



WASC 172

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WASC 172

FILE REFERENCE: AA 53709/1

SCHEDULE ENTRY COPY

ENTRY IN THE SCHEDULE OF MONUMENTS COMPILED AND MAINTAINED BY THE SECRETARY OF STATE UNDER SECTION 1 OF THE ANCIENT MONUMENTS AND ARCHAEOLOGICAL AREAS ACT 1979 AS AMENDED.

MONUMENT: Waltham Abbey Royal Gunpowder Factory

PARISH: WALTHAM ABBEY

COUNTY: ESSEX

DISTRICT: EPPING FOREST

NATIONAL MONUMENT NO: 21567

NATIONAL GRID REFERENCE(S): TL37640177
TL37670059

DESCRIPTION OF THE MONUMENT

The monument is situated on the northern outskirts of Waltham Abbey and includes intact buildings, ruins, earthworks and buried remains of parts of the Royal Armament Research and Development Establishment, formerly known as the Royal Gunpowder Factory. The remains are associated with the manufacture of gunpowder, guncotton, nitroglycerine, cordite paste and tetryl, and include a number of ancillary buildings and structures associated with these manufacturing processes. Intact buildings, ruins, earthworks and buried remains of parts of a complex concerned with producing and testing modern high explosives, parts of an extensive water management system and parts of an associated tramway and railway network are also included. The scheduling occupies two separate areas.

The site is set within and around a series of watercourses, most of which are man-made and channel the River Lea as it flows from N to S. Although the manufacture of gunpowder in the Waltham Abbey area dates back to the 1560s, there is no documentary evidence for production at this site before the mid-17th century. Between 1702 and 1787 the site was in the possession of the Walton family who developed many improvements to the gunpowder manufacturing process here. Cartographic evidence from this period indicates that these early works occupied the area known as Millhead to the W of Middle Road and Powdermill Way in the southern part of the main constraint area. Here the mills and other buildings were set on either side of a large leat fed by a branch of the Lea. Water from this leat (the Millhead Stream) was drawn off at regular intervals along its course to power the mills and was returned to the river by means of two parallel tailraces either side of the leat. These mills included stamping mills which blended the raw materials of saltpetre, sulphur and charcoal, a corning house and a glazing house, and a number of stoves for drying the finished product. There were also associated ancillary buildings, including powder magazines.

Some of these early mills were horse-powered and, in 1963, construction work in the Millhead area recovered the remains of at least two horse mills surviving beneath the ground surface. An engraving of the site in 1735 indicates that, by this date, water-powered mills either side of Millhead Stream were already in use, but water-power did not entirely replace horse-power until 1814. A number of mills along Millhead Stream, including Smeaton's Mill and Head Mills, have been located during excavation work and recent ground clearance. These remains indicate structures with a complex history
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On behalf of the Secretary of State for National Heritage.

DESCRIPTION OF THE MONUMENT (Continued)

retaining evidence for several phases of construction. The remains of Smeaton's Mill were found to include the brick foundations of a mill building which also forms the inner edge of the tailrace situated to the E of Millhead Stream. Within this mill a central wheelpit is visible, although rubble-filled. Irregular scarps on the platform between the E tailrace and Millhead Stream indicate the presence of further building remains beneath the ground surface. The remains of the mill buildings in the Millhead area are also visible above ground. The Dusing House, for example, in use between the early 18th and mid-20th century, shows a number of alterations and rebuilding phases and is represented by brick foundations either side of a central wheelpit. The wheel was powered by water from Millhead Stream and its flow was regulated by a sluice gate. The Dusing House was latterly provided with a concrete traverse (blast wall). Traverses, both standing structures and foundations, are present throughout much of the site and are constructed from a number of different materials, including brick, earth, and corrugated iron. They served an important function in minimising the damage caused to buildings by explosions elsewhere on the site. A number of roofed buildings also survive within the Millhead area, including the 18th century offices, a powder and barrel store, and washing house. These buildings are of exceptionally rare types and are intrinsic to the site's history and development. They are not, however, included in the scheduling but are protected as Listed Buildings. An important surviving group of steam-powered incorporating mills, the earliest dating from 1857, is situated to the E and SE of the area of the scheduling. This part of the site also includes associated expense magazines, ancillary structures and two accumulator towers. These buildings are Listed Grade II, II* and I and are not included in the scheduling.

