

## ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND

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## HISTORIC BUILDING REPORT

RAF Misson Springs Road Misson Nottinghamshire

3 March 1997

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### **ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND**

Nottinghamshire

NBR No: 95774

Misson

NGR: SK 7056 9766

**Springs Road** 

**RAF Misson** 

#### SUMMARY

The site consists of a Bombing Range, Surface to Air Guided Weapon (SAGW) site and a Training Area. RAF Misson was originally established as a bombing range during the Second World War. Post War, the area continued to be used for military training and has continued to be used as such, until the mid 1990s. The surface-to-air guided weapons site was built circa 1959/60, as one of nine 'Stage 1' SAGW sites guarding the nuclear deterrent force. The site is situated on low-lying ground, 9-km (5.5 miles) southeast of Doncaster. The site consists of a total of sixty-four structures/features, which include thirty-two missile standings, and various maintenance and control buildings, all of which are enclosed by a chain-link perimeter fence.

#### HISTORY

RAF Misson was established as an inland bombing range during the Second World War. It's origins may date back to 1939, when No.5 Group Pool at RAF Finningley (NBR No. 95121) acquired the role of operational training for the Volunteer Reserve and Hampden bomber crews. It was certainly used by No. 25 Operational Training Unit (OTU), which operated from RAF Finningley between February 1941 and January 1943. Responsibility for the bombing range fell to No. 18 OTU in March 1943, which used its facilities until late 1944, when it was passed onto the Bomber Command Instructor's School (BCIS).

The precise date at which the bombing range went out of use has yet to be established; it was certainly still being used for air gunnery in May 1948 and fresh bomb craters can be seen on aerial photographs taken in September 1948. It is doubtful if the bombing range continued in use much after this date, as no additional bomb craters can be discerned on later aerial photographs.



During the 1950s a considerable amount of thought was given to the air defence of Great Britain, culminating with the issuing of the 1957 Defence White Paper. This document marked a distinct shift in British defence policy, emphasising the concept of 'Nuclear Deterrence' in preference to direct defence. It indicated the government's intention that due to the fact that no air defence system was one hundred percent effective, substantial reductions could be made in the strength of Fighter Command. In addition, it advocated the use of surface-to-air guided weapons (SAGW) to protect the deterrent forces, rather than fighter aircraft.

As a direct consequence of the proposals outlined in the Defence White Paper, the RAF went ahead with plans to use Bristol Bloodhound Mk I surface-to-air guided weapon (SAGW) system, to protect the V-force medium bomber stations, and the Thor intermediate range ballistic missile (IRBM) bases. Trials of the complete missile system, with its attendant Type 82 tactical control radar (TCR) and Type 83 target illuminating radar (TIR), were undertaken in 1958 at North Coates, Lincolnshire.

Even before the Bloodhound MkI missile had become operational, it had been recognised that the system was flawed, and development work had commenced on a MkII version. The problem lay with the missile's pulsed radar guidance system. Pulsed radar works on the basis of an extremely short transmission, followed by a brief period of silence, in which, to determine the range of the target, the reflected signal can be detected and the time elapsed measured. Unfortunately, pulsed systems have two major drawbacks: the signal can be jammed relatively easily, and, when operating at low level, the signal tends to get broken up by ground returns (reflections from objects on the ground). As a result, the Bloodhound MkII was designed around a continuous-wave radar system, which detects a moving target, by the constantly changing frequency of the returned signal or Doppler effect.

While the development of the Bloodhound MkII was going ahead, there remained an urgent need to provide some degree of protection for the nuclear deterrent forces and the decision was taken to go ahead with installation of Bloodhound MkI SAGW. Eleven sites where chosen in the eastern counties of England, stretching from Carnaby in the East Riding of Yorkshire, through to Rattlesden, Suffolk.

Construction work commenced on the missile site at Misson, circa 1959/60. It was located adjacent to Springs Road, on the western edge of the former bombing range. The site consisted of two fire units, each equipped with sixteen Bloodhound Mk I missiles and two Yellow River (Type 83) target-illuminating radars (TIR). The site became operational towards the close of 1960, manned by No. 94 Squadron, who formed on 1st October, under the auspices of No. 21 Wing, 11 Group, Fighter Command. The squadron was sub-divided into four flights; two flights forming a fire unit. The two fire units

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were provided with long-range target data from the Type 82 tactical control radar at No. 21 Tactical Control Centre, RAF Lindholme (NBR No. 95649).

