

THE ROYAL
GUNPOWDER FACTORY
THEN AND NOW.

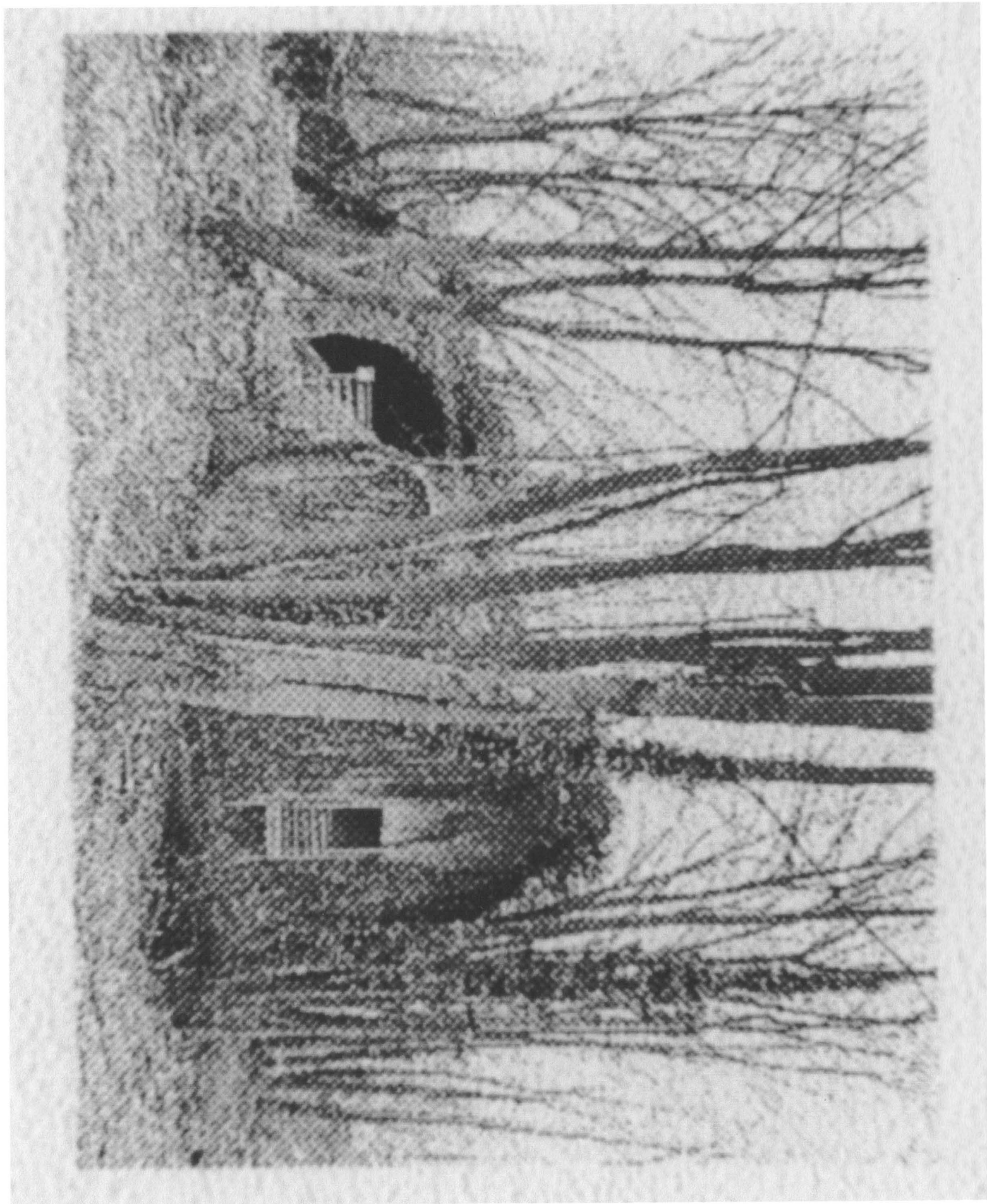


SPECIAL USES FOR THE No.22 GRENADE.

In January and February of 1916 the 4th Canadian Infantry Brigade undertook experiments to convert the No.22 or Newton grenade to message carriers to be used in the event of failure of other communication means. This took the form of removing the explosive and detonator from the grenade and modifying the cap. Messages could then be placed inside a .303-inch casing and put in place of the detonator. The cap was modified by having four holes punched in it and the magnesium projectile from a 1.5-inch Very Light wired onto it. A piece of No.10 Safety Fuze, cut to burn for 10 seconds, was then wired to the fuze end of the magnesium projectile.

The grenade was prepared by inserting a message in the cartridge casing, inserting it into the grenade, and finally clipping the cap with flare attachment in place on the grenade. The fuze was then lit and the rifle fired. The signal was to attract the attention of the recipient to the point where the grenade fell. The signal gave a bright light at night and a smoke trail during the daytime. The average distance achieved with this grenade was 295-yards.

Further tests were undertaken with some modifications. These involved cutting the grenade off immediately below the lugs and attaching a one inch flare. The ammunition used to fire the grenades was a normal service cartridge with the bullet removed. Upon firing from a Ross rifle with the barrel cut off to 23.5-inches an average range of 390 yards was obtained. Other tests from the same rifle with the full size grenades gave results of 355 yards. It was discovered that the use of a 1-inch flare did not make much difference in locating the grenade after firing but it did increase the range to a marked degree. It is not known how far these experiments were carried but the ideas and results were sent up as high as the Commander of the Canadian Corps.



DEATH PLAQUE.

A bronze plaque, 120mm in diameter. In relief is an upright Britannia holding a trident and extending a laurel wreath. At her feet is a lion. The wording reads 'He died for freedom and honour' with the name of the deceased. With it came a printed letter from Buckingham Palace : I join with my grateful people in sending you this memorial of a brave life given for others in the Great War. George VI.

The plaques were individually cast with the name on them rather than being subsequently engraved.

The design was by E. Carter-Preston, who created the 1914-1918 General Service Medal. They were manufactured in Acton and 1,355,000 were issued. Market value is catalogued at £12. Only 600 were issued in respect of women and this rarity raises the value to £900.

GUN-COTTON.

"I was told to use, for the explosive, the guncotton slabs from my Section's tool-cart, in which we carry some 700 slabs. The latter are rectangular, 6-inches long by 3-inches wide, and it is essential that each slab should be in actual contact with the next slab. In order to economise, as all explosives and shells were in short supply, each slab was to be sawn in half, down its length. This was something we had not previously envisaged when training. My Section carpenters were markedly dubious as to the likely results of the shock or heat generated by sawing through them, a view which I must confess to sharing at first. However, by standing at their elbow with as nonchalant an air I could muster, confidence gradually grew, and the operation on the large number required was satisfactorily completed, and we had learned another lesson."

Lt. Col.V.F. Eberle, MC.

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GRENADE, HAND, LACHRYMATORY, No.67 (L).

This was designed in early WW 2 as one of the "Fear of Invasion" emergency pattern stores. The grenade was never formally introduced for service but was produced. It is unlikely this grenade was actually used due to its extreme fragility.

The grenade is nothing more than the bulb portion of a 100-watt light bulb filled with a lachrymatory liquid and sealed with plaster of paris. The filling is 250cc of SK or MSK. SK is a mixture of 75% Ethyl Iodoacetate and 25% Alcohol whereas MSK is 100% Ethyl Iodoacetate.

A paper label attached to the grenade is marked "INSTRUCTIONS FOR USE: THROW BULB ABOUT 20 FEET IN THE AIR SO AS TO FALL AND BREAK UPWIND OF THE OBJECTIVE"

Upon exposure the air in the liquid would vaporize creating a localized gas cloud. SK and MSK are intensely irritating to the eyes and respiratory tract, causing involuntary tearing and violent coughing.

Lee Metford Mark 1* Rifle.

During 1898, British Infantry units engaged in operations on the North-West Frontier of India were asked to report on the Lee Metford Mark 1* rifles with which they were armed. The general efficiency of the rifle was reported to be good and it appeared to be popular with the troops. It had undergone severe tests in dust, wet, heat and rough usage, and had stood up to them well. Although many of the units had not had occasion to resort to magazine fire, it was generally agreed that the reloading of magazines by single rounds was a rather clumsy business and took too long. In the heat of action there might be some difficulty in carrying out this operation and there was a real need for some form of clip, or charger, loading. The 1st Bn. The Royal West Kent Regiment did not like having to load their magazines by hand with single rounds, but they were of the opinion that this method caused no practical disadvantage. If men, after discharging eight or ten rounds, had been unable to check an enemy's advance, their morale would be so impaired that it would make no difference to them whether they could put in a clip of eight cartridges, or whether they had to load them one at a time. In several instances where they had used magazine fire, jamming of the rounds had occurred, and this had usually been due to the magazine springs having become weakened. A smart tap on the bottom of the magazine sometimes remedied this defect. Sand had often proved very troublesome by getting into the magazines and causing the cartridges to jam and miss-feed. On the unanimous approval for a cartridge made in India known as the Dum-Dum Mark 11 Special. This was considered to be much superior in every respect to the normal British cartridge for the Lee Metford rifle. The 1st Bn. The Buffs reported having fired some 40,000 rounds of Dum-Dum Special and gave high praise on its performance. Nearly all the firing they had done had been at long ranges. Volleys had been kept up consistently and, as far as could be ascertained, the results had been good. They considered the enemy did not like facing the Lee Metford rifle and Dum-Dum Special pattern, fired from a distance of about 1,000 yards. Despite this long range, this bullet had passed through a soldier's body and lodged in the "D" of his waist-belt, after previously passing through his mess-tin and thirteen folds of the rolled great-coat of the man in front of him. The bullet was in good shape and not distorted in any way. Considerable shooting was reported to have taken place with effective results at distances up to 2,000 yards. Units engaged in operations in the Sudan also submitted reports on their Lee-Metfords and ammunition, and their experiences were similar to those of the troops in India. There seems little doubt that the Lee Metford rifle and Dun-Dum ammunition was a formidable combination, and was used with considerable confidence in these two campaigns.

Cordite .303-in. S.A. Ball Cartridge, Mark V.

Case.- Solid drawn-brass with cap chamber formed in base. Fixed anvil, two drilled fire-holes, letter "C" stamped on base. The case was not lacquered.

Cap.- Made of copper, containing .6 grain of cap composition, pressed in and varnished (sometimes covered with tinfoil).

| | |
|--------------------------------------|-----------|
| Cap composition.- Chlorate of potash | 14 parts. |
| Sulphide of antimony | 18 parts. |
| Fulminate of mercury | 8 parts. |
| Sulphur | 1 part. |
| Mealed powder | 1 part. |

Charge.- About 31 grains of size 3¾ cordite---60 strands.

Wad.- A glazeboard disc placed on top of the cordite.

Bullet.- Hollow-nosed. Core consisting of 98% lead and 2% antimony, enclosed in a cupro-nickle envelope. The envelope was solid, drawn from an alloy comprising about 80% copper, 20% nickle, and about .5% iron.. The core was secured by turning over the envelope and pressing it into a groove formed round the base of the core.

A cavity about .35 in. deep and .1 in. diameter was punched in the nose of the bullet; the punch carrying a small disc of the envelope to the bottom of the cavity. A cannellure, coated with beeswax, was formed round the bullet near its base. The bullet was secured in the case by coning and three indents. The length of the bullet was between 1.28 in. and 1.244 in. The test for "bullet pull" (security of bullet in case) was "not less than 60 lb."

The overall length of the cartridge was between 3 and 3.075 in.

The immediate predecessors of this cartridge, Marks 111 and 1V, never went into general production. The Mark 1V differed from the Mark V only in the bullet being slightly shorter and the core being made of pure lead. The Mark 111 had a metal cup, or tube, inserted in the nose of the bullet. Only a small number of these were made.

HIGHBRIDGE STREET WW2.

This picture, shows rescue workers going in through a window, for Mrs. K. Peck who was one of the victims. She died later of her injuries. 7th of March. 1945.



HIGHBRIDGE STREET WW2.

The devastation caused,when a German V2 rocket fell in Highbridge Street,on 7th of March,1945. Nearly all the buildings,from Powdermill Lane to the Refinery bridge were devastated,5 people were killed and 53 injured. A rounderbout now forms part of the cleared site.



HIGHBRIDGE STREET WW2.