In 1787 the site was purchased by the government who implemented an extensive programme of modernisation. Map evidence indicates that by the early 19th century the site had expanded northwards and eastwards, but the Millhead area continued to play an active role in gunpowder manufacture. In the N part of the site, served by an extension to the canal system, horse-powered corning houses were constructed. In the NE part of the site an oval, battered brick traverse, present on an 1806 map, remains standing. It was originally associated with a gunpowder corning mill that fell into disuse by c.1827. The mill was re-equipped with a water-powered hydraulic pump and a gunpowder press in the mid-19th century. The structures associated with this press include a single storey brick building which retains its water-driven hydraulic pump and its cast-iron water-wheel attached to the external S wall. To the N of this structure are the foundations of the press house, which retains its cast-iron gunpowder press in situ.

At the N extremity of the site, well away from other danger buildings and served by the canal, the finished powder was stored in the Grand Magazine. The final building on this site was of brick and is now partly ruined.

The saltpetre refinery which served the mills is situated approximately 265m to the S of the Millhead area in a separate constraint area N of Highbridge Street; map evidence indicates that refinery buildings were present at the site by the 1780s. Here, the saltpetre was prepared, concentrated and crystallised ready for incorporation with the other raw materials. The buried remains of the refinery survive beneath the ground surface and are included in the scheduling.

In the early 19th century, after the sale of its factories in Faversham and Ireland, the Royal Gunpowder Factory at Waltham Abbey became the only government owned gunpowder manufacturing site in the country.

By the middle of the 19th century there was a growing interest in two new

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DESCRIPTION OF THE MONUMENT (Continued)

explosives, guncotton and nitroglycerine, and in 1863 an experimental plant for the production of guncotton was set up at the site. Cartographic evidence indicates that this plant was situated on the site of the original saltpetre refinery and included a guncotton processing building. It is thought that some of the buildings associated with the saltpetre process were also adapted and reused.

The production of guncotton increased dramatically and in 1885 a new site was acquired at Quinton Hill to the south of Waltham Abbey for a larger capacity plant for the production of guncotton and nitroglycerine, a liquid explosive. In 1891 the manufacture of cordite, a mixture of guncotton and nitroglycerine, was introduced at the main site. The importance of the role of gunpowder, both as an explosive and as a propellant declined with these new innovations and, as a result, a number of buildings formerly used for gunpowder manufacture were adapted and new buildings erected, for the production of cordite. In 1895-6 a nitroglycerine factory was also built in the northern part of the site to cater for the increased demand for cordite. The manufactured guncotton from Quinton Hill was transported by barge to the main site where it was dried stoves, mixed with nitroglycerine and washed to produce cordite.

The remains of this process survive right across the site, particularly in the N and NE. Some of the most prominent features are the standing and earthwork remains of the guncotton drying stoves. These stoves typically survive as circular brick or concrete walls revetted with an earthen traverse. A timber round-house was originally located within the centre of these traverses where the wet guncotton was dried on racks for a period of approximately eight days. The concrete platform upon which the round-houses were sited is visible within a number of the stoves and several retain their metal drying racks. In 1936 a rectangular stove with 18 bays was erected for the drying of guncotton. Known as the Quinan Stove, it replaced an earlier circular stove and is thought to be the only surviving example of its type. The drying stoves were heated by hot, dry air and, in most cases, pairs of stoves were connected by cast-iron pipes to an associated engine or fan house. This system of pipework survives in parts and its remains are included in the scheduling. In several parts of the site the pipes are carried over canals by bridges which are also included in the scheduling. Many of the fan houses survive in the form of concrete floor slabs and sandstone blocks which retain vertical mounting bolts. The system of canals was extended to serve the early guncotton drying stoves, to transport the wet guncotton to the stoves and to move the dried guncotton to the mixing houses. These canals survive as partly infilled earthworks and as buried features. The guncotton stoves, which are aligned NW-SE and lie adjacent to Cornmill Stream, were also served by a narrow gauge railway network.