The operational life of RAF Misson was very brief, the site being closed, just two and a half years after its opening. The missiles were withdrawn during the late spring and early summer of 1963, and 94 Squadron disbanded on the 30th June 1963. The site's closure was due in part to the early obsolescence of the Bloodhound Mk I pulsed radar guidance system, but primarily as a consequence of the removal of the joint US and British nuclear deterrent Thor IRBM missiles. In the meantime, the Army had commenced using part of the former bombing range as a training area in 1962. It appears that the Army's usage of the area was at a low intensity and no new buildings were erected.

Although the missile site was closed in 1963, RAF Misson was retained in MoD ownership until 1969, when it was included, as a part of an overall disposal of 246.86 hectares (600 acres) of the peripheral land around the former bombing range. The Bloodhound site was sold to L. Jackson & Co., who have operated a surplus MoD vehicle and equipment dealership on the URocket Site' since that time; the remainder was returned to agricultural use.

The 84 hectares (207 acres) of the Misson Army Training Area did not feature in the sale and continued to be retained by the MoD. Approximately 4.8 hectares (110 acres) of the site consisted of good agricultural land, which was let to a local farmer, while the remainder was rough scrub. No boundary fence was erected, as the original field boundaries and drainage ditches served the purpose. A fenced vehicle compound was erected near to the southwest corner of the Army Training Area, near to the small bridge that permitted access from Levels Lane.

The detritus left on the wartime bombing range was gradually removed from the training area during the late 1970s and the RAF eventually issued a clearance certificate on the 13th July 1979. The training area continued to be given occasional use by the Army until 1995, when they undertook their own explosive ordnance disposal inspection. A clearance certificate was issued early in 1996, permitting the site to be placed on the disposal list on the 7th May 1996.



#### DESCRIPTION

RAF Misson/Misson Training Area is situated on low-lying ground, approximately 4 metres (13 feet) above Ordnance Datum. It is located approximately 3 kilometres (1.75 miles) northeast of Misson village and 9 kilometres (5.5 miles) east of Doncaster. The site occupies a roughly triangular shaped parcel of land, with an area of 84 hectares (207.5 acres). 78.9 hectares (195 acres) of this site have been declared a Site of Special Scientific Interest (SSSI) by English Nature, on the 28th February 1997.

#### Bombing Range

At its fullest extent, the Second World War bombing range occupied 326.81 hectares (807 .5 acres) of land. It consisted of a trapeze shaped area, bounded to the north by Snow Sewer, to the east by the South Idle Drain, to the south by Cow Pasture Drain and to the west by Springs Road. The range was entered on the western side, via a lane off Springs Road, north of Misson Springs Cottage. The lane continued across the impact area to the eastern boundary, a little south of Fountain Farm.

The range was controlled from a quadrant tower some 50 metres (164 feet) northeast of Misson Springs Cottage. Adjacent to the tower was a 4.87 metre (sixteen foot) span Nissen hut, a latrine, an air raid shelter, information squares, and a concrete range direction arrow pointing towards the south east (ie the centre of the range). The target marker was sited in the centre of the range; it was aligned to the north and consisted of a concrete equilateral triangle with a hollow triangular centre. An earthen bank gun butt for air to ground fire, was located in the field to the east of Levels Farm.

The air raid shelter is the only structure that survives intact from this phase. It is a low single-storey, single room,  $3.05 \times 6.10$  metres (10 x 20 feet) rectangular plan structure, of fair-faced English bond brick construction. The reinforced concrete roof is shouldered and has a slightly raised ridge. It is ventilated at floor level by two ceramic drainage pipes in the east and west walls. The doorway is located in the south wall and is protected by a freestanding brick blast wall. An emergency exit, consisting of a square of dry-laid brickwork, is located in the north wall.