Remains of the 'Ordnance Arms' public house and the Alms houses in Highbridge Street after the V2 incident, in March 1945.



ROCKET ON HIGHBRIDGE STREET.

On 7th March 1945 a rocket fell in Highbridge Street, completely isolating the town from Waltham Cross.

Three children and a lorry driver lost their lives in this incident, the driver (Mr Ellis) and the lorry added to the horror by being blown to pieces. The macabre discovery of his leg, and later his foot at an incredible distance away was made, while the children were killed when innocently engaged in play. There were however miraculous escapes by others.

The County Court (never replaced), the regimental drill hall, almshouse and other fine buildings were destroyed.

The Ordnance Arms was one of the many pubs which suffered, while the lady occupant was allegedly in bed indulging in an afternoon's rest. Another conjecture was that she was in the bath.

EXTRACT FROM WEEKLY TELEGRAPH, 4th MAY 1945.

Waltham Abbey had even a bigger share of rockets than Cheshunt. Persons killed and injured, damage to property including the nursery industry was considerable and noticeably reduced the output. The most serious happened at approximately 5 p.m. on a March afternoon when a shattering explosion rocked the ancient town when a rocket dropped plumb in the centre of Highbridge Street a few hundred yards from the Abbey Church causing damage to property and nurseries. Directly hit were - the Courthouse, Almshouses, the Ordnance Arms, and recreation hall. A lorry driver in his cab was blown to pieces, parts of the vehicle being found on the Town Mead a quarter of a mile away. Three children playing in the street were killed, a car was demolished after the driver had left it a moment before. He luckily escaped.

ROCKETS.

1,000 rockets fell on England causing 2,754 fatalities.

The rocket travelled at 3,000 mph and carried 1 ton of explosive.

A BRIEF
HISTORY OF
THE ROYAL
GUNPOWDER FACTORY,
WALTHAM ABBEY
1665~1998



Steven EB Chaddock

explosives of every kind.

Many of the old cordite and gunpowder laboratory buildings were used as laboratories; also some of the test beds were converted from nineteenth-century process buildings. A number of purpose-built test beds were also constructed. The site finally closed in June 1991 after 204 years of Government service.



Between 1992 and 1996 a programme of decontamination and remediation was carried out with the aim of putting the site to beneficial reuse in the public sector. The decontamination process removed the collected silts from disused canals which resulted in the discovery of many explosives related artefacts such as millstones and barges.

The newly formed Waltham Abbey Trust Steering Committee, whose membership was drawn from local, regional and national organisations, commissioned the preparation of a feasibility study and business plan. This was followed by an application to the National Heritage Lottery Fund. In October 1996 the National Heritage Lottery fund offered the project up to £6.5 million for the preservation and interpretation of the site. In addition the WARGM Charitable Foundation is managing a c.£5 million endowment from the MoD. WARGM CF have a lease and management agreement with another charity, WARGM Co. Ltd., whose purpose is to develop and operate the site

as a visitor attraction, and in particular to undertake the Stage I works which are part funded by the HLF grant offer.

Stage I will focus on the whole history of the site, and will include the development of the Island Complex as an interpretative centre, as well as trails to other interpreted buildings associated with the manufacture of explosives and propellants. A series of guided walks through the closed off parts of the site will also be available to

the visitor. Specific works include turning A200, Walton's House, back into offices, developing H7 into an entrance and ticketing building, transforming L176 into a restaurant and L157 into an interpreted display area. The main exhibition and audio visual interpretation area is planned in A203 where there will also be educational facilities. Incremental development of the site is planned over the next few decades with the eventual aim of repairing and reusing the multi-level canal system and reinstating the narrow gauge railway as different methods of visitor transport.

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To become a 'Friend of the Gunpowder Mills'.

Contact:

Mr Norman Paul
24, Anglesey Close, Bishop's
Stortford, Herts. CM23 4PE

For other information contact:

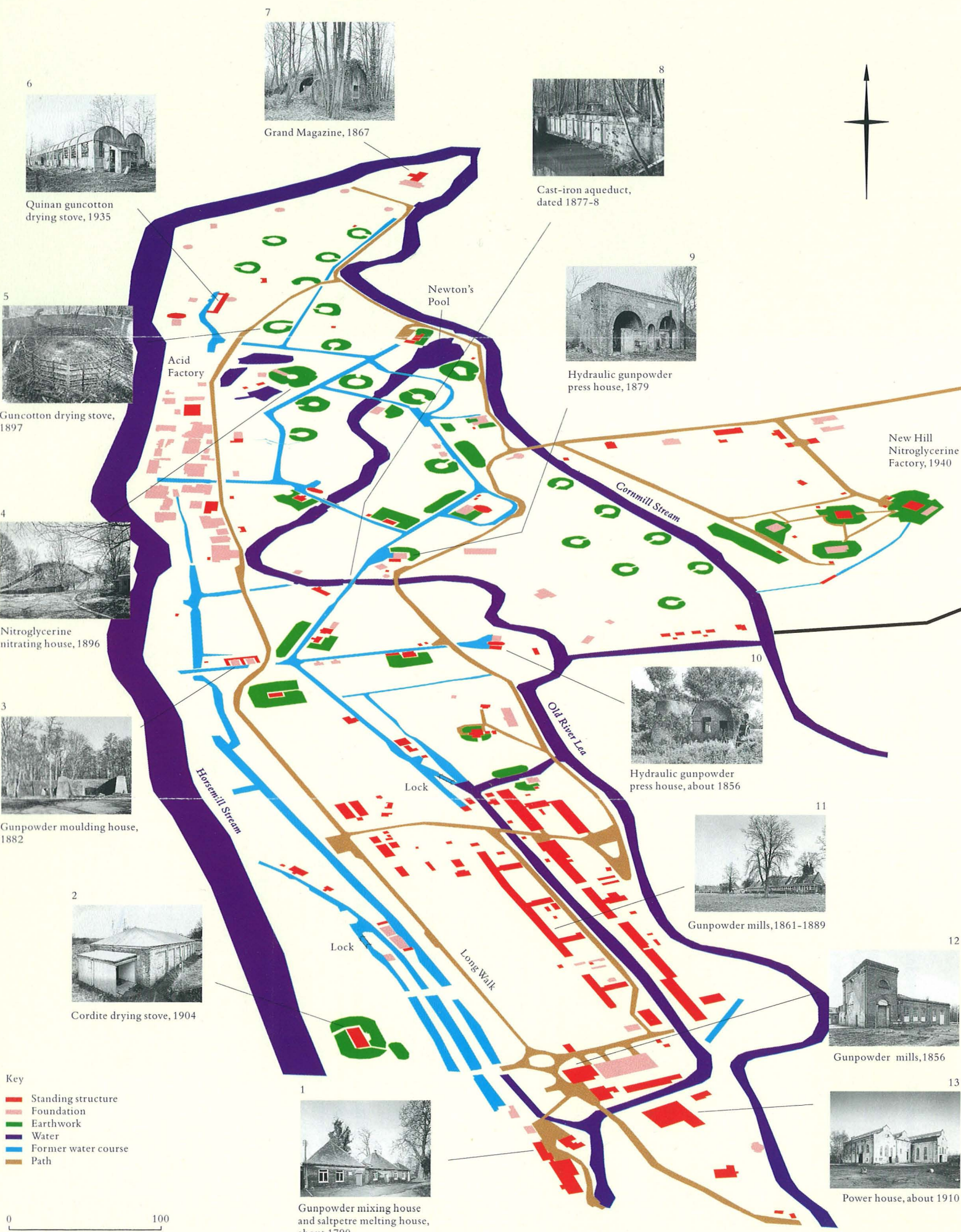
Chairman of the Board of Trustees
Don Spinks, Rosemead, Pynest Green Lane, Waltham
Abbey,
EN9 3QN

Press enquiries should be directed to:

Andy Mansfield, 13 Horrocks Close, Ware, Herts, SG12
OQL 01920 486466. e-mail

**For Further
Information:**

Waltham Abbey Royal Gunpowder Mills



6 Quinan guncotton drying stove, 1935



7 Grand Magazine, 1867



8 Cast-iron aqueduct, dated 1877-8



5 Guncotton drying stove, 1897



9 Hydraulic gunpowder press house, 1879



4 Nitroglycerine nitrating house, 1896

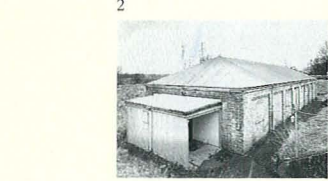
New Hill Nitroglycerine Factory, 1940



3 Gunpowder moulding house, 1882



10 Hydraulic gunpowder press house, about 1856



2 Cordite drying stove, 1904



11 Gunpowder mills, 1861-1889



12 Gunpowder mills, 1856

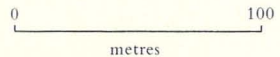
- Key
- Standing structure
 - Foundation
 - Earthwork
 - Water
 - Former water course
 - Path



1 Gunpowder mixing house and saltpetre melting house, about 1790



13 Power house, about 1910



Waltham Abbey Royal Gunpowder Mills

Gunpowder, and the explosives and propellants which followed it, provided a form of energy which changed the world by encouraging trade, exploration, mining, and civil engineering, as well as serving the military purposes of conquest and defence.

History

Gunpowder production began at Waltham Abbey in the mid 1660s on the site of a late medieval fulling mill. The gunpowder mills remained in private hands until 1787, when they were purchased by the Crown. From this date, the Royal Gunpowder Mills developed into the pre-eminent powder works in Britain and one of the most important in Europe.

In the surviving structures, the earliest of which date from the Crown's acquisition of the mills [1], we may trace the evolution of gunpowder technology to its ultimate form in the late nineteenth century, with production on an industrial scale [3, 9, 10, 11, 12]. The development of new chemical explosives ran in parallel with this refinement of gunpowder making. Remains of this activity include two nitroglycerine factories, one dated 1896 [4], the other 1940, and drying stoves [5, 6], where guncotton was dried before being mixed with nitroglycerine to form cordite [2].

During this century Waltham Abbey was responsible for research and development of high explosives, including Teteryl, TNT and RDX.

Production at the factory ceased during the Second World War in favour of sites less accessible to German bombers. After the war it became the principal government research establishment for investigating non-nuclear explosives, often reusing existing buildings for a second, third or fourth time. Since the site's decommissioning in 1991 the Ministry of Defence has undertaken its decontamination, so that access can be provided to this secret world. Here the visitor will find a remarkable landscape which has evolved into a final state of mysterious complexity. There are over 300 structures, 21 listed buildings, and a profusion of waterways, surviving in a park-like landscape of 71 hectares. More than two-thirds is a Scheduled Ancient Monument, and 34 hectares are designated as a site of Special Scientific Interest including the largest heronry in Essex. Although not a conventional museum, displays and presentations will introduce the visitors to the site and help them to explore and understand its history.

The future

The Royal Gunpowder Mills at Waltham Abbey is an industrial monument of major national and international importance.

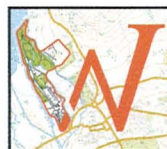
To safeguard the site in perpetuity the Waltham Abbey Royal Gunpowder Mills Charitable Foundation (WARGPM CF) has been set up, whose charitable Foundation Trustees administer an income generating endowment fund and a contingency fund, both established by the Ministry of Defence. A Heritage Lottery Fund grant has also been secured, for expenditure on the restoration and interpretation of the site, the development and management of which will be in the hands of Waltham Abbey Royal Gunpowder Mills Company Limited (WARGMCo Ltd), set up by the Foundation.

This concept of partnership reflects the way in which the success of the project so far has been achieved, through an alliance of local and national interests. It will also provide a vision for the future in which the site will be interpreted in its entirety as a comprehensive record of the men and women who worked here, the processes they developed, and the environment they occupied. All will be set within the context of the local, national, and international importance of the site.