The 1895-6 nitroglycerine factory at the site includes the nitrator, where the nitroglycerine was produced, washing houses, a wash water settling house, mixing house and their associated traverses. A number of the support stanchions for the lead-lined gutters which carried the nitroglycerine from one process building to the next remain in situ. The nitroglycerine was moved by gravity and, therefore, the nitrator is situated on one of the highest points of the factory. In 1941, due to increased demand for explosives during World War II, a second nitroglycerine factory was constructed in the E part of the site, known as New Hill. The remains of this factory are similar in layout and construction to the 1895-6 plant, but it is thought that this second factory never became operational.

In 1910 a small plant was established at the site for the small-scale manufacture of tetryl, a booster explosive. The visible remains of this plant

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DESCRIPTION OF THE MONUMENT (Continued)

include two pairs of rectangular drying stoves which were built in 1940 and are situated in the E part of the site, to the S of New Hill. These pairs of stoves survive as standing buildings separated by breeze-block traverses. The storage lockers where the tetryl was dried remain within the buildings. The stoves were served by the light railway network. Other standing and earthwork remains of the tetryl plant include cleaning houses and a corning house. Part of the tetryl plant was situated to the NW of the area of the scheduling and immediately to the W of the site's 1895-6 nitroglycerine plant. These buildings have been demolished and, as there are not thought to be any distinctive buried remains of this part of the plant, this area is not included in the scheduling.

In the early years of World War II, the Royal Gunpowder Factory was in the forefront of explosives production, but the erection of new larger factories during this period led to a gradual transfer of production. The contribution of the Waltham Abbey site declined, with the high explosive RDX and tetryl remaining as its principal products. The Royal Gunpowder Factory closed in 1945, but reopened in the following year as an experimental station for the research and testing of modern high explosives and propellants. A number of existing buildings at the site were adapted and reused for these experiments and some new construction work also occurred. Evidence for these activities remains visible throughout the N part of the site, particularly at the New Hill nitroglycerine factory and within several of the 19th and early 20th century engine houses. Firing points were established within these structures and the steel plating, to minimise the consequent damage, survives within several buildings. The internal walls of these buildings are marked as a result of explosives testing.

Seven powder barges and three punts, which transported both the raw materials and the finished products around the site, survive in the canal beds. These barges, built of timber, copper and leather, are rare survivals in context and are included in the scheduling.

Some of the electricity insulators at the site are thought to date from c.1890 and indicate that electricity was being produced at the site prior to the construction of the central power house in 1914-15. These insulators and the poles upon which they are located provide important evidence for the early introduction of electricity at the Waltham Abbey site and they are, therefore, included in the scheduling.

The library and lecture theatre building, built in the 1960s, the late 18th century superintendent's office and the contemporary mixing house and saltpetre mill building which all occupy part of the Millhead area; the old police gatehouse and the old gas meter building, both situated on the site of the original saltpetre refinery; the lamp posts, fence posts, railings, sign posts, fire hydrants and the surfaces of all roads and pathways are excluded from the scheduling, but the ground beneath all these features is included.

ASSESSMENT OF IMPORTANCE

Gunpowder was the only explosive available for military use and for blasting in mines and quarries until the mid-19th century. Water-powered manufacturing mills were established in England from the mid-16th century, although powder had been prepared by hand for at least 200 years. The industry expanded until the late 19th century when high explosives began to replace gunpowder. Its manufacture declined dramatically after World War I with British production ceasing in 1976.