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#### Bloodhound MkI Surface-to-Air Guided Weapons Site

RAF Misson consists of a complex of thirteen buildings, three 68,189 litre (15000 gallon) static water tanks, four target illuminating radar (TIR) caravan hardstandings and two groups of sixteen missile hardstandings. The site is contained within a reversed 'L' plan chain-link perimeter fence. Access to the site is provided by a concrete road that enters via a gate in the southwest projection of the perimeter, which is flanked by the electricity intake substation. Two secondary galvanized steel gates adjacent to the picket post (guard room) close the road.

The Picket Post currently functions as an office. It is a single-storey, rectangular plan structure, of fair-faced stretcher bond, brick cavity-wall construction, with a secondary false pyramidal grey tile roof. Bargeboards partially obscure the original flat reinforced concrete roof. A verandah carried on brick pillars was formerly located against the north elevation. The spaces between the pillars of the verandah have been bricked-in and glazed, to provide additional office space. The structure is currently entered by a doorway in the blocking of the verandah opening in the east elevation.

The Station Headquarters and the Air Ministry Works Directorate (AMWD) Building stand beyond the picket post. The two buildings have identical construction and a similar appearance to that of the picket post, the only differences are in the roof types and ground plans; the headquarters having an 'L' plan and the AMWD building a square plan. Both currently function as offices.

The road widens to the north of the headquarters building to permit parking. Adjacent to the east elevation of the AMWD building, a narrow spur-road branches off the access road in a southerly direction, to an angled rectangular concrete hardstanding. The function of this hardstanding has not been determined.

Continuing along the access road in an easterly direction, concrete footings to the north of the parking area indicate the former position of a Refuelling Building and oil catch pit. To the south of this point, a concrete hardstanding flanked by a 68,189 litre (15000 gallon) emergency water supply tank, allows access to the missile servicing building.

The Missile Servicing Building is a tall single-storey, eight-bay long, rectangular plan structure, of steel frame construction clad in corrugated aluminium sheeting, with two parallel single-aisle Fink Truss roofs, divided by a central valley. The east wall is of fair-faced Flemish bond brick construction, with two stretcher bond construction annexes. The original flat reinforced concrete roofs over both of the annexes have been enclosed by secondary mono-pitch corrugated sheeting clad roofs. The diesel generator room and the electrical switch room occupied the southern annexe. The northern annexe

originally consisted of three hydraulic plant rooms, and a heating and ventilation (H+V) plant room. Three timber louvered ventilation ducts remain in the north elevation. The H+V plant room occupies the southern end of the northern annexe. It retains its flat concrete roof, which is approximately 1.67 m (5 ft 6 in) higher than the concrete roof over the remainder of the annexe. A service road runs down the east side of the missile servicing building, permitting access to the annexes and a fuel storage area opposite the plant room.

The interior of the Missile Servicing Building is entered via pair of tall rolling steel doors in the north elevation, of the west range. The northern three bays of the west range form a missile handling area, containing a steel framed gantry crane, capable of lifting a safe working load of 2,032 kilogrammes (2 tons). A doorway with a 3.35 metre (11 foot) clearance permits access into the servicing area, which occupies the southern five bays of both the east and west ranges of the building. The west and south walls of the west range are lined with single storey brick offices, workshops, latrines etc. The northern three bays of the east range functioned as the stores, with a timber serving counter spanning the full width of the range. Ducting from the plant room provided ventilation. Natural lighting is provided by fixed, sixteen-light, steel windows in the walls and by skylights in the roof. Artificial illumination is provided by Imagazine standard' electrical lighting.

A little to the northeast of the Missile Servicing Building, the access road forms a cross. A service road (mentioned above) branches off to the south; to the north the road permits access to the Missile Fire Units and the road, which continues eastwards leads to a loop that passes through the isolated Armoury Shed.

The Armoury Shed is currently used as a paint spray shop. It is a tall singlestorey, 6 x 4 bay rectangular plan structure, of steel framed construction, clad in secondary plastic-coated corrugated steel sheets, with a 30.5 cm (1 foot) thick flat reinforced concrete roof, carried on eight substantial steel girder beams. This is an unusual arrangement for a frangible building, as the roof would force the blast of any accidental detonation to radiate outwards, rather than upwards, which is the more usual practice. As originally built, the walls were of concrete with 'Hy-Rib' expanded steel reinforcement.