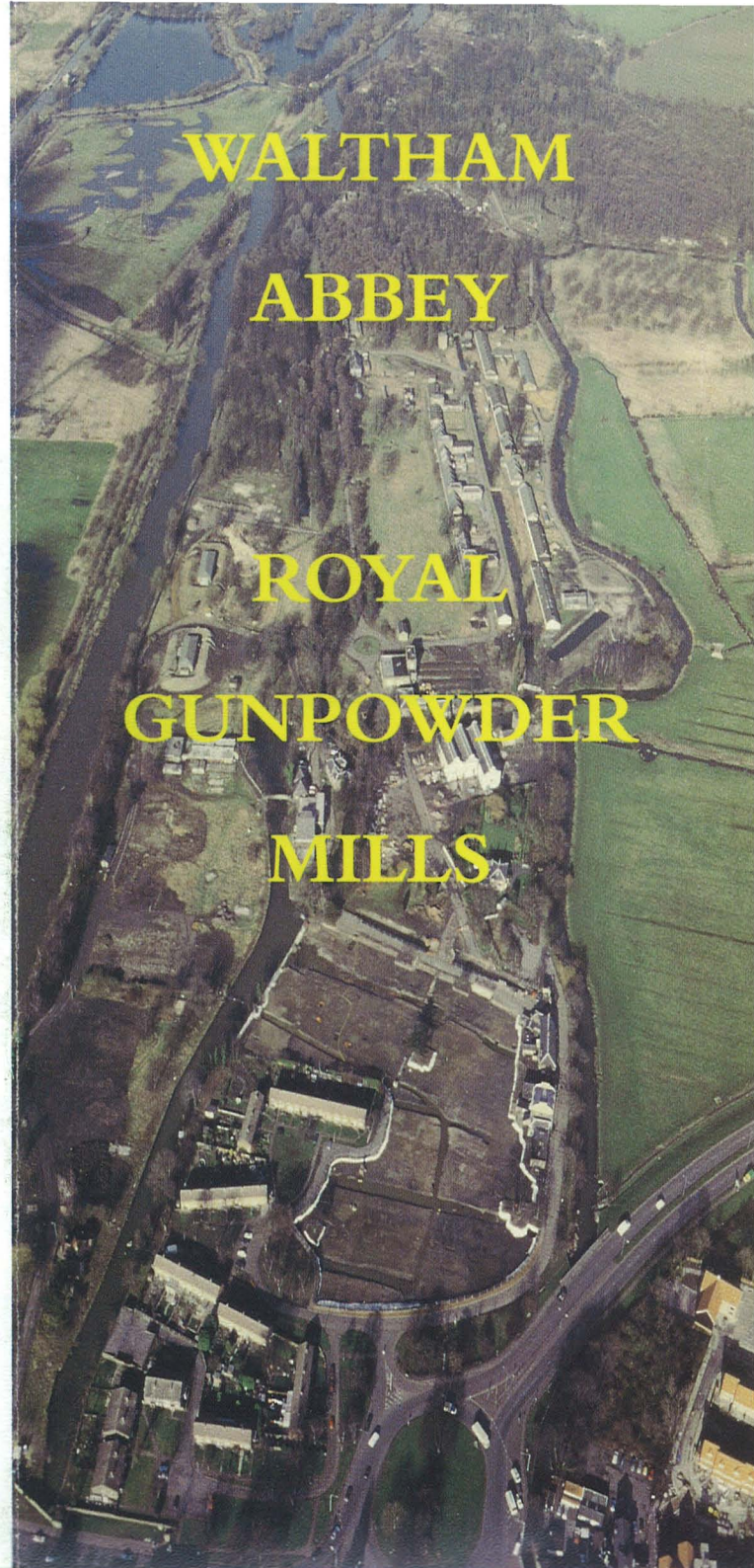
It is hoped that Waltham Abbey Royal Gunpowder Mills will be open to visitors by the year 2000. Until then the nature of the landscape means that only limited access can be allowed, by special arrangement.

The photographs used in this leaflet are from the National Monuments Record. Copies of these and the detailed archive associated with them are available from the NMR:
Call 01793 414600.
[Http://www.rchme.gov.uk](http://www.rchme.gov.uk)

For further information about the project please write to:
WARGPM Project,
Powdermill Lane,
Waltham Abbey,
Essex,
EN9 1BN



WALTHAM
A B B E Y
R O Y A L
G U N P O W D E R
M I L L S



SANDURST HOSPITAL.



THE REFINERY BRIDGE HIGHBRIDGE STREET.
BUILT IN 1847.

The traffic was often stopped by the RGPF police, to allow a barge loaded with gunpowder, to pass safely underneath. The bridge was levelled in 1967, when the road was widened.

To the left of the bridge a railway tunnel was built to allow a small train to pass under the bridge.



HORSEMILL STREAM.

Powder Barges once sailed down here on their way to Perfleet and Woolwich loaded with barrels of gun-powder.

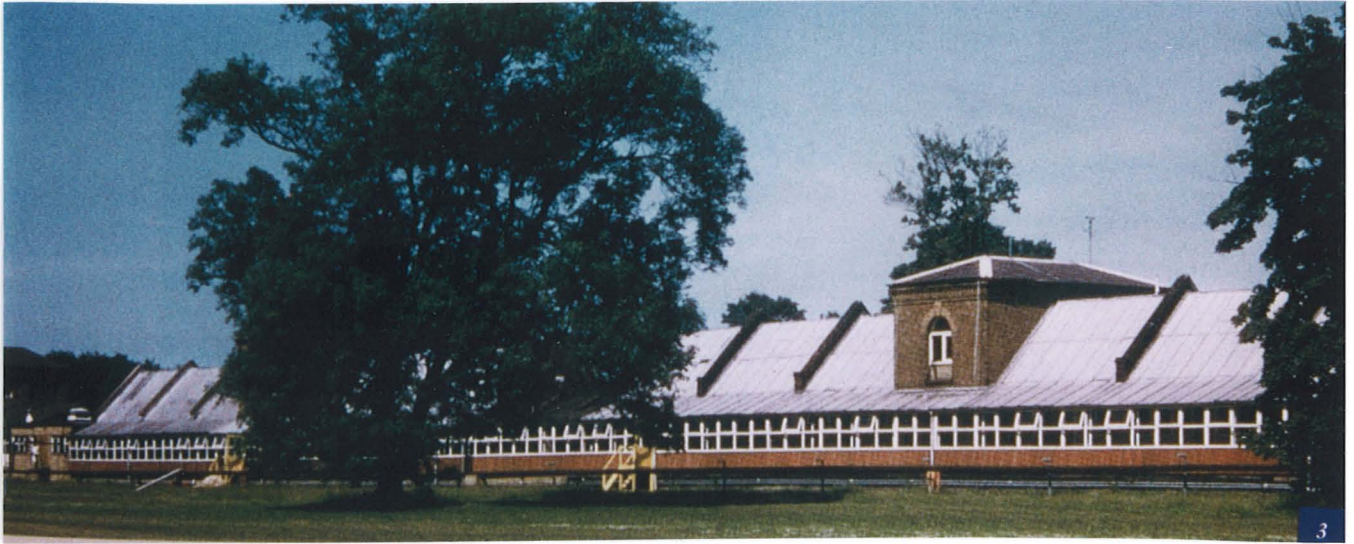


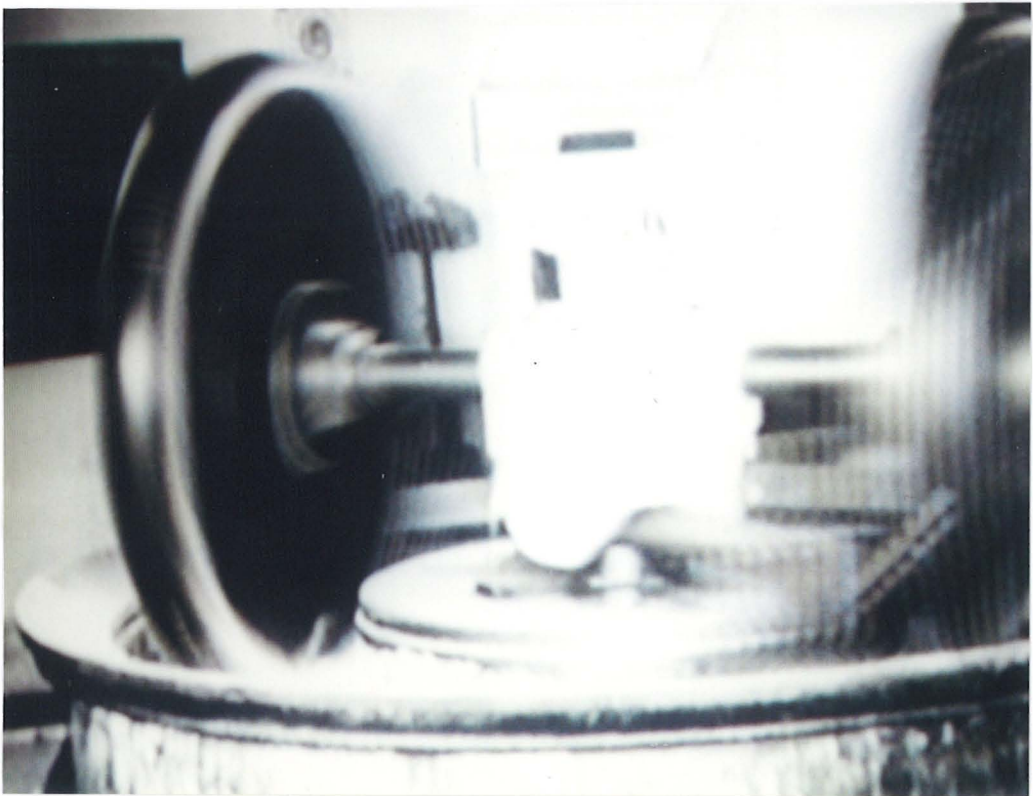
HORSEMILL STREAM.

The ground beside the stream has been set aside for a housing estate.



STEAM-DRIVEN INCORPORATING MILLS.





TRANVERSE

One of the old tranverse used to take the blast and protect the workers if there was an explosion in the Press House.

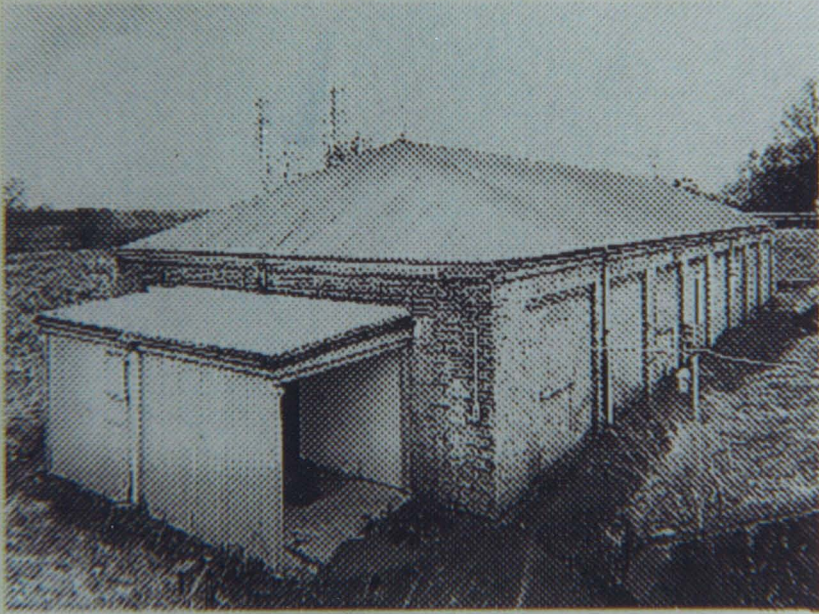
The Press House has long gone with just this remaining 'a mass of masonry, concrete and earth.'



TRANVERSE.



CORDITE DRYING STOVE, 1904.



Cordite drying stove, 1904

GUNPOWDER MIXING HOUSE
AND SALTPETRE MELTING HOUSE
1790.