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ASSESSMENT OF IMPORTANCE (Continued)

The technology of gunpowder manufacture became increasingly complex through time with the gradual mechanisation of what were essentially hand worked operations. Waterwheels were introduced in the 16th century, and steam engines and water turbines from the 19th century. Pressing and corning were also introduced between the 16th and 19th centuries to improve the powders. Pressing improved the explosive power of the mill cake and corning broke the pressed cake into different sizes and graded it with respect to its fineness. Additional techniques were developed throughout the 17th, 18th and 19th centuries to improve the quality and consistency of the finished product, and this in turn resulted in a variety of types of powders; ranging from large coarse grained blasting powders (used in mines and quarries) to fine varieties (used, for example, in sporting guns).

Gunpowder manufacturing sites are a comparatively rare class of monument with around 60 examples known nationally. Demand for gunpowder centred on the London area (for military supply), other ports (for trade) and the main metal-mining areas. Most gunpowder production was, therefore, in Cumbria, the south west, and the south east, around the Thames estuary. The south east of England was perhaps the most important of these areas. The first water-powered mills were established here from the mid-16th century onwards and many of the major technological improvements were pioneered in the mills at Waltham Abbey and Faversham. All sites of gunpowder production which retain significant archaeological remains and survive well will normally be identified as nationally important.

The Waltham Abbey gunpowder mills are important for three main reasons: because many of the processes used in this international industry were invented and developed at Waltham, because the works survive in a remarkably complete state and because many of the structures themselves are rare nationally and internationally.

Most of the structures on the site survive in a remarkably complete state, in several cases only the matchwood components of the buildings are absent. Unusually a sequence of complete transport and power systems which connect the structures also survives in a complete condition. Although some similar structures are known at other sites, the Waltham examples are all in a much more complete state than elsewhere and quite a number (such as the press house and the Quinan Stove, for example) are thought to be unique survivals. Not only do the structures survive well, but several of them (like Smeaton's Mill, for example) were the prototypes for technologies which subsequently became standard and were exported around the world. Since the site survives so completely it is possible to trace the entire history of the gunpowder industry through the alterations and adaptations made to the structures here.

At an industrial site there is also a remarkable collection of documentary information which, most unusually, allows the functions of the various buildings and structures to be understood in great detail.

The Waltham Abbey site is further distinguished from others by the quality of the surviving remains of the guncotton, nitroglycerine and cordite industries, which replaced gunpowder for most military purposes at the turn of the 19th century. Again the structures of these related industries survive in a near complete condition. Many of them are thought to be unique to this site (the drying kilns of the late 1870s, for example) and, as with the gunpowder industry remains, there are several structures which were the earliest examples in the world, within which the whole industry was invented and developed. These structures also have accompanying documentation which adds to the significance of the surviving remains.

Finally, the site at Waltham has several other features of interest such as

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ASSESSMENT OF IMPORTANCE (Continued)

the unique surviving components of the tetryl works and the interesting adaptations undertaken to the site during the initial years of the British rocketry programme.

MAP EXTRACT

The site of the monument is shown on the attached map extract outlined in black and highlighted in red.

MONUMENT INCLUDED IN THE SCHEDULE ON 26th November 1993

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On behalf of the Secretary of State for National Heritage.

21567

MPP45/ AA 53709/1

ACKNOWLEDGEMENT OF RECEIPT OF SCHEDULE ENTRY

Please help us by completing the following and returning it to English Heritage using the pre-paid envelope provided.

I acknowledge receipt of notification of scheduling.