A large vehicle doorway exists in the east and west walls, permitting a vehicle to pass through the building on the loop-road. Two small single-storey, rectangular plan annexes, of English garden wall bond brickwork, with flat asphalted reinforced concrete roofs, flank the doorway in the west elevation. The south annexe functioned as an electrical switch room and heating unit, and the north annexe as the armoury store/workshop. The roofs of the annexes are noteworthy, in that the verges that face the roadway are raised to force the fall of rainwater in the opposite direction, and the roofs project approximately 45 cm (1.5 foot) beyond the walls. Internally, the Armoury Shed consists of a single room. Natural lighting is provided by corrugated clear plastic deadlights in each bay and fluorescent tubes provide artificial lighting. Angle plates on the wall stanchions carry rails for two Matterson travelling cranes, dated 1960. The cranes are moved manually and have a safe working load of 508.02 kilogrammes (0.5

moved manually and have a safe working load of 508.02 kilogrammes (0.5 ton). The floor is of non-grit asphalt, anti-static magazine type, with integral earthing straps.

Returning to the loop-road, it passes a small brick built Officers' and Airmen's Latrine, a 68,189 litre (15000 gallon) static water tank and a small Pyrotechnic Store, before returning to the crossroads. Proceeding towards the Missile Fire Units, the first building encountered is the Hydrogen Store and Filling Room used to prepare balloons for calibration of the TIR radars. This building is a single-storey, approximately  $4.5 \times 3.05$  metres ( $15 \times 10$  feet) rectangular plan structure, of fair-faced English garden wall bond brickwork, with a flat asphalted roof. A double and a single doorway, allowing access to the two chambers pierce the west elevation. Glazed panels provide natural illumination over each of the doorways, and louvered aluminium panels in the other elevations provide ventilation.

RAF Misson has two identical Missile Fire Units. Each originally consisted of, an Officers and Airmen's Mess, two target illuminating radar (TIR) hardstandings, a Maintenance and Engineering Building, a Launch Control Post, and sixteen hardstandings for Bloodhound MkI SAGWs.

All features remain extant on both Fire Units, apart from the messes; however, the Launch Control Posts and the Maintenance and Engineering (M+E) Buildings have been substantially altered in appearance by the insertion of windows, and the blocking up and creation of doorways. Both building types are of identical construction, being single-storey, rectangular plan structures of fair-faced, stretcher bond, cavity-wall brick construction, with flat asphalted reinforced concrete roofs.

Each Launch Control Post has a secondary external latrine, built against the south elevation, at the southeast corner. The Launch Control Costs were built to house duplicate communication and control equipment for two flights of eight missiles. The missile engagement controllers for each flight were able to view the missiles through a pair of small armoured glass windows in the east elevation.

Electrical power for each fire unit was obtained direct from the National Grid, with an electricity distribution centre protected by a 9.14 x 1.52 x 1.82 metres (30 x 5 x 6 foot) high concrete block blast wall, adjacent to each of the (M+E) buildings. Internally, each M+E building would have housed two stand-by diesel generators, air compressors, and various ancillary equipment.

RAF Misson was equipped with two Fire Units. A Fire Unit consisted of two flights of eight Bloodhound Mk I SAGWs (total of sixteen missiles) arranged around a square loop-road, accessed by a central roadway, which passed between the LCP and the M+E building. Each missile would have been mounted on a launcher, which was secured to a holdfast at the centre of an octagonal plan reinforced concrete hardstanding, accessed by a spur off the loop road.

The steel holdfast sockets for the missile launchers are identical to those used by '3.7 inch' and '4.5 inch' heavy anti-aircraft guns during the Second World War. A cable duct is recessed into the floor of the hardstanding and extends back from the launcher services coupling pit in the centre of the holdfast, to a rectangular platform that projects on one side of the emplacement.

The platform has ten threaded holdfast bolts cast into its surface, which would have received a Launcher Plant Assembly (LPA) Mk 1A. The LPA was a rectangular steel box, which housed equipment that provided cooled air, electrical power and hydraulic pressure directly to both the launcher and the missile. Immediately to the rear of the LPA platform the cable duct is straddled by a pair of galvanized steel girders that originally supported a steel box called a Cable Termination Pillar. The Cable Termination Pillar contained a junction box for the 415 volt 50 cycles 3 phase electrical supply for the LPA, two 230 volt 13 amp servicing sockets, the various electrical connections linking the LCP and the LPA, and a 230 volt 60 watt heating unit. The cable Termination Pillar, which allows access to the cable ducting from the LCP and the M + E building.