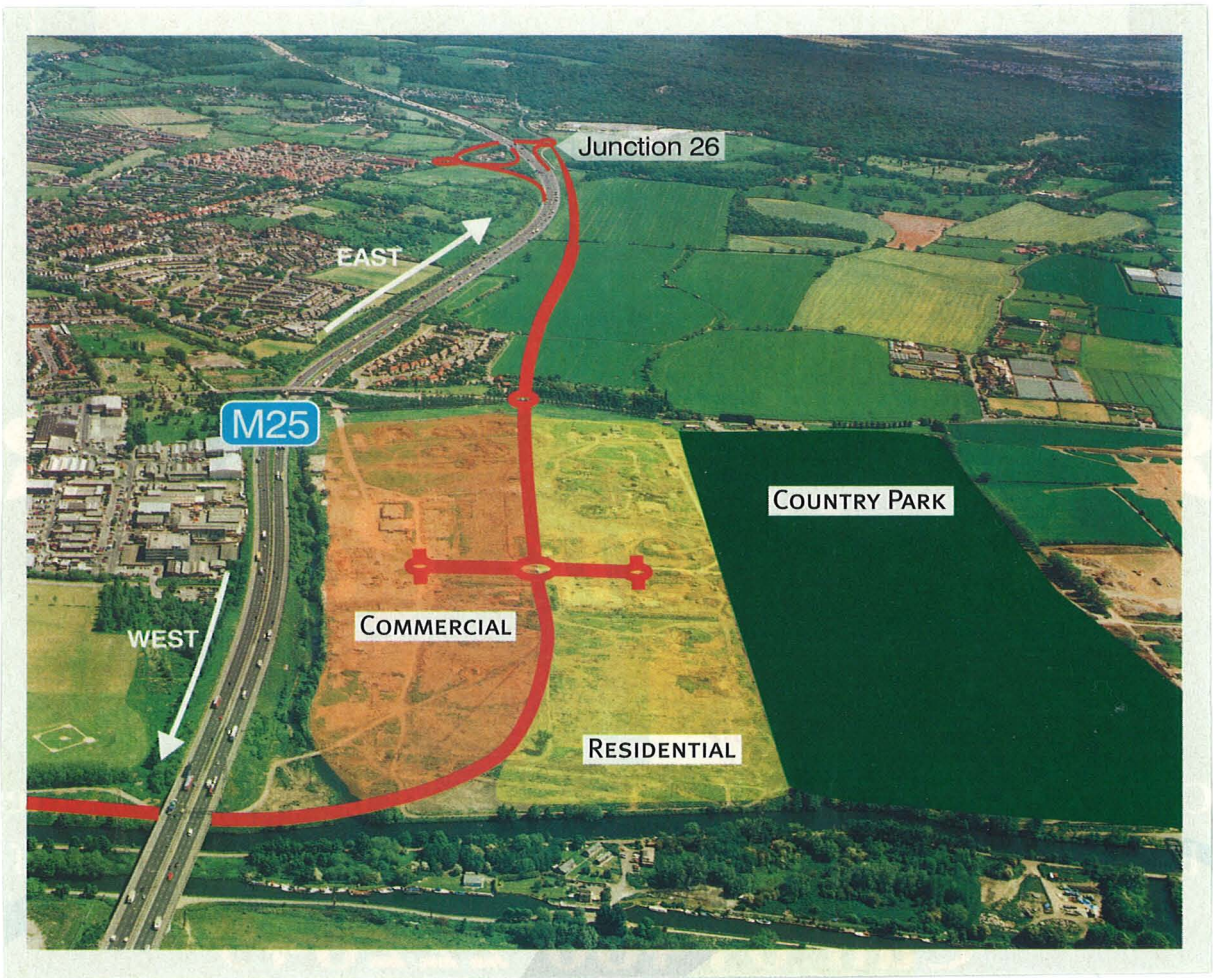


NEW HILL
NITROGLYCERINE FACTORY
1940.



SAFETY.

To reduce the dangers of explosions from the tools used in the process, all metals were phosphor bronze or lead, and rooms were lined with wood, leather or lead. In some cases virtually the whole floor of some buildings were lined with clearly defined inter-locking sections of elephant hide and one such building survived into the 1990s. Thick leather buckets fashioned from the same source, were the rule. By 1940, for newer items, there was a general move towards the substitution of rubber for the leather but with the superior longevity of the leather item, both materials were to be employed side by side for a further 50-years.



WALTHAM ABBEY ROYAL GUNPOWDER MILLS (W.A.R.G.M.)

- Update -

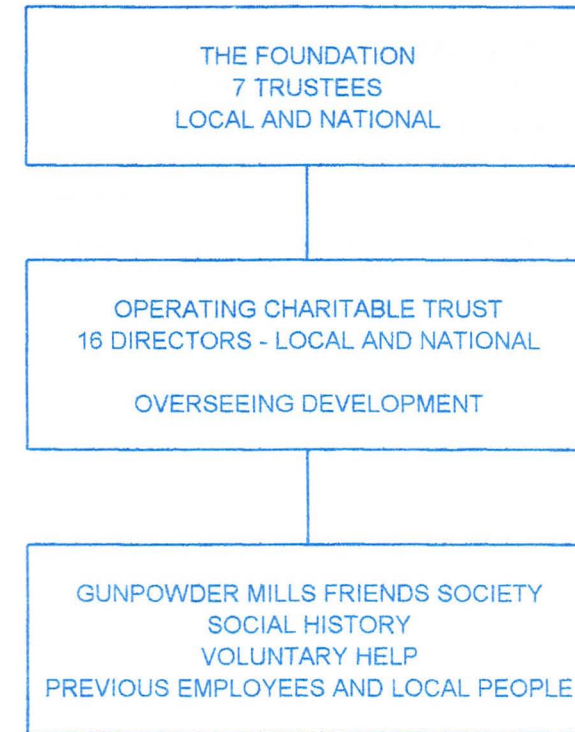
The Steering Committee of the Waltham Abbey Royal Gunpowder Mills is now in the final stages of securing this unique site for the benefit of the people - both locally and nationally. As you already know the committee was successful in securing a grant of £6.5 million from the Heritage Lottery Fund which is to be used for stage one, covering three years of development designed to open an Interpretation Centre, provide educational facilities, limited access to the 75 acres of special scientific interest with all its species of wildlife and their habitat and many other different facilities to attract a broad expanse of people with different interests. After phase one there will be an incremental development of the site to achieve the long term aim of establishing a museum of both national and international standing.

The Ministry of Defence, with the Steering Committee as its advisors, is now working hard to achieve the handing over of the land together with a 5.5 million endowment to the Foundation by the 31st March. At this point the Foundation will take over the management of the site and invest the endowment to ensure that the site can be maintained and the buildings preserved in perpetuity. The present Steering Committee will continue to advise the Foundation until November 1997 by which time they will hand over to 16 trustees who will be Directors of the Operating Charitable Company, they will take over the day to day running of the site.

This site is unique in its history of nearly 400 years of manufacturing gunpowder, it has a wealth of social history in which countless local people were employed on the site - this is another story that will slowly unfold as there are many ex-employees waiting to contribute their knowledge and help to this exciting project. As local people you cannot have missed the mass of private development that has occurred in Waltham Abbey over the last 5 years or so which has been mainly for the benefit of individuals - this is not to be deplored - the need for both private and social housing as well as creating employment is necessary, however it will continue to put pressure on scarce land resources.

5.5 MILLION
MoD ENDOWMENT
SECURING SITE
IN PERPETUITY

6.5 MILLION H.L.F.
GRANT FOR PHASE 1
INTERPRETATION AND
HERITAGE CENTRE



The difference with the Royal Gunpowder Mills is that except for 9 acres out of 180 acres there will be no land sold off for development - all the retained buildings will remain the property of the Foundation bound by legal agreements and the rules of the Charity Commissioners. This site is guaranteed to remain for the people, managed and run by the people, and for the benefit of the people.

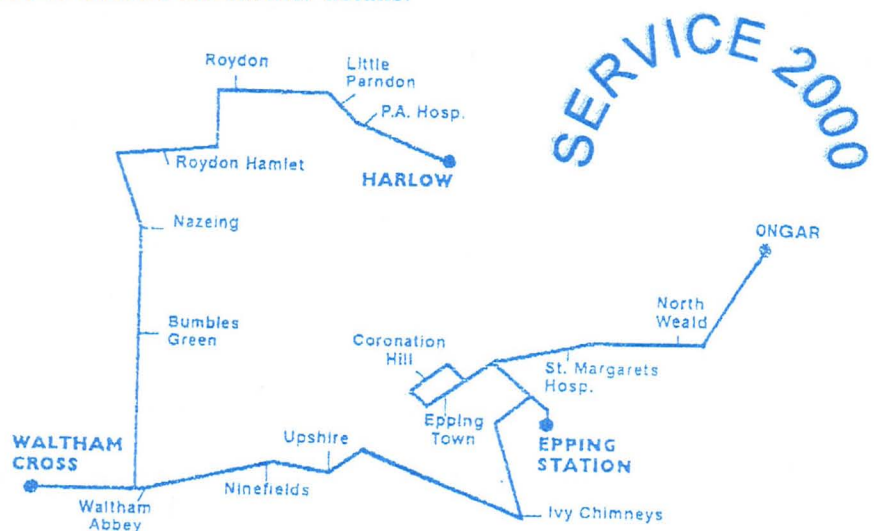
Whispers will continue to keep you informed of progress and will let you know where you can be involved in the future of this outstanding asset in Waltham Abbey.

Contribution from Don Spinks
(Chairman of the Waltham Abbey Royal
Gunpowder Mills Steering Committee)

"Bus with a difference"

Do you know about this service? This is a joint venture between E.C.C. and E.F.D.C., providing a transport service between Waltham Abbey to Harlow and Waltham Abbey to Ongar. This has been in operation since 1994.

Following recent discussions improvements to the scheme are being introduced in April. This service is available to everybody but, if you are elderly or disabled, the drivers are trained to assist you. Ring Essex Busline on 0345 000333 for further details.



Town Mead

The development of Town Mead as a leisure facility is advancing well, the 1st Phase is nearing completion and the Club house is due to be opened in February.

The Town Council's Officers are to be congratulated for the hardwork they have put into this project, which will see the culmination of four years work which was originated by the former Conservative Town Council, thanks also to the current administration for continuing the project.

Development Committee meeting - 29th October

Council Meeting - 20th February

Explosive waste stays in Waltham Abbey.

Despite opposition from Liz and Norma the Development Committee recommended approval for the planning application for the Royal Ordnance site which included the deposit of explosive waste in a pit on clean farmland just north of Hawes Lane. This was confirmed at the later Council meeting.



While no permanent guarantees could be given that this would never cause a problem, members were persuaded that this was the safest option for dispersion. Promises were given that the area would be monitored constantly in line with Public Health and environmental requirements. This issue was a matter of opinion. Liz and Norma felt that, without guarantees, there was still a risk: one that we were not prepared to take. It is important to note that every councillor was given full access to all available information, several opportunities to visit the site and a chance to debate the matter at a meeting specially arranged for the purpose. The decision has been made, not in ignorance, but with full knowledge of the facts. Maybe we were over cautious: we hope so. Only time and future generations can decide that.

Surgeries go from strength to strength.

Our successful surgeries held from 10am to 12 midday on the 2nd and 4th Saturdays in each month are being streamlined to make them more convenient for residents. In future, to avoid waiting time, we are introducing an appointments system. The appointments can be made by phoning :

Cllr. Mrs Liz Webster01992 715957 (Housing & Planning)

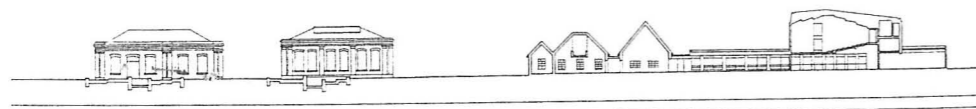
Cllr. Mrs Norma Green0181 508 7682 (All other District Council Matters)

Cllr. Mrs Syd Stavrou0181 508 7070 (All Town Council Matters)

So, from now on please do not just turn up. With the recent increased attendance, and the necessary new system, you may well be disappointed.

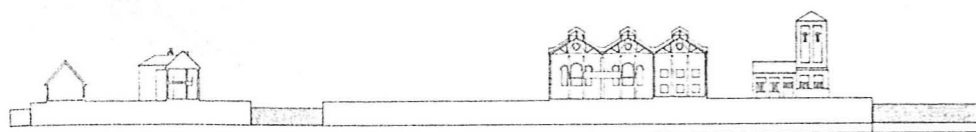
URGENT PROBLEMS will continue to be dealt with on a day to day basis.

We have a desire and a responsibility to help you to the best of our ability.