I hereby confirm that

I am the owner
occupier

(please delete if not applicable)
of the whole of the area of the monument indicated on the attached
map extract

of that part of the area of the monument which I have indicated on
the attached map extract

Signed

Name

Address

Date

DETAILS OF OTHER PART OWNERS/OCCUPIERS

(PLEASE IGNORE THIS PART OF THE FORM IF IT IS INAPPROPRIATE OR IF YOU HAVE
ALREADY SUPPLIED US WITH THE INFORMATION)

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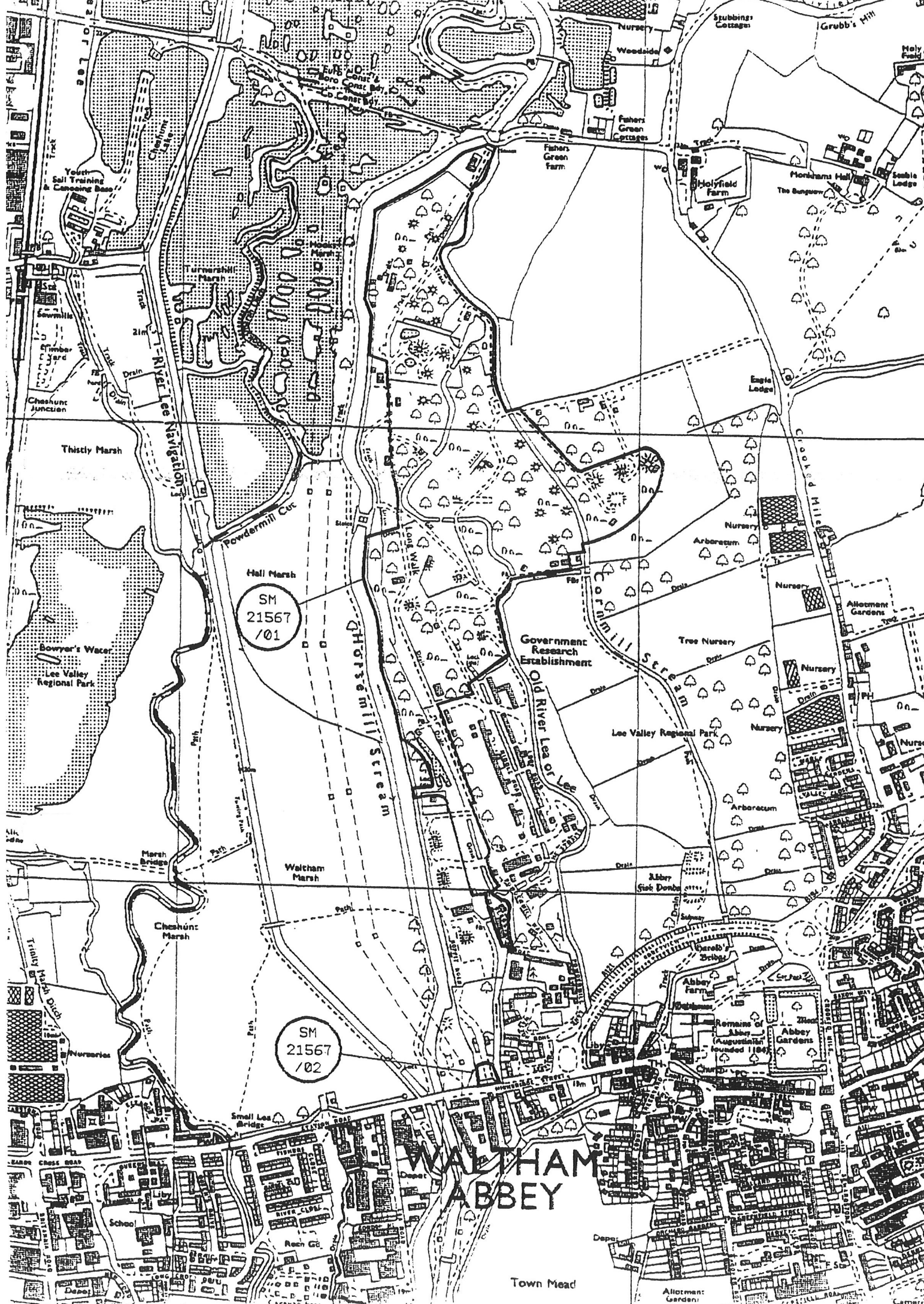
Address

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SM 21567 /01

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WALHAM ABBEY

Town Mead

Allotment Garden