#### Bloodhound MkI Surface to Air Guided Missile

The Bristol / Ferranti Bloodhound MkI was the first British surface to air guided weapon (SAGW) to enter service. The missile was originally conceived in response to a requirement issued by the Army in 1950, when contracts were placed with different contractors to develop two guided weapons, Red Duster and Red Shoes. Red Duster eventually became the Bloodhound Mk I. Both weapons were to be radar-guided, using an internal scanning receiver, which 'locked' onto a target that was 'illuminated' by a transmitting radar on the ground (ie it was semi-active homing weapon).

The Billuminating' radar was developed from the existing Anti-aircraft No. 3 Mk 9 gun-laying radar or Yellow River, known as the Type 83 in RAF service. This radar had the ability to produce a wide beam for target acquisition, and a narrow beam for tracking and illumination. With ever increasing aircraft speeds, it was essential that the Type 83 target illuminating radar (TIR) was locked onto its allocated target as quickly as possible. To achieve this aim, the Type 83 radar sets at RAF Misson, were allocated or 'put-on' to hostile plots by the Target Selection Officers (TSO) at No. 21 Tactical Control Centre RAF Lindholme, using information provided by the long range Type 82 tactical control radar (TCR).

The design of the missile was carried out by the Bristol Aeroplane Co. (absorbed into BAe) and Ferranti Ltd., the latter being responsible of the guidance systems and the launch control post equipment. The Bloodhound MkI missile had an overall length of 7.67 m (25 ft 2 in), consisting of a cylindrical body with a pointed dielectric ogival nose cone. It was divided into a forward pressurised guidance bay, containing the radar receiver dish and the missile's electronic controls, and a rear section, which contained the warhead, fuel tanks, and an auxiliary equipment bay. This latter compartment housed the fuel pumps, high-pressure hydraulic accumulators, hydraulic pumps and the Mach number control unit.

Two Bristol Siddeley Thor ramjet motors were fixed on pylons above and below the missile and four Royal Ordnance Factory (ROF) Gosling solid booster rocket motor with large canted stabilising fins, were equi-spaced around the main body. The rocket motors were pinned down by a thrust yoke at the tail of the missile and were held in place against the centre section by ring brackets.

On ignition, a total thrust of 45,360 kilogrammes (100,000 pounds) was developed by the ROF Gosling motors, which, given that the missile only weighed 1,814kilogrammes (4,000 pounds), resulted in the Bloodhound shearing its launcher bolts and attaining 0 - 1,200 Km/h (0 - 760 mph); the speed of sound within its own length. Once at Mach 1, the two liquid fuel Thor ramjet engines ignited and four seconds after launching, the Gosling rockets accelerated the missile to Mach 2.5, by which time the motors had burnt out.

At the end of the boost phase of the launch, the fins generated radial lift, which forced the forward end of the rocket motors to lift away from the missile body, automatically unlocking the control surfaces. At burn-out, the aerodynamic drag on the rocket motors forced them to slide rearwards as a unit, until they separated from the thrust yoke and 'petaled' outwards to fall away. From this point onwards, to a maximum range in excess of 80 kilometres (50 miles), the missile was powered on its interception course by the pair of Thor ramjets. In reality, due to the possible evasive actions taken by the target, the range at which an interception would have taken place, would have been nearer 32 kilometres (20 miles).

While in flight, the missile was controlled by its Ferranti guidance equipment, which obtained the pitch and yaw information from the radar receiver, and processed it to control the hydraulic system that actuate the all-moving monoplane wings. The wings were moved asymmetrically for roll, and symmetrically to control pitch. The Bloodhound used a proportional navigational course to intercept its target; ie the rate, at which the weapon changed its course, was proportional to the rate of change of the angle of sight between the missile and the enemy aircraft. Thus, although the radar receiver dish was pointing directly at the target, the guidance system was steering the missile to a predicted interception point along a continually adjusted course, dependant on the enemy aircraft's movements.