Plan: Grade 1 Listed Incorporating Mill

Partnership The success of the Waltham Abbey Royal Gunpowder Mills project so far has been due in large part to a partnership of local and national interests. This partnership has addressed seemingly intractable problems and created far-sighted solutions. It is envisaged that the partnership approach will be developed and refined, building on what has already been achieved, ensuring the successful conservation and development of the site as an internationally significant resource. *Trust* To safeguard the site in perpetuity a Foundation will be established. The Foundation will hold title to the land and a capital fund sufficient to ensure that the site and its operation can be maintained. The Foundation will be a charitable trust. The Foundation will establish an Operating Charitable Company to develop and maintain the site as a museum and visitor attraction. *Vision* The development of the museum will be phased and incremental. The site will be treated as a whole, with the interpretive emphasis placed on integrating themes, not isolating them. The museum will be operated to the highest professional and ethical standards, both museological and ecological. As a museum the site will be a major educational resource, operating for the public benefit.



Sectional Elevation: Power House Complex and Island Site

A selection of Species at Waltham Abbey Herons · Otters ·

Bats · Grass Snake · Shiny Ramshorn · Woodpeckers · Muntjac · Fallow

Deer · Siskin · Kestrels · Hobby · Tawny Owl · Tree Sparrow · Reed

Warbler · Sedge · Blackcap · Wagtails ·

Kingfishers · Grou · its · Grey Squirrels ·

Foxes · Moles · Sh · Loach *Aquatic*

Habitats 27 Ac · brate Communities

Perch · Perch · *Tr* · ench · Ground Ivy ·

Minnow · Pea M · · Gudgeon · · Chub ·

Bleak · Bream · B · · Bugs · Red-Eyed

Damselfly · Band · Pond Snail · Water

Snails · Jenkins Sp · a · Sawfly · Bithynia

Leachi · Physalhet · Larvae · Theodoxus

Fluiatillis *Shru* · Ash · Poplar · Elder ·

Blackthorn · Vari · y · Common Water

Starwort · White · ed · Fat Duckweed ·

Reed Canary-Gras · Soft Rush · Common Reed · Bulrush · Cladophora

Sp · Fontinalis Antipyretical · Blunt-Fruited Water-Starwort · Stinging

Nettle · Lesser Pond Sedge · Greater Pond Sedge · Reed Sweetgrass ·

Branched Bur-Reed *Ground Flora* Wild Arum Roots · Comfrey ·

Lichens · Wall Lettuce · Goat Willow · Clematis · Rosa · White Willow

Coral-Bark Willow *A selection of Species at Waltham Abbey*



Project Partners

Waltham Abbey Town Council
Ministry of Defence
Lee Valley Regional Park Authority
Essex County Council
Epping Forest District Council
English Nature
English Heritage

Advisory Team

Lead Consultants
Prince Research Consultants
Limited

Planners
Civix Limited

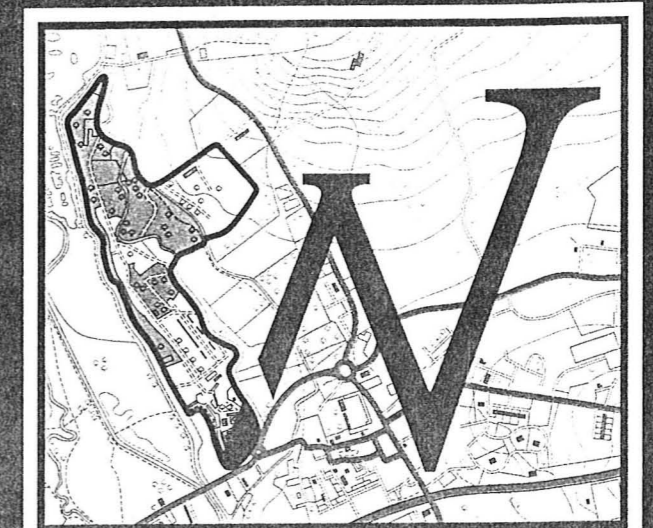
Architects
Carden & Godfrey
RMA Architects

Landscape Architects
Pearson Landscape Design

Designers
Typearea Limited

Solicitors
Norton Rose

Accountants
Tranter Lowe



WALTHAM
A B B E Y
R O Y A L
GUNPOWDER
M I L L S

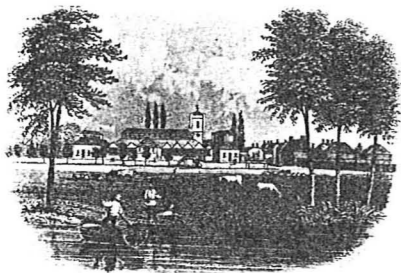
The Site has been described by English Heritage as "the most important to the history of explosives in Europe"

Introduction

Following the closure of the Royal Armament Research & Development Establishment at the Waltham Abbey Royal Gunpowder Mills site in Essex, a partnership of local and national bodies has identified an important opportunity for the development of a major new museum, educational resource and visitor attraction.

Extensive consultation with both the local community and recognised experts over a range of disciplines has highlighted the immense social, historical, ecological and economic importance of the site. This brochure sets out details of the proposed development of the site as a museum, describes the resource and illustrates a vision for its future.

For many centuries the Gunpowder Mills site has been important, both locally and nationally. The proposals developed by the Waltham Abbey Royal Gunpowder Mills Steering Committee will take this valuable and unique site and ensure that it is conserved and developed for the public benefit. Above all the site presents an opportunity...



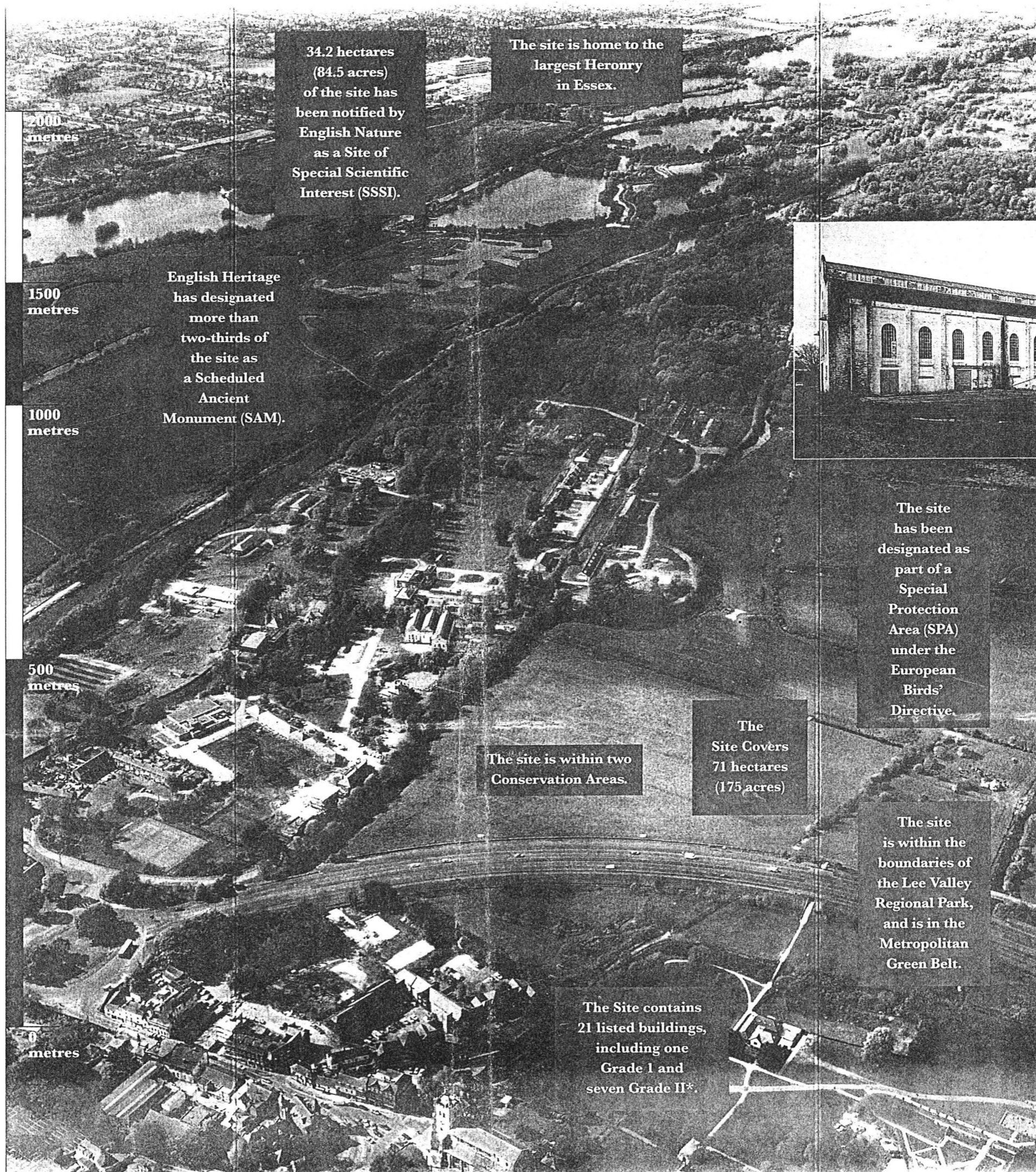
Powder Mills Waltham Abbey

History

The site's situation on the River Lee placed it at the hub of a transportation system and provided a source of power, making it a natural place for the development of the English gunpowder industry. Gunpowder manufacture is thought to have taken place in the Waltham Abbey area as early as the 1560s, and there is documentary evidence that by the mid 1660s gunpowder was being produced on the site.

The Gunpowder Mills were nationalised in 1787 in an attempt to standardise the quality of gunpowder. As propellants such as cordite replaced gunpowder in the late nineteenth century, many technological innovations and developments of working practices took place on the Waltham Abbey site.

Most of the cordite used by the British in WWI was produced at Waltham Abbey. When explosives manufacture on the site was run down in the late 1940s it became home to an explosives and propellants research establishment.



2000 metres

1500 metres

1000 metres

500 metres

0 metres

34.2 hectares (84.5 acres) of the site has been notified by English Nature as a Site of Special Scientific Interest (SSSI).

The site is home to the largest Heronry in Essex.

English Heritage has designated more than two-thirds of the site as a Scheduled Ancient Monument (SAM).

The site is within two Conservation Areas.

The Site Covers 71 hectares (175 acres)

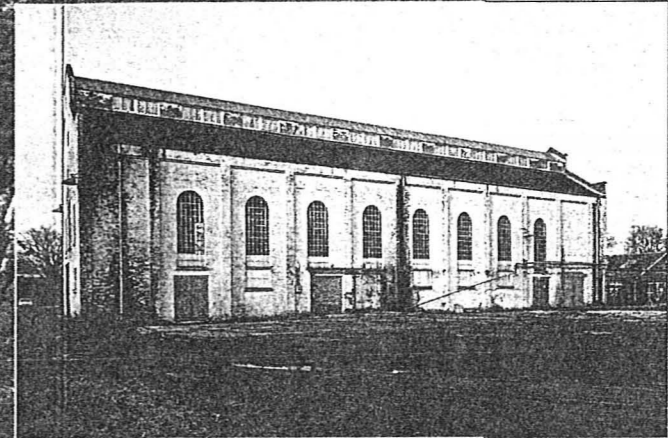
The Site contains 21 listed buildings, including one Grade I and seven Grade II*.

The site has been designated as part of a Special Protection Area (SPA) under the European Birds' Directive.

The site is within the boundaries of the Lee Valley Regional Park, and is in the Metropolitan Green Belt.

The Site

is situated to the north west of Waltham Abbey in Essex and covers some 71 hectares (175 acres). Its importance is reflected in level of statutory protection afforded to it. The northern part of the site is largely wooded, whilst to the south there is an area of more formally developed land. The immense archaeological, historical and ecological value of the site is enhanced by state of preservation.



Main picture: An aerial view of the site, illustrating the wooded nature of its northern part. Twenty one of the visible buildings are listed. The western boundary of the site is defined by the Horsemill Stream, the eastern by the Cornmill Stream.
Insert: The Power House is a dominant feature of the site. It is a spacious building, intended as the exhibition centre for the site.

The Landscape

of the Royal Gunpowder Mills site, originally marshland, has been formed and altered by human activity over the centuries. More than three hundred structures, including buildings, blast walls and testing beds combine with extensive wooded areas (originally planted to provide charcoal for gunpowder manufacture), canals and railway tracks to produce a complex, fascinating and unique landscape.

The Ecology

of the site has developed largely as a result of restrictions on public access. This has led to the development of rich and varied habitats. Wildlife flourishes in a mixture of woodland, grassland and aquatic environments. The alder woodland is home to the largest colony of herons in Essex. Other bird life, including the largest over-wintering flock of siskin in Britain, abounds. The seclusion and aquatic nature of the landscape provide an ideal habitat for otters and for the internationally rare Shiny Ramshorn snail.



From Closure to Disclosure

Spring 1995



Planning

Outline Planning Consent was granted by Epping Forest District Council for the heritage interpretation and residential land use proposals in April 1995. As the planning consent represents a departure from the approved Local Plan the application had to be referred to the Department of the Environment. In late May confirmation was received from the Secretary of State for the Environment that the application would not be 'called-in'.

Organising and Funding the Project

Throughout the Spring and Summer of 1995, PRC's work focused on the management and funding arrangements for the project, prior to applications for support from the Heritage Lottery Fund and other sources. They were also engaged in the preparation of brochures, an exhibition for the public launch at Waltham Abbey and presentations at the Museums Association's Annual Conference, the House of Commons and to an invited audience at the Royal Town Planning Institute.

Project Team

- *Project Co-ordination, Town Planning & Marketing*
CIVIX
- *Heritage Business Planning*
Prince Research Consultants
- *Highways*
Colin Buchanan and Partners
- *Architecture*
RMA Architects/Carden & Godfrey
- *Landscape*
Pearson Landscape Design
- *Legal*
Norton Rose
- *Accountancy*
Tranter Lowe
- *Site Remediation*
Project Manager – W S Atkins
Contractor – ESG Royal Ordnance



Waltham Abbey Royal Gunpowder Mills

From Closure to Disclosure

The beneficial re-use of one of Europe's most important monuments

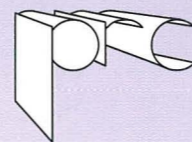
Conceived and prepared jointly by:



CIVIX
27 Old Street
London EC1V 9HL

Tel: 0171 253 1843
Fax: 0171 253 5077

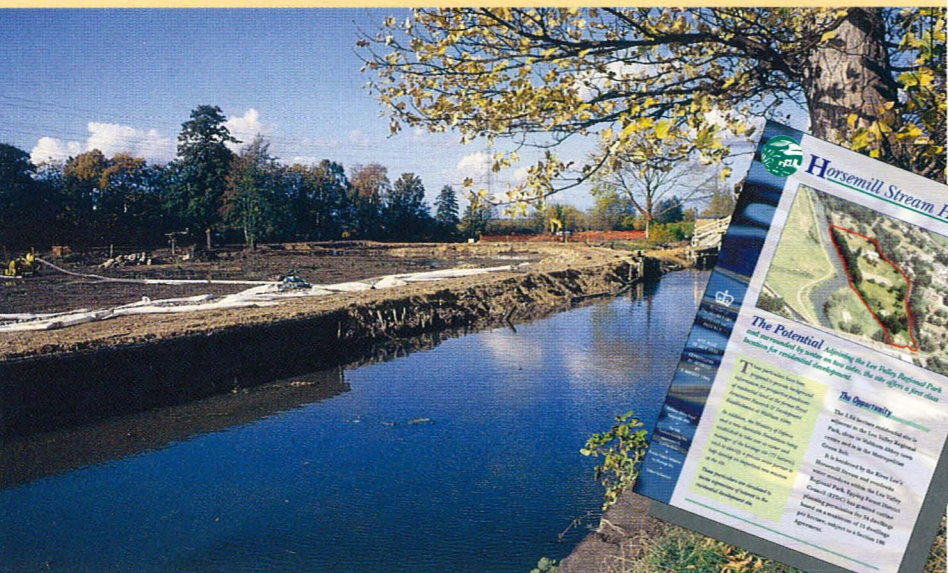
PRINCE RESEARCH CONSULTANTS



3 Homer Street
London W1H 1HN

TEL: 0171 706 0365
FAX: 0171 724 5856

Graphics: Equinox Partners, London EC1 0171 251 8851



Horsemill Stream Housing Site

Summer 1995

Sale Western Flank & PFI

'Expressions of Interest' for Horsemill Stream Housing site and Private Finance Initiative were announced.

PFI Development Partner

John Laing Construction Limited was selected as the Preferred Development Partner for the project, drawing to a close the pre-development work.

September 1995

The Royal Gunpowder Mills

Explosives are recorded to have been manufactured on the 190 acre site since the Middle Ages, at a time when industrial activities, including the woollen industry, relied upon water power obtained from the River Lee. Corn milling was mentioned in the Domesday Book, and provided an additional activity when gunpowder making was reduced in times of peace.

"Nationalisation" took place in 1787 when the site was purchased by the Government and was further developed during the Napoleonic Wars between 1793-1814.

The introduction of steam in the 1850s provided the increase in power to advance the production technology of gun cotton and nitroglycerine in 1895 and tetryl in 1910.

The site has always been a source of major employment for the town of Waltham Abbey, requiring a workforce of over 5,000 during the 1914-18 War.

As a research establishment it was responsible for the development of the "Dambusters" explosive, RDX, and late 20th century missile propellants.

In 1991, the rationalisation plans for national defence research left the site surplus to Ministry of Defence requirements.

The opportunity has presented itself to establish the beneficial re-use of this site in a way that is commensurate with its unique history.

The Royal Gunpowder Mills

Introduction

Between closure of the site on 30 June 1991 and the formation of a trust to take over its ownership and management, a number of events and activities have had a critical influence on the progress of the project proposals.

The purpose of this brochure is to both articulate and interpret the development planning process and to set out the key events, from the closure of the site to the disclosure of its history to the public.

With an appreciation of the activities undertaken during the process of re-planning the site at Waltham Abbey, it is possible to explore the rationale for the proposals to sensitively re-use this internationally important site.

It explains the approach to public consultations and the consequential establishment of a trust to take over the ownership and management of this intriguing site.

*Steam-driven
Incorporating Mills*



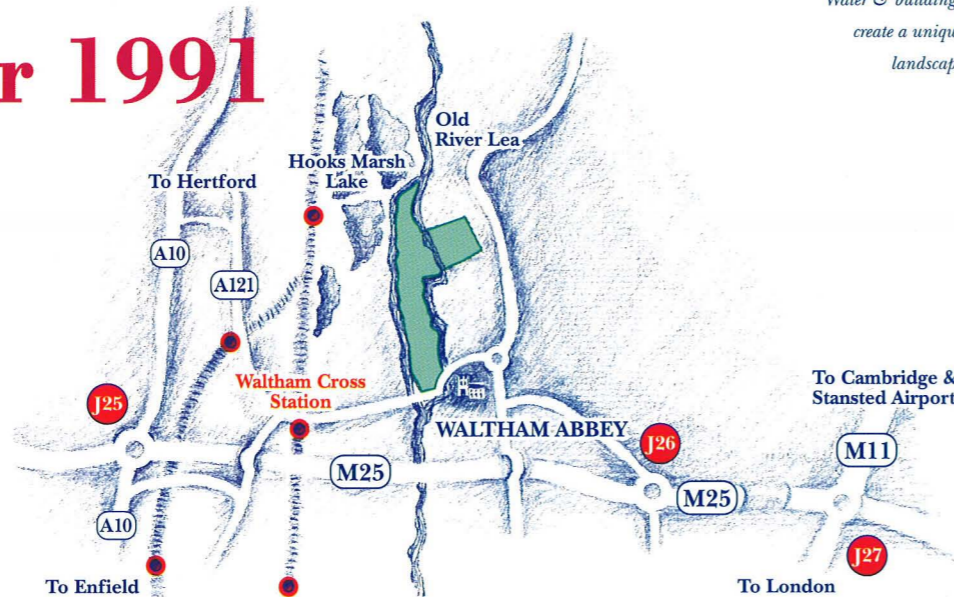
Physical Attributes & Planning Context

- Total site area approx 190 acres.
- Woodland area approx 100 acres.
- Waterways approx 4 miles in length.
- SSSI approx 85 acres – largest heronry in Essex.
- Majority of site in Green Belt.
- Whole site in Conservation Area.
- Whole site in Lee Valley Regional Park.
- Planning brief called for heritage interpretation and recreational uses.
- Presumption against new development on site.



Summer 1991

Water & buildings create a unique landscape



Site Closure

The Defence Research Agency moved to Fort Halstead, Kent.

A Strategy for Beneficial Re-use – June 1991

A report for the Ministry of Defence prepared by CIVIX established the options for strategic development, re-use and disposal.

Key Recommendations

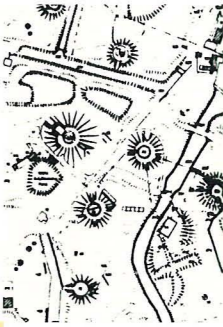
MoD should:

- Carry out an assessment of the physical condition of the site – the landscape, the buildings and the waterways,
- Engage in a programme of public consultation – to cover all local and national organisations with an interest in the site’s beneficial re-use,
- Adopt a pro-active approach to the development planning process.

Autumn 1991

Site Investigation

PSA Specialist Services were commissioned by MoD to carry out an initial site investigation.



Winter 1991/92



Consultation & Negotiations

CIVIX were appointed by MoD to commence discussions with the relevant local opinion formers and national policy makers. Discussions were held with:

- Waltham Abbey Town Council
- Epping Forest District Council
- Essex County Council
- Lee Valley Regional Park Authority
- English Heritage
- English Nature

and it was concluded that:

- Programmed remediation of the site’s contamination should be undertaken. Early on in the discussions, local political representatives and EFDC’s planning officers stipulated that the designation of any future land re-use proposals would be conditional on the programmed remediation of the site’s contamination.
- Commercial uses were to be excluded – the site had little/no commercial value. Local Plan policies restricted the future uses to heritage interpretation and recreation and with these constraints on land-use planning the site had no latent commercial value.
- There was no obvious new owner for the site. With such complex and diverse constraints and uncertainties relating to the site’s future, no single organisation had the capacity nor the ambition to take over the site from MoD.

The man-made and natural landscapes, SSSI (left) and part of canal system



Spring/Summer 1992

Planning Forums

CIVIX ran two public consultation workshops involving representatives of the local community, local government and the key national bodies. The outcome of these consultations was the creation of a consensus in favour of proposals for the site's future heritage interpretation to be funded by 'enabling development'. The Department of Geography, University College London observed and reported on the proceedings of the two consultation events. The recognition by those attending the workshops of the need for enabling development to cross-subsidise heritage proposals proved to be a defining moment in the development planning process. The planning workshops proved vitally influential in shaping the views of local politicians. General agreement was reached that for there to be an eventual beneficial re-use of the site it was necessary to allow a departure from the local plan by allowing limited development on part of the site. The idea of residential use for the western flank, the Hoppit Road/Horsemill Stream site emerged.

Development Brief Powdermill Lane

At the same time that the planning workshops were defining the context for the development of the site for heritage interpretation, CIVIX was negotiating the basis of a development brief for residential use on the Powdermill Lane Site.

This 5 acre site is located within the Waltham Abbey Town Conservation Area but lies outside the Green Belt. Planning permission for the site's development for housing was obtained December 1992.

Development Studies

Following the public consultation programme CIVIX prepared a number of development options for MoD. Working with landscape architects, Higson Pearson, and highway engineers, Colin Buchanan and Partners, CIVIX reviewed the physical design constraints and opportunities for the site. Options included new build residential, light industrial, 'long-boat' marina and building conversions for small business and catering use. Recreation and leisure uses, including a gunpowder museum and public access to the wooded area, were also developed.



Planning Forums (top)
Site development study

Autumn 1992



Millhead Stream Pool during remediation (above)
Lord Astor at the Public Exhibition (left)

Public Exhibition

CIVIX advised MoD that, with an emerging consensus for the beneficial re-use proposals for the site, it was essential to communicate with the public.

Department of National Heritage Minister, Lord Astor, opened a public exhibition and a full colour

leaflet was circulated to over 1,500 Waltham Abbey households.

Members of Waltham Abbey Town Council supported the establishment of a local development trust to take over the ownership and management of the site as a public attraction.

Site Remediation

Following the report by PSA Specialist Services, tender documents were prepared for the remediation of the site. The Environmental Services Group of Royal Ordnance Plc (ESG) were the successful bidders and commenced operations on site in September 1992.

Winter 1992/93

KPMG Peat Marwick Study

In order to assess the viability of the emerging proposals to:

- Open the site to the public,
- Restore and convert, buildings to new uses,
- Establish a charitable trust to own and manage the site,

a further study was required.

Three management consultants tendered for the opportunity to advise MoD.

KPMG's report (presented in June 1993) confirmed that the principle of enabling development was essential – the viability of the project depended on 'cross-subsidies' from income generated from the sales of redundant land. As at this stage the site was not affected by ancient monument scheduling or listed buildings legislation, KPMG's costs for rehabilitation of buildings/landscape were based on minimal restoration works.

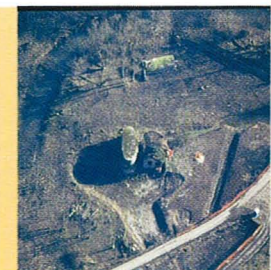
RCHME Archaeological Survey

The Royal Commission On The Historical Monuments of England commenced a full site survey in January, 1993. The aim of the survey was to provide a documentary record of the site as found, to investigate archive sources and to report to English Heritage on the site's importance to the history of the explosives industry.

A team of 5 archaeologists worked continuously for 6 months to survey the site.

Remediation of the site had been underway for three months when RCHME commenced its study. A close working arrangement between ESG and RCHME was essential if the site's emerging historic importance was to be safeguarded.

To manage the concurrent activities of site survey and site remediation, monthly liaison meetings were convened. Representatives from RCHME, English Heritage, English Nature, EFDC, Essex County Council, ESG and W S Atkins (MoD's site manager in succession to PSA Specialist Services) and CIVIX met to agree and monitor the basis of a continuing programme of works.



Aerial view of Water-powered Press House (RCHME)



Aerial view of Newton's Pool (top) & E2 Nitrator (RCHME)

Spring 1993

Briefing Meeting

The findings and proposals of the KPMG study were presented to a third planning forum in March 1993. At the meeting, the Head of MoD's Defence Lands Service, together with other senior MoD officials, agreed that the findings should form the basis of further work to be undertaken to establish a

trust. It was proposed that a fully argued case for the trust should be prepared for submission to MoD & Treasury Ministers. As a consequence, it was agreed by the local and national authorities involved that a Trust Steering Committee should be formed to oversee this work.



Autumn 1993

Scheduling & Listing

After 6 months survey work by RCHME and the collaboration of English Heritage, The Department of National Heritage confirmed the importance of the site with the scheduling of much of the site (100 acres) and bestowing listed building designations on 21 buildings – 1 Grade I; 7 Grade II* and 13 Grade II.

'.....the most important site for the history of explosives in Europe. This can be stated with confidence as it was not only the place where most of the major technological breakthroughs were made but it also retains, by a very long way, the best surviving examples of structures representing each of these technologies.'.....

David Stocker
Inspector of
Ancient Monuments,
English Heritage



Detail of
water-powered
Press House



Summer 1993

Inaugural Meeting of Trust Steering Committee

• Members of the Trust Steering Committee:
Don Spinks
(then) Leader
Waltham Abbey Town Council

John Burgess
Chief Executive
Epping Forest District Council

Tom Limna
Chief Executive
Lee Valley Regional Park Authority

David Buckley
County Archaeologist
Essex County Council

Oliver Pearcey
Deputy Director
Conservation Group
English Heritage

Dr Jeremy Dagley
(then) Conservation Officer
English Nature

Peter McMillan
Leisure Officer
Waltham Abbey Town Council

David Stanners
(then) Principal Surveyor
Ministry of Defence

Dan Bone
Secretary
CIVIX

Submission of Outline Planning Application

In June 1993, CIVIX submitted an Outline Planning Application for the whole site on behalf of MoD. This application included proposals for the heritage uses and the 'enabling' residential development on the western flank.



Illustrative layout for
Powdermill Lane Housing

The Trust Steering Committee met for the first time in June 1993 and established its terms of reference. The TSC's first task was the preparation of its proposal to the MoD seeking financial support for its work.

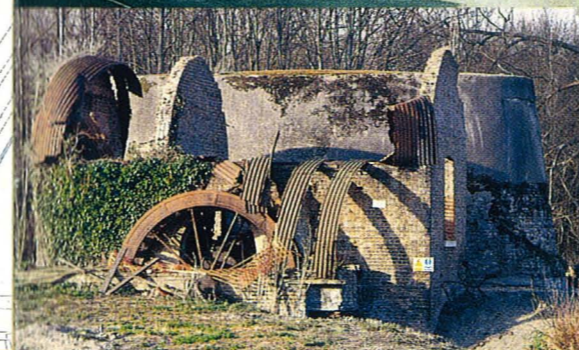
Powdermill Lane Site Advertised

The 5 acres of residential land was put to the market in July 1993. Offers were received from 10 regional and national housebuilders and negotiations commenced with Wimpey Homes.

The sale to Wimpey Homes was completed in 1994.



Former Saltpetre stores (top) &
Water-powered Press House



Winter 1993/94

MoD funds Trust Steering Committee

Lord Cranborne, Under Secretary of State for Defence, agreed to provide funds for the detailed business planning and viability work for the proposed trust. In addition, English Heritage, Waltham Abbey Town Council, Epping Forest District Council and Essex County Council provided additional financial support for the work of the Steering Committee.

Trust Steering Committee Appointments

In order to prepare the 'Statement to Minister' the Trust Steering Committee released a number of tenders for professional advice and the following firms were appointed to carry out specific tasks

Lead Adviser

Prince Research Consultants (PRC) –
Heritage policy and management
Business planning
Commercial viability

Solicitor

Norton Rose
Foundation and Operating
Company structures
Charity Commission discussions
Management Agreements

Accountant

Tranter Lowe
Financial Planning

Architects

Carden & Godfrey
Buildings Condition Survey
RMA Architects
Building refurbishment,
conversion proposals and
costings.

'...the most important site for the history of explosives in Europe.'

Summer 1994



English Heritage Seminar

In addition to the formal scheduling and listings, English Heritage sought to broaden the debate on the site's importance. On August 6 presentations were made by Sir Neil Cossons, Director of the Science Museum, London; Ms Jennifer Page, (then) Chief Executive of English Heritage; Dr Geoff Hooper, former Site Director RARDE, and Dr David Prince, Prince Research Consultants. Invitations were extended to 80 interested individuals and organisations representing a mix of academic and local community interests.

'The heritage of this country belongs to everyone, in a very genuine sense, because it threads through all our lives. By understanding our past and appreciating it we in actual fact find our roots. We find also the resources and investment that previous generations have left for us and we will be judged by how we handle it and pass it on.'

Jennifer Page, Chief Executive of English Heritage 6 August 1994, Waltham Abbey



'Statement to Minister' Submitted

English Heritage Seminar, August 6, 1994

The work of the Trust Steering Committee's consultants during the March to August 1994 period was led by Prince Research Consultants. Their efforts culminated in the submission of the research and viability assessments in the 'Statement to Minister' written by PRC for the Under Secretary of State for Defence, (then) Lord Cranborne.

English Heritage sought to broaden the debate on the site's importance.



Wayne Cocroft of RCHME (right) talking to Lord Cranborne

The restored landscape



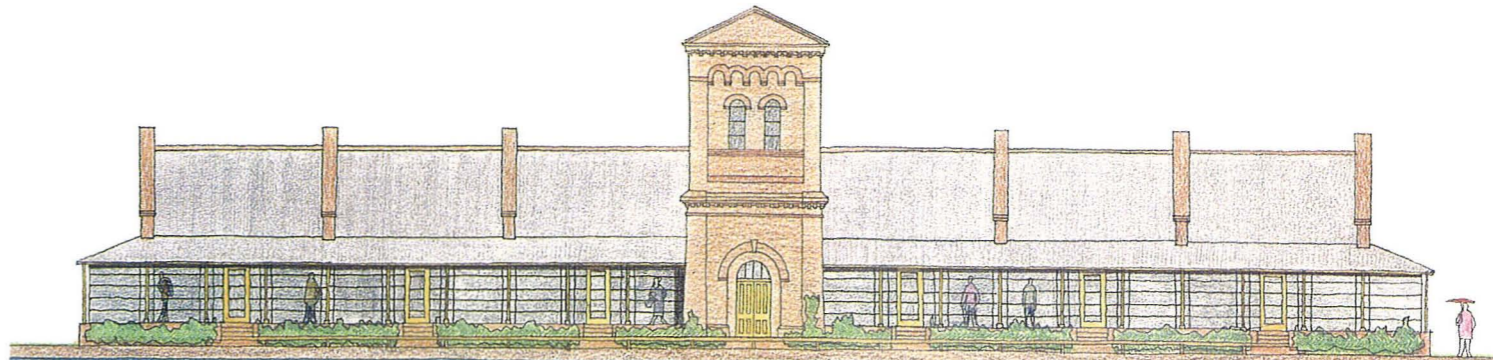
Winter 1994/95

Meeting with Lord Henley

In January 1995, the new Under Secretary of State for Defence, Lord Henley called a meeting to discuss the conclusions and recommendations of the TSC's 'Statement to Minister'. Senior officials from the Defence Lands Service and the MoD's museum advisers (Ian Robertson, Director of the National Army Museum; Sir Neil Cossons, Director of the Science Museum and Dan Chadwick, Director of the South-Eastern Museums Service) together with the advisers to the Steering Committee (PRC and Tranter Lowe) discussed the recommendations contained in the Statement.

The 'Statement to Minister' was accepted in its entirety and further instructions given by MoD

to the Trust Steering Committee's consultants to prepare a capital review and funding package over a six month period. In addition to developing the capital model for the project, the work has supported the preparation of the TSC's application to the National Heritage Memorial Fund, Lottery Unit. Lord Henley also instructed the consultants to examine the inclusion of the Private Finance Initiative (PFI) in the funding package. It was suggested that through the PFI mechanism, MoD would be assured of the 'hands-on' involvement of the private sector. It was agreed that the best way to harness the private sector would be to include the PFI as part of the sale package of the western flank – the Horsemill Stream Housing land.



THE ROYAL
GUNPOWDER FACTORY
THEN AND NOW.



AMATOL.

A mixture of trotyl and ammonium nitrate.

The proportions of the two constituents are shown by means of a fraction placed after the name, thus amatol 40/60 is a mixture of 40% ammonium nitrate and 60% trotyl, and amatol 80/20 is a mixture of 80% ammonium nitrate and 20% trotyl

AMMONAL.

An explosive used in hand grenades is ammonal. This is a mixture of ammonium nitrate, aluminium powder and organic and carbonaceous matter, usually trotyl and charcoal; e.g.

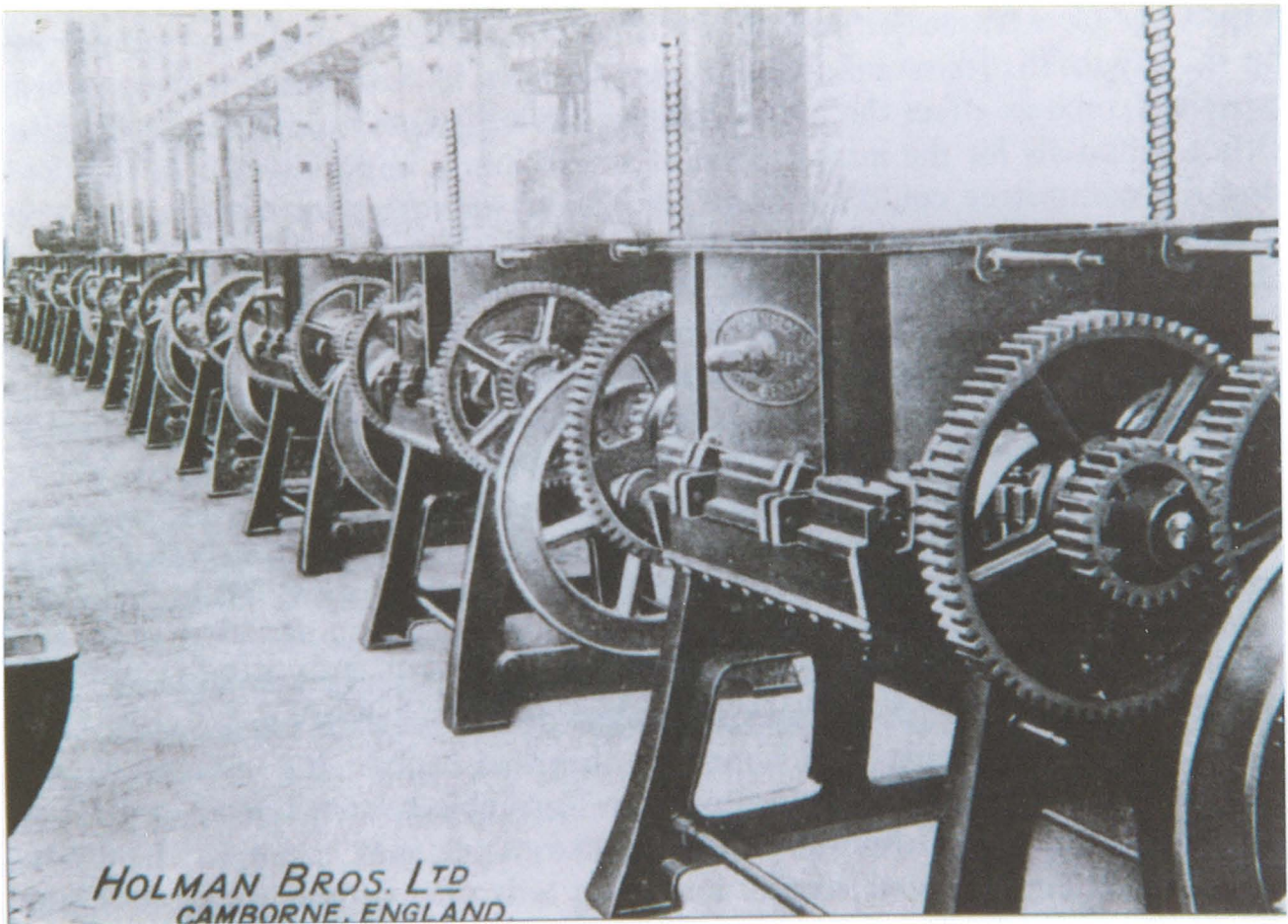
| | |
|------------------|-------|
| Ammonium nitrate | 58.6. |
| Aluminium | 21.0. |
| Trotyl | 18.0. |
| Charcoal | 2.4. |

Ammonium nitrate is itself an explosive, but can only be detonated with extreme difficulty, unless it be mixed with oxidisable matter. The mixtures made with it are not very sensitive; hence their use for military purposes. It has the disadvantage that it is very hygroscopic. Therefore these explosives must not be left exposed to the air, or they will absorb moisture and become damp and useless.

Compressed blocks are protected by being covered with paraffin wax or other waterproof material, and shells and bombs filled with these mixtures must be thoroughly sealed.

MACHINES FOR MIXING CORDITE

They had a capacity of 200 litres and were fitted with two four-bladed, horizontal shafts which could be rotated in either direction.



ROYAL ENGINEERS LAYING GUNCOTTON CHARGES.





WALTHAM ABBEY.
NORTH SITE.

Women's Hospital, 1916: below the skylight was the operating room.

GROUP A MILLS,ENGINE HOUSE
MECHANICS SHOP.
Foundation Stone 1856,erected 1857.

THE ROYAL

GUNPOWDER FACTORY

2000.



THE ROYAL GUNPOWDER FACTORY



THE ROYAL GUNPOWDER MILLS.

Production at the factory ceased during the Second World war in favour of sites less accessible to German bombers. After the war it became the principle government research establishment for investigating non-nuclear explosives, often reusing existing buildings for a second, third or fourth time. Since the site's decommissioning in 1991 the ministry of defence has undertaken its decontamination, so that access can be provided to this secret world.

Here are over 300 structures, 21 listed buildings, and a profusion of waterways, surviving in a park-like landscape of 71 hectares. More than two thirds is a Scheduled Ancient Monument, and 34 hectares are designated as a site of Special Scientific Interest including the largest heronry in Essex

WALTHAM ABBEY ROYAL GUNPOWDER MILLS.
New Hill Nitroglycerine factory, 1940.

THE ROYAL GUNPOWDER FACTORY.
GUNCOTTON DRYING STOVE 1897.

THE ROYAL GUNPOWDER FACTORY.
HAND PROPELLED WAGONS.
These were used in the process areas.

THE ROYAL GUNPOWDER FACTORY.
STEAM DRIVEN
INCORPORATING MILLS.

THE ROYAL GUNPOWDER FACTORY.
STEAM DRIVEN
INCORPORATING MILLS.

THE ROYAL GUNPOWDER FACTORY.
GUNPOWDER MOULDING HOUSE.
1882.

THE ROYAL GUNPOWDER FACTORY.
GUNPOWDER MOULDING HOUSE.
1882.

THE ROYAL GUNPOWDER FACTORY.
HYDRAULIC GUNPOWDER PRESS HOUSE
1856.

THE ROYAL GUNPOWDER FACTORY.
HYDRAULIC GUNPOWDER PRESS HOUSE
1856.

THE ROYAL GUNPOWDER FACTORY.
GUNPOWDER MIXING HOUSE
AND
SALTPETRE MELTING HOUSE 1790.



THE ROYAL GUNPOWDER FACTORY.
GUNPOWDER MIXING HOUSE
AND
SALTPETRE MELTING HOUSE 1790.

THE ROYAL GUNPOWDER FACTORY.
OLD TANGE PRESSES.





THE ROYAL GUNPOWDER FACTORY.
TANGE PRESS.

The extrusion of Cordite by means of a Tange press. In case of explosion the workers were protected by a thick curtain or a rope mat.

Note extruded Cordite on the table.





THE ROYAL GUNPOWDER FACTORY.
VICTORIAN FIRE ALARMS.

1906.

Operated by pulling a lever- which acuated a type of morse-code relayed to a central control board at the Fire Station,so showing the position of the fire.





Guncotton.

Detonator being inserted into blocks of guncotton, to be used to blow down a tree.

ROYAL GUNPOWDER FACTORY WALTHAM ABBEY.

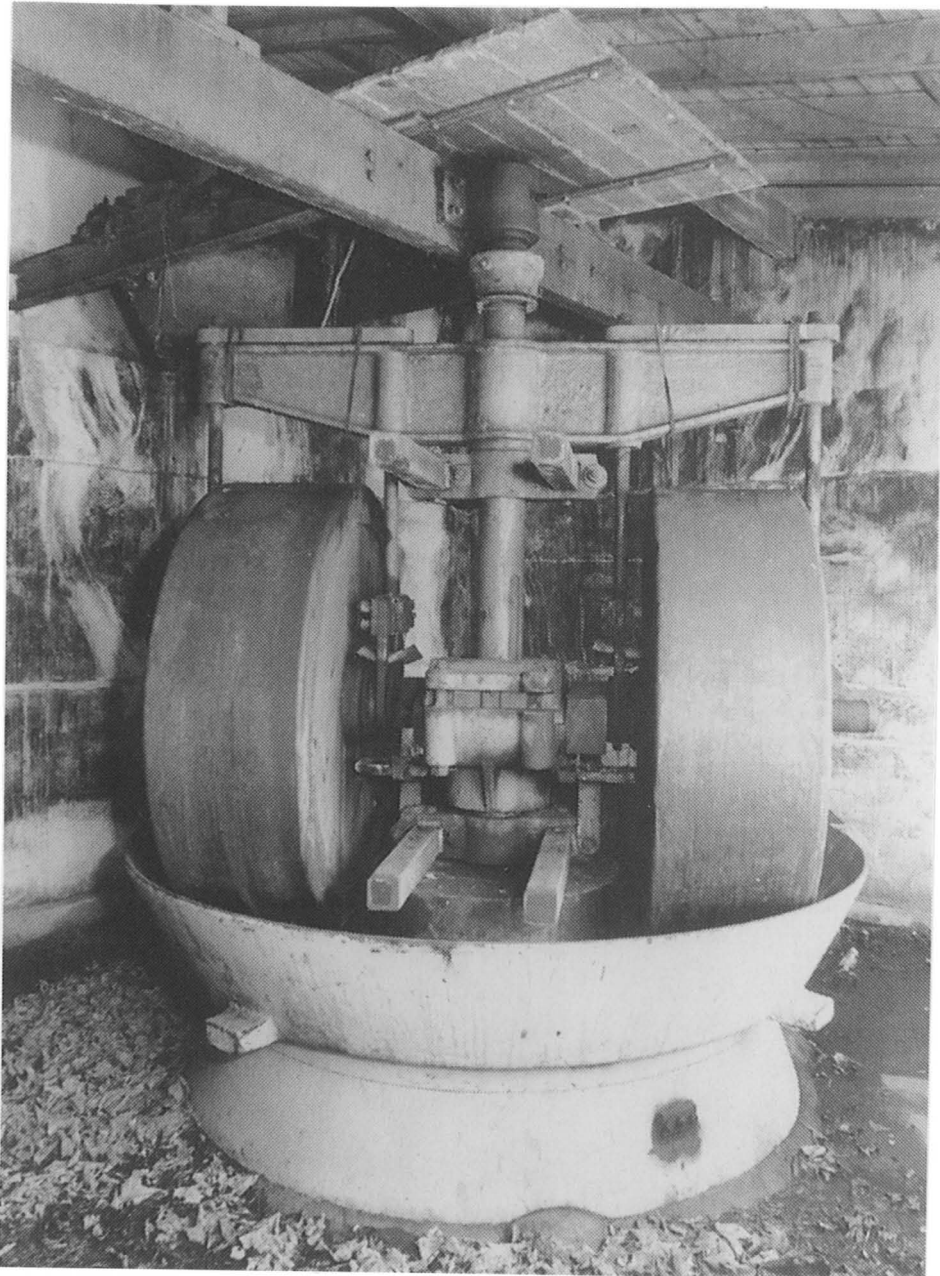
Making cylinder charcoal at Waltham Abbey, 1895. The charring of wood in airtight cylinders, from which the by-products of combustion were extracted, was developed for the government factories in the late eighteenth century by Richard Watson. Professor of Chemistry at Cambridge and absentee bishop of Llandaff.

ROYAL GUNPOWDER FACTORY WALTHAM ABBEY.

A nineteenth-century press house at Waltham Abbey. The press was powered by a hydraulic pump driven by the waterwheel. The structure behind is a protective 'traverse'. This is oval in plan with walls tapering upwards and is filled with earth to absorb the blast from any explosion.

INCORPORATING MILL.

An underdriven, electrically powered iron incorporating mill with suspended runners at Ardeer in Ayrshire. The Ardeer factory was established by Nobel's British Dynamite Company in 1872, and black powder production was moved there by ICI in the 1930s. By then the authorised mill charge was 250-lbs.



**SEND
A GUN
TO DEFEND
A BRITISH HOME**

British civilians, faced with threat of invasion,
desperately need arms for the defense of their homes.

THE AMERICAN COMMITTEE FOR DEFENSE
OF BRITISH HOMES

has organized to collect gifts of

**PISTOLS—RIFLES—REVOLVERS
SHOTGUNS—BINOCULARS**

from American civilians who wish to answer the call and aid in defense
of British homes.

These arms are being shipped, with the consent of the British Government, to
CIVILIAN COMMITTEE FOR PROTECTION OF HOMES
BIRMINGHAM, ENGLAND

The members of which are Wickham Steed, Edward Hulton, and Lord Davies

YOU CAN AID

by sending any arms or binoculars you can spare to

AMERICAN COMMITTEE FOR
DEFENSE OF BRITISH HOMES

C. Suydam Cutting, *Chairman*

ROOM 100

10 WARREN STREET, NEW YORK, N. Y.

The Firearms Acts 1920 and 1937 had so reduced the ownership of private
firearms in Britain that we found it necessary to beg gun owners in the US to
give us their guns to defend our country.

state), and place the contents of its petition as a 'proposition' on the

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ROYAL GUNPOWDER FACTORY WALTHAM ABBEY.

An explosion at the incorporating mills, Waltham Abbey, 1861. Workmen had neglected to place the customary piece of leather under the edge runners when they were being moved for cleaning, and a spark ignited the powder. Four men were badly burnt, and one of them died from his injuries. The picture shows a typical arrangement of six incorporating mills powered by a steam engine, in this case a beam engine in the tall engine house. A covered tram can be seen at the left of the picture.