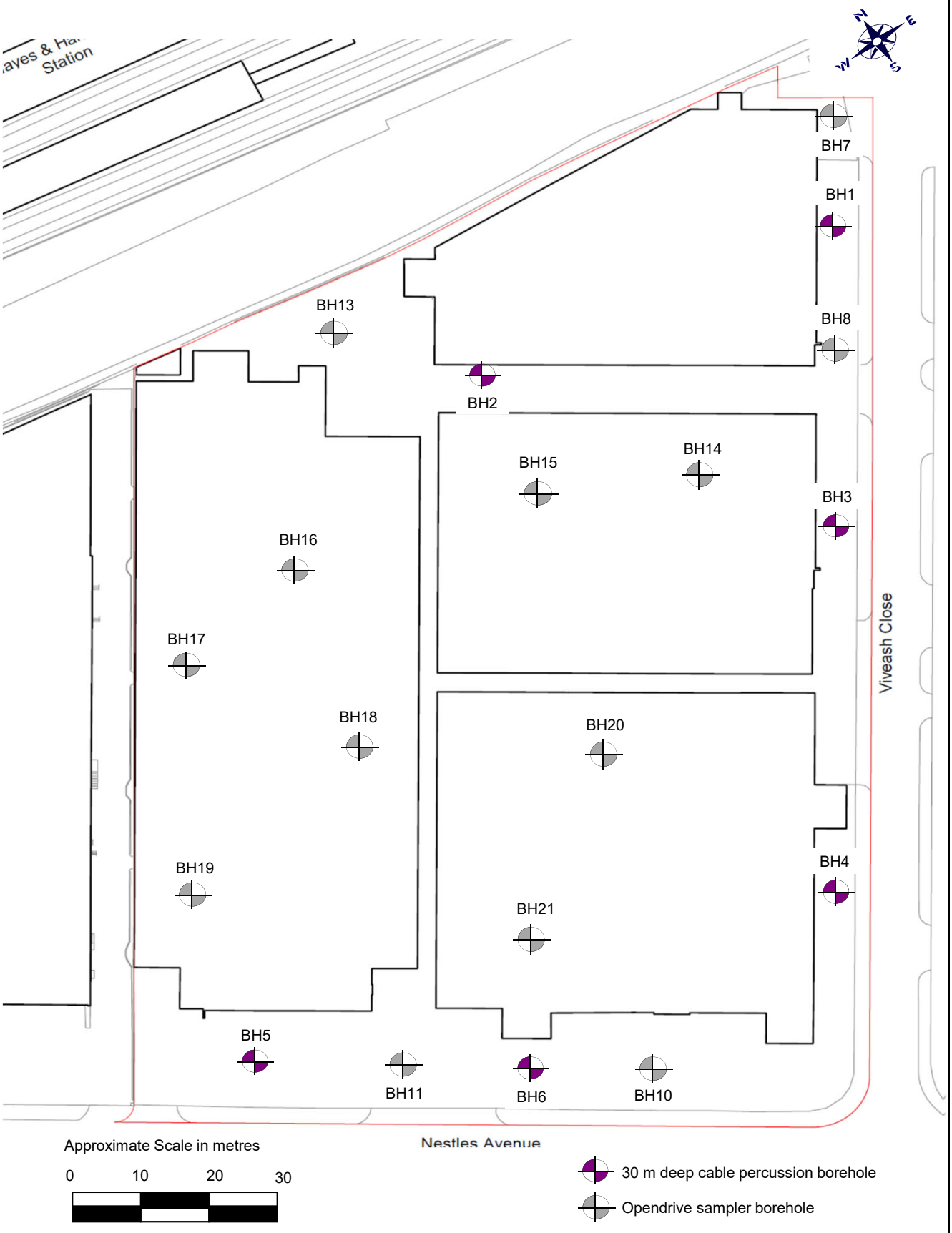
Herts | 01727 824666 Notts | 01509 674888

Site Plan

Site	Nestle Avenue, Hayes and Harlington, London UB3 4SH
Client	Buccleuch Property
Agent	Gardiner & Theobald

Job Number J19090

Sheet 1 / 1



Geotechnical & Environmental Associates (GEA) is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

We have offices at

Widbury Barn
Widbury Hill
Ware
Hertfordshire
SG12 7QE
tel 01727 824666
mail@gea-ltd.co.uk

Church Farm
Gotham Road
Kingston on Soar
Notts
NG11 0DE
tel 01509 674888
midlands@gea-ltd.co.uk

Enquiries can also be made on-line at

www.gea-ltd.co.uk

where information can be found
on all of the services that we offer.

GEA

GEA Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 233-236 Nestles Avenue, Hayes & Harlington, London UB3 4SH	Number **BH7**

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Opendrive Percussive Sampler (Terrier rig)			Buccleuch Property	J19090
	Location	**Dates** 17/04/2019	**Agent** Gardiner and Theobald	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.24) 0.24	Concrete		
0.40	D1				(0.81)	Made Ground (brown clayey sand with gravel, and ash, brick and concrete fragments)		
					1.05 1.15	Soft brown sandy CLAY with fine to coarse sub-angular to sub-rounded gravel		
					(0.65)	Dense reddish brown slightly clayey SAND and fine to coarse sub-angular to sub-rounded GRAVEL		
1.90 2.00-2.29	D2 SPT(C) 50/140	DRY	10,15/22,28		1.80 (0.20) 2.00	Dense orange-brown slightly clayey fine to coarse SAND with occasional fine to medium sub-angular to sub-rounded gravel		
						Terminated at 2.45m		

Remarks
Borehole terminated due to density of the soil at a depth of 2.45 m.
Groundwater not encountered.

Scale (approx)	Logged By
1:50	AT

Figure No.
J19090.BH13