Although the missile guidance system had been proved to be sufficiently accurate physically to strike a target aircraft, the warhead was detonated by a proximity fuse, rather than by impact. The Bloodhound missile could be armed with one of two types of warhead: high explosive (blast) or continuous rod. Using the latter type, the destructive effect was not only caused by the explosion itself, but by the scattering effect of a layer of metal rods around the warhead, which formed a 37 m (120 foot) diameter spinning mass around the point of detonation, somewhat akin to a circular saw.

Visited by: Report by: 35 mm Photography by: Drawn Archive: Roger J C Thomas, March 1997. Roger J C Thomas. Roger J C Thomas. Allan T Adams.

### ACKNOWLEDGEMENT

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## Schedule of Surviving Structures / Features, RAF Misson, 03 March 1997.

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Bldg.No.	Structure / Feature	NGR
(WWII Bombing Range)		
-	Air Raid Shelter	SK 7031 9790
(SAGW Site		
1	Electricity Intake Sub-station	SK 7022 9747
2	Picket Post	SK 7022 9743
3	Station Headquarters	SK 7025 9742
4	Air Ministry Works Directorate Bldg.	SK 7027 9742
5	15000 Gallon Static Water Tank	SK 7029 9742
8	Missile Servicing Building	SK 7032 9738
10	Pyrotechnic Store	SK 7053 9736
11	15000 Gallon Static Water Tank	SK 7058 9734
12	Officers' and Airmen's Latrine	SK 7057 9733
13	Armoury Shed	SK 7059 9731
15	Maintenance and Engineering Building	SK 7042 9765
. 16	Launch Control Post	SK 7042 9767
17	Latrine	SK 7043 9776
18	15000 Gallon Static Water Tank	SK 7043 9779
19	Maintenance and Engineering Building	SK 7046 9787
20	Launch Control Post	SK 7047 9789
21 - 36	Missile Hardstandings (feature centre)	SK 7061 9785
37	Target Illuminating Radar Hardstanding	SK 7040 9762
38	÷ ; ;	SK 7042 9772
39		SK 7044 9784
40		SK 7046 9794
41 - 56	Missile Hardstandings (feature centre)	SK 7057 9764
57	Hardstanding	SK 7042 9772
58	Hydrogen Store & Filling Room	SK 7038 9751

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# Schedule of Structures / Features RAF Misson (SAGW site), c1960

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<u>Bldg. No</u>	Function	AMWD Drg. No.
1	Electricity intake sub-station	•••••
2	Picket Post	* * * * * * * * * *
3	Station Headquarters	
4	Air Ministry Works Directorate bldg.	11314B-58
5	15000 Gallon fire reserve storage tank	7564A-58
6	Refuelling	2311B-58
7	Oil storage catch-pit	2017B-58
8	Missile servicing building	2452B-58
9	Oil storage catch-pit	2453A-58
10	Pyrotechnic Store	9487A-58
1.1	15000 gallon fire reserve storage tank	7564A-58
12	Officers & Airmen's latrine	7797A-58
13	Armoury Shed	3195B-58
14	Officers & Airmen's Mess	301-60G
15	Maintenance & Engineering building	6777-59G
16	Launch Control Post	2313B-58
	2556-61G	
17	Latrine	7797A-58
18	15000 gallon fire reserve storage tank	7564A-58
19	Maintenance & Engineering building 6777-59G	2313B-58
20	Launch Control Post	2556-61G
21 to 36	Standings	10669-59K
37 to 40	Standings	4554B-58
41 to 56	Standings	10669-59K
57	Standing	•••••
58	Hydrogen Store & Filling Room	10448-56
59	Oil trap	6131-53
60	Oil trap	6131-53
61	Electricity Distribution Centre <sup>IA</sup>	14610A-56
62	Electricity Distribution Centre <sup>OB</sup>	14610A-56
63	Electricity Distribution Centre <sup>DC</sup>	14610A-56
64	Electricity Distribution Centre <sup>0D</sup>	14610A-56

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The National Monuments Record contains all the information in this report – and more: original photographs, plans old and new, the results of all RCHME field surveys, indexes of archaeological sites and historical buildings, and complete coverage of England in air photographs.



The Royal Commission on the Historical Monuments of England gathers information on England's heritage and provides it through the National Monuments Record